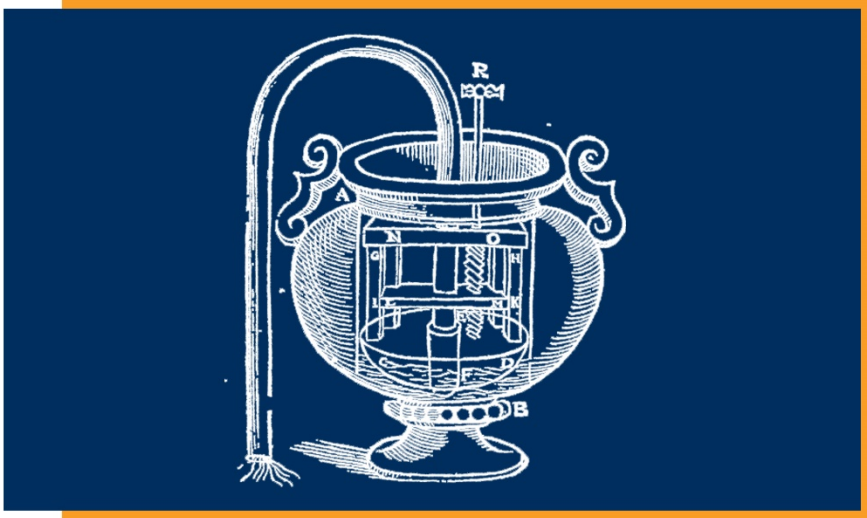
CNR-IRCrES Working Paper

How to measure the social acceptability of alternative environmental management solutions in wetlands and other ecosystems



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How to measure the social acceptability of alternative environmental management solutions in wetlands and other ecosystems

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ABSTRACT
The paper provides a conceptual framework and a guidance to analyse the social acceptability (SA) of environmental restoration and alternative management options, particularly in the case of wetlands. Social acceptability is a fundamental step to guarantee the success of environmental management projects, that should also consider stakeholders' perceptions and preferences to ensure the true effectiveness of restoration actions. However, many restoration projects fail to integrate socio-economic analyses and bio-geo-physical research. To the best of our knowledge no systematic review and guidelines exist for the assessment of social acceptability and this paper explores the most recent international (academic and grey) literature with the aim to assess the state-of-the-art on SA assessment and to develop an original methodological framework to identify local stakeholders' perceptions and preferences for ecosystem restoration options.

KEYWORDS: social acceptability, wetland, environmental management projects, restoration.

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CONTENTS

1. INTRODUCTION

This paper provides a conceptual framework and a guidance to analyse the social acceptability (SA) of environmental restoration and alternative management options, particularly in the case of wetlands. In fact, SA is a fundamental step to guarantee the success of environmental management projects, that should also consider stakeholders' perceptions and preferences to ensure the true effectiveness of restoration actions. However, restoration projects often fail to integrate socio-economic analyses and bio-geo-physical research, mainly focusing on environmental aspects.

Since no systematic review and guidelines exist for SA assessment, this paper explores the most recent international (academic and grey) literature with the aim to assess the state-of-the-art on SA assessment and to develop an original methodological framework to identify local stakeholders' perceptions and preferences for wetland restoration (e.g., prioritization of co-benefits and other ecosystem services).

This investigation is developed within the EU-funded RESTORE4Cs project "Modelling RESTORation of wEtlands for Carbon pathways, Climate Change mitigation and adaptation, ecosystem services, and biodiversity, Co-benefits"[2] evaluating how restoration measures impact wetlands using a socio-ecological approach. The application of the SA analysis to the RESTORE4Cs case pilots will come afterwards, operationally adapting the proposed framework to the specific territorial and institutional context.

The rest of the paper is organized as follows: section 2 describes the methodology applied for the systematic literature review of both academic papers and other projects' reports; section 3 introduces the issue of social acceptability in the context of wetland management; section 4 investigates the relevant acceptability factors building a framework classifying socio-cultural, perceptual, and physical factors. The subsequent sections operationally explore stakeholders' management in SA (sec. 5) and the different available assessment methodologies of land use, land-use change, and forestry (LULUCF) decisions (sec. 6). Section 7 concludes.

2. LITERATURE REVIEW METHODOLOGY

To provide the initial understanding of the assumptions and methods beneath the measurement of the social acceptability of the projects and actions that affect land use, land-use change, and forestry (LULUCF), we developed a three-step review of the literature.

1. The initial phase, which took place in July 2023, consisted of a selection of the international literature (English language only) under the *Preferred Reporting Items for Systematic Review and Meta-Analysis* (PRISMA) *Statement* (Sarkis-Onofre *et al.*, 2021). More specifically, using a selection of relevant keywords combined in query strings (see Table 1 for the details about the strings), we investigated the repositories Scopus and Web of Science as sources of information.

[2] https://cordis.europa.eu/project/id/101056782/it

2. The second phase was the selection of relevant articles published in specialised Journals investigating the issue of wetland management. Once we identified "Wetlands" and "Wetlands Ecology and Management" as the most recognized journals (i.e., those with the highest scores according to https://www.scimagojr.com/), we used their homepage search tool to select the articles to consider.
3. The third action was the identification on the Cordis research platform (https://cordis.europa.eu/search/en) of the projects that have already experienced the assessment of social preferences on LULUCF in wetlands.

Table 1 shows the results of the three-step selection of the literature and quantifies the bulk of documents (journal articles and reports) that have been analysed to develop this methodological document. The table also indicates the strings and keywords we used for the different steps of the review.

Table 1. Sources, criteria and number of references (records) resulting from the selection of the literature

Database	WOS (1)	Scopus (2)	WoS+Scopus	Specialised Journals	Cordis (3)
Total records from the query (1) (2)	170	156	326	14	76
Removed duplicate record	110		110	-	-
Selected records	170	46	216	14	57
Pertinent(4) records according to abstract and keywords	33		33	9	10
Very relevant records according to content	16		16	3	3

(1) WOS query string: TITLE-ABS-KEY ((public AND acceptability) OR (social AND acceptability)) AND TITLE-ABS-KEY ((restor*) OR (restore) OR (abandon*) OR (convers*)) AND TITLE-ABS-KEY ((land AND cover*) OR (land AND use*) OR (land*) OR (landscape) OR (territor*) OR (community))
(2) Scopus query string: (TS=((public acceptability) OR (social acceptability))) AND (TS=((restor*) OR (restore) OR (abandon*) OR (convers*))) AND (TS=((land cover*) OR (land use*) OR (land*) OR (landscape) OR (territor*) OR (community)))
(3) Cordis query string: “wetlands” AND “social” AND “acceptability”
(4) values >=2 of a range of relevance 0-3, where 0 = not relevant at all, 1= poorly relevant, 2= relevant, 3= very relevant

As a result, we found 22 references[3] (see Annex 1 for details) providing key, recursive elements for understanding of how social acceptability is conceived and analysed in the context of wetland management. As we will document further, the management of wetlands represents a critical area in decision-making, intersecting many different interests in complex and dynamic ways (Ramsar, 2005). Therefore, the literature focused with such an issue has many aspects in common with the general literature on LULUCF management, but it also requires dedicated focus. Section 3 of the paper provides the specific theoretical framework to study the social acceptability of alternative decisions/scenarios of wetland restoration.

[3] As the reader will notice, the references cited in this document exceed the 22 listed here as very relevant. On the one hand, these additional references have been identified because they are functional to the general discourse; thus, they are not necessarily part of the wetland and SA literature. On the other hand, they are also the result of a snowballing process from the 22 very relevant references that helped us to specify better their content.

3. THE SOCIAL ACCEPTABILITY OF WETLAND RESTORATION

Initially, the concept of social acceptability (SA) applied to natural resource management emerged in the 1990s with regard to forestland (Shindler et al., 2002; Brunson & Shindler, 2004). Since then, the research on SA has significantly expanded including other types of land use, land use change and forests (LULUCF). Generally speaking, the SA of an intervention (for instance, the decision to substitute the existing vegetation with other species or to treat them chemically or mechanically) or a scenario (i.e. the foreseeable alteration of existing environmental conditions due to some main socio-ecological trends) that concerns existing LULUCF refers to the judgement of opportunity and shareability the individuals give on them.

Currently, the literature analyses SA in the context of a varied set of management options and territorial contexts, frequently assessing prioritisation rankings of preferences and management actions. The disciplines that are involved in this effort of scientific investigation are varied too, including both social and natural sciences. In land management research, for instance, scholars have particularly focussed on the acceptability of different options of forest, grassland, and coastal management (Arnberger et al., 2022; Sutton et al., 2022; Dixon et al., 2008; Morton et al., 2010). In this literature, the perceived impact of the different interventions on the local landscape is the key. Conversely, in ecological economics and environmental management studies the focus is mainly on the impacts caused on fragile ecosystems and the way to restore them (Campbell-Arvai, 2019; Uprety et al., 2012; Gamborg, Morsing & Raulund-Rasmussen, 2019; Psychoudakis, Ragkos & Seferlis, 2005). In fact, LULUCF preferences can be motivated according to different sets of values including the effects they produce at the ecosystem-level (particularly ecosystem services and disservices), as well as their economic/financial relevance. By the way, it is important to note that a deep and comprehensive assessment of SA should be based on an integrated framework from social and natural sciences, that combines socio-economic and decision-making knowledge with biophysical analysis (Ford at al., 2021).

As a common trait, the assessment of SA relies on surveys, interviews and questionnaires with stakeholders. Nevertheless, scholars also employ approaches that vary according to their objective and the site they work on. For example, in some studies, the SA has been successfully investigated via visual representations such as landscape pictures and images coupled with ecological information (Hill & Daniel, 2007) and renders of the different LULUCF management options (Arnberger et al. 2022). Conversely, oral and written opinions are used above all when the investigated management options are either hardly visualisable or linked to beliefs and values that are socially grounded (Arnberger et al., 2022).

Initially, the need for a shared social understanding on LULUCF arose in the realm of forest management. Later, it started to be applied to wetlands too (marshes, bogs, sloughs, and swamps) and the pressing challenges threatening them. A new stream of literature thus started paying specific attention to the role the ecosystem services (ES) provided by preserved, altered, or restored wetlands play in the SA of the interventions to them addressed (Gamborg, Morsing, Raulund-Rasmussen, 2019; Guo et al., 2019; Moshofsky, Gilani, Kozak, 2019; Morton et al., 2010). In this literature, stakeholders are often asked to express their opinions in a "relative" way, i.e. choosing among a given set of options (Gamborg, Morsing, Raulund-Rasmussen, 2019; Guo et al., 2019; Moshofsky, Gilani, Kozak, 2019; Morton et al., 2010). Consistent with Brunson's definition (1996), the investigation of SA of decisions affecting ES requires that the stakeholders' judgments are comparatively assessed, which means that any preservation or restoration action is deemed "acceptable" if it is rated equal or better than its alternatives (Brunson & Shindler, 2004).

In this comparative process, contextual, institutional and cultural factors influence the individual's evaluation process via the formation of cognitive beliefs (Shindler, 2000). Cognition is in fact shaped by social influences such as education and peer interaction, but it also reflects the situated experience stakeholders develop individually (Bem, 1970) and with the rest of the local residents (Manfredo et al., 1990).

Another distinguishing feature of the literature on SA of LULUCF in wetlands refers to the dramatic relevance wetland restoration actions have for the health of the global terrestrial ecosystem (Ramsar, 2005). Wetlands are complex ecosystems that host various habitats and

species. They rely on fragile equilibria that are currently exposed to several menaces (pollution, urbanisation, climate change, alien species, etc.). Also, wetlands produce fundamental ecosystem services whose benefits expand far beyond the geographical borders of the wetland itself (Ly et al. 2022).

According to this, the literature shows that assessing and discussing the degree of SA that the environmental management action arises in the local community plays a fundamental role to foster future public participation and the acceptance of its implementation (Garcia et al., 2020). Weir and Doty (2016) corroborated this perspective in the context of wetland restoration projects, asserting that assessing social acceptability is a valuable tool for measuring project viability. In particular, the assessment of SA plays a crucial role for the restoration of degraded wetlands (Alaira et al., 2021) and riparian wetlands (Garcia et al., 2020), implying the experimentation of innovative technologies. In these contexts, the involvement of the local actors in the SA survey helped to increase feelings of acceptance, accountability and participation, while reducing initial sense of alienation and conflict. Finally, it helped the integration of the contrasting/diverging viewpoints, favouring the maximising of the social and ecological benefits (Garcia et al., 2020).

4. Relevant issues of social acceptability of wetland management

Social acceptability is a key determinant of the success of technologies or projects regarding environmental management: stakeholders' engagement in restoration actions is essential to their success. However, according to literature, several types of factors play a key role in influencing stakeholders' orientation in the area of social acceptability.

The bulk of factors classified as relevant is really large, ranging from individual perceptions, preferences and values, to contextual and institutional elements. Gupta et al. (2011) reviewing nearly 300 articles noted that the multifaceted nature of social acceptability involves considerations of trust, risk, knowledge, perceived benefits, individual differences, attitudes, value orientations, and the broader social context (see also Alaira et al., 2021). Hence, a comprehensive classification is hard to find. Moreover, it is essential to consider that most of the effects are highly context-specific, depending on the features of the specific study site, on the stakeholders affected, and on the management practices under consideration. In addition, factors influencing preferences for ecological management are interconnected and can influence each other (Garcia et al., 2020). Hence, the assessment of social acceptability is a cumbersome issue.

This section is intended to provide an annotated review of relevant variables in the case of wetland management actions. Based on the work of Garcia and colleagues (2020) on the acceptability of river rehabilitation projects, we propose a tripartite classification of social acceptability determinants: i.e., physical, perceptual, and socio-cultural dimensions. Each category includes several factors. As we will see, both individual and public/community aspects are fundamental in determining preferences.

Figure 1. Mindmeister framework of wetland acceptability factors

Adapted from Garcia et al. (2020), p.15.

4.1. Socio-cultural factors

The socio-cultural dimension refers to factors related to the individual's social and cultural background that shape individuals' preferences. Relevant dimensions include: socio-demographic characteristics; place attachment; knowledge about ecosystems and the services they provide; information about environmental management practices and their effects; individual and collective values and beliefs.

Most of the literature does not simply observe restoration preferences, but tries to trace them back to specific value orientations and to understand whether they are typical of certain stakeholders' groups. Hence, it is fundamental to investigate **individual beliefs and values** to assess public acceptability judgments (Ford et al., 2014). Scholars try to identify significant correlations between individuals' preferences for particular values and their attitudes toward environmental issues. For example, people preferring values like participation and freedom of opinion tend to have a positive attitude towards restoration actions (Weir, 2015; cit. in Alaira et al., 2021). Several studies show that the values mostly influencing individuals' attitudes toward natural resource management are related to ***people's view of the human-nature relationship***, that is to say the balance between the needs of human societies and the needs of natural ecosystems (Brunson and Steel, 1996; Shindler et al., 1996). Literature mainly investigates the dichotomous *distinction between ecocentrism (or Nature for Nature valuing) and utilitarianism/anthropocentrism (or Nature for People valuing)*, measured by means of particular metrics like the Economic-Environmental Paradigm (EEP), i.e. a Likert-based score expressing individuals' ecocentric or anthropocentric orientation in environmental issues (see for example Alaira et al., 2021). Garcia et al. (2020) point out that people more oriented towards nature conservation are more supportive of ecological restoration, while people focused on traditional land uses may oppose it. However, ecocentric people may have a negative opinion towards particular rehabilitation measures, even if they generally support the objectives of rehabilitation.

Lengieza et al. (2023) recently have proposed to add a measure of *valuing Nature as Culture* as complementary to Nature for Nature (ecocentric) and Nature for People (anthropocentric) measures, showing that it represents a distinct psychological factor helping predict pro-environmental behaviour. Recent research by Feucht et al. (2023) explored the different types of values associated with nature in terms of intrinsic, instrumental and relational values. In particular, *instrumental values* refer to the practical benefits or services that nature provides to humans, such as clean air, water, and resources for food and shelter (Pascual et al. 2017); *intrinsic values* are based on the belief that nature has inherent worth and should be valued for its own sake, regardless of its usefulness to humans, emphasizing the importance of preserving nature for its inherent beauty, biodiversity, and ecological integrity (Díaz et al. 2015); *relational values* focus on the interconnectedness and relationships between humans and nature, recognizing the importance of nature for human well-being, cultural identity, and sense of place and emphasizing the emotional and spiritual connections that individuals have with nature (Muraca, 2011). These three values are not mutually exclusive and can coexist in individuals' perceptions of nature: understanding their role is important for motivating people for environmental protection and conservation efforts. Feucht et al. (2023) found that university students in Germany, regardless

of their major, generally agree on the intrinsic and instrumental values of nature, but differ in their relational perception of nature. Environmental disciplines show the strongest agreement with relational values, followed by people-aligned disciplines, while disciplines not directly associated with people or nature agree less with relational and intrinsic values.

Beyond the values of single individuals, the ***alignment of value orientations within stakeholders' groups is relevant***. In fact, the acceptability of management actions and the levels of agreement may vary markedly among groups, especially when restoration actions could impact them directly (Alaira et al., 2021). As an example, Bath et al. (2022) find significant differences among stakeholders' groups (managers, the public, hunters) in accepting bison management strategies, depending on ecocentric *vs* anthropocentric values assigned to bison and beliefs about the impacts of bison restoration. Specifically, managers and the public were more likely to accept reducing the number of remaining bison available to be harvested compared to hunters. Similarly, farmers often express stronger preferences for agricultural activities and urban development over wilderness and non-intensively managed landscapes (Garcia et al. 2020). Also, the perceived importance of specific ecosystem services - and the preferences towards environmental management strategies preserving their provision - can vary depending on stakeholders' characteristics and interests (Alaira et al., 2021). For example, Ly et al. (2022) show that communities with greater floodplain forest cover have a higher dependence on fishing and other resources, and fishers have a higher perception of the importance of ecosystem services for their livelihood. Although, no significant direct influence of community characteristics emerges on the perception of floodplain resources.

Apart from values and beliefs, another relevant dimension to assess social acceptability of natural resources management concerns individuals' ***socio-demographic characteristics***, such as sex, age, income, and education. Many studies investigate their associations with the preferences of the general public on alternative rehabilitation actions, particularly related to the provision of specific ecosystem services. Concerning the attractiveness of landscapes, Garcia et al. (2020) find that income and education are positively associated with higher willingness-to-pay for riparian rehabilitation actions, while older people tend to show lower acceptance levels, especially when rehabilitation counters traditional practices. Ly et al. (2022) investigate the role of socio-demographic variables in judgments of wetland acceptability: respondents' work, household size, age and sex are significantly correlated with the perceived benefits of specific ecosystem services. In particular, male-headed households and young people have a greater willingness to pay for aesthetic, social relationship and cultural heritage services. In addition, Alaira et al. (2022) explore demographic associations with individuals' environmental orientation measured by the EEP scale. They suggest that women, young people, more educated individuals, higher-income persons significantly tend to be more environmentally oriented. However, income can have an ambivalent role: on the one hand, it can positively influence individuals' willingness to pay for environmental development; on the other hand, low-income people can be more likely to accept restoration actions if they expect enhanced living conditions and income (Espaldon et al., 2016; Muzari et al., 2012).

Besides socio-demographic characteristics, the ***geographic context*** influences acceptability judgments as well (Kakoyannis et al., 2001). Urban and peri-urban residents are generally more environmentally oriented (Alaira et al., 2022). Brunson and Shindler (2004) confirm the existence of region-specific preferences in natural resource decision-making.

Another issue that is generally considered along with socio-demographic features is ***place attachment***, i.e. the emotional bond individuals develop towards their everyday life context. Literature suggests that it depends on social integration and that greater attachment to places leads to opposition to development projects. In particular, Garcia and colleagues (2020) claim that water-related landscapes typically evoke stronger attachment and are more exposed to conflicts. In this regard, both the length of residence and the distance with respect to the site of restoration can have a role that is generally context-specific. In fact, newcomers typically base their attachment on environmental quality, while longtime residents base it on social ties. The distance of residence can have twofold effects: in the case of forest management, Abrams et al. (2005) find that people living farther from the rehabilitation area are more likely to accept a new

environmental technology/project/practice, probably because they have the perception to be less affected by its activities and consequences. Conversely, people living near the rehabilitation site can accept it, because they perceive direct positive impacts.

The last aspect to consider within socio-cultural factors is the relevance of ***information and knowledge*** about ecosystems, their services, and environmental management measures on the formation of social acceptability judgements (Arnberger et al., 2022; Kakoyannis et al., 2001). Firstly, because acceptability judgments incorporate cognitive information and are expressed in relation to socially shared norms; secondly, because providing information about a management problem helps establish a context for more reasoned judgments. For example, Brunson and Shindler (2004) show that attitudes towards wildland fuels management practices are more positive among citizens who understand the natural role of fire in ecosystems, suggesting that an individual's cognitive judgments of acceptability can differ from its beliefs/attitudes on the same issue.

That being said, the effectiveness of *informational interventions* on acceptability judgments proves some inconsistency in several studies (Hill and Daniel, 2007; Arnberger et al., 2022). This is mostly because it is difficult to isolate the role of knowledge from that of other factors conditioning social acceptability.

In any case, it is believed that *familiarity and experience with environmental management* can lead to higher acceptability ratings. In fact, Arnberger and colleagues (2022) show that information about restoration goals and a comprehensive understanding of its key attributes increase acceptability judgments, while they have no effect on landscape preferences. Moreover, Gamborg et al. (2019) investigate the effects of a direct involvement of stakeholders in ecological restoration processes. Most of the engaged stakeholders feel that their knowledge and views were actually incorporated into the project, and that the project effectively represents ecological restoration interests. In addition, they feel that the participation process was worthwhile and would join a similar project in the future. Since stakeholders' knowledge and familiarity play a role in social acceptability, restoration treatments should be implemented cautiously, starting with smaller-scale changes. As more people understand the values of environmental rehabilitation, larger-scale treatments may become more acceptable.

Although knowledge and cognitive processes can shape perceptions and intentions to modify the landscape, having access to knowledge about wetlands ecology may not immediately influence restoration preferences. One reason is that people with higher knowledge of ecosystems and nature conservation may see beauty in landscapes, while others may not (Garcia et al., 2020). A specific wetland-related problem concerns the difficult access to information for resource management, that affects decision making and management capacity (Finlayson et al., 1998). Investing in wetland knowledge is also a challenge because social and biophysical knowledge must be integrated into environmental decision making: hence, it is necessary to merge knowledge based on different epistemic assumptions (Eliot et al., 1998). Moreover, continuous research and monitoring are necessary to understand environmental changes, develop management strategies, and evaluate their effectiveness.

To overcome these problems, investments in data and information are needed, including coordination of data acquisition and the development of meta-databases, that would reduce uncertainty, improve decision making, and avoid failing projects. Although many restoration projects start including the construction of a *Decision Support System (DSS)*, Ford et al. (2021) point out that the DSS design needs to consider project framing issues carefully: when the project framing is dominated by the biophysical sciences, technique-driven integration is a barrier to many potential contributions from the social sciences, that could help linking the DSS with surrounding social and decision-making contexts. On the contrary, conceptual integration is more effective when social researchers directly contribute to the DSS design, e.g. analysing and incorporating stakeholders' values in the design.

4.2. Perceptual factors

This dimension includes the various perceptual and psychological factors influencing stakeholders' environmental management preferences. The perception of naturalness, aesthetics, recreation as well as risk and safety are often analysed to explore the wetland landscape preferences of the general public. In particular, evolutionary theories state that aesthetic preferences are influenced by *evolutionary factors* and may not be significantly altered by ecological information and education (Hill and Daniel, 2007). This is a reason for the inconclusiveness of traditional approaches using brochures and information letters to promote environmental management (see section 4.2). In fact, the emphasis on information as a means of changing attitude and behaviour is based on rational models of decision-making, while it seems that aesthetic preferences are deeply rooted in the landscape and may be influenced by emotions and biology and by millions of years of natural selection. In particular, cognitive psychology and decision sciences indicate that landscape preferences are driven by basic emotional and affective processes and are not easily influenced by cognitive factors.

Literature generally points out a strong relationship between objectively measured naturalness and landscape preference. However, this relationship is heavily mediated by the way individuals perceive naturalness, and sometimes it is no longer evident (Cockerill and Anderson, 2014). More generally, changes in the landscape biophysical characteristics (e.g., water quality, vegetation) affect **naturalness, aesthetics, and recreation perceptions**. However, Dennison et al. (2021) find that stakeholders' attitudes towards land use change are highly context-specific and coexist with concerns about the aesthetic and recreational impacts of the management intervention: this means that research on cultural ecosystem services is generally related to the case study and has poor external validity.

For this reason, Busse et al. (2019) use the concept of *cultural landscapes (CL)*. Studying the acceptability of sustainable redevelopment of wet meadows through artificial pools, they define CLs as landscapes affected, influenced, or shaped by human involvement. If a management action is likely to alter or damage a CL, stakeholders are likely to reject or at least be reluctant to accept the action. However, high CL appreciation does not necessarily translate into acceptance of the management action. For instance, Busse et al. (2019) state that the degree of appreciation of the CL depends on the perceived importance of the wetland maintenance in general. In addition, some limited evidence suggests that landscape heterogeneity positively influences stakeholders' preferences (Dennison et al., 2021).

Wetlands, especially bogs or swamps, are classic examples of landscapes with high ecological value that are judged as aesthetically unpleasant (Gobster et al., 2007; Nassauer, 2004). The *misalignment between stakeholders' perceptions and scientific ecological measures* is a critical issue in acceptability. Since aesthetic preferences are strongly influenced by perceptions of naturalness, the public may (mis)perceive degraded ecosystems as natural and may fail to identify objective biophysical factors that contribute to naturalness. As a result, a disconnection between ecological quality and aesthetic preferences may occur, with landscapes of high ecological value judged aesthetically unpleasant, while rehabilitated landscapes can be aesthetically valued, despite they determine no significant improvements in ecological integrity.

Finally, public **perception of risk and safety** significantly influences acceptability of river and wetland management actions mainly because perceiving restoration measures as a threat (e.g., in terms of flood risk) rises the support for their implementation. However, Garcia et al. (2020) point out that the perception of risk associated with a phenomenon can be also ambivalent, depending on the point of observation. For example, wood in rivers is seen as both improving habitat services and increasing the risk of flooding and infrastructure damage. The authors also highlight that perceptions of flood risk and prior flood experience affect the acceptance of restoration measures. Other important concerns expressed by stakeholders about wetlands include water quality, mosquito problems and general health safety.

Some scholars explore the relationship between value orientation and risk perception introducing the concept of cultural risk cognition (CRC), i.e. the tendency to perceive risks and related facts in relation to personal values. Moshofsky et al. (2019) specifically explore the role

CCR in influencing the acceptability of forest adaptation strategies. In particular, they observed the distribution of stakeholders' worldviews, noting interesting trends in the perceived acceptability of adaptation scenarios among cultural groups. In particular, individualists are more likely to accept scenarios involving high risk and economic return. Foresters are willing to improve local forest resilience preferring locally-based scenarios with conventional timber species and no assisted migration practices. On the contrary, environmental participants are more receptive to assisted migration and prefer scenarios with mixed species, while local citizens have a slight preference for scenarios incorporating local seed sources.

In conclusion, it is important to be aware that, since societal perceptions of rehabilitation interventions and their risks influence their uptake, incorporating social views into environmental management is crucial to cope with the climate change challenge (Elliot et al., 1998). In fact, societal perceptions and values are reflected both in the awareness of the potential effects of climate change and in the attitudes towards environmental hazards and threats. In this perspective, raising stakeholders' awareness is crucial in changing governmental and community perceptions of climate change implications and environmental resource management, including public resources allocation and administrative adjustments to address the consequences of climate change.

4.3. Physical factors

This category includes factors that consider the relationship between the *elemental, structural (design) and functional characteristics* of wetland landscapes and people's preferences. These can be categorised as **landscape biophysical and functional features,** like ecosystem services and disservices.

Concerning the specific case of wetlands, water bodies have a positive attraction effect on humans, but the specific configuration of biophysical elements influences stakeholders' preferences. In fact, waterscape aesthetic preferences are influenced by the presence of both water and the natural structures surrounding it, such as vegetation. Garcia and colleagues (2020) find that vegetation and water/sediment are significant predictors of aesthetic appreciation of riparian landscapes, but preferences for wood vary across cultures and contexts. Water clarity, trophic status and biodiversity, particularly the richness of bird and wildlife species, contribute to the increased attractiveness of wetlands.

These considerations are strictly related to the provision of ecosystem services (ES) that needs to be considered in social acceptability studies. Particularly concerning wetlands, it is well known that they cover a small percentage of the earth's surface, but provide nearly half of the global ES. Ly et al (2022) specifically investigate the ES provided by flooded forests, classified into **provisioning, regulating, supporting and cultural ecosystem services**. In their case study (Asia Tonle Sap Lake floodplain), the human-nature interaction is particularly intense, and the local communities' perception and dependence on wetland ES are influenced by the interplay of socioeconomic factors, cultural characteristics, and political phenomena that cannot be neglected in the evaluation of social acceptability.

However, it is evident that an exhaustive list of these factors is necessarily contextual and dependent on the number and types of the provided ES. If you consider different types of wetlands, some biophysical characteristics and functions could obviously be different, but most of the functions are common. For instance, Ly et al. (2022) focus on the cultural services of flooded forests including cultural heritage, ecotourism, aesthetic value, spiritual and religious value, inspirational value, and social relations. Andrews and Russo (2022) collect citizens' opinions about the most important functions of urban wetlands: biodiversity conservation, water quality improvement, and habitat creation emerge. Depending on the type of stakeholder, flood control, research space, carbon storage, and climate change mitigation are also considered very important functions. The study also investigates the use of urban wetlands for educational activities and physical exercise: no difference in educational activities emerges among age groups,

but younger individuals are less likely to use wetlands for physical exercise. Finally, the scholars underlie that supporting ES (e.g. by providing some infrastructures for recreation and leisure, as well as visual and physical access to the area) could positively affect stakeholders' preferences for wetlands rehabilitation. In addition, "cues to care" management practices can be exploited to help people labelling the landscape as attractive and improve aesthetic perception of rehabilitated areas: mimicking familiar cultural cues and using signs to help people understand the ecological value of landscapes can contribute to appreciation of ecological improvements (Garcia et al., 2020).

The last physical dimension affecting wetlands acceptability concerns their **vulnerabilities**. According to Van Alphen et al. (2021), vulnerability is determined by the exposure to stressors and sensitivity of the system (the external impact) and by the ability to withstand or mitigate these impacts (adaptive capacity). Vulnerability assessments are important in discussions of global change and can help identify existing and future problems, explore uncertainties, and find robust management solutions. Some vulnerabilities affect the totality of wetlands, while others are type- and context-specific. Generally, wetlands of high natural value are at risk of being abandoned or harmed, leading to a decrease in ecosystem functioning, biodiversity, and cultural values (Busse et al., 2019).

Climate change is considered a global problem and can cause different issues depending on the type of wetland considered. When assessing vulnerability to climate change, it is fundamental to consider natural climate variability and distinguish it from changes caused by human populations. As an example, an assessment framework for evaluating the vulnerability of coastal wetland areas in the Alligator Rivers Region (Eliot et al., 1998) was guided by various sources, including IPCC workshops and conferences, as well as studies on the application of the IPCC Common Methodology to Australian conditions. The framework recognizes that changes in the environment of the coastal wetland areas are influenced by both natural forces and human activities. The assessment process involves scoping the issues related to climate and other changes, identifying the resources that could be affected, describing the change processes, assessing the significance of the changes, and determining the range of responses and actions to be implemented.

While the main threat to coastal wetlands is the joint action of climate change and humans (including natural hazards such as extreme weather events, flooding, coastal erosion, saltwater intrusion and changes in wetland inundation), in the case of flooded forests the most serious threats are predominantly human actions. Flooded forests are under severe threats globally, including degradation and loss due to illegal logging, land conversion, fires, and dams. The loss of flooded forests in tropical floodplains negatively impacts the livelihoods of local communities, as their primary food source and income are linked to the benefits derived from these forests. Human activities, including indiscriminate fishing and infrastructure development, are causing further degradation of resources (Ly et al., 2022).

In the specific case of wetlands, many projects aim to improve the community service functions while conserving good ecological status, supporting community-based solutions for wetland management, integrating them into river basin management and identifying strategies to adapt wetland management to changing environmental conditions (e.g., WETwin, BINGO). Among the main problems identified at different case study sites (Zsuffa et al., 2012), there are:

- desiccation and territorialization caused by reduced water inflows and climate change, as well as riverbed incision, floodplain aggradation, and agricultural drainage;
- encroachment and disturbance due to housing and agriculture, especially in developing countries;
- pollution, e.g. discharging untreated waste-waters and agricultural runoff into wetlands, that causes severe diseases, eutrophication, habitat degradation;
- provision of habitats for disease vectors like mosquitoes and snails.

Generally, these projects propose participatory approaches to investigate risk fragility and adaptation measures by means of collaborative communities of practice (CoPs) formed with local stakeholders and researchers.

5. STAKEHOLDERS' MANAGEMENT IN SOCIAL ACCEPTABILITY ASSESSMENT

A comprehensive contemplation of any individual and organisation involved in the decisions of wetlands management is essential to assess their social acceptability. Wetland restoration actions, particularly, link their success to the commitment and acceptability they stimulate in societies and local communities. Generally speaking, restoration projects must have resources allocated to involve both the government and the community levels in a comprehensive and inclusive way. Wide participation and the consideration of multiple perspectives allow to better address and combine the aims of environment conservation with economic valorisation and social sustainability (Gamborg, Morsing & Raulund-Rasmussen, 2019). This task is complex, however, and evolves with the process: initially, it requires considering all the diverse interest groups claiming the right to express their preference about wetland management (i.e. stakeholder mapping; see section 5.2); then, representatives of the selected interest groups (i.e., the stakeholders) must agree to be involved in the project and participate in a survey (see section 5.3). Figure 2 illustrates stakeholders' contribution along the different phases of the wetland management process (from design to evaluation).

The first phase benefiting from the consideration of the local stakeholders is the **local context analysis**. In this phase, contributions mainly have the form of narrative reports on the local economy, the local environment, the local society, and how they reciprocally interacted and evolved in time and space.

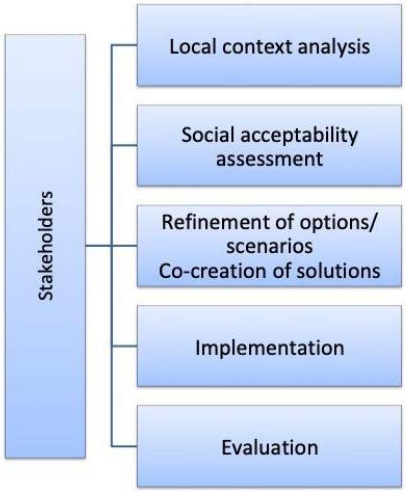
The second phase is the **Social Acceptability assessment**, which means investigating, based on a system of options/scenarios of wetland management, the preferences of the local stakeholders, and possibly their determinants. In this phase, stakeholders are asked to participate in an inquiry expressing their judgments on a selection of arguments, options, processes, and scenarios.

The third phase consists in the **refinement of the management options** researchers have derived from the analysis of the literature (both official and grey) and the consideration of existing practices and policy decisions. Here, the contribution of the stakeholders is both in the form of information provision (e.g. memories of past solutions), public debate on preferences and opinions (e.g. brainstorming), discussion and co-design.

The fourth phase regards the **implementation of the management options**. According to the type of actions to be implemented, the contribution of the stakeholders may be very residual (nearly no contacts) or critical (active participation in the implementation).

The fifth phase is the **evaluation of the project results and impacts**. In this phase, too, the intensity of the involvement ranges from very low (e.g. participation in a survey) to high (e.g. public debates, multi-actor workshops).

Figure 2. Stakeholders' contribution to the different phases of wetlands management



Source: authors' elaboration.

Each phase may require different levels of involvement based on the features of the site and the aim of the study (van Ingen et al., 2010). For instance, when the aim is adaptation measures (van Alphen et al., 2021) or innovative remediation solutions (Weir, 2015; Arnberger et al., 2022), the commitment should be the highest, since stakeholders have to be convinced of their relevance, usability and legitimacy. Also, high levels of stakeholder involvement increase the likelihood of positive outcomes such as: hazard risk reduction, socio-economic empowerment, social justice, and good governance. Consistent with this, in the three workshops organised by the COASTAL project to collect stakeholders' priorities (sector workshops, multi-actor workshops, and validation workshops), a main aim was also to increase their commitment to the project. Similarly, the PREPARED project (2021) developed a two-stage approach for selecting measures to adapt to extreme weather events. In the first stage, the researchers analysed previous EU research projects to identify a collection of best practices. In the second stage, the local stakeholders were asked to discuss potential climate hazards and suitable measures. As a result, the project identified a mix of adaptation measures (informational, financial, regulatory, and infrastructural) ranked on the basis of their relevance, feasibility, and governance.

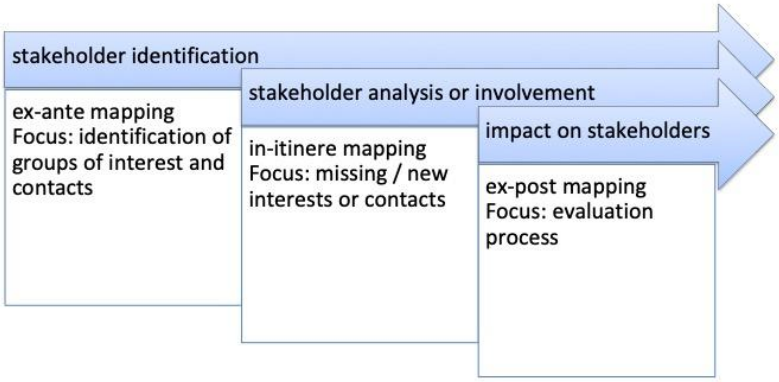
5.1. Stakeholders' identification and mapping

To identify all relevant stakeholders in a wetland restoration process, the first need is to catch all the interest groups involved in the different scenarios of wetland management and decide whether they are relevant.

Schematically, a preliminary exercise in stakeholder-based wetland management projects is the identification of the involved interests according to different scenarios of maintenance and restoration. It applies to both the research projects and the studies investigating the social acceptability of interventions on wetlands within a local community - which is the argument of this working paper - and to participative projects involving stakeholders in decision and management. Psychoudakis et al. (2005), for instance, making the assessment of a selection of wetland management options, used published sources and focus groups to identify a comprehensive list of relevant stakeholders and investigate their characteristics. Then, for each

interest group, contact details (name, surname, role, email, phone number of the representative) are needed to display the map of the stakeholders. This passage can be run both before and after their involvement in the project, so we can refer to an ex-ante, in-itinere, and ex-post mapping of the stakeholders (see Figure 3).

Figure 3. The phases of stakeholder mapping



Source: authors' elaboration.

Usually, stakeholder mapping occurs at the beginning of a project, during the planning and the initial phase. Nevertheless, repeating and updating it throughout the project also has benefits (SECOA, 2013). For instance, additional stakeholders can help when the stakeholders already involved cannot provide all the relevant information researchers look for. For instance, in the study by Ly et al. (2022) in-itinere stakeholder mapping provided additional information on ecosystem services.

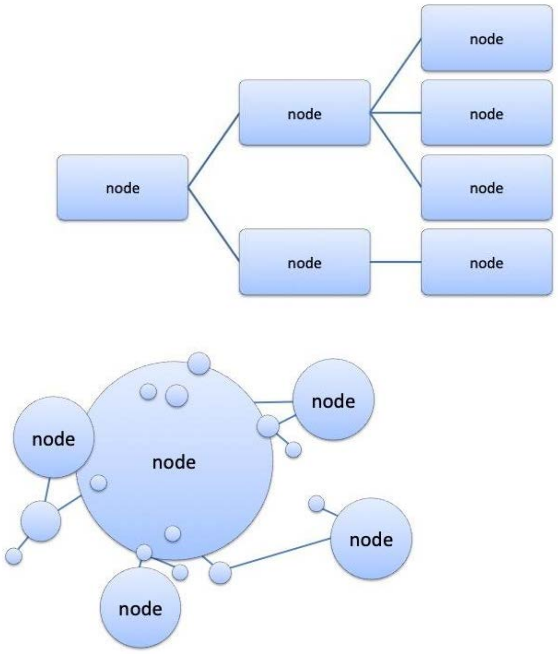
In contexts and LULUCF scenarios characterised by conflicts, contacts and negotiation among the stakeholders may be necessary before identifying the groups of interests. It is the case, for instance, of the institutional arrangements run for the purpose of integrated management of coastal wetlands in Northern Australia among Aboriginal associations, economic actors, and local community representatives (Eliot et al.1998). There, the adoption by the Australian Government of flexible and dynamic processes considering geographic diversity, jurisdictional configurations (i.e., territorial government levels), and cultural context proved successful.

Conversely, a more collaborative approach can stem when interests are shared. For instance, the COASTAL project (Tiller and Palmer, 2021) adopted a collaborative System Dynamics Framework to firstly identify the interest groups (coastal and rural entrepreneurs, administrators, experts, and other stakeholders) and, then, analyse their priorities to improve land-sea interaction. Consistent with this approach, the COASTAL project also produced a visual map of the stakeholders and their relationships, which turned critical for the success of the exploitation and societal impact of the project. In the experience of this project, the systematic display of the stakeholders' decision powers (e.g., on a scale ranging from low to high), interests (conflicting or converging), and relationships helped to construct appropriate target groups that enhanced the exploitation of results and the uptake of the decisions.

Furthermore, stakeholder mapping helped identify decision-makers, inform stakeholders, address conflicts, and find collaboration opportunities (Tiller and Palmer, 2021). Conversely, poor integration within the Government and public sector, unclear responsibilities, and the involvement of too numerous agencies affected the coastal wetland management negatively. As the case of Alligator Rivers Region has shown, integrated environmental management and coordination between the various departments and agencies is necessary for effective intergovernmental land management (Eliot et al., 1998).

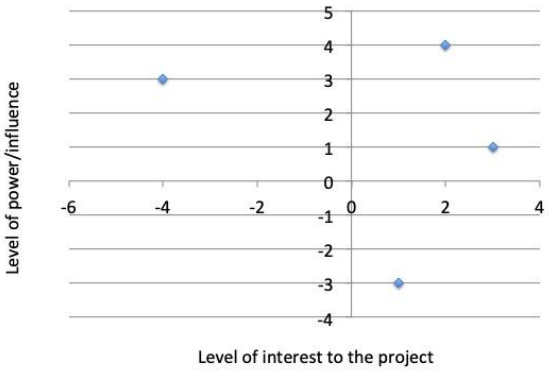
The quality of the stakeholder identification process increases the soundness of the acceptability assessment, while transparency increases its credibility and legitimacy and moulds the subsequent co-creation process. Hence, it is also important the way the information is collected and organised for the analysis. Mapping stakeholders means to represent the relational space of the project, i.e. the system of the stakeholders that have an interest in the project activities from either a personal or working perspective, and the (graphical/visual) representation of these relationships. According to their features and relationships, the stakeholders can be categorised and classified into hierarchies, axes, analytical dimensions, or pathways (Tiller and Palmer, 2021). To clarify this point, the figures that follow (Figures 4-6) offer examples of very common ways to map stakeholders in social acceptability studies.

Figure 4. Examples of hierarchical (a) and relational/pathway (b) stakeholder mapping



Source: authors' elaboration.

Figure 5. Two-dimension stakeholder mapping



Source: authors' elaboration.

In addition, stakeholders may be displayed/organised using a multidimensional mapping (Figure 6), e.g., according to their economic sector, the function they express (i.e., political, economic, social), the geographical scale they act (international, national, regional, or local).

Figure 6. Multidimensional stakeholder mapping

Territorial Interest (e.g. land/sea)	Sector	Type (individual stakeholder or representative)	Contact	Key interest in the project

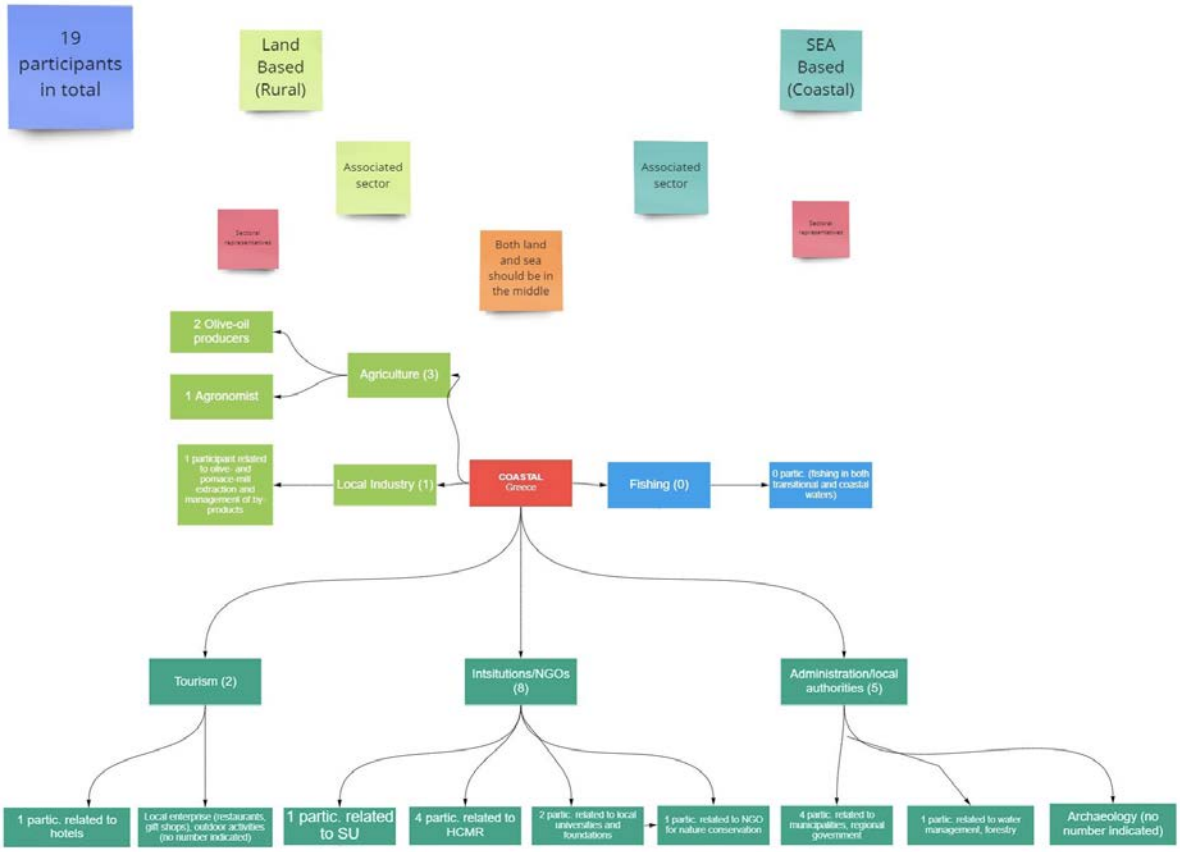
Source: authors' elaboration.

Finally, the way mapping is organised depends on the aim of the mapping itself: identification, analysis, involvement, or management aim. For the management aim, in particular, more complex information is needed. The guidelines provided by the COASTAL (2021) project have clarified that proper mapping should identify:

- persons and organisations involved in the decision-making that benefit from the project outcomes;
- persons and organisations that need to be informed about the project;
- potential sources of conflict requiring attention and mitigation;
- potential opportunities for collaboration between stakeholders;
- the actions to be taken or avoided to enhance stakeholder's participation or satisfaction.

Figure 7 shows the example of a mapping scheme used in the COASTAL (2021) project. On the top, it identifies two main categories of stakeholders invited to participate in the project's multi-actor labs: land-based *vs* sea-based, including stakeholders representing both individual and collective interests. In the middle, the picture sub-categorizes stakeholders according to the nature of the sea-based and land-based interests in the project. It is also a helpful practice for stakeholder brainstorming. After this, each sub-category is detailed to the level of individual contacts to be involved.

Figure 7. Greek stakeholder mapping within the COASTAL project



Source: COASTAL, 2021: p. 17.

Operationally, the COASTAL project collected the stakeholders' contact details by addressing the local stakeholders who expressed their interest in the project through a Letter of Support and by asking the project partners for additional relevant contacts. Since the number of stakeholders involved in the activities was low, the snowball method (Biernacki and Waldorf, 1981) was adopted to increase the stakeholders' sample size.

In any case, the effectiveness of the stakeholder analysis, involvement, or management doesn't rely exclusively on the number of the involved stakeholders. In fact, large samples of unessential and uncommitted stakeholders can fail to provide the information the researcher wants, while minuscule groups of just two individuals can provide crucial information (Sandelowski, 1995).

Finally, among the most diffused methods to systematise stakeholder information, the stakeholder matrix is one of the most renowned. In the matrix elaborated by Psychoudakis et al. (2005), for instance, the stakeholders are categorised according to six types (farmer, fishermen, hunter, ecologist, residents, non-residents, ministry of agriculture) and, for each of them, the matrix assesses: the capacity (high/moderate/low), the acceptability (high/low/conflicting) and the quality (positive/negative/conflicting) of the impact they will receive by the LULUCF decision, the presence of conflicting interests with other stakeholders, the emerging interests, the commitment level (very high/high/moderate/low/very low), and the type of influence (very significant/scattered/weak).

5.2. Stakeholders' involvement and participatory arrangements

In social acceptability studies, the involvement of the stakeholders is crucial because of the interests they express, the values they cultivate, and the relationships they set. The more these features are constitutive, familiar, and shared in the local community, the better is for the assessment of the acceptability. However, researchers also need to involve stakeholders effectively and significantly, if they want to be successful.

After mapping the stakeholders and collecting their contact details, there is the need to assess their capacity of action (power, agency) and to identify the appropriate type of engagement. Engagement issues clearly apply to the purpose of stakeholders' involvement in active/participatory processes. However, it also applies to the study of SA since high levels of acceptability are often positively correlated with the direct involvement and discussion stakeholders enjoyed before participating in the SA survey (Weir, 2015; Arnberger et al., 2022). Stakeholder involvement can be pursued for a **speculative and explorative aim** only. For instance, they can contribute to the testing of the preferences of a local community on a given land use decision without any practical implication. This is the case with the work of Alaira et al. (2021) and Abrams et al. (2005), which gathered the opinions of local household owners to better define the LULUCF management options. In these studies, stakeholders do not actively contribute to the formulation of the management options (i.e., a participatory process), but they contribute by providing the information the researchers needed for their purposes (participative process).

Concerning this latter type of engagement, different solutions can be identified for the purpose of SA assessment, differentiated by involvement intensity and based on the management options considered (van Ingen et al., 2010). For example, the studies conducted in the COASTAL (Tiller and Palmer, 2021) and WETwin (Zsuffa et al., 2012) projects pursue a more significant involvement addressed to identify the factors explaining the different opinions. In both cases, stakeholders must accept to participate in a survey. Moreover, for the information to be valuable (i.e. clear, pondered, honest, and exhaustive), stakeholders must feel committed to the project.

The highest level of engagement, defined as **co-design** by Garcia et al. (2020), involves stakeholders who do not only express preferences, but actively participate in the development of the preferred action. Conversely, some studies suffer from the total lack of consideration of stakeholders and their preferences. The risk of such an approach is the adoption of self-referential decisions that might end up with discontent, protest, opposition, and failure (Garcia et al., 2020). In between, there are intermediate situations in which stakeholders' preferences are considered for improving the management options and running participatory actions, but the final decision remains up to the research group and the authority entitled to take it.

Another possibility is the organisation of *multi-sectoral and multi-actor workshops*, as it happened in the context of the aforementioned COASTAL project (Tiller and Palmer, 2021) to allow the discussion of the different interests in terms of concrete policy action potentials and future scenarios.

Concerning the effectiveness of stakeholder involvement, easy-to-use and accessible mechanisms should be put in place to accommodate the consultative processes, including the use of electronic communication systems that foster community involvement (Eliot et al., 1998). Stakeholders can also be involved individually (as in the case of interviews) or collectively (e.g., focus groups), anonymously (e.g., web questionnaires) or personally (e.g., face-to-face meetings), episodically (just once) or continuously in time.

Finally, if we consider the many phases of the wetland/environmental management process that involve the local stakeholders (see Figure 3), another critical issue is the steadiness of their involvement. For example, in project COASTAL (Tiller and Palmer, 2021) the French and Spanish partners had a stable group of stakeholders that they kept involved for the entire duration of the project, while the Romanian partner changed stakeholders as the project progressed.

A separate discourse regards how to manage SA studies concerning sites from different countries. The researchers may, in fact, decide to adopt different approaches to select and involve stakeholders according to the specific features of the national institutional, cultural, and territorial contexts. Small-scale local contextual features may also influence the interaction with the

stakeholders. For instance, in COASTAL (Tiller and Palmer, 2021), all partners opted for an online format for the meetings with the stakeholders, but reported different experiences. Many of them suffered from limitations due to the lack of personal contacts and informal chats (e.g., during coffee breaks), the difficulty to keep stakeholders focused and to get them involved in online activities, the lack of dynamism in conversations. Unlikely, some partners found the online format better than expected, even if they experienced difficulties in controlling conversations.

6. METHODOLOGIES FOR ASSESSING SOCIAL ACCEPTABILITY

This section accounts for the most common methodologies that can be applied in wetland social acceptability studies.

Generically speaking, we identify four families of approaches:

A. methods "explicitly" investigating what management options/scenarios stakeholders prefer most, also controlling for their beliefs, values, and other relevant SA factors (see section 4);
B. "implicit" assessments of the acceptability of the different management options/scenarios, based on the stakeholders' appreciation of related ecosystem services;
C. qualitative methods to analyse stakeholders' discourse and action;
D. mixed/combined methods.

Choosing a methodology over the others mainly relies on the context of reference. However, concurrent or subsequent combinations of multiple methodologies are also frequent. Moreover, these approaches are applied not only to assess the SA of the considered alternative measures, but also to promote and manage stakeholders' participation. In this working paper, we will not deal with this latter aim of analysis.

6.1. Methods explicitly investigating stakeholders' preference for alternative management options

In LULUCF studies, there are several ways to collect stakeholders' preference for alternative options/scenarios. In this paragraph, we focus on the most popular methods asking directly for stakeholders' preferences, either in absolute (typically, asking him/her to evaluate on a Likert scale the adequacy of the alternatives) or relative terms (for instance, asking to indicate the most adequate solutions or to rank them from the more to the less adequate).

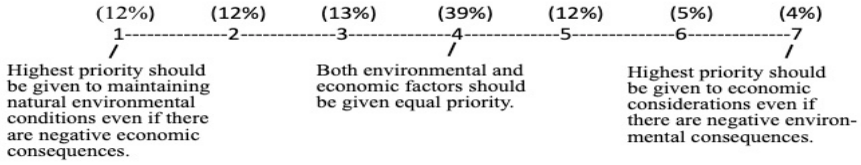
As a result, for this family of methods, we found that **questionnaire-based surveys** are the most widespread tool. They occur in qualitative, quantitative, and mixed-method analysis. Also, they are instrumental in many different methodological approaches, disciplinary fields, and research aims. Questionnaires are used in studies assessing social acceptability in a variety of LULUCF situations. They occur in wetland studies (which are key in this study) but also in studies dealing with forests, drylands, and other types of LULUCF. Also, they are used in speculative/theoretical studies as well as in participative and participatory projects of land management.

Usually, the questionnaires addressing SA investigate stakeholders' preferences for alternative management options or scenarios and a number of other related personal (e.g., age, sex, nationality, profession etc.), cultural (e.g., beliefs, values, opinions, knowledge), and local factors (e.g., territorial, institutional, legal context).

Among the most common techniques, the **Environmental Economic Priority (EEP) scale** occurs in 19 of the studies considered in our 3-step review of the international literature (see section 2), and it is commonly considered a reliable tool for measuring public attitudes toward environmental and economic issues. Abrams et al. (2005), for instance, in a questionnaire-based

survey investigating people's views on the concept of forest health, used the EEP scale to classify respondents' environmental and economic preferences on a Likert 7-point scale (Figure 8), where score 1 indicates the highest preference for the natural environment conditions (i.e., the ecocentric extreme) and score 7 the highest preference for the economic aspects (i.e., the anthropocentric extreme).

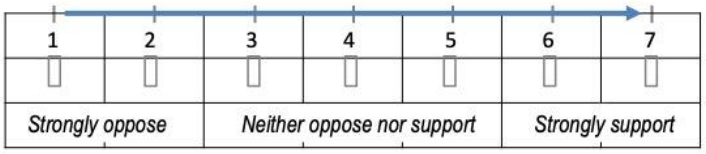
Figure 8. Environmental Economic Priority (EEP) scale



Source: Abrams et al., 2005. pp. 498.

Similarly, Guo et al. (2019) asked respondents to rate on a 7-point Likert scale their support for different wetland restoration scenarios characterised by varying levels of nutrient retention (Figure 9). Then, the authors used this information, together with other explanatory variables, in some **linear mixed-effects regression models** to identify the determinants and predict respondents' support to a selection of voluntary and regulatory measures improving farmers' management.

Figure 9. Questionnaire using a 1-7 Likert to quantify stakeholders' support/opposition with respect to a proposed scenario



Source: Guo et al., 2019: pp. 326.

Abrams et al. (2005) also used an EEP scale to investigate the determinants of the social acceptability of a selection of active forest management options and the perceived threats to forests In the Washington and Wisconsin states. They verified that respondents' value orientation, represented by the EEP scores, significantly relied on their understanding of forest health conditions, management practice, and the forests' initial condition (i.e., overstocked vs healthy forests). In addition, they demonstrated a correlation between the value orientation and variables such as age, gender, income, education, and town size (see section 4 for details).

Differentiating according to the initial conditions of LULUCF is very important when studying SA in wetlands, not only for evaluating the different management options but also for identifying the options themselves. Indeed, the foreseeable management actions may vary significantly according to the initial status of preservation or alteration of the wetlands. Moreover, they may also vary significantly according to the selection of scenarios that can be considered. For instance, typical scenarios considered in mitigation studies are the future scenarios of the IPCC Climate Reports ranging from optimistic to very pessimistic (to avoid at all costs) alternative Earth's temperature increase.

For example, in an online survey concerning the reintroduction of bison in Yukon (Canada), Bath et al. (2022) asked three groups of stakeholders (the general public, the hunters, and the wildlife managers) reached through social media, email, and personal contacts to express their opinion on a set of management options referred to five policy scenarios of bison reintroduction. The respondents expressed their preferences via a Likert scale ranging from 1 (extremely unacceptable) to 5 (extremely acceptable). Their replies to the questionnaire were then analysed via **descriptive statistics, chi-square tests, and logistic regression models**. Bath et al. (2022) also provided insights into the perspectives of different stakeholder groups and highlighted the importance of considering these perspectives when developing management plans.

Frequently, when expressing their acceptability judgments on a management option, stakeholders also portray the aesthetic and scenic dimensions of the environment involved in the action. Stakeholders may be thus asked to rate images rather than descriptions of the intended actions (**visual scenic assessment**). Hill and Daniel (2007), for instance, used a 10-point scale (where 1 stands for "ugly/unacceptable" and 10 for "beautiful/acceptable") to collect stakeholders' opinions on both the scenic beauty and the acceptability of a selection of pictures of different restoration solutions of the natural environment. The dimension of the scenic beauty was chosen based on previous research and studies from the literature. The acceptability dimension measured the perceived quality and appropriateness of the expected outcomes of restoration. As a result, the authors pointed out that this method is particularly useful in understanding the influence of information (see section 4.2) on the judgments of aesthetic acceptability.

Campbell (2019) also used visual scenic assessment to test the effect of information on social acceptability judgments. More specifically, he developed a **multivariate analysis of variance** (MANOVA) on three binary series of pictures/photos representing: the sites (before and after disturbance), the type of disturbance affecting the sites (human vs natural), the size of the disturbance (3 ha vs. 300 ha). As a result, Campbell (2019) found statistically significant differences on the five measures of the ecosystem scene quality they analyse: i.e., beauty, health, naturalness, restoration satisfaction, and enjoyment.

6.2. Implicit (monetary and non-monetary) assessment methodologies

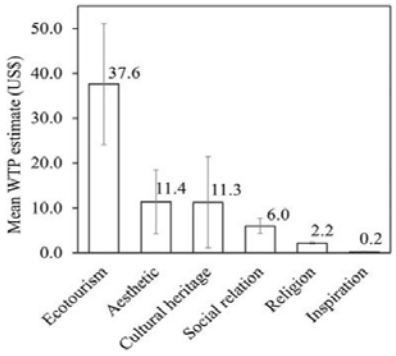
Several SA studies have stressed the influence of the appreciation of ecosystem services (ES) on the judgments on wetland management. An interesting point in this literature is the recognition that stakeholders' awareness of wetland functions affects their evaluation in both a direct and an indirect way. Thus, it is possible to integrate the analysis of the ecological and environmental interactions in wetland ecosystems (Psychoudakis et al., 2005) with the monetary, non-monetary, or hybrid appreciation of their services (i.e. ecosystem services).

The literature promotes different methodologies to assign value to ecosystem services (ES). However, it is important to premise that ES economic valuation techniques are mainly conceived and applied as decision support tools in policymakers' environmental management activities. But since they implicitly provide valuable information on how stakeholders prioritize ecosystem co-benefits and services, some scholars applied them to evaluate the SA of restoration actions and scenarios.

The first recurring method, monetary in nature, is ***Contingent Valuation (CV)***, applied to evaluate goods without a market by detecting actual or potential stakeholders' preferences (Mitchell and Carson, 1989). CV finds favourable application in estimating the Total Economic Value of public and mixed goods in the presence of significant externalities (Andreoli, Brau and De Magistris, 1998; Sirchia, 2000), including environmental and natural resources. The theoretical foundation of CV relies in the possibility of quantifying the changes in compensatory surplus underlying the demand curve of a public good (Hicks, 1939, 1941, 1943), i.e., in the possibility to measure individuals' ***Willingness to Pay*** (WTP) for the quantitative and qualitative improvement of a non-market good. This technique, which involves creating a hypothetical market for the good, has been adopted by Ly et al. (2008) in the context of an economic

assessment of flooded forests. This study asked residents about the importance of cultural services and the WTP for their conservation (see Figure 10). As a result, the ecotourism services were the most valued, whereas inspiration received the weakest appreciation. Then, the local market value was estimated to assign a market or equivalent unit price to the traded and non-traded goods/services annually provided by the forests. A strength of the CV method is its adaptability to various situations and types of natural/cultural goods.

Figure 10. Estimate of mean WTP for cultural services per year



Source: Ly et al., 2008 pp. 10.

Psychoudakis et al. (2005), indeed, applied the CV to calculate the average annual WTP for six wetland functions (flood water retention, food web support, groundwater recharge, nutrient export, sediment retention) using a sample of 210 respondents, representative of the population affected by the wetland in the Greek Zazari-Cheimaditida lakes catchment.

Differences in the value attributed to goods and services from wetland management are often due to differences in functional performance, which can be evaluated by employing Functional Assessment Procedures. Estimating the WTP curve, whose dynamic usually follows an exponential decay in the context of increasing functional performance, is essential for calculating benefits and costs and, consequently, investigating SA's determinants. Coherently, Psychoudakis and coauthors underline the importance of having concurrent analyses of stakeholders' social and economic perceptions when considering the opportunity and the feasibility of alternative wetland management solutions.

The second recurring monetary estimation method of ecosystem services is the ***Cost-Benefit Analysis*** (CBA). According to Van Alphen et al. (2021), CBA is commonly used to prioritise flood risk reduction as a vital measure for climate change adaptation. CBA requires estimating the monetary costs of implementing a selection of actions on a given site (a wetland, for instance) and the savings these actions will produce because of reduced impacts and adverse effects. Co-benefits, such as improved ecosystem services, can also be included in the analysis. In the PREPARED project (Van Alphen et al., 2021), a CBA was conducted on the initial investment and the operational, rehabilitation, and disposal costs of interventions (green roofs and other green infrastructures), diminishing the risk of flooding in Badalona (Catalunya, Spain). Benefits, mainly associated with regulating, supporting, and cultural ecosystem services, were evaluated with monetization based on market and non-market prices. Avoided cost methods were used for this purpose, including estimating the difference in damages between the baseline and alternative scenarios and monetizing ecosystem service benefits. As to the costs, the expected annual damage based on historical data measured the flood damage in Badalona.

The third method for monetizing the ecosystem services produced in wetlands involved in different options of LULUCF management is the ***Cost Comparison*** (CC) approach. CC dynamically compares the costs, investments, and operational expenses for implementing a climate adaptation measure over its entire lifecycle, including carbon capture and storage (Götze

et al., 2015; DWA, 2012). An advantage of the CC is that it compares adaptation measures based on single cost indicators. Therefore, it validly supports decision-making when adaptation costs are the only available or critical data. However, it also allows complex decision-support analysis incorporating more than one indicator (Van Alphen et al. 2021).

Finally, when the assessment aim is monitoring the costs and measuring the effectiveness of an environmental measure, the typical methodology is ***Cost-Effectiveness Analysis*** (CEA). CEA's central idea is to test the correlation between the actions' costs (e.g., for conservation, adaptation, restoration) and its effectiveness, such as the technical performance (Levin and McEwan, 2001). Quantifying costs and effectiveness with suitable indicators are key for calculating the cost–effectiveness ratio. In the PREPARED project (Van Alphen et al. 2021), CEA explored infrastructural and non-infrastructural adaptation measures reducing the risks of insufficient water storage in the Große Dhünn reservoir (Wupper River basin). The reservoir, operated and owned by the Wupperverband (regional water Authority), usually stores up to 81 Mm3 of water for the drinking use of 1 million people. The risk assessment directed by PREPARED considered the unfair circumstance of 1000 days with less than 35 Mm3 water storage due to exceptional climate change fluctuations. Effectiveness was measured by a non-monetary indicator of technical performance quantifying the additional amount of water available per year because of a reduction of the low water elevation (non-infrastructural measure) and in reason of a transfer pipeline from the Kerspe reservoir to the Große Dhünn reservoir (infrastructural measure). The additional water availability by a new horizontal well (infrastructural measure) and by water-saving devices coupled with water use restrictions as emergency action (non-infrastructural measure) could be estimated. The available data allowed a cost estimation for all four measures: in this case, a cost–effectiveness analysis was the best-fitting decision support method, offering the possibility to rank technically and/or organisationally feasible risk reduction measures by their cost–effectiveness ratio, advising the Wupperverband and other regional stakeholders in the prioritisation of climate change adaptations for their regional situation (Strehl et al., 2019).

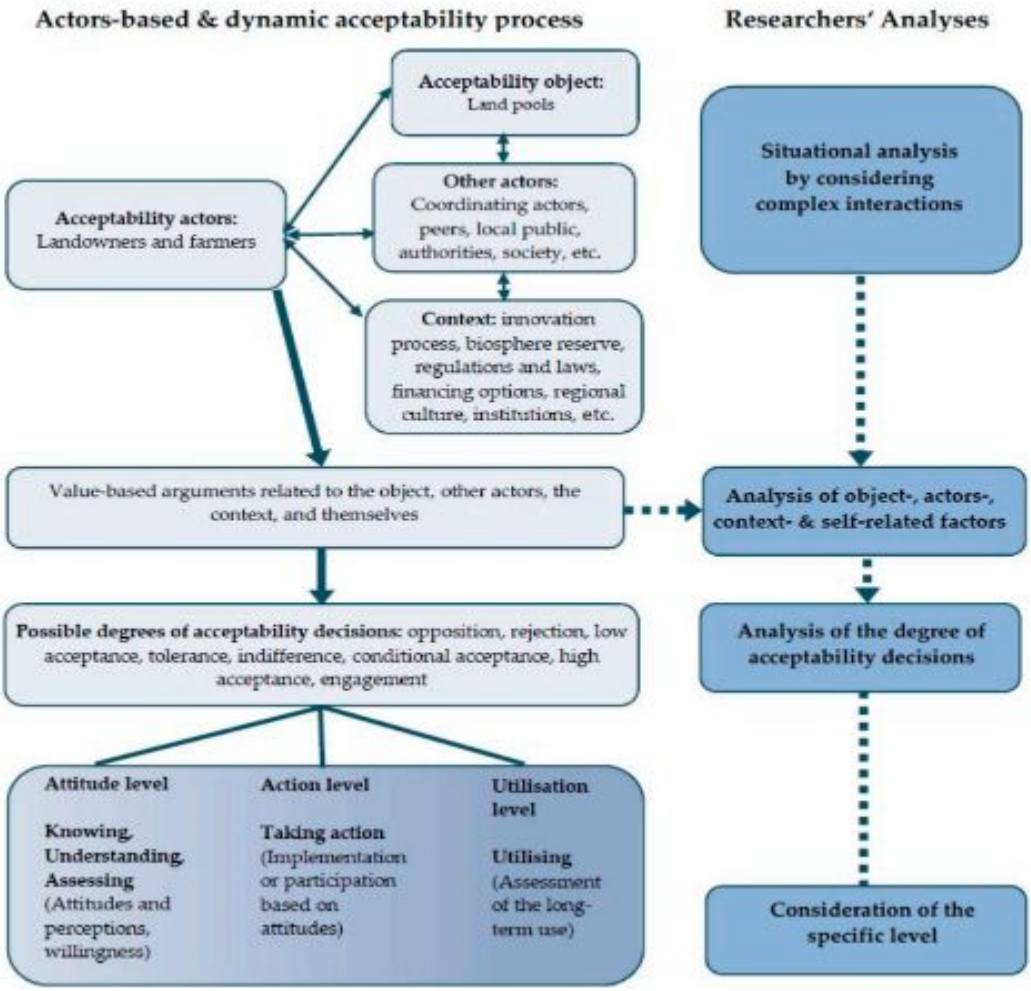
6.3. Qualitative content and text analysis

Another indirect way to assess SA is by analysing and deconstructing stakeholders' discourse and action. For instance, in a study of two German wetlands, Busse et al. (2019) applied a **qualitative text analysis**, i.e., a structured type of Qualitative Content Analysis, combining thematic categories with an evaluating category to define acceptability decisions. The analysis focussed on stakeholders' attitude and actions, involving category definitions, example coding, and coding guidelines. In order to complete their analysis on the SA of land pool decisions, interviews were firstly conducted with regional experts to understand the current situation and to frame the research questions and hypotheses. Subsequently, an in-depth analysis was conducted using qualitative, problem-centred interviews with farmers and landowners in the two study areas, focusing on the respondents' relationship with their land ownership, and their attitudes toward maintaining land pools and alternative solutions for marginalised wetlands. Additional material, such as workshop minutes and feedback, and an opinion statement from a local interest group, were also used in the research. The authors also embedded the analysis in a communication model, applying a rule-based and step-wise procedure scheme, coding and analysing the text based on categories, and ensuring transparency, validity and reliability. The results were summarised in a profile matrix for further thematic and topic analyses.

The left side of the diagram (Figure 11) shows actor-based processes and dynamic processes of acceptability. Acceptability actors reflect on the object of acceptability, the arguments of the other actors involved, and the context. These interactions form the basis for the value-based arguments that lead to the actors' acceptability decision. Acceptability decisions can range from opposition to commitment and can be based on different levels, such as attitude, action or level of use. The right side of the diagram, on the other hand, shows the complexity that needs to be

handled by researchers in managing the different components, such as analyzing the specific situation considering the complexity emerging from the interactions, analyzing the factors based on the actors' stated acceptability arguments, analyzing the particular degree of acceptability, and reflecting on the level at which decisions are made (in Busse 2019, Lucke et al. 1995; Kollmann, 1998).

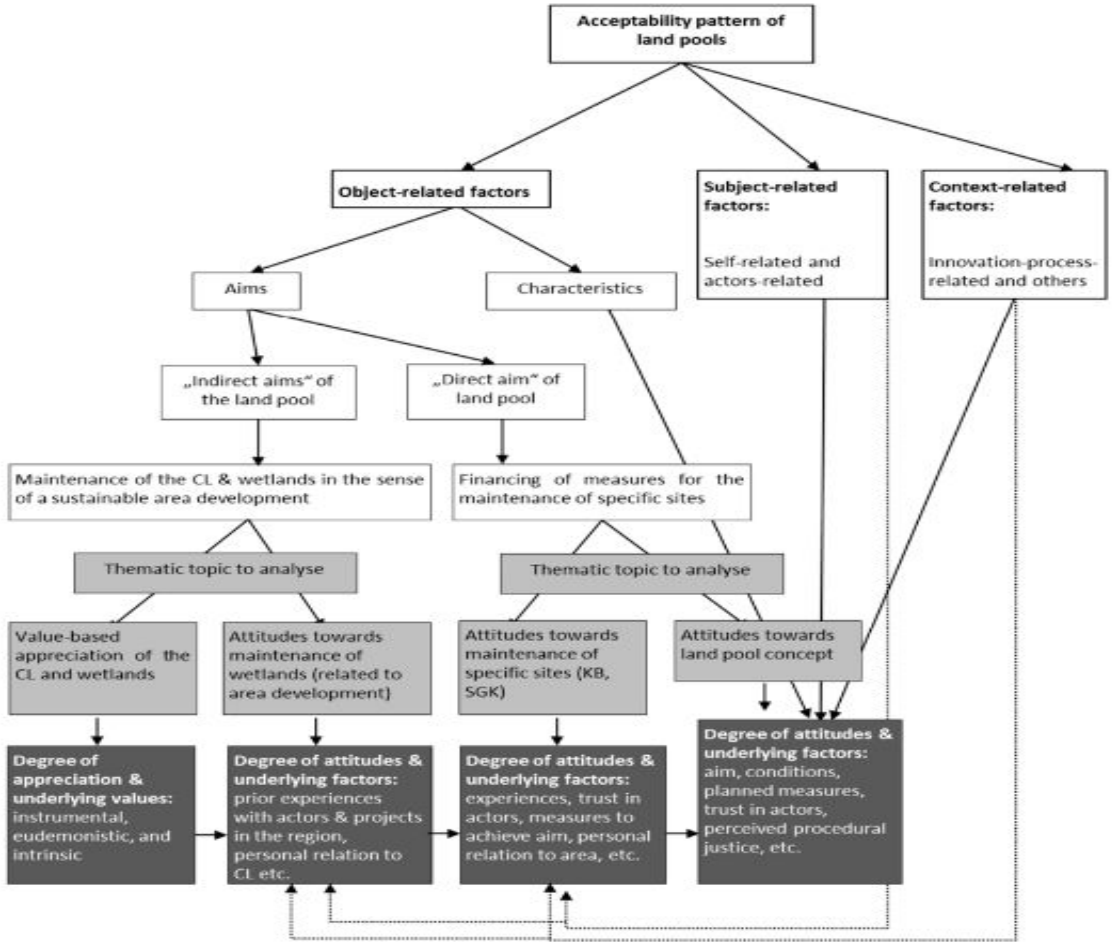
Figure 11. Conceptual framework of acceptability of wetlands land pools



Source: Busse et al., 2019 pp. 4.

Figure 12, on the other hand, applies this general analytical model of acceptability to an interview in the context of land basin research. Thus, the left side of Figure 12 shows the themes and topics analyzed (middle boxes in light gray) in the interviews and the respective outcome aspects that include specific grades and underlying factors (lower boxes in dark gray). The themes in the interviews are derived from deductively constructed factors (object, subject and context-related factors) and inductively constructed goals (direct goal and indirect goal).

Figure 12. Visualisation of the general analytical acceptability pattern of land pools and its application to one interview



Source: Busse et al. 2019 p. 9.

Compared to the other methods, the qualitative approach by Busse et al. (2019) is advantageous, above all, in exploratory and tentative analyses of SA, willing to determine the very general framework of the determinants, factors, and processes influencing social acceptability. Moreover, it is also very useful when discussing the final results of the surveys.

6.4. Mixed methods

The last family of methodologies **combines the analysis of stakeholder preferences with economic valuations**, usually intending to assess future development and management scenarios.

Psychoudakis et al. (2005), for example, considered both the economic perspective and stakeholders' preferences when analysing the wetland ecosystem services of the Greek Zazari-Cheimaditida lakes catchment deteriorated by agrochemical use, animal stocking, fishing, hunting, and sewage disposal.

After conducting the above-mentioned Contingent Value analysis and obtaining the annual WTP for the restoration of the wetland functions, Psychoudakis et al. (2005) investigated stakeholders' behaviour, intentions, and interests. These additional surveys completed the economic data and were used to assess the three alternative management scenarios of "Business as Usual", "Policy Compliance" involving the conversion of the wetland to arable land, and "Deep

Green" restoring wetland functions. More specifically, a weighted **Multi-criteria Analysis (MCA)**, considering implementation costs, non-environmental benefits, and wetland function benefits, and a Cost-Benefit Analysis, expressing the differences in discounted benefits and costs in terms of Net Present Value (NPV), were applied to identify the most advantageous scenario. The adopted method also differentiated according to the budget of the works needed to realise the scenarios, leading to the conclusion that conservative budgeting exercises a crucial influence on the acceptability of a restoration scenario. Table 2 shows that a 47% budget reduction is needed to make the Deep Green scenario more favourable than the Business As Usual.

Table 2. NPV of management scenarios and influence of construction costs on the NPV of the Deep Green scenario

Management scenarios		NPV* (mil. €)
1. Policy Compliance (PC)		−2.02
2. Business As Usual (BAU)		6.22
3. Deep Green (DG)		
Construction costs	4.63	3.80
	4.17	4.31
	3.71	4.82
	3.24	5.33
	2.78	5.84
	2.43	6.22
	2.32	6.35

*The NPV for 6% discount rate a period of 30 years

Source: Psychoudakis et al. (2005), p. 122,

Regarding the MCA, Psychoudakis et al. (2005) used a weighted sum method, which implied that:

- stakeholders agreed on relevant indicators to assess the impacts of the different options;
- stakeholders assigned a weight to each indicator;
- stakeholders evaluated each indicator's manifestation in each option (for example, applying a 5-point scale where 1 is very negative, 5 is very positive).

Nevertheless, Psychoudakis et al. (2005) did not solely rank the scenarios based on their weighted evaluation score (corresponding to the typical process of MCA according to Carrico et al., 2014), but they also considered the results of the NPV analysis.

Coherently, the PREPARED project (Van Alphen et al., 2021), in studying the flooding of the Wupper River Basin and the Netherland Veluwe region affected by long-term droughts and warming/heat stress, also combined MCA with CEA. More specifically, the MCA was chosen as a source of additional analytical support on non-monetary indicators essential to compare the alternative measures. Moreover, the MCA framework used in the Wuppertal case study followed the Analytical Hierarchy Process (AHP) to weigh and evaluate non-monetary effectiveness indicators of measures.

7. CONCLUSIONS: OPERATIONAL STEPS IN THE CONTEXT OF RESTORE4CS

The literature identifies various critical aspects and methods of the SA assessment in wetlands[4] (see sections 4 and 6) that can apply individually or combined. Furthermore, they require different levels of human, technical and financial resources, as well as different levels of stakeholders' involvement, urging a choice among alternative methods.

The guidelines that follow namely apply to the RESTORE4Cs project. However, they are general enough to adapt to other projects dealing with wetlands and other types of LULUCF management. Information from the literature has been used to derive a set of alternative research paths, whose adequacy varies according to the context of the research. In any case-study, in fact, the spectrum of the feasible actions should reflect:

- the sites' territorial and institutional features, including challenges and scenarios;
- the presence of a pool of local partners (i.e., local stakeholders responsible of the site) that possess the site-specific information to develop the social acceptability assessment.

Notably, a proactive expert group of local partners is critical not only for overcoming the linguistic and cultural barriers that hamper the work of researchers in international projects (Sella et al., forthcoming), but also for a valuable site-specific knowledge.

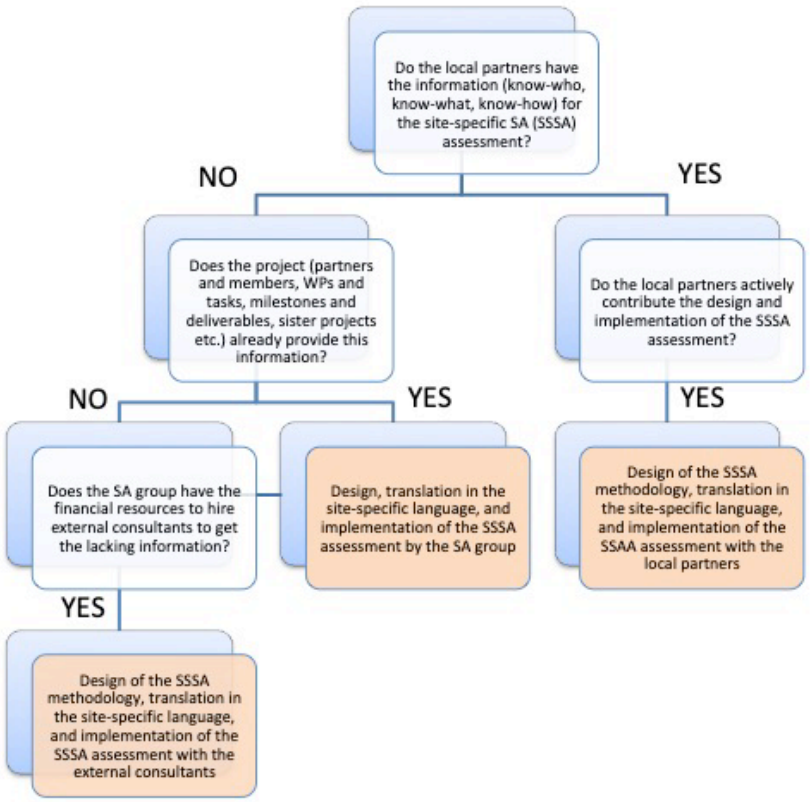
Concerning the social acceptability of environmental management solutions, useful local partners' knowledge may be of four types:

- **Know-how.** It refers to the understanding of the generative process that constitutes the phenomena under investigation, i.e. it refers to the LULUCF processes generating social consensus and opposition;
- **Know-what.** It is the appreciation of the phenomena worth pursuing, i.e. the site-specific conditions of the environmental, institutional, social, cultural context of the sites;
- **Know-who.** It identifies the appreciation and personal acquaintance of the other local stakeholders affected by the management options;
- **Know-why.** It refers to the partners' understanding of the underlying principles, i.e. their social science background and competence in socio-economic investigation.

Consistent with this interpretation, the decision tree in Figure 13 represents the very preliminary starting point to design the SA assessment, in the RESTORE4Cs project as well as in other similar projects.

[4] Among the others: wetland features (restored, preserved, degraded); individuals' demographics (gender, age, education, income, family status); individual and collective values, opinions, beliefs, interests, experience, knowledge; contextual (social, cultural, institutional) features; governmental levels (national, regional, local); social capital; climate change; stakeholders' involvement processes.

Figure 13 - Decision tree for setting site-specific SA (SSSA) assessment



In this scheme, the local partners play a key role based both on their general (know-why) and site-specific knowledge (know-how, know-what, know-who), and on their availability for a proactive involvement in the assessment of the SA. The reference to the contribution of the project consortium, instead, recalls the flow of information (data and knowledge) among the project Work Packages (WPs) and tasks, that is usually a key part of the project (clearly stated in the Declaration of Acceptance document). As a general warning, especially when coping with complex LULUCF issues (as in the case of wetland restoration), it is very important that the different WPs and tasks within the project collaborate exchanging information and results in a multidisciplinary and interdisciplinary way. As demonstrated in other LULUCF projects (Sella et al., forthcoming), a genuine interdisciplinary approach to the co-construction of a glossary and a shared set of research questions is essential to make the research more significant and closer to the site-specific needs.

From the literature, we derived a list of procedural guidelines for the site-specific SA assessment, organised according to 4 phases:

1. analysis of the **territorial context** of the case studies, including local habitats and ecosystem services;
2. analysis of the **institutional and cultural context** of the case studies, including the legal and regulatory framework;
3. **mapping** the stakeholders;
4. survey with the stakeholders and **SA assessment**.

Then, for each phase we identify 4 different research solutions based on the features of the local partners (LPs) and the overall availability of human and financial resources (including the LPs contribution) to develop the single case studies. As a result, a system of 16 research actions emerged (tables 3-6).

Table 3. Analysis of the territorial context (phase 1): available research options

1 - Analysis of the **territorial context**		LPs' availability to contribute with general and site-specific knowledge	
		high	low
human (person-month) and financial (euros) resources provided by the project consortium	high	• analysis of existing data and literature (incl. consortium docs) • provision of data and information by the LPs • brainstorming with the LPs to set and validate the analysis • in-presence site visits (direct experience, sense of place)	• analysis of existing data and literature (incl. consortium docs) • provision by the LPs of the contacts of local experts for consultancy • translation of documents by the LPs
	low	• analysis of existing data and literature (incl. consortium docs) • provision of data and information by the LPs • brainstorming with the LPs to set and validate the analysis	• analysis of existing data and literature (incl. consortium docs) - *risk of language barriers*

Table 4. Analysis of the institutional context (phase 2): available research options

2 - Analysis of the **institutional context**		LPs' availability to contribute with general and site-specific knowledge	
		high	low
human (person-month) and financial (euros) resources provided by the project consortium	high	• analysis of existing data and literature (incl. consortium docs) • provision of data and information by the LPs • brainstorming with the LPs to set and validate the analysis	• analysis of existing data and literature (incl. consortium docs) • provision by the LPs of the contacts of local experts for interviews • LPs translation/linguistic assistance in interviews
	low	• analysis of existing data and literature (incl. consortium docs) • brainstorming with the LPs to set and validate the analysis	• analysis of existing data and literature (incl. consortium docs) - *risk of language barriers*

Table 5. Stakeholders' mapping (phase 3): available research options

3 – Stakeholders' **mapping**		LPs' availability to contribute with general and site-specific knowledge	
		high	low
human (person-month) and financial (euros) resources provided by the project consortium	high	• data from the consortium • provision by the LPs of the contacts of the local stakeholders • snowballing to enlarge the sample • collection of stakeholder information (mapping) • brainstorming with the LPs to set and validate the mapping	• data from the consortium • provision by the LPs of the contacts of local experts for consultancy
	low	• data from the consortium • provision by the LPs of the contacts of the local stakeholders	• data from the consortium • desk analysis to identify and map the stakeholders • risk of language barriers, size limits

Table 6. Survey with the stakeholders and SA assessment (phase 4): available research options

4 - Survey with the stakeholders and **SA assessment**		LPs' availability to contribute with general and site-specific knowledge	
		high	low
human (person-month) and financial (euros) resources provided by the project consortium	high	• brainstorming with the LPs to set and validate the assessment **Suggested Method**: mixed/combined methods (D Type; see 6.4)	• provision by the LPs of the contacts of local experts for consultancy **Suggested Method**: investigate stakeholders' preferences "explicitly" (A Type; see 6.1)
	low	• provision by the LPs of the contacts of local experts for interviews • LPs translation/linguistic assistance in interviews • brainstorming with the LPs to set and validate the assessment • synergies with other WPs and tasks **Suggested Method**: "implicit" assessments (B Type; see 6.2)	• provision by the LPs of the contacts of local experts for interviews • LPs translation/linguistic assistance in interviews • synergies with other WPs and tasks **Suggested Method**: qualitative analysis of discourse and action (C Type; see 6.3)

Besides the specific objectives of the RESTORE4Cs project, the framework proposed here for the SA assessment is innovative and helpful: in fact, it proposes a systematization of procedures and provides general operational guidelines to face a problem that researchers currently encounter in any site-specific analysis, but that the literature mostly neglects. Indeed, any research method

is generally selected because of its overall feasibility, including the financial one. However, in international projects, little room is generally dedicated to discuss how to operationally translate the methodological principles derived from the literature into a feasible methodology, considering the risk of a poor involvement/commitment of the local partners.

In LULUCF and environmental restoration issues, choosing the proper socio-economic methodology is essential, since situations are highly context-specific. In fact, property regimes and key stakeholders, policy frameworks, institutional settings, and cultural aspects can be significantly different, requiring tailored solutions for the assessment of SA. The value added of the proposed framework is to identify four different assessment methods that vary according to the LPs' engagement level and the project's availability in terms of time and money resources. The approach that we suggest could be fruitfully adopted and discussed in all site-specific analyses of LULUCF.

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ANNEX 1

Reference	Review	Topic	Period	Methodology	Stakeholders	Scale	Country
Abrams et al. 2005	no	Stakeholders percetpions of forest management	2001-2002	Quantitative research, surveys, Likert scake, correlation Pearson's R	Sample of rural and urban population	various	United States of America
Andrews, Russo 2022	si	Driving factors for urban wetland design and use and how wetland landscapes are perceived.	not defined	Mixed-method study which merged qualitative and quantitative methodologies using a triangulation design to obtain results.	various	State	United Kingdom
Arnberger 2022	no	Acceptability of different silvicultural treatments to restore pine barrens	2014	Online survey, Rating scales based on verbal and visual descriptions, Delphi method, Data analysis (T Student; Cronbach Alpha; ANOVA; Cluster analysis; Wald test etc. Logistic regression)	Landowners	Lakewood Southeast (encompasses a 15,000-hectare area of forest)	United States of America
Ball et al. 2014	no	Environmental governance/ Multi scalar governance systems for tropical forest management	2013	Qualitative, semi-structured interviews	Residents, various stakeholders (NGO, Bank, University, Consulting agency	REGION: Tropical forest area in San Paulo	Brasil
Bath et al. 2022	no	Compared views of the public, hunters and wildlife manafers on bison reintroductio n	2019-2020	Pre-tested questionnaire containing close-ended questions, Likert scale, ANOVA test	Wildlife managers, residents, hunters	REGION: Yukon	Canada
Brunson, Shindler 2004	no	Acceptability of Wildlands Fuel Management practices	not defined	Mail survey, frequency tables, Spearman Rho	0	REGION: Federal lands in Western United States	United States of America
Busse et al. 2019	no	Acceptablity of land pools for the sustainable revalorizatio n oof wetland meadows	2015-2017	Qualitative research, interview, Acceptabiltiy framework, Explorative interviews, Qualitative text Analysis	Landowners and farmers	Biosphere reserve Sprewald (Sprewald Region)	Germany
Dixon et al. 2008	yes	New sea wall behind an existing one to create new inter-tidal environment	1991- on	Qualitative review of 24 case studies	Residents, varios		
Donnison et al. 2021	yes	LUC to bioenergy	various	Qualitative: meta-analysis	Residents, landowners	various	various

Reference	Review	Topic	Period	Methodology	Stakeholders	Scale	Country
		crops (impacts on cultural ES & biodiversity)					
Eliot, Finlayson, Waterman (s.d.)	no	Predicted climate change, sea-level rise and wetland management	not defined	Conceptual framework (vulnerability assessment framework)	None	REGION: Alligator Rivers Region	Australia
Ford, Rawluk, Williams 2021	no	Integration of biophysical and social knowledge in the development of a landscape decision support system (DSS) for forest and fire management	2017-2020	Qualitative action reasearch	Researchers	NATION	Victoria, Australia
Gamborg, Morsing, Raulund-Rasmussen 2019	no	Riparian wetland adjustive ecological restoration in a case study of privately owned land with public access	2013-2017	Qualitative survey, content analysis of meetings	Landowners, NGOs, local authorities	LOCAL	Denmark
Garcia et al. 2020	yes	River rehabilitation options: preferences and public participation	various	Qualitative systematic literature review	various stakeholders	various	various
Guo et al. 2019	no	Lake management system: regulations to mitigate agricultural runoff of nutrients	not defined	Mixed: survey, regression model (random eff.)	Residents	NATION: Ohio Federal state	Ohio, US
Hill, Daniel, 2007	no	Ecological information and landscape scenic perception on willingness to accept restoration on woodland	early 2000	Experiment: computer-based landscape perception; ANOVA, PCA	Undergraduate students	NATION: USA	United States of America
Ly et al. 2022	no	Economic evalution of Ecosystem Services	2020	Quantitative, questionnaire	Residents, landowners	REGION: Foodplain of Tonle Sap Lake	Cambogia
Merton et al. 2010	no	Perceptions of landowners concerning conservation, grazing, fire,	2007	Quantitative, questionnaire	193 landowners total population (response rate 51%)	NATIONAL/REGIONAL South Iowa + North	United States of America

Reference	Review	Topic	Period	Methodology	Stakeholders	Scale	Country
		and eastern redcedar management in tallgrass prairie.				Missouri --> Grand River Grassland region	
Moshofsky et al. 2019	no	Management, human interventions in forested ecosystems	not defined	Qualitative: focus groups procedure; Q-sort exercise	Foresters, environmentalists, residents	REGION: forest-based communities in British Columbia and Alberta	Canada
Psychoudakis, Ragkos, Seferlis 2005	no	Three wetland management scenarios	not defined	Mixed: Willingness to Pay (WTP); cost-benefit analysis (CBA) and multi-criteria analysis (MCA); Contingent Valuation (CV)	Local Farmers, Fishermen, Hunters, Ecologists, residents, non-residents, Ministry of Agriculture	REGION: Kallonia Bay wetland in Zazari-Cheimaditida lakes catchment	Greece
Tiller, Palmer 2021	no	Multi-actor approach in maritime coastal collaboration	2018-2022	Multi-actor/stakeholder Labs	various stakeholders	Various	Europe
van Alphen et al. 2021	no	Climate change adaptation measures at six research sites across Europe	2021	Governance analysis, Analysis of socio-economic implications, Cost-benefit analysis, MCA, CC	various stakeholders	Various	Germany
Zsuffa et al. 2012	no	Strategies for restoration and sustainable wetland management	2012	Mixed: DSIR methodology, Vulnerabilities Assessment, Multicriteria Analysis, Decision Support Framework	various stakeholders	Various	

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Numeri precedenti/Previous issues

The paper provides a conceptual framework and a guidance to analyse the social acceptability (SA) of environmental restoration and alternative management options, particularly in the case of wetlands. Social acceptability is a fundamental step to guarantee the success of environmental management projects, that should also consider stakeholders' perceptions and preferences to ensure the true effectiveness of restoration actions. However, many restoration projects fail to integrate socio-economic analyses and bio-geo-physical research. To the best of our knowledge no systematic review and guidelines exist for the assessment of social acceptability and this paper explores the most recent international (academic and grey) literature with the aim to assess the state-of-the-art on SA assessment and to develop an original methodological framework to identify local stakeholders' perceptions and preferences for ecosystem restoration options.

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