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Participatory process to prioritize actions for a sustainable management in a biosphere reserve

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ABSTRACT

The aim of the study was to analyze a participation process for the implementation of a sustainable land management plan in the Urdaibai biosphere reserve in northern Spain. We have analyzed the forecasted changes that would result from the implementation of the participatory process, including a quantitative evaluation of actions needed to achieve the desired outcome. We integrated participatory methods with quantitative analysis, which has allowed us to successfully identify and prioritize the proposed actions. The participatory process has lead to social learning, relationship building and an enhancement of participants' understanding of other perspectives. Moreover, quantitative analysis has allowed us to identify actions that would have more beneficial effects for the different properties held in the territory, so that we can prioritize needed actions depending on the properties that we want to improve. The participatory process highlighted the importance of taking measures for the more sustainable development of local communities in the biosphere reserve. We believe that this methodology could be readily applied in other biosphere reserves.

1. Introduction

The quest for sustainable communities might be fostered by a "place-based" governing approach that engages civil society and other actors in local decision-making processes (Edge and McAllister, 2009). To strengthen decision making, managers of natural resources have increasingly relied on new participatory processes that incorporate different criteria and use different methods and approaches (Gunton et al., 2006; McGee, 2006; Xu et al., 2006). These new participatory processes can stimulate social learning by encouraging participants to engage with and discuss options for coping with uncertainty through collaborative action (Johnson et al., 2012; Wilner et al., 2012). The potential for cooperation among actors from the science, policy, and management sectors in support of natural resource governance is widely known. However, there is little agreement on how the production and use of knowledge is shaped by social interactions. New concepts and methods in support of natural resource governance and the testing of conditions under which effective governance can be achieved are therefore badly needed (Crona and Parker, 2012). Although

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the evaluation of natural resources management initiatives is a challenge for managers, these evaluations are critical for the identification of the possible outcomes caused by management decisions (Bellamy et al., 2001).

The inclusion of stakeholders in the management process of protected areas has experienced rapid advancement over the last two decades (Apostolopoulou et al., 2012). For biosphere reserves (BR), participation is inherent to the concept, and there are successful examples of collaboration between stakeholders to address social and environmental issues (Halliday and Glaser, 2011; Jungmeier et al., 2011; Bavinck and Vivekanandan, 2011), even if it is not always applied (Stoll-Kleemann et al., 2010). Participatory conservation guides the concept of UNESCO Biosphere Reserves (Stoll-Kleemann et al., 2010). These reserves represent the interdependence of society and nature in a socio-ecological system, understood as a complex network of interacting components (Parrot et al., 2012).

In this study, we focused on the Urdaibai river basin in northern Spain, which was declared a biosphere reserve in 1984 by the UNESCO MaB Programme. The local Basque government created legislation in 1989 to protect this ecosystem and to promote sustainable development. In 1993, a Plan for land Management (PM) was approved by the local administration to reconcile the conservation of natural resources with their sustainable use, but it has been implemented slowly due to the conflict between public and private interests in addition to other causes. In 2010, the Reserve Management Board decided to renew this PM, which should be approved by 2013, and developed a participatory process to integrate the knowledge and cooperation of stakeholders from different disciplines, sectors and levels of hierarchy in decision-making. The objective of this participatory process was to work together to address social and environmental issues from a system perspective.

The aim of this study was to propose an innovative methodology that is based on the integration of participation methods with quantitative analysis. The final objective is to predict changes that might result from the implementation of the proposals arising from the participatory process, including an evaluation to prioritize actions needed to achieve the desirable results. This methodology could be a guideline for decision makers who desire to implement a participatory future for a socio-ecological system.

2. Methods

2.1. The Urdaibai biosphere reserve

The study was conducted in the UBR, Biscay, northern Spain (43°19′ N, 2°40′ W), which is a river basin that occupies an area of 220 km^2, with an average temperature of 12.5 °C and an average annual rainfall of 1200 mm. The reserve has approximately 45,000 inhabitants and 20 townships, including two towns of approximately 15,000 inhabitants (Gernika and Bermeo). The economy activity is based on the service sector (61%), industry (24%), construction (10%) and the primary sector (4%).

This area was declared a reserve to protect core areas, such as coastal ecosystems and natural forests, because of their extraordinary biodiversity. Urdaibai has the best-preserved estuary and salt marshes in the area. Indeed, the estuary was included in the Ramsar Convention on Wetlands in 1996. Additionally, in 1994, the estuary was declared a Special Protection Area for Birds, which allowed its incorporation into the NATURA 2000 network. The area is a unique Atlantic landscape formed by a mosaic of woodlands and fields, due to the activity of farmers. The Cantabrian green oak forest is one of the most highly valued natural forests of the reserve, which, together with the mixed-oak forest Natural forests, has suffered substantial degradation in the past. Currently, pine and eucalyptus plantations occupy a substantial area, having replaced natural forests. These tree plantations have had a negative effect on biodiversity and have caused significant environment problems (Merino et al., 2004; Onaindia et al., 2013).

The cartographic areas in the reserve are as follows: (1) estuaries, coastline, streams and river banks (core area); (2) green oak woodlands (core area); (3) areas of archaeological, historical and artistic interest; (4) areas of scenic interest; (5) areas of agricultural interest; (6) forestry areas; (7) rural population centres; (8) rural land (Atlantic landscape mosaic); and (9) urban–rural systems.

2.2. Participatory process and evaluation of scenario proposed

2.2.1. The participatory process

The participatory process and evaluation was coordinated by the UNESCO Chair on Sustainable Development (University of the Basque Country), which acted as a bridging organization and facilitated and moderated the participatory process. The protocol for participation, which was defined jointly by the Reserve's managers and the UNESCO Chair, consisted of a preparatory phase for process planning and five subsequent phases as follows: (1) the presentation and discussion of the objectives and protocol with stakeholders; (2) the development of workshops and proposals for action for the new PM; (3) the presentation of results to decision makers; and (4) the evaluation of the potential results of applied proposed actions and the publication of documents and media materials (Table 1). Before and after each seminar, informal interviews were performed with participants to know their level of integration.

To ensure transdisciplinary participation, participants in the process included public-administration technicians and policymakers (the Basque government, the County Council of Biscay, various municipal governments, and the Ministry of the Environment), researchers and experts in different disciplines (architecture, economics, ecology, biology, engineering, law, geology, and engineering), personnel from various environmental associations and NGOs, environmental education professionals, and representatives from agriculture and forestry. It was assumed in this transdisciplinary process that scientists would gradually transfer ownership of their vision to local stakeholders (Fischer-Kowalski et al., 2011). As the question of how the invitations were delivered is of major relevance for the success of a participatory process (Pahl-Wostl et al., 2008), we decided that stakeholders should be invited jointly by the local

Table 1 – Development of the full participation and evaluation process for proposed actions for the renewal of the Plan of Management.

Steps	Activities	Actor involved	Time
Preparatory phase	Planning. Definition of the objectives	Biosphere reserve's technicians and university researchers	December 2010
Phase 1	Presentation and discussion of the objectives and protocol	Key stakeholders, politicians	March 2011
Phase 2	Development of workshops and proposals for action	Key stakeholders	April, May, June, July 2011 (6 h each)
Phase 3	Presentation of results to decision makers	Key stakeholders. Politicians	September 2011
Phase 4	Evaluation the potential results of applied proposed actions. Documents	Biosphere reserve's technicians and university researchers	January 2012–June 2012
Follow-up phase	Development of a new rule to renew the Plan of Management	Biosphere reserve's decision makers	End of 2013

government (Director of Biodiversity) and the UNESCO Chair.

In the first meeting the full plan for the process, levels of participant involvement, and methods for plan questioning and revision were specified.

Before the workshops, we asked experts from each knowledge area to answer a survey to provide data for the workshop and optimize the results of the working groups. Three questions were asked. (i) What are the most important problems facing the reserve? (ii) What are the most important defects of the current PM? (iii) What changes should be introduced in the new PM to attain sustainable development? A total of 38 experts from different knowledge areas of answered the questions. Then, we proceeded to develop workshops to analyze the reserve's situation, grouping issues into four topics for each of four different workshops: legal issues, protection areas, productive issues (agriculture, forestry, tourism, energy, and industry), and issues affecting rural areas.

The workshops were held at the Urdaibai Biodiversity Centre (Busturia) over four days from April to July 2011, with an average length of 6 h. This schedule facilitated the inclusion of various important decision-makers and experts in the process. For all workshops, a 10 min talk from an expert (10 min) was followed a round of conversation where participants were invited to propose actions.

Results from workshops were presented in public sessions and videos. Personal interviews were recorded to enrich the analysis with different type of information.

2.2.2. *Evaluation of the potential results from applying proposed actions*

After the workshops, participants responded via e-mail to a survey to evaluate the impact of the proposed actions on the natural, ecological, scenic, recreational, cultural and productive properties of the reserve. The survey was conducted during March and April of 2012.

The respondents were asked to first assign an initial value (V_i) for each property of the biosphere reserve to assess its current condition (Table 2). The lowest values were assigned to areas of lowest quality or degraded condition, while higher values corresponded to areas in better condition. The survey then requested a final value (V_f) for each property resulting from each proposed action, assuming full implementation of the actions proposed in the workshop. The scale of work was chosen by each respondent. The difference between V_f and Vi was a measure of the effect (impact) of each action on each property in the different areas of the reserve. To correct for differences in the magnitude of impacts due to different scales of work, the relative impact (Ir) was calculated using the equation ($Ir = (V_f - V_i/V_i) \times 100$). This equation was the same used for the analysis of the 1993 PM (Alonso-Campos, 2003) so that comparisons could be made between the two PMs.

Results of the survey were analyzed using Principal Component Analysis (PCA) and the Pearson correlation index with XLSTAT 2008 software. PCA allowed us to analyze the joint variation pattern of the relative impact of the actions so that we could prioritize actions that most favored the conservation of local properties in the different areas of the Reserve.

3. Results

3.1. *Distribution of the proposed actions and comparison with the previous PM*

A total of 120 people from a wide range of professions and fields of interest took part in the workshops, with an average of 63 persons per workshop. Fourteen percent were technicians

Table 2 – Properties of the Biosphere Reserve defined in the Plan of Management (Alonso-Campos, 2003).

Properties	Evaluation criteria
Natural	Presence of species and habitats of scientific interest
Ecological	Maturity and complexity of the ecosystem: biogeochemical balance, risk of erosion, fragility
Scenic	Landscape value: heterogeneity, topographic features, presence of water, and presence of the native landscape
Recreational	Potential for leisure activities and outdoor recreation
Cultural	Historical and artistic heritage, educational and didactic potential of ecosystems, and presence of traditional agrarian cultures
Productive	The potential for food extraction

Table 3 – Distribution of the proposed actions for the new Plan of Management (PM) sorted according to areas of the Reserve. Relative frequency (%) for all the actions included in the 1993 PM and the new PM.

Areas of the biosphere reserve	1993	2012
1. Estuary, coastline, streams and river banks	10	15
2. Green oak woodlands and live fences	6	8
3. Areas of archaeological interest	6	14
4. Areas of scenic interest	12	9
5. Areas of agricultural interest	13	12
6. Areas of forestry interest	23	9
7. Rural population centres	9	15
8. Rural land (Atlantic landscape mosaic)	18	11
9. Rural–urban systems	3	8

from the Reserve, 31% were researchers, 19% were from NGOs and consulting firms, 14% were from local governments, and 22% were from the Basque Government and County Council of Biscay. Nearly everyone invited agreed to take part in the process and we observed an increased understanding of participants' viewpoints among themselves along the participatory process.

During the participatory process, a total of 66 actions were identified (information presented in Appendix A), most of which focused on issues of coastal ecosystems, areas of archaeological and historical interest and rural population centres, while areas of scenic and forestry interest and urban–rural systems were subject of less actions (Table 3).

The recreational and cultural properties would be the most favored in view of the implementation of the proposed actions in the new plan, due to their high relative impact of 17, 3 and 17, 6, respectively (Table 4). On the other hand, productive properties would be the least favored, with an average relative

Table 4 – Relative impact for each of the Reserve's properties by the 1993 and the 2012 Plans of Management.

Properties	Relative impact 1993	Relative impact 2012
Naturalistic	19.0	16.3
Ecological	24.8	17.0
Scenic	15.5	15.9
Recreational	50.0	17.3
Cultural	23.7	17.6
Productive	−35.8	13.5

impact of 13, 5 (Table 4). Concerning the recreational and cultural properties of the reserve, the areas that would most improve with the proposed actions will be the areas of forestry interest and urban–rural systems. In relation to the productivity, the areas that would mainly improve will be rural and agricultural lands (Appendix B).

Comparing to the 1993 plan, the distribution of the effects of actions in relation to the environmental properties was more even for the new plan than for the previous one (Table 3). The productive value of the Reserve will be improved in the new proposal with respect to the 1993 plan, where it was negatively affected (Table 3). In the new proposal there was a reduction in the percentage of actions focusing on areas of scenic, forestry and rural land issues, while the coastal and archaeological areas were subject of many actions (Table 4).

3.2. *Prioritization of the proposed actions*

The surveys were responded by more than half of participants attending seminars, and the composition and background of the responders was similar to the participants in the seminars

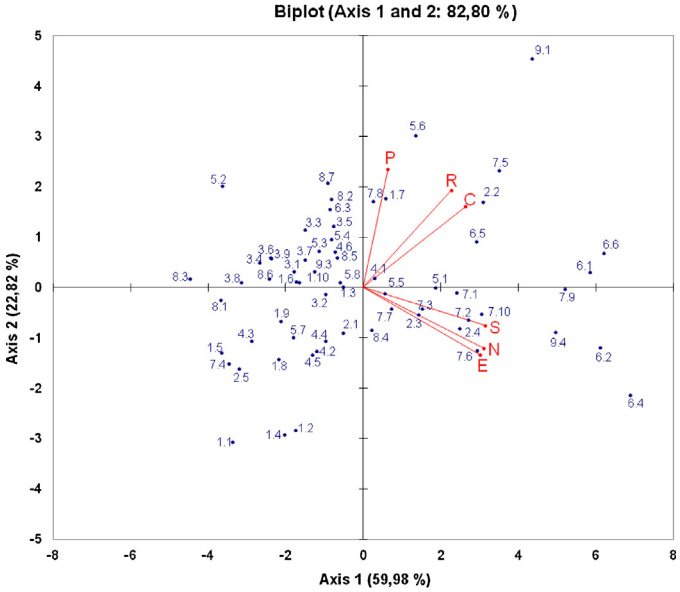

Fig. 1 – Distribution of the actions in the plan along axes 1 and 2 of the PCA, grouped according to the area. ((1) Estuary, coastline and river banks. (2) Green oak woodlands. (3) Archaeological interest. (4) Scenic interest. (5) Agricultural interest. (6) Forestry interest. (7) Rural population. (8) Common rural land. (9) Urban–rural systems). Properties of the area: N = naturalistic, E = ecological, Pa = scenic, R = recreational, C = cultural and P = productive. Proposal codes like appendix A. Proposal 9.5 contributes most positively to axis 1, and proposal 9.2 contributes the most negatively. These two proposals were eliminated from the graph to achieve a better dispersion of variables.

Table 5 – The 10 proposals which most contribute to improving the natural, environmental and scenic properties (axis 1) and those which most contribute to improving the productive, cultural and recreational properties (axis 2).

Axis 1	Proponed actions	Axis 2	Proponed actions
9.5	Adopt a holistic approach and integrate environmental factors into urban development	9.1	Consolidate cultural infrastructures and facilities for active tourism
6.4	Avoid timber extraction techniques that use heavy machinery, clearfelling or linear subsoiling on slopes of over 30%; optimize tracks and avoid uncontrolled logging routes	5.6	Promote synergies between the tourist industry and the agricultural sector
6.6	Develop an Agroforestry Plan that lays the groundwork for developing the Territorial Action Plan and the sector-based plan for woodland areas	7.5	Encourage tourist and recreational activities in rural towns or villages with scenic attractions
6.2	Obey the distances established for forest plantations to ensure the protection of river courses	8.7	Use tourism as a means to ensure rural development and bring about the economic diversification of the primary sector
6.1	Ensure that forest plantation profits are compatible with the multiple functions of forest ecosystems	5.2	Develop transport and cultural infrastructures in rural areas
7.9	Facilitate pedestrian transport and the use of bicycles by means of a slow mobility strategy	1.7	Develop an Plan for environmental research and environmental education
9.4	Instead of creating new industrial areas to implement new economic activities, use the space in the Gernika industrial area	8.2	Foster social relations in rural areas and reduce residents' need to travel: care centres for the elderly, leisure activities, country guesthouses, restaurants
9.1	Consolidate cultural infrastructure and facilities for active tourism	7.8	Develop a programme of leisure activities for residents and holiday residents
7.5	Encourage tourist and recreational activities in rural towns or villages with scenic attractions	2.2	Forestry subsidies should prioritize regeneration actions, and payment for environmental services, and compensatory measures for owners
2.2	Forestry subsidies should prioritize regeneration actions, and payment for environmental services, and compensatory measures for owners	6.3	Speed up administrative processes for fostering the use of wood in construction

(see Section 3.1). Regarding the results obtained from the PCA (Fig. 1), the first factor explained 60% of the variance and was correlated with environmental, natural and scenic properties, except for productivity. The second factor explained 23% of the variance and was closely correlated with productive and recreational properties. Thus, the proposals located on the positive side of axis 1 are those that should improve all properties of the territory, with the exception of productive properties, whereas those located on the negative side contributed less or negatively to them. On axis 2, the proposals located at the top corresponded to proposals that should contribute the most to improving the productive and recreational properties of the Reserve, while those located at the bottom will contribute less or negatively to them. The proposals located in the centre of the graph were actions with minor effects. The natural, ecological and scenic properties of the Reserve were closely correlated with each other (Fig. 1).

Environmental variables (axis 1) were the most important for prioritizing the proposed actions, while productive variables (axis 2) were the second most important. Thus, the order of actions on axis 1 represented the importance of each action for naturalistic, ecological, scenic and cultural properties, and axis 2 prioritized the actions that would most improve the productive and recreational properties. There were 10 actions that explained approximately half of the total variance for each axis, and there were three proposal of high importance for all properties (Table 5). Therefore, the application of the 17 proposals in Table 5 would attain 50% of environmental, cultural, recreational and productive targets in the Urdaibai reserve.

4. Discussion

4.1. *Management priorities*

Proposed actions relating to the conservation of areas of archaeological and historical interest increased relative to the former plan, although they were not considered to be a priority. This increase in interest was based on new research and knowledge from the last decade concerning the importance of these areas and resulted from an increase in research funds for the reserve. Indeed, UNESCO's MaB programme has recommended the dissemination of good practices developed by the Urdaibai biosphere reserve. These practices have been reported in their periodic review as an example of applied research on biosphere reserve management (UNESCO, 2011). Biosphere reserves' periodic reviews can be used as learning tools to share these lessons (Reed and Egunyu, 2013).

On the other hand, the significant increase in the number of actions proposed that affect the rural population, highlights the increasing importance given to development issues relative to the previous plan. These areas, as well as being a source of environmental benefit, can also be an important source of recreational and cultural resources. The expansion of urban areas has created a situation where more people seek to experience rural life, encouraging the development of recreational and cultural resources in these areas. Different authors have suggested that sustainable tourism should be small-scale, decentralized, friendly to the natural and cultural environment, and based on active the participation of locals. As an economic activity, it should be based on the

commodification of the natural and cultural capital of a particular locality or region (Kusová et al., 2008). Recreational and cultural resources still require improvement in the Urdaibai biosphere reserve, as was demonstrated in the participatory process.

There is a clear need for an evolution from conservation to more sustainable rural development, in the same way that there has been a continuous evolution in the MaB programme. The primary focus of biosphere reserves created in early 1980s or before was conservation, but there has been an evolution of this program towards strengthening the development of local communities (Price et al., 2010).

Contrary to the 1993 plan, the proposed actions in the new plan related to forestry decreased, but respondents thought that the actions proposed for these areas would improve many properties. The environment problems caused by the pine and eucalyptus plantations of these areas have been substantial (Onaindia et al., 2013), so the actions proposed in these areas continue to be a priority.

Quantitative analysis allowed us to identify what actions would have more beneficial effects on the properties of the reserve, so we can prioritize future actions depending on the properties we wish to improve. In fact, the application of nearly one third of the proposed actions would result in progress for half the benefits estimated from the optimum scenario, so these should be the first actions implemented. Moreover, almost all areas in the reserve would benefit from these high-priority actions.

4.2. *Integration of methods in the participatory process including quantitative evaluation*

The removal of walls between disciplines and civil society should enable new knowledge and understanding to emerge through integrated, mutually learned insights (Torkar and McGregor, 2012). There are a multitude of methods and processes being proposed to aid environmental management (Pereira et al., 2005; Barreteau et al., 2010; Palomo et al., 2011; Somarriba-Chang and Gunnarsdotter, 2012; von Korff et al., 2012).

In our experience, a combination of different participation methods has achieved successful results, especially the combination of quantitative and qualitative techniques. The integration of quantitative analysis with participatory valuation methods has also been successful for other authors (Helming and Pérez-Soba, 2011), but it is also important that the coordinator of a process should propose at each stage an adaptive plan for the following stages.

Thus, we believe that the methodology used to identify and prioritize the actions for this reserve was very useful and could easily be applied in other reserves. Therefore, it should be applied at an international scale with the aim of more sustainable management in the Biosphere Reserve network. Moreover, participation was very representative, and stakeholders recommended by some authors (Van Asselt and Rijkens-Klomp, 2002) were involved. The proposed actions were diverse and took into account the importance of involving policymakers, such that they could directly influence the planning process (Kok et al., 2007), and local communities could benefit. According to other studies, protected-area management schemes often fail because benefits for local people are not realized (Hirschnitz-Garbers and Stoll-Kleemann, 2011). However, the prioritization of actions obtained from the survey was apparently influenced by the specific composition of the group of respondents. Thus, this result should be complete with other kind of studies, such as cost-benefit analysis and environmental, social and cultural impact investigations.

The significance of the participatory process in decision-making to increasing efficiency in the management of natural resources was highlighted, especially in areas such as Biosphere Reserves. There is also value in using biosphere reserves to implement the learning-laboratories concept locally and globally in a way that creates a worldwide network of 'Learning Laboratories for Sustainable Development' (Nguyen et al., 2011).

4.3. *Participation as a collective learning process and policy relevance*

Public participation is increasingly viewed as a means to initiate social learning among stakeholders, resource managers, and policy makers. We understand social learning as a change in mutual understanding that allows greater interaction between groups of actors (Albert et al., 2012). There are many frameworks and definitions surrounding this topic (Garmendia and Stagl, 2010; Albert et al., 2012; Rodela, 2013). Despite widespread support for learning as a normative goal and process, core concepts, assumptions and approaches to learning have been applied in vague and sometimes uncritical ways (Armitage et al., 2008), and there is frequently confusion between the concept itself and its potential outcomes (Reed et al., 2010). However, there is an emerging consensus that the key outcome of social learning is to improve problem-solving capacities for participants (Cundill and Rodela, 2012). Our results suggested that this is true, as there was significant social learning throughout the process. There was an increased understanding of other participants 'viewpoints that resulted in positive changes in attitude towards them. Thus, we can conclude that participatory workshops built relationships and enhanced participants' understanding of other perspectives.

Moreover, though involving local people was an important success, prevailing political conditions have the potential to prevent management success (Hirschnitz-Garbers and Stoll-Kleemann, 2011), and governance networks can complement representative democracy. Thus, we believe that there are five major points that can improve the success and relevance of policy: (1) the institution and persons responsible for facilitating and moderating the participatory process, (2) transparency in the design of the protocol, (3) the involvement of decision makers in the design of the process, (4) analysis of expert's opinions to create workshops, and (5) the creation and evaluation of quantitative scenarios for the applied proposals.

We expected that the full-process results could be used to inspire political dialogue and we have concluded that governance networks are needed to contribute to more balanced decision making and to greater appreciation in the general population.

5. Conclusions

The attendants to the participatory process highlighted the importance of achieving more sustainable development in local communities in biosphere reserves. There is a clear need for an evolution from conservation to more sustainable rural development, in the same way that there has been a continuous evolution in the MaB program.

Regarding methodology, in our experience, the integration of participation methods with quantitative analysis has been successful in identifying and prioritizing necessary actions. The participatory process has lead to important social learning, relationship building and enhanced understanding by participants of other perspectives. Moreover, quantitative analysis allowed us to identify actions that would have more beneficial effects in the different properties of the Reserve. This allowed us to prioritize actions, depending on the properties that we wish to improve. We believe that this methodology could be readily applied to other biosphere reserves, taking into account the five major points that should improve the success of the process: (1) the institution and persons responsible for facilitating and moderating the participatory process, (2) the transparency of protocol design, (3) the involvement of decision makers in the design of the process, (4) the analysis of expert's opinions in the creation of workshops, and (5) the creation and quantitative evaluation of applied-proposal scenarios.

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Appendix A. Description of the 66 actions used in the PCA.

Actions for each area	
1.	Estuaries, coastline, streams and river banks
1.1	Limit and regulate recreational activities in certain parts of the estuary. Motor boats: express authorization required upriver from the line between Busturipunte and the Kanala shipyard; all vessels: limited circulation in the zone
1.2	Establish a list of invasive, allochthonous animal and vegetable species to be eradicated; said species should be expressly prohibited within the boundaries of Urdaibai
1.3	Develop the Territorial Action Plan (PAT) for the river network and specify in the PM that the PATs for both key and buffer zones, as well as for the river network itself, should be considered Management Plans for Urdaibai's ZECs (special conservation areas) and ZEPAs (special bird protection areas)
1.4	No dredging to be allowed. In the event that dredging is absolutely unavoidable, it should be duly justified and carried out in accordance with the meandering line of the ebb channel
1.5	Include in the map the protection zone easement of the Public Maritime–Land Domain
1.6	Include climate change and its relationship with ecosystems and species, and design actions to help mitigate or adapt to its effects.
1.7	Develop a plan for environmental research and environmental education
1.8	Establish the boundaries of special protection zones in the river network, as well as a water plan
1.9	Establish a Territorial Action Plan (PAT) for the water supply, establish the perimeters of the protected area for existing collection points and identify those areas which are still lacking protection (include the Gernika aquifer)
1.10	Incorporate the forecast of the 2007 Comprehensive Flood Prevention Plan and integrate the criteria of the Management Plan for the river ZEC (special conservation area) and the new Water Plan for the inland basins of the Basque Country (PHCCII)
2.	Green oak woodlands and live fences
2.1	Prioritize actions aimed at preventing negative impacts, although mitigation and restoration plans should also be implemented
2.2	Forestry subsidies should prioritize regenerative actions, payment for environmental services, compensatory measures for owners whose rights may be affected by restrictions on use, and for land stewardship formulas aimed at ensuring conservation and regeneration
2.3	Prohibit the replanting of areas with eucalyptus and maintain existing forestry mass in green oak woodlands and buffer areas of the estuary and coastline
2.4	Increase the percentage of Atlantic oak groves to 20% of the available surface area
2.5	Include the concept of Sensitive Environmental Area and the environmental impact assessment instruments identified by current law, and incorporate ZEC (special conservation area) conservation measures and ensure their compatibility with the Green Oak TAP (Territorial Action Plan)
3.	Areas of archaeological, historical and artistic interest

Appendix A (*Continued*)

3.1	Reclassify archaeological sites and establish various protection levels and include the new categories ''*Archaeological traces*'' and ''*Areas of Geological-Archaeological Interest*''
3.2	Focus conservation efforts on the most valuable prehistoric sites and prohibit all telecommunications or energy generation facilities, pipelines and other such installations in these areas
3.3	Compile a global catalogue of general cultural heritage that would include intangible heritage such as language, rites and dance; a catalogue of specific places to be protected which would be useful in practical cases, such as the prevention of the impact from public works; and a catalogue of existing buildings
3.4	Update the information available, incorporating it into the Urdaibai Cultural Heritage Inventory, and define the limits between archaeology and other areas to reach a consensus regarding boundaries
3.5	Endow the area's historical-artistic heritage with greater value and provide institutional aid for restoration work required to protect it
3.6	Develop a methodology for documenting the history of buildings in the Reserve (using synchronic study plans of identifiable eras or periods and diachronic, dynamic and developmental plans)
3.7	Respect the history of buildings during conversions and take as a reference the laws governing buildings of historical-artistic interest, namely Act 7/90 on Cultural Heritage, Act 2/2006 on Land and Urban Development and Act 5/89 on the Protection and Planning of Urdaibai
3.8	Permit novel, non-aggressive interventions that document historical (or other) references after the end of the intervention itself
3.9	Explore other concepts of heritage, such as ethnographic heritage, the heritage of public or industrial works and immovable heritage
4.	Areas of scenic interest
4.1	Foster sustainable agricultural practices as an indirect means of maintaining the cultural landscape of Urdaibai
4.2	Incorporate the Urdaibai ecological corridor network and add coastal areas, including tidal plains and boulder and pebble beaches
4.3	No new construction to be permitted without an associated rural activity
4.4	Regulate metal fences, which may constitute an eyesore, and boundary hedges, defining which species should be used
4.5	Include the landscape catalogues currently being compiled in the three functional areas as a result of the Landscape Act and the regulations deriving from this piece of legislation (following its approval)
4.6	Approach guidelines from a comprehensive perspective that encompasses immaterial, cultural, symbolic and spiritual values
5.	Areas of agricultural interest
5.1	Ensure environmentally friendly, traditional, ecological agriculture
5.2	Develop transport and cultural infrastructure in rural areas
5.3	Offer incentives to encourage private owners to participate in the creation of a shared pool of agricultural land.
5.4	Promote high-quality brands (eco-labels), local markets and transformation industries to encourage the consumption of local produce
5.5	Strengthen land stewardship contracts
5.6	Promote synergies between the tourist industry and the agricultural sector
5.7	Study the creation of an eco-tax for those agricultural activities with the greatest environmental impact
5.8	Develop the PAT (Territorial Action Plan) for areas of agricultural interest, along with the Sector-based Agricultural Plan of the PADAS (Socioeconomic Activity Harmonization and Development Programme)
6.	Areas of forestry interest
6.1	Ensure that forest plantation profits are compatible with the multiple functions of forest ecosystems
6.2	Obey the distances established for forest plantations to ensure the protection of river courses
6.3	Speed up administrative processes for fostering the use of wood in construction
6.4	Avoid timber extraction techniques that use heavy machinery, clearfelling or linear subsoiling on slopes of over 30%; optimize tracks and avoid uncontrolled logging routes
6.5	Establish appropriate compensatory mechanisms to provide financial aid to landowners whose rights may be affected by specific actions
6.6	Develop an Agroforestry Plan that lays the groundwork for developing the Territorial Action Plan and the sector-based plan for woodland areas
7.	Rural population centers

Appendix A (*Continued*)

7.1	Correct the contradictions existing between the PM and the Basque Land Use and Urban Planning Act with regards to facilities and infrastructure for existing buildings, the number of buildings and possible building sites or horizontal divisions. Establish a criterion for the consolidation of current rural centres, providing they comply with the Land Use Act, limiting as far as possible the establishment of new developments
7.2	Limit the construction of plot boundaries in the population centres because they undermine the concept of public space, which is an intrinsic characteristic of these environments
7.3	Study the possibility of demanding that new construction in rural population centres be houses linked to some type of agricultural activity
7.4	Create a new category, ''low density farmer'', to provide towns and villages with a greater degree of flexibility
7.5	Encourage tourist and recreational activities in rural towns or villages with scenic attractions
7.6	Reclassify population centres as other categories within the ''non-development land'' class. This would effectively prevent the construction of new houses, thus avoiding the proliferation of detached houses and cottages, but would enable new facilities and infrastructures for existing buildings, always bearing in mind the tolerated uses to ensure that new construction complies with regulations
7.7	Optimize the area's constructed heritage by segregating houses, following an urban development study designed to assess the impact of this step
7.8	Develop a program of leisure activities for residents and holiday residents
7.9	Facilitate pedestrian transport and the use of bicycles by means of a slow mobility strategy
7.10	Implement energy efficiency actions, such as the use of energy-efficient streetlights. Increase subsidies for the use of renewable energy (geothermal energy, small wind turbines, solar panels, etc.) in private homes, provided a feasibility study is conducted. Introduce more flexible regulations for the implementation of electrical energy, such as wind power and photovoltaic panels because current regulations hamper implementation. Foster the use of photovoltaic energy in public buildings through specific investments and establish new regulations for renewable energy generation facilities to avoid environmental impact, especially in relation to industrial facilities
8	Rural land (Atlantic landscape MOSAIC)
8.1	Do not allow the extension of original volumes through the expansion of built-on land, but do allow the occupation of vacant plots within existing farmhouse areas as a means of preserving existing heritage
8.2	Foster social relations in rural areas and reduce residents' need to travel, for example, by creating care centres for the elderly, small shops, crèches or tourist / leisure activities such as visitors' centres, country guesthouses, restaurants, etc
8.3	Enable farmhouses to be divided into flats or apartments to regulate a practice that occurs anyway with no authorization or control. Insist on prior studies to gauge the impact this may have on the area and the environment and to assess its effectiveness
8.4	Establish strategies for preserving the landscape and heritage and regulating the type of plot boundaries used, to avoid visual obstacles
8.5	Facilitate access for those who wish to work in agriculture but do not have the means to do so
8.6	Update the regulations governing farmhouse reconstruction as established by the MPUM to coincide with the Land Use and Urban Development Act regulations (art. 30) and Decree 105/2008 (art. 9.2); harmonize the heritage protection bylaws to coincide with the Basque Cultural Heritage Act
8.7	Use tourism as a means to ensure rural development and bring about the economic diversification of the primary sector (camping areas in farmhouses, etc.)
9.	Urban–rural systems
9.1	Consolidate cultural infrastructure and facilities for active tourism
9.2	Reinterpret urban and development land in accordance with that specified in PTP (Partial Territorial Plan) proposals and the DOTs (Regional Planning Guidelines), contemplating the possibility of occupying non-development land to enable or anticipate possible growth through the creation of ''development potential markets''
9.3	Study the possibility of integrating land classified as non-development land into areas governed by urban development planning, to break down somewhat the limits between the two types through the creation of intermediate zones
9.4	Instead of creating new industrial areas to implement new economic activities, use the space in the Gernika industrial area
9.5	Adopt a holistic approach and integrate environmental factors into urban development

Appendix B. Mean relative impacts on the area's properties. Code like Appendix A

Code	Naturalistic value	Ecological value	Escenas Value	Recreational value	Ccultural Value	Productive value	Code	Natural value	Ecological value	Escenas Value	Recreational	Ccultural Value	Productive value
1.1	18.09	19.42	6.68	−15.40	−1.22	−18.97	6.1	38.58	39.83	33.80	37.44	35.99	16.45
1.2	18.74	22.33	11.59	4.00	4.97	−36.37	6.2	46.75	46.00	39.57	35.96	26.23	−1.60
1.3	19.63	22.78	12.43	3.51	10.79	42.20	6.3	8.54	7.76	6.18	9.69	29.85	36.81
1.4	17.72	20.75	10.82	1.37	5.50	−38.90	6.4	51.27	51.93	43.97	36.54	27.32	−22.39
1.5	6.38	13.16	2.51	−3.10	2.60	0.97	6.5	24.87	24.38	27.32	31.02	25.09	32.10
1.6	13.25	20.92	8.87	0.42	5.46	47.85	6.6	37.94	38.62	37.16	37.78	38.64	24.28
1.7	14.42	17.12	10.35	16.76	28.15	49.82	7.1	26.42	26.89	29.09	21.04	20.57	22.30
1.8	12.86	19.06	9.49	0.17	5.29	1.98	7.2	27.92	28.60	32.65	23.42	19.18	9.24
1.9	10.04	19.99	6.29	2.19	7.64	16.40	7.3	28.44	25.85	24.22	14.14	15.24	25.63
1.10	9.60	16.62	8.43	3.93	11.38	31.32	7.4	13.51	12.21	6.82	−4.54	−4.22	10.27
2.1	17.56	17.86	15.06	12.74	14.04	−2.85	7.5	15.71	15.75	29.86	46.33	36.06	32.17
2.2	28.14	27.43	25.70	23.99	23.65	68.56	7.6	32.10	35.24	31.44	15.00	20.98	5.41
2.3	22.25	21.91	21.12	22.03	24.25	−6.30	7.7	22.76	21.34	21.89	18.71	12.54	15.49
2.4	24.25	23.52	23.52	29.86	32.56	−29.55	7.8	10.12	10.12	9.00	39.59	22.92	20.38
2.5	8.57	8.12	4.25	8.53	6.05	−27.17	7.9	42.47	38.10	30.83	41.78	24.68	15.85
3.1	5.56	9.05	8.45	13.38	16.30	12.79	7.10	34.96	38.00	24.99	15.26	20.74	28.09
3.2	9.24	9.82	19.16	13.09	15.54	8.18	8.1	0.66	0.38	8.98	2.10	6.87	10.76
3.3	3.84	2.22	10.42	20.54	20.04	19.18	8.2	7.25	7.57	4.70	28.44	21.58	30.06
3.4	2.86	3.18	5.01	13.18	13.65	13.64	8.3	−0.11	−1.09	−1.08	6.09	2.89	17.45
3.5	5.42	4.30	19.01	21.21	18.03	29.44	8.4	19.22	18.70	22.44	10.75	16.48	3.10
3.6	2.57	1.93	9.97	14.39	13.35	16.36	8.5	13.75	15.57	11.19	14.24	14.63	33.36
3.7	3.98	3.34	17.99	11.84	18.04	18.27	8.6	3.42	3.24	10.20	11.21	13.72	9.00
3.8	−0.67	3.82	9.76	10.30	6.36	14.43	8.7	7.32	6.79	3.95	34.90	16.12	38.07
3.9	1.16	1.80	12.15	13.97	12.59	18.11	9.1	12.87	8.42	9.91	65.47	63.94	26.20
4.1	18.29	20.47	16.06	10.63	19.57	28.03	9.2	−35.20	−35.20	−39.29	−3.63	−9.02	−5.50
4.2	19.83	17.42	8.20	10.04	11.53	−9.32	9.3	2.73	2.73	22.39	13.42	19.12	8.85
4.3	9.02	10.17	6.77	0.30	8.43	−1.63	9.4	41.86	43.34	45.72	11.30	20.33	39.79
4.4	15.91	15.08	14.87	9.59	13.82	−7.00	9.5	84.18	86.10	77.35	43.74	46.04	16.28
4.5	15.61	10.22	11.16	11.96	17.76	−27.93							
4.6	8.95	8.88	9.35	13.39	28.58	11.84							
5.1	24.62	25.40	20.54	23.00	23.08	14.06							
5.2	−7.93	−7.34	−7.05	34.15	14.28	14.42							
5.3	8.60	9.26	11.78	15.09	17.07	25.31							
5.4	9.97	11.98	7.94	13.14	22.90	28.59							
5.5	20.89	19.93	19.05	19.13	14.87	17.94							
5.6	8.09	7.61	11.31	59.24	26.29	30.81							
5.7	13.42	15.36	10.92	5.92	8.31	2.88							
5.8	14.75	11.99	16.01	16.63	13.98	17.1							

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