

## Research Paper

# Finding common grounds for conflict resolution through value analysis of stakeholders around the socio-ecological crisis of the Mar Menor coastal lagoon (Spain)

Carolina Boix-Fayos<sup>a,\*</sup>, Javier Martínez-López<sup>a,b,c</sup>, Juan Albaladejo<sup>a</sup>, Joris de Vente<sup>a</sup>

<sup>a</sup> Soil and Water Conservation Research Group, CEBAS-CSIC, National Research Council, Campus de Espinardo 25, 30100 Murcia, Spain

<sup>b</sup> Department of Ecology, Faculty of Science, University of Granada, 18071 Granada, Spain

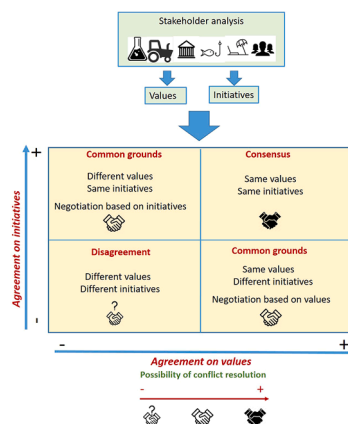
<sup>c</sup> Instituto Interuniversitario de Investigación del Sistema Tierra en Andalucía (IISTA), Universidad de Granada, Avda. del Mediterráneo s/n, E-18006 Granada, Spain



## HIGHLIGHTS

- Value analysis provides insight in complex interactions in socio-ecosystems.
- Aligning with stakeholders' values strengthens social acceptability of decisions.
- Main values related to emotional heritage, education and governance.
- Stakeholders prioritized governance respecting nature and cultural landscapes.
- We propose a values-based model to identify common ground for negotiation.

## GRAPHICAL ABSTRACT



## ARTICLE INFO

## Keywords:

Values  
Socio-ecological system  
Stakeholder analysis  
Conflict resolution  
Environmental management  
Coastal lagoon  
Mar Menor

## ABSTRACT

Aligning with people's values in landscape political decisions can help to minimise conflicts between stakeholders and support social acceptability of solutions for systemic transitions. This paper explores how shared and diverging values of the main stakeholders involved in socio-ecological crises, and the co-creation of solutions, can be key for finding common grounds for conflict resolution and sustainable socio-ecosystems management. These concepts were applied by a participatory process to identify and select solutions for the environmental and socio-economic crisis of the Mar Menor coastal lagoon and its watershed (SE Spain). With information from six sectorial workshops and one multisector workshop, a stakeholder analysis based on values and initiatives was performed. The results indicate that all the stakeholder groups prioritised transition to governance, economic and educational models that respect nature and cultural landscapes, with values aligning with the population's identity and their livelihoods. The values and solutions linked with stakeholders 'Farmers', which represented

\* Corresponding author.

E-mail addresses: [cboix@cebas.csic.es](mailto:cboix@cebas.csic.es) (C. Boix-Fayos), [javier.martinez@ugr.es](mailto:javier.martinez@ugr.es) (J. Martínez-López), [jalba@cebas.csic.es](mailto:jalba@cebas.csic.es) (J. Albaladejo), [joris@cebas.csic.es](mailto:joris@cebas.csic.es) (J. de Vente).

the dominant model of high intensive agriculture in the area, differentiated most from the other stakeholders directly affected by the impact of their activities, such as 'Fishers and salt producers', 'Tourism sector' and 'Local population'. Despite marked similarity in the underlying values among most stakeholders, reaching an agreement on initiatives can still be difficult. Therefore, we propose a conceptual model to find common grounds for negotiation based on shared values and initiatives. In those cases in which no common ground is found and disagreement persists, rules and enforcement are needed to protect all stakeholders' sustainable development and livelihood.

## 1. Introduction

The way in which people relate to nature is mediated by their values that, in turn, condition their behaviour. Both values and behaviour can provide key insights into the social dimension of socio-ecological systems (Jones et al., 2016). Therefore, the co-design of solutions for sustainable management of socio-ecosystems can benefit from finding alignment with people's values (Chapin et al., 2009). It is expected that this can help to minimise conflicts between stakeholders and facilitate social acceptance of decisions (Ives and Kendal, 2014). As defined by Schwartz (1994; 2012), a person's value refers to the belief regarding desirable end-states or modes of conduct and guides the behaviour and interaction with other people and events. Each value is ordered by importance in relation to other values to form a system of value priorities. Lubchenco et al. (2019) explain how the analysis of multiple values helps to understand complex interactions in socio-ecological systems by considering environmental, social, economic and cultural aspects.

Incorporation of value analysis into environmental, behavioural and natural resources research and decision-making processes has advanced in the last decade (Bryan et al., 2010; Larson et al., 2013; Fales et al., 2016; Goggin et al., 2019; Laurila-Pant et al., 2019; Lithgow et al., 2019; Boix-Fayos et al., 2020). Various studies have illustrated how value analysis can support constructive dialogue and mutual understanding between stakeholders by focussing on what is valued, by creating narratives that promote positive change in socio-ecological systems, by adapting scientifically-driven management strategies to the social context, and by reducing conflicts through adaptive co-management or stewardship of socio-ecological systems (e.g. Kofinas, 2009). Including social values in a decision-making process can expand the benefits of sustainable environmental management beyond environmental and economic values, and can thereby strengthen the engagement of stakeholders in the planning process (Bryan et al., 2010; Raymond et al., 2009), with specific examples of civic engagement on coastal management (Anthony et al., 2009). On the contrary, insufficient understanding of stakeholders' values and perceptions may lead to management decisions based on limited or incorrect information (Lithgow et al., 2019) and, ultimately, to failed management strategies due to limited ownership, acceptance and adoption of solutions by stakeholders (Martínez-López et al., 2019a). Nevertheless, value analysis is still not fully incorporated into natural resources research or environmental decision-making processes, despite the benefits that it can provide (Jones et al., 2016).

The severe environmental crisis of the 'Mar Menor' coastal lagoon (SE Spain), that started by marked environmental degradation, has become a socio-economic crisis in recent years with serious social, ecological and economic consequences. Increasing human impacts from large expansions of irrigated agriculture since the 1980s, growth of mass tourism, and contamination from historic mining activities in the area have strongly affected the surface and groundwater quality and quantities, and have resulted in an ecological crisis that affects the tourism potential and local housing prices. Recent research (Cabello and Brugnach, 2023) has explored the different narratives surrounding the lagoon's environmental crisis that dispute the centrality of agriculture as driver of eutrophication. The two co-existing narratives, supported by different stakeholder groups, agree on the severity of the lagoon's eutrophication problem, but differ in the why and how it occurred.

Nowadays conflicts and confrontations between stakeholders, regional and national governments, are making it very difficult to reach a consensus about the development of sustainable management and restoration plans for the area. The Mar Menor coastal lagoon watershed is a typical example of the 'tragedy of the commons' (Hardin, 1968) in environmental management, where a value analysis can help to find common ground for conflict resolution. Understanding the power of values, emotions and experience was pointed out by Toomey (2023) as a solution that can impact changing collective behaviour related to nature conservation.

This paper aims to increase the understanding of the role of values in the actions, perceptions and solutions supported by the stakeholders in the socio-ecological system of the Mar Menor to find common grounds for the conflict resolution and sustainable management of the area. The two specific objectives of the paper are to: (i) determine the shared and diverging values of the main stakeholders related to the socio-ecological crisis of the Mar Menor lagoon; (ii) identify which initiatives or actions are accepted by all the stakeholders and relate them to their values to support the co-creation of solutions. We analyse solutions proposed by stakeholders both from the values perspective and from the sustainability approaches proposed by Chapin et al. (2009).

## 2. Study area

The Mar Menor coastal lagoon (135 km<sup>2</sup>) is located in the Murcia Region (SE Spain; Fig. 1). It is the largest hypersaline lagoon of the Mediterranean basin with a capacity of 645 hm<sup>3</sup> and an average depth of approximately 4.5 m. The catchment area draining to the lagoon covers 1,250 km<sup>2</sup> with average annual precipitation in the area below 300 mm and average potential evapotranspiration of around 1,275 mm (Álvarez-Rogel et al., 2020). From this point onwards, we refer to this system as the Mar Menor coastal lagoon watershed. The lagoon is separated from the Mediterranean Sea by a natural sand bar that is 22 km long and 100–900 m wide, which is fragmented by five shallow channels that connect the lagoon to the Mediterranean Sea. The lagoon state was originally oligotrophic (Ruiz Fernández et al., 2019), which resulted in high water transparency (Martínez and Esteve Selma, 2020). The lagoon also had very high biodiversity with special bird, fish and bivalve species (Martínez and Esteve Selma, 2020). It is surrounded by wetlands that are typified as littoral crypto-wetlands, coastal salt pans and salt marshes (Vidal-Abarca et al. 2003), which partly disappeared with the encroachment of urbanisation and tourism development in the second half of the 20th century. The main traditional economic activities in the area were rainfed agriculture, fisheries and salt production in the lagoon and adjacent wetlands, and mining in the southern part of the catchment area in the second half of the 19th century (Álvarez-Rogel et al., 2020). From the 1960s, the tourism industry started to bloom. In the 1980s, intensive irrigated agriculture, supported by groundwater and water transfer from other watersheds, started to quickly develop. The wetlands surrounding the lagoon were key for retaining the contaminated sediment that resulted from mining activities and nutrients from agricultural activities (Martínez-López et al., 2014). The lagoon is protected by different regional (Regional Park of San Pedro del Pinatar, Protected Landscape of Open Spaces and Mar Menor Islands), national (ZEPA – Special Bird Protection Area) and international (SIC – Site of Community Importance, Ramsar Convention wetland, SPAMI, Special Protected

Areas of Community Importance) protection agreements.

2.1. The environmental and socio-economic crisis of the Mar Menor coastal lagoon

In the past decades, the Mar Menor lagoon has shifted from an oligotrophic to a eutrophic state, mainly due to the input of inorganic nutrients (i.e. nitrogen and phosphorus), which reached the lagoon by lateral flows from the intensive agriculture fields in its catchment area, and surpassed the system's self-regulatory capacity (Álvarez-Rogel et al., 2020; Ruiz Fernández et al., 2019). In addition, since the 1980s diverse point and non-point source contamination, such as sewage systems from urban areas, runoff and subsurface flows from sealed surfaces and agricultural fields, and also from the shallow Quaternary aquifer, have discharged their flows into the Mar Menor lagoon (García-Pintado et al., 2007). This situation was aggravated by the uncontrolled extraction and desalination of saline groundwater for its use in irrigated agricultural schemes (Hunink et al., 2015). This process generates highly nutrient-rich brine as a by-product, which is often systematically discharged into the lagoon via either the sewage system or the hydrological network (Delgado and Tudela, 2019). Runoff and flood risks have also increased in the last 40 years due to an expansion of sealed surfaces as a result of urbanisation (Romero Díaz et al., 2017). Agricultural

management changed from rainfed agricultural systems with traditional soil and water conservation structures to irrigated levelled topographies (García-Ayllon and Radke, 2021) with greater hydrological and sediment connectivity. Although the anthropic impacts on the lagoon were initially buffered by self-regulatory mechanisms, this ended when the lagoon was pushed beyond its ecological threshold, which led the system from its original oligotrophic state to a eutrophic state in 2016 (Ruiz Fernández et al., 2019). This ecological collapse has negatively affected its appeal and the tourism and fishery potential, and has generally made local communities' quality of life worse, which has resulted in considerable social unrest. Fig. 2 presents a chronology of the main events and milestones. They are arranged as four periods: Expectations period; Pre-environmental crisis; Environmental crisis; Socio-ecological crisis. The Supplementary Material (S1) explains the events that have occurred during all the periods in more detail.

3. Methods

The methodological approach used in this research combines: (i) a participatory analysis of the socio-ecological crisis of the Mar Menor coastal lagoon watershed with six sectoral workshops and one multi-sector workshop, followed by: (ii) a value analysis of the stakeholder groups and an analysis of the initiatives proposed by each one as

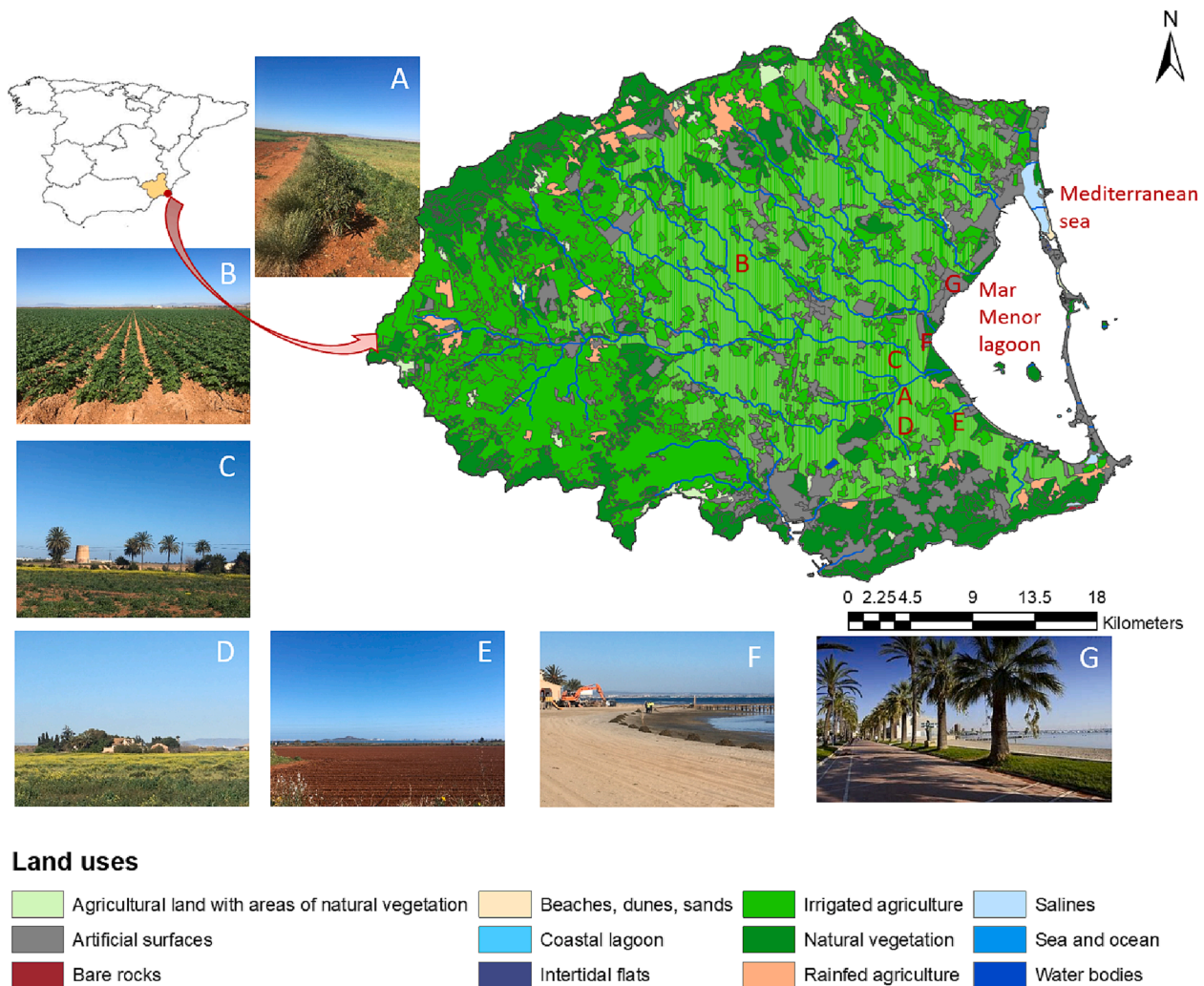


Fig. 1. Location and land use in the Mar Menor coastal lagoon watershed (based on Corine Land Cover 2018). A: vegetated strips in agricultural fields as a conservation measure enforced by Public Administrations in the last law to protect the Mar Menor lagoon. B: Horticultural crops. C: Ruins of the traditional windmills used in the past for grain, water or salt. D: Ruins of an old traditional farm. E: Recently ploughed agricultural field close to the lagoon. F: Extraction of sludge on the beaches of the lagoon. G: Coastal promenade near the shore (own photographs).

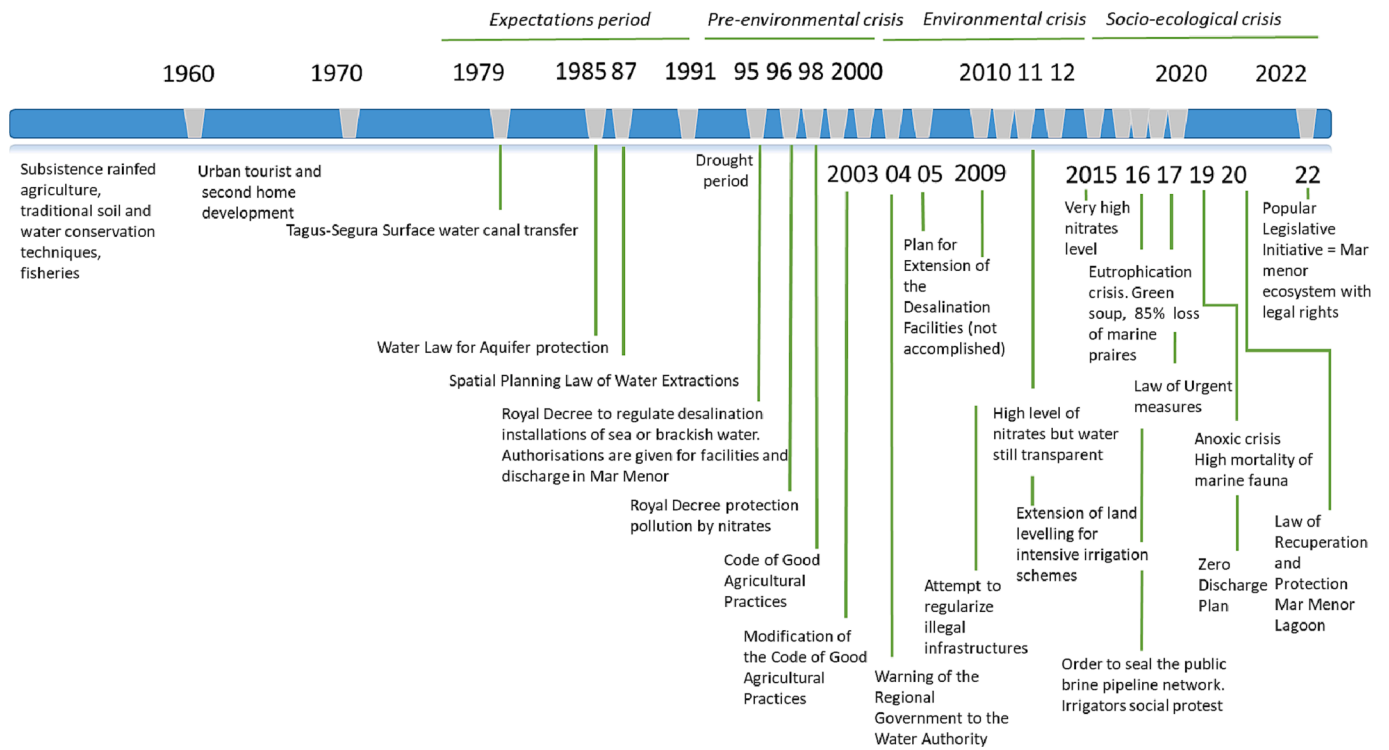


Fig. 2. Schematic representation of the chronology of the environmental crisis that affects the Mar Menor lagoon. Own elaboration based on: Delgado and Tudela (2019); Mar Menor Portal de la Transparencia (CARM); Guaita-García et al. (2020).

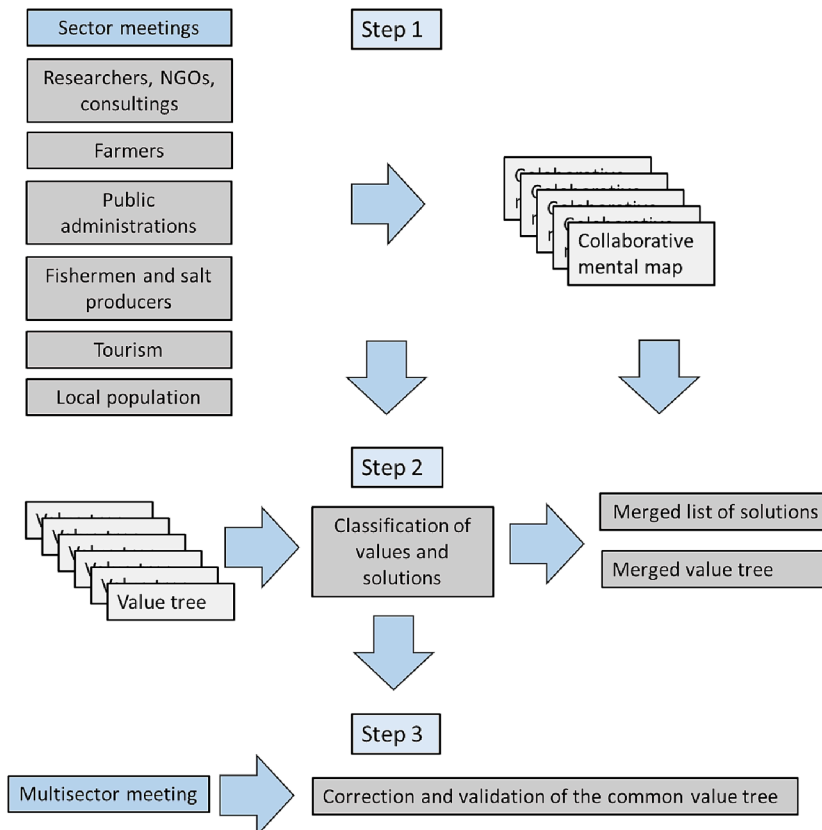


Fig. 3. Summary of the stakeholder participation process steps to collect data about values and solutions.

(partial) solutions to the socio-ecological crisis (hereafter initiatives and solutions are used as synonyms). More details about the design of the sectoral and multisector workshops can be found in [Tiller et al. \(2021\)](#).

### 3.1. Stakeholder participation, data collection of values and solutions and classification of values

Stakeholder participation was organised following three steps covering (Fig. 3): (i) sector meetings with different stakeholders, during which a collaborative mental map was constructed for each meeting that facilitated dialogue, participation and analysis of problems and solutions; (ii) processing the results obtained during sector meetings to firstly generate individual value trees for each stakeholder group, a common list of solutions and a common value tree; (iii) a multisector meeting to validate the solutions and the common value tree. The [Supplementary Material \(S2\)](#) describes all the applied process and methods in detail.

1. Firstly, six meetings were held on three consecutive weeks with representatives from six different stakeholder groups: (1) ‘Researchers, NGOs, environmental consulting companies’; (2) ‘Farmers’; (3) ‘Public administrations’ (from local to national levels); (4) ‘Fishermen and salt producers’; (5) ‘Tourism’; (6) ‘Local population’. Following snowball sampling ([Biernacki & Waldorf, 1981](#)), stakeholders were identified and 260 people were convened, of whom 42 attended workshops (16% positive response). The participants were highly motivated and contributed with many suggestions. The main objective of the meetings was to develop mental maps to represent socio-ecosystem functioning according to each sector. Each meeting lasted 4 h and included several dynamics to promote open participation (Box 1). For questions 2 and 3 (Box 1), the participants were given 15–20 min to write their answers. This was later followed by an open discussion group during which all the participants presented their answers to the group.

#### Box 1. Group dynamics of workshops

- Welcome
- Introducing the research project
- 1st round of questions- Ice breaking for individual participation “What is your favourite landscape and why?”
- 2nd round of questions “In your opinion, what are the main problems of the Mar Menor coastal lagoon and what are their causes?”
- 3rd round of questions “In your opinion, what are the possible solutions for the Mar Menor lagoon?”

A team of three researchers played three different roles during the workshop: one researcher acted as the workshop facilitator by controlling the process and making sure that each participant had the equal opportunity to express his/her opinion. The second researcher was in charge of constructing a collaborative mental map to represent the answers of all the participants and to project them onto a white board during the discussion following the methodology described in [Tiller et al. \(2021\)](#). This mental map was used to identify the interactions between the variables and processes taking place in the socio-ecosystem of the Mar Menor coastal lagoon watershed. The in-depth discussions in each sectoral workshop provided ample room for deliberation ([Prokopy, 2011](#); [Shipley et al., 2020](#)). A third researcher played the non-intrusive observer role ([Munarriz, 1992](#); [Prokopy, 2011](#)) by taking detailed notes of all the answers and identifying the “values” mentioned during conversations and presentations. The entire workshop was also recorded to be later consulted by the researchers. The third researcher only played an active role in the open discussion when it was necessary to request specific answers if they were ambiguous. The deliberative dynamics in the group enabled us to more confidently identify the stakeholder group values ([Shipley et al., 2020](#)).

2. A first content analysis of the information collected during workshops was carried out as follows: (i) values were identified from the qualitative information and direct mentions provided by the

participants during the workshops. All the values were coded in groups on the same day as the workshop to construct an initial value tree ([von Winterfeldt, 2013](#)); (ii) the solutions mentioned by the participants during each workshop were identified and listed on the days following the workshop based on the information from the mental map constructed and discussed during the workshop. Special attention was paid to distinguish values from solutions; (iii) when all the workshops had finished, the six individual value trees were merged into a common value tree by merging similar groups of values or categories, which resulted in nine values groups: *Environmental status*, *Natural resources preservation*, *Emotional heritage*, *Ethnographic heritage*, *Education*, *Research and development*, *Environmental ethics* and *Governance and Economy*. We identified all the values in each category by indicating which stakeholder group mentioned each value. If in doubt, the workshop recordings and notes were consulted. A more in-depth content analysis was later done as explained in Section 4.3. A general validation of the value tree was made during a seventh multisector workshop, in which representatives of all the sector workshops participated. This workshop was carried out 5 months after the first six sectoral workshops. During this workshop, a first common value tree for all the sectors (see Section 4.2), which was developed based on the input obtained during the sector workshops, was presented to the participants. The categories of the values were explained, and the frequency that each value was mentioned in each sector, and the agreement and disagreement in values among the stakeholder groups, were presented to the participants. Following the explanation, open discussion for feedback was facilitated to validate the value tree, which resulted in slight modifications of the common value tree.

### 3.2. Classification of solutions

We used the term ‘solutions’ in the workshops for simplification reasons, however the proposals in the workshops were initiatives (i.e. actions towards solutions), and a group of initiatives would form part of a solution of a complex problem. For this reason, hereafter the ‘solutions’ of workshops are also called ‘initiatives’. Once initiatives were identified as explained in Section 4.1., the list of initiatives was classified according to the same nine values categories (*Environmental status*, *Natural resources preservation*, *Emotional heritage*, *Ethnographic heritage*, *Education*, *Research and development*, *Environmental ethics*, *Governance and Economy*). Furthermore, to make the socio-ecological analysis more in-depth, the list of initiatives was analysed from the *Fostering sustainability* perspective by the main sustainability approaches proposed by [Chapin et al. \(2009\)](#) (Fig. 1, [S2 Supplementary Material](#)).

Within this framework initiatives can be classified in different sustainability approaches: (a) vulnerability addresses the nature of the stressors that bring about change and the adaptive capacity to adjust change; (b) adaptive capacity addresses stakeholders and groups of stakeholders’ capacity to adjust and minimise the negative impacts of change; (c) resilience provides flexibility to address change; (d) transformability addresses the active steps to change the system to a potentially more desirable state (Fig. 1, [S2 Supplementary Material](#)).

### 3.3. Content analysis, indices and cluster analysis

Firstly, a content analysis identified the frequency that values and initiatives were mentioned by stakeholders during workshops. Several direct indicators were used: total number of values, total mentions of values in a category, maximum number of mentions of two values within one category, number of mentions per value, number of mentions of initiatives by categories and coincidence of mentioning each initiative by pairs of stakeholder groups. Furthermore, two indices were created to provide insight into the relative importance attached to values and initiatives:

Key values group index (KVI):

**Table 1**  
Value classification deriving from the six sectorial workshops.

Categories	Category name	Definition	Values	Total mentions	Maximum number of mentions of two values	Key values group index (Kvi)
1	Environmental status	Values considering the different condition and quality of environmental variables in conservation or degradation terms.	Biodiversity Water quality System self-regulation capacity Prevent degradation Life quality for local population (beach and water quality) Good condition of catchment area	12	7	2
2	Natural resources preservation	Values that acknowledge the importance of preserving and valuing natural resources	Landscape value Access to good quality water Water licences Good condition of piping systems Landscape diversification: crops and agrotourism Keeping location of agricultural properties Preserve the coastline Sustainable boating	10	4	1.3
3	Emotional heritage	Values related to feelings of identity and attachment to natural resources and all types of experiences related to emotions and beyond what is material.	Belonging Attachment to landscape Historical value Emotional value	14	8	3.5
4	Ethnographic heritage	Values that acknowledge respect for and preserving many different cultural heritage and history aspects; also related to the self-esteem and dignity of the 'Local population' (traditional land management, traditional crafts, gastronomy, land stewardship, etc.)	Restore architectural values Traditional salt extraction Traditional fisheries Restore traditional crafts Manage salt production areas	7	4	1.4
5	Education	Values related to environmental and social education.	Non-utilitarian vision of common good Respect for own ecosystems Education in planning Responsible consumption Environmental education	11	8	2.2
6	Research and development	Values related to research into ecosystems functioning and applying technological advances	Knowledge of the system R&D investment Water-saving technology Control and monitoring Science-society transfer	11	5	2.2
7	Environmental ethics*	Aspects related to self-esteem to fulfil personal goals, and learning from experiences beyond what is material.	Self-control for good practices Sustainable land use among sectors	6	5	2
8	Governance	Values related to all types of systems, relations and tools for management and political decision making	Change to long-term planning Teamwork capacity Integrated policies Coordination and dialogue Well-prepared politicians Clearly defined competences Opportunity for crisis management Social participation Comanagement Citizen empowerment Reductions in regulations Application of regulations Incentive development Environmental monitoring All-year service coverage Holistic planning No short-term models Feasible models fitted to the spatial scale Environment-agriculture reconciliation Improve large companies' image Small farmers' self-esteem Link between agricultural and tourism sectors Coresponsibility between sectors Adapt legislation to local conditions Communication between fishers and managers	42	7	1.4

(continued on next page)

Table 1 (continued)

Categories	Category name	Definition	Values	Total mentions	Maximum number of mentions of two values	Key values group index (Kvi)
9	Economy	Needs, aspects and values related to the area's economic feasibility.	Review protection figures Property rights (freedom for expropriation) No conflict of interests among decision makers Internalising environmental costs Political interest in agriculture and tourism Environmental costs of degradation Legal security Nautical infrastructures Economic opportunities linked with natural capital products Change in tourist strategy (water sports, beach and wind, winter and equestrian tourism) Change in the tourist model (coast-inland) Commitment with sustainable economic development	10	4	1.3
Total			72	123	–	–

\*All these values were mentioned in a context to discuss environmental ethics. For example: Self-control for environmentally sustainable practices (not carrying out practices like: dumping brine into public waterways because of self-control driven by own environmental awareness).

$$KVi = \frac{\sum(a^*k_i)}{\sum(k)_x} \tag{1}$$

This is the ratio between the total (1 per stakeholder) mentions (a) of values (k<sub>i</sub>) of a value category (Table 1) and the total number of values in that category. This index expresses the relative importance of a value category based on mentions by stakeholders. The range oscillates between 1 and 6. A higher ratio means that more different stakeholders mentioned values in the group as being important.

Initiative acceptance index (IAi):

$$IAi = \frac{\sum(a^*s_i)}{\sum(s)_x} \tag{2}$$

This is the ratio between the total mentions (1 per stakeholder, (a) of initiatives (s<sub>i</sub>) of a value category (Table 1) and the number of initiatives in that value category. The groups used for this classification of initiatives are those found in Table 1. This index expresses the relative importance attached by stakeholders to the initiatives belonging to a value category. The range oscillates between 1 and 6. A higher index means that the solution was considered more important for stakeholders.

Proximity and consensus on values and initiatives among stakeholders were explored by two methodologies: a cluster analysis and by calculating the Jaccard Index. The Jaccard Index or similarity coefficient (Chung et al., 2019) was used as an indicator of the similarity between pairs of stakeholders in values and initiatives.

A hierarchical cluster analysis and Ward's linking method were used to classify groups of stakeholders according to their similarity in values and initiatives based on the analysis of variance (Davis, 1986). Input variables were the values and the initiatives or solutions (each one was assigned a number) and the stakeholders who mentioned them.

## 4. Results

### 4.1. Common value tree and groups of values

The total number of identified values came to 123 during the six sectoral workshops. Some values were only mentioned by one stakeholder sector (72 were unique values), and others were mentioned by at least two different stakeholders (51). Finally, the constructed common value tree (Table 1) grouped all the recorded values into nine categories. Of the nine categories (definitions of categories appear in Table 1), six

(Education, Research and development, Environmental ethics, Environmental status, Emotional heritage, Ethnographic heritage) comprised a few values, with a maximum of six values per category, which accounted for 50% of the value mentions. Assigning values to different categories was mediated by the context in which values were mentioned. Apparently several values could belong to different categories, but they were assigned to a specific category by indicating the context in which this value was mentioned by stakeholders.

The remaining three larger categories (Natural resources, Governance and Economy; Fig. 4) comprised between 8 and 29 values, which accounted for the other 50% of mentions.

The Governance category obtained the most mentions. The two most repeated values belonged to the categories of Emotional heritage (attachment to landscape; belonging), Education (non-utilitarian vision of common good; respect for own ecosystems), Environmental status (importance of biodiversity; water quality) and Governance (environmental monitoring; non-short term planning models) (Table 1). The highest Key Values index was observed for the Emotional heritage category, followed by the categories of Education, and Research and Development. Despite its few values, the Emotional heritage category obtained high scores for the three indicators shown in Table 1. The Education and Governance groups scored high for two of the indicators listed in Table 1.

Regarding the distribution of categories into each stakeholder group (Fig. 4), only the 'Farmers' and 'Public Administrations' groups were represented by values in seven of the nine values categories. 'Fishers and salt producers', 'Local population' and 'Scientists, NGOs and environmental consultancy companies' had values in six of the nine values categories, while the 'Tourism sector' only mentioned values in three of the nine values categories.

All the stakeholders, except for 'Local population', had the most values in the Governance category. The percentage of values in this category was much higher in Public Administrations, Scientists and Tourism sector (40–60%), and was slightly lower for 'Farmers' and 'Fishers and salt producers' (20–30%). For the 'Local population', the values in the Governance category represented 17% of all the mentioned values. Ethnographic heritage was present in three of the six stakeholder groups, and was the second most important (23%) value mentioned by 'Fishers and salt producers' after Governance. Education was present in four of the six stakeholder groups, but was not mentioned by 'Farmers' and the 'Tourism' sector. Economy values were present only in the

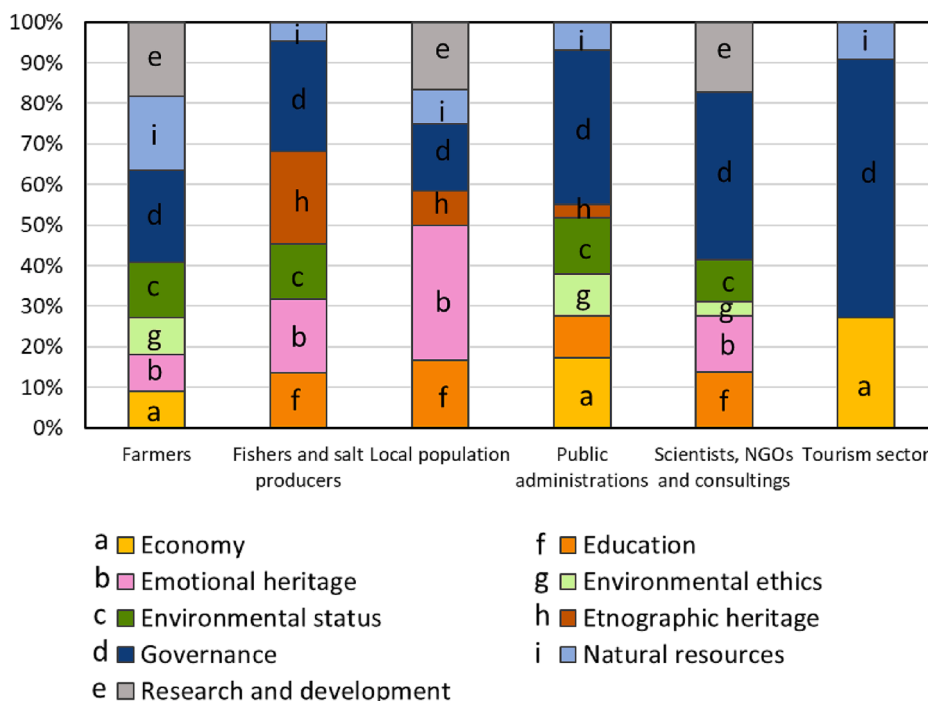


Fig. 4. Percentage of the values mentioned by the different stakeholder groups according to our own value classification.

‘Tourism’ sector (27%), ‘Public Administrations’ (17%) and ‘Farmers’ (9%). The *Emotional heritage* group was dominant (33%) for ‘Local population’ and quite important for ‘Fishers and salt producers’ (18%). This values category was represented in four of the six stakeholder groups, but was not mentioned by ‘Public Administrations’ and the ‘Tourism’ sector.

#### 4.2. Initiatives proposed by stakeholders and their relation to values

All the initiatives proposed by stakeholders can be consulted in Table 2 (Supplementary Material 3, S3). Following our value classification (Table 1), most of the initiatives proposed by stakeholders as part of the potential solutions for the socio-ecological crisis of the Mar Menor coastal lagoon watershed belonged to the value categories of *Economy* (23.2%), *Natural resources* (23.2%), *Governance* (19.6%) and *Environmental status* (12.5%). The other categories had less than 10% initiatives (Fig. 5A). Most of the initiatives of the ‘Local population’ concentrated in the *Ethnographic heritage* and *Governance* categories (>20%). The ‘Tourism’ sector showed a similar distribution but with a better representation of initiatives in the *Natural resources* category (<30%) (Fig. 5B). ‘Fishers and salt producers’ also had a similar distribution with representation in the *Economy*, *Governance* and *Ethnographic heritage* sector, and added *Research and development*. ‘Farmers’ showed a more equal distribution of initiatives in the different values categories, more than 20% of the initiatives in the *Natural resources* category and a marked representation of *Research and development* (Fig. 5B). ‘Public Administrations’ and ‘Scientists, NGOs consultancies’ had initiatives in all the categories, each with around 20% in the *Environmental status* and *Governance* categories (Fig. 5B).

Following the main sustainability approaches of Chapin (2009) (Supplementary Material 2, S2), most of the initiatives proposed by stakeholders corresponded to the *Socio-ecological resilience* category (46%)(Fig. 6A). This means that these initiatives focused on increasing the system’s resilience to absorb a spectrum of perturbations to sustain and develop its fundamental function, and identity to recover and reorganise itself in a new context. Those initiatives classified as *Socio-ecological resilience* dominated many stakeholder groups (Fig. 6B). Examples of this are: precision agriculture, promote the use of agricultural

waste as natural fertilisers, biotechnology for crop varieties resistant to drought, restore old windmills, restore salt pans, restore forest areas and technologies to reduce evaporation).

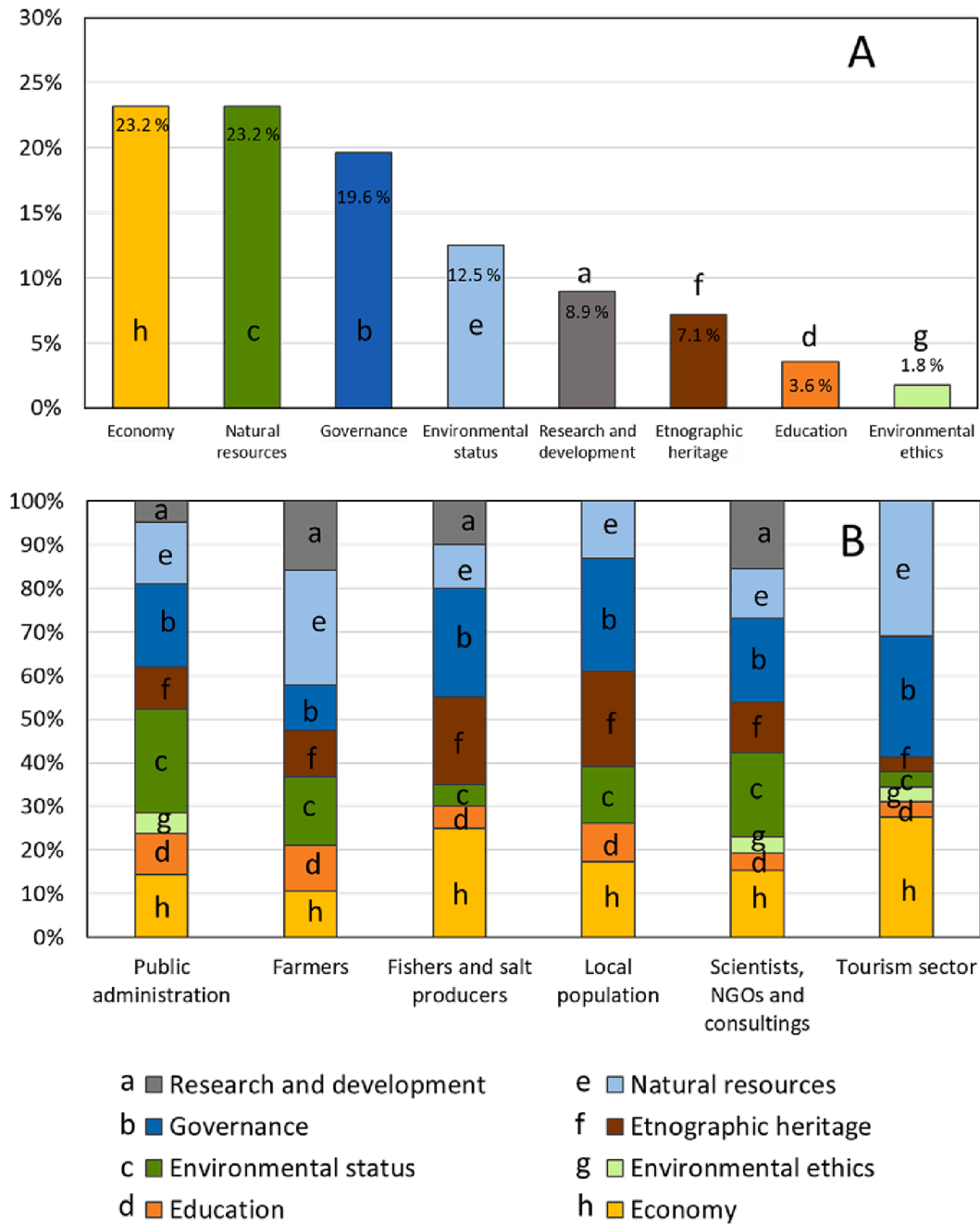
The initiatives in the *Transformability* category also represented a high percentage of all the initiatives (26.8%), which highlights that actively navigated transformations are needed for the area’s sustainable development and are related to the identification of future options, pathways and enhanced capacity to learn from the crisis (Chapin et al., 2009) (Fig. 6A). This group dominated in ‘Public Administrations’, but was also very important in ‘Tourism’ and ‘Fishers and salt producers’ (Fig. 6B). Examples of this are: create a slow tourism trade mark, promote international sailing competitions, improve the sewage system around coastal areas of the lagoon, enhance public transport and public services connected with inland airports.

The initiatives following the *Reduce vulnerability* approach represented 18% (Fig. 6A and 6B). This category focuses on reducing the system’s vulnerability to specific hazards or stressors by reducing mainly exposure and the system’s sensitivity by sustaining natural capital by taking prevention or mitigation measures. Examples of this are: build channels to divert brine to treatment plants, convert to sustainable intensification to reduce the extension of cropland areas, implement buffer strips around cropland areas and around the lagoon, decrease the number of crop harvests per year. The *Adaptive capacity* category represented 9% of the initiatives and was related to stakeholders’ adaptability (individual and groups) to respond and address changes by relying on people’s reflexive action capacity (Chapin et al., 2009). Examples of this are: promote capacity-building activities fertiliser use and produce agricultural products with a higher added value like seeds. The analysis of the initiatives indicated that the stakeholder groups understood that measures had to be taken to increase the capacity of the socio-ecological system to sustain its function and identity. The environmental and socio-economic crisis has triggered transformation needs and demands a change of paradigm reflected in *Governance*.

#### 4.3. Agreement and acceptance of initiatives among stakeholders

The index of acceptance of initiatives (IAi) indicates the degree of





**Fig. 5.** Total initiatives classified according to our own values categories (A) and according to the stakeholder groups that proposed initiatives in each values category (B).

accepting the different initiatives of all the stakeholders (Fig. 7A). The initiatives related to the *Education* and *Ethnographic heritage* categories obtained the highest stakeholders' acceptance, followed by those classified as *Environmental ethics*, *Governance* and *Environmental status*. Some categories had a few initiatives (categories *Education* and *Ethnographic heritage*), but a high acceptance level for all or the majority of the involved stakeholders. Despite the large number of initiatives in the *Governance* and *Economy* groups, their IAI was lower than 3 (Fig. 7A).

Agreement about certain initiatives among the different stakeholder groups was explored by counting the initiatives that coincided between pairs of sector representatives (Fig. 7B). Two stakeholder groups obtained the largest number of common initiatives: 'Scientists, NGOs and consultancy firms' and 'Local population' showed coincidences with five other sectors, and each represented 61 and 60 shared initiatives,

respectively (Fig. 7B). 'Fishers and salt producers' also well agreed with other stakeholder sectors, while 'Public Administrations' reached a good agreement with 'Scientists', 'Tourism' and 'Local population'. However, the group with the fewest total number of shared initiatives with other stakeholder groups was 'Farmers', whose number of shared initiatives was always under 10. 'Farmers' showed a particularly low agreement level with 'Fishers and salt producers' and 'Tourism'. A low agreement level was also observed between 'Public Administrations' and 'Fishers and salt producers'. These low agreement levels indicate that potential disagreements about solutions between stakeholder groups exist and may, therefore, be indicative of conflicts.

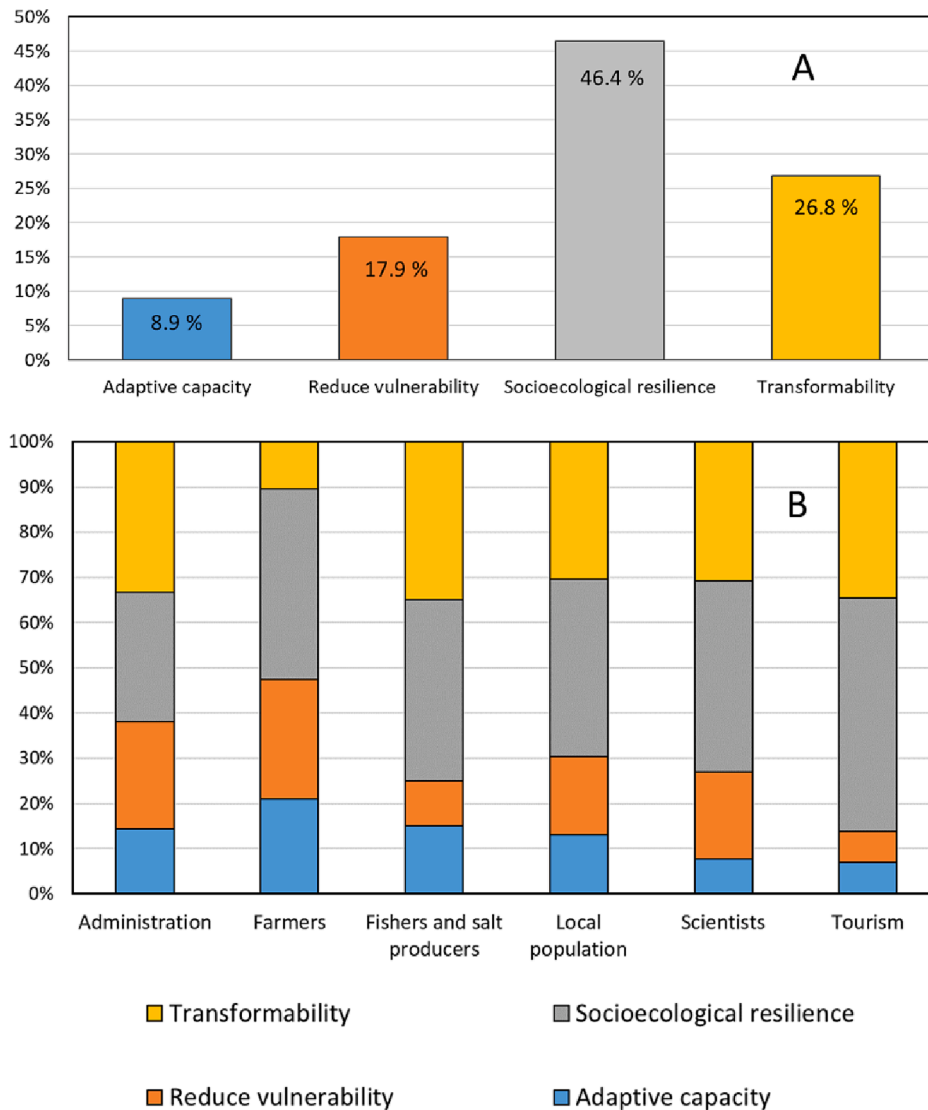


Fig. 6. Total initiatives proposed by the stakeholders classified according to Chapin (2009) (A) and as proposed by the stakeholder groups (B).

4.4. Similarities and differences among stakeholders according to their values and initiatives

The cluster analyses on the individual values and initiatives (Fig. 8) showed three clearly differentiated stakeholder subclusters: (i) ‘Fishers and salt producers’; and ‘Local population’; (ii) ‘Public Administrations’; ‘Scientists, NGOs, consultancy firms’, and ‘Farmers’; (iii) the ‘Tourism sector’. Regarding values, the ‘Tourism’ subcluster was clearly differentiated from the first and second subclusters, but was similar to the first subcluster regarding initiatives to a certain extent.

For the cluster analysis based on values (Fig. 8, left), the first ‘Fishers and salt producers’ and ‘Local population’ subclusters shared several values, which was also reflected in the Jaccard Index for values of 0.5 (Fig. 8). They shared values of *Education*, *Emotional and Ethnographic heritage* (i.e. respect for own ecosystems, non-utilitarian vision of common good, attachment to landscape, emotional and historical values). The second stakeholders cluster (i.e. ‘Public Administrations’, ‘Scientists, NGO and consultancy firms’ and ‘Farmers’) also shared several individual values as reflected by a relatively high Jaccard Index (>0.3; Fig. 8). These values represented a marked interest in technologies for efficiency and sustainable agriculture of ‘Farmers’, ‘Public Administrations’ and ‘Scientists’. The third subcluster, represented by ‘Tourism’, was clearly different for the values from the other two clusters (Fig. 8),

which was also reflected in the low Jaccard Index values (<0.1 Fig. 9). This group was interested in values of *Economy and Governance* (i.e. change of touristic model, touristic opportunities linked with natural products, integrated environmental cost in economic activities).

Regarding the initiatives proposed by stakeholders, the first subcluster (‘Fishers and salt producers’ and ‘Local population’) had a relatively high Jaccard Index value for initiatives (Fig. 9) proposed in *Ethnographic heritage* (20–22%), *Governance* (25–26%) and *Natural resources* (10–13%)(Fig. 5). The second subcluster (‘Farmer’, ‘Public Administrations’ and ‘Scientists, NGOs and consultancy firms’) showed a relatively good agreement for initiatives (Jaccard index between 0.37 and 0.62, Fig. 9), proposed in *Environmental status* (16–23%) and *Economy* (10–15%)(Fig. 5). The subcluster that represented ‘Tourism’ somewhat agreed with the initiatives with ‘Local population’ and ‘Fishers’ as reflected by a relatively high Jaccard Index value (Fig. 9), and represented an agreement in the *Economy and Governance* initiatives (Fig. 6B).

Lack of a clear correlation between the Jaccard Index of values and the Jaccard Index of initiatives indicated that an agreement about values did not necessarily mean an agreement about initiatives among stakeholders (Fig. 9). Interestingly, we found areas of agreement in initiatives, but not in values, or *vice versa*, and similarly with agreement or disagreement in both values and solutions. This evaluation can help to

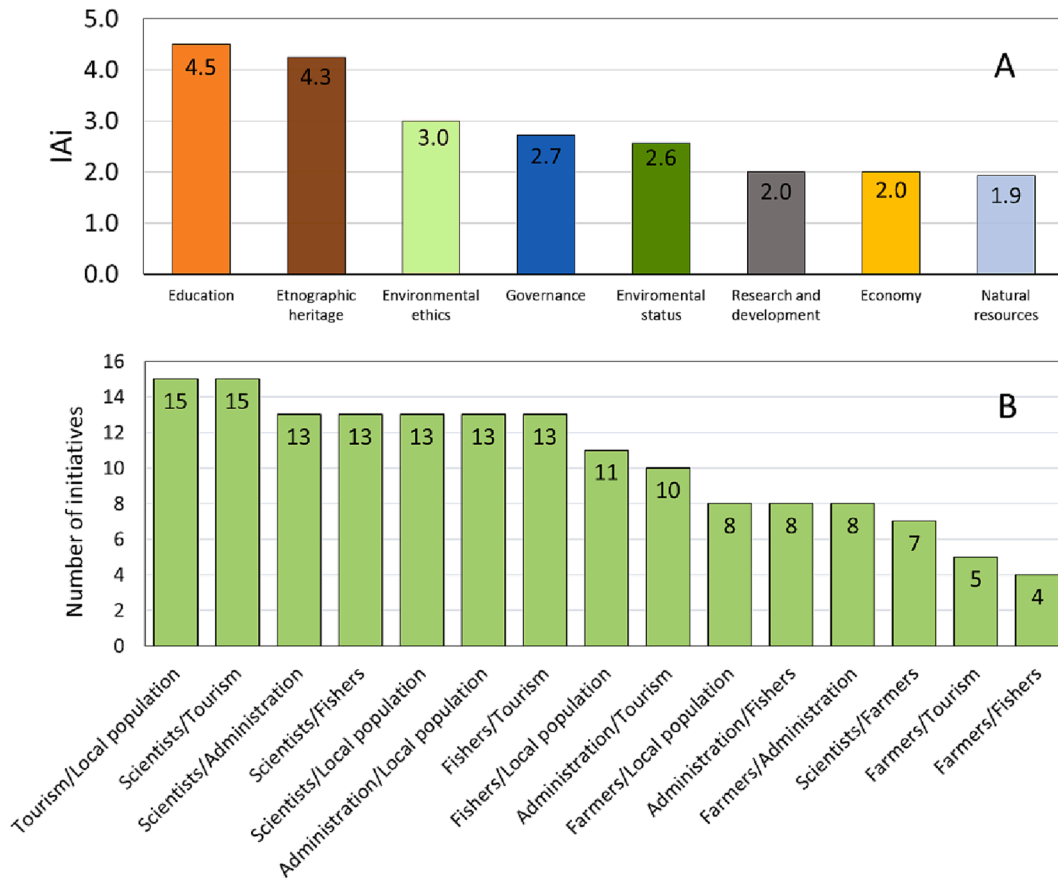


Fig. 7. Index of acceptance of initiatives (IAi) among the stakeholder groups (A) and agreement with specific initiatives (number of indicated initiatives) among stakeholders (B).

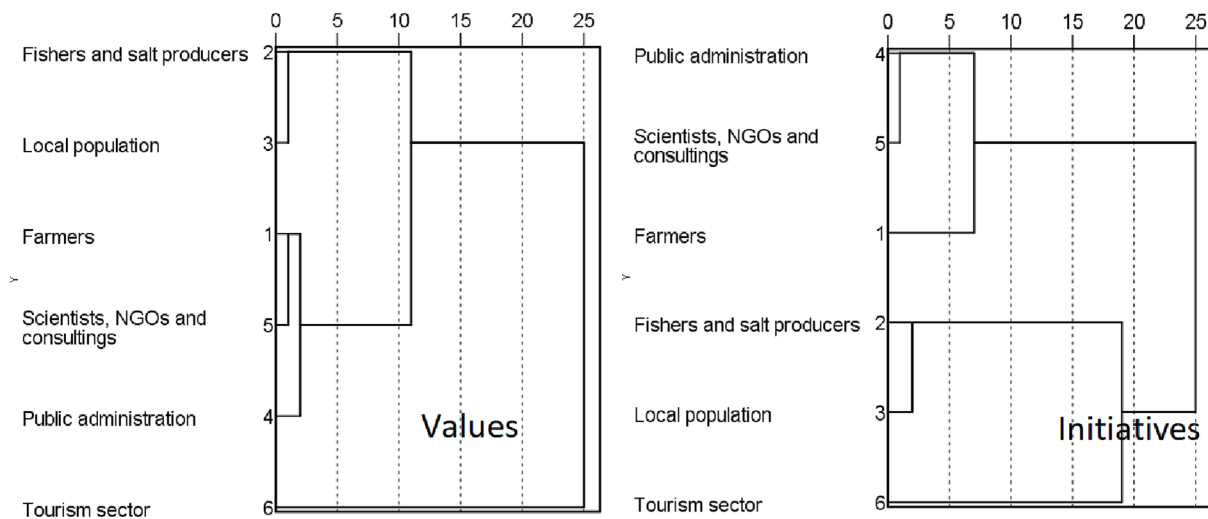


Fig. 8. Dendrogram based on our value classification and the initiatives by stakeholder groups.

understand where a consensus is reached, where there is some common ground based on either initiatives or values, and which solutions are the most difficult ones to be implemented to overcome disagreements.

5. Discussion

Previous research has repeatedly highlighted the benefits of incorporating different types of societal values into ecosystem management to align management plans with societal views (Chapin et al., 2009; Ives

and Kendal, 2014; Jones et al., 2016). Particularly in the case of coastal lagoons, their setting in the coastal landscapes renders these ecosystems vulnerable to disturbances from coastal and inland activities (Martínez-López et al., 2019b). Management scenarios need to be feasible and reflect the values that society holds on these unique socio-ecosystems (Anthony et al., 2009). Knowledge about values can help to identify the factors that connect and divide different stakeholder groups to reach a consensus. Therefore, this knowledge can help to identify the solutions that are most likely to be supported, and to identify barriers and

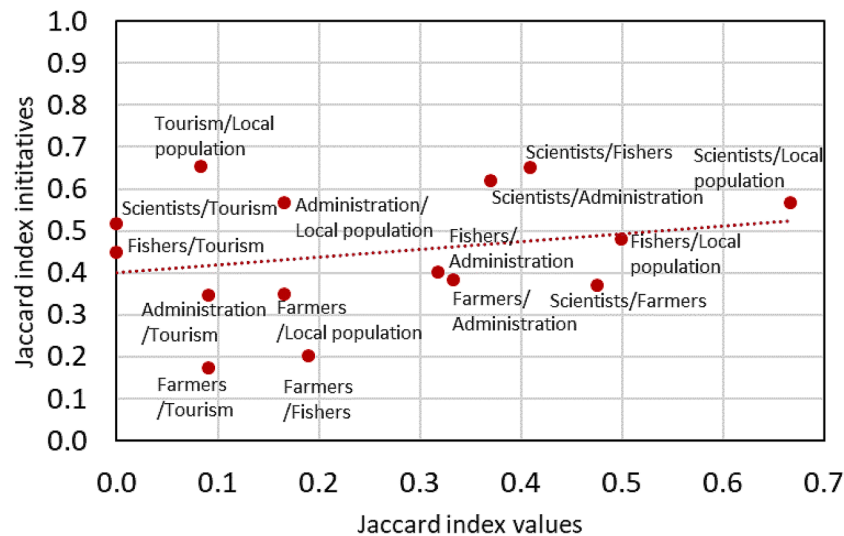


Fig. 9. Jaccard Index among stakeholders based on an agreement with individual values (x-axis) and initiatives (y-axis).

opportunities for their implementation.

### 5.1. Values connecting stakeholder groups

The value analysis showed a particularly good agreement in the *Emotional heritage* and *Governance* value categories among all the different stakeholder groups and can, therefore, be used to identify solutions (Table 1). The values that we classified as *Emotional heritage* fell into the ‘tacit values’ category of Anthony et al., (2009), which were considered to be unspoken values and less tangible perceptions that strongly influence human behaviour and can promote civic engagement in coastal management. The fact that we found a good agreement with *Emotional heritage* is particularly important because the values in this category are often the basis for individual decisions made to bring about change (van der Weff, 2013).

During the workshops, discussions on *Emotional heritage* values were related to ‘attachment and identity’. Van der Werff et al. (2013) also emphasise the importance of values related to environmental self-identity because the values that are linked with self are the most influential ones on individual choices. A very good example of empowerment and action of civil society, based on this category and other categories of values (*Educational* and *Environmental ethics*), was the social movement to promote the Popular Legislative Initiative to protect the Mar Menor lagoon. This social movement brought to the Spanish Parliament a Popular Legislative Initiative based on more than 500,000 signatures to recognise the right of the Mar Menor Lagoon to be protected and preserved. The Popular Legislative Initiative is a participatory democratic mechanism that allows citizens to propose a law. It was approved in October 2022 and grants the Mar Menor lagoon and its watershed status of a legal person. It is a legal procedure based on the defence of rights of nature. Although this example goes beyond the objective of the study in this paper, it is an example of how values in the *Emotional and Ethnographic heritage* groups, related to the identity and attachment to a territory, can be the basis of a social movement to promote direct action to solve problems.

Our evaluation found that ‘Fishers and salt producers’ and ‘Local population’ aligned with a similar pattern of values in the the *Emotional and Ethnographic heritage* groups linked with their identity. A high acceptance level for the initiatives related to *Education*, *Ethnographic heritage*, *Environmental ethics* and *Governance* for all the stakeholders was detected (Fig. 7). From the proposed solutions, 73% were in the groups of ‘Socioecological resilience’ and ‘Transformability’ solutions (Chapin et al., 2009) (Fig. 6A) (e.g. promote land stewardship initiatives, enhance a monitoring system and control in agricultural areas,

internalise the cost of environmental impacts in agricultural production, promote international sailing competitions, promote slow tourism trademark), understood as the capacity to create a new system with different characteristics (Walker et al. 2004). Our results indicated that stakeholders prioritised new governance initiatives to advance in solving the environmental crisis. In contrast, Guaita-García et al. (2020) studied perceptions of the socio-economic crisis of the Mar Menor coastal lagoon and found a high agreement level for diagnosing the crisis, but not for its solutions.

While the ‘Tourism sector’ was the most different one for the values from ‘Fishers’ and ‘Local population’, it revealed a better agreement with them identifying solutions (Fig. 9). This can be explained by the fact that the livelihood and living environment of all three stakeholder groups depends directly on the state of the natural lagoon resources and they, therefore, share many initiatives to improve the lagoon’s environmental status (e.g. restore historical buildings and traditional infrastructures, improve sewage systems and promote agritourism), although apparently different values underlie these preferences (Fig. 9).

### 5.2. Values that disconnect stakeholder groups

The value analysis helped to identify the polarisation among some stakeholders based on their values and preferred initiatives. The main differences in values appeared between ‘Farmers’ versus ‘Fishers’ and ‘Tourism sector’ (Fig. 9). ‘Farmers’ also had the lowest agreement level for initiatives with the other stakeholders (Fig. 7B). This falls in line with the results of Guaita-García et al., (2020), who concluded that all the stakeholders around the Mar Menor coastal lagoon watershed reached a broad consensus about the perception of farming activities being mainly responsible for the lagoon’s eutrophication, but this did not lead to a stakeholder group agreement on solutions. They also detected a high disagreement level in the agrarian sector about particular initiatives (e.g. reduce the irrigated area around the Mar Menor lagoon)(Guaita-García et al., 2020).

In the ‘Tourism sector’, the *Economic* and *Governance*- (Fig. 4) related values were the dominant ones, while the *Emotional heritage* values (33%, Fig. 4) were the most important for ‘Local population’. Despite the different values, ‘Fishers’ and ‘Local population’ versus ‘Tourism sector’ showed a high agreement level for solutions (Fig. 7B) (e.g. apart from those mentioned in the previous section: the creation of a slow tourism trade mark, several educational initiatives and create a public organisation that integrates the management of the lagoon and its watershed).

One of the factors that plays a crucial role in stakeholders’ values are the benefits that they obtain from the system that directly affects their

livelihood. For example, for ‘Farmers’, besides some concerns about the lagoon’s *Environmental status*, they supported the solutions in the value categories related to the *Research and technology* and technological initiatives. In contrast, the ‘Tourism sector’ supported the *Economy* and *Governance* values, and ‘Local population’ and ‘Fishers and salt producers’ placed more emphasis on *Education* and *Emotional and Ethnographic heritage* to guarantee the good environmental status of the lagoon on which their livelihoods directly depend (Fig. 4). Indeed ‘Farmers’ were very disconnected in terms of the values and initiatives from most of the other stakeholders (Fig. 9). They shared more values with the stakeholders that do not make a living from natural resources in the area (‘Public Administrations’, ‘Scientists’). Notwithstanding, they shared only a moderate level of initiatives (Fig. 7B, 8, 9) with other stakeholders (a maximum number of eight of the proposed 59; [Supplementary Material 3](#)) and few that directly affected their own activities (e.g. remove agriculture near coastal areas, correct bad agricultural practices that promote soil erosion). A similar situation was also presented by Landini et al. (2011) in their analysis of stakeholders in central Argentina. They reported very different perceptions of and interests in the benefits provided by local ecosystems.

There were also differences in stakeholder groups; for instance, two ‘Farmers’ subgroups were detected by [Guaita-García et al. \(2022\)](#): (i) local ‘Farmers’ managing their own land; (ii) large foreign companies managing their own land or leasing from small landowners. Both were also detected in our analysis, and both were reflected in the value pattern of the ‘Farmers’ group (Fig. 4). The *Emotional heritage* and *Environmental ethics* values related to the first ‘Farmers’ subgroup, while *Governance* and *Research and development* related to the second subgroup, despite the data about the ‘Farmers’ group being presented all together.

5.3. Reaching a consensus and common grounds for sustainable development based on values

The large number of values (28) and initiatives (11) mentioned by the stakeholders in the *Governance* category indicates a demand for

change in management. Changes in *Governance* are needed to deal with rapid directional change, adapt to it, shape it and create opportunities for positive transformations of socio-ecosystems. Rapid changes are challenging, but also create prosperous development opportunities. Such development requires systems of governance of socio-ecological dynamics that maintain and enhance adaptive capacity for societal progress, while sustaining ecological life support systems (Folke et al., 2009). Many of the Mar Menor coastal lagoon stakeholders align with this societal progress vision with environmental awareness, as demonstrated also by the large number of initiatives (21) proposed in the *Natural resources preservation* and *Environmental status* categories.

In the Mar Menor coastal lagoon watershed case, stakeholders prioritised a transition to governance and economic and educational models that respect nature and the population’s cultural identity, as indicated by the highest Initiatives Acceptance index classified in the values categories of *Education*, *Ethnographic heritage* and *Environmental ethics* (Fig. 7A). However, the initiatives currently promoted by the Government with the latest policy regulations to deal with the environmental Mar Menor coastal lagoon watershed crisis do not yet reflect these values of society. [Martínez-Fernández and Esteve-Selma \(2020\)](#) explained how the first Law of Urgent Measures of February 2018, passed without the support of the political party leading the Regional Government then, has barely been implemented in practice. In fact it was derogated and substituted for Royal Decree Law of Integral Mar Menor Lagoon Protection, in which the regulations that addressed the agrarian sector were much weaker than in the first law ([Martínez-Fernández and Esteve-Selma, 2020](#)), which denotes little concern for *Education*, *Ethnographic heritage* or *Environmental ethics*.

Based on our results, we propose a conceptual model to help to reach a consensus and common grounds to build agreements. An agreement about initiatives and values can be used to identify a consensus and common grounds with the possibility of further agreement (Fig. 10). When identifying the agreement level in the values or initiatives among stakeholders, agreements can be negotiated. The maximum consensus, and therefore the best conditions to find agreements, occurs when stakeholders hold similar values and propose similar initiatives to solve

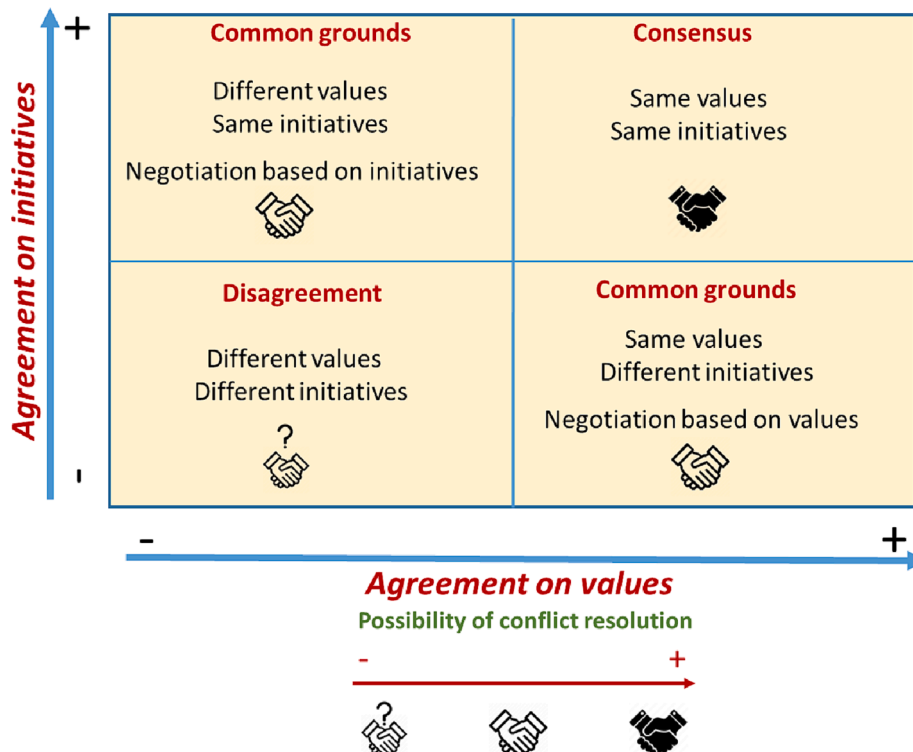


Fig. 10. Conceptual diagram for finding common grounds for conflict resolution based on stakeholders’ values and initiatives.

problems or conflicts (i.e. upper right area in Fig. 10). In our case study, this was often the situation between stakeholders 'Tourism' and 'Local population', which share an important number of initiatives, many of which are related to improve access to the villages around the lagoon, facilitate transport between natural and urban areas, and restore the historical buildings in the area. The upper left area in Fig. 10 represents the situations in which stakeholders have different values, but propose similar initiatives because their objectives converge, and correspond to initiatives that will be relatively easy to reach an agreement with. For instance, in the Mar Menor coastal lagoon watershed case, the values for stakeholders 'Tourism' and 'Fishers and salt producers' differ, but they are interested in solutions that benefit the lagoon's water quality because their livelihood directly depends on it. The opposite situation appears in the lower right area of Fig. 10, where stakeholders share the same values, but disagree on initiatives. In this case, negotiation of initiatives based on common values is necessary. An example of this is found in 'Public Administrations' and 'Scientists' versus 'Farmers', with a similar pattern of values (Fig. 4), but less agreement on initiatives (Fig. 7). In both these "areas" in the diagram, there is room for creative negotiation because common grounds are found and can be used in the negotiation process by appealing for values or initiatives. The most difficult area is the lower left of Fig. 10, which represents an area in which stakeholders have very different values and propose very distinct initiatives to solve conflicts. A good representation in our case study is 'Farmers' versus 'Fishers' with different values and differing initiatives (only share four; Fig. 7) because the activities of 'Farmers' directly affect the quality of the lagoon's water and, thus, fisheries. From the initiatives that they share, only one is related to the quality of the lagoon's water: 'Improve the sewage system in coastal areas around the Mar Menor'. They do not share any initiative directly applied to the activities of 'Farmers'. In this case, negotiation to reach an agreement would be much more difficult and, therefore, informed decisions or rules need to be imposed to guarantee sustainable development despite possible trade-offs.

## 6. Conclusions

Knowledge about the values which underlie stakeholders' perceptions and decisions can help to align management plans and policy decisions with societal views. Here we demonstrate how a value analysis can help to identify connections and disconnections among stakeholder groups regarding conflicts related to natural resources. They also help to identify solutions for the environmental and socio-economic crisis of the Mar Menor coastal lagoon watershed with more general support to be implemented.

Values related to *Emotional heritage*, *Education*, *Governance* and *Research and Development* are central to stakeholders' perception and their relation to the socio-ecosystem of the Mar Menor coastal lagoon watershed. Initiatives related to the *Education* and *Ethnographic heritage* value categories are more accepted by stakeholders, followed by the initiatives in the *Environmental ethics*, *Governance* and *Environmental status* values categories. Altogether, values and initiatives indicate that stakeholder groups prioritise a transition to governance, economic and educational models that respects nature and cultural landscapes, with values aligning with belonging, the population's identity and its livelihoods linked with the territory.

'Scientists, NGOs and consultancy firms' and 'Local population' share the most initiatives with other stakeholder groups, which indicates that these stakeholder groups might act as important knowledge brokers to help to identify solutions. The group with the fewest shared initiatives with other stakeholder groups is 'Farmers', which obtains a particularly low agreement level with 'Fishers and salt producers' and 'Tourism sector'. This reflects opposing interests and livelihood dependence on either inland ('Farmers') or coastal (tourism, fishers and salt producers) areas. Although the 'Tourism sector' does not show much similarity in values with 'Local population', 'Fishers and salt producers', all three

stakeholder groups have a very high agreement level for initiatives to solve the crisis because their livelihoods are directly affected by the activities performed in the watershed where 'Farmers' operate, and by the top-down decisions implemented by 'Public Administrations'. The dominant high intensity agriculture model in the catchment area that occurs mainly for international markets disconnects the 'Farmers' group from the other stakeholders that are directly affected by the impact of their activities.

The complexity of the situation means that agreements in values are not directly translated into agreements in initiatives among the same stakeholders. Therefore, a conceptual model to reach a consensus and common grounds for negotiation is proposed to help to co-create agreements based on common values and initiatives. Only for those aspects for which no common grounds are found in values or initiatives, and where disagreements dominate, can top-down well-informed implemented rules and law enforcement be proposed to foster the sustainable development of the socio-ecosystem to protect the livelihood of all the involved stakeholders.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data will be made available on request.

## Acknowledgements

We acknowledge the projects COASTAL 773782 (H2020 European Commission), AGRI\_SER PID2020-119825RB-I00 (Spanish Ministry of Science and Innovation) and AGROALNEXT (PRTR-C17.I1) and THIN-KINAZUL (C17.I01) from the Spanish Ministry of Science and Innovation with funding from European Union NextGenerationEU - and Fundación Séneca (Region of Murcia) for financial support. We are very grateful to all the participants in the COASTAL project workshops for their insights, constructive collaboration and interest. JML was also funded by a María Zambrano postdoctoral grant by the Spanish Ministry of Universities and Next Generation European Union funds. We also thank two anonymous reviewers and the associate editor for providing valuable comments and suggestions which improved the early version of the manuscript.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.landurbplan.2023.104829>.

## References

- Álvarez-Rogel, J., Barberá, G. G., Maxwell, B., Guerrero-Brotos, M., Díaz-García, C., Martínez-Sánchez, J. J., et al. (2020). The case of Mar Menor eutrophication: State of the art and description of tested Nature-Based Solutions. *Ecological Engineering*, 158. <https://doi.org/10.1016/j.ecoleng.2020.106086>
- Anthony, A., Atwood, J., August, P., Byron, C., Cobb, S., Foster, C., et al. (2009). Coastal lagoons and climate change: Ecological and social ramifications in U.S. Atlantic and Gulf coast ecosystems. *Ecology and Society*, 14. <https://doi.org/10.5751/ES-02719-140108>
- Biernacki, P., & Waldorf, D. (1981). Snowball sampling: Problems and techniques of chain referral sampling. *Sociological Methods & Research*, 10, 141–163. <https://doi.org/10.1177/004912418101000205>
- Bryan, B. A., Raymond, C. M., Crossman, N. D., & Macdonald, D. H. (2010). Targeting the management of ecosystem services based on social values: Where, what, and how? *Landscape and Urban Planning*, 97, 111–122. <https://doi.org/10.1016/j.landurbplan.2010.05.002>
- Cabello, V., & Brugnach, M. (2023). Whose waters, whose nutrients? Knowledge, uncertainty, and controversy over eutrophication in the Mar Menor. *Ambio*, 52, 1112–1124. <https://doi.org/10.1007/s13280>

- Chapin, F.S., Kofinas, G.P., Folke, C., 2009. Principles of ecosystem stewardship: Resilience-based natural resource management in a changing world. In: Chapin, F.S. et al. (Eds). *Princ. Ecosyst. Steward. Resilience-Based Nat. Resour. Manag. a Chang. World* 1–40. 10.1007/978-0-387-73033-2.
- Chung, N. C., Miasojedow, B., Startek, M., & Gambin, A. (2019). Jaccard/Tanimoto similarity test and estimation methods for biological presence-absence data". *BMC Bioinformatics*, 20, 644. <https://doi.org/10.1186/s12859-019-3118-5>
- Davis, J. C. (1986). *Statistics and data analysis in Geology* (p. 646). New York: John Wiley and Sons.
- Delgado, A., Tudela, A., 2019. La máquina del regadío - Mar Menor: Historia profunda de un desastre (eldiario.es).
- Fales, M., Dell, R., Herbert, M. E., Sowa, S. P., Asher, J., Neil, G. O., et al. (2016). Making the leap from science to implementation: strategic agricultural conservation in Michigan 's Saginaw Bay watershed. *Journal of Great Lakes Research*, 42, 1372–1385. <https://doi.org/10.1016/j.jglr.2016.09.010>
- García-Pintado, J., Martínez-Mena, M., Barberá, G. G., Albaladejo, J., & Castillo, V. M. (2007). Anthropogenic nutrient sources and loads from a Mediterranean catchment into a coastal lagoon: Mar Menor. *Spain. Sci. Total Environ.*, 373, 220–239. <https://doi.org/10.1016/j.scitotenv.2006.10.046>
- García-Ayllón, S., & Radke, J. (2021). Geostatistical analysis of the spatial correlation between territorial anthropization and flooding vulnerability: Application to the DANA phenomenon in a mediterranean watershed. *Applied Sciences*, 11, 1–22. <https://doi.org/10.3390/app11020809>
- Goggin, C. L., Barrett, T., Leys, J., Summerell, G., Gorrod, E., Waters, S., et al. (2019). Incorporating social dimensions in planning, managing and evaluating environmental projects. *Environmental Management*, 215–232. <https://doi.org/10.1007/s00267-018-01131-w>
- Guaita-García, N., Martínez-Fernández, J., Barrera-Causil, C.J., Esteve-Selma, M.Á., Fitz, H.C., 2020. Local perceptions regarding a social-ecological system of the mediterranean coast: the Mar Menor (Región de Murcia, Spain). *Environ. Dev. Sustain.* 10.1007/s10668-020-00697-y.
- Guaita-García, N., Martínez-Fernández, J., Barrera-Causil, J., Fitz, H.C. (2022). Stakeholder analysis and prioritization of management measures for a sustainable development in the social-ecological system of the Mar Menor (SE, Spain). *Environmental Development*. 10.1016/j.envdev.2022.100701.
- Hardin, G. (1968). The Tragedy of the Commons. *Science*, 162, 1243–1248. <https://doi.org/10.1126/science.162.3859.1243>
- Hunink, J. E., Contreras, S., Soto-García, M., Martín-Gorri, B., Martínez-Álvarez, V., & Baille, A. (2015). Estimating groundwater use patterns of perennial and seasonal crops in a Mediterranean irrigation scheme, using remote sensing. *Agric. Water Manage.*, 162, 47–56. <https://doi.org/10.1016/j.agwat.2015.08.003>
- Ives, C. D., & Kendal, D. (2014). The role of social values in the management of ecological systems. *J. Environ. Manage.*, 144, 67–72. <https://doi.org/10.1016/j.jenvman.2014.05.013>
- Jones, N. A., Shaw, S., Ross, H., Witt, K., & Pinner, B. (2016). The study of human values in understanding and managing social-ecological systems. *Ecol. Society*, 21, 15.
- Kofinas, 2009. Adaptive co-management in social-ecological governance. In: Chapin, F. S. et al. (Eds). *Princ. Ecosyst. Steward. Resilience-Based Nat. Resour. Manag. a Chang. World*, 77–101. 10.1007/978-0-387-73033-2.
- Larson, S., Stoeckl, N., Neil, B., & Welters, R. (2013). Using resident perceptions of values associated with the Australian Tropical Rivers to identify policy and management priorities. *Ecological Economics*, 94, 9–18. <https://doi.org/10.1016/j.ecolecon.2013.07.005>
- Laurila-pant, M., Mäntyniemi, S., Venesjärvi, R., Lehikoinen, A., 2019. Science of the Total Environment Incorporating stakeholders ' values into environmental decision support : A Bayesian Belief Network approach 697.
- Lithgow, D., De, G., Silva, R., 2019. Ecosystem-Based Management strategies to improve aquaculture in developing countries : Case study of Marismas Nacionales 130, 296–305.
- Lubchenco, J., Menge, B. A., Barth, J. A., Carr, M. H., Caselle, J. E., Chan, F., et al. (2019). Connecting science to policy makers, managers and citizens. *Oceanography*, 32, 106–115.
- Martínez-López, J., Carreño, M. F., Martínez-Fernández, J., & Esteve, M. A. (2014). Wetland and landscape indices for assessing the condition of semiarid Mediterranean saline wetlands under agricultural hydrological pressures. *Ecological Indicators*, 36, 400–408. <https://doi.org/10.1016/j.ecolind.2013.08.007>
- Martínez-López, J., Teixeira, H., Morgado, M., Almagro, M., Sousa, A. I., Villa, F., et al. (2019). Participatory coastal management through elicitation of ecosystem service preferences and modelling driven by "coastal squeeze". *Science of the Total Environment*, 652, 1113–1128. <https://doi.org/10.1016/j.scitotenv.2018.10.309>
- Martínez-López, J., Bergillos, R. J., Bonet, F. J., & de Vente, J. (2019). Connecting research infrastructures, scientific and sectorial networks to support integrated management of mediterranean coastal and rural areas. *Environmental Research Letters*, 14(11). <https://doi.org/10.1088/1748-9326/ab4b22>
- Martínez-Fernández, J. and Esteve-Selma, M.A., 2020. El colapso ecológico de la laguna del Mar Menor. In: Challenges for Water Management and Planning in Spain [Retos de la planificación y gestión del agua en España. Informe 2019]. Observatorio de Políticas del Agua (OPPA). Colección Informes Nueva Cultura del Agua, 75 pp.
- Munarriz, Begoña (1992). Técnicas y métodos de investigación cualitativa. Metodología educativa I. Jornadas de Metodología de Investigación Educativa (A Coruña, 23-24 abril 1991), coordinadores Eduardo Abalde Paz, Jesús Miguel Muñoz Cantero. A Coruña: Universidade da Coruña, Servizo de Publicacions, 1992, p. 101-116. ISBN: 84-600-8006-4. ISBN 84-600-8006-4.
- Prokopy, L. S. (2011). Agricultural human dimensions research: The role of qualitative research methods. *Journal of Soil and Water Conservation*, 66. <https://doi.org/10.2489/jswc.66.1.9A>
- Raymond, C. M., Bryan, B. A., MacDonald, D. H., Cast, A., Strathearn, S., Grandgirard, A., et al. (2009). Mapping community values for natural capital and ecosystem services. *Ecological Economics*, 68, 1301–1315. <https://doi.org/10.1016/j.ecolecon.2008.12.006>
- Romero Díaz, A., Caballero Pedraza, A., & Pérez Morales, A. (2017). Expansión urbana y turismo en la Comarca del Campo de Cartagena-Mar Menor (Murcia). Impacto en el sellado del suelo. *Cuadernos de Turismo*, 521. <https://doi.org/10.6018/turismo.39.290691>
- Ruiz Fernández, J.M., León, V.M., Marín Guirao, L., Giménez Casalduero, F., Álvarez Rogel, J., Esteve Selma, M.A., Gómez Cerezo, R., Robledano Aymerich, F., González Barberá, G., Martínez Fernández, J., 2019. Informe de síntesis sobre el estado actual del Mar Menor y sus causas en relación a los contenidos de nutrientes. Univ. Alicante. 1–7.
- Schwartz, S. H. (1994). Are there universal aspects in the structure and contents of human values? *Journal of Social Issues*, 50, 19–45. <https://doi.org/10.1111/j.1540-4560.1994.tb01196>
- Schwartz, S. H. (2012). An overview of the schwartz theory of basic values. *Online Readings in Psychology and Culture*, 2(1). <https://doi.org/10.9707/2307-0919.1116>
- Shipley, N. J., Johnson, D. N., van Riper, C. J., Stewart, W. P., Chu, M. L., Suski, C. D., et al. (2020). A deliberative research approach to valuing agro-ecosystem services in a worked landscape. *Ecosystem Services*, 42. <https://doi.org/10.1016/j.ecoser.2020.101083>
- Tiller, R. G., Destouni, G., Golumbeanu, M., Kalantari, Z., Kastanidi, E., Lazar, L., et al. (2021). Understanding stakeholder synergies through system dynamics: integrating multi-sectoral stakeholder narratives into quantitative environmental models. *Front. Sustain.*, 2, 1–12. <https://doi.org/10.3389/frsus.2021.701180>
- Toomey, A. H. (2023). Why facts don't change minds: Insights from cognitive science for the improved communication of conservation research. *Biological Conservation*, 278. <https://doi.org/10.1016/j.biocon.2022.109886>
- Vidal-Abarca, M. R., Esteve Selma, M. A., Suárez Alonso, M. L., 2003. Los Humedales de la Región de Murcia: Humedales y Ramblas de la Región de Murcia. Murcia: Consejería de Agricultura, Agua y Medio Ambiente.
- von Winterfeldt, D. (2013). Bridging the gap between science and decision making. *Proceedings of the National Academy of Sciences*, 110, 14055–14061. <https://doi.org/10.1073/pnas.1213532110>
- Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, adaptability, and transformability in social-ecological systems. *Ecology and Society*, 9. <http://www.ecologyandsociety.org/vol9/iss2/art5>.