

Article

Co-Developing Business Plans for Upscaled Coastal Nature-Based Solutions Restoration: An Application to the Venice Lagoon (Italy)

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Abstract: Upscaling coastal nature-based solutions (NbSs), from the river to sea scale, essential to the ultimate success of restoration, requires larger investments, greater socio-economic engagement and a transformative shift in governance. Consequently, the ability to catalyze blended finance from public and private investors through business model innovation and accessibly written long-range business plans is imperative. This research proposes a methodology to systematically co-design, through iterative stakeholder engagement, suitable and effective business models for upscaling NbSs coastal restoration, as well as a framework to develop business plans adaptable to different investors needs and financial criteria. This method was tested and validated in a saltmarsh restoration project coordinated by public agencies in the Venice Lagoon. It delivered an advanced business model canvas, carefully assessed through a stakeholder questionnaire and a related business case centered on ecotourism complemented by a willingness-to-pay analysis. The resulting business plan lays out the governance, management, business and financial strategies for successful restoration, addressing specific interconnected issues, improving five main ecosystem services and delivering NbS multifunctional environmental, economic, social and cultural benefits. The methodology has proven to be applicable beyond the Venice Lagoon saltmarsh case and types of restoration projects.

Keywords: ecosystem services; nature-based solutions; coastal restoration upscaling; business plan; business model; stakeholder co-development; eco-tourism



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1. Introduction

It is widely scientifically acknowledged that climate change, notably an exacerbation of natural hazards and ecosystem degradation, will define our future [1]. This progressive degradation of ecosystems adversely impacts the provisioning of ecosystem services (ESs), and thus constitutes a systematic risk to societies, economies and companies [2,3]. The global community has outlined ambitious ecosystem restoration targets [4], including the political push to integrate nature-based solutions (NbSs) in adaptation efforts. Cohen-Shacham et al. [5] defines NbSs as “measures that aim to protect, sustainably manage and restore ecosystems, thereby addressing societal challenges while simultaneously providing human well-being and biodiversity benefits”. These NbSs utilize natural features and processes, are resource-efficient and are tailored to address social, environmental and economic challenges in diverse environments [6]. The acceptance and application of NbSs is on the rise due to their ability to simultaneously address looming challenges, offer additional ESs, as well as benefits to multiple stakeholders [7]. Moreover, NbSs

are firmly encouraged in the EU policy agenda, including proposed actions on flood management, climate change adaptation, water retention, disaster management [8], the recent EU Restoration law, the EU biodiversity strategy, the EU Green deal, as well as the Urban Agenda 2030, the UN Climate Action Summit 2019 and the Convention of Biological Diversity, advocating for the use of natural solutions over grey or engineered, physical infrastructure [9]. While NbSs are considered to be more cost-effective and efficient than grey infrastructure, especially in attenuating hazards [10], NbS implementation remains slow, partially limited by precarious financial funding [4,9].

NbSs generate wide-spread public benefits, but do not produce immediate revenue streams and, as such, must rely on public funding, often subject to political and governmental restrictions [4,9]. Public financing, however, most often is insufficient to tackle larger international restoration targets [3]. A strategic NbS has the potential to align environment goals with private sector economic interests, stimulating private investments from banks, institutions and venture capitalists as the most promising alternative source of key funding [11]. To attract private investments, a supportive environment that harmonizes financial incentives with sustainability objectives must be created [12]. This includes providing more reliable and granular data to estimate up-front and running costs, as well as the short and long-term merits of restoration projects. Investors and other project stakeholders will be focused on potential investment returns, unfolding of private–public partnerships and realistic assessment of financial risk/reward ratios [13]. Cost-benefit and cost-effectiveness analyses equip policymakers with quantitative tools to make decisions regarding the implementation of NbS projects. However, stakeholders in the private sector are looking more to enhanced profits as a standard for willingness to participate, including the economic evaluation of ES improvements generated by restoration activities [14,15]. Underlining the necessity to conduct a comprehensive analysis of the costs and benefits associated with NbSs, it is crucial to integrate both monetary valuation and non-monetary impact assessments to address social, environmental and cultural effects [16]. Another difficult task of the NbS is in capturing the value of intangible rewards, such as better health or increased biodiversity, for the private investors deciding where to make the greatest difference in alignment with their own financial priorities and sense of responsibility to the public [17].

Barriers to NbS implementation are complex and interwoven, spanning technical, financial, economic and governing domains [18,19]. To overcome the barriers and bridge the gap, a keener knowledge and awareness of NbS business models is needed to stimulate the involvement of private stakeholders in financing NbS upscaling [20]. As such, a shift is occurring, so is diving deeper into the mechanisms that unlock private resources for NbSs from institutional investors, businesses and citizens [9]. The inclusion of various stakeholders is deemed a suitable and sustainable way towards the mainstreaming of NbS implementation; allowing for new synergistic alliances to create more flexible and innovative milieus, sustainable perspectives and reduced dependencies upon temporal financing [21].

The current literature depicting business models reveals an important knowledge gap concerning the design and implementation of value creation and value capture processes across organizations [22,23]. This vacuum creates a pressing need to facilitate the development of business models and case study examples that identify the necessary elements for achieving value [20]—capable of evaluating and integrating environmental, economic, social and cultural value propositions—arising from NbSs restoration efforts spanning different time periods. An innovative concept, although still in its infancy, refers to regenerative business models that aim to contribute to ecological restoration and societal well-being, generating value across multiple stakeholder levels, including nature, societies, customers, suppliers, shareholders and employees [24].

A business model (BM) represents the “design or architecture of the value creation, delivery, and capture mechanisms” of a firm [25]. Following this, a business plan (BP) formulates specific management, business and financial strategies aimed at achieving revenues

and funding that mirror the objectives of NbSs restoration. In the context of NbSs restoration, the BM reveals how an organization generates, delivers and captures environmental, economic and social value through restoration [26]. One of the most important forms of BM innovation nowadays is the move from selling products to selling outcome-based services [27–30], where the provider assumes responsibility for the performance outcomes of the services offered and penalties in case of fault [30]. In the NbSs interventions context, the performance outcomes are linked to the expected ESs and biodiversity improvements, which are difficult to measure, with a crucial need for governance support and social acceptance. Drawing from the BM Canvas [26], business modelling tools have evolved to address various aspects such as sustainability [31–33], circular economy principles [34] and in recent years natural assurance schemes and NbSs [20,21,35].

A high-risk BM innovation strategy, infused with holistic thinking that embraces entrepreneurship, ESs, NbSs, life cycle thinking, sustainability and circular economy, must be adopted [21]. A clear assessment of the underlying reasons for the value attributed to NbSs is expected to help with the prioritization and uptake of NbS projects by managing expectations and providing a basis for a more transparent decision-making process [1]. Such an evaluation should consider critical research domains including the challenges associated with integrating various financial mechanisms, the complexities in evaluating multiple value propositions (including environmental, economic, social and cultural elements) from different stakeholders and the difficulties in transitioning from identifying the overall social impact of NbSs restoration to establishing effective value capture mechanisms. Therefore, this work addresses the complexity of the topic by proposing a systematic methodology for co-developing business plans based on innovative business models for upscaling NbSs restoration, capable of addressing NbSs multifunctionality while incorporating participatory stakeholder engagement. The methodology has been developed, tested and validated using the Venice Lagoon (Italy) as one of the pilot sites of the broader collaborative research project, REST-COAST, the large-scale RESToration of COASTal ecosystems through rivers-to-sea connectivity.

2. Materials and Methods

This section includes three parts: (i) exploring scientific and grey literature on business model innovation and NbSs restoration complemented by a scientometric analysis; (ii) systematizing the co-development of a BP based on BM innovative stakeholder participation; (iii) characterizing the case study.

2.1. Unveiling Business Models and Business Plans in the Current Literature through a Scientometric Analysis

The framework design for innovative business models relies on the extensive knowledge in the scientific and grey literature related to key principles of NbSs restoration. The analysis and quantification of suitable business models and plans for upscaling coastal restoration using a scientometric approach has been included in this article. A scientometric analysis assists in identifying structures and capturing the development of a discipline to generate a comprehensive and objective portrait of the state of knowledge [36]. This quantitative review, through the open-source Bibliometric Package, builds on the metadata—i.e., citation and bibliographic information, as well as the abstracts and keywords—of the publications identified through Scopus.

Scopus is considered the largest curated bibliographic abstract and citation database, containing over 76 million records [37], and has been selected as the main source of information for this review due to its comprehensive and accurate coverage of academic content. A total of 15 queries were made in Scopus on the 5 August 2024, combining relevant keywords such as “business model”, “business plan”, “business model canvas”, “finance”, “nature-based solution” and “restoration” in various combinations through Boolean operators, i.e., OR, AND. This resulted in the identification of 1236 publications, published between 1992 and 2024, primarily written in English (Appendix A), revealing

a lack of consideration about the role that business plans can play in NbSs restoration, complementing the strong focus of the literature on financial aspects for restoration.

This analysis was complemented with knowledge from the past and ongoing EU projects, selected through the Research and Innovation community platform of the European Commission, CORDIS. Emphasis was given to the recent EU projects which are part of the NetworkNature European initiative, including the recent efforts from its Task Force 3 about financing and business models for NbSs in a nature-positive economy (Blessing and Barrientos, 2023), thereby highlighting a focus on BM and evaluation methods, while limited attention is paid to BPs. Through this scientometric analysis, it becomes clear that there is a niche for NbSs in coastal restoration business plans. This article pursues this opportunity through the introduction of a methodology to systematically co-develop business plans.

2.2. Hybrid Approach to Systematically Co-Develop a Business Plan for NbSs Restoration

The methodology for co-developing the BP is based on five main steps (Figure 1), as well as an iterative stakeholder engagement and coaching process by economic consultants and professionals in business management, tested and validated at the Venice Lagoon. This resulted in the (i) stakeholder (STK) analysis and interest–influence map (step 1); (ii) NbS-ES Business Model Canvas (step 2-3-4); (iii) NbS-ES Business Plan (step 5). The three main categories of STK identified in the Venice Lagoon were: (i) the core team of STKs, composed of experts representing different scientific disciplines, owning a deep knowledge of NbSs restoration in the Venice Lagoon and its stakeholders and beneficiaries; (ii) the broad STKs group, consisting of an extensive ensemble of stakeholders potentially impacted by/or impacting NbSs restorations; (iii) the tourists and visitors, representing potential beneficiaries and customers.

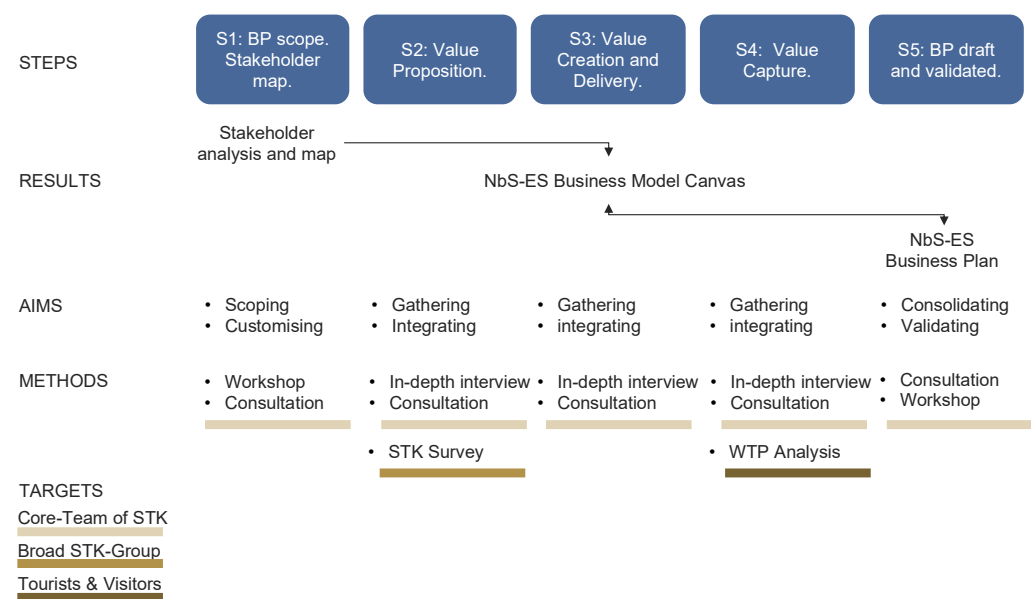


Figure 1. Methodological approach for co-developing the NbS-ES Business Plan, showing steps, results, aims, methods used and targets involved.

The core team of STKs was constantly engaged through in presence and remote workshops with the aim of scoping the BP, as the development required site-specific knowledge, customization, flexibility and contextual adaptation. Subsequently, the core team, nested within the broad STKs group, acted as the main interface with the two other STK categories, facilitating their engagement throughout the iterative process. Step 1, the stakeholder analysis and mapping, is based on information provided by the core team regarding two factors: interest and influence scaled from 1 (lowest) to 5 (highest), commonly used in participatory processes [38]. The ensuing map plots the position of

stakeholders into four different quadrants and foresees different types of engagement: i.e., actively engaged, keep informed, keep satisfied and monitor. Therefore, it allows to analyze, categorize and map all stakeholders to be involved in the process, confirming the core team scoping for the BP and integrating the stakeholder' perspectives and needs in the co-development of the NbS-ES Business Model Canvas [39].

The NbS-ES Business Model Canvas (NbS-ES BMC) is at the core of the formulation of the BP, including the co-developed value proposition (step 2), creation/delivery (step 3) and capture (step 4). The NbS-ES BMC developed in this research builds on former business model approaches, emphasizing the contribution of NbSs restoration to the improvement of ESs and biodiversity. Quantitative and qualitative data were gathered through in-depth interviews and consultations with open-ended questions with the core team of STKs. The co-development process was complemented with (i) an online survey to the broad STK group (Appendix B) in order to co-define multiple value propositions depending on the type of environmental, economic, social and cultural benefit, assessed by stakeholders between 12 August 2024 and 10 September 2024; and (ii) a willingness-to-pay (WTP) study targeting tourists and visitors conducted between 12 August 2024 and 26 August 2024 (Appendix C), to strengthen the analysis of value capture using an ecotourism business case based on a selection of benefits and value propositions. In step 5, the information included in the BMC were used for the co-development and validation of the BP with the core team of STKs, to better align value creation and value capture [40] previously defined in the BM and deepened through the business case.

The template illustrated in Figure 2, helps to frame the process and all elements involved in the provision of coastal restoration through NbS interventions and the BM for up-scaling restoration. This latter contemplates information gathered through in-depth consultation into three main clusters: (i) the value proposition that NbSs restoration interventions aim to offer to stakeholders and beneficiaries through multiple benefits—environmental, economic, social and cultural; (ii) the value creation/delivery, consisting of the specific restoration activities, ruled and impacted by regulation and governance, executed by key partners and other implementers, the resources needed, the delivery channels and customer relationship foreseen to deliver the value proposition to stakeholders, beneficiaries and customers; (iii) the value capture, comprising costs, revenues and additional financial sources to financially sustain the NbS restoration investments; (iv) horizontal aspects, including technological, governance and financial barriers and enablers, impact indicators, risks and mitigation solutions affecting the business model development and implementation.

The different elements of analysis indicated in the ES-NbS BMC, grouped into 20 main categories, represent the basis for the NbS-ES Business Plan, elaborated through additional analysis and consultation. The innovative BP structure was designed by adapting the mainstream template of the business plan to peculiarities of NbS investments and financial requirements from investors. It comprises five main chapters: the value proposition shapes the NbS restoration objectives (I) and the multifunctional NbS offering (II), the latter calibrated through the market analysis; the value creation and delivery from one side contributes to assessing the feasibility of the NbS's multifunctional offering (I) and from the other allows to define the management, business and financial strategies (III) comprising the organizational model supporting the execution of the activities, and the intertwined strategies for business development generating revenues and gathering funding; the value capture complements with quantitative information about costs, revenue, cash flow and financial gap; the business and financial strategies (III) are temporally estimated into economics and financial projections (IV); the horizontal aspects allow the risk and contingency plan to be defined (V), considering the impact of barriers, the contribution from enablers and establishing thresholds for impact indicators.

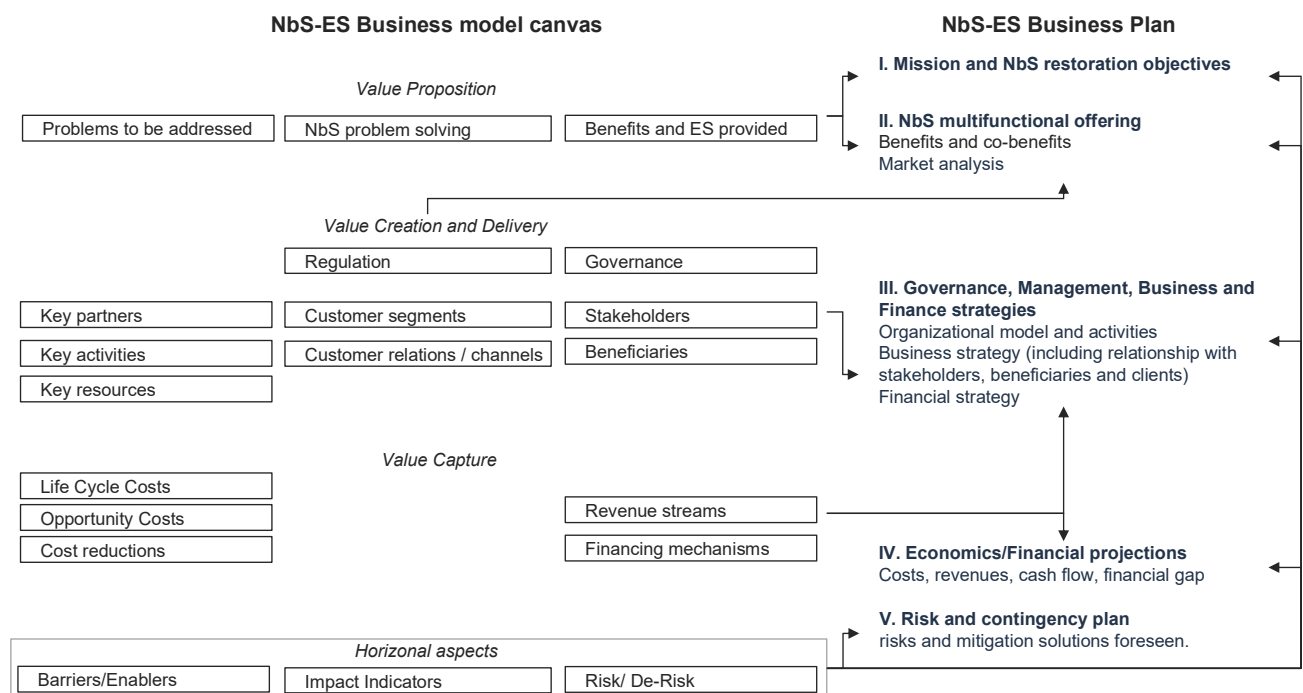


Figure 2. Connection flow diagram highlighting the contribution of the four categories of elements of the NbS-ES Business Model canvas to the five chapters of the NbS-ES Business Plan.

2.3. Characterizing the Venice Lagoon as a Case Study for Restoration Upscaling

The Venice Lagoon (Italy) is the largest lagoon in the Mediterranean Sea, located in the north-western Adriatic between the current mouths of the Brenta and Sile rivers, spanning roughly 550 km² [41,42]. The morphology within the Venice Lagoon includes different habitats whose distribution depends on the hydrodynamic regime [43], creating a complex mosaic of coastal habitats including 6800 ha of saltmarshes and mudflats, 6000 ha of seagrasses and islands [44–46], all of which are interwoven with cultural heritage and urban centers.

Venice and its lagoon have been a UNESCO World Heritage site since 1987, and therefore require the preservation of the landscape itself. Since its foundation, the Venetian Republic considered Venice and its lagoon as a single entity that should be carefully preserved in all its components. The safeguarding of Venice and its lagoon is dictated by a set of precise laws (e.g., L. 171/73, L. 798/84, L. 360/91, and L. 139/92). The Venice Water Authority (i.e., Provveditorato Interregionale per le Opere Pubbliche per il Veneto, Trentino Alto Adige e Friuli Venezia Giulia, hereafter Provv. OO. PP.), as the peripheral body of the Italian Ministry of Transport and Infrastructure (MIT), is responsible for safeguarding of Venice and its lagoon. In particular, the legal framework of the Venice Lagoon's governance is the result of overlapping three legal systems: (1) ordinary, applying EU Directives on various subjects including habitats, species, water quality, ports, mobility and use of sediments; regulatory and policy instruments of national, regional, provincial and municipal competence; (2) special, based on the national interest of safeguarding the city of Venice and its lagoon; (3) commissarial, dealing with different types of socio-economic, environmental and hydraulic emergencies with different commissioners, each for a specific emergency. The Venice Lagoon's governing structure is composed of nine municipalities, two provinces (Venice and Padua), the Metropolitan City of Venice which is responsible for urban restoration and social vitalization, the Veneto Region which looks after the de-pollution of the drainage basin, the Italian State which takes charge for the physical safeguard from sea and rivers and port functioning, and the Comitatore, including ministries and local administration, which oversees the coordination among the main actors. Altogether, the regulations contribute to defining a “lagoon law”, with origins in

the institution of the “Magistrato alle Acque di Venezia” (Venice Water Authority), now Provv. OO. PP, during the Republic of Venice in 1501.

The Provv. OO. PP. has been responsible for the planning, implementation and maintenance of the works in the lagoon since 1992, implementing a variety of interventions in order to counter the negative morphological evolution of the lagoon, as well as the disappearance and degradation of the lagoon’s unique habitats. One of the key habitats that has been negatively impacted by human activities in the 20th century are saltmarshes [42], with the habitat’s extent in the Venice Lagoon diminished by over 76% in the past two centuries [44]. In the past three decades, 1600 ha of artificial saltmarshes and mudflats have been created by the Provv. OO. PP. with the aim to limit the loss of sediment, protect internal marshes from wave energy and thus erosion, preserve the ecological functioning of the saltmarshes and help re-establish the transitional environment. In line with these objectives, 138 ha of saltmarshes are currently under “active” maintenance in the central lagoon.

In particular, the current NbS interventions consist of two phases, spanning ± 5 years, including partially concurrent planning, implementing and monitoring activities, subsequently followed by the naturalization of the marsh, that allows for the provisioning of ESs. The first phase, initiated by the Provv. OO. PP., outlines the restoration of the degraded edges and prepares the site for the upcoming second phase. The latter is executed by the Venice Port Authority (VPA) as part of controlling and maintaining port operationality and refers to the nourishment of the saltmarshes using sediments dredged from the channels to keep the lagoon navigable. Through nature-based processes, saltmarshes play an important role in food supply, nutrient cycling, contaminant filtering, sediment storage and flood control at the local scale, while at a larger scale the restored marshes help to regulate regional climate and provide habitat of conservation importance [47]. Various legislative and planning documents highlight the saltmarshes’ capacity for ES provisioning, including reduction of erosion and flood risk (RCF), water quality purification (WP), carbon sequestration/CCR, food provisioning (FP), as well as biodiversity (BdV) (these ecosystem services are aligned with those studied in the REST-COAST project and are associated with various societal problems faced by coastal communities including flooding, degradation of coastal landscapes due to erosion, water quality degradation and eutrophication), and as such the importance of restoring these habitats is crystal clear.

3. Results

3.1. Stakeholder Analysis and Interest–Influence Map

The core team of STKs supported the identification of the broad STKs group starting from a list of over 70 stakeholders (many of these stakeholders also participated in the Venetian REST-COAST project participatory table, known as CORE-PLAT (Coastal Restoration PLATform), established as a platform for dialogue and collaboration to foster the exchange of knowledge, and ultimately develop a shared vision for the future of the lagoon. Although the recommendations made during CORE-PLAT meetings are not binding for public administrations, the platform aims to play a crucial role in shaping discussions around restoration activities), arising from the “Contratto per la laguna Nord” which is a voluntary tool for strategic and negotiated planning on a participatory basis, with the objective of safeguarding the northern part of the lagoon. These 70 stakeholders are impacted or impact NbSs restoration upscaling in the Venice Lagoon. From this list, 38 stakeholders have been contacted based on their alignment and past engagement with natural and artificial saltmarsh restoration. These 38 stakeholders can be categorized into two broader classes, i.e., the public sector ($n = 13$) and the private sector ($n = 25$), and eight categories, i.e., Governments, NGOs, Education and Research institutions, Environmental associations, Economic associations, Companies, Local Communities and Other. Subsequently, the stakeholders have been mapped (Figure 3), by the core team of STKs, according to their influence and interest in restoration upscaling to provide key insights on their role and expectations for developing and advancing the business plan.

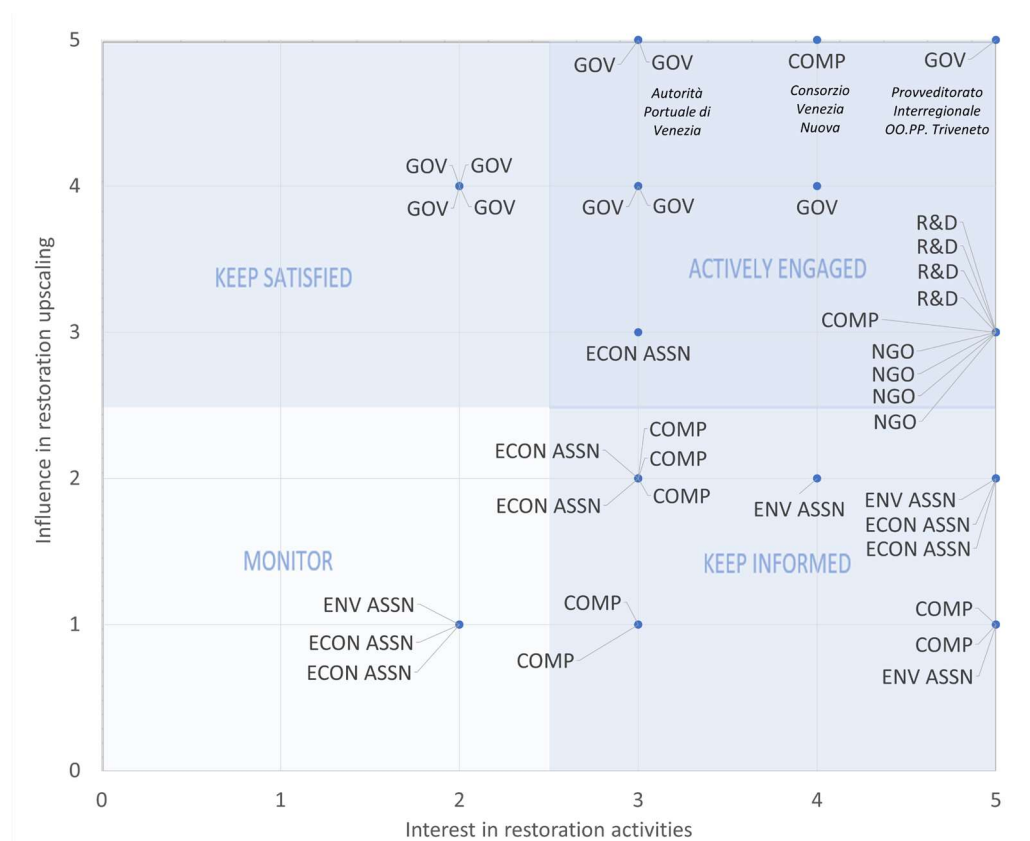


Figure 3. Interest–influence map of stakeholders' category for restoration upscaling on the Venice Lagoon Pilot. The map only mentions the name of the two initiators of the upscaling restoration work (Prov. OO. PP. and VPA) supported by the concessionary company Consorzio Venezia Nuova in implementing the work.

The upper-right quadrant shows two governmental organizations with a very high score, i.e., Prov. OO. PP. (5,5) and VPA (3,5), who are the initiators of the current and upscaling restoration activities in the Venice Lagoon and are responsible for safeguarding Venice and its lagoon (the former) and keeping the channels navigable (the latter). These are followed by a company, Consorzio Venezia Nuova (5,4), who is the concessionaire of Prov. OO. PP. for the implementation of the interventions to protect Venice and its lagoon, including the MOSE system (the MOSE consists in a series of mobile barriers located at the lagoon inlets to protect the city of Venice from high tides). Indeed, among the multiple competent authorities and stakeholders, the only one legally empowered to decide and implement restoration activities is the Prov. OO. PP. The initiators are followed, in terms of score, by the four research organizations involved in the REST-COAST project (the Consortium for the coordination of research activities concerning the Venice Lagoon system (CORILA), University Ca'Foscari of Venice (UNIVE), Euro-Mediterranean Center on Climate Change (CMCC) and University of Padova (UNIPD)), all NGOs and one economic association. The engagement strategy was to actively collaborate in co-shaping the BP through dedicated meetings, workshops and events.

3.2. Framing the NbS-ES Business Model Canvas through Stakeholder Co-Development

The conceptualization of the BMC and its content is the result of a strong iterative process with the core team of STKs spanning 10 months. This was started from the value proposition, built-up by assessing the relevance of the problems impacting the Venice Lagoon, and was addressed through restoration of the saltmarshes, the relevance of ESs and biodiversity (BdV) improvements derived by NbSs restoration activities and the potential

rewards. The value proposition was nourished with stakeholder participation through the survey, which highlighted the importance of saltmarshes and their benefits for Venetian STKs. From the 38 stakeholders in the sample, 28 responses have been received, coming from the different STK categories: Environmental associations, Companies, Education and Research institutions, and Other with five responses each, followed by Government and Environmental NGOs, with three responses each, and, finally, Economic associations and Local Community represented by one answer, respectively.

Approximately one third of the respondent STKs are personally involved in the Venice Lagoon including scientific research (36.4%) and/or recreational activities (27.3%), while political and administrative work was around one fifth (18.2%). Finally, a minority of the respondents took part in hunting (9.1%), professional fishing (6.1%) and/or navigation for passenger transport (3.0%). On average, respondents indicated that they take part in three activities related to saltmarsh restoration, with a predominant role of scientific research (27.9%), very close to recreational activities such as rowing and birdwatching (22.1%), policymaking and administration (18.6%), hunting (10.5%), professional fishing (9.3%), passenger navigation (7.0%) and freight transport (4.7%). Thereafter, the respondents were introduced by various problems affecting the lagoon, and were asked to rank the degree of importance of each of the problems, i.e., erosion, biodiversity loss, habitat loss, sediment loss, water pollution, subsidence, flood damage and soil contamination, showing that all the problems were considered more than neutral on average (Figure 4A), confirming the assessment of these problems from the core team. Considering the remediating influence of saltmarsh restoration, assessed with the next question, there is coherence between the most relevant problems and the highest influence from restoration, showing as the highest influential on erosion (78%), biodiversity loss (75%), habitat loss (71%), sediment loss (54%), flood damage (39%), water pollution (7%), subsidence (7%) and soil contamination (4%) (Figure 4B–I). This confirms the perception from stakeholders of the capability of saltmarshes restoration to positively impact the most important problems.

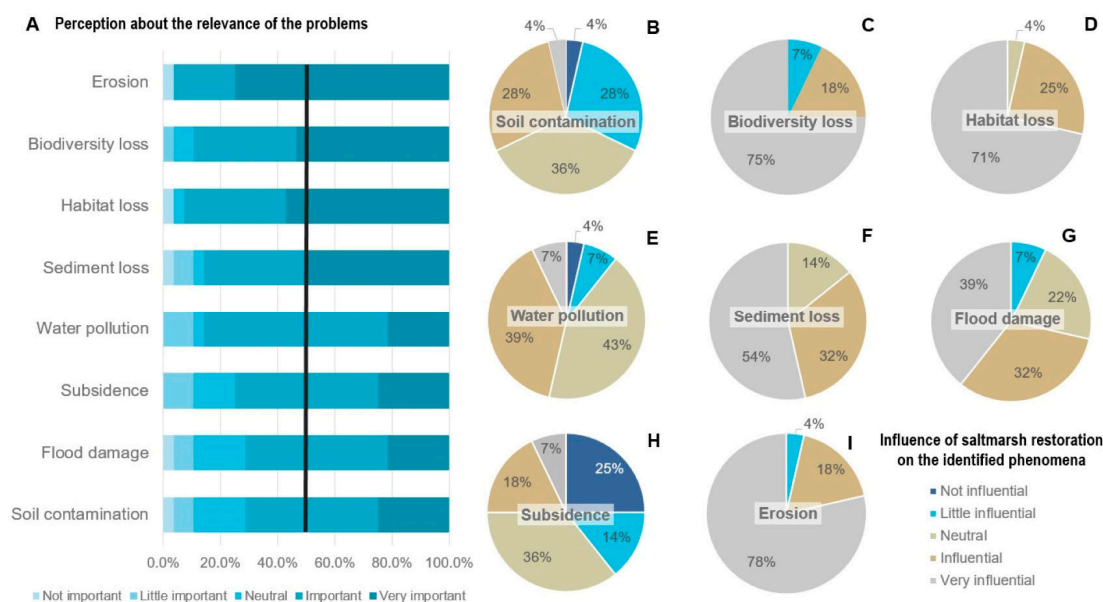


Figure 4. The figure shows two main graphs illustrating, respectively, the importance of the phenomena affecting the Venice Lagoon (A) and the positive influence of saltmarsh restoration on these problems (B–I).

Additional problems were identified by six STKs, such as wave motion, limited speed control of motorboats and loss of territorial identity.

In order to assess the value proposition, ESs and BdV were introduced, and the STKs were asked to indicate the importance of restoration for ES provisioning, highlighting

that most respondents think restoration is important or very important for biodiversity [BdV] (96.4%), reduction of coastal erosion [RCE] (92.9%), carbon sequestration [CCR] (82.1%), reduction of flood risk [RCF] (75.0%), food provisioning [FP] (64.3%) and water quality purification [WP] (60.7%). Moreover, the STKs were presented with environmental, economic, social and cultural benefits associated with the restored saltmarshes occurring alongside the provisioning of ES and BdV improvements, indicating an overall agreement with the identified benefits. Overall, among the seven environmental benefits, the STKs primarily indicated a very high and high agreement, highlighting their knowledge of restoration impact such as naturalization of saltmarsh dynamics (89.3%), availability of habitat and improvement of biodiversity (92.9%), carbon capture and storage (82.1%), improved water quality purification (82.1%), provisioning of protection and nursery for juveniles (89.3%) and availability of new areas colonizable by native vegetation (89.3%).

The majority of the 20 economic benefits associated with the ESs and BdV received a large, varied distribution of responses. Focusing on the economic benefits only derived by biodiversity (considering the environmental benefit with highest importance), the survey revealed among the most important economic benefits ecotourism activities, birdwatching (both 82.1%), opportunities for developing educational activities (78.6%), corporate social responsibility activities related to NbSs (64.3%) and activities arising from circular economy (46.4%). The same dispersion pattern can also be observed for the six social benefits, as well as the three cultural benefits (see the Supplementary Material).

Finally, since the objectives of the restoration plan are correlated with the value proposition (Section 2.2), the participants were asked to indicate their agreement with the inclusion of nine different objectives in the BP in relation to the protection and restoration of saltmarshes (Figure 5). Consistent with the previous answers, on the perception of the problems and the influence of restoration to solve them, the last question shows an overall agreement from STKs with the majority of the objectives.

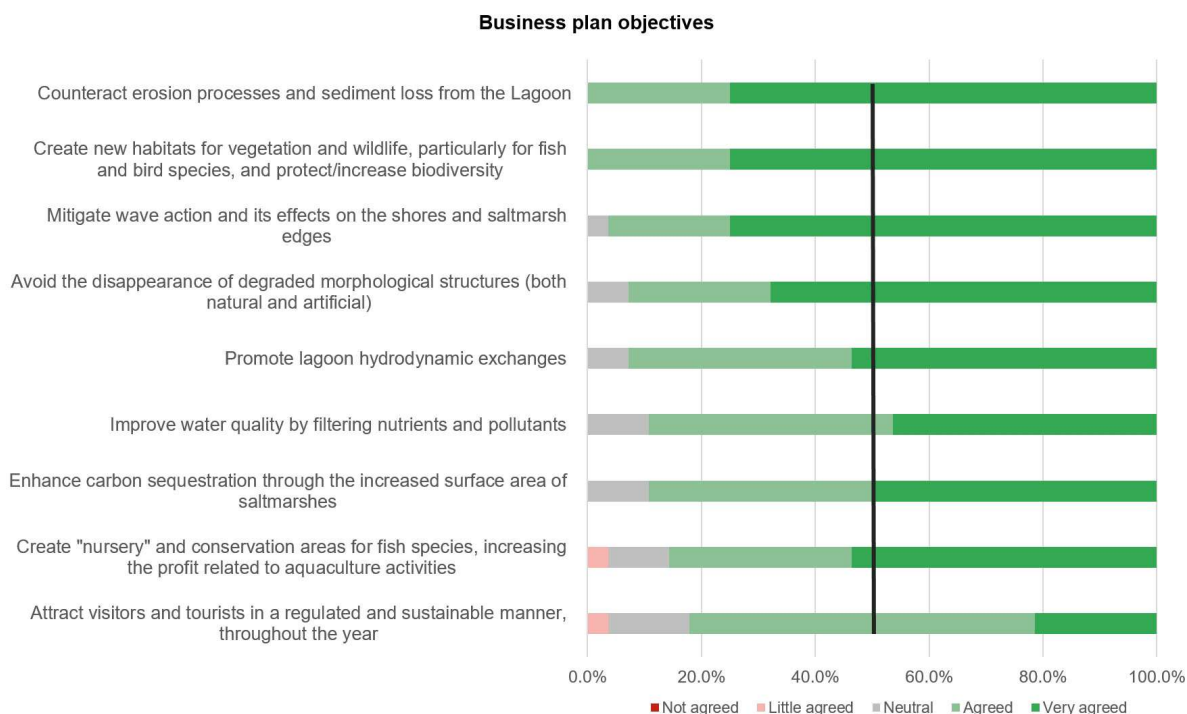


Figure 5. Level of agreement to include specific restoration objectives in the business plan. The legend illustrates the percentage of answers for the five potential options in the Likert scale, from “Not agreed” to “Very agreed” although none of the stakeholders had chosen the lowest level of agreement (depicted in red).

Concerning the value capture, to complement the information collected from the core team of STKs and broad STK group, a questionnaire was circulated among tourists and visitors. Of the 91 respondents, 84 identified as visitor/tourist and eight identified as resident. In total, 58% of the respondents identify as male, 35% as female, 1% as non-binary and 2% prefer not to disclose this information (Figure 6A,B). Overall, the respondents indicated 190 reasons to visit the saltmarshes (Figure 6C), principally visiting the saltmarshes to observe nature (28.9%) and to enjoy the beauty of the area (26.3%). Subsequently, each of the respondents was presented with a detailed description of three visitation scenarios including (i) enjoying the beauty of nature; (ii) a birdwatching trip; (iii) a recreational fishing trip. These scenarios were populated with information about the Venetian saltmarshes, the flora and fauna that might be observed and the benefits that could be enjoyed during a visit in said scenario. Then, the respondents were asked what they would be willing to pay for such a visit (Figure 6D), and most of the respondents indicated a willingness to pay up to EUR 25 for each of the scenarios, 49.5%, 45.1% and 18.7% for enjoying the beauty of nature, birdwatching and recreational fishing, respectively.

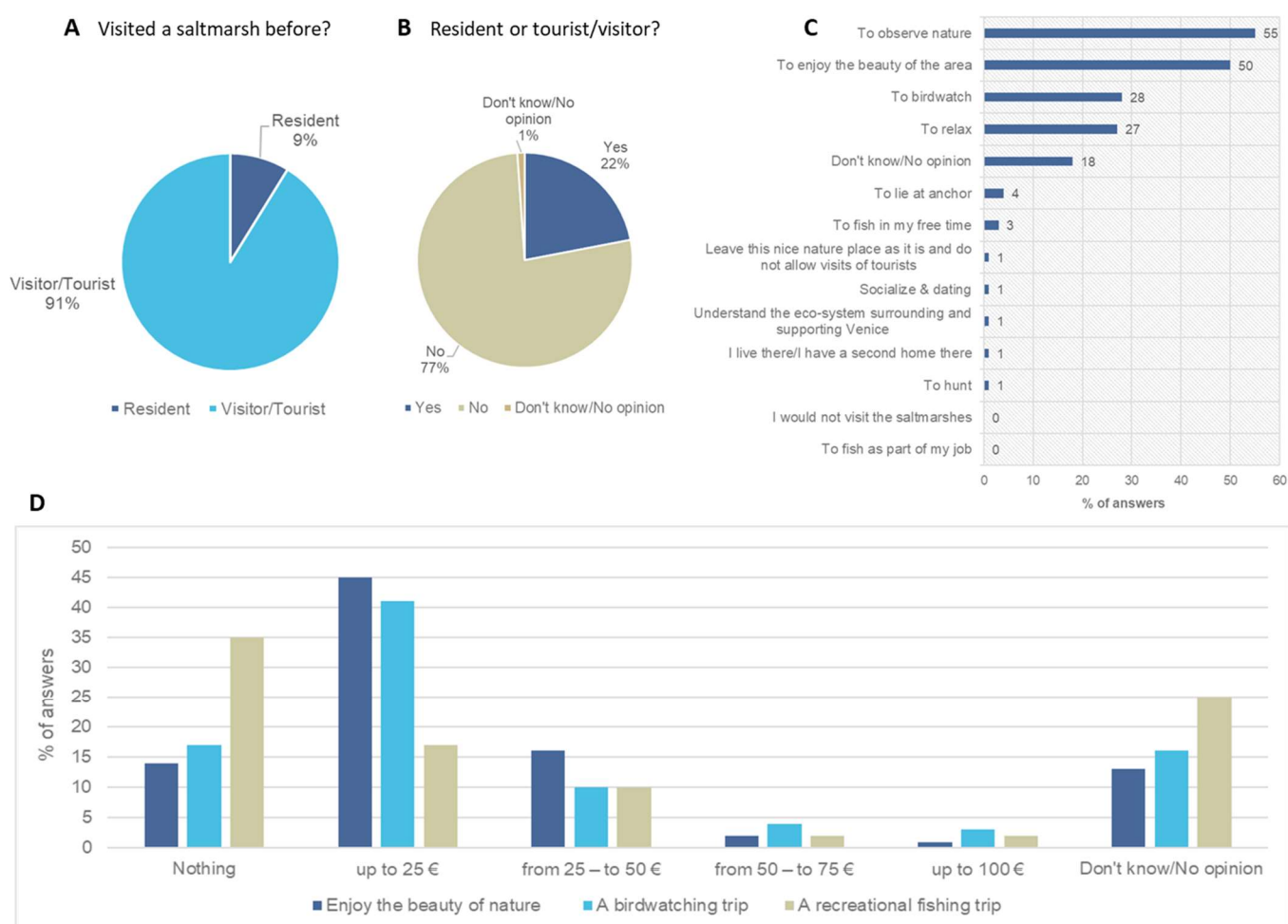


Figure 6. Displaying the results from the WTP analysis, including (A) whether respondents already visited saltmarshes in the Venice Lagoon, (B) the type of respondent, (C) the reasons for the visits to the saltmarshes and (D) the willingness to pay.

The results of the iterative process, including the collaboration with the core team of STKs, the broad STKs questionnaire and the WTP questionnaire to the tourists and visitors is synthesized in the NbS-ES Business Model Canvas in Figure 7.

VALUE PROPOSITION		
Problems to be addressed -Erosion -Damaged from flooding -Subsidence -Loss of sediments -Wave motion -Water pollution and solid waste -Loss of habitats and biodiversity	Environmental benefits -Natural (re)vegetation dynamics [RCF] -Habitat and biodiversity [RCE] -CO₂ capture and reduction [CCR] -Higher self-depuration capacity [WP] -Protection and nursery [FP] -New areas colonised by autochthonous vegetation species; habitats for feeding, roosting and breeding birds [BdV]	Economic benefits -Ecotourism including birdwatching [RCF, RCE, BdV] -Reduction of damage costs from flooding, coastal erosion [RCF, RCE] and sediment transport to landfill -Fish yield and recreational fishing [FP] -Eco-labeled goods [BdV] -CSR and philanthropy [RCF, RCE, BdV] -Restoration works [RCE, BdV] -Circular-economy activities, including artistic activities [BdV] -Educational activities [BdV]
Restoration problem-solving -Avoiding disappearance of degraded morphological structures -Contrasting erosion and sediments loss -Attenuating wave motion -Reducing water pollution and solid waste -Creating new habitats for wildlife	Social benefits -Safer life [RCF] -Space of quality, higher sense of attachment, higher human health [RCE] -Traditional fishing [FP] -Better water quality for social purposes [WP]	Cultural benefits -Traditional fishing techniques [FP] -Maintain cultural landmarks [RCF, RCE, BdV] -Human-nature experience [BdV] -Educational activities [BdV]
VALUE CREATION/DELIVERY		
Key partners Provv OO. PP. and Port Authority of Venice (initiators), supported, through procurement arrangement, by several implementers of scientific (CORILA, CMCC, UNIVE and UNIPD) and technical competence.	Regulation -UNESCO World heritage site -3 Legal systems: ordinary, special, and commissarial -3 Policy levels: EU, National, Regional -Authority for the Lagoon of Venice replacing Provv OO. PP.	Governance Multiple administrative levels: n.9 municipalities, n.2 provinces (Venice and Padua), Metropolitan City of Venice, Veneto Region, Italian State, n.1 Ministry and Local Administration Committee ("Comitatone")
Key Resources -Scientific and technical expertise (director of works, multidisciplinary team, RUP, CSP, CSE) -Technical means (equipment) -Tools (e.g., monitoring instruments)	Customers segments - No direct customers -Ecotourists -Students for educational activities -Entrepreneurs contributing to restoration activities	Stakeholders 38 stakeholders (25 private and 13 public) split into 7 categories: 10 Gov org., 4 Research org., 8 Companies, 4 NGOs, 7 Economic associations, and 4 Environmental associations
Key activities -Phase 1. Interventions to protect the edges of the saltmarshes (5 yrs) -Phase 2: Nourishment of the salt marshes with new sediments (1 yr)	Customer relations & channels -Wide range of means and social media -Series of attractions reward NbS-friendly actions and services -Annual advanced training course -Basic e-learning courses -Events, workshops, seminars, etc.	Beneficiaries -tourists and visitors -(social) entrepreneurs -companies -Artists and cultural organisations -Schools -Citizens and local communities -Policy makers
VALUE CAPTURE		
Costs -Costs for phase 1 (362 €/LM), phase 2 (19 €/m³ of sediment nourished) -Costs for naturalisation (2,900 €/ha of saltmarsh) -Saving costs for sediments (by water and land) transport to landfill (53€/ha of saltmarsh)	Revenue streams None directly to the initiators, but to other stakeholders from NbS interventions, ecotourism, eco-labelling, education.	Financing and funding Taxation, EU projects, Public grants (Superintendence of Archaeology, Fine Arts and Landscape for the Municipality of Venice and Lagoon, Coldiretti, Veneto Agricoltura), private investors and companies.
HORIZONTAL ASPECTS		
Barriers/Enablers -Limited stakeholder engagement, communication, collaboration, bureaucratic rigidity -Improved transparency	Impact Indicators -Impact on ES, biodiversity -Impact on human capital and produced capital	Risks/De-Risk -Emissions for sediment transport -Delay for changes in responsibilities -Additional funding availability

Figure 7. Overview of the NbS-ES Business Model Canvas, indicating the value proposition in light green, the value creation/delivery in green and the value capture in dark green.

3.3. From Business Modelling to Business Plan

Following the methodological framework explained in Section 2.2, this work allows for the development of a BP tailored to the peculiarities of NbSs in the Venice Lagoon. The BP delineates as a NbS upscaling plan the active maintenance of the already existing 1600 hectares of artificial saltmarshes and mudflats, by utilizing the results of the ongoing restoration (i.e., 138 ha of restored artificial marshes in the central lagoon) to model the upscaling. The BP describes the governance, management, business and financial strategies for upscaling saltmarshes restoration, considering a temporal horizon of five years, building on the results achieved through the NbS-ES business model canvas. The main findings are presented in the Sections 3.3.1–3.3.5.

3.3.1. Mission and NbS Restoration Objectives

Two public bodies, Provv. OO. PP and VPA, have jointly advanced, up to now, the recovery and maintenance of the lagoon of Venice habitats and morphology, according to their institutional mission. The Provv. OO. PP. is responsible for the safeguarding and management of the Venice Lagoon, through ordinary and extraordinary maintenance works contracted through its concessionaire CVN or private companies that secure contracts relative to specific projects; the VPA is accountable for planning, coordinating, promoting and controlling port operations, by dredging the lagoon canals to guarantee the safety of entering ships. Soon, Provv. OO. PP. will be replaced by the Authority for the Lagoon of Venice, whose stated mission, addressing mainly public services, drives the BP for upscaling restoration and its objectives. The nine main objectives of the upscaling restoration plan (Figure 6), endorsed by the stakeholders, include (i) avoiding the disappearance of the degraded natural and artificial morphological structures, (ii) contrasting the erosion process and the negative trend of loss of sediments in the lagoon, (iii) attenuating the wave motion and reducing its effects on the shores, (iv) favoring hydrodynamic exchanges within the lagoon, (v) filtering nutrients and pollutants resulting in an improvement of water quality, (vi) creating new habitats for wildlife, in particular for birds, thus improving and safeguarding the biodiversity, (vii) creating nursery, protection and provision areas for fish and increasing yields of fisheries, (viii) attracting, in a regulated and sustainable manner, visitors and tourists all year round and finally (ix) capturing carbon (CO₂) and sequestering it in the soil.

3.3.2. NbSs Multifunctional Offering

The upscaled restoration plan delineates different interrelated problems (Section 3.1, Figure 4) allowing the improvement of five ESs as well as BdV, that will produce a large variety of environmental, economic, social and cultural benefits to multiple stakeholders and beneficiaries, assessed through the STK questionnaire (Section 3.2). These benefits are listed in the NbS-ES Business Model Canvas (Figure 7) and concurrently appease multiple stakeholders alongside the two initiators of the restoration upscaling. Through the kaleidoscopic composition of the NbS offering, economic gains have been analyzed more closely, since they may generate potential profits for several stakeholders positively impacted by saltmarshes restoration that can contribute to financially sustaining NbS restoration investments as a form of compensation for their own economic gains.

- Restoration works [RCE, BdV]: Economic associations and companies being paid for delivering goods and services in NbS restoration and environmental monitoring. Environmental associations and NGOs being paid for services related to protecting the lagoon. Social cooperatives being paid for delivering goods and services that could also employ vulnerable people, contributing to social inclusion. Research institutions and education being paid to support the initiators in the restoration interventions;
- Ecotourism [RFC, RCE, BdV]; birdwatching [BdV]; recreational fishing [BdV, FP]; traditional fishing [FP]: Companies, economic and environmental associations, players in the eco-touristic value chain benefiting from the increase of visitors and tourists who will pay for different services (e.g., recreational fishing, birdwatching, etc.);

- Increase of fish yield [FP]: Fishermen and valley owners/managers being paid for a higher quantity of fish due to the improved water quality and habitats;
- Hunting [FP, BdV]: Companies and associations providing hunting services benefiting from an improved lagoon able to attract more birds, some of which are huntable, leading to a higher number of hunters willing to pay for this service;
- Eco-labeled goods [BdV]: Companies and economic associations being paid for producing goods in an eco-sustainable manner and also with the use of native vegetation species of the lagoon for the production of typically Venetian goods, saltmarsh honey, artisanal liqueur, seaweed fabrics, natural cosmetics, herbal teas, etc.;
- Educational activities [BdV]: Research institutions and environmental associations being paid for providing educational activities and training about NbSs restoration;
- Corporate social responsibility [RCF, RCE, BdV, CCR] and philanthropic activities [RCF, RCE, BdV, CCR]: Companies from the Venice area, and elsewhere, may invest to create shared value in the territory receiving back a positive reputational impact, and can benefit from offsetting, i.e., from carbon emissions, water pollution, etc. Similarly, philanthropists may want to have a positive impact in the Venice area;
- Circular economy activities [BdV] and artistic activities [BdV]: The removal of waste from the saltmarshes could contribute to the creation of a circular economy model by valorizing the materials and turning them into products to be reused in artistic products, testing the opportunity to reuse them for the maintenance of the saltmarshes, or creating Venetian souvenirs that help in raising awareness on waste reduction in the lagoon (e.g., starting a collaboration with a waste management operator);
- Cost reduction for solid waste management [WP]: The restoration works in the saltmarshes, including waste removal, offer a strategic opportunity to reduce costs. Typically, the removal of waste from these areas involves significant expenses. Aside from some occasional voluntary clean-up efforts organized by local associations, the costs of waste removal would need to be fully borne by the competent authorities. By integrating waste removal into large-scale restoration activities, it is possible to avoid duplicating efforts and expenses, such as those related to transportation. Additionally, the restored and cleaned environment brings broader benefits, benefiting both the environment and the community;
- Reduction of damage costs from flooding, coastal erosion [RCF, RCE]: Governments responsible for environmental risk management can benefit from cost saving due to the mitigation effect that a saltmarsh can have on flooding and coastal erosion;
- Cost reduction for water purification [WP]: Governments and agencies responsible for water resource management can benefit from cost saving due to an improved self-depuration capacity of the lagoon system thanks to saltmarsh restoration.

The market analysis pinpoints four main and strongly connected market sectors: (i) ecotourism; (ii) economic activities for organizations contributing to implementing NbS interventions; (iii) economic activities linked to eco-labelled products; (iv) educational activities on nature restoration. In particular, according to the International Ecotourism Society, ecotourism can be considered a subcategory of sustainable tourism restricted to the natural environment, and is driven by an unspecified need to experience a natural habitat that is largely unaffected and untouched [48]. It addresses several market niches (agro, rural, enogastronomy, wildlife, heritage, cycling, kayaking, etc.), and can deliver products or services in a synergistic manner to other market sectors, while protecting nature and bringing prosperity to local communities. Ecotourists also spend more than the average tourists [49]; many ecotourists place more value on the learning experience and environmental education, and are more satisfied if they have a knowledgeable guide [50]. Similar to the ecotourist, the birdwatcher is likely a highly educated and high-income tourist, and spends more than the average tourist; they generally prefer local guides, and because of this, they are more likely to converse with and integrate into the local community [51].

The NbSs multifunctional offering, however, must take into account the other type of benefits assessed with stakeholders, including the following:

- Environmental benefits: Natural (re)vegetation dynamics [RCF], habitat and enhanced biodiversity [RCE], carbon capture, CO₂ reduction in the air [CCR], higher self-depuration capacity [WP], offering protection and nursery for fish communities [FP], new areas colonized by autochthonous vegetation species and habitats for feeding, roosting and breeding birds [BdV];
- Social benefits: Safer life [RCF], space of quality, higher sense of attachment [RCE], traditional fishing [FP] and better water quality for social purposes [WP];
- Cultural benefits: Traditional fishing techniques [FP], maintain cultural landmarks [RCF, RCE, BdV], human–nature experience [BdV] and educational activities [BdV].

The majority of these benefits are difficult to monetize, requiring complex evaluation methods and data availability, but their potential positive result has to be judged by investors, as these elements contribute in creating shared value, allowing activities that are critical for the local community.

3.3.3. Governance, Management, Business and Finance Strategies

The BP describes four strategies, i.e., governance, management, business and finance that are strongly interconnected. The governance strategy compounds the regulatory framework and governance structure for the restoration in the Venice Lagoon described in Section 2.3. The new Authority for the Lagoon of Venice will be established soon, constituting a centralized entity for all the decisions related to Venice and its lagoon, favoring and streamlining the planning and management processes of the interventions at the lagoon scale. The authority manages public lands and waters within the lagoon, issues relevant permits and coordinates with other agencies on infrastructure and environmental projects. The regulatory laws frame the objectives, responsibilities, instruments, measures and financial resources for carrying out future restoration activities.

The management strategy defines the organizational model through which “key partners” and other implementers achieve the work, including the necessary monetary and non-monetary resources. The initiators of the restoration works, i.e., the Prov. OO. PP. and VPA, will arrange procurements with several implementers, taking decisions leveraging the knowledge of the research institutions for activities including planning, data analysis and monitoring. The core team of STKs, together with other relevant stakeholders, including those from the CORE-PLAT, are willing to participate in the planning process for upscaling restoration, by identifying, among others, NbS interventions to be implemented and the most suitable locations in the lagoon.

The NbS interventions consist of the maintenance of the 1600 ha of saltmarshes in the Venice Lagoon and will be conducted in two phases, as previously described (see Section 2.3), spanning five years, including partially concurrent planning and implementing and monitoring activities. The two phases are the precursors for the naturalization of the saltmarshes allowing for the provisioning of ESs.

The “key resources” for the restoration activities include (i) a multidisciplinary scientific and technical team with in-depth knowledge and experience in the lagoon; a director of the works to coordinate the implementation of the interventions supported by a project manager (RUP), a Safety Planning Coordinator (CSP) and a Safety Coordinator of the Execution phase (CSE); (ii) technical means and tools, e.g., equipment required by the contracting companies, multiparametric probes for evaluating water quality, soil sampling cores, sediment trap, (kaoline) markers for sediment compaction, biological monitoring means, including drones to confirm the naturalization process continues as expected. The monitoring verifies that the ecosystem is moving in the desired direction. Moreover, a detailed map of the status of the saltmarshes in the lagoon is crucial for assessing the restoration costs and setting out the works on site.

The co-development of the value proposition with stakeholders helps to discern the financial rewards, and therefore to assess the NbSs multifunctional offering, that the

business strategy has in view to land in the market, spatially and temporally generating revenues from economic activities executed by different stakeholders, including:

- Companies and economic associations engaged in the ecotourism sector;
- Companies and economic associations (farming, fishing, hunting, etc.) benefitting from economic activities closely related to biodiversity and/or selling eco-labeled products;
- Research organizations, companies, NGOs and environmental associations engaged in educational activities;
- Companies, NGOs, economic and environmental associations engaged as implementers and subcontractors in restoration works.

Except for the implementation of the restoration works, assigned by the initiators through procurement arrangements to companies and other stakeholders, none of the described economic activities are performed by the initiators. Therefore, there are no direct clients and no revenues for them that the business strategy can directly take into account. Customers mainly pertain to the other categories of stakeholders, generating economic transactions that can result in indirect value capture streams, e.g., from taxations. Additionally, the business strategy shall consider potential environmental, social and cultural benefits even if these cannot immediately generate direct revenues, but instead play a crucial role to sustain human activities in the area, even when their negative externalities are not measured and threaten the carrying capacity of the Venice Lagoon ecosystems.

The category of “customer relationship activities” do not directly refer to the initiators, rather mainly relate to stakeholders for goods and services offered to customers and obtained by the improvements of ESs/BdV. The initiators can promote the generation of economic transactions between stakeholders to strengthen the endorsement of the upscaling restoration plan by the whole business community and civil society. This can have an impact on customer relationship activities, e.g., the initiators can stimulate the activation of a series of attractions that reward climate-friendly actions and services where tourists and residents may redeem rewards by showing proof of green actions; for instance, by participating in clean-up efforts in the lagoon.

In terms of “distribution channels”, NbSs restoration interventions are not intended to transfer commercial products or services to the market by the initiators, and therefore distribution channels should be reinterpreted in terms of communication strategies and channels necessary to engage a broad set of stakeholders and beneficiaries, including the general public. Several stakeholders, such as research institutes and universities, may organize advanced courses on key aspects of environmental protection and restoration, targeting master or PhD students and practitioners, as well as a basic training course configured as “knowledge pills” on primary concepts of environmental protection and restoration; ad hoc events and debates are key to raising awareness among the general public.

The finance strategy looks at attracting funding to close the financial gap for upscaling restoration interventions, including research and testing of more sustainable NbS techniques, otherwise too expensive, and executing a widespread and continuous recovery plan of the lagoon morphology and habitats, that would prevent the need to spend very large sums to repair the significant damages that occur if the ordinary maintenance is not carried out. Moreover, funding will be needed to increase biodiversity through dedicated projects seeking the recovery of specific endangered or declining target species. The finance strategy will pursue blended finance, considering public and private investments. Public investors could comprise those with a high interest in preserving the lagoon landscape, such as the Superintendence of Archaeology, Fine Arts and Landscape for the Municipality of Venice and Lagoon. Similarly, agencies whose core business is to improve the competitiveness of businesses and production chains in the agricultural, agri-food, forestry and fishing sectors could see benefits from an upscaling plan for restoration in the Venice Lagoon as a means for improving the productivity of the area. Another source of public funding may stem from EU projects, already used for ongoing restoration interventions. Private investors are

not yet identified. Investors could curry favor with headquarters, storefronts in the city or might be private companies steeped in tourism that could be encouraged to invest if they foresee economic returns in terms of an increased number of eco-tourists. Private investors can also include companies that try to offset the impact of their activities and projects.

3.3.4. Economics and Financial Projections

The economics of the BP, projected in a temporal range of 5 years, include costs and revenues. The cost structure analyzed three main components, i.e., life cycle costs, opportunity costs and costs reduction. Life cycle costs include all costs to be afforded for all three stages of saltmarshes restoration, i.e., planning, implementing and monitoring. Their estimation was based on the analysis of the metric calculations of the saltmarshes' executive projects included in REST-COAST for a total of 138.43 ha (Appendix D). The costs, validated by Provv. OO. PP. and summarized in Table 1, are described for each restoration stage:

- Planning: Surveys, assessments and investigations to support the project design (e.g., expeditious monitoring and survey on of the morphological/ecological state of the saltmarshes, chemical analysis costs and technical checks), supervision of the works, coordination for safety during the design, execution and testing phase of the works;
- Implementation: Interventions to protect the edges (first phase) and nourishment of the saltmarshes (second phase) (This estimation is based on the regional price list for 2023. To these values, 20% must be added to consider the increased cost of materials registered in 2024 (see <https://prezziario.regione.veneto.it/>, accessed on 18 June 2024));
- Monitoring: Multiparametric probes, top-bathymetric surveys, monitoring of terrestrial vegetation and sedimentation, monitoring BdV (i.e., birds and seagrasses).

Table 1. Cost structure of the NbS restoration upscaling plan.

Restoration Activities	Total Duration	Planning	Implementation	Monitoring	Total Costs
First Phase—Intervention to protect the edges	5 years	2 years	1 year	At least 1 year	EUR 362/LM
Second Phase—Nourishment of the saltmarshes	5 years	2 years	1 year	At least 1 year	EUR 19/m ³ of sediment nourished
Monitoring/Control Phase ¹	Up to 10 years		Between 2 months and a year	At least 1 year	EUR 2900/ha of saltmarsh

¹ It also follows the naturalization process that reaches the optimum condition for biodiversity after 3 to 10 years.

No opportunity costs can be assessed since no other alternatives to saltmarshes restoration and creation are contemplated/planned in the lagoon of Venice. Concerning the potential cost reductions, four main considerations can be made: firstly, reuse of good quality sediments dredged from the lagoon channels for saltmarsh nourishment, besides being a form of circular economy, may reduce the costs for the VPA compared to its transfer to a landfill (once moved, the sediments are considered hazardous waste), leading to a significant environmental impact due to the emissions linked to the sediments' transport by water and land, thus a reduced carbon footprint. Since in the coming years VPA plans to extract circa 3 million m³ of sediments, this represents an important opportunity for the restoration upscaling plan. Secondly, reduction of damage costs from erosion and flooding are difficult to measure since there is a lack of precise information regarding the investments already in place to fight erosion, and the non-proximity of the saltmarshes to the old city of Venice with assets at risk of flooding. Thirdly, a reduction of costs for water purification is difficult to assess since there is no association between saltmarsh restoration and reusing water for commercial use (e.g., drinking, irrigation). Finally, reducing costs for solid waste management is difficult to quantify, as no regular service for cleaning the saltmarshes of the Venice Lagoon has been implemented yet. However, based on data collected during voluntary clean-up initiatives in March 2023 and April 2024 (Legambiente Venezia,

pers. comm.), we can estimate that the waste density in the saltmarshes is approximately 0.22 tons per hectare. Waste removal from these areas implies significant costs, including labor, mechanical equipment, suitable boats for transportation and disposal in legal landfills, with the latter costing EUR 240 per ton (April 2024). All these expenses would need to be fully covered by the competent authorities. Integrating waste removal into large-scale restoration activities helps avoid duplicating efforts and related costs, such as transportation. By combining restoration with waste removal, resources can be optimized, leading to a reduction in overall costs compared to addressing these tasks separately.

Concerning revenues, these can be generated through direct and indirect value capture streams. In the NbS-ES BP, direct value capture streams are linked to ES and BdV improvements that can be monetized and/or translated to economic activities that are based on said improvements and stimulate economic transactions by trading goods and/or services. However, at present, the initiators do not conduct economic activities for which these economic transactions are generated. On the contrary, other stakeholders are involved in such economic transactions, delivering goods and services as described in the NbSs offering and business strategy. As a consequence, revenues cannot be assessed in a conventional manner and they do not directly contribute to the compensation for the restoration costs borne by the initiators. On the other hand, the economic transactions will generate indirect value capture streams from taxations (e.g., value-added tax), and positively contribute to a broad range of economic activities and sectors impacted by restoration, including the green economy and bioeconomy, with positive fallout in terms of employment, GDP, investments. In particular, leveraging the well-consolidated touristic sector that characterizes the city of Venice and its lagoon, and the challenge to sponge it and find a better balance between the growing demand and the need for sustainability, the business strategy can select ecotourism, considering its various interconnections with the other sectors identified in the NbS multifunctional offering.

Financial information usually includes the estimation of the financial gap assessed as a difference between all costs (including costs reduction) and revenues. Since neither the overall costs are available nor are these directly counterbalanced by revenues, the financial gap cannot be calculated. Moreover, the absence of specific revenues directly associated with the initiators of the upscaling restoration activities, and the lack of information about the temporal distribution for funding, does not allow for the calculation of cash flow.

An overview of the business model framework is provided in Figure 8. It portrays four types of arrangements and potential transactions [11]: (i) granting, provided by capital suppliers to the initiators of the upscaling NbSs restoration interventions with the expectation of receiving non-monetary rewards; (ii) financing, provided by financiers interested in making productive use of their capital by securing future monetary returns; (iii) procurement, provided as form of payments for services outsourced by the initiators to implementers or subcontractors; (iv) value capture, provided as forms of payment to goods and services paid by clients to stakeholders, but not directly to the initiators.

3.3.5. Risk and Contingency Plans

Governance and regulatory risks relate to, e.g., the DM 86/2023, i.e., the “Regulation containing provisions for the issuing of authorizations for the movement, in sea areas located within the lagoon border of Venice, of the sediments resulting from the excavation of the seabed of the lagoon border”, which rules sediment reuse. Indeed, the sediments now have to be characterized not only in the place of dredging but also in the place where they will be released before the refilling phase can start. This will limit the general sediment availability for refilling the saltmarshes. The VPA will continue to dredge the channels to make them navigable and this could lead to the risk that the VPA will sustain additional expenses for the transport of the dredged sediments to the landfill, leading in this way to a further environmental impact due to the emissions linked to the sediments transport by water and by land. Another risk may arise with the appointment of the new Authority for the Lagoon of Venice that could lead to some changes in the definition of responsibilities,

causing delays in the full operation of lagoon management, as well as in the administration of works (e.g., definition of sites to be restored and timing).

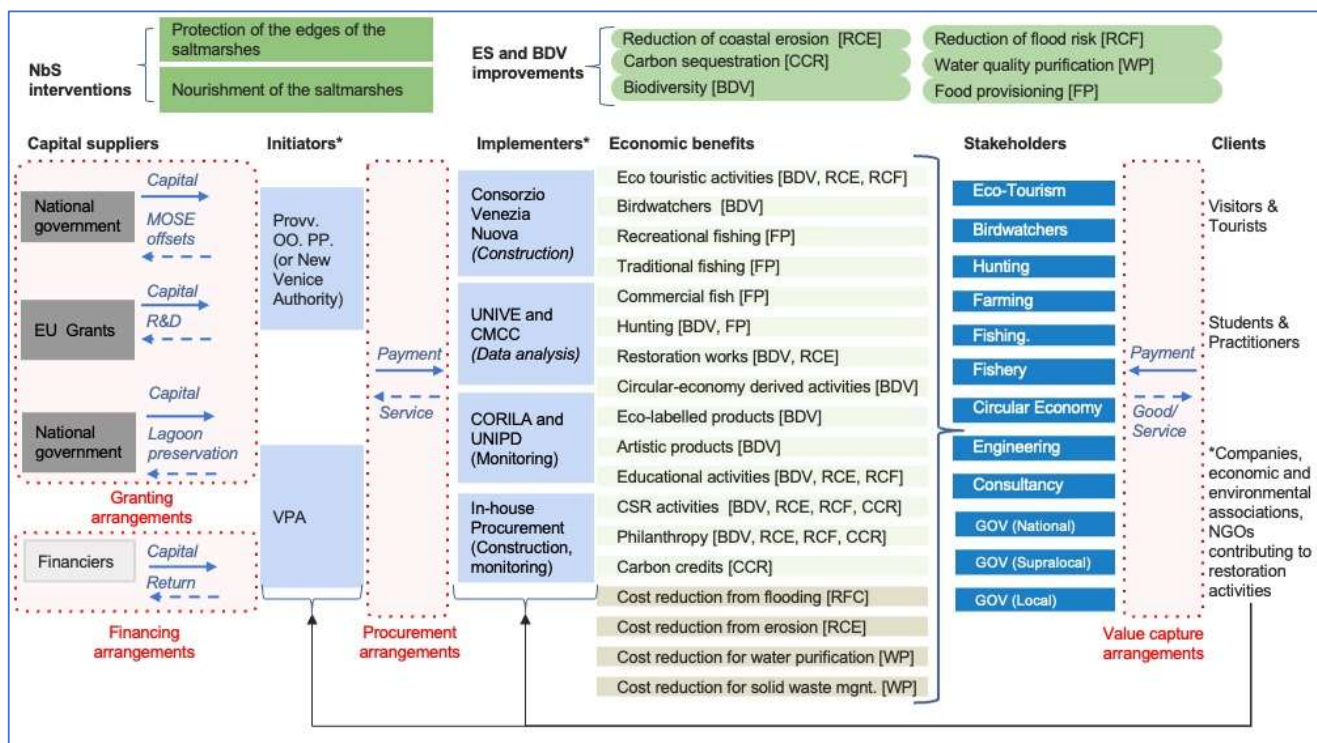


Figure 8. Advanced business model framework for the Venice Lagoon. The asterisk shows that companies, economic and environmental associations and NGOs may be paid by the implementers and/or the initiators of the restoration works through procurement arrangements.

Although of good chemical and ecotoxicological quality, a biophysical risk may be linked to the type of sediments used for the restoration; in particular, for the refilling of saltmarshes; sediments are generally mainly constituted of sand, and this could adversely affect the colonization of the saltmarsh by typical vegetation species. Particular attention should also be paid to evaluate the altimetry of the sediments nourished as this may create an opportunity for the invasive species (e.g., *Baccharis halimifolia*) to displace native species such as *Spartina*, *Salicornia*, *Limonium* spp. Additionally, some risks originating from climate change and extreme meteorological conditions may hamper the success of restoration or alter the natural revegetation dynamics.

Funding and market risks could stem from the challenge of significant upfront investment and securing funding, as well as the demand for NbSs restoration interventions which may be affected by changes in political priorities and economic conditions.

4. Discussion

Coastal NbSs can be more effective if designed for a river-to-sea scale, considering the adjacent landscape and the socio-economic context of stakeholders and beneficiaries [52]. Innovative NbS techniques, enhanced funding, socio-economic engagement and a transformative shift in governance can act as enablers for upscaling restoration, overcoming technical, financial, economic and governance barriers, thus contributing to filling the present implementation gap [17,19]. In this case study, a limitation for restoration upscaling proved to be the lack of a precise map and spatial plan of the current status of the saltmarshes in the Venice Lagoon (i.e., level of degradation, morphological and ecological status) which curtailed the proper estimation of restoration activities and related costs. Moreover, it has been challenging to apply the necessary economic evaluation methods for properly quantifying the various economic benefits, considering the temporal horizon

of the present research and the available data that are mostly not owned or shared by the initiators.

Despite the above hindrances, decision-makers and initiating actors of NbS projects are starting to demand user-friendly tools that offer guidance at least for the selection of suitable business models for NbSs [35]. The findings of the scientometric analysis have confirmed a gap in the available tools to better connect business planning with coastal restoration projects. The methodology for co-developing the BP, based on enabling stakeholders' participation at the key stages and capturing, through surveys and economic evaluation methods (e.g., WTP), their insights, perceptions and willingness to pay, shows evidence that it is crucial to frame the business plan within the local context, reducing the complexity of the process. The methodological approach faced the challenge of cultivating a large variety of relevant representative stakeholders in the Venice Lagoon, but the survey achieved a 73.7% of the sample, which is considered a high representation, substantiating the inputs collected in the research. This adheres to the need for creating legitimate participation processes, highlighted as key to the general acceptance of NbS initiatives [35]. In this line, the results of this research revealed a strong alignment between the stakeholders' perception about the importance of the problems impacting the Venice Lagoon and the perception about the potential influence of saltmarsh restoration to solve them. Similarly, their endorsement on all the objectives proposed in the business plan (Section 3.2). Moreover, the coaching component empowered the team in charge of business planning to further customize the business plan according to a variety of investor needs and financial criteria. In this sense, it has proven to be applicable beyond the specific case and type of restoration activities currently ongoing. The implementation of NbS restoration projects faces difficulties to properly consider NbS ES provisioning multi-functionality for developing suitable business and/or investment cases that can stimulate adequate fundings [21,53]. In this case, the NbS multifunctionality has revealed a large amount of potential economic gains but not directly for the initiators, often spread between different stakeholders potentially competing among them. Some examples of these circumstances have been identified for the restoration works, ecotourism, educational activities, etc. Additionally, the potential cost savings arising (flooding, erosion, waste management, etc.) are difficult to measure and benefit. Similar to findings from other authors in the field [35], this study encountered several types of environmental, social and cultural benefits presenting major difficulties to be quantified (e.g., space of quality, human health, higher sense of attachment and maintaining cultural landmarks). This requires carefully co-designed win-win strategies that may unlock synergies and cooperation between stakeholders that will enable them to capture all the value created in a holistic manner [21] as well as governance models and financial mechanisms enabling the consideration of revenues generated by other stakeholders as contributing to support the investments in the multi-party restoration plan.

Managing the interconnections between the four strategies of the BP is particularly challenging [35], and requires taking into account several aspects, as follows: (i) The presence of a clear governance strategy ready to be implemented. The "special" legal system sets different responsibilities of the different levels of administration (national and local) and requires their cooperation. After nearly 50 years since the passage of the first law, it remains necessary and urgent to define a more comprehensive planning and programming framework. This duly affects the management strategy as it may enable or impede the design and implementation of restoration, even from a business and financial innovation perspective. (ii) The border between business and finance is fluid, because innovative financial mechanisms, e.g., green bonds and environmental impact bonds, green loans and credit lines and green microfinance, not yet fully exploited in the Venice Lagoon, can trigger unexpected business opportunities as sources of financial creation [54] but also financial criteria from investors can shape the value proposition and the business strategy.

The WTP analysis confirmed, with a percentage of 49.5% of visitors and tourists willing to pay up to EUR 25, the key role that ecotourism and its market niche birdwatching, with

45.1%, can play for stimulating indirect value capture mechanisms (including taxation and private investments). This is aligned with the findings from the previous LIFE project VIMINE, which assessed the importance of saltmarshes for the people [55] who visit/live in or near the Venice Lagoon, and their preferences about the management of the landscape. Consequently, there is a potential to position ecotourism at the core of the business strategy for upscaling coast restoration.

This may transform the overexploitation of tourism in Venice into a NbS-driven tourism offer, more sustainable and decompressed, taking into consideration how to manage the social–ecological system in a way that the flow of multiple ESs is provided without eroding the ESs capacity [56]. This approach also raises the possibility of delivering value in a synergetic manner to multiple sectors under the umbrella of bioeconomy and green economy. Part of the revenues generated by ecotourism can be channeled directly back into conserving the ecosystem, and can be a vital tool to make sure these protected areas receive the funds they need [57]. However, it is crucial not to exceed carrying capacity, and utilize breaks and/or off-seasons, since overcrowding negatively impacts ESs and biodiversity that people pay to see [56,58,59].

Therefore, the results of this research demonstrate that it is possible to demystify the belief that business plans just pursue the commodification of nature, and instead steer us toward the emerging concept of a nature positive approach in which businesses, governments, public institutions and the general public take collective action at scale to reduce and remove the drivers and pressures fueling the degradation of nature, and work to actively improve the state of nature and the ESs it provides.

5. Conclusions

This study has pioneered the co-development of a framework bridging business modelling innovation tools with business planning in the NbSs context for restoration upscaling advocating multi-stakeholder engagement. The innovative process combines business management consulting skills with a holistic knowledge on ESs provisioning through NBSs restoration projects, from a multidisciplinary scientific perspective, as well as an executive approach. Additionally, this research produced an innovative business plan conceptualized for the public sector, able to connect public and private services, across multiple economic sectors. This link is considered of special significance since public bodies usually act as initiators in restoration projects, accessing mainly public funds (granting arrangements). Indeed, the business plan reveals how increasing costs for upscaling will call for a financial strategy that stretches beyond public funding, by spawning private investments through creative financing and value capture arrangements stimulated by economic advances in ecotourism, eco-labelled products, complemented by educational activities with financial rewards and compensated by appreciable amounts of cost savings. This process has empowered the Venice Lagoon core team while raising awareness about the multifunctional merits of NbSs among all stakeholders.

The application of the framework contributes to initiating an enabling environment at a scale that can attract investors and sustain the financing of landscapes in the near future. Future research steps should assess extending the adoption of methods for quantifying non-market values in monetary equivalent terms, identifying governance and financial mechanisms that can allow part of revenue generation to compensate the restoration costs afforded by the initiators, and putting the upscaling framework into practice in different geographic areas for outscaling.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/su16208835/s1>, Figure S1: Graphs from the results of the Stakeholder survey.

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Conflicts of Interest: Author Umberto Pernice was employed by the company Pernice Collaborative Innovation Management; Authors Francesca Coccon and Caterina Dabalà were employed by the company Consortium for Coordination of Research Activities Concerning the Venice Lagoon System (CORILA); Authors Fabienne Horneman and Silvia Torresan were employed by the company CMCC Foundation—Euro-Mediterranean Center on Climate Change; Author Laura Puertolas was employed by the company Albirem Sustainability.

Appendix A

The Scopus search was conducted on the 5 August 2024 using 15 queries (Table A1), combining relevant keywords such as “business model”, “business plan”, “business model canvas”, “finance”, “nature-based solution” and “restoration” in various combinations through Boolean operators, i.e., OR, AND.

Table A1. Queries used to support the scientometric analysis.

Query	Date of Search	Number of Publications
(“Business plan”) AND (Restoration)	5 August 2024	16
(“Business plan”) AND (NBS OR “Nature-based solution” OR “Nature based solution”)	5 August 2024	0
(“Business plan”) AND (Restoration) AND (NBS OR “Nature-based solution” OR “Nature based solution”)	5 August 2024	0
(“Business plan”) AND (Restoration OR NBS OR “Nature-based solution” OR “Nature based solution”)	5 August 2024	16
(“Business model”) AND (restoration)	5 August 2024	82
(“Business model”) AND (NBS OR “Nature-based solution” OR “Nature based solution”)	5 August 2024	28
(“business model”) AND (NbS OR “Nature-based solution” OR “Nature based solution”) AND (restoration)	5 August 2024	3
(“Business model”) AND (NBS OR “Nature-based solution” OR “Nature based solution” OR restoration)	5 August 2024	107
(“Business model canva”) AND (restoration)	5 August 2024	0
(“Business model canva”) AND (NBS OR “Nature-based solution” OR “Nature based solution”)	5 August 2024	0
(“Business model canva”) AND (NBS OR “Nature-based solution” OR “Nature based solution”) AND (restoration)	5 August 2024	0
(Finance) AND (restoration)	5 August 2024	540
(Finance) AND (NBS OR “Nature-based solution” OR “Nature based solution”)	5 August 2024	78

Table A1. Cont.

Query	Date of Search	Number of Publications
(Finance) AND (NBS OR “Nature-based solution” OR “Nature based solution”) AND (restoration)	5 August 2024	14
(Finance) AND (NBS OR “Nature-based solution” OR “Nature based solution” OR restoration)	5 August 2024	604

This resulted in the identification of 1236 publications, published between 1992 and 2024 (Figure A1) primarily written in English. It should be noted that queries combining “business plan” AND “nature-based solutions” resulted in zero publications, while those including the “finance” term show a higher number of publications, in particular in relation to “restoration”, while less information is available in combination with “nature-based solutions”. This reveals a lack of consideration about the role that business plans can play in NBS restoration, complementing the strong focus of literature on financial aspects for restoration. This is one of the aims that this research addresses.

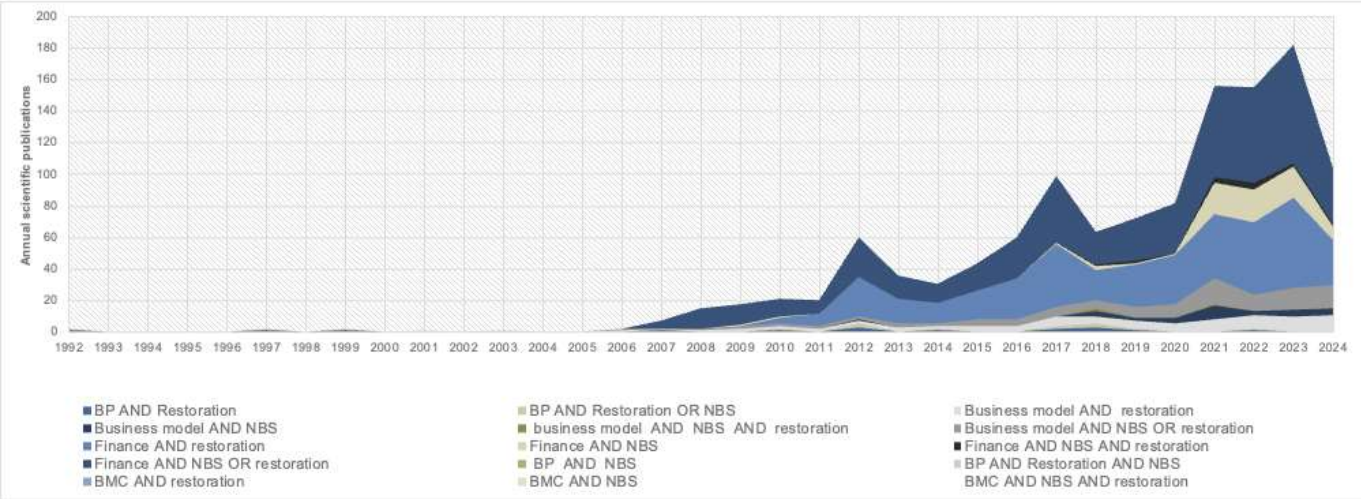


Figure A1. Scientific annual production of the different queries, highlighting an increasing trend of publications in the period between 1992 and 2024.

This bibliometric analysis also highlights that in relation to “business plan”, emerging terms include “stakeholders” and “decision-making”, showing the multifunctionality of NbSs for multiple stakeholders and the role that a business plan can play as a tool for decision-makers. These terms are repeated when it comes to “business model”, and complemented with terms such as “cost-effectiveness”, “cost-benefit” and “sustainable business development”. These terms can be attributed to the business model’s attribution of value creation, delivery and mechanisms, and associated evaluation methods able to capture socio-economic value frequently mentioned by other authors. Moreover, in relation to “nature-based solutions”, central terms included “ecosystems”, “biodiversity” and “climate change”. This is rather fitting with the definition of the IUCN that NBS should contribute to preserving biodiversity and managing or restoring ecosystems sustainably while delivering a range of ESs [60]. NbSs are a way to leverage ecosystem services, where NbSs are the physical solutions that utilize the ecosystem’s nature and natural capital to adapt to climate change and other stressors [61,62].

Appendix B. Broad STK Questionnaire: A Business Plan for the Protection and Restoration of the Saltmarshes of the Venice Lagoon, Only the English Version Is Reported Here for Readers' Convenience

Introduction

As part of the Horizon 2020 REST-COAST project, CORILA (Consortium for the Coordination of Research on the Venice Lagoon System), in collaboration with other project partners, is conducting a survey to understand the importance of the saltmarshes in the Venice Lagoon and to assess how to financially support the conservation and restoration of these environments. The aim of this questionnaire, developed within the European Horizon 2020 REST-COAST project, is to explore how to financially support the protection and morphological restoration of the typical environments of the Venice Lagoon, primarily mudflats and saltmarshes. Your contributions will help us understand how important the restoration activities of the lagoon saltmarshes are to you and what benefits may arise from them.

Privacy disclaimer for participation

We are committed to protecting your privacy. The information collected through this questionnaire will be used exclusively for research purposes and will be kept strictly confidential. Your responses will be anonymized and will not be linked to any personally identifiable information. The data will be processed in accordance with the General Data Protection Regulation (GDPR) [63] to ensure your privacy and data security. The survey takes less than 7 min to complete. We thank you in advance for your time and participation.

Section 1

1. Please indicate the type of organization you belong to:

- ☐ Government entity
- ☐ Non-Governmental Organization (NGO) of Environmental nature
- ☐ Other environmental association (Non-NGO)
- ☐ Non-Governmental Organisation (NGO) of Social nature
- ☐ Local community
- ☐ Economic association
- ☐ Company/Business operating in the Venice Lagoon
- ☐ Educational and research institution
- ☐ Other

2. Indicate the legal nature of the organization.

- ☐ Private
- ☐ Public
- ☐ Other

3. What activities do you carry out in the lagoon? (You can answer both in a professional capacity and as a regular citizen).

- ☐ Political or administrative functions
- ☐ Recreational activities in nature (rowing, birdwatching, etc.)
- ☐ Scientific research
- ☐ Navigation for freight transport
- ☐ Navigation for passenger transport
- ☐ Recreational boating
- ☐ Professional fishing
- ☐ Amateur/recreational fishing
- ☐ Hunting
- ☐ Other...

4. And which activities, in your opinion, are connected to the protection and restoration of saltmarshes?

- ☐ Political or administrative functions
- ☐ Recreational activities in nature (rowing, birdwatching, etc.)

- ☐ Scientific research
- ☐ Navigation for freight transport
- ☐ Navigation for passenger transport
- ☐ Recreational boating
- ☐ Professional fishing
- ☐ Amateur/recreational fishing
- ☐ Hunting
- ☐ Other...

Section 2: Perception of the problems affecting the Venice Lagoon.

5. In your opinion, which of the following problems affecting the Venice Lagoon are most relevant? For each problem, please indicate the degree of importance.

	Not Important	Little Importance	Neutral	Important	Very Important
Erosion	☐	☐	☐	☐	☐
Subsidence	☐	☐	☐	☐	☐
Damage caused by flooding	☐	☐	☐	☐	☐
Sediment loss	☐	☐	☐	☐	☐
Water pollution	☐	☐	☐	☐	☐
Habitat loss	☐	☐	☐	☐	☐
Biodiversity loss	☐	☐	☐	☐	☐
Sediment contamination	☐	☐	☐	☐	☐

6. Please add any other problems not listed, indicating their degree of importance.
7. Among the problems listed below, which could be positively influenced by the protection and restoration of saltmarshes? For each problem, indicate the degree of influence or contribution to solving the problem.

	Not Influential	Little Influential	Neutral	Influential	Very Influential
Erosion	☐	☐	☐	☐	☐
Subsidence	☐	☐	☐	☐	☐
Damage caused by flooding	☐	☐	☐	☐	☐
Sediment loss	☐	☐	☐	☐	☐
Water pollution	☐	☐	☐	☐	☐
Habitat loss	☐	☐	☐	☐	☐
Biodiversity loss	☐	☐	☐	☐	☐
Sediment contamination	☐	☐	☐	☐	☐

Section 3: Perception of the ability of saltmarsh restoration to contribute to solving the problems listed above.

8. How important do you consider the improvements that conservation and restoration activities for saltmarshes could bring in terms of providing ecosystem services and increasing biodiversity? (Ecosystem services are the benefits and services that nature provides to humans free of charge).

	Not Important	Little Importance	Neutral	Important	Very Important
Biodiversity	☐	☐	☐	☐	☐
Food supply (fish resources)	☐	☐	☐	☐	☐
Water purification	☐	☐	☐	☐	☐
Reduction of coastal erosion risk	☐	☐	☐	☐	☐
Carbon capture/sequestration and climate regulation	☐	☐	☐	☐	☐
Reduction of coastal flood risk	☐	☐	☐	☐	☐

9. Please add any other ecosystem services not listed, indicating their degree of importance.

Section 4: Restoration of saltmarshes and expected benefits.

10. With reference to the ecosystem service ‘reduction of coastal flood risk’, please indicate your level of agreement regarding the expected benefits, categorized into four groups: Environmental (Env.); Economic (Econ.); Social (Soc.); Cultural (Cult.).

	Not Agreed	Little Agreed	Neutral	Agreed	Very Agreed
Promote the renaturalization dynamics of saltmarshes (Env.)	o	o	o	o	o
Benefits in terms of reducing costs caused by flood damage (Econ.)	o	o	o	o	o
Opportunities for developing educational activities (Econ.)	o	o	o	o	o
Promote ecotourism activities (guided tours) (Econ.)	o	o	o	o	o
Support corporate social responsibility activities related to nature-based solutions (Econ.)	o	o	o	o	o
Support philanthropic activities (Econ.)	o	o	o	o	o
Provide benefits in terms of quality of life (Soc.)	o	o	o	o	o
Support the maintenance of a landscape and cultural identity (Cult.)	o	o	o	o	o

11. With reference to the ecosystem service ‘reduction of coastal erosion risk’, please indicate your level of agreement regarding the expected benefits, categorized into four groups: Environmental (Env.); Economic (Econ.); Social (Soc.); Cultural (Cult.).

	Not Agreed	Little Agreed	Neutral	Agreed	Very Agreed
Availability of habitats and improvement of biodiversity (Env.)	o	o	o	o	o
Reduction of costs caused by erosion damage (Econ.)	o	o	o	o	o
Opportunities for developing educational activities (Econ.)	o	o	o	o	o
Ecotourism activities (e.g., guided tours) (Econ.)	o	o	o	o	o
Corporate social responsibility activities related to nature-based solutions (Econ.)	o	o	o	o	o
Philanthropic activities (Econ.)	o	o	o	o	o
Increased sense of belonging or identity (Soc.)	o	o	o	o	o
Maintenance of the cultural value of the landscape (Cult.)	o	o	o	o	o

12. With reference to the ecosystem service ‘carbon sequestration and climate regulation’, please indicate your level of agreement regarding the expected benefits, categorized into four groups: Environmental (Env.); Economic (Econ.); Social (Soc.); Cultural (Cult.).

	Not Agreed	Little Agreed	Neutral	Agreed	Very Agreed
Carbon capture and sequestration in sediment (Env.)	o	o	o	o	o
Carbon credits (CO ₂) for commercialization (Econ.)	o	o	o	o	o

13. With reference to the ecosystem service ‘water purification’, please indicate your level of agreement regarding the expected benefits, categorized into four groups: Environmental (Env.); Economic (Econ.); Social (Soc.); Cultural (Cult.).

	Not Agreed	Little Agreed	Neutral	Agreed	Very Agreed
Increased water self-purification capacity (Env.)	o	o	o	o	o
Higher survival rate of commercial and non-commercial fish species (Econ.)	o	o	o	o	o
Improved water use in agriculture (Econ.)	o	o	o	o	o
Opportunities to benefit from an improved lagoon environment in terms of water quality for social reasons (Soc.)	o	o	o	o	o

14. With reference to the ecosystem service ‘food provisioning (fish resources)’, please indicate your level of agreement regarding the expected benefits, categorized into four groups: Environmental (Env.); Economic (Econ.); Social (Soc.); Cultural (Cult.).

	Not Agreed	Little Agreed	Neutral	Agreed	Very Agreed
Provision of protection and nursery for juveniles (Env.)	o	o	o	o	o
Increase in the availability of economically valuable fish resources (Econ.)	o	o	o	o	o
Practice of traditional fishing (Econ.)	o	o	o	o	o
Restoration of traditional fishing practice for local and island communities (Soc.)	o	o	o	o	o
Social inclusion through fishing-related activities (Soc.)	o	o	o	o	o
Preservation of traditional fishing techniques (Cult.)	o	o	o	o	o

15. With reference to biodiversity, please indicate your level of agreement regarding the expected benefits, categorized into four groups: Environmental (Env.); Economic (Econ.); Social (Soc.); Cultural (Cult.).

	Not Agreed	Little Agreed	Neutral	Agreed	Very Agreed
Availability of new areas for colonization by native vegetation (Env.)	o	o	o	o	o
New habitats for breeding and feeding birds (Env.)	o	o	o	o	o
Ecotourism activities (e.g., guided tours) (Econ.)	o	o	o	o	o
Birdwatching (Econ.)	o	o	o	o	o
Circular economy activities (e.g., reuse of waste in artistic objects, reduction of costs for waste recovery and treatment) (Econ.)	o	o	o	o	o
Opportunities for developing educational activities (Econ.)	o	o	o	o	o
Corporate social responsibility activities related to nature-based solutions (Econ.)	o	o	o	o	o
Increased sense of cultural attachment/identity (Soc.)	o	o	o	o	o
Improvement of human health (Soc.)	o	o	o	o	o

16. Please add any other benefits not listed above, indicating their degree of importance.

Section 5: Investigation of the Objectives for Saltmarsh Restoration in the Venice Lagoon.

17. How much do you agree with including the following objectives in a business plan aimed at funding conservation and restoration activities for saltmarshes in the Venice Lagoon? Please indicate your level of agreement.

	Not Agreed	Little Agreed	Neutral	Agreed	Very Agreed
Prevent the disappearance of degraded morphological structures (both natural and artificial)	☐	☐	☐	☐	☐
Counteract erosion processes and loss of sediment from the lagoon	☐	☐	☐	☐	☐
Mitigate wave action and its effects on shores and saltmarsh edges	☐	☐	☐	☐	☐
Promote lagoon hydrodynamic exchanges	☐	☐	☐	☐	☐
Improve water quality by filtering nutrients and pollutants	☐	☐	☐	☐	☐
Create new habitats for vegetation and wildlife, particularly for fish and bird species, and protect/increase biodiversity	☐	☐	☐	☐	☐
Create “nursery” and conservation areas for fish species, increasing profit related to aquaculture activities	☐	☐	☐	☐	☐
Attract visitors and tourists in a regulated and sustainable manner throughout the year	☐	☐	☐	☐	☐
Promote carbon sequestration through increased saltmarsh area	☐	☐	☐	☐	☐

Please add any other objectives not listed above, indicating their degree of importance.

Appendix C. Survey on the Importance of Saltmarshes in the Venice Lagoon

Introduction

Within the framework of the Horizon 2020 project REST-COAST, CORILA (Consorzio per il coordinamento delle ricerche inerenti al sistema lagunare di Venezia), in collaboration with other project partners, is carrying out a survey to understand the importance of saltmarshes in the lagoon of Venice and to explore how to financially support the upscaling of saltmarshes restoration

What Is Rest-Coast

The overall goal of REST-COAST (*Large-scale RESToration of COASTal ecosystems through rivers to sea connectivity*) is to address, with effective and innovative tools, the key challenges faced by coastal ecosystem restoration across Europe. The project will deliver improved techniques and practices for hands-on ecosystem restoration, supported by the co-design of innovative governance and financial arrangements for planning and implementing coastal restoration activities with the engagement of local stakeholders and communities

Why This Survey?

This survey will allow the importance and attractiveness of saltmarshes in the lagoon of Venice to be understood for visitors and tourists, and in particular, their willingness to pay for experiencing eco-touristic trips to these precious environments. The survey will take you less than 5 min to fill it in. We thank you in advance for your time and collaboration! Do you have questions or want to learn more about REST-COAST? Please do not hesitate to contact Caterina Dabalà (dabala@corila.it) and Francesca Coccon (coccon@corila.it).

Privacy Participation Disclaimer.

We are committed to protecting your privacy. The information collected in this questionnaire will be used solely for research purposes and will be kept strictly confidential. Your responses will be anonymized and will not be linked to any personally identifiable information. Your data will be processed in accordance with the General Data Protection Regulation (GDPR) (EU) 2016/679 and other relevant privacy law to ensure your privacy and data security.

What Are Saltmarshes?

The saltmarshes (in Italian *barene*), both natural and artificial, are unique environments that characterize the lagoon of Venice. They are low-lying areas that are periodically submerged by the tide, characterized by a unique vegetation specially adapted to survive in salty and waterlogged conditions. The saltmarshes hold significant conservation importance due to their high productivity and richness in biodiversity, in particular birds, that use these areas for nesting, feeding, and resting during migration periods.

View of the saltmarshes in front of the island of Burano, in the northern lagoon of Venice.

**(1) Have you already visited a saltmarsh in the Venice lagoon?**

- ☐ Yes
- ☐ No
- ☐ Don't know/no opinion

(2) Why have you visited (or would you visit) the saltmarshes and the environment surrounding them? multiple choice.

- ☐ To relax
- ☐ To fish in my free time
- ☐ To fish as part of my job
- ☐ To birdwatching
- ☐ To hunt
- ☐ To observe nature
- ☐ To lie at anchor
- ☐ To enjoy the beauty of the area
- ☐ I live there/I have a second home there
- ☐ Don't know/no opinion
- ☐ Other

Willingness to pay for a trip to the saltmarshes to enjoy the beauty of nature, including birdwatching and recreational fishing.

The Venice Lagoon, besides hosting the historical city of Venice, is characterized by a mosaic of coastal wetland habitats, primarily saltmarshes, which host a particular rich biodiversity in terms of flora and fauna. Visiting these environments, whether by land or water, allows you to deeply connect with the surrounding nature, appreciating the scents and colors of the typical lagoon vegetation, which between July and August turns violet thanks to the blooming of *Limonium*. You will be able to admire the numerous species of birds that use these areas for nesting, feeding and resting during migration periods, enjoy a recreational fishing experience or an aperitif accompanied by the sounds of the lagoon and gently rocked by the typical lagoon boats. On the way to the saltmarshes, you will have the chance to visit some of the wonderful and characteristic islands, where you can disembark and enjoy the local products and flavors in one of the many charming traditional venues. Stunning emotions and breathtaking photos are guaranteed ingredients in this visit to the Venice saltmarshes.

(3) How much would you be willing to pay for **a trip to the saltmarshes to enjoy the beauty of nature** and the above-mentioned activities.

- ☐ Nothing
- ☐ Up to EUR 25
- ☐ From EUR 25–50
- ☐ From EUR 50–75
- ☐ Up to EUR 100
- ☐ Don't know/no opinion

Willingness to pay for a trip to the saltmarshes to birdwatching.

The lagoon of Venice is the largest Important Bird Area (IBA) on a national scale, counting the highest number of species of community importance to be preserved. Every year, hundreds of thousands of birds choose the lagoon of Venice for wintering, while a total of 140 species breed in the area, representing around 55% of the known species for Italy. Many of these species are threatened, according to the Red List of IUCN, because of the restricted areal distribution linked to wetlands, or because of their small populations. The visit will allow you to admire and take some pictures of the numerous species of birds that use these areas for nesting, feeding and resting during migration periods (“stop over sites”).

(4) How much would you be willing to pay for **birdwatching trip** as that above-described?

- ☐ Nothing
- ☐ Up to EUR 25
- ☐ From EUR 25–50
- ☐ From EUR 50–75
- ☐ Up to EUR 100
- ☐ Don't know/no opinion

Willingness to pay for a trip to the saltmarshes to recreational fishing

The Venice Lagoon is characterized by a very large number of fish species of which marine stragglers are the most abundant category (55 species), followed by marine migrants (16 species) and lagoon residents (15 species). You will have the opportunity to experience fishing activities in accordance with current legislation, get to know different local fish species and practice artisanal techniques. This will allow you to enjoy and connect with the surrounding nature, while also appreciating ways to contribute to the preservation of natural and local resources.

(5) How much would you be willing to pay for **recreational fishing trip** as that above described?

- ☐ Nothing
- ☐ Up to EUR 25
- ☐ From EUR 25–50
- ☐ From EUR 50–75

- ☐ Up to EUR 100
- ☐ Don't know/no opinion

Thank you for your time in taking this survey. If you have any comment, you can share it with us here.

Getting to know venetian tourists/visitors.

We aim to collect some general and anonymous information about your profile to better understand the main touristic trends in the Venice Lagoon.

Are you a resident or a visitor/tourist?

- ☐ Resident
- ☐ Visitor/Tourist

What Country are you coming from?

Gender: How do you identify?

- ☐ Man
- ☐ Woman
- ☐ Non-binary
- ☐ Prefer not to say

What age group do you belong to?

- ☐ Under 18
- ☐ 18–29
- ☐ 30–39
- ☐ 40–49
- ☐ 50–59
- ☐ Over 60

What is your occupation?

- ☐ Student/in training
- ☐ Employed
- ☐ Freelance
- ☐ Unemployed
- ☐ Retired
- ☐ Other

What is your level of education?

- ☐ Elementary school
- ☐ Junior high school
- ☐ High school
- ☐ University: Bachelor's degree
- ☐ UniversityL Master's degree
- ☐ Doctoral degree
- ☐ Other

What is your annual net income?

- ☐ Information obtained with this question is needed for statistical purposes, we would appreciate very much your answer. Below EUR 15,000 per year.

- EUR 15,000–30,000 per year
- EUR 30,000–55,000 per year
- EUR 55,000–75,000 per year
- More than EUR 75,000 per year
- Prefer not to say

Appendix D. Restoration Works

Table A2. Current restoration works in the Venice Lagoon as part of the REST-COAST project.

Saltmarsh	Surface (ha)	Sediment Volume Provisioning (m ³)	Responsible	Financing Resource	First Phase	Second Phase
Cornio 4	9.2	92,300	Prov. OO. PP.	MIT		
Gorna	7.5	52,600	Prov. OO. PP.	MIT		
Casonetto Zappa	6.5	59,000	Prov. OO. PP.	MIT		
Casone Zappa A	25.37	N/A	Prov. OO. PP.	MIT		
Lago della Pietra	5.78	37,000	Prov. OO. PP.	MIT		
Raina	5.37	N/A	CVN	Piano Europa	April 2023–June/2024	Not defined
Cornio 1	9.34	N/A	Prov. OO. PP.	MIT		
Cornio 2	21.92	N/A	Prov. OO. PP.	MIT		
Casone Zappa B	28.18	N/A	Prov. OO. PP.	MIT		
Cornio 3	12.39	30,000	Prov. OO. PP.	MIT		
Piovego	6.98	N/A	CVN	Piano Europa		
	138.43	270,900				

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