

## Article

# Community Acceptance of Nature-Based Solutions in the Delta of the Tordera River, Catalonia

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**Abstract:** Much has been debated regarding the environmental and economic aspects that conform the pillars of sustainability in nature-based solutions (NbSs). However, the social implications are lagging behind in both theory and practice. NbSs are not inherently socially and environmentally just and they might not work for or benefit everyone. On the contrary, they may lead to unequal environmental tradeoffs influencing therefore community acceptance. This research explored the different levels of community acceptance of NbSs in the Tordera delta (Catalonia) through structured interviews and Q-methodology with representative stakeholders. It pretended to contribute to more just NbS discussions by identifying variables of community acceptance through a socio-environmental perspective. The results exposed existing socio-economic and socio-spatial differences that cause unequal co-benefits and tradeoffs among stakeholders of the area. Three distinctive discourses were identified: (1) NbSs as an opportunity to re-naturalize the river; (2) the possibility of NbS implementation if aligned with the current socio-economic structure of the delta; and (3) the belief in a hybrid NbS future, combining grey infrastructure and NbSs. Building on those results and discussions, the paper reflected on a restructuration of the delta's governance through further collaborative processes to seek a more socio-environmentally just and inclusive NbSs in the area.

**Keywords:** social acceptance; environmental tradeoffs; social justice; Q-methodology; stakeholder discourses; Nature-based Solutions; Tordera River; Catalonia



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## 1. Introduction

Over the past 20 years, disasters linked to extreme natural events have increased significantly in number compared to previous decades [1], influenced by drivers such as climate change, urbanization, technological developments, and environmental degradation [2,3]. In particular, climate-related disasters, and more specifically floods, have experienced a sharp increase. Furthermore, flash floods events are likely to occur more frequently in Europe in the coming years, affecting notably the Mediterranean region, characterized by long dry spells and short but intense rainfall events. Vulnerabilities to floods are expected to rise due to increasing exposure along with the upsurge of extreme precipitation episodes [4] related to climate change [5].

A clear example of the growing recurrence of floods in the Mediterranean is the Tordera river basin (Catalonia), which has experienced numerous flooding events in its lower and delta parts occupied by a mix of urban, industrial, tourist, and agricultural land uses. Since 2015, the Regional Government of Catalonia, experts, and the ACA (Catalan Water Agency) which are responsible for the planning and management of the water cycle in Eastern Catalonia have proposed different courses of action to manage the basin in more sustainable ways. The unregulated conditions of the river [6] facilitate the introduction of nature-based solutions (NbSs) to restore natural functions. NbSs feature new approaches

to integrate rather antagonistic objectives such as biodiversity and flood management [7]. Discussions about the relevance of NbSs in this respect came with force after storm *Glòria* hit the region in January 2020 [8]. While the storm devastated infrastructures and agricultural and tourist land, it also caused unexpected positive impacts in terms of restoration of natural areas after decades of environmental degradation [9] partially related to the over-exploitation of the aquifer [6]. Whereas emergency actions taken after *Glòria* demonstrated a path dependency in action–reaction disaster dynamics, the storm evidenced the multiplicity of visions around the future of the delta.

Over the last decades, NbSs have been debated widely [10]. NbSs are defined as holistic solutions that mitigate climate change, protect biodiversity, and support ecosystem services through natural processes characteristic of the water cycle such as lamination, infiltration, retention, etc. NbSs link ecological and economic benefits [11] by taking into account multiple issues of interest for different stakeholders [10]. However, in most documents, policies, and guidelines, the social aspects of NbSs—especially the changing costs and benefits derived from their implementation—remain largely ignored [12]. An interesting exception is the Impact Evaluation of NbS report by the EC [13], where societal challenges were examined, specifically in the category “Social justice and social cohesion”.

Economic and environmental assessments that dismiss social effects are targeted as ineffective [14]. However, these effects have not been debated much from a social–environmental perspective [15–17]. When NbSs are not socially and environmentally just, they may fail to spread benefits [14,18] and lead to serious conflicts [19–21]. This research aimed to contribute to more just NbSs by identifying variables of community acceptance using a socio–environmental perspective. Looking into the community acceptance of NbSs in this way may be relevant in the sense that it exposes existing socio–economic and socio–spatial differences that cause unequal co-benefits and tradeoffs [22]. We examined different levels of community acceptance of NbS projects in the delta of the Tordera river guided by the following research questions: (i) how are socio–environmental aspects of NbSs being considered by stakeholders of the area? (ii) which social and environmental tradeoffs can be identified in the delta of the Tordera River? and (iii) what are the different perceptions regarding the social and environmental future of the delta?

In order to respond to these questions, the paper first includes a brief literature review on the social aspects of NbSs. We examine afterward the geographical and climate characteristics of the delta as well as the governance of flood management in this area, introducing in turn the rise of NbSs and its socio–environmental effects in the Tordera delta. In the fourth section, the paper introduces the methodology used in the study, involving Q analysis and structured interviews. Section 5 summarizes the results by showing the different levels of community acceptance of NbSs and identifying contrasting discourses. Results reflect on the importance of incorporating opposed views for a more socio–environmentally just NbS-inspired future in the delta. Last, discussions and conclusions including policy recommendations, are presented.

## 2. The Social Dimension of Nature-Based Solutions (NbSs)

NbS is an umbrella term for other concepts such as green infrastructures (GI) and blue–green infrastructure (BGI) [23,24], with the difference that NbS puts more emphasis on the value of nature to overcome societal challenges [11]. While it is true that as an alternative, it can match biodiversity aspects with sustainable livelihoods and flood management, it has barely been reviewed under social justice perspectives [16]. Reports by the European Commission and the International Union for Conservation of Nature (IUCN) have not reflected on the fact that NbSs are designed and applied in places with ongoing socio–economic and socio–spatial differences but have rather been uncontextualized and vaguely politicized, putting socio–environmental justice tradeoffs aside [22]. This is a shortcoming that takes place in broader climate action strategies where issues related to justice are not mainstreamed. In this regard, Hughes and Hoffmann (2019) [25] introduced the idea of Just Urban Transitions as an agenda that ventures to the reconfiguration of power, political

barriers, and empowerment of new actors in sustainable transitions. As Along the same line, Guerrin et al. [26] argue that natural resources are deeply political, in the sense that different actors defend their interests and positions of power in transitions that involve new reconfigurations of socio-natural assets.

It is deceptive to simply assume that NbSs by definition can balance the triple challenge of economic, environmental, and social sustainability [21,27]. NbSs produce positive synergies but also unequal outcomes among different population groups [17,28]. NbSs are not inherently socially just and inclusive and may lead to problematic social and environmental tradeoffs [16,19,22]. These tradeoffs occur when ES provisions are conditioned by other ES and/or when some stakeholders appropriate specific ES at the expense of others [29]. In this research, ES are defined as the benefits of nature for people [30] in social, economic, and environmental terms [31]. The analysis of tradeoffs is therefore vital since the planning and implementation of certain types of flood management strategies comes at the expense of others, producing winners and losers [15,28]. The win-win discourse that greening projects seem to suscite at first glance has been contested thoroughly by critical environmental studies, geography, and political ecology, among others [12,19,32,33]. While in most cases, political and social interests are present in implementing NbSs, development implies significant economic pressures into land uses [34], resulting in critical barriers to develop NbSs [35]. Neglecting the unequal consequences of tradeoffs among stakeholders, considering that some of the latter may be underrepresented in the implementation process, may lead to conflict and opposition to NbSs [19].

In projects where NbSs are involved, social acceptance becomes crucial, as seen for instance, in the field of energy transitions [36]. Social acceptance is understood as the combination of the three dimensions: socio-political, market, and community [36]. Socio-political acceptance refers to the acceptance among different stakeholders from the general public to policy makers; market acceptance refers to the relationships between investors and consumers; and lastly, community acceptance, the focus of this research, refers to how the local stakeholders engage to accept NbS technologies and projects, linked to procedural justice, distributional justice, and trust and recognition justice [14].

These three categorizations of justice are articulated as drivers [37] showing how 'just' NbS can be [38], leading to more or less acceptance among communities. Procedural justice refers to levels and forms of participatory processes in decision making [39]. This in turn involves governance related factors such as institutional capacity, knowledge and experience [40], political commitment, legal frameworks, mechanisms of feedback, access to financing, positive public image, and product costs, among others [14,41]. Distributional justice concerns distribution of costs and benefits associated with NbSs [42,43]. In this way, community acceptance depends on the benefits that NbSs generate at the community level, involving local stakeholders' perceptions and views [44]. Perceived benefits may vary [45] and divergence of co-benefits and unequal tradeoffs may exist [19,45]. Additionally, the distribution of cost [45] and outcome efficacy [40] as the effectiveness of risk reduction [38] is scrutinized. Last, recognition justice refers to the identification of diverse needs and values of a community taking into account dimensions such as race, gender, age, and ethnicity [46]. Here, problem diagnosis and perception [39] as well as place attachment are the first elements that compromise NbSs [19] since they imply different ways of valuing and relating to nature [47]. This depends also on trust among stakeholders and on non-hidden agendas [40,45].

### 3. The Context: Floods in the Delta of the Tordera

#### 3.1. Geographical Context, Governance Structure and Climate Overview

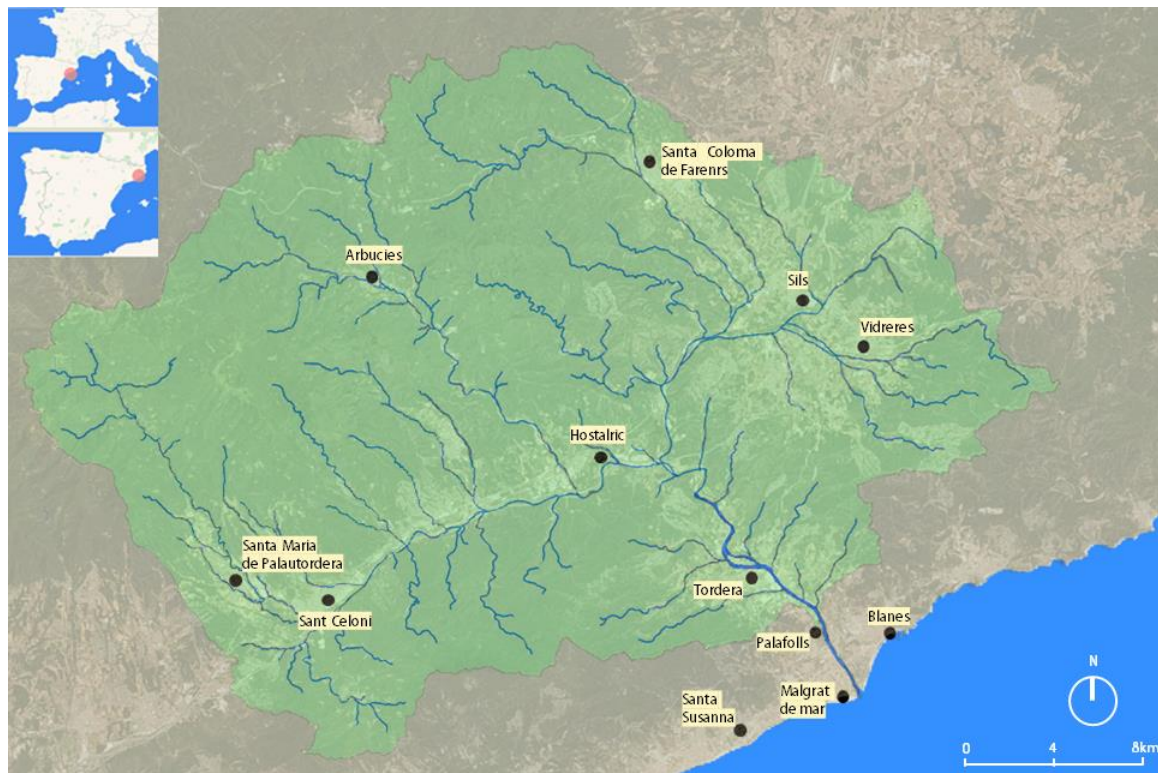
The Tordera river rises in the Montseny massif (1700 m.a.s.l.) and drains towards the Mediterranean Sea, ending in the fourth largest delta (8 km<sup>2</sup>) in Catalonia [48]. Orographic and climate features conform a rich diversity of natural conditions in which three biogeographical regions coexist (Mediterranean, Eurosiberian, and Boreoalpine), shaping an exceptionally biodiverse landscape [48,49]. Sections of the lower basin of the river have

been defined as protected natural areas and are part of the Natura 2000 Network, classified as Special Conservation Zones (ZEC) and as Sites of Community Interest (LIC). The Tordera delta is also included in the Inventory of Wetlands of Catalonia by the Department of the Environment and Housing of the Regional Government [50].

The river, especially in its lower course, vertebrates a number of economic activities [51,52], producing a high diversity of land uses mixing agricultural, urban, touristic, and industrial functions. The current population in the basin is 282,513 inhabitants, mostly located in the lower Tordera floodplain, along with infrastructures, industrial and logistic parks, and agricultural land. The population doubles or even triples in summer due to tourism staying in numerous campsites [53], hotels, and apartments [8,49].

The River Basin District Management Plan of Catalonia defines the lower part of Tordera as vital for the socio-economic development of the region [6]. This area has experienced multiple water-related transformations: from the configuration of a constrained river course [48,51] to the building of desalination, drinking, and wastewater treatment plants. At the same time, the overexploited delta aquifer is affected by salinization due to seawater intrusion and pollution [6]. These transformations damage the ecological status of the aquifer and aquifer depletion is expected to worsen due to climate change [6].

The Tordera River delta presents singularities in its governance structure as well, with effects on flood management [51]. The coastal strip is the responsibility of the Spanish National Government, while the basin is shared by three different counties (*comarques* in Catalan) (Maresme, La Selva, and Vallés Oriental), all containing numerous municipalities. Hence, water-related governance is complex due to different administrative levels (regional and basin level: managed by the regional government of Catalonia and counties; and local level: managed by each municipality). This research focused only on municipalities located within the Tordera delta including Malgrat de Mar, Palafròls, Tordera in Maresme county, and Blanes in La Selva county [54]. (See Figure 1).



**Figure 1.** (a) The basin location within Europe and Spain. (b) Tordera's basin. Adapted from ©L'Institut Cartogràfic i Geològic de Catalunya (<https://visors.icgc.cat/contextmaps/#7.26/41.729/1.189> accessed on 11 April 2022).



The flow regime of the Tordera River is highly dependent on the Mediterranean climate, alternating droughts and heavy rainfall episodes [8,53]. Floods in the area (known locally as *Torderades*) develop in the form of storm surges in coastal locations or as flash floods inland [55].

Floods in the region have increased during the last decades, leaving behind devastated infrastructures and damaged agriculture and tourist activities [8]. The most recent episode, storm *Glòria*, showed again how existing levees—known as *motas* in Catalan—were unable to contain rising river runoff. At the same time, however, the storm and subsequent flooding revigorated river and delta ecosystems, bringing in debates around the role of such ecosystems in future flood management projects and raising awareness toward how natural phenomena influence water and flood management [8]. The landscape created after *Glòria* has even encouraged the municipalities of Blanes and Malgrat de Mar to sign an agreement to manage the site as a partial natural reserve [8,9].

Storm *Glòria* was a disruptive event [56] reframing the intersection of flood management and biodiversity protection agendas in the area [57]. The storm effects were unevenly framed by different actors: “For environmentalists, *Glòria* was a blessing; for the affected municipalities, a disaster, and for those involved in research, an opportunity” [58] (par.8, translated by author). This diversity of visions makes it difficult to find common ground regarding future flood management actions in the Tordera delta.

### 3.2. Towards More Sustainable Paths in Flood Management: What Do NbSs Imply in the Delta?

Local administrations and professional experts in the Tordera river basin are searching for more natural solutions to manage floods especially in terms of climate change adaptation [59]. The gradual implementation of NbSs seems to guide the county’s target to reduce flood vulnerability and boost biodiversity, understanding floods as a resource and not solely as a hazard [60]. The discussion about NbSs takes place at different levels since it is not only an urban issue but affects a wider area with important agricultural and natural functions. NbSs are planned to be implemented at different scales, from urban to basin, involving a growing number of stakeholders.

Regarding biodiversity, several environmental directions have been taken in the area. In 2001, the Tordera Environment project (2001), part of a LIFE project, aimed to improve the river’s aquifer by reusing wastewater and recovering wetlands from the river islands [61,62]. Moreover, in 2016, the Tordera River Basin Adaptation Plan—part of the European BeWater project [63]—proposed to start a dialogue between social and environmental sciences towards a more sustainable management of water in Mediterranean basins, based on climate change adaptation [59]. Through different actions, this plan focused on biodiversity protection [64]. Along the same lines, the ISACC TorDelta project [65] had the objective of bringing society closer to climate change issues in the Tordera delta. An output of this project was the creation of a working group called *Taula del Delta i de la Baixa Tordera* in 2018 based on a scheme of participatory governance. In addition, the REDAPTA project [65] was launched as an integrated strategy for reducing vulnerability to the impacts of global change in the delta.

At a wider scale, the green infrastructure program in Catalonia—authored by the regional Government—was developed to foster proactive interventions to be taken in short and long term. This plan included some projects affecting the middle and lower Tordera such as the replacement of drainage systems to adapt to wildlife that has not started yet; the revegetation and planting of trees at the entrance of waterproof systems in a lagoon created to infiltrate and recharge the aquifer (already finished); the recovery of old wetlands and the morphological adaptation and restoration of vegetation ponds that is under study; and the restructuration of land uses liberating parts of the floodplain from intensive occupation that has not started yet [66]. Information last updated on 11 April 2022 [66].

More specifically and targeting jointly flood management and biodiversity, the Levee Management Plan prepared by the ACA, the agency responsible for the Flood Risk Management Plan (FRMP) of the River Basin District of Catalonia, was enacted. The FRMP

2016–2021 consisted of numerous sectoral plans aiming to reduce the negative impacts of flooding [7]. The Sectoral Plan approved in 2017 flagged the objective of improving the ecological status of surface water bodies by recovering the natural functioning of flood-plain areas—setting back the levees or *Motas*—and preserving the riverine areas with their corresponding environmental status [7]. As a measure of the FRMP, the Levee Management Plan (2018–2020) was developed for three Catalan basins including the Tordera, where different types of NbSs were analyzed including cost-benefit procedures through the H2020 RECONNECT project [7]. This project was highly innovative as it was one of the few projects that introduced NbSs in flood risk management in the River Basin District of Catalonia.

Although these plans opened new horizons, their legacy remains ambiguous. While the potential of the Levee Management Plan is high in bringing a paradigm shift in flood management, questions related to the willingness of locals and land owners to support NbSs remain unanswered or are still being processed [7]. For instance, will agricultural functions of the delta adapt to NbS? What types of agricultural development can coexist with NbSs? Can NbSs modify the tourist model of the delta based on campsites? How will NbSs alter the costs and benefits of urban and industrial drainage in the area? These and other questions may enhance the interest of this case study especially when taking into account the power relations and imbalances that configure the design and implementation of policies based in NbSs and derived terms.

#### 4. Materials and Methods

This study used Q-methodology, as a tool to measure conflict and contestation [67–69]. Q-methodology was employed to understand different discourses and competing configurations in the community acceptance of NbSs through a mix of qualitative and quantitative elements. This methodology contributed to exposing existing socio-economic and socio-spatial differences that created a variety of perceptions among the future of NbSs for the delta.

In quantitative terms, our methodological approach did not involve a large number of participants. Representativeness in Q-methodology was achieved through different statements (called ‘Q-sets’) and not by the number of subjects participating [70]. This categorization of stakeholders is defined as bottom-up, since it is the result of empirical analysis of stakeholders’ perceptions and not of theoretical perspectives [69,71].

In this regard, Q-methodology has been reviewed as an epistemologically unbiased methodology that leads to “true” subjectivity [72]. In contrast, this has been criticized for its “naïve empiricism”, since the way in which empirical data is analyzed depends on its relationship with theories that are already articulated in the research [72,73]. Despite this, Q-methodology as an iterative tool allows one to practically study subjectivity in a complex manner, leading to a more open process when the researcher allows emancipatory surprises in the research [72]. In this contribution, Q-methodology was applied as an ‘analytical approach into subjectivity’ [68], revealing the different arrangements or patterns around and within the community acceptance of NbSs and the future of the basin.

Following Q-methodology [68], the steps guiding this research were as follows: (a) preliminary interviews and literature review; (b) creation of exhaustive list on NbS community acceptance and development of Q-set; (c) selection of participants (P-Set); (d) Q-sorting exercise; (e) Q-sort analysis; and (f) interpretation and follow up.

The first step of the methodology built on press reviews, social media reviews, academic articles, policy documents, and government plans regarding NbS implementation in the delta as well as interviews. Preliminary structured interviews to actors directly or indirectly involved in and affected by flood management and NbS projects were held (total = 19, including actors in government, public entities, private institutions in the industrial, touristic, agricultural, or consultancy companies, the academy, NGOs, and community groups).

As mentioned previously, in Q-methodology the sample was not representative of all stakeholders involved since the aim was to disclose different viewpoints but not to analyze how common these are [70]. Therefore, we tried to reach groups as diverse as possible in

order to voice all opinions. The participants of this research encompassed a rich variety of sectors from different levels including representatives and managers from city councils; public entities such as water companies and technical branches from the regional government of Catalonia; private institutions such as private consultancy companies working in the delta, as well as environmental managers from industrial companies, the agricultural sector represented by local farmers and local farmers associations; academics working in the field; environmental NGOs of the region; and lastly, voices from the community such as directors of schools and directors of cultural associations located in the delta's municipalities. The name and associated institution of the participants are not displayed for confidentiality reasons.

While a larger group of stakeholders were approached (approximately 30), several of them showed unwillingness to participate due to time constraints or for not having opinion on the topic. It was particularly difficult to reach the industrial sector. The inclusion of new participants was achieved through a snowball sampling method. Interviewees were asked to suggest new participants, but many of the suggested names were repeated. Structured interviews were held in Catalan and/or Spanish, recorded, and lasted 40 to 60 min. All interviews were manually transcribed. Questions included topics such as perceptions of floods in the delta, perspectives on current flood management projects, water governance, preferred flood and biodiversity management approaches, and the future visions of the delta.

After analyzing the literature review and the transcription of preliminary interviews, an exhaustive list on the community acceptance of NbSs and the future of the delta was created. A list of repeated statements or controversial phrases around the topic of NbSs and the future of the delta emerged up to a saturation point (280 approx.), taken from the issues identified in the transcription of interviews and literature review. This was followed by a Q-Sort where repetition in phrases was eliminated. In order to narrow down the Q-Sort, statements were thematically sorted to display differences between them [68] through a categorization of topics: diagnosis of the river situation, current flood measures and impacts, NbS vision, governance dynamics, and future of the delta and its values. This resulted in 42 final statements (see Appendix A).

Afterward, we engaged in the second selection of participants (P-Set). In step A, 19 participants took part in the preliminary interviews, but in this step, 20 new participants were introduced following a snowball sampling method since the survey asked participants to suggest new candidates. As it happened in step A, stakeholder suggestions reached a saturation point, as several names were repeated over in the surveys or already were part of the research. Hence, a total of 39 participants (19 from preliminary interviews + 20 new) participated in the Q-sort, while eight did not respond to the survey. (Table 1).

**Table 1.** Number of participants per steps.

	N° of Participants Preliminary Interviews + Q-Set (n for Steps A & C)	N° of Participants Q-Set + Follow Up Interviews (n for Step C)
Government	4	2
Public entity	2	4
Private consultant	1	4
Tourism sector	2	1
Agricultural sector	2	1
Industrial companies	1	1
Academia	3	3
NGO	2	3
Community	2	1
Sub-total n per step	19	20
<b>Total n for step C</b>		<b>39</b>

Once the whole set of participants was selected, the Q-sorting exercise followed in which we presented the set of statements to the participants (total  $n = 39$ ) which had to be ranked from +5 (strongly agree) to −5 (strongly disagree). This ranking attempted to offer a comprehensive portrait of how people thought about several ideas in relation to other ideas (Q-factor analysis) instead of looking into each idea in isolation. In this way, the results were ready to be transformed into factors (also known as discourses) in step E.

The Q-sorts were analyzed and grouped in set of factors or discourses [70]. This was created by using a PQ-Method software which identified commonalities in sorts. In order to do so, a Q-centroid analysis after Horst's centroid factor method [74] was performed, determining the common patterns shared by the different discourses.

With the aim of reducing the clusters into only the most clearly differentiated and representative, a statistical tool within the software (Varimax rotation) was used. In this Q-sort analysis, and as a result of correlating similar behaviors in the answers of the participants, three different discourses emerged. Each discourse had specific characteristics that were disclosed by analyzing the score given to each answer. The number of factors (discourses) was determined by the Eigenvalue (EV) of each factor, and only those with a value above 1 were taken into consideration. This resulted in three basic discourses.

The diversity of views by the three different discourses depended on the variability and framings of answers given by participants. Appendix A displays the scores of statements for each discourse.

In the final stage, the interpretation of each discourse was reinforced with follow up interviews as well as by comments by the participants during the Q-sort in order to expand their answers. The objective was to identify contrasting viewpoints and assess how this diversity of knowledge enabled or disabled coherence in ideas, policies, plans, and projects for the area. In sum, Q-methodology in this paper attempted to shed light on the bases of the conflict around flood management and biodiversity of Tordera delta through the inclusion of all perspectives and rationalities in each discourse [63,64].

## 5. Results

From the analysis of written documents, the interviews, and the Q-sort exercise with participants, we observed three distinctive levels (discourses) of acceptance of NbSs in the area. A first discourse saw NbSs as an opportunity to re-naturalize the river. The second understood that the implementation of NbSs was possible if aligned with the current socio-economic structure of the delta. The third believed in a hybrid NbS future characterized by a “business as usual” scenario based on grey infrastructures, compatible with the introduction of several NbSs.

All three discourses combined explained a variance of 50% (significance of discourse 1 = 24%; discourse 2 = 9%; and discourse 3 = 17%) (Table 2). This means that among the three discourses, there was a 50% common variance (shared meaning) explaining the correlation among sorts [70]. While it depends on the researcher to choose the number of factors (discourses) to extract, it is recommended to select factors that have a variance of 50 or above in order to ensure that the solutions are representative of the diversity of views [70]. Notwithstanding the different views and framings on NbSs, the common variance also enabled us to identify the common ground shared by the three discourses.

**Table 2.** Factor (discourse) characteristics for Tordera's delta.

Factors Characteristics	Factor		
	1	2	3
Eigenvalue	11.58	2.95	1.98
Number of defining variables	17	4	11
Composite reliability	0.986	0.941	0.978
SE of factor scores	0.120	0.243	0.149
% of total variance	24	9	17



### 5.1. Levels of NbS Community Acceptance: Identifying Contrasting Discourses

Contrasting discourses around NbSs and flood management in the Tordera delta were identified through the Q-methodology factor analysis, exposing three different discourse types. The full list of statements and scores by discourses can be found in Appendix A. Consensus statements were those for which the three discourses scored similarly or equally. This implies that these statements did not distinguish between any pair of discourses but were shared by all three discourses (Table 3).

**Table 3.** Consensus statements with scores by discourse.

	Consensus Statements	Scores by Discourse (Factor Scores)		
		D1	D2	D3
2 *	Only when floods result in human losses real actions are taken. If not, the same always happens. Actually, all stakeholders involved will cooperate more if floods happened more frequently and posed more serious risks.	0	0	0
8	So far, most measures were taken after the occurrence of a disaster rather than from a risk management or prevention perspective.	4	1	1
13	Most likely, not everyone finds NbS useful due to the fact that cost/benefit analysis would unveil economic losses in the short term, mainly for sectors such as agriculture and tourism.	1	1	2
16	Local managers and municipal politicians of the area should be better trained in NbS and flood management, since they have the capacity to make decisions on these matters.	1	2	4
18 *	Political fragmentation of responsibilities regarding the management of the Tordera is the most significant barrier to overcome in order to agree on a common objective for the area.	0	−1	−1
22 *	The optimal scale for river management would be the basin level, as it would allow a more integral vision of the delta.	4	3	4
23	Everyone related to the river is tired of being part of participatory processes that in the end do not result in concrete actions. It is very discouraging to see that there is so much inertia to move forward and improve. Many times, experts who are not part of the territory come with fixed ideas and do not listen to us.	1	1	−1
26	ACA needs more support by the Regional Government of Catalonia ( <i>Generalitat</i> ) to foster communication among stakeholders. More coordination needs to be enforced between who manages floods and who environmentally protects the river.	−1	1	1
27	Politicians do not implement preventive policies since these have a long-term time span incompatible with most decisions that are based on the short term and do not alter the status quo.	2	3	0
28 *	The natural ecosystems of the delta, as well as its habitats and fauna have to be protected since they are part of the natural heritage. We should learn about the importance of the natural heritage.	5	5	5
37 *	Now it is the perfect time to act, as most city councils are sensitive to flood issues after <i>Glòria</i> . But this momentum will pass.	0	2	1
42 *	Sustainability must be viewed from a broader spectrum and all stakeholders must commit to it for the future of the delta. Today there is a polarization as to what we understand by sustainable that does not make sense: on the one hand there is the ecological perspective of protecting the river and on the other, there is that one of producing fresh crops locally. It is necessary to create dialogues between all visions of sustainability.	3	2	5

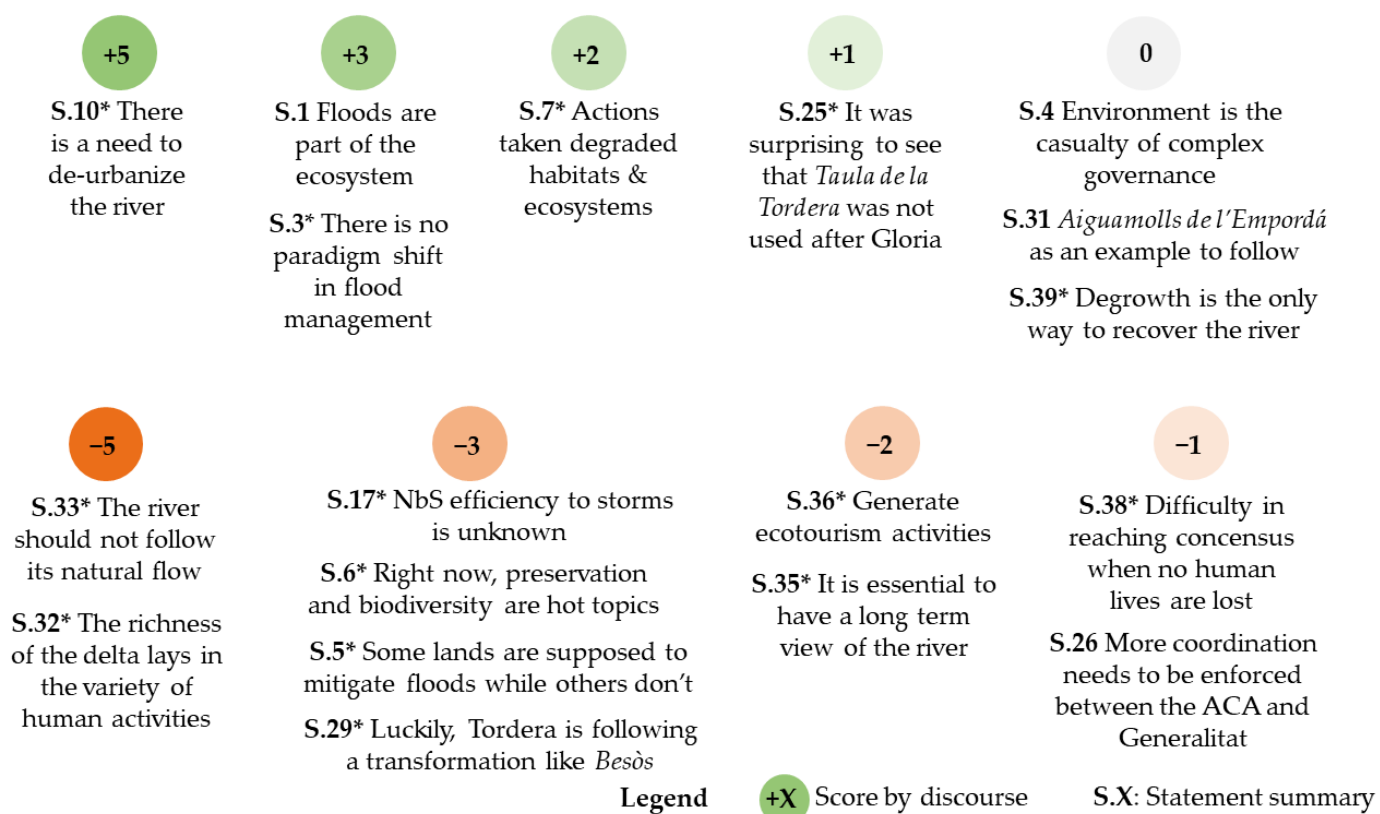
**Note:** all listed consensus statements are statistically non-significant (since they do not belong to a specific discourse) at  $p > 0.01$ ; those flagged with \* are also non-significant statistically at  $p > 0.05$ .

Some of the consensus statements identified were statements related to the management of the delta, since all three discourses agreed on the idea that the political fragmen-

tation of responsibilities was not necessarily a challenge to overcome in order to find a common sustainable path (S18), although managers, civil servants, and politicians had to be better trained in NbSs and flood management (S16). The belief in the management of the river at basin level in order to have a more integral vision of the delta was a common statement among different actors (S22) and was frequently repeated in interviews, comments, and follow up interviews. The discourses also concurred on perceived benefits and tradeoffs as they understood that a cost–benefit analysis of NbSs would display differences, and in the long term might not benefit everyone equally (S13). Moreover, the statement that built more consensus was S28, putting emphasis on the need to acknowledge and value accordingly the rich natural heritage of the delta in biodiversity terms.

#### 5.1.1. Discourse 1: NbS as an Opportunity to Re-Naturalize the River

The first discourse Figure 2 understood that the main problem faced by the delta was environmental degradation (Participants #2, #5, #6, #7, #16, and #36), aggravated by decisions taken by public administrations, whereby the protection of people and assets took priority over the environment (S3: +3). Therefore, discourse one saw in NbSs an opportunity to improve this situation. Proponents were worried about biodiversity loss if NbSs were not implemented soon (S10: +5) (Participants #15, #17, and #34). Most of the ideas defended were taken from the *Manifest de la Tordera*, a document created after *Glòria* which listed eight short-term and long-term actions for the protection of the river.



**Figure 2.** Summary of most important statements for discourse one. All statements were statistically significant at  $p < 0.05$ ; those flagged with \* are statistically significant at  $p < 0.01$ . This means that only statements that loaded significantly in a factor were included. The number of statements to include was calculated after the formula  $(2.58(1/\sqrt{n}))$ ,  $n$  being the number of statements (in this research =42), having a significance factor level at 0.01 [71]. Note: statements were summarized for visibility issues. Complete written statements can be found in Appendix A.

Along the same lines, many of the participants represented by this discourse acknowledged that floods were a blessing for the territory rather than a hazard (S1: +3) because of their positive impacts in biodiversity terms:

“The natural dynamics of the river is the only thing (in the medium and long term) that makes most of the ecosystem and economic services possible, from which almost half of the Maresme region and part of the La Selva and Vallès Oriental counties benefit from.” (Participant #2).

Understanding that floods are natural processes, the discourse also believed that several lands used for economic purposes should be allowed to inundate, as it is in the delta nature to do so (S5: −3). In this vein, the discourse reflected on the need to de-urbanize and make space for the river (S10: +5), especially when talking about existing critical infrastructures such as the desalination plant (Participants #21 and #34). The re-naturalization of the river was agreed on as fundamental issue, regardless of the current situation of its economic exploitation (S32: −5 and S33: −5). The discourse defended that the delta’s socio-economic structure was unsustainable in front of floods (Participant #32). Urban development and infrastructures increasing impervious areas are still being promoted in the delta, putting too much pressure on NbSs to mitigate floods and enhance biodiversity. Big projects are being developed such as a supermarket with a considerably large impervious parking lot in the coastal municipality of Malgrat de Mar (Participant #6). Moreover, a five-star hotel was built in 2020 in the coastal municipality of Santa Susana (Participant #13).

In terms of institutional capacity, this discourse believed that the current administrations did not lack support to manage floods (S26: −1). Some participants agreed that the management model to follow for the re-naturalization of the river should consist of a combination of integrated coastal zone management (ICZM) and ecosystem-based management (EBM); that is, an integrated strategy opposing the current sectoral management of the area (Participants #2 and #5). However, this discourse admitted that the delta should not try to emulate directly the *Aiguamolls de l’Empordà* case (S31: 0)—a natural park with numerous wetlands, north-east Catalonia—since the Tordera has followed different dynamics in a very small and contested territory for many decades (Participants #7, #24, #25, and #30). Some of the participants argued that the example of the *Platera*, a rural area formed by meadows in Baix Empordà around 60 km North of the Tordera delta, came closer to the needs of this territory, bridging the differences in habitats, vegetation, and hydrology (Participant #2). By no means should the Tordera follow the example of the *Besòs*—a Fluvial Park located in Barcelona and aimed at the re-naturalization of the river but for sports and recreational purposes (S29: −3). They believed that in this case, the multiple activities taking place in the riverbanks did not respect ecosystems and that biodiversity was actually lost (Participants #12 and #15).

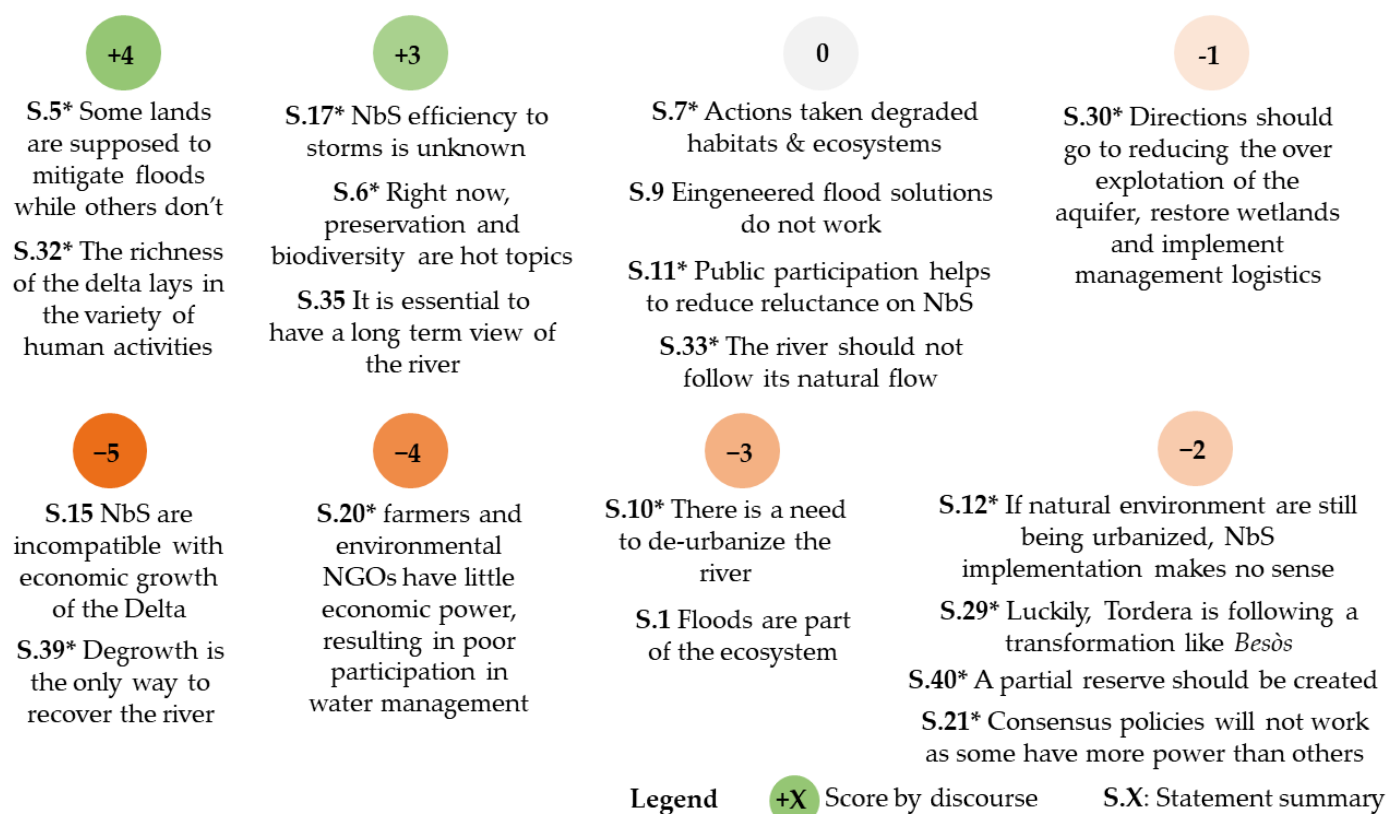
#### 5.1.2. Discourse 2: NbS Aligned with the Dominant Socio-Economic Structure of the Delta

In contrast, discourse two claimed that the main richness of the delta was explained by the variety of activities offered (S32: +4). This discourse was against statements suggesting that actions taken so far to manage floods have degraded the river ecosystem (S7: 0), or that have created a false feeling of safety (S9: 0) (Figure 3).

In discourse two, NbSs appeared as an opportunity as long as they could contribute to the current socio-economic structure and its expansion in the delta (S15: −5). In this sense, NbSs were seen as potentially important in the improvement of productive activities (Participants #2, #26, and #31). While some participants remained skeptical of the effectiveness of NbSs during heavy storms (S17: +3) (Participants #6, #9, and #16), others recognized that the same would likely happen to any type of engineering solutions, as floods in the area may also eventually overtop protection measures (Participant #33).

According to this discourse, NbSs would not be threatened by more urban development in the area (S12: −2) or that current developments needing restructuring to make room for NbSs. This was a controversial point that has been discussed for decades and continuously debated in interviews because several stakeholders were reluctant to leave

their lands. Campsite owners were not open to reallocate, arguing that they are in the possession of all the legal permits, counting on early warning systems for flood prevention and some even drafting a NbS project based on wetlands (Participants #3 and #8). The agricultural sector recognized the current struggles to endure in the area since there is no hereditary tradition of working the land anymore, acknowledged the change in the means of production, and was not open to allow flooding of their lands without some type of compensation (Participant #10). In summary, in this discourse, there was no room for degrowth ideas (S39: −5 and S10: −3): “The river does not resemble its original form, it was channeled decades ago. We should not romanticize the idea of having a 100% natural river, with non-developed land next to it.” (Participant #10).



**Figure 3.** Summary of most important statements for discourse two. All statements were statistically significant at  $p < 0.05$ ; those flagged with \* were statistically significant at  $p < 0.01$ . This means that only statements that loaded significantly in a factor were included. The number of statements to include was calculated after the formula  $(2.58(1/\sqrt{n}))$ ,  $n$  being the number of statements (in this research =42), having a significance factor level at 0.01 [71]. Note: statements were summarized for visibility issues. Complete written statements can be found in Appendix A.

For discourse two, floods appeared as a threat and not a blessing (S1: −3), mainly for some sectors that suffer the most during and after flood events (S5: +4; Participants #10, #26, and #34). This was discussed extensively after *Glòria*, as most farmers did not have insurance when lands remained unproductive for almost five months after the disaster (Participants #10, #13, and #18). After *Glòria*, much of this changed, and insurance companies updated their policies specifically covering agricultural produce in farms, to the point that currently, nearly 90 percent of the agricultural lands are covered by insurance schemes (only 1.2 percent were insured before *Glòria*) (Participant #10).

However, when looking into who is less represented in flood strategies, proponents of this discourse did not claim that environmentalists and farmers were the most affected (S20: −4). Discourse two believed that the agricultural sector gained more power with the creation of the Agricultural Area of the Lower Tordera (*Espai Agrari Baixa Tordera*)—an

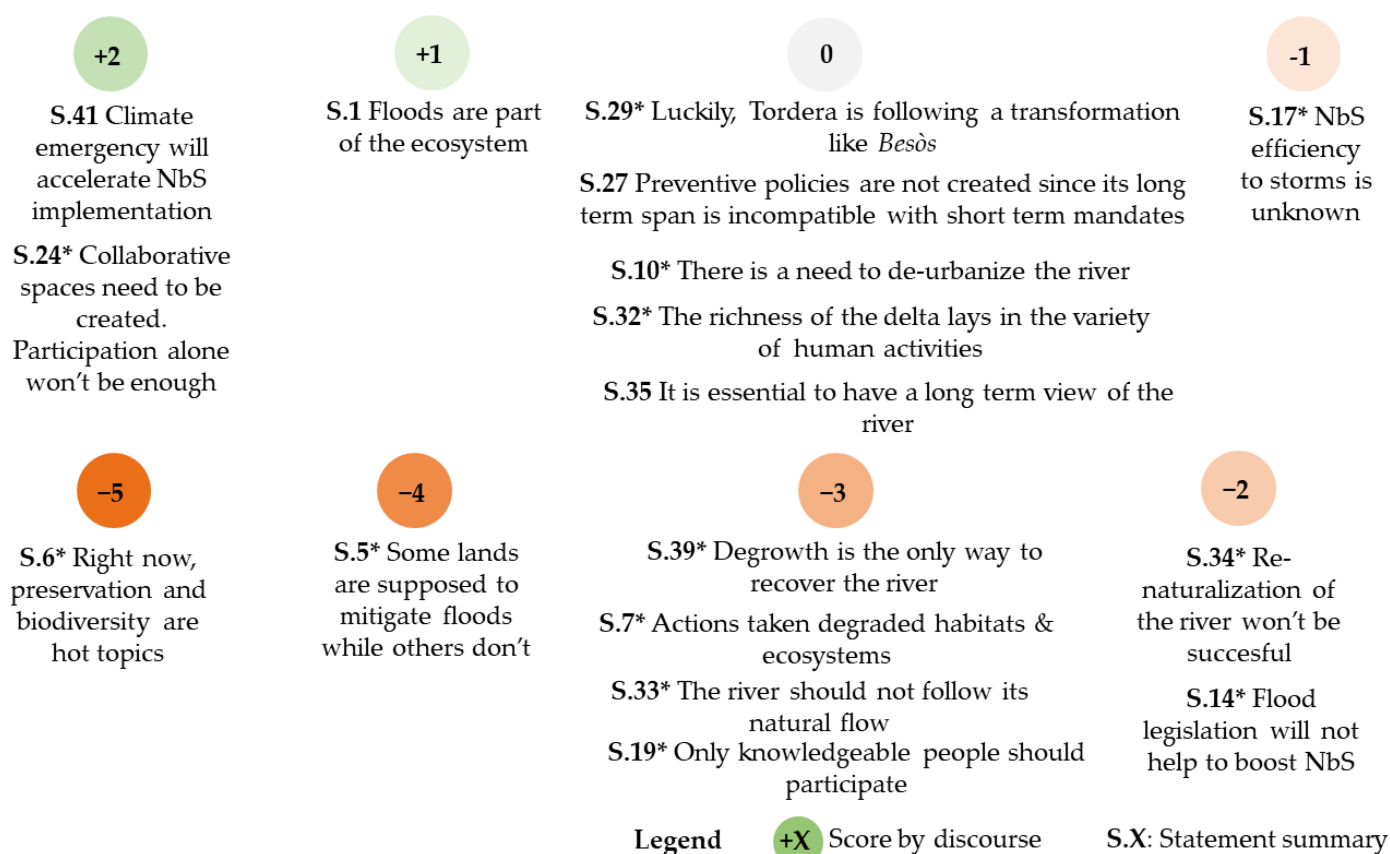


initiative created by municipalities and coordinated by the provincial government of Barcelona in order to protect the lower Tordera and the locally produced food (Participant #1, #18, and #35). For this discourse, the whole economic activity of the area suffered the consequences, with the main focus of flood initiatives addressed to protect urban areas first (Participants #4, #9, #12, and #14).

In terms of future actions to be taken, this discourse considered it fundamental to create a common view of the river (S35: +3), understanding that sustainability models can generate social and economic values for all (Participant #19). It did not pretend to follow a *Besòs*-type transformation (S29: −2) or the creation of a natural reserve in the area as outlined by some municipalities (S40: −2) lacking the economic resources to develop value (Participant #25). Discourse two opted for more compensatory measures (like tax breaks or partial coverage of insurance) for land owners if NbSs were to be implemented in the area (Participants #6 and #14).

### 5.1.3. Discourse 3: A Hybrid NbS Future

This discourse yielded a considerable number of non-committal answers (Figure 4), demonstrating a rather indifferent position towards NbSs. It basically considered that NbS and current actions were compatible, acknowledging that in the future NbSs would gain leverage due to climate change (S41: +2). Still, it sustained that conventional flood control strategies worked correctly and did not degrade ecosystems (S7: −3).



**Figure 4.** Summary of most important statements for discourse three. All statements were statistically significant at  $p < 0.05$ ; those flagged with \* were statistically significant at  $p < 0.01$ . This means that only statements that loaded significantly in a factor were included. The number of statements to include was calculated after the formula  $(2.58(1/\sqrt{n}))$ ,  $n$  being the number of statements (in this research =42), having a significance factor level at 0.01 [71]. Note: statements were summarized for visibility issues. Complete written statements can be found in Appendix A.

Reinforcing this idea, hybrid views did not believe that engineering solutions might cause biodiversity loss to river ecosystems (S10: 0). At the same time, the discourse suggested that NbSs could be promoted as doing both, mitigating floods and boosting biodiversity (S14: −2), and believed that the preservation and enhancement of diversity was not a temporary matter but that it will stay in future debates (S6: −5).

In terms of political commitments, discourse three was against the belief that incompetence in long-term flood policies was related to short-term political mandates (S27: 0) or that a long-term view of the river was needed (S35: 0). However, it recognized that there was a lack of expertise regarding land use and environmental planning (Participant #25), and believed that in the short term, politicians should make a better effort to update local emergency and civil protection plans (Participants #12 and #19). It also argued that the Catalan Water Agency should update return periods for flooding episodes, arguing that these periods have changed to the point that extreme episodes occurred more frequently (Participants #8, #12, and #15).

Moreover, discourse three strongly acknowledged that it was reasonable for some economic sectors to let their lands flood (S5: −5), understanding floods as natural and positive for the environment (S1: 1). Some believed that there was an opportunity to align agriculture with the enforcement of NbSs (Participant #6), since agriculture in the Tordera delta, one of the more fertile lands of Catalonia partly as a result of flooding, has a strong environmental potential which is not recognized enough (Participants #13 and #18). Others even ventured for new agricultural products lined up with environmental dynamics, such as growing rice in wetlands, that could attract new types of biodiversity (Participant #21). Others targeted ecotourism as a way to develop activities respectful of the environment (Participants #3, #8, and #26) without needing to resort to degrowth (S39: −3).

Regarding the future of the delta, defenders of this discourse believed that the development of the area should not be driven by the current unsustainable economic activities (S33: −3). Some participants supported the view that the re-naturalization of the river was compatible with the economic potential of the area and that it was not too late to bring natural flows back partially (Participant #35). They also highlighted that the river re-naturalization would happen either in good (planned and giving compensations to the most affected) or bad terms (in a more uncontrolled way). For this scenario, they foresaw that nature would force several economic activities to relocate due to more frequent storms, destroying infrastructures more often and making rebuilding economically unsustainable (Participants #2 and #21).

Lastly, the discourse proposed the creation of collaborative spaces for stimulating the exchange of ideas (S24: 2) and strongly argued for more participatory processes where all voices were taken into account (S19: −4): “Public participation can help resolve situations of disagreement, overcome mistrust and adopt solutions. With this, I do not mean that public participation by itself is the panacea of any type” (Participant #1).

## 6. Discussion

The variety of discourses unraveled in this research offers insights into how community acceptance is influenced by procedural, distributional, and trust and recognition justice concerns [14]. In other words, how willing or not a specific community is to implement NbSs depends on how ‘just’ NbSs may appear to them [38].

First, all three discourses emphasized that what makes the Tordera delta unique is its natural value. However, understandings of nature varied. To some, nature should maintain its original form and thus, we should aim for improving the re-naturalization of the river (discourse one); while for others, nature could be appropriated and put at the service of the socio-economic potential of the area (discourse two). For the third discourse, nature could gain importance due to the impacts of climate change, but NbSs should still be implemented along with conventional flood control infrastructures. This brings us to the questions: why should NbSs be implemented? What are the reasons for their introduction in this area? These and other questions were guided by recognitional justice [46]. For discourses one

and three, flood was not a problem as it is in the nature of a river to flood surrounding lands while the main concern should be biodiversity degradation. Discourse two saw flood as a hazard to existing infrastructures and development for which compensatory measures should be implemented. In this sense, the needs and values of communities varied. Because of these differences, the diagnosis of the problem, the understanding of natural values [47], and consequently, the understandings of NbSs also differed among stakeholders.

Second, results indicated that there was tension among discourses regarding the perceived benefits and costs of NbSs [19,45] and their social and environmental distribution. Discourse one claimed that nature has been overwhelmed by economic development and that the river should have space to flow, meaning that existing economic activities and facilities including the desalination plant would have to be relocated. Although forcefully, discourse three also understood that nature would require the relocation of several unsustainable economic activities. In contrast, discourse two argued that some economic sectors suffered flood effects more intensively than others, claiming a differential distribution of protection measures. Distributional justice allows one to express more clearly how NbSs can be implemented more fairly in terms of the distribution of costs and benefits [42,43]. Still, some common ground could be found, as observed in the consensus statements. These provide opportunities to act on more equal and just flood management and biodiversity strategies, realizing that NbS win-win discourses are not realistically represented in the current power structures of the delta [15].

Third, results suggest that the governance structure of the delta could be improved. Discourse three pointed out the need to create more expertise in land use and environmental planning and believed that better efforts should be made by organizations in this regard as well as in relation to more participatory spaces. Discourse two aimed at creating a common vision of the river that defines a shared conception of sustainability. On a similar note, discourse one understood that administrations should focus more on an integrated strategy of the area, against the current siloed management. Procedural justice addresses these issues [14,39] by asking the question: for whom are NbSs designed? Agreement among the three discourses was found on the need to follow more reflexive governance structures that include participation processes, to design and implement more just ways of enhancing the exchange of knowledge, and the creation of institutional capacities [40,41].

This last point is of particular interest since it recognizes that while NbSs are political [26], by acknowledging conflicts and tradeoffs, they may also become the starting point to creating more democratic governance schemes and policies [63].

#### *Is a More Socio-Environmentally Just NbS Future in the Delta Possible through New Governance Schemes?*

While different views could be identified regarding what is best for the river and how NbS should be developed, our results also highlighted common grounds calling for a more holistically sustainable governance of the Tordera delta.

Political fragmentation has not helped to develop an integral vision of the area, but some of our interviewees argued that this should not serve as an excuse for non-intervention (Participants #1, #2, and #35). In multiple cases, participants suggested the necessity to create a supra-municipal organization managing the lower basin of the Tordera river integrated within a basin-wide governance framework. This scheme would reduce pressure on the Catalan Water Agency (ACA) and help local governments in flood management and mitigation measures (Participant #19). Moreover, it could be supported by the existing Maresme County Council (*Consell Comarcal del Maresme*) that works hand in hand with municipalities to bring new participation opportunities to municipalities and local communities. Other voices in our research preferred a more decentralized and bottom-up scheme such as participative co-decision processes in contrast to a top-down supra-municipal organization (Participants #9 and #31).

Either way, suggestions to rethink the governance of floods align with the reflexive governance model that NbSs ideally strive for [17], taking into account social inclusion,

environmental justice, and multiple territorial challenges [60]. While these more reflexive governance levels are already explored in the delta, they need further support (Participants #6, #8, and #9) in the form of a constant evaluation of decisions and initiatives. In this sense, NbS requires that governance adapts and remains open to challenges posed by everyday politics [60].

The most solid effort following a reflexive governance model has been the creation of the delta and Lower Tordera's roundtable (*Taula del Delta i de la Baixa Tordera*). Although several participants praised the efforts and objectives of this project, they argued that it lacked a preliminary step of targeting, in a collaborative manner, the main problems of the river (Participants #2, #7, #13, and #14). Surprisingly, the roundtable was not used after storm Glòria (Participants #9 and #11). Instead, short-lived initiatives followed such as the creation of a temporary Territorial Commission for the lower part of the river (*Comissió Territorial de la part baixa de la Conca de la Tordera*), listing 75 emergency actions to pursue, as well as a technical governance committee (*Taula Tècnica de Valoració del Temporal Glòria*) to decide which direction to follow [8]. In contrast, environmentalists, scientists, and academics signed the Manifest de la Tordera called "La Tordera after storm Glòria, and now what?" (*La Tordera després del temporal Glòria, i ara què?*).

The need to create a supra-municipal organization, underscored by many actors, was also reinforced in the Development Plan of Agricultural Area of the Lower Tordera (*Espai Agrari Baixa Tordera*). This plan understood that action should go hand in hand with La Selva County Sustainable Water Plan (2007), which proposed to create an external entity that veiled for water management in the delta [75]. Interestingly, while the upper and middle part of the river constitutes part of the Besòs-Tordera Consortium (formed by 68 entities, most of them municipalities along the Besòs and Tordera rivers, managing sanitation, environmental improvement and education, and support for the member entities of the river), the delta is not part of such Consortium.

Nevertheless, neither the creation of this supra-municipal organization nor having more participative co-decision processes guarantee that consensus will be met regarding the management of floods and biodiversity through NbS (Participants #6 and #14). It must be acknowledged that measures taken through more collaborative schemes including the potential creation of a supra-municipal organization neither are translated automatically into win-win situations (Participant #6) nor satisfy everyone's needs and visions (Participants #18 and #36).

While consensus will hardly be achieved (and maybe it is even not always desirable, as sometimes ignores the interests of actors with less power), the creation of a supra-municipal governance or having more participative co-decision processes may be tools to more fully incorporate the diversity of views. The NbS potential to contribute to environmental justice and social cohesion will take place first if opposed perceptions, needs, and wants are acknowledged [22]. So far, the conflict among stakeholders has pushed back action (Participants #7, #33, and #36), leading to short-lived endeavors or just claiming for an optimal management as an excuse to do nothing (Participant #2): "Not doing anything, leads to business as usual, and that is the most dangerous drawback that NbS have for the delta" (Participant #13). There is a need to include all views in the process, understanding why tradeoffs occur, rather than assuming that they will benefit everyone [32]. While the win-win discourse is inaccurate as some might win more and others less, what is crucial is to be transparent and be able to reorient NbS strategies.

## 7. Conclusions

Using a Q-methodology approach under a socio-environmental justice perspective, this research attempted to demonstrate that different drivers of community acceptance shaped three different discourses in the delta of the Tordera River. The first discourse argued that NbSs should be implemented as soon as possible, mainly because of their potential in fostering biodiversity; the second discourse believed that NbS future depends on its capacity to adapt to existent economic structures and dynamics; lastly, the third discourse



sustained that the most preferred model would be a combination of both NbS, as it allows a partial re-naturalization of the area, and more conventional flood management procedures.

The research argued that new governance configurations are desired and needed in order to discuss and exchange opinions regarding problem diagnosis, possible solutions, and management procedures to meet targets in the delta. While this possibility was already explored years ago, it needs further institutional support if a more socially just NbS future in the Tordera delta is to be achieved. Moreover, a deeper understanding of the capacity of institutions and willingness of different stakeholders to conform to such a governance scheme is needed, as well as a comprehensive technical analysis of NbS behavior in flood prevention and biodiversity enhancement. If the delta community aspires for a NbS-based future (although for different purposes, as this study showed), its participatory direction needs to be aligned with policies of land use, flood prevention, and environmental protection in order to achieve economic, social, and environmental sustainability.

The socio-environmental justice analysis helped us to understand the unequal consequences of tradeoffs by identifying the different views regarding what is best for the river and how NbSs should be developed [19]. The research defended that it is extremely complex but necessary to understand how NbSs—if at all—best fit the context of a specific region. This study also attempted to shed light on the divided perceptions among stakeholders of the Tordera River delta, regarding NbSs as a possible instrument toward more sustainable ways of managing floods and boosting biodiversity.

The multi-dimensional approach of the research also allowed us to delve into the synergies that can be found across different discourses. These synergies may act as buffers against conflicts and tradeoffs that will unavoidably happen, as it must be recognized that NbSs are also intrinsically political [26]. Therefore, while consensus might not be met—as some will lose while others will benefit from the co-benefits provided by NbS—the range of different opinions analyzed in this research in contrast to generalized and simplified ideas brought insights to creating achievable democratic policies [70,71]. Regardless of the differences, it became evident that shared perspectives among discourses can constitute the basis for more just NbS policies in the delta of the Tordera following a participative governance scheme.

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**Institutional Review Board Statement:** Since the study did not involve experiments with animals or humans, ethical review and approval procedures were waived by the Ethics Commission on Animal and Human Experimentation of Universitat Autònoma de Barcelona. All participants in surveys and interviews agreed to collaborate signing a consent form based on the regulations issued by the Universitat Autònoma de Barcelona in this regard.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Not applicable.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

**Table A1.** Statement list with scores by discourse.

	Statements	Scores by Discourse (Factor Scores)		
		D1	D2	D3
1	Floods are part of the ecosystem, without floods there is no ecosystem. River floods are actually a blessing since they recharge the aquifer and maintain ecosystems, but nowadays they are seen as a risk.	−3	−3	1
2	Only when floods result in human losses real actions are taken. If not, the same always happens. Actually, all stakeholders involved will cooperate more if floods happened more frequently and posed more serious risks.	0	0	0
3	I do not see right now in the administration a paradigm shift to apply more natural solutions in flood risk management, I see a continuity in actions that leads us to the same action-reaction measures.	3	−3	−1
4	Unfortunately, most of the times the environment is the casualty of the complexity of governance in the region. Due to the difficulty in the coordination among all administrations, actions are simply not taken.	0	−1	−2
5	I believe unfair the normalization with which land used for several economic activities has to flood or is planned to be flood, while other land is protected.	−3	4	−5
6	Right now, the preservation and enhancement of biodiversity of the fluvial ecosystem is a hot topic. But, within some years this will not be the priority of the city councils and the river will decline again.	−3	3	−5
7	Actions taken to protect people and assets have been carried out at the cost of degrading habitats and ecosystems.	2	0	−3
8	So far, most measures were taken after the occurrence of a disaster rather than from a risk management or prevention perspective.	4	1	1
9	Engineered solutions that put the river in a box do not function, as this brings a false sense of security. Infrastructures are based on calculations to mitigate floods, but mother nature is unpredictable and might overcome these barriers.	2	0	1
10	It is vital to make space (de-urbanize) the river in order to make possible a minimum balance between economic and social activities and the maintenance of biodiversity. If NbS for flood mitigation are not implemented in the Delta and the dependence on engineered fluvial systems continues, the river biodiversity will be negatively affected.	5	−3	0
11	I understand that public participation can help to reduce reluctance or doubts regarding the implementation and management of NbS to manage floods.	3	0	2
12	It makes no sense to foster NbS if the natural environment is urbanized. NbS cannot solve all problems if there continues to be an increasing pressure on impervious areas.	2	−2	4
13	Most likely, not everyone finds NbS useful due to the fact that cost/benefit analysis would unveil economic losses in the short term, mainly for sectors such as agriculture and tourism.	1	1	2
14	Flood legislation will not help to boost NbS in the area. NbS in the delta need to be introduced by highlighting the benefits they offer from an environmental point of view, such as in the case of wetlands, rather than the part NbS play as flood mitigation measures.	−1	1	−2
15	NbS are incompatible with the economic and potential value of the land and can limit the growth of productive activities.	−4	−5	−4
16	Local managers and municipal politicians of the area should be better trained in NbS and flood management, since they have the capacity to make decisions on these matters.	1	2	4
17	The issue with NbS is that we do not know yet if they will be able to absorb extreme meteorological events, such as <i>Glòria</i> in 2020. It is very unlikely to know how efficient they will be in mitigating big floods.	−3	3	−1

Table A1. Cont.

	Statements	Scores by Discourse (Factor Scores)		
		D1	D2	D3
18	Political fragmentation of responsibilities regarding the management of the Tordera is the most significant barrier to overcome in order to agree on a common objective for the area.	0	−1	−1
19	Only knowledgeable people and experts about the topic should make the decisions regarding flood mitigation and management.	−4	−4	−4
20	Both, the industrial and tourism sector have a lot of power and influence in the economic aspects. Contrary, farmers and environmental NGOs are the ones with less economic power and this results in less participation in water management.	−1	−4	−1
21	I am not in favor of consensus policies as to what to do in the delta as some voices are imposed based on existing power relations.	−4	−2	−4
22	The optimal scale for river management would be the basin level, as it would allow a more integral vision of the delta.	4	3	4
23	Everyone related to the river is tired of being part of participatory processes that in the end do not result in concrete actions. It is very discouraging to see that there is so much inertia to move forward and improve. Many times, experts who are not part of the territory come with fixed ideas and do not listen to us.	1	1	−1
24	Participation alone is not enough if different opinions are not taken into account in decision-making. What is needed is to create collaborative spaces where different actors meet and discuss different topics, such as with the <i>Espai Agrari Baixa Tordera</i> . This will provide a good opportunity to start generating dialogues between the actors involved, and see with the ACA what river we want.	−2	−1	2
25	It was surprising to see that the <i>Taula de la Tordera</i> was not used as a reference to manage the impacts of storm <i>Glòria</i> . It was the perfect time to put it into practice, but it just did not happen as it was not taken seriously.	1	−1	−2
26	ACA needs more support by the Regional Government of Catalonia ( <i>Generalitat</i> ) to foster communication among stakeholders. More coordination needs to be enforced between who manages floods and who environmentally protects the river.	−1	1	1
27	Politicians do not implement preventive policies since these have a long-term time span incompatible with most decisions that are based on the short term and do not alter the status quo.	2	3	0
28	The natural ecosystems of the delta, as well as its habitats and fauna have to be protected since they are part of the natural heritage. We should learn about the importance of the natural heritage.	5	5	5
29	Luckily, the Tordera river is following a transformation similar to the <i>Besòs</i> , where numerous activities coexist and the ecosystem is respected.	−3	−2	0
30	Reduce the overexploitation of the aquifer, restore the wetlands and implement management logistics to improve the river is the direction we should follow.	4	−1	3
31	I wish our Delta looked more like the <i>Aiguamolls de l'Empordà</i> , where different sectors coexist and the respect for nature is constant.	0	2	3
32	The main richness of the delta is the variety of activities it offers to humans in a very small territorial extension.	−5	4	0
33	The river should not just follow its natural flow. The river has been manipulated for decades now, and we need to acknowledge that certain activities benefit from this.	−5	0	−3
34	Re-naturalization of the river won't be successful, since there are many economic interests in the area and no one wants to lose land. But, if we continue with the current situation, the delta will become a <i>Baix Llobregat</i> , where natural spaces are in a state of permanent threat.	−2	−4	−2
35	It is essential to have a long-term view of the river, as there are too many interests and owners cannot simply lose their land and economic gains.	−2	3	0

Table A1. Cont.

	Statements	Scores by Discourse (Factor Scores)		
		D1	D2	D3
36	Commitment should go in the direction of enhancing the value of the river through its protection, but being able to observe it while keeping distance. This may bring economic benefits since it can also generate ecotourism activities.	−2	5	3
37	Now it is the perfect time to act, as most city councils are sensitive to flood issues after Glòria. But this momentum will pass.	0	2	1
38	Since floods do not cause human losses, consensus on what to do with the river will be much more difficult to reach. No specific management measures are developed since it is the river who suffers and this does not have a strong social impact such as the loss of human lives.	−1	−3	−3
39	As far as possible, we should try to make the river look as it used to be before the time of the great industrial and tourist development, although it will be difficult because the administrations and the economic sectors are not interested. Degrowth will be the only possibility to recover the river.	0	−5	−3
40	Blanes and Malgrat de Mar initiative to create a partial reserve and manage it together is the direction we should take. We should do this upstream in the river, in the upper and middle parts as well.	1	−2	3
41	The climate emergency we are experiencing will accelerate the implementation of NbS in sensitive environments such as the Tordera delta.	−1	5	2
42	Sustainability must be viewed from a broader spectrum and all stakeholders must commit to it for the future of the delta. Today there is a polarization as to what we understand by sustainable that does not make sense: on the one hand there is the ecological perspective of protecting the river and on the other, there is that one of producing fresh crops locally. It is necessary to create dialogues between all visions of sustainability.	3	2	5

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