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Essential Environmental and Socio-Economic Variables for future and current Protected Areas

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Abstract	An inventory and analysis of the most important Essential Environmental Variables for Protected Areas (EEVPA) and Essential Socio-Economic Variables for Protected Areas (ESVPA) is presented. To this end, four major surveys have been carried out in 2015, 2017 and 2018, to assess the variables judged by PA managers, rangers and EcoPotential scientists to be the most important for the status and development of the Ecosystem Functions and Structures (EF), Ecosystem Services (ES), and pressures (Threats) of/on their PA. More than 120 PA managers, rangers and scientists of 26 PAs, of which 22 European, 1 Israelian, 3 near/in Africa, participated in the surveys. Due to the relative large number of PAs investigated, the many managers, rangers and scientists queried, the standardised methods used for the third survey, and the finally strong consensus among PA managers as well as EcoPotential scientists on the final results

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	regarding the most important ES, EF and Threat variables to indicate the status and development of their area, the outcomes of the surveys are highly representative and of direct use for PAs in general. In total 396 variables were suggested by PA managers and scientists as being important in PAs, together with 768 indicator-metrics combinations to measure these variables. At the start of the project (2015) large differences were observed in the perception of the most important variables on the functioning, structures, services and threats in PAs, whereby PA managers had a consistent and comparable view on the importance and type of variables, and the EcoPotential scientists deviated strongly from each other and from the managers. Within 2 years time of EcoPotential actions the views of PA managers and scientists, as surveyed in 2017/2018, became much more uniform and equilibrated. After harmonisation a total of 67 harmonised variables remained. The importance level of these variables as perceived by the PA managers and scientists was calculated, and finally 17 very highly important variables over all PAs were found (11 EEVPA and 6 ESVPA). For all variables a range of indicators and their metrics were prioritised along a range of criteria, including that they should give unambiguous outcomes, convey a single meaningful message, be informative at the detail level of the specific variable, and be generally applicable in time and space over all studied domains (TW, SA, MO) during any moment in the year. For the 17 most important variables 50 possible indicators were obtained. The selected priority variables are for the EF 5 EEVPA (Habitat suitability, Biodiversity, Population dynamics, Primary production, Land- and sea-scape). For the ES there are 4 EEVPA (Habitat for feeding and breeding, Charismatic landscape, Biodiversity conservation, Charismatic species), and 3 ESVPA (Leisure activities, Education and research, Spiritual significance). For the Threats there are 3 ESVPA (Overexploitation, Disturbance, Tourism) and 2 EEVPA (Change in species, Climate change). Because of their general occurrence in the majority of the PAs the EEVPA and ESVPA may form the preferable basis for further studies and comparisons on the current and future status and changes in the quality and requirements of PAs. Because of a low appearance of ESVPA in other EcoPotential reports, these variables should get more attention in the further studies.
Keywords	Essential variables, Ecosystem Services, Ecosystem Functions, Habitat, Threats, Biodiversity, Tourism, Charismatic landscape, Education, Spiritual significance, Overexploitation, Disturbance, Climate change, Biotic, Abiotic, Socio-economic

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This report has mainly been based on 4 surveys focussing on 26 Protected Areas, and thereby has been established with the strong support of a very high number of colleagues, being scientists, PA managers, or rangers of the Protected Areas, or scientists at institutions studying those PA.

These colleagues are:

Philippe Isenmann, Clarisse Brochier, Brigitte Poulin, Hélène Fabrega, Julien Caucat, Marco Heurich, Christian Binder, Teresa Schreib, Florian Porst, Franziska Pöpperl, Hartmann Pôlz, Elmar Prôll, Regina Buchriegler, Simone Mayrhofer, Angelika Stûckler, Christoph Nitsch, Johannes Kobler, Johannes Peterseil, Stein Byrkjeland, Christian Rossi, Ruedi Haller, Ramona Viterbi, Bruno Bassano, Christiana Cerrato, Antonis Barnias, Antonis Tsakirakis, Dimitris Kontakos, Dimitris Poursanidis, Nektarios Chrysoulakis, Arthur Herbreteau, Zilvinas Grigatis, Lina Diksaite, Arturas Razinkovas Baziukas, Rasa Morkūnė, Robertas Kubilius, Jūratė Dulkytė, Arturas Razinkovas Baziukas, Rasa Morkūnė, Edgaras Ivanauskas, Irina Baran, Aurel Nastase, Cristina Despina, Adrian Burada, Mihai Marinov, Mihai Adamescu, Mihai Doroftei, Diana Bota, Eugenia Cioaca, Alexe Vasile, Constantin Cazacu, Asaf Tsoar, Amir Shafir, Daniel Orenstein, Pedro Azenha Rocha, Fernanda Rodrigues, Guilherme Santos, Vânia Proença, Carmen Cabrera, Blanca Ramos Losada, Havza Redzep Kakel, Antonio Baleski, Jasminka Trajkovska Momiroska, Orhideja Tasevska, Goce Kostoski, Sasha Trajanovski, Dafina Guseska, Suzana Patcheva, Elizabeta Veljanoska Sarafiloska, Trajce Talevski, Ajman Al Malla, Orhideja Tasevska, Goce Kostoski, Dafina Guseska, Suzana Patcheva, Elizabeta Veljanoska Sarafiloska, José Juan Chans Pousada, Guyonne Janss, Felix Manuel Medina, Antonio San Blas Alvaros, Angel Palomares Martinez, Juan Antonio Bermejo, Gerard Janssen, Lies van Nieuwerburgh, Paolo Lupino, Stefano Cresta, Emiliana Valentini, Anna Chiesura, Federico Filipponi, Fabrizio Piccari, Alma Rossi, Alessandra Nguyen Xuan, Marzia Mirabile, Astrid Raudner, Armando Loureiro, Luisa Jorge, Henrique Carvalho, Alexandre Oliveira, Ana Fontes, Claudia Santos, Salvador Arenas-Castro, Antonio Monteiro, Leo Adriaanse, Kees van Westenbrugge, Vladimir Klc, Anton Potas, Stanislav Rak, Margareta Malatinova, Juraj Svajda, Jaap van der Meer, Sander Wijnhoven, Arno Nolte, Matthias Jurek, Magnus Andresen, Carl Beierkuhnlein, João Honrado, Ana Stritih, Tessa Bargmann, Alex Ziemba, Francisco Bonet-García, Thomas Dirnboeck, Tiago Domingos, Javier Cabello, Pablo Mendez, Abel Ramoelo, Izak Smit, Antonello Provenzale, Lisette Luif, Laura Soissons

(details on the contributors to the 1st and 2nd surveys are mentioned in Hummel et al 2017)

(details of participants in the 3rd and 4th surveys are presented in appendix 8)

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Executive summary

The present report is deliverable 9.1 of the EcoPotential project, which is funded by the European Union's Horizon 2020 Programme under Grant Agreement 641762.

EcoPotential aims to blend Earth Observations from remote sensing and field measurements, data analyses and modelling of current and future ecosystem conditions and services. The project focuses its activities on a targeted set of on internationally recognized Protected Areas (PA) in Europe, the majority being mountainous, semi-arid, and coastal areas, marked as a UNESCO World Natural Heritage Site, Biosphere Reserve, National Parks and/or Natura 2000 site.

This document presents an inventory and analysis of the most Essential Environmental Variables for Protected Areas (EEVPA) and Essential Socio-Economic Variables for Protected Areas (ESVPA). To this end, four major surveys have been carried out in 2015, 2017 and 2018, to assess the variables judged by PA managers, rangers and EcoPotential scientists to be the most important for the status and development of the Ecosystem Functions and Structures (EF), Ecosystem Services (ES), and pressures (Threats) of/on their PA.

More than 120 PA managers, rangers and scientists of 26 PAs, of which 22 European, 1 Israelian, 3 near/in Africa, participated in the surveys. In total 396 variables were suggested by PA managers and scientists as being important in PA, together with 768 indicator-metrics combinations to measure these variables.

Due to the large number of PAs investigated, the many managers, rangers and scientists queried, the standardised methods used for the third survey, and the finally strong consensus among PA managers as well as EcoPotential scientists on the final results regarding the most important ES, EF and Threat variables to indicate the status and development of their area, the outcomes of the surveys are highly representative and of direct use for PA in general.

At the start of the project (2015) large differences were observed in the perception of the most important variables on the functioning, structures, services and threats in PA, whereby PA managers had a consistent and comparable view on the importance and type of variables, and the EcoPotential scientists deviated strongly from each other and from the managers. Yet, within 2 years time of EcoPotential actions the views of PA managers and scientists, as surveyed in 2017/2018, became much more uniform and equilibrated.

After harmonisation, and taking out duplications, a total of 67 harmonised variables remained. The importance level as perceived by the PA managers and scientists was calculated, and finally 17 very highly important variables over all PAs were selected (11 EEVPA and 6 ESVPA). For all variables several indicators and their metrics were prioritised along a range of criteria, including that they should give unambiguous outcomes, convey a single meaningful message, be informative at the detail level of the specific variable, and be generally applicable in time and space over all studied domains (TW, SA, MO) during any moment in the year. For the 17 most important variables 50 possible indicators with their metrics were obtained to measure these variables (next to 13 slightly less important variables with 39 indicators and metrics).

The selected variables are for the EF 5 EEVPA (Habitat suitability, Biodiversity, Population dynamics, Primary production, Land- and sea-scape). For the ES there are 4 EEVPA (Habitat for feeding and breeding, Charismatic landscape, Biodiversity conservation, Charismatic species), and 3 ESVPA (Leisure activities, Education and research, Spiritual significance). For the Threats there are 3 ESVPA (Overexploitation, Disturbance, Tourism) and 2 EEVPA (Change in species, Climate change).

These EEVPA and ESVPA and some sub-top important variables do cover all the elements of the 7 Essential Variables (EV) abstracted from the Storylines by Guerra et al 2017 (WP2). At the other hand the EV do hardly cover any of the ESVPA. Moreover, although the RS modules and products, as summarised by WP12 for WP4 (Williams et al 2017), do offer more than described in this report to be needed for the most important variables, the RS modules and products do not cover any of the ESVPA. It is concluded that a stronger emphasis in further studies has to be laid on RS methods for measuring ESVPA.

Because of their general occurrence in the majority of the PAs the EEVPA and ESVPA indicated in this report may form the preferable basis for further studies and comparisons on the current and future status and changes in the quality and requirements of PAs.

Glossary on abbreviations

A	Variable of Abiotic nature
Avg	Average
B	Variable of Biotic nature
Ch	For variables in Table 5: There is often a focus on changes in time for this variable
CICES	Common International Classification of Ecosystem Services
CV	Coefficient of Variation
EC	European Community
EEVPA	Essential Environmental Variables for Protected Areas (EV and IV of abiotic and biotic nature)
EF	Ecosystem Functions and Structure
EO	Earth Observation (includes Remote Sensing and *in situ* observation)
ES	Ecosystem Services
ESVPA	Essential Socio-Economic Variables for Protected Areas (EV and IV of socio-economic or cultural nature)
EU	European Union
EV	Essential Variable (variable in 75-100 % of PAs indicated as (very) important (score 4 or 5 in range 0-5))
IPR	Intelligence Property Rights
IV	Important Variable (variable in 50-75 % of PAs indicated as (very) important (score 4 or 5 in range 0-5))
LTER	Long-Term Ecological Research (site)
M&M	Material and Methods
MEA	Millennium Ecosystem Assessment
Med	Mediterranean
MO	Mountainous areas and lakes in those areas
N2k	Natura 2000 site
NP	National Park
PA	Protected Area(s)
RS	Remote Sensing
S	Variable of socio-economic or anthropogenic nature
SA	Semi-Arid areas
SD	Standard Deviation
SE	Standard Error
TEEB	The Economics of Ecosystems and Biodiversity
Thr	Threat(s) (Pressures)
TW	Transitional Waters
UBR	UNESCO Biosphere Reserve
UWH	UNESCO World Heritage
WP	Work Package

1. Introduction

The EcoPotential project focuses on blending Earth Observations from remote sensing and *in situ* field measurements, data analyses and modelling of current and future ecosystem conditions and services. The studies target a set of internationally recognised protected areas (PAs) in Europe and beyond, including three ecosystem types (domains) of crucial interest to Europe, i.e. mountain, arid and semi-arid, and coastal and marine ecosystems.

These three categories of ecosystems include UNESCO World Heritage Sites and Biosphere Reserves, National Parks, Natura 2000 sites, and LTER sites. The PAs selected in EcoPotential span all Europe and are characterized by widely different environmental conditions, often include crucial, diverse and endangered ecosystems, and play a central role for conservation and management strategies in rapidly changing environments.

The diversity of environmental conditions and protection status of the PAs calls for a broad view on the ecological functioning and structure (EF) of the ecosystems, on the ecosystem services (ES) provided by the European PAs, and on the pressures and changes (Threats) imposed on them. For this reason, EcoPotential considers for the three different domains a sufficiently large suite of PAs in order to avoid singularities and to work out generality across a broad range of biogeographical settings and environmental conditions.

In order to properly describe and analyse the current and future EF of the PA, the ES they deliver, and the development of pressures imposed on them, an agreed set of indicators of the underlying variables has to be available.

In the first year of the EcoPotential project it became clear from a first survey among scientist and a second survey among PA managers that there was a strong mismatch between the perception of scientists and PA managers on what the most important indicators and variables are.

In the course of the project, due to the flow of information, the ideas and perception at both sides might have changed which was inventoried again in the third year of the project. To this end, a third and fourth series of surveys have been carried out among EcoPotential scientists and along the management and rangers of 26 PAs, questioning them on the environmental, socio-economic, and cultural assets of their PAs, including what the perception of the most important variables indicating the status and functioning of their PA was.

For the last, fourth survey an underlying question was whether EcoPotential has helped strengthen or change the view on the importance of ES, EF and threats in the Protected Areas.

The aim of this report, Deliverable 9.1, is to present an overview of the initially and finally selected variables and measures that are judged by the management and rangers of the PAs, and by EcoPotential scientists, to be the most essential indicators for the current status and changes in their PAs. From these indicators a harmonised sub-set of indicators, the Essential Environmental Variables for Protected Areas (EEVPA) and Essential Socio-economic Variables for Protected Areas (ESVPA), has been selected that can be generally applied in all the three studied ecosystem types, are geographically widely applicable, and response specific.

The finally selected EEVPA and ESVPA in the PAs considered here may provide, together with the knowledge base from the other WPs in EcoPotential, notably WP4 to WP7, a basis for the definition of the quality status and further requirements of current and future PAs.

This report is therefore intended as a toolbox of measures available to scientists, policy makers and managers of PAs to improve the understanding on the current status, and possible future changes and developments, in the functioning and delivery of ES in PAs, and to allow, because of its general and harmonised character, comparisons between PAs at large geographic scales.

2. Material and methods

2.1 The surveys

The importance of various variables underlying the ecosystem functions and structures, the ecosystem services (ES) and the threats in transitional waters (marine coastal waters, deltas, lagoons) and mountainous PAs were assessed in four surveys during 2015 to 2018 (table 1).

A first survey was distributed by e-mail among environmental scientists involved in EcoPotential (hereafter called ‘scientists’) at the start of the project in 2015, and replies were received from 15 scientists. An example of the first survey is presented in Appendix 1. In this survey, the EcoPotential scientists were asked to identify the major ecosystem types for the PA and the most important ecosystem services in these ecosystems. Subsequently the major ecosystem functions and structures underlying the most important services had to be indicated, and lastly the major threats to these ecosystem services, functions and structures.

A second survey was distributed shortly after the first one in 2015 among the managers of the studied PAs, and 11 managers of PAs were interviewed face to face by scientists working in the EcoPotential project. This survey was under the lead of EcoPotential WP11 (Nolte et al 2016; Deliverable 11.2). An example of the relevant part in the second survey, and used in the present report, is presented in Appendix 2.

The results of the first and second survey have also been published in the international Open Access journal PLosOne (Hummel et al. 2017).

The third survey was a thoroughly updated version of the second survey (see Addendum A, because of its length not an appendix yet an addendum towards the end of the report) that was send in summer and autumn 2017 to the management of PAs, with the request to cooperate and to fill in the survey during an interview that would last 1 day at their premises. A positive reply was received from 25 PAs. These PAs were visited by a specially installed taskforce to interview the PA management, consisting of Prof.Dr. Herman Hummel (lead) and Christiaan Hummel MSc of the Royal Netherlands Institute for Sea Research (NIOZ), Yerseke, the Netherlands, and Yolande Boyer MSc and Dr. Rutger de Wit of the University of Montpellier (UMontpellier), France.

In order to note solely the perception and opinion of the PA management and rangers during the interviews the interception or help of EcoPotential scientists was not allowed unless insurmountable obstacles in answering or understanding a question occurred.

The present report will focus with regard to the third survey only on section B. For some PAs, part B was already filled in by their PA managers, in absence of further EcoPotential scientists (except of the survey-team members), during an EcoPotential workshop May 2017 in Pisa, Italy. At this workshop, the PA manager of Kruger NP also completed part B, whereas the survey team was not able to visit them at their premises for the remainder of the third survey.

The fourth survey was a factual copy of section B of the third survey, in a slightly different format (appendix 3) and send to EcoPotential scientists in January 2018. A reply for 15 PAs was received. An underlying question of this survey is whether EcoPotential has helped strengthen or change the view on the importance of ES, EF and Threats in the Protected Areas.

Together with the fourth survey the EcoPotential scientists were also questioned to indicated concrete *in situ* and Remote Sensing (RS) measures and metrics for the variables they judged to be most important (appendix 4).

2.2 The Protected Areas

To be able to obtain a proper overview of the major variables that are important for environmental scientists and PA managers in Europe, a broad range of PAs with different biogeographic settings and environmental conditions were included in the surveys and analyses (Fig 1, Table 1). The analyses included transitional or coastal waters and connected wetlands, hereafter called Transitional Waters (TW), mountainous areas and lakes in those areas, hereafter called Mountains (Mo), and semi-arid areas (SA).

All of these areas are recognised PAs having one or more of the following designations: National Park status, Natura 2000, UNESCO World Heritage area, or UNESCO Biosphere Reserve (Table 1). Only Appia Antica did not have such a status and is a Regional Park, yet was included since it represents a PA with a very high socio-cultural value due to its history near Rome.

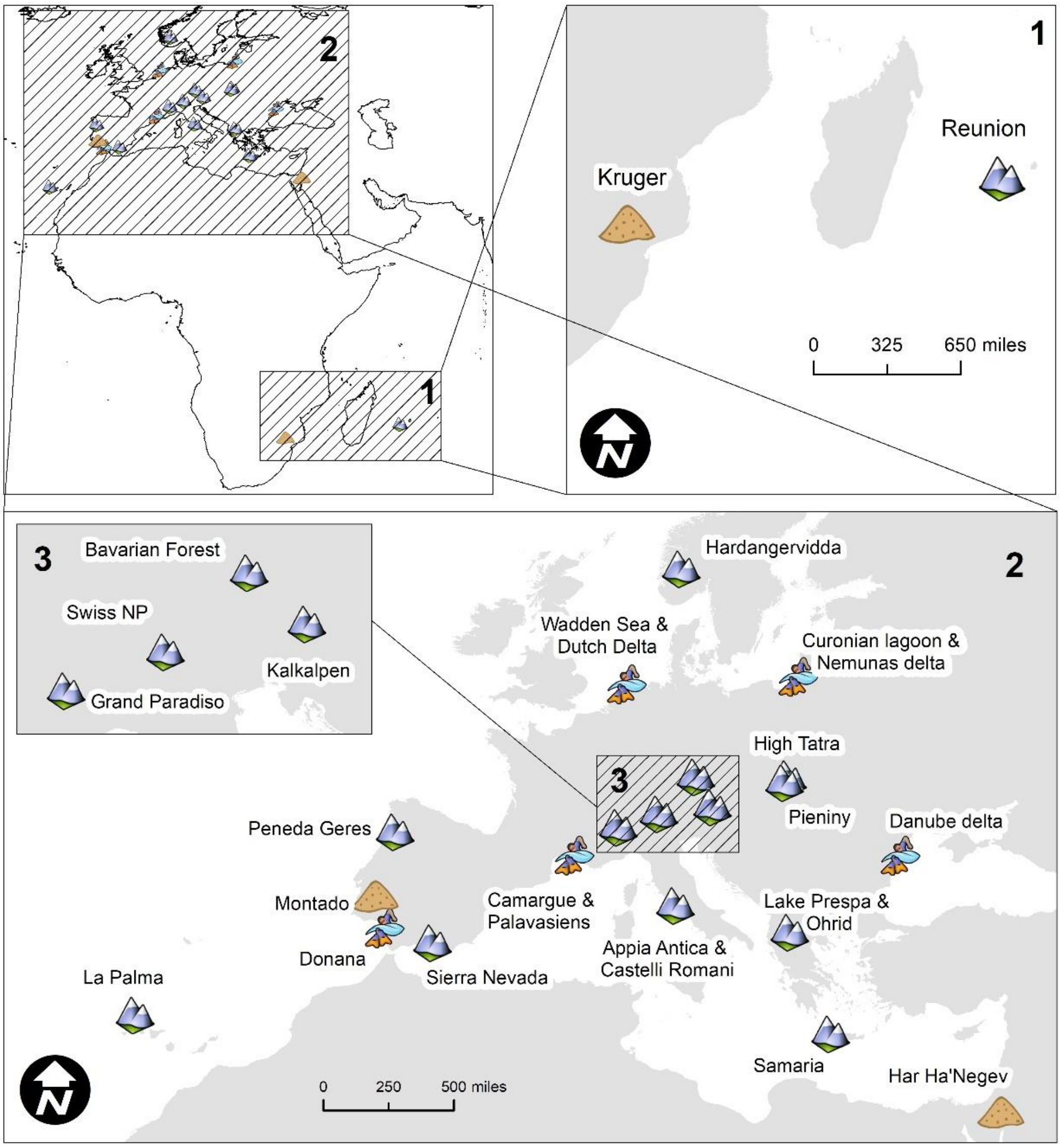

Figure 1: Overview of PAs surveyed in Europe and beyond. Mountain symbol = Mountainous PA, Wave symbol = Transitional Waters PA, Sand hill = PA in Semi-Arid area (graph composed by Dimitris Poursanidis, Foundation for Research and Technology, Crete, Greece).

Table 1: Protected areas surveyed in the studies (including country, protection status, and for those surveyed in 2017 and 2018 also the IUCN category (1 to 6; lowest category is highest protection level), surface (hectare), and earliest creation date (year))

		Transitional Waters				Semi-Arid areas (a+) and Mountains (+)				Protection status	IUCN category	Surface (ha)	Creation date (yr)
	Country	Scientists		Managers		Scientists		Managers					
		2015	2018	2015	2017	2015	2018	2015	2017				
Camargue	F	+		+	+					UBR, N2k	4	221000	1927
Curonian Lagoon	LT	+		+	+					NP, N2k, UWH	2	27389	1991
Danube Delta	RO	+	+		+					UBR, N2k, UWH	1	576421	1961
Doñana	E	+	+	+	+					NP, N2k, UBR, UWH	2	54252	1969
Eastern Scheldt*	NL	+	+		+					NP, N2k	2	36980	1989
Nemunas Delta	LT			+	+					N2k	1	29149	1992
Palavasiens	F				+					N2k	4	6546	1942
Wadden Sea	NL	+	+	+	+					NP, N2k, UBR, UWH	4	271770	1989
Western Scheldt*	NL	+								N2k			
Samaria	GR	+		+		+	+	+	+	NP, N2k, UBR	2	58454	1962
Har Ha Negev	Isr								a+	NP, UWH	4	102349	1974
Montado	P						a+		a+	N2k	6	321769	1989
Kruger	SA						a+		a+	NP, UBR	2	1963300	1926
Appia Antica	I						+		+	***	5	3400	1988
Bavarian Forest	D								+	NP, N2k	2	24218	1970
Castelli Romani	I						+		+	N2k	5	15014	1984
Gran Paradiso	I					+		+	+	NP, N2k	2	71044	1922
Hardangervidda	N					+		+	+	NP	2	427200	1981
High Tatra	PL					+		+		NP, N2k, UBR			
La Palma	E							+	+	NP, N2k, UBR	6	87251	1954
Kalkalpen	A					+	+	+	+	NP, N2k, UWH	2	20849	1998
Lake Ohrid	Mac						+		+	NP, N2k, UWH	3	24700	1977
Lake Prespa	Mac						+		+	****	3	17789	1995
Oros Idi**	GR					+				NP, N2k			
Peneda-Gerês	P					+			+	NP, N2k, UBR	2	69590	1971
Pieniny NP	SK						+		+	NP, N2k	2	3750	1932
Reunion	F								+	NP, UWH	2	105384	2007
Sierra Nevada	E					+	+		+	NP, N2k, UBR	2	172238	1982
Swiss NP	CH						+	+	+	NP, UBR	1	17033	1914

NP= National Park, UBR= UNESCO Biosphere Reserve, N2k= Natura 2000 site, UWH= UNESCO World Heritage; *The Western and Eastern Scheldt though separate water bodies are both part of the area called Dutch Delta; **Oros Idi is part of Crete and connected to Samaria NP; ***Appia Antica is a Regional Park; **** Lake Prespa is in Greece and Albania a National Park, in Macedonia a Strict Nature Reserve.

2.3 Harmonisation of variables

For the harmonisation of variables we followed the procedure as described in Hummel et al 2017.

Starting point was that in the first survey EcoPotential scientists were asked to mention for all the habitats (ecosystem types), encountered in the PA of their studies, all ecosystem services (ES) they judged to be important. Subsequently, the major ecosystem functions and structures (EF) underlying the ES had to be indicated, and lastly the most important threats to these ES and EF. In the second survey with PA managers, other additional variables were mentioned for the ES and Threats as well.

A very high number of variables was indicated in the first and second surveys, being in total 396. An overview of all the ecosystem types mentioned in the first and second surveys is given in appendix 5, an overview of all the indicated variables for ES, EF and Threats in appendix 6.

Therefore, to overcome the critical issue of such a high number of, often almost similar, variables assigned by scientists or PA managers, they were harmonised to a standard set of variables. An overview of this harmonisation of variables is given in appendix 6. The harmonisation resulted in a total of 70 harmonised variables, a reduction of 82 percent (4 out of 5 variables could be dissolved).

The harmonised variables have been used for the third and fourth surveys.

As indicated in Hummel et al 2017) to remain as close as possible to the original answers given by managers and scientists we did not to use the existing ES classification schemes of the Millennium Ecosystem Assessment (MEA 2005), TEEB (2008), and CICES (Haines-Young & Potschin 2012), mainly because they lack an integrated approach for classifying the EF and threats, making it hard to harmonise all variables in the same way. Moreover, using the original variables (and their synonyms) as given by managers and scientists as much as possible makes it easier to distinguish between the different answers and different views of scientists and managers.

Some variables were miscategorised and “corrected” by Hummel et al (2017). For example, “water supply” was indicated as an ecosystem function whereas it is an ecosystem service. For further analysis, and to overcome this type of flaws, the variables were matched with the contextually most similar variable within a category. In this specific case “water supply” was matched with the variable “hydrodynamics” in the category of Ecosystem functions and structures. All incorrectly categorised variables are summarised in appendix 7; the “corrected” variables are included in appendix 6 (see also Hummel et al. 2017.

Hummel et al (2017) categorised all harmonised variables in those of biotic, abiotic and socio-economic nature for ES and EF, and of biotic, abiotic and anthropogenic nature for threats (details can be found in appendix 6, and in Hummel et al 2017). The categorisation of the variables is dependent on the origin of the variable, to prevent loss of causality. For example: the ES aquaculture is categorised as biotic since the object in aquaculture is of biotic origin, and the ES materials of economic use as abiotic since the materials are of abiotic origin, though both could be considered to be socio-economic, because both are an economic activity. If both would have been categorised as socio-economic, the origin of the variable (abiotic or biotic) would be lost, and with this the possible connections and implications for the supporting (functions in the) (eco)system.

2.4 Calculations on data

For the first survey among EcoPotential scientists, the relative number of times a variable was mentioned in a category (ES, EF, threats) per PA, across all ecosystem types, was adopted as the degree of importance of that variable in a given PA (Hummel *et al.* 2017). In each survey the total importance of all variables mentioned by a scientist or a manager for each category (i.e. the ES and threats) in each PA were indexed, and the total score on relative importance of all variables in a category always summed up to 100 % per PA. The relative importance of each variable was then averaged over all surveyed PAs, and the standard error was calculated.

During the second survey, PA managers were asked to indicate the major ecosystem functions and structures (EF), the ecosystem services (ES), and the threats in their protected area (see Hummel et al 2017). Next, they were asked to indicate the relative importance of each EF, ES and threat. For EF and ES we have used the standard 5 point Likert scale [Likert 1932] (0 = not present, 1= very low importance, 2 = low importance, 3 = moderate importance, 4 = high importance, 5 = very high importance). For threats we have adopted the 3 point IPCC scaling for Risks (Gattuso et al 2015) (0= no threat, 1 = low to moderate threat, 2 = strong threat, 3 = very strong threat). In each survey the total importance of all variables mentioned by a scientist or a manager for each category (i.e. the EF, ES and threats) were indexed, and in each PA then always summed up to 100 %. The counts of relative importance for each variable were averaged over all surveyed PAs, and the standard error was calculated.

In the third and fourth survey we have only used the standard 5 point Likert scale for all variables (Likert 1932) (0 = not present, 1= very low importance, 2 = low importance, 3 = moderate importance, 4 = high importance, 5 = very high importance. The scores of importance (0 to 5) for each variable were analysed in two different ways. Firstly, as for second survey, all the scores of importance for each group of variables (EF, ES, Threats) were indexed for each PA (total score per PA is 100 %), then the scores were averaged over all surveyed PAs, and the standard error was calculated. Secondly, the number of times a specific score of importance (0 to 5) was counted for each variable over all surveyed PAs.

All underlying data and analyses of the first and second survey have been made available through open access at https://doi.org/10.6084/m9.figshare.5513530.v1. The data and analyses of the third and fourth survey will be launched similarly through open access at publication in an international journal within the duration of the project.

2.5 Representation and selection of variables

The basic results on the relative importance of variables as obtained from EcoPotential scientists and PA managers in the surveys held from 2015 to 2018 are all represented in Addendum B. For each survey the results are categorised in 3 ways:

- 1) for the type of variable, i.e. Ecosystem functions or structures (EF), Ecosystem services (ES), and Threats (Threats),
- 2) for the domain of the PA, i.e. Transitional Waters (TW), Mountains (Mo), and Semi-Arid areas (SA), and
- 3) for the nature of variables, i.e. whether they are of abiotic nature (A), biotic nature (B) or socio-economic or cultural nature (S; regarding Threats it includes the anthropogenic pressures).

All results are depicted in graphs and tables in which for the variables the Average (Avg.), Standard deviation (SD), and Standard error (SE) are indicated. The nature, domain, and level of importance of the variables are often visualised by means of color-codes.

The final selection of the most important variables, to be denominated as the Essential Environmental Variables for Protected Areas (EEVPA) or the Essential Socio-economic Variables for Protected Areas (ESVPA), was dependent on having a high score in the results of all surveys. The variables in the top category of EEVPA and ESVPA had to have absolute importance scores a high score (Likert 4 or 5 score) within at least 75 % of the surveyed PAs, and variables in the sub-top category had to have such a high score in at least 50 to 75 % of the PAs. Moreover, the average relative importance of a variable, according the perception of as well the scientists as the PA manager, should be for the top-category not less than 25 % of the difference between maximum and minimum score lower than the maximum score (calculates as: x = > max – 0,25*(max–min)), and for the sub-top category not lower than 50 % of the difference between maximum and minimum score lower than the maximum score (calculates as: x = > max – 0,5*(max–min) but x = < max – 0,25*(max–min)). For the first and second survey (called the 2015 survey) the 2 on average most important variables were chosen as the top for each category (EF, ES, Threats), and for the sub-top the subsequent 4 variables were chosen.

For the variables, the lowest scores was also checked for. Those in the lowest category had a very low score (Likert 0 or 1 score) within at least 75 % of the surveyed PAs, and those in the sub-lowest category had a very low score in at least 50 to 75 % of the PAs. Moreover, their relative importance according the perception of the scientists as well as the PA manager was on an average not higher than 25 % of the difference between maximum and minimum score higher than the minimum score (calculates as: x = < min + 0,25*(max–min)). These variables, because of their minor importance and rare recognition, are better not to be used in European wide comparisons and studies, yet notwithstanding the fact that in a few PA they might have a role to be included in local studies.

In the fourth survey for all harmonised variables concrete proxies and metrics for the variables were inventoried. Again, a high diversity was suggested. On basis of the inventories, expert opinion and literature reviews the most practical proxies and metrics for the variables were chosen.

In order to select the most practical indicators, proxies and metrics for variables, one or more of the following criteria were used (in order of priority): 1) Distinctive and unambiguous (fool-proof) outcomes, 2) Conveys a single meaningful message, 3) Informative at the detail level of the specific variable, 4) Standardised and harmonisable (to increase its wider use over the domains (TW, MO, SA)), 5) General applicable in time and space (of use in/for several domains (TW, SA, MO) during any moment in the year), 6) Consistently repeatable (to validate - falsifiable), 7) Easy available, 8) Easy to measure and quantifyable.

3. Results

3.1 Data harmonisation

Overall, in the first and second surveys, a highly divers set of in total 396 variables were suggested as being important in Protected Areas, consisting of 151 ES variables, 95 EF variables and 150 Threat variables (appendix 6).

Harmonisation resulted in 25 ES variables (appendix 6.a), 17 EF variables (appendix 6.b) and 25 Threat variables (appendix 6.c), a total 67 harmonised variables.

When searching for concrete proxies and metrics for the variables, mainly in the fourth survey, again a high diversity of in total 768 proxies was suggested by the EcoPotential scientists (Addendum C). On basis of the inventories, expert opinion of the consulted scientists, and literature reviews, and following the criteria indicated in chapter 2.5, the most practical proxies and metrics for the variables were finally chosen (chapter 3.5).

3.2 Representativeness of the PA

On basis of climatic and biogeographic data, as solar radiation, evatransporation, PA size, and temperature, Beierkuhnlein et al (2016) demonstrated that the EcoPotential PAs are very representative for the conditions of the European network of PAs and also for the overall climatic conditions and biogeographical regions of Europe.

Beierkuhnlein et al. (2016) summarised that whereas the Annual Solar Radiation in Europe ranges from 4 to 17 MJ/m^2/d, in the EcoPotential PAs it can range from 4 to 19 MJ/m^2/d, due to the inclusion of HarHaNegev and Kruger NP. The same holds for the Potential Evapotranspiration which ranges from 300 to 1600 mm in Europe and in the EcoPotential PAs ranges from 300 to 1900 mm, thus extending again slightly the ranges of solely European PAs. Regarding the Mean Annual Temperature in Europe it ranges from -11 to 20 ^{o}C, wheres it is for the EcoPotential PAs from -6 to 20 ^{o}C, since no PAs were included from full Arctic areas. Lastly, the Mean Annual Precipitation ranges in Europe from 200 to 2800 mm, and in the EcoPotential PAs it ranges from 200 to 2200 mm. All these data together show that the EcoPotential PAs do represent the conditions of European PAs in general, yet with the inclusion of some more warm conditions and exclusion of extreme cold conditions. In view of the common increasing temperature trends in Climate Change this may help to include conclusions regarding effects of future climatic changes on PAs.

In addition we have assessed how the levels of the IUCN protection categories, the PA surface area, and the creation dates of the surveyed EcoPotential PAs are distributed (Table 1), to answer the question whether we had an uneven, clustered, sample of PAs, or an evenly distributed, thereby more representative, sample of PAs.

The results show that all measured factors in the surveyed PAs are (in relation to each other) evenly distributed (Fig. 2). A younger or older PA can have the same surface or IUCN protection level, and thus older PAs are not per se larger or better protected.

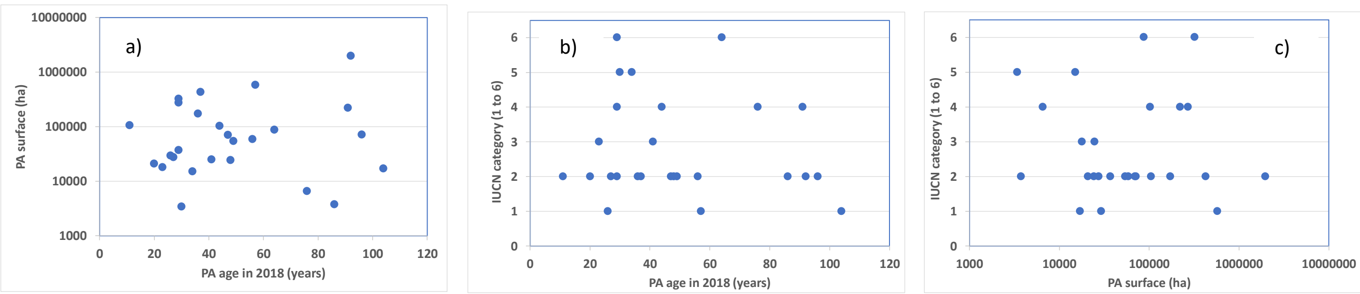

Figure 2: The distribution of the surface, age (derived from creation date), and IUCN protection level of the surveyed EcoPotential PA (data from Table 1).

The total surface of the surveyed PAs was 47300 km2, being 1.5 times the surface of the Netherlands.

All in all, the climatic, biogeographic and protection data show that the EcoPotential PA are an evenly distributed and proper representation of European PA.

3.3 The surveys of 2015

More than 120 PA managers, rangers and scientists of 26 PAs, of which 22 European, 1 Israelian, 3 near/in Africa, participated in the surveys.

The surveys on important ES, EF and Threats variables in 2015 (the first and second survey) resulted, even after harmonisation (see 4.1), in a high diversity of outcomes (figures 3, 4a,b, 5a,b). Strong differences were found between perceptions of scientists versus PA managers, and between those of transitional waters versus mountains, as concluded also by Hummel et al (2017).
It was noted that the PA managers had a more consistent and stable view than the scientists, with much less variation in the importance of variables and less differences among managers from the different domains (compare Fig. 4a with 4b, or Fig. 5a with 5b, and table 2 in chapter 3.3.1).

The 6 most important EF were, in order of importance, Primary production, Habitat suitability, Biodiversity, Population dynamics, Sediment characteristics and Secondary production (Fig. 3, table 4).

The 6 most important ES were Leisure activities, Habitat for feeding and breeding, Climate regulation, Spiritual significance, Animals of economic use, and Education and research (Fig. 4, table 4). Scientists put more emphasis on the biotic and abiotic (environmental) ES, whereas PA managers put more emphasis on the socio-economic and cultural ES (Fig. 4).

Among the Threats Climate Change is thought to be by far the most important (Fig 5), followed in importance by Overexploitation, Disturbance, Tourism, Habitat loss, and Change in species (table 4).

As a result of the observed mismatch in 2015 between PA managers and scientists regarding the viewpoints on the most important variables, the situation has been discussed thoroughly in the EcoPotential project during the 2 years after culminating in a stakeholder workshop in May 2017. This has led to the surveys of 2017/18, using a harmonised set of variables, standardised interview protocol, and face-to-face interviews 'on the spot' along a larger group of stakeholders.

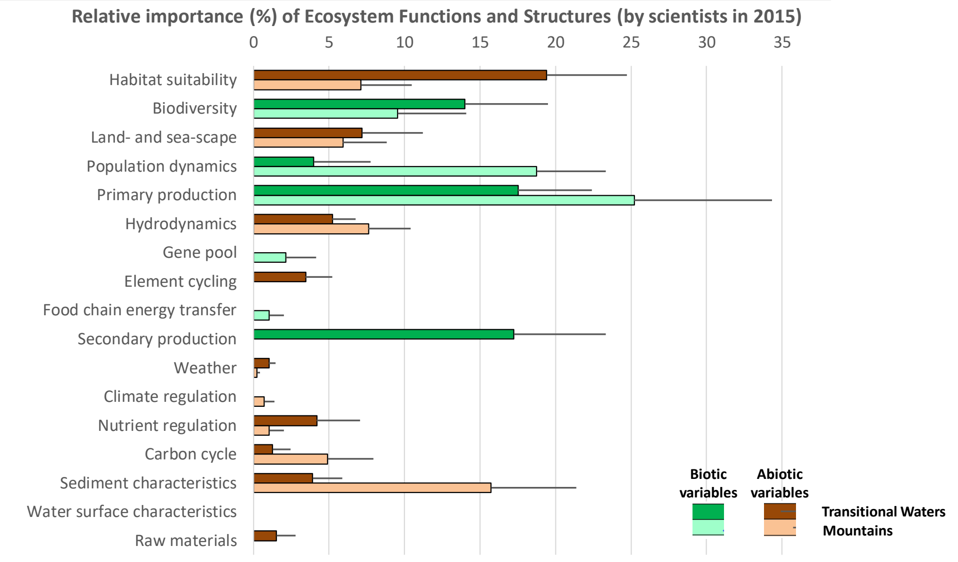

Figure 3. Relative importance (in %) of Ecosystem Functions and Structures (EF) as perceived in 2015 by EcoPotential scientists in Transitional Waters and Mountains. Upper row (darker colours) indicates Transitional Waters, lower row (lighter colours) indicates Mountains, separated in EF of biotic (green) and abiotic (brown) nature (indicated are averages and standard errors; for comparison the order of variables corresponds with the order of importance as found in 2017/18).

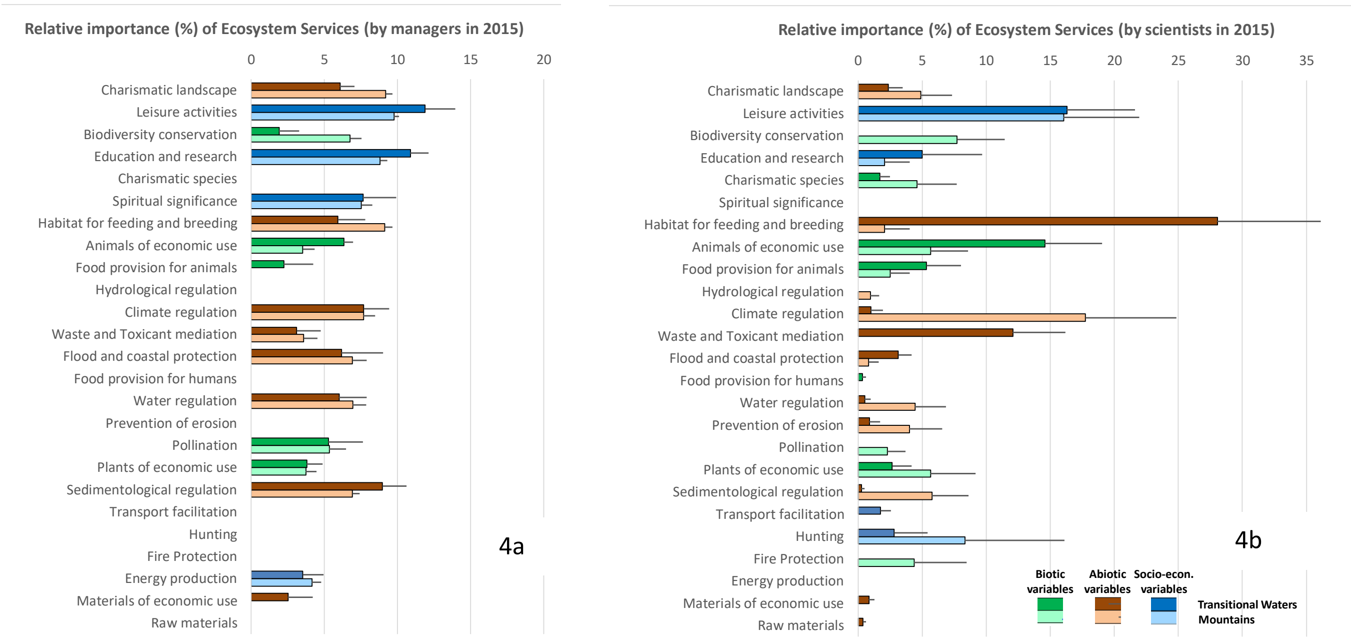

Figure 4. Relative importance (in %) of Ecosystem Services (ES) as perceived in 2015 by PA managers (4a) and EcoPotential scientists (4b) in Transitional Waters and Mountains. Upper row (darker colours) indicates Transitional Waters, lower row (lighter colours) indicates Mountains, separated in ES of biotic (green), abiotic (brown) and socio-economic (blue) nature (indicated are averages and standard errors; for comparison the order of variables corresponds with the order of importance as found in 2017/18).

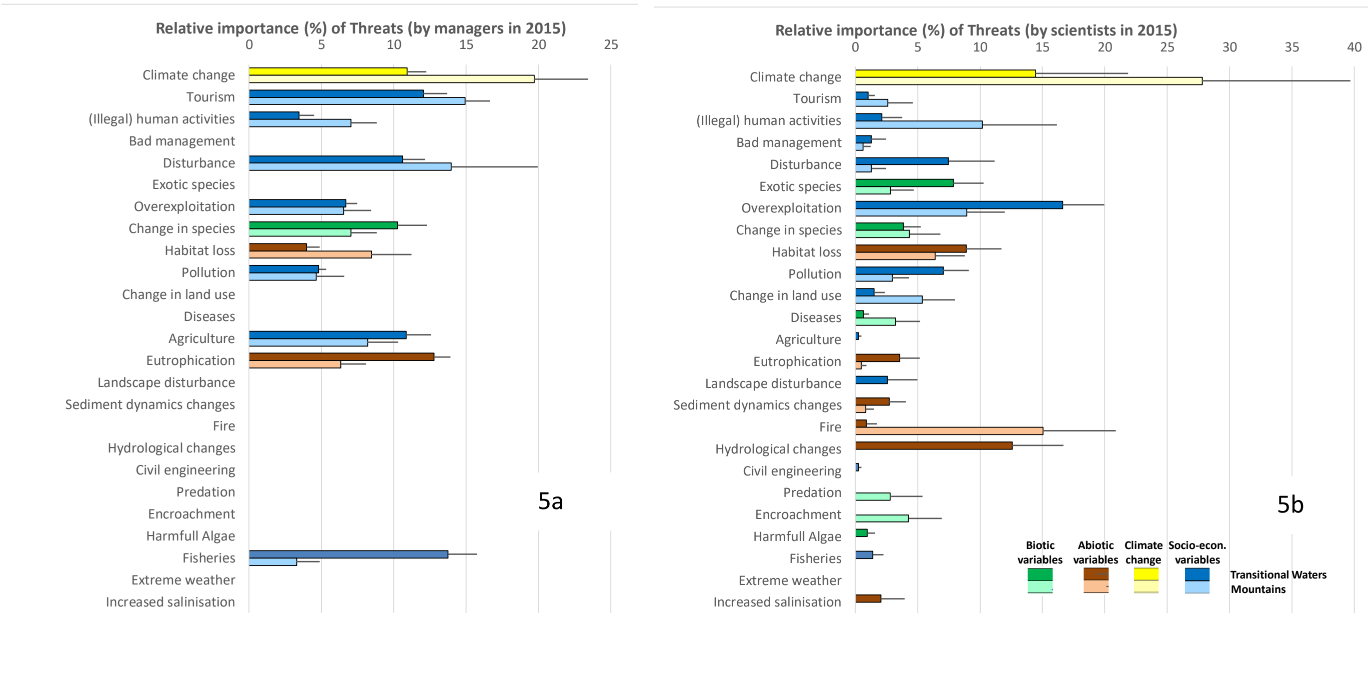

Figure 5. Relative importance (in %) of Threats as perceived in 2015 by PA managers (5a) and EcoPotential scientists (5b) in Transitional Waters and Mountains. Upper row (darker colours) indicates Transitional Waters, lower row (lighter colours) indicates Mountains, separated in Threats of biotic (green), abiotic (brown), climatic (yellow), and anthropogenic (blue) nature (indicated are averages and standard errors; for comparison with the results of 2017/18 the order of variables corresponds with that of the order of importance as found in 2017/18).

3.4 The surveys of 2017/2018

3.4.1 Participation of PAs in the survey

Although initially a full range of EcoPotential surveys in less than 10 PAs was planned, finally more than 120 PA managers, rangers and scientists from 26 PAs participated in the surveys. Of these PAs 22 were on the European continent, 1 was Israelian, and 3 near/in Africa (though 2 of them officially belonging to the EC). An additional dozen scientists from related EcoPotential institutions, related to the PAs, were involved in the surveys too. Most participants were involved in the third series of surveys (appendix 8).

Due to the dissemination activities of EcoPotential, e.g. at conferences, several of the surveyed PAs did originally not belong to the project yet wanted to become involved in the EcoPotential project and its 2017/2018 surveys and thereby were interviewed at their own request. These PA are Prespa RP in Macedonia, Pieniny NP in Slowakia, and Appia Antica and Castelli Romani in Italy.

3.4.2 Relative importance of variables

In 2017/18 all the results of the surveys on the importance of ES, EF and Threats variables are more complete, regular, and consistent than in 2015, as well among the domains (Transitional Waters, Mountains, Semi-Arid) as between PA managers and scientists. The eminent differences and the huge variation that were observed in 2015 have disappeared. The change in variation, as measured by the Coefficient of Variation (table 2), especially decreased threefold for the perception of the scientists, who moved in the direction of PA managers for whom the variation in perception remained almost similar.

The decrease in variation, and the increased similarity between the perception of PA managers and scientist, is also in a glance eminent from the depicted results in Figs 6, 7, and 8.

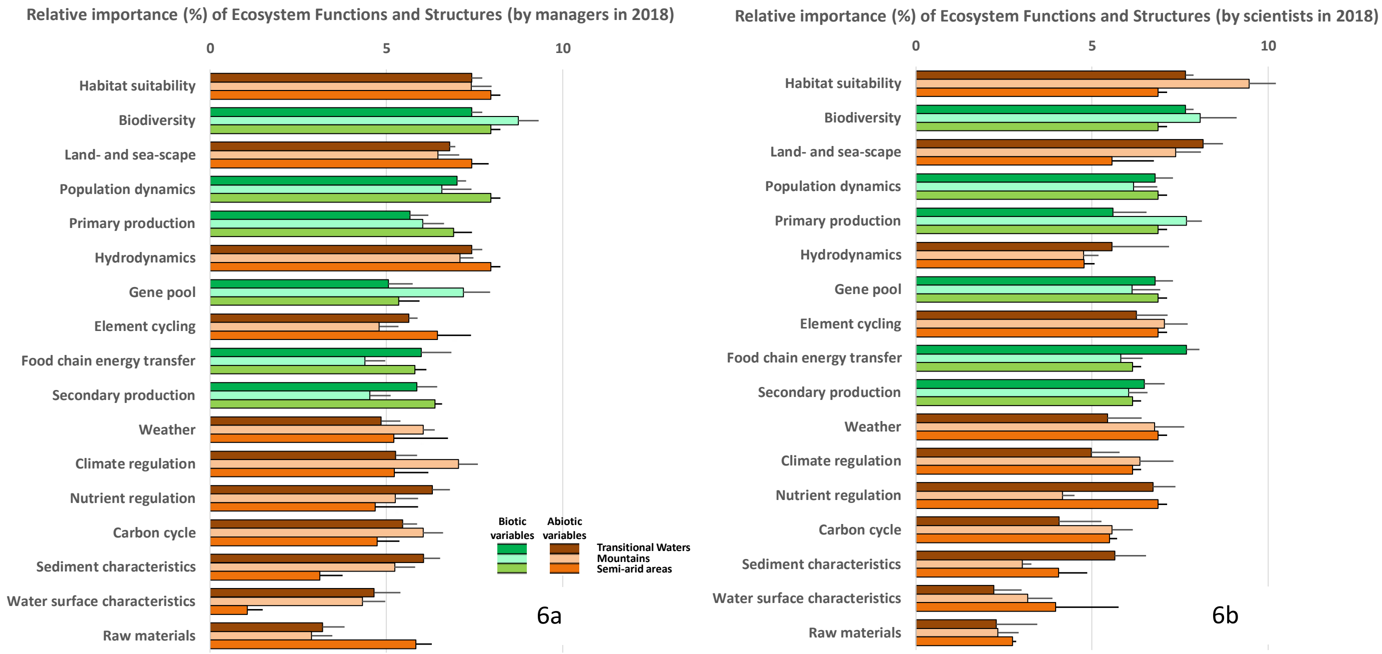

Figure 6. Relative importance (in %) of Ecosystem Functions and Structures (EF) as perceived in 2017/18 by PA managers (6a) and EcoPotential scientists (6b) in Transitional Waters, Mountains, and Semi-Arid areas. Upper row (darker colours) indicates Transitional Waters, middle row (lighter colours) indicates Mountains, lower row (mediocre colours) indicates Semi-Arid areas; all separated in EF of biotic (green), and abiotic (brown) nature (indicated are averages and standard errors).

The EF with the highest scores were Habitat suitability, Biodiversity, Land- and sea-scape, and Population dynamics (Fig. 6). The EF of the sub-top are Primary production, Hydrodynamics, Gene pool, Element cycling, Food chain energy transfer, Secondary production, Weather, Climate regulation, and Nutrient regulation.

The EF judged to be of lower importance are all abiotic environmental variables.

For the ES a somewhat stronger differentiation of importance than for EF occurred (Fig. 7). The most important (top) ES variables being Charismatic landscape, Leisure activities, Biodiversity conservation, Education and research, Charismatic species, and Spiritual significance. The sub-top ES variables are Habitat for feeding and breeding, Animals of economic use, Food provision for animals, Hydrological regulation, Climate regulation, and Waste and Toxicant mediation. A couple of variables, especially Raw materials and Materials of economic use, is judged to be of very low importance.

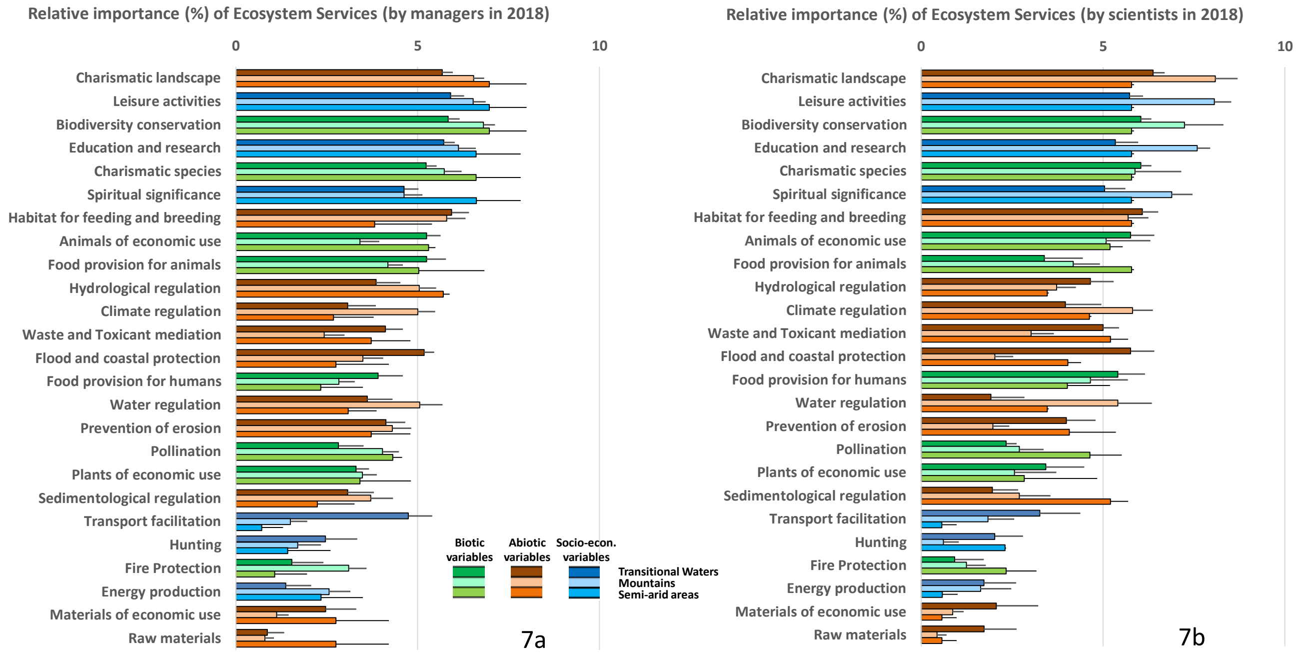

Figure 7. Relative importance (in %) of Ecosystem Services (ES) as perceived in 2017/18 by PA managers (7a) and EcoPotential scientists (7b) in Transitional Waters, Mountains and Semi-Arid areas. Upper row (darker colour) indicates Transitional Waters, middle row (lighter colour) indicates Mountains, lower row (mediocre colour) indicates Semi-Arid areas; all separated in ES of biotic (green), abiotic (brown) and socio-economic (blue) nature (indicated are averages and standard errors).

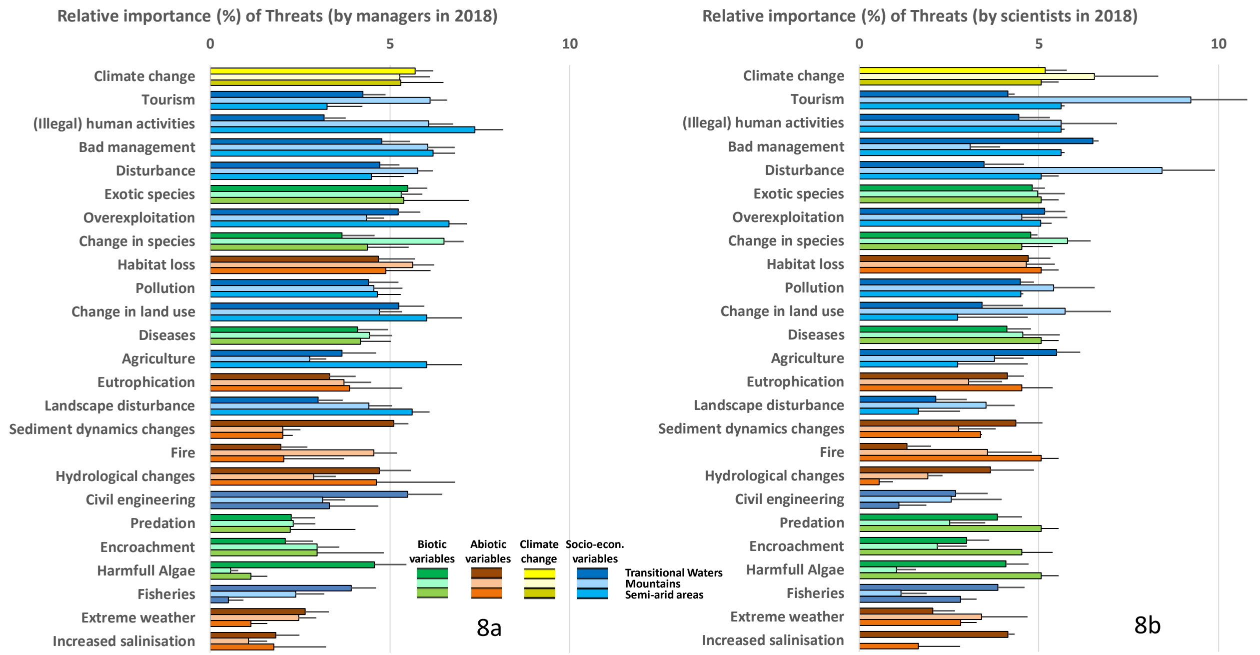

Figure 8. Relative importance (in %) of Threats as perceived in 2017/18 by PA managers (8a) and EcoPotential scientists (8b) in Transitional Waters, Mountains and Semi-Arid areas. Upper row (darker colours) indicates Transitional Waters, middle row (lighter colours) indicates Mountains, lower row (mediocre colours) indicates Semi-Arid areas; all separated in Threats of biotic (green), abiotic (brown), climatic (yellow), and anthropogenic (blue) nature (indicated are averages and standard errors).

Among the importance level of Threat variables more variation occurred than for ES or EF. The differences between PAs was higher, and therefore a higher CV was found (table 2), yet also stronger differences between the different domains (TW, Mo, SA) were found (Fig. 8). Nevertheless, the variation was much less than in 2015, and similar trends were indicated by PA managers and scientist (Fig. 8).

The most important (top) Threats being Climate change, Tourism, (Illegal) human activities, Bad management, Disturbance, Exotic species, Overexploitation, Change in species, and Habitat loss. The sub-top Threats were Pollution, Change in land use, Eutrophication, and Diseases, and Agriculture.

A few variables were judged to be hardly a Threat, as e.g. Extreme weather, Fisheries, and Increased salinisation.

Table 2. Coefficient of variation (CV) in the relative importance of ecosystem functions and structures (EF), ecosystem services (ES) and threats (Thr) indicated by scientists and PA managers, for transitional water PA (TW), mountainous PA (MO), and semi-arid PA (SA).

		2015	*2015*	*2018*	*2018*		*2018*	*2018*
Domain	*Variable*	*CV among Scientists*	*CV among PA Managers*	*CV among Scientists*	*CV among PA Managers*		*Among all domains*	*CV among all*
TW	EF	1.15		0.26	0.23		All EF	0,24
TW	ES	1.15	0.70	0.35	0.39		All ES	0,38
TW	Thr	1.19	0.36	0.32	0.52		All Thr	0,47
MO	EF	1.15		0.31	0.39			
MO	ES	1.60	0.28	0.49	0.45			
MO	Thr	1.40	0.72	0.71	0.58			
SA	EF			0.10	0.17			
SA	ES			0.14	0.46			
SA	Thr			0.22	0.46			
Average		**1.27**	**0.52**	**0,32**	**0,41**			

3.4.3 Absolute scores for the importance level of variables in 2017/18

The counts of the scores (called: the absolute score) of importance for all variables were very comparable between PA managers and scientists (table 3). This yielded a straightforward overview on most important ES, EF, and Threats variables.

For the EF the most important (top) variables are Biodiversity, Habitat suitability, Land- and sea-scape, and Population dynamics (table 3). The sub-top variables are Hydrodynamics, Gene pool, Climate regulation, Primary production, Weather, and Element cycling.

For the ES the most important (top) variables are Leisure activities, Charismatic landscape, Biodiversity conservation, Education and research, and Charismatic species (table 3). The sub-top variables are Habitat for feeding and breeding, Spiritual significance, Animals of economic use, and Climate regulation. Raw materials were judged to be hardly of any importance.

For the Threats no specific strong Threats were indicated (table 3). Therefore, only sub-top variables are noted, being Bad management, Change in land use, Disturbance, Exotic species, Tourism, Overexploitation, and Change in species. The Threats by Fisheries, Harmful algae, and Increased salinisation were indicated to be hardly of any importance.

Table 3. Frequency of high and low scores on importance of variables as indicated in the third (PA managers) and fourth (scientists) survey (break-off levels for color-codes at 50 and 75 % of maximum scores, being 14 by scientists, 26 by PA managers, and 40 as a total)

	Color-code for scores 4 + 5				Color-code for scores 0 + 1		Color-code for scores 4 + 5				Color-code for scores 0 + 1		Color-code for scores 4 + 5	Color-code for scores 0 + 1
n =	12 - 14				8 - 11		20 - 26				14 - 19		31-40	21-30
n =	8 - 11				12 - 14		14 - 19				20 - 26		21-30	31-40
Main description of variable	**Scores by scientists**						**Scores by PA managers**						**Total**	
	score = 5	**score = 4**	**score = 3**	**score = 2**	**score = 1**	**score = 0**	**score = 5**	**score = 4**	**score = 3**	**score = 2**	**score = 1**	**score = 0**	**score = 4 + 5**	**score = 0 + 1**
Ecosystem Functions and Structures														
Biodiversity	9	3	0	1	1	0	23	2	1	0	0	0	37	1
Habitat suitability	9	4	1	0	0	0	17	6	1	2	0	0	36	0
Land- and sea-scape	7	2	3	2	0	0	12	10	1	2	0	1	31	1
Population dynamics	4	5	2	2	1	0	14	8	0	1	3	0	31	4
Hydrodynamics	1	4	3	4	1	1	15	7	3	1	0	0	27	2
Gene pool	3	6	2	2	1	0	9	9	3	2	3	0	27	4
Climate regulation	2	5	2	4	1	0	7	12	3	2	2	0	26	3
Primary production	4	5	3	2	0	0	8	8	5	3	2	0	25	2
Weather	4	4	1	5	0	0	5	9	7	2	3	0	22	3
Element cycling	4	4	4	2	0	0	4	9	8	1	3	1	21	4
Carbon cycle	1	4	4	2	3	0	4	11	6	4	0	1	20	4
Secondary production	1	5	6	2	0	0	6	6	7	3	3	1	18	4
Food chain energy transfer	3	4	4	3	0	0	8	3	9	1	2	3	18	5
Nutrient regulation	4	0	3	6	1	0	6	7	7	3	2	1	17	4
Sediment characteristics	0	3	1	6	4	0	6	5	8	4	2	1	14	7
Water surface characteristics	1	1	0	5	5	2	3	6	5	4	4	4	11	15
Raw materials	0	0	1	6	3	4	1	3	6	8	3	5	4	15
Ecosystem Services														
Leisure activities	7	7	0	0	0	0	18	7	1	0	0	0	39	0
Charismatic landscape	10	3	1	0	0	0	17	8	1	0	0	0	38	0
Biodiversity conservation	9	3	0	1	1	0	22	2	2	0	0	0	36	1
Education and research	6	6	2	0	0	0	15	9	1	0	1	0	36	1
Charismatic species	6	6	0	0	0	2	11	11	2	1	1	0	34	3
Habitat for feeding and breeding	4	6	3	0	1	0	15	5	4	0	1	1	30	3
Spiritual significance	5	5	3	1	0	0	6	9	8	1	1	1	25	2
Animals of economic use	6	3	2	1	0	2	6	7	7	1	3	2	22	7
Climate regulation	1	7	2	3	1	0	6	8	4	2	3	3	22	7
Water regulation	2	2	5	1	2	2	9	4	6	2	2	3	17	9
Food provision for animals	3	2	2	3	4	0	8	3	6	9	0	0	16	4
Hydrological regulation	1	2	4	5	2	0	9	4	9	2	0	2	16	4
Flood and coastal protection	2	2	2	3	3	2	7	5	5	2	5	2	16	12
Food provision for humans	3	5	2	2	0	2	2	5	4	8	4	3	15	9
Prevention of erosion	1	2	1	4	4	2	5	7	7	2	4	1	15	11
Sedimentological regulation	1	2	2	2	4	3	4	7	3	4	3	5	14	15
Pollination	1	0	2	7	2	2	1	10	4	6	3	2	12	9
Waste and Toxicant mediation	2	2	3	4	2	1	5	3	4	4	6	4	12	13
Plants of economic use	3	1	0	3	2	5	3	3	9	6	3	2	10	12
Transport facilitation	1	0	3	2	2	6	3	3	3	5	3	9	7	20
Hunting	0	0	1	4	2	7	3	4	2	1	2	14	7	25
Fire Protection	0	0	3	0	4	7	3	2	6	2	3	10	5	24
Materials of economic use	0	1	0	1	5	7	3	1	2	3	6	11	5	29
Energy production	0	0	3	1	2	8	1	3	3	4	7	8	4	25
Raw materials	0	0	1	1	3	9	1	0	1	4	6	14	1	32

Threats														
Bad management	5	1	2	2	2	2	8	9	3	3	3	0	23	7
Change in land use	2	4	3	0	2	3	8	8	3	3	2	2	22	9
Disturbance	3	4	4	1	1	1	6	8	7	3	2	0	21	4
Exotic species	1	5	3	4	0	1	8	7	2	5	3	0	21	4
Tourism	3	4	5	2	0	0	7	7	5	3	4	0	21	4
Overexploitation	4	3	4	0	0	3	7	7	5	3	3	1	21	7
Change in species	1	4	5	2	2	0	8	7	6	1	2	2	20	6
Habitat loss	2	3	4	3	1	1	9	6	5	2	2	2	20	6
(Illegal) human activities	5	3	0	2	3	1	8	3	9	2	4	0	19	8
Climate change	2	3	6	0	3	0	9	3	7	5	2	0	17	5
Pollution	1	5	6	0	0	2	5	3	8	4	5	1	14	8
Fire	1	3	0	3	2	5	5	5	1	4	4	7	14	18
Hydrological changes	1	1	0	3	5	4	6	6	2	3	2	7	14	18
Landscape disturbance	0	1	4	3	2	4	5	6	7	1	3	4	12	13
Civil engineering	0	1	1	5	0	7	5	6	4	3	2	6	12	15
Diseases	1	4	0	5	4	0	3	3	8	9	2	1	11	7
Eutrophication	1	3	3	3	1	3	3	4	6	4	5	4	11	13
Agriculture	4	0	3	1	4	2	4	3	5	4	6	4	11	16
Sediment dynamics changes	1	1	3	2	4	3	4	2	2	6	6	5	8	18
Extreme weather	0	0	1	6	4	3	1	3	2	8	5	7	4	19
Encroachment	1	1	2	4	2	4	2	3	4	3	7	7	7	20
Predation	1	2	3	3	1	4	2	2	5	2	5	10	7	20
Fisheries	0	1	4	3	0	6	5	2	3	1	5	10	8	21
Harmfull Algae	1	3	1	2	2	5	4	1	1	1	7	12	9	26
Increased salinisation	0	0	5	0	0	9	1	3	1	1	3	16	4	28

3.5 Comparison of the surveys, and selection of EEVPA and ESVPA

As a last step, on basis of all surveys a final selection of the most important variables was performed. These variables had to have in most surveys a top-score for importance as perceived by scientists as well the PA managers (see explanation of the valuation in chapter 2.5 of the M&M, and table 4).

When abstracting all the information towards a general overview on what the most important variables are, a remarkable resemblance was found between the outcomes (table 4), irrespective of the earlier differences in perception of PA managers and scientist (as found for the 2015 surveys) and irrespective of the different approaches used in the surveys and in analysing the results. This makes that these selected variables can trustfully be nominated the Essential Environmental Variables for Protected Areas (EEVPA) and the Essential Socio-economic Variables for Protected Areas (ESVPA).

In the end, there are among the Ecosystem Functions and Structures (EF) 5 EEVPA (Habitat suitability, Biodiversity, Population dynamics, Primary production, and Land- and sea-scape).

Among the Ecosystem Services (ES) there are 4 EEVPA (Habitat for feeding and breeding, Charismatic landscape, Biodiversity conservation, and Charismatic species), and 3 ESVPA (Leisure activities, Education and research, and Spiritual significance).

For the Threats 3 ESVPA (Overexploitation, Disturbance, and Tourism) and 2 EEVPA (Change in species, Climate change) can be indicated. The most important Threats thus being of anthropogenic origin.

All these finally selected variables are because of their high prioritisation by PA managers and scientists and because of the generality of their occurrence in the majority of the PAs of utmost importance to be used in further studies and comparisons of the current and future status and changes in the quality and requirements of PAs.

On the other hand, some variables, because of their minor importance and rare recognition, are better not to be used in European wide comparisons and studies (table 4), yet notwithstanding the fact that in a few PAs they might have a role to be included in local studies. These variables are 2 EF (Water surface characteristics, Raw materials), 5 ES (Hunting, Fire Protection, Materials of economic use, Energy production, Raw materials), and 3 Threats (Extreme weather, Fisheries, Increased salinization).

Table 4. Selection of the very highly important (top; blue) and sub-top (yet still high importance; green) EF, ES and Threats variables, of which the top variables are to be nominated Essential Environmental Variables for Protected Areas (EEVPA) or Essential Socio-economic Variables for Protected Areas (ESVPA). The final score is based upon the importance scores in 2015 (top 2 = blue, and sub-top 4 = light-green; chapter 3.2), the relative importance scores in 2017/18 (top = 0-25 % of score amplitude below max = blue, and sub-top = 25-50 % of score amplitude below max = light-green; chapter 3.3.1), and the absolute importance scores in 2017/18 (top = 75-100 % high scores all-over = blue, and sub-top = 50-75 % high scores all-over = light-green, where 100 % is 40; chapter 3.3.2, table 3). The final score was calculated as 2 points for each top-score and 1 point for each sub-top score, whereby the final top EEVPA and ESVPA must have 4 to 6 points and sub-top 2 or 3 points. In the table is also indicated whether it is a variable of abiotic environmental (A), biotic environmental (B), and socio-economic or anthropogenic (S) nature. Moreover, some alternative descriptions are indicated for further clarification (taken from the harmonisation tables in appendix 6).

Variable	Alternative descriptions and examples	B/A/S	EEVPA or ESVPA	Final score	2018 avg	2018 score 4+5	2018 score 0+1	2015 avg
Ecosystem Functions and Structures								
Habitat suitability	Habitat availability, Feeding and breeding grounds, Ecotypes, Salinity	A	Abiotic EEVPA	6	7,80	36	0	13,3
Biodiversity	Status, Changes, Endemism, protected species	B	Biotic EEVPA	5	7,79	37	1	11,8
Population dynamics	Recruitment, Seed dispersal, Reproduction, Pollination, Succession, Resilience, Grazing, Predation, Species distribution	B	Biotic EEVPA	5	6,90	31	4	11,4
Primary production		B	Biotic EEVPA	5	6,46	25	2	21,4
Land- and sea-scape	UNESCO World Heritage	A	Abiotic EEVPA	4	6,96	31	1	6,6
Hydrodynamics	Currents, Water flow, Water regulation and retention	A		2	6,26	27	2	6,4
Gene pool	Genetic resources	B		2	6,23	27	4	1,1
Climate regulation	Change of microclimate	A		2	5,84	26	3	0,4
Weather	Temperature, Evaporation	A		2	5,87	22	3	0,6
Element cycling	Biogeochemical cycling, Hydro-geo-eco processes	A		2	6,18	21	4	1,7
Secondary production		B		2	5,91	18	4	8,6
Carbon cycle	Storage, Sequestration	A		0	5,23	20	4	3,1
Food chain energy transfer	Energy flow	B		1	5,97	18	5	0,5
Nutrient regulation		A		1	5,66	17	4	2,6
Sediment characteristics	Soil composition, structure and formation, sediment transport, erosion	A		1	4,52	14	7	9,8
Water surface characteristics	Albedo	A		-2	3,23	11	15	
Raw materials	Sand, Pebbles, Amber	A		-2	3,21	4	15	0,8
Ecosystem Services								
Leisure activities	Recreation and tourism, Birdwatching	S	ESVPA	6	6,50	39	0	13,5
Education and research		S	ESVPA	5	6,20	36	1	6,7

Habitat for feeding and breeding		A	Abiotic EEVPA	5		5,52	30	3	11,3
Charismatic landscape		A	Abiotic EEVPA	4		6,57	38	0	5,6
Biodiversity conservation	Protection of species, habitat and genetic resources	B	Biotic EEVPA	4		6,45	36	1	4,1
Charismatic species		B	Biotic EEVPA	4		5,88	34	3	2,1
Spiritual significance		S	ESVPA	4		5,60	25	2	7,6
Animals of economic use	Aquaculture, Bait, Beekeeping, Cattle, Fishing, Shellfish	B		3		5,00	22	7	7,5
Climate regulation	incl. Carbon sequestration	A		3		4,20	22	7	8,5
Food provision for animals	Grazing, Fodder	B		1		4,64	16	4	3,4
Hydrological regulation	Water flow maintenance	A		1		4,41	16	4	0,5
Waste and Toxicant mediation	Denitrification, Wastewater treatment, Nutrient regulation, Pest and disease control	A		1		3,92	12	13	4,7
Water regulation	Fresh water, Water storage, Supply of drinking water	A				3,76	17	9	4,5
Flood and coastal protection	Flood and erosion protection, Coastal protection	A				3,87	16	12	4,3
Food provision for humans	Food collection	B				3,86	15	9	0,2
Prevention of erosion		A				3,70	15	11	2,4
Sedimentological regulation	Maintenance of soil fertility, Soil formation	A				3,15	14	15	5,5
Pollination	Seed dispersal	B				3,48	12	9	3,2
Plants of economic use	Agriculture, Cork, Fruits, Timber, Mushrooms, Berries	B				3,17	10	12	4,0
Transport facilitation	Shipping lanes	S		-1		2,11	7	20	0,9
Hunting	Selling licenses	S		-2		1,76	7	25	5,6
Fire Protection	Wildfire regulation	B		-2		1,71	5	24	2,2
Materials of economic use	Mining, Salt, Amber extraction	A		-2		1,64	5	29	1,1
Energy production	Hydropower, Wind farms, Geothermic water	S		-2		1,70	4	25	3,8
Raw materials	Sand, gravel, shell extraction	A		-4		1,19	1	32	0,2
Threats									
Overexploitation	Intensive agriculture, Overfishing, Too high tourist density	S	ESVPA	5		5,16	21	7	9,7
Disturbance	Anthropogenic disturbance, Off-road vehicles, Transport	S	ESVPA	4		5,32	21	4	8,3
Tourism	Recreational activities	S	ESVPA	4		5,43	21	4	7,6
Change in species	Species loss, Successional stagnation, Aging of wild stocks, Food competition with cultured species, Prey decline	B	Biotic EEVPA	4		4,94	20	6	6,4
Climate change	Change in precipitation or snow cover, Droughts, Sea level rise, Global Warming	C	Abiotic EEVPA	4		5,51	17	5	18,2
Bad management	Inappropriate water management	S		3		5,37	23	7	1,0
Exotic species	Invading species	B		3		5,17	21	4	5,3

Habitat loss	Habitat fragmentation, Loss of connectivity, Forest decay, Reduction of salt-marshes	A		3		4,94	20	6	6,9
Change in land use	Abandonment of farming, Decrease of crops, Urbanisation, Harbour Extension	S		2		4,64	22	9	3,4
(Illegal) human activities	Poaching, Picking of plants, Illegal logging, Illegal fisheries	S		2		5,38	19	8	5,7
Pollution	Pesticides, Atmospheric Pollution, Sonar and sound pollution	S		1		4,67	14	8	4,9
Diseases	Pests	B		1		4,41	11	7	1,9
Eutrophication	Hypertrophic conditions	A		1		3,77	11	13	5,8
Agriculture		S		1		4,08	11	16	4,8
Fire		A				3,09	14	18	8,0
Hydrological changes	Deepening shipping lanes, Hydraulic modification, Increased turbidity, Increased wave action, Ground-water extraction	A				3,05	14	18	6,3
Landscape disturbance	Visual ruining, Gas platforms	S				3,39	12	13	1,3
Civil engineering	Increased number of dams	S				3,05	12	15	0,1
Sediment dynamics changes	Avalanches, Erosion, Embankments within wetlands, Dredging, Siltation	A				3,27	8	18	1,8
Encroachment		B				2,96	7	20	2,1
Predation	Incl by exotic species as rats and cats	B				3,04	7	20	1,4
Harmfull Algae	Algal blooms	B		-1		2,74	9	26	0,5
Extreme weather	Storm surges	A		-2		2,42	4	19	
Fisheries	Bycatch in gill nets	S		-3		2,45	8	21	4,6
Increased salinisation		A		-3		1,74	4	28	1,0

3.6 Proxies and metrics for EV and IV, and the use of in-situ or RS observation

In the fourth survey concrete proxies and metrics for all harmonised variables were inventoried. Again, a high diversity of in total 768 ‘variable-indicator-metrics’ combinations was suggested (appendix 9). After taking duplications out, on basis of the inventories, expert opinion and literature reviews, the most practical proxies and metrics for the variables were chosen (table 5).

In total for the 30 EV and IV a set of 88 indicators (proxies) are given, of which 30 % can be measured through RS observation and 91 % by means of *in-situ* observation. Since some indicators can be measured by means of *in-situ* as well as RS observation the percentage is higher than 100; the excess over 100 % indicates the percentage that both observation approaches can be used.

This division (90 % for *in-situ* and 30 % for RS) is consistent for the 3 major groups of variables (EF, EV, Threats). For the EF variables a total of 30 indicators and their metrics are advised to be measured by means of RS (9) or *in situ* (26) for further studies. For the ES variables a total of 22 indicators and their metrics are advised to be measured by means of RS (7) and/or *in situ* (22 = all). For the Threat variables a total of 36 indicators and their metrics are advised to be measured by means of RS (10) and/or *in situ* (31).

Clearly for most variables a wide variety of *in situ* indicators is available. Whereas RS indicators are much less numerously available, still for most variables a RS indicator is available. Nevertheless, it is logic that for an EF as ‘Gene pool’, or an ES as ‘Education and Research’, or an Threat as ‘Bad management’, there do not exist methods to use RS observation. This may be partially the cause of the skewed distribution towards more *in-situ* observation, next to a more or less traditional view of the PA management on observing their PA.

Some indicators can thus be measured via RS as well as *in situ*. It should be considered that in those cases the combination of both approaches may yield stronger results than measured individually.

Table 5. Selection of indicators, and their metrics, for the most important variables (top and sub-top) EF, ES and Threats, judged to be the best for further harmonisation (of highest importance to be measured especially in comparisons between PA and in time = blue = EESVPA and ESVPA; of high importance = green variables); Ch = for this variable there is often a focus on changes in time; In-situ = indicator (proxy) can be measured by in-situ observation, In-situ / RS = indicator can be measure by in-situ as well as RS observation, RS = indicator can be measured by in RS observation)

Category / Variables (and some examples)	Ch	Selected Indicator	Reference	*In situ*	RS	Metric Unit	Remarks
ECOSYSTEM FUNCTIONS AND STRUCTURES							
Habitat suitability (Habitat availability, Feeding and breeding grounds, Ecotypes, Salinity)		Suitable niche theories of ecosystem engineers	Hirzel & Le Lay 2008	*In situ*		%	
		Habitat classification (incl. EUNIS)	Lucas et al. 2007; Moss 2018	*In situ*	RS	Class type	To be combined with characteristics and needsof organism, and habitat availability
		Carrying capacity	Larson et al. 2004	*In situ*		%	
Biodiversity (Status, Changes, Endemism, protected species)	Ch	Shannon Index (H)	Peet 1974, 1975	*In situ*		H	H = -Sum [(pi) * ln(pi)] E=H/Hmax
	Ch	Diversity Index	Rocchini et al. 2017		RS	RAO's Q	Rao's Q: diversity based on digital imagery > Shannon Index
Population dynamics (Recruitment, Seed dispersal, Predation, Reproduction, Pollination, Succession, Resilience, Grazing, Species distribution)	Ch	Vegetation cover changes	Homer et al. 2015		RS	%	
	Ch	Population structure (age, sexes)	Skalski et al. 2010	*In situ*		age/sex classs ratio	Change in composition
Primary production		Chlorophyll a	Yentsch & Menzel 1963; Cannizzaro & Carder 2006	*In situ*		wavelength mu	Highly sensitive optical system of the turner fluorometer
		Phytoplankton + microphytobenthos	Kromkamp & Peene 1995	*In situ*		g $C/m^2/y$	
		Net primary production	Rafique et al. 2016	*In situ*	RS	g C/y	
Land- and sea-scape (UNESCO World Heritage)		Habitat heterogeneity (EUNIS)	expert opinion	*In situ*	RS	nr habitats / ha	
Hydrodynamics (Currents, Water flow, Water regulation and retention)		Snow depth & water content	"http 3"	*In situ*		mL	Melting snow sample (set size)
		Flow velocity	Kostaschuk et al. 2005	*In situ*		m/s	Acoustic Doppler current profiler; debite in m^3/s divided by surface of section in m^2
		Tidal amplitude	Frisch and Weber 1980	*In situ*	RS	m	Doppler radar system
		Flood duration	Richter et al. 2008	*In situ*		h/year	
Gene pool (Genetic resources)		Genetic diversity	Nei 1972, 1978	*In situ*		H_0, Fst, D	

Climate regulation (Change of microclimate)	Ch	Land Surface Temperature	Tomlinson et al. 2011; "https 2"; "https 3"		RS	°C	Satellite based sensors; through thermal infrared - the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite.
	Ch	Sea Surface Temperature	Rayner et al. 2013		RS	°C	Two-stage reduced space optimal interpolation procedure, HADMATI data
	Ch	air temperature	Zhu et al. 2013; Kotchi et al. 2016	*In situ*	RS	°C	Estimation of minumum and maximum air temperature / Use of hygrothermometers
	Ch	relative humidity	Manabe 1967	*In situ*		%	Use of hygrometer
Weather (Temperature, Evaporation)	Ch	Precipitation	Weather station reports	*In situ*		mm	Rain gauge
	Ch	Cloud cover	Weather station reports	*In situ*		oktas	Cloud base recorder
	Ch	Wind speed	Weather station reports	*In situ*		m/s	Anemometer
	Ch	air temperature	Weather station reports	*In situ*		°C	
	Ch	Snow depth	"http 3"	*In situ*		mm	To be measured daily
Element cycling (Biogeochemical cycling, Hydro-geo-eco processes)		Nutrient budgets in soil	Hussain et al. 2007	*In situ*		mg/kg	LIBS method
		Mineralisation rates C, N	Fornara et al. 2009; Hansen 1991	*In situ*		g/kg	
		Element budgets	Moreno-Jimenez et al. 2011; Tyler & Olsson 2001	*In situ*		µMol	Carbon, Nitrogen, Phosphor, Silicium etc.
Secondary production	Ch	Standing stock of secondary producers	Daskalov et al. 2007; Odum 1986	*In situ*		g/m^2	
		P/B ratio	Kimmerer 1987	*In situ*		$g.\ y^{-1}\ g^{-1}$	Growth / biomass
ECOSYSTEM SERVICES							
Leisure activities (Recreation and tourism, Birdwatching)		Nr. tourists + tourist days	expert opinion	*In situ*		days/year	
		Number of pleasure crafts	Smallwood et al. 2011; Jensen & Cowen 1999	*In situ*	RS	nr/ha	Aerial observations
Education and research		Number of educational visits	Smith et al. 2013	*In situ*		nr/year	
		Funding (on basis of GNP)	expert opinion	*In situ*		euro/y/ha	
		Number of scientific projects, articles, studies	"http 10"	*In situ*		nr/year	Through googlescholar
Habitat for feeding and breeding		Number of offspring of indicator species	expert opinion	*In situ*		nr/ha	

		Breeding success of indicator species	Nisbet & Drury 1972	*In situ*		nr/breeding pairs	Includes juvenile mortality as proxy for feed abundance
		Suitable habitat for indicator species	Hirzel & Le Lay 2008	*In situ*	RS	%	
Charismatic landscape (Aesthetic values, Cultural heritage, Iconic landscapes)		Density of charismatic landscape elements	Ode et al. 2008; Kleban et al. 2009; Li et al. 2013; Gliozzi et al. 2016; Sessions et al. 2016; Dunkel et al. 2015	*In situ*	RS	nr/ha	Geocoded picture density; in EcoPotential contact Ioannis Manakos and Guy Ziv
		Percentage of undisturbed view	Ode et al. 2008; Filova et al. 2015	*In situ*	RS	%	Contact Ioannis Manakos
		Perception by inhabitants and visitors	Isendahl et al 2010	*In situ*		Likert-scale	By means of questionnaires
Biodiversity conservation (Protection of species, habitat and genetic resources)	Ch	(Change in) Indicator species	Carignan & Villard 2002; Coppolillo et al. 2004; Caro & Odoherty 1999	*In situ*		Shannon index	
	Ch	Historical biodiversity index (HBI)	Boero & Bondsdorff 2007	*In situ*		HBI	HBI= realised biodiversity/potential biodiversity
Charismatic species		Number of charismatic species	Verissimo et al. 2011	*In situ*		nr/ha	Article on how to select flagship species
Spiritual significance		Number of locations of spiritual significance	Plieninger et al. 2013	*In situ*		nr/ha	Through enquetes
Animals of economic use (Aquaculture, Bait, Beekeeping, Cattle, Fishing, Shellfish)		Livestock biomass	expert opinion	*In situ*		g/ha/year or kg/m^3/year	
Climate regulation (incl. Carbon sequestration)		Oceanic carbon sink	RS: Landschutzer et al. 2014; Sabine et al. 2004; Psomas et al. 2011	*In situ*		Mol/m^2	
		Terrestrial carbon sink	Petrokofsky et al. 2012; "http 11"	*In situ*	RS	g C/m^2	
		Surface + Air temperature	Tomlinson et al. 2011; "https 2"; "https 3"; Rayner et al. 2013; Zhu et al. 2013; Kotchi et al. 2016	*In situ*	RS	°C	
		Relative humidity	Manabe 1967	*In situ*		%	
		Light intensity	"https 5"	*In situ*	RS	lux	

		Windspeed	Weather station reports	*In situ*		m/s	
THREATS							
Overexploitation (Intensive agriculture, Overfishing, Too high tourist density)		Percentage fish below reproductive size	Usseqlio et al. 2016	*In situ*		%	
		Reduction of adult size	Pauly et al. 1998	*In situ*		%	
		Desertification	Han et al. 2015		RS	%/year	Landsat (MSAVI+ Albedo + LST + TVDI + FVC combi index
		Number of visitors above desired amount	Arnberger et al. 2005	*In situ*		%	
		Fishing and harvesting above MSY	Milner-Gulland & Akcakaya 2001; "http 12"	*In situ*		%	
Disturbance (Anthropogenic disturbance, Off-road vehicles, Transport)		Landscape disturbance	Bourbonnais 2017		RS	%	
		Noise disturbance (ocean)	Can 2015	*In situ*		pascal, dB, SPL, ESL	
		Noise disturbance (land)	Merchan et al. 2014	*In situ*		decibel	
		Number of dams	Dare et al. 2002	*In situ*	RS	nr/km	
		Number of vehicles	Muhar et al. 2002	*In situ*	RS	nr/ha/day	
		Soil sealing	Shalaby & Tateishi 2007; "https 6"	*In situ*	RS	%/ha	Copernicus land monitoringservices / Corine Land Cover (CLC) , urban atlas
		Number of pleasure crafts	Smallwood et al. 2011; Jensen & Cowen 1999	*In situ*	RS	nr/ha	Aerial observations
Tourism Recreational activities)		Number of visitors	Arnberger et al. 2005	*In situ*		nr	
		Money spent by visitors	Knaus & Backhaus 2014	*In situ*		euros	
		Spatial patterns of visitors	Monz et al. 2010	*In situ*		nr/ha	To assess hotspots in PA
		Crowd photos analysis	"https 7"	*In situ*		nr	
Change in species (Species loss, Successional stagnation, Aging of wild stocks, Food competition with cultured species, Prey decline)	Ch	Species community composition	Symstad et al. 1998; Godinho & Rabaca 2011	*In situ*		Shannon-index	
Climate change	Ch	Acidification (change in)	Appelhans	*In situ*		pH	digital pH meter
		Sea level	Colburn et al. 2016; Kostiuk 2002; Yang et al. 2013	*In situ*	RS	m	tide gauge/ satellite

(Change in precipitation or snow cover, Droughts, Sea level rise, Global Warming)		Hectares of wildfires	Klos et al. 2015	*In situ*	RS	ha	
		Precipitation	Ramos et al. 2015	*In situ*		mm	
		Temperature	Weather station	*In situ*		°C	
		Snow cover	Yang et al. 2013; Notarnicola et al. 2013	*In situ*		mm	
Bad management (Inappropriate water management)		Quotum and harvest above MSY	"http 13"	*In situ*		tonnes	MSY = Maximum sustainable yield
		Disproportional influence of stakeholders	Bienfait et al. (in prep.)	*In situ*		Si	
		Mismatch perception degree of corruption and political stability in PA vs country	Hummel et al. (in prep.)	*In situ*		index	
Exotic species (Invading species)	Ch	Invasive species	Kostoski et al. 2004; Talevski et al. 2010	*In situ*		Shannon-index	
Habitat loss (Habitat fragmentation, Loss of connectivity, Forest decay, Reduction of salt-marshes)	Ch	Habitat fragmentation	Wang et al. 2014	*In situ*			
	Ch	Accessible habitat (connectivity)	Eigenbrod et al. 2008	*In situ*		%	
	Ch	Reduction in habitat amount	Liu et al. 2001	*In situ*		ha	
	Ch	Number, size and isolation of patches	Liu et al. 2001; Molianen & Nieminin 2002; Winfree et al. 2005; Kindlmann & Buran 2008	*In situ*		nr; km^2; NNI	NNI = nearest neighbour index
Change in land use (Abandonment of farming, Decrease of crops, Urbanisation, Harbour Extension)	Ch	Detrimental land use/cover change	Rawat et al. 2014; Zhu et al. 2014; Tewkesbury et al. 2015		RS	% land cover	Distinction vegetation, agriculture, barren and built-up land
	Ch	Rate of urbanisation		*In situ*	RS	%	Rate of change in the size of the urban population over a given period of time.
(Illegal) human activities (Poaching, Picking of plants, Illegal logging, Illegal fisheries)		Number of ceased fishing nets/gears	expert opinion	*In situ*		Nr	
		Number of penalties by police/guards	expert opinion	*In situ*		Nr	
		Deforestation	Sánchez-Azofeifa et al. 2001		RS	km^2/year	Landsat

4. Discussion

4.1 The perception of importance of variables ànd the EcoPotential goals

The partipation in the surveys was much higher than expected. Instead of less than the initially 10 PAs intended to be surveyed, finally 26 PAs were involved in the extensive third survey, including several PAs that only noticed the project after outreach activities. This may indicate the strong interest in, and high relevance of, the aims and processes studied by EcoPotential. Also the disciplinary and geographic range of colleagues participating in the surveys, including more than 120 PA managers, rangers and scientists of 26 PAs, of which 22 European, 1 Israelian, 3 near/in Africa, indicates the commitment and relevance of the topics studied in EcoPotential.

The perception of the importance of the various EF, ES, and Threats variables differed strongly between colleagues at the start of the project (2015), especially between PA managers versus scientists. Though scientists may be "by nature" deviant in their findings and opinions, and managers more connected to similar practical issues that come everywhere to the foreground, the views were miles away from each other. That the views at both sides have been 'growing' towards each other, i.e. mainly a shift of the perception of the scientists towards the PA managers, may be due to the actions on the first results. The clear communication on the first results and the extensive EcoPotential surveys may have helped to overcome the earlier observed diaspora.

It is thus the result of the long and strong consultation process that out of the hundreds of suggested variables and indicators now a commonly agreed, strongly harmonised and standardised, listing has been reached for the most important EF, ES, and Threats variables, the 11 (abiotic and biotic) Essential Environmental Variables for Protected Areas (EEVPA) and 6 Essential Socio-economic Variables for Protected Areas (ESVPA) can be presented.

The selection of the best and most practical indicators (or proxies) and their metrics belonging to the selected EEVPA and ESVPA have still to be tested and further developed during the course of the project. The indicators have now been prioritised for their unambiguous outcomes or to be informative at the detail level of the specific variable, and for their general applicability in time and space over all studied domains (TW, SA, MO) during any moment in the year. Yet, the practical implementation and use for the selected EEVPA and ESVPA still has to follow and the results ot their use should be included in further updates.

Remarkable was that especially for RS some very general indicators as "land cover" were frequently brought forward (in this case 36 times), whereas care should be taken that such indicators may not meet the criteria on specificity and may not always deliver unambiguous (fool-proof) and distinctive outcomes. When following our selectrion criteria strictly these indicators would have to be ignored. For these RS indicators it is most appropriate to specify them more clearly and to combine them with ground-truthing or *in situ* indicators.

Nevertheless, because of the jointly high perception of importance of the selected 17 EEVPA and ESVPA variables, and their general occurrence in the majority of the PAs, they may form, together with the suggested indicators and metrics, the preferable basis for further RS and *in situ* studies and comparisons on the current and future status and changes in the quality and requirements of PAs.

In conclusion, we may state that due to the large number of PA investigated, the many managers, rangers and scientists queried, the standardised methods used for the third survey, and the finally strong consensus among PA managers as well as EcoPotential scientists on the final results regarding the most important ES, EF and Threat variables to indicate the status and development of their area, the outcomes of the surveys are highly representative and of direct use for PA in general

4.2 Comparison with inventories in other WPs

In WPs 2, 4, 7 and 12 some inventories of variables, indicators and metrics have been composed in the frame of their aims. These inventories can be compared to our overviews and selection of variables and indicators in order to see whether these lists do compare and are complementory to a satisfying degree or at theother hand do deviate too much and need additional attention.

4.2.1 Comparison with variables indicated by WP2

In Deliverable 2.2 of WP2, focussing on conceptual approaches, an overview of Essential Variables is presented derived from 15 EcoPotential Storylines (Guerra et al 2017). A pool of 45 variables was abstracted from the information in the Storylines and judged to be required to understand ecosystem and ecosystem service change within a PA. Yet, thirty-eight of these variables were not shared across a large number of areas. Therefore, across the different Storylines a shortlist of seven Essential Variables were obtained. This shortlist includes “Ecosystem extent and fragmentation”, “Precipitation”, “Population abundance”, “Taxonomic diversity”, “Land use”, “Land cover”, and “Net primary productivity”.

The 7 selected essential variables are all covered in our present list of EEVPA and ESVPA or the suggested indicators and metrics for these variables (table 6). The EV listed by Guerra et al coincides with 7 of the present 11 EEVPA and with 1 of the present 6 ESVPA,, 4 sub-top variables, and 2 metrics for the indicators. The EV by Guerra do thus merely miss the socio-economic variables (ESVPA) that were perceived by the PA managers and scientists as to be very important. This lack of ESVPA may be explained, as indicated by Guerra et al, by the Storyline approach that depends in “… the centre of decision making on the experts”. Indeed, from the survey of 2015 we now know that the experts, i.e. EcoPotential scientists, often did not mention socio-economic issues, and especially no Charismatic or Spritual issues. Therefore, the list of Guerra et al has to be extended with especially the ESVPA in this report.

Nevertheless, although the 7 EV mentioned by Guerra et al (2017) may be a too short listing to come to a proper understanding of as well the EF, as ES and Threats in a PA, we fully agree with their conclusion that “… By focusing on a concrete, but limited set of essential variables that is absolutely necessary to monitor the state and trends of a given protected area, managers are able to collect a robust set of data, from within and beyond its boundaries, facilitating the creation of a regular time series of data suitable for analysis. This process will help to identify the potential technological, methodological, knowledge and capacity building needs that have to be addressed to ensure the timely and continued indicator implementation process …” (p. 20).
Extending their 7 EV towards the now presented 17 EEVPA and ESVPA may for sure yield the results as foreseen by Guerra and his colleagues.

Table 6. Comparison of the Essential Variables (EV) selected by Guerra et al (2017)(Deliverable 2.2) and the variables, indicators or metrics in the present report (abstracted from table 4 and 5; sub-top = sub-top variable i.e. highly important variables but not as important as the EEVPA and ESVPA (highlighted in green color in tables 4/5)).

EV by Guerra et al 2017 (on basis of Storylines of 15 PA)	**EEVPA/ESVPA or Indicator in this report** (on basis of 4 Surveys in 26 PA)
“Ecosystem extent and fragmentation”	“Habitat suitability” (EEVPA for EF) “Habitat for feeding and breeding” (EEVPA for ES) “Habitat loss” (sub-top. for Threats)
“Precipitation”	Part of “Climate change” (EEVPA for Threats) Part of “Weather” (sub-top. for EF) Indicator for “Weather” (sub-top. for EF)
“Population abundance”	Population dynamics (EEVPA for EF)
“Taxonomic diversity”	“Biodiversity” (EEVPA for EF) “Gene pool” (sub-top. for EF) “Biodiversity conservation” (EEVPA for ES)
“Land use”	“Change in land use” (sub-top. for Threats)
“Land cover”	Metric for “Change in land use” (sub-top. for Threats) Metric for “Soil sealing” as part of “Disturbance” (EEVPA for Threats)
“Net primary productivity”	“Primary production” (EEVPA for EF)

4.2.2 Measures indicated by WP4 and WP12

In Deliverable D12.6 a listing is indicated of EO modules and products, including modules presented by WP4.2 to 4.7 (Williams et al 2017). This list is compared to the present list of variables, indicators and metrics, taking into account whether they match with variables of the highest importance (the EEVP or ESVP; blue color), or with sub-top highly important variables (green color) or a less important variable, and/or with the indicators and metrics belonging to these variables (table 7).

The WP4/WP12 inventory can be interpreted as the Supply-side, i.e. what can be offered by EcoPotential, whereas the present WP9 inventory represents more or les the Demand, i.e. what products is requested for.

Of the 36 Products/modules offered 22 match (mostly only partly) with 10 of the present 11 EEVPA, with none of the 6 ESVPA in this study, and with 6 sub-top important variables. Although for almost all EEVPA a RS products/module, that may match partly the content of the variables, the offered products thus completely miss the socio-economic variables (ESVPA) that were perceived by the PA managers and scientists as to be very important. This lack of ESVPA may be explained by the fact that those EEVPA are best measured by *in situ* techniques.

Therefore, what is offered is only for a smaller part covering the demands for the studied PA. In further studies an emphasis should be laid on RS methods suitable to measure also the ESVPA, as certainly there are (see table 5).

Table 7. Comparison of variables and products that can be measured with EO as indicated in D12.6, including those presented by WP4.2 to 4.7, with the present list of (EF, ES, Threats) variables, indicators and metrics (positive match is indicated in blue for variables of the highest priority (the EEVP or ESVP), in green for highly important variables (= sub-top variables), and in yellow for a less important variable (blank in case of no match)(part = only part of the WP9 variable is covered by the WP4/WP12 product).

	WP4 / WP12 Variable/Product	**Match with WP9 variable/indicator/metric**	
Soil	Soil Moisture	--	
	Soil Moisture Volumetric Water content	--	
	Spectral Soil Quality Index (SSQI)	--	
	Soil sealing (Imperviousness)	Disturbance (Threat, EEVPA, part)	
Physical Land	Surface Albedo	Water surface characteristics (EF)	
	Land Surface Temperature (LST)	Climate regulation (EF, sub-top., part)	
	Digital Elevation Model (DEM)	--	
In-Land Water (includes Snow)	Water bodies delineation (coverage)	--	
	Water turbidity (inland waters)	Hydrological change (Threats, part)	
	Hydroperiod (seasonal water bodies)	Hydrodynamics (EF, sub-top., part)	
	Total Suspended Solids (TSS)	--	
	Snow cover maps (snow cover area+snow status wet/dry)	Climate change (Threat, EEVPA, part)	Weather (EF, sub-top., part)
	Snow cover (snow cover maps, snow cover duration maps)	Climate change (Threat, EEVPA, part)	Hydrodynamics (EF, sub-top., part)
LU/LC	Land cover/land use	Change in land use (Threat, sub-top., part)	
	Land Cover Change (LCC)	Disturbance (Threat, EEVPA, part) Population dynamics (EF, EEVPA, part)	
	Habitat Mapping	Habitat suitability (EF, EEVPA, part) Land- and Seascape (EF, EEVPA) Habitat for feeding and breeding (ES, EEVPA)	Habitat loss (Threat, sub-top., part)
	Leaf area index (LAI)	--	

Biological terrestrial	NDVI	Population dynamics (EF, EEVPA, part)	Change in land use (Threat, sub-top., part)
	Landscape (e.g. Fragmentation)	Land- and Seascape (EF, EEVPA) Charismatic landscape (ES, EEVPA, part) Disturbance (Threat, EEVPA, part)	
	Biodiversity indicators	Biodiversity (EF, EEVPA) Biodiversity conservation (ES, EEVPA)	
	Forest biomass	Population dynamics (EF, EEVPA, part)	Change in land use (Threat, sub-top., part)
	Forest disturbances (annual)	Population dynamics (EF, EEVPA, part)	Change in land use (Threat, sub-top., part) Habitat loss (Threat, sub-top., part) (Illegal) human activities (Threat, sub-top., part)
	Herbaceous biomass	Population dynamics (EF, EEVPA, part)	
	Gross Primary Production (GPP)	Primary production (EF, EEVPA)	
	Vegetation wetness (Vegetation water content (VWC) or Equivalent Water Thickness (EWT), NDWI, Tasseled Cap)	--	
	Vegetation height and structure (e.g. Canopy Height Models (CHM))	--	
	Fire impact (forest canopy)	Climate change (Threat, EEVPA, part)	Fire (Threat)
	Phenology (start and end of the season, length of the season)	--	
Physical Sea/Marine	Shoreline change detection	--	
	Bathymetry (marshes, inland waters)	--	
	Sea Surface Temperature	Climate change (Threat, EEVPA, part)	Climate regulation (EF, sub-top., part)
	See surface Wind Speed and Direction	Weather (EF, sub-top., part) Climate regulation (EF, sub-top., part)	
	Marine oil spill detection and characterization	Pollution (Threat)	
Biological sea/marine	Sea bed classification	--	
	Colored Dissolved Organic Matter (CDOM)	--	
	Chlorophyll-a Concentration	Primary production (EF, EEVPA, part)	

4.3 Contribution to knowledge output of EcoPotential

In this report, Deliverable 9.1, we address three out of six issues mentioned by Williams et al 2017 (Deliverable 12.6) that are elementary in contributing to the knowledge output of the project and to the advancement of ecosystem studies and management of protected areas (PA):

- "Create a corpus of innovative, field-tested, peer reviewed and documented monitoring methodologies to define the ecological status of current and future protected areas, based on EO, both, remote and *in situ* data." The present report delivers that corpus, which may be refined in next steps of the project
- "Address the issues related to cross-scale interactions and landscape-ecosystem dynamics, including biological, geomorphological, climatic, social and economic connections and emergent properties across scales and using concepts and approaches from the fields of Macrosystem Ecology."

The standardised integrative and harmonised approach used in the present report for selecting indicators and measure for ES, as well as the underlying EF and eventually influencing Threats do present the issues needed for defining the interactions and connections across scales.

- "Quantify ecosystem services, taking into account social demand."
  In our report we have composed an overview on which ES to focus, and on which specific quantifiable measures, exactly in due consultation with the PA managers, taking next to environmental drivers also into account the socio-cultural and economic demands and impacts.

This report therefore does fullfil a significant part of the core aims in the EcoPotential project

4.4 Next steps towards a Roadmap for PAs

For further studies on the current and future requirements of PAs we may reach a standardised and harmonised approach by using one or two of the suggested metrics for each of the indicated highly important EEVPA and ESVPA. Thereby such a standardised approach will enable to compare the quality status of various mountainous, semi-arid, and coastal PAs in time and space, and will help to define the requirements for the current and future PAs.

The results of this report will be further developed through the following actions for Deliverable 9.2 (requirements for protection) and Deliverable 9.3 (impact of changes). Alltogether the results of these actions will be assembled in the Roadmap for PAs that may form a guideline for managers and policy involved in the management of PAs aiming to secure the best environmental quality in those areas and a sustainable use of its services (Task 9.3).

5. Rules for use of data (IPR, Privacy)

Due to the intense and detailed character of the queries, especially in the third series of surveys during summer and autumn 2017 among 25 PAs, a couple of special rules for the use of the data have been agreed. The most important rules are the following.

Regarding the Privacy, i.e. the use of Personal data, it was stated that: "The collected personal data information will never be provided to third parties without your explicit unambiguous consent." During the course of the survey the management of 4 PAs already on beforehand has stated that with regard to the use of Personal and/or General Data the free/open use/access of the data by third parties cannot be granted. The consequence is that the use of data from this report can be granted for part of the data only after consultation of the lead of the surveys, i.e. Herman Hummel of NIOZ

Regarding Copyright, it has been stated that the survey materials can be used solely with the permission of the responsible partners (Herman Hummel and Christiaan Hummel (NIOZ) and Rutger de Wit and Yolande Boyer (UMontpellier)), and that copies, adaptations, translations, edits, changes to all or part of the survey, in any form or by any means, are strictly prohibited, unless prior written permission has been granted by those responsible partners.

Therefore, although for most data holds that Open Access may be the case, for each (re-)use of data mentioned in this report, and in connected databases, the main lead of the surveys, Prof.Dr. Herman Hummel, of the NIOZ at Yerseke, NL (email: herman.hummel@nioz.nl), has to be contacted in order to clear any case of doubt on the use and copyrights of the data.

All underlying data and analyses of the first and second survey have already been made available through open access at https://doi.org/10.6084/m9.figshare.5513530.v1. The data and analyses of the third and fourth survey that can be made public will be launched similarly through open access at publication in an international journal within the duration of the EcoPotential project.

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http 11 = http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.684.7623&rep=rep1&type=pdf; http://whrc.org/wp-content/uploads/2015/09/HoughtonBiologist.02.pdf

http 12 = http://www.pewtrusts.org/~/media/assets/2015/03/turning_the_tide_msy_explained.pdf

http 13 = http://www.fao.org/docrep/w5449e/w5449e0b.htm

https 1 = https://www.agvise.com/educational-articles/soil-organic-matter-a-choice-of-methods/

https 2 = https://earthobservatory.nasa.gov/GlobalMaps/view.php?d1=MOD11C1_M_LSTDA&d2=MYD28M

https 3 = https://earthobservatory.nasa.gov/GlobalMaps/view.php?d1=MOD11C1_M_LSTDA&d2=MYD28M

https 4 = https://pubs.usgs.gov/sir/2012/5287/support/sir2012-5287.pdf

https 5 = https://www.omega.com/technical-learning/shining-a-light-on-intensity-measurement.html

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8. List of Appendices and Addenda

8.1 Appendix 1. Example of first survey

Example of the first survey sent in 2015 to, and answers from, the EcoPotential scientists working on Protected Areas (after Hummel et al 2017)

Responsible scientific researcher filling in the table: Sander Wijnhoven

	Name of Protected Area (type of protection): Western Scheldt & Saeftinghe (Natura2000)		
Habitat / Ecosystem type	**Ecosystem service**	**Ecosystem functions and structures**	**Major threat(s)**
Tidal flats	Feeding grounds for birds and fish	Primary and secondary production	Increasing hydrodynamics; Increasing elevation and steepening edges (deepening for shipping); Increasing wave-action (more and larger boats); Reduction of intertidal area; Invading species
	Resting places for birds and mammals	Undisturbed habitats	Disturbance by recreants and food-collectors
	Cultural: Aesthetic values	Habitat heterogeneity	Reduction of intertidal area
	Cutting Sea-aster	Secondary production	Over-exploitation
Salt marshes	Protection of coastline	Habitat heterogeneity	Storm surges; Increasing hydrodynamics (deepening for shipping)
	Charismatic species	Breeding grounds for birds (biodiversity)	Disturbance by recreants); Reduction of area salt marshes (deepening for shipping); aging of marshes (obstruction of succession)
	Mediation of wastes	Nutrient cycling	Reduction of area, change in species composition (spatial planning)
	Tourism and wilderness experience	Habitat heterogeneity and biodiversity	Disappearance appreciated plant species (by eutrophication)
High dynamic gulleys	Fishing	Secondary production	Overfishing; Disturbance foodweb by pollutants; Disturbance foodweb by increasing sediment loads upstream (deepening for shipping)
	Waterway for supertankers	Surface, currents, hydrodynamics	Cons and impacts becoming larger than the benefits
	Cooling water intake	Buffering capacity, hydrodynamics	Invading species (fouling)
Low dynamic shallow waters (e.g. subtidal flats and small gulleys)	Nursery area for shrimps and fish	Habitat heterogeneity	Overfishing; Increasing hydrodynamics (deepening for shipping); Reduction of low dynamic shallow water areas
	Shellfish fisheries	Secondary production	Overfishing; Increasing hydrodynamics (deepening for shipping); Increasing water turbidity; Reduction of low dynamic shallow water areas; Invading species

8.2 Appendix 2. Example of second survey

Example of the second survey which was sent to Protected Area managers in 2015 (after Hummel et al. 2017). The survey was originally carried out by members of EcoPotential WP 11/12.

Filled in by PA managers of the Curonian lagoon and Nenumas Delta

	How important are the following ecosystem services to the beneficiaries of the PA? (relative to the other ecosystem services, on a scale from 1 (least important) to 5 (most important) 0 = not important or unknown)						
	Ecosystem service	0	1	2	3	4	5
Provisioning services	Agriculture, meat	X	☐	☐	☐	☐	☐
	Agriculture , grain	X	☐	☐	☐	☐	☐
	Fisheries	☐	☐	☐	☐	☐	X
	Farmed sea food	X	☐	☐	☐	☐	☐
	Genetic resources	X	☐	☐	☐	☐	☐
	Timber	☐	☐	☐	☐	X	☐
	Wild land meat	X	☐	☐	☐	☐	☐
	Wild non meat food products (e.g. berries, mushrooms, kelp)	☐	X	☐	☐	☐	☐
	Fresh water	X	☐	☐	☐	☐	☐
	Energy production (e.g. hydropower, wind farms)	X	☐	☐	☐	☐	☐
	Please fill in if others:						
	Amber extraction	☐	☐	☐	☐	☐	X
	Geothermic water	☐	☐	☐	☐	☐	X
		☐	☐	☐	☐	☐	☐
Regulating services	Carbon sequestration and storage	☐	☐	☐	X	☐	☐
	Erosion prevention (coastal or inland)	☐	X	☐	☐	☐	☐
	Lifecycle and habitat protection	☐	☐	☐	☐	X	☐
	Pollination	☐	☐	☐	☐	☐	X
	Pest and disease control	☐	☐	☐	☐	☐	X
	Water treatment	X	☐	☐	☐	☐	☐
	Flood prevention	X	☐	☐	☐	☐	☐
	Please fill in if others:						
		☐	☐	☐	☐	☐	☐
Cultural services	Spiritual significance	☐	☐	☐	☐	X	☐
	Recreation	☐	X	☐	☐	☐	☐
	Education	☐	☐	X	☐	☐	☐
	Aesthetic qualities	☐	X	☐	☐	☐	☐
	Research	☐	☐	X	☐	☐	☐
	Please fill in if others:						
		☐	☐	☐	☐	☐	☐
Other	*Please fill in if others:*						
		☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐

What are the most damaging environmental pressures or threats to your PA?				
Environmental pressures	High pressure	Medium pressure	Low pressure	No pressure
Agriculture	☐	☐	X	☐
Forestry	☐	X	☐	☐
Climate change	☐	☐	X	☐
Invasive species	☐	X	☐	☐
Eutrophication	X	☐	☐	☐

Tourism	X	☐	☐	☐
Pollution	☐	☐	X	☐
Hunting	☐	☐	☐	X
Fishing	☐	X	☐	☐
Other biological resource extraction (e.g. shells, berries)	☐	☐	X	☐
Transport	X	☐	☐	☐
Landscape fragmentation	☐	X	☐	☐
Please fill in if others:				
Sonar and sound pollution	☐	☐	☐	X
	☐	☐	☐	☐

8.3 Appendix 3. Example of fourth survey

Example of the fourth survey which was sent to EcoPotential scientists in 2018.

Your name		0	factor not present, not important		3	moderate importance	
Name of the Protected Area		1	very small importance		4	high importance	
The discipline* of your education		2	small importance		5	very high importance	
The discipline* of your present job							
** Discipline is e.g. Forester, or Marine Ecologist, or ICT developer, or GIS analyst*		Your score for importance of the factor in the PA					
		0	1	2	3	4	5
		Fill in for each factor only 1 value (in the proper column)					
<u>Factor</u>	<u>Examples / Explanatory description</u>						
Ecosystem Functions and Structures							
Biodiversity	Status, Changes, Endemism, protected species						
Carbon cycle	Storage, Sequestration						
Climate regulation	Change of microclimate						
Element cycling	Biogeochemical cycling, Hydro-geo-eco processes						
Food chain energy transfer	Energy flow						
Gene pool	Genetic resources						
Habitat suitability	Habitat availability, Feeding and breeding grounds, Ecotypes, Salinity						
Hydrodynamics	Currents, Water flow, Water regulation and retention						
Land- and sea-scape	UNESCO World Heritage						
Nutrient regulation							
Population dynamics	Recruitment, Seed dispersal, Reproduction, Pollination, Succession, Resilience, Grazing, Predation, Species distribution						
Primary production							
Raw materials	Sand, Pebbles, Amber						

Secondary production							
Sediment characteristics	Soil composition, structure and formation, sediment transport, erosion						
Weather	Temperature, Evaporation						
Water surface characteristics	Albedo						
Other (specify)							
Ecosystem Services							
Animals of economic use	Aquaculture, Bait, Beekeeping, Cattle, Fishing, Shellfish						
Biodiversity conservation	Protection of species, habitat and genetic resources						
Charismatic landscape	Aesthetic values, Cultural heritage, Iconic landscapes						
Charismatic species							
Climate regulation	incl. Carbon sequestration						
Education and research							
Energy production	Hydropower, Wind farms, Geothermic water						
Fire Protection	Wildfire regulation						
Flood and coastal protection	Flood and erosion protection, Coastal protection						
Food provision for animals	Grazing, Fodder						
Food provision for humans	Food collection						
Habitat for feeding and breeding							
Hunting	Selling licenses						
Hydrological regulation	Water flow maintenance						
Leisure activities	Recreation and tourism, Birdwatching						
Materials of economic use	Mining, Salt, Amber extraction						
Plants of economic use	Agriculture, Cork, Fruits, Timber, Mushrooms, Berries						
Pollination	Seed dispersal						
Prevention of erosion							

Raw materials	Sand, gravel, shell extraction						
Sedimentological regulation	Maintenance of soil fertility, Soil formation						
Spiritual significance							
Transport facilitation	Shipping lanes						
Waste and Toxicant mediation	Denitrification, Wastewater treatment, Nutrient regulation, Pest and disease control						
Water regulation	Fresh water, Water storage, Supply of drinking water						
Other (specify)							
Threats							
(Illegal) human activities	Poaching, Picking of plants, Illegal logging, Illegal fisheries						
Agriculture							
Bad management	Inappropriate water management						
Change in land use	Abandonment of farming, Decrease of crops, Urbanisation, Harbour Extension						
Change in species	Species loss, Successional stagnation, Aging of wild stocks, Food competition with cultured species, Prey decline						
Civil engineering	Increased number of dams						
Climate change	Change in precipitation or snow cover, Droughts, Sea level rise, Global Warming						
Diseases	Pests						
Disturbance	Anthropogenic disturbance, Off-road vehicles, Transport						
Encroachment							
Eutrophication	Hypertrophic conditions						
Exotic species	Invading species						
Extreme weather	Storm surges						
Fire							
Fisheries	Bycatch in gill nets						

Habitat loss	Habitat fragmentation, Loss of connectivity, Forest decay, Reduction of salt-marshes						
Harmfull Algae	Algal blooms						
Hydrological changes	Deepening shipping lanes, Hydraulic modification, Increased turbidity, Increased wave action, Ground-water extraction						
Increased salinisation							
Landscape disturbance	Visual ruining, Gas platforms						
Overexploitation	Intensive agriculture, Overfishing, Too high tourist density						
Pollution	Pesticides, Atmospheric Pollution, Sonar and sound pollution						
Predation	Incl by exotic species as rats and cats						
Sediment dynamics changes	Avalanches, Erosion, Embankments within wetlands, Dredging, Siltation						
Tourism	Recreational activities						
Other (specify)							

8.4 Appendix 4. Example of request for indicators and metrics

Example of the table send to EcoPotential scientists to indicated for the major variables some concrete indicators and the metrics to measure the indicator. Sent together with the fourth survey which was sent to EcoPotential scientists in 2018.

Your name		For the factors with moderate or (very) high importance (level 3, 4, 5)								
Name of the Protected Area		Indicator 1 by RS		Indicator 2 by RS			Indicator 1 by *in situ*		Indicator 2 by *in situ*	
Factor	Examples / Explanatory description	Name of Indicator	Literature reference	Name of Indicator	Literature reference		Name of Indicator	Literature reference	Name of Indicator	Literature reference
Ecosystem Functions and Structures										
Biodiversity	Status, Changes, Endemism, protected species									
Carbon cycle	Storage, Sequestration									
Climate regulation	Change of microclimate									
Element cycling	Biogeochemical cycling, Hydro-geo-eco processes									
Food chain energy transfer	Energy flow									
Gene pool	Genetic resources									
Habitat suitability	Habitat availability, Feeding and breeding grounds, Ecotypes, Salinity									
Hydrodynamics	Currents, Water flow, Water regulation and retention									
Land- and sea-scape	UNESCO World Heritage									
Nutrient regulation										
Population dynamics	Recruitment, Seed dispersal, Reproduction, Pollination, Succession, Resilience, Grazing, Predation, Species distribution									
Primary production										
Raw materials	Sand, Pebbles, Amber									
Secondary production										
Sediment characteristics	Soil composition, structure and formation, sediment transport, erosion									
Weather	Temperature, Evaporation									
Water surface characteristics	Albedo									
Other (specify)										

Ecosystem Services									
Animals of economic use	Aquaculture, Bait, Beekeeping, Cattle, Fishing, Shellfish								
Biodiversity conservation	Protection of species, habitat and genetic resources								
Charismatic landscape	Aesthetic values, Cultural heritage, Iconic landscapes								
Charismatic species									
Climate regulation	incl. Carbon sequestration								
Education and research									
Energy production	Hydropower, Wind farms, Geothermic water								
Fire Protection	Wildfire regulation								
Flood and coastal protection	Flood and erosion protection, Coastal protection								
Food provision for animals	Grazing, Fodder								
Food provision for humans	Food collection								
Habitat for feeding and breeding									
Hunting	Selling licenses								
Hydrological regulation	Water flow maintenance								
Leisure activities	Recreation and tourism, Birdwatching								
Materials of economic use	Mining, Salt, Amber extraction								
Plants of economic use	Agriculture, Cork, Fruits, Timber, Mushrooms, Berries								
Pollination	Seed dispersal								
Prevention of erosion									
Raw materials	Sand, gravel, shell extraction								
Sedimentological regulation	Maintenance of soil fertility, Soil formation								
Spiritual significance									
Transport facilitation	Shipping lanes								
Waste and Toxicant mediation	Denitrification, Wastewater treatment, Nutrient regulation, Pest and disease control								

Water regulation	Fresh water, Water storage, Supply of drinking water									
Other (specify)										
Threats										
(Illegal) human activities	Poaching, Picking of plants, Illegal logging, Illegal fisheries									
Agriculture										
Bad management	Inappropriate water management									
Change in land use	Abandonment of farming, Decrease of crops, Urbanisation, Harbour Extension									
Change in species	Species loss, Successional stagnation, Aging of wild stocks, Food competition with cultured species, Prey decline									
Civil engineering	Increased number of dams									
Climate change	Change in precipitation or snow cover, Droughts, Sea level rise, Global Warming									
Diseases	Pests									
Disturbance	Anthropogenic disturbance, Off-road vehicles, Transport									
Encroachment										
Eutrophication	Hypertrophic conditions									
Exotic species	Invading species									
Extreme weather	Storm surges									
Fire										
Fisheries	Bycatch in gill nets									
Habitat loss	Habitat fragmentation, Loss of connectivity, Forest decay, Reduction of salt-marshes									
Harmfull Algae	Algal blooms									
Hydrological changes	Deepening shipping lanes, Hydraulic modification, Increased turbidity, Increased wave action, Ground-water extraction									

Increased salinisation											
Landscape disturbance	Visual ruining, Gas platforms										
Overexploitation	Intensive agriculture, Overfishing, Too high tourist density										
Pollution	Pesticides, Atmospheric Pollution, Sonar and sound pollution										
Predation	Incl by exotic species as rats and cats										
Sediment dynamics changes	Avalanches, Erosion, Embankments within wetlands, Dredging, Siltation										
Tourism	Recreational activities										
Other (specify)											

8.5 Appendix 5. List of ecosystem types

List of Ecosystem Types (after Hummel et al 2017). Indicated by EcoPotential scientists in the first survey for the transitional waters (TW) and the mountainous (MO) Protected Areas.

Ecosystem Type	Transitional Waters / Mountainous
Aeolic sands with juniper forest and playa lakes	TW
Alpine and subalpine meadows	MO
Alpine Prairies	MO
Altitudinal transects from the Montane to the Alpine belt	MO
Coastal and marine ecosystems	TW
Coastal dunes and sea shore	TW
Coniferous and mixed mountain forests	MO
Cupressus Forests	MO
Freshwater and brackish marshes with emergent vegetation	TW
Freshwater ecosystems	TW
Fruit tree crops	MO
Grass lands	MO
Heath and Scrub	MO
High altitude Alpine Lakes	MO
High dynamic gulleys	TW
High mountain grasslands and shrub lands	MO
Lagoon fringe reed beds	TW
Lagoons	TW
Lichen fields	MO
Low dynamic shallow waters	TW
Mediterranean annual rich dry grassland	TW
Mediterranean shrub land with cork oak forest	TW
Mid mountain shrub lands	MO
Montado	MO
Montane Spruce-Fir-Beech forest	MO
Mountain lakes and surrounding meadows	MO
Native Deciduous Forest	MO
Natural forests	MO
Olea and Ceratonia forests	MO
Open Lagoon	TW
Permanent Grassland	MO
Pine forests	MO
Pine plantations	MO
Quercus forests	MO
River	TW
Rocks and screes	MO
Rocky Watersheds	MO
Salt marshes	TW

Seagrass Meadows	TW
Seasonal freshwater marshland	TW
Shrub lands	MO
Tidal Flats	TW
Wetlands	TW

8.6 Appendix 6. Harmonisation tables for EF, ES, and Threats

Harmonisation tables for all variables indicated by the EcoPotential scientists in the first survey and PA managers in the second survey (after Hummel et al 2017). (6.a) ecosystem services, (6.b) ecosystem functions and structures, (6.c) threats, and the classification of the variables into variables of biotic, abiotic or socio-economic (anthropogenic) nature, grey cells are variables indicated by PA managers

Appendix 6a: Harmonised Ecosystem Services

Harmonised variable	Former (original) indication	Classification
Aesthetic qualities	Aesthetic qualities	Socio-economic
Aesthetic qualities	Cultural heritage	Socio-economic
Animals of economic use	Animal Production	Biotic
Animals of economic use	Aquaculture	Biotic
Animals of economic use	Bait collection	Biotic
Animals of economic use	Beekeeping	Biotic
Animals of economic use	Capture fisheries	Biotic
Animals of economic use	Cattle grazing	Biotic
Animals of economic use	Collecting of bait	Biotic
Animals of economic use	Commercial fisheries	Biotic
Animals of economic use	Fishing	Biotic
Animals of economic use	Food provision	Biotic
Animals of economic use	Honey production	Biotic
Animals of economic use	Manual cockle fisheries	Biotic
Animals of economic use	Oyster culture	Biotic
Animals of economic use	Shellfish fisheries	Biotic
Animals of economic use	Wild foods	Biotic
Animals of economic use	Agriculture, meat	Biotic
Animals of economic use	Farmed sea food	Biotic
Animals of economic use	Fisheries	Biotic
Animals of economic use	Wild land meat	Biotic
Biodiversity conservation	Biodiversity Conservation	Biotic
Biodiversity conservation	Biodiversity protection	Biotic
Biodiversity conservation	Refuge for biodiversity	Biotic
Biodiversity conservation	Genetic resources	Biotic
Charismatic landscape	Aesthetic values	Abiotic
Charismatic landscape	Charismatic habitat	Abiotic
Charismatic landscape	Charismatic habitat and species	Abiotic
Charismatic landscape	Charismatic landscapes	Abiotic
Charismatic landscape	Cultural heritage	Abiotic
Charismatic landscape	Cultural landscape	Abiotic
Charismatic landscape	Iconic landscapes	Abiotic
Charismatic species	Charismatic reindeer	Biotic
Charismatic species	Charismatic species	Biotic
Charismatic species	Existence value (of cetaceans)	Biotic
Charismatic species	Presence of flagship species	Biotic
Climate regulation	Carbon sequestration	Abiotic
Climate regulation	Carbon Uptake	Abiotic

Climate regulation	Climate regulation	Abiotic
Climate regulation	Local Scale Climate Regulation	Abiotic
Climate regulation	Carbon sequestration and storage	Abiotic
Education and research	Education	Socio-economic
Education and research	Research	Socio-economic
Education and research	Scientific research	Socio-economic
Education and research	Education	Socio-economic
Education and research	Research	Socio-economic
Energy production	Energy production (e.g. hydropower, wind farms)	Socio-economic
Energy production	Geothermic water	Socio-economic
Fire Protection	Wildfire regulation	Biotic
Flood and coastal protection	Buffer for coastal erosion	Abiotic
Flood and coastal protection	Buffering floods	Abiotic
Flood and coastal protection	Coastal protection	Abiotic
Flood and coastal protection	Flood and erosion protection	Abiotic
Flood and coastal protection	Flood mitigation	Abiotic
Flood and coastal protection	Flood retention	Abiotic
Flood and coastal protection	Protection of coastline	Abiotic
Flood and coastal protection	Flood prevention	Abiotic
Food provision for animals	Fodder	Biotic
Food provision for animals	Food for birds	Biotic
Food provision for animals	Food for cattle	Biotic
Food provision for animals	Food for fish	Biotic
Food provision for animals	Grazing	Biotic
Food provision for animals	Sheep fodder	Biotic
Food provision for animals	Reed as raw material or fodder	Biotic
Food provision for humans	Food collection	Biotic
Habitat for feeding and breeding	Breeding places and shelter for birds	Abiotic
Habitat for feeding and breeding	Feeding and staging grounds for birds	Abiotic
Habitat for feeding and breeding	Feeding grounds for birds	Abiotic
Habitat for feeding and breeding	Feeding grounds for fish	Abiotic
Habitat for feeding and breeding	Fishing ground	Abiotic
Habitat for feeding and breeding	Migration corridor for fish	Abiotic
Habitat for feeding and breeding	Nursery area	Abiotic
Habitat for feeding and breeding	Nursery area for shrimp and fish	Abiotic
Habitat for feeding and breeding	Nutrition for cattle	Abiotic
Habitat for feeding and breeding	Rangeland for cattle	Abiotic
Habitat for feeding and breeding	Resting place for birds	Abiotic
Habitat for feeding and breeding	Resting place for mammals	Abiotic
Habitat for feeding and breeding	Resting places for birds	Abiotic
Habitat for feeding and breeding	Resting places for mammals	Abiotic
Habitat for feeding and breeding	Sanctuary for fish fry	Abiotic
Habitat for feeding and breeding	Spawning and nursery grounds for fish	Abiotic
Habitat for feeding and breeding	Water for aquaculture	Abiotic
Habitat for feeding and breeding	Lifecycle and habitat protection	Biotic
Habitat for feeding and breeding	Nursery area – supporting	Biotic

Hunting	Hunting	Socio-economic
Hunting	Selling licenses	Socio-economic
Hydrological regulation	Hydrological cycle and water flow maintenance	Abiotic
Hydrological regulation	Hydrology	Abiotic
Leisure activities	Birdwatching	Socio-economic
Leisure activities	Ecotourism	Socio-economic
Leisure activities	Recreation	Socio-economic
Leisure activities	Recreation and tourism	Socio-economic
Leisure activities	Recreational activities	Socio-economic
Leisure activities	Recreational diving	Socio-economic
Leisure activities	Recreational fishing and boating	Socio-economic
Leisure activities	Symbolic and Aesthetic values	Socio-economic
Leisure activities	Tourism	Socio-economic
Leisure activities	Recreation and tourism	Socio-economic
Materials of economic use	Amber extraction	Abiotic
Materials of economic use	Cooling water	Abiotic
Materials of economic use	Mining	Abiotic
Materials of economic use	Salt production	Abiotic
Materials of economic use	Amber extraction	Abiotic
Materials of economic use	Gitios extraction	Abiotic
Materials of economic use	Salt production	Abiotic
Plants of economic use	Agriculture	Biotic
Plants of economic use	Biomass (wood, food)	Biotic
Plants of economic use	Biomass extraction	Biotic
Plants of economic use	Building material	Biotic
Plants of economic use	Cork Production	Biotic
Plants of economic use	Fruit crops	Biotic
Plants of economic use	Fuel pellets	Biotic
Plants of economic use	Pine seed extraction	Biotic
Plants of economic use	Plant collection	Biotic
Plants of economic use	Thatching materials	Biotic
Plants of economic use	Timber	Biotic
Plants of economic use	Wild plants and their outputs	Biotic
Plants of economic use	Agriculture, grain	Biotic
Plants of economic use	Timber	Biotic
Plants of economic use	Wild non meat food products	Biotic
Pollination	Pollination	Biotic
Pollination	Pollination and seed dispersal	Biotic
Pollination	Pollination	Biotic
Prevention of erosion	Control of erosion	Abiotic
Prevention of erosion	Erosion regulation	Abiotic
Raw materials	Sand, gravel, shell extraction	Abiotic
Resilience	Resilience	Biotic
Sedimentological regulation	Land incrementation	Abiotic
Sedimentological regulation	Maintenance of soil	Abiotic
Sedimentological regulation	Maintenance of soil fertility	Abiotic

Sedimentological regulation	Soil formation	Abiotic
Sedimentological regulation	Soil protection	Abiotic
Sedimentological regulation	Erosion prevention (coastal or inland)	Abiotic
Spiritual significance	Spiritual significance	Socio-economic
Transport facilitation	Shipping lanes	Socio-economic
Transport facilitation	Waterway for shipping	Socio-economic
Waste and Toxicant mediation	Denitrification	Abiotic
Waste and Toxicant mediation	Dewatering of wastewater treatment sludge	Abiotic
Waste and Toxicant mediation	Mediation of wastes	Abiotic
Waste and Toxicant mediation	Nutrient Regulation	Abiotic
Waste and Toxicant mediation	Pollution trapping	Abiotic
Waste and Toxicant mediation	Toxicity regulation	Abiotic
Waste and Toxicant mediation	Water filtration	Abiotic
Waste and Toxicant mediation	Water purification	Abiotic
Waste and toxicant mediation	Nutrient retention	Abiotic
Waste and toxicant mediation	Pest and disease control	Abiotic
Water regulation	Fresh water	Abiotic
Water regulation	Water storage	Abiotic
Water regulation	Water supply	Abiotic
Water regulation	Fresh water	Abiotic
Water regulation	Water treatment	Abiotic

Appendix 6b. Harmonised Ecosystem Functions and Structures

Harmonised variable	Former (original) indication	Classification
Biodiversity	Biodiversity	Biotic
Biodiversity	Bird biodiversity	Biotic
Biodiversity	Invertebrate biodiversity	Biotic
Biodiversity	Response of biodiversity to climate change	Biotic
Biodiversity	Vegetation biodiversity	Biotic
Carbon cycle	Carbon Sequestration	Abiotic
Carbon cycle	Carbon storage	Abiotic
Climate dynamics	Climate change attenuation	Abiotic
Climate dynamics	Climate regulation	Abiotic
Climate dynamics	Change of microclimate	Abiotic
Element cycling	Biogeochemical cycling and storage	Abiotic
Element cycling	Element cycling	Abiotic
Element cycling	Hydro-geo-eco processes	Abiotic
Element cycling	Water purification	Abiotic
Flood protection	Flood control	Abiotic
Food chain energy transfer	Energy flow	Biotic
Food chain energy transfer	Functional connectivity	Biotic
Gene pool	Genetic resources	Biotic
Habitat suitability	Breeding grounds for birds	Abiotic
Habitat suitability	Disturbance regime management	Biotic
Habitat suitability	Dominance of palatable grasses	Biotic
Habitat suitability	Feeding area for birds	Abiotic
Habitat suitability	Habitat	Abiotic

Habitat suitability	Habitat availability	Abiotic
Habitat suitability	Habitat heterogeneity	Abiotic
Habitat suitability	Habitat suitability	Abiotic
Habitat suitability	Habitat suitability for birds	Abiotic
Habitat suitability	Maintenance of habitat: landscape structure	Abiotic
Habitat suitability	Nursery grounds	Abiotic
Habitat suitability	Provision of shade and shelter	Abiotic
Habitat suitability	Salt water	Abiotic
Habitat suitability	Supporting habitats	Abiotic
Habitat suitability	Tree Encroachment	Biotic
Habitat suitability	Undisturbed habitats	Abiotic
Hydrodynamics	Buffer against floods	Abiotic
Hydrodynamics	Buffering capacity	Abiotic
Hydrodynamics	Currents	Abiotic
Hydrodynamics	Hydrodynamics	Abiotic
Hydrodynamics	Hydrologic flux and storage	Abiotic
Hydrodynamics	Water cycle regulation	Abiotic
Hydrodynamics	Water Flow	Abiotic
Hydrodynamics	Water regulation	Abiotic
Hydrodynamics	Water retention	Abiotic
Hydrodynamics	Water supply	Abiotic
Hydrodynamics	Water treatment	Abiotic
Landscape	Charismatic landscapes	Abiotic
Landscape	Dunes landscape	Abiotic
Landscape	Landscape formation	Abiotic
Landscape	Landscape opportunity	Abiotic
Landscape	Seascape formation	Abiotic
Nutrient regulation	Nutrient regulation	Abiotic
Nutrient regulation	Nutrients regulation	Abiotic
Population dynamics	Dense canopy over-shading understory	Biotic
Population dynamics	Distribution and densities of pine trees	Biotic
Population dynamics	Distribution of pine trees	Biotic
Population dynamics	Dominance of meso-hygrophytic plants	Biotic
Population dynamics	Flowering	Biotic
Population dynamics	Grass quality	Biotic
Population dynamics	Ibex and Chamois population dynamics	Biotic
Population dynamics	Insect demographics	Biotic
Population dynamics	Invertebrate population dynamics	Biotic
Population dynamics	Key stone species reproduction	Biotic
Population dynamics	Phenology	Biotic
Population dynamics	Plant phenology	Biotic
Population dynamics	Pollination	Biotic
Population dynamics	Population dynamics	Biotic
Population dynamics	Recruitment	Biotic
Population dynamics	Seed dispersal	Biotic
Population dynamics	Sheep presence	Biotic

Population dynamics	Species turnover	Biotic
Population dynamics	Vegetation structure	Biotic
Population dynamics	Zooplankton population dynamics	Biotic
Primary production	Olive oil production	Biotic
Primary production	Pharmacological resources	Biotic
Primary production	Primary Production	Biotic
Primary production	Primary production of lichens	Biotic
Primary production	Vegetation productivity	Biotic
Raw materials	Raw materials	Abiotic
Secondary production	Productivity of fish	Biotic
Secondary production	Secondary Production	Biotic
Sediment characteristics	Regulation of soil carbon storage	Abiotic
Sediment characteristics	Regulation of soil fertility	Abiotic
Sediment characteristics	Regulation of soil structure	Abiotic
Sediment characteristics	Retention of soil	Abiotic
Sediment characteristics	Retention of soil nutrients	Abiotic
Sediment characteristics	Sediment retention	Abiotic
Sediment characteristics	Sediment transport	Abiotic
Sediment characteristics	Soil formation	Abiotic
Sediment characteristics	Soil moisture	Abiotic
Sediment characteristics	Soil retention	Abiotic
Sediment characteristics	Soil structure	Abiotic
Water dynamics	Evaporation	Abiotic
Water surface characteristics	Albedo	Abiotic
Water surface characteristics	Surface	Abiotic

Appendix 6c: Harmonised Threats

Harmonised variable	Former (original) indication	Classification
(Illegal) human activities	Conflicting activities	Anthropogenic
(Illegal) human activities	Illegal catches	Anthropogenic
(Illegal) human activities	illegal logging	Anthropogenic
(Illegal) human activities	Picking of plants	Anthropogenic
(Illegal) human activities	Poaching	Anthropogenic
(Illegal) human activities	Gas extraction	Anthropogenic
(Illegal) human activities	Hunting	Anthropogenic
Agriculture	Agriculture	Anthropogenic
Agriculture	Agriculture	Anthropogenic
Bad management	Inappropriate water management	Anthropogenic
Bad management	Negligent management	Anthropogenic
Change in land use	Abandonment	Anthropogenic
Change in land use	Abandonment of farming	Anthropogenic
Change in land use	Changes in land use	Anthropogenic
Change in land use	Decrease of crops	Anthropogenic
Change in land use	Depopulation	Anthropogenic
Change in land use	Development of tourist facilities	Anthropogenic
Change in land use	Extension port areas	Anthropogenic
Change in land use	Forest management around the park	Anthropogenic

Change in land use	Harbour Extension	Anthropogenic
Change in land use	Settlements	Anthropogenic
Change in land use	Soil tillage	Anthropogenic
Change in land use	Spatial planning	Anthropogenic
Change in land use	Urbanisation	Anthropogenic
Change in species	Aging of the wild stocks	Biotic
Change in species	Bush encroachment	Biotic
Change in species	Change of plant species composition	Biotic
Change in species	Changes in bird dispersal	Biotic
Change in species	Disappearing charismatic species	Biotic
Change in species	Extinction of species	Biotic
Change in species	Food competition with cultured species	Biotic
Change in species	Impact of bird colonies	Biotic
Change in species	Plant species composition	Biotic
Change in species	Prey decline	Biotic
Change in species	Species composition	Biotic
Change in species	Species loss	Biotic
Change in species	Species reduction	Biotic
Change in species	Storms	Biotic
Change in species	Succession	Biotic
Change in species	Successional stagnation	Biotic
Change in species	Sudden oak death	Biotic
Change in species	Invasive species	Biotic
Civil engineering	Increased number of dams	Anthropogenic
Climate change	Change in precipitation	Climate change
Climate change	Change in snow cover	Climate change
Climate change	Changes in snow cover	Climate change
Climate change	Climate change	Climate change
Climate change	Droughts	Climate change
Climate change	Less precipitation	Climate change
Climate change	Sea Level Rise	Climate change
Climate change	Severe drought	Climate change
Climate change	Temperature changes	Climate change
Climate change	Climate change	Anthropogenic
Diseases	Diseases	Biotic
Diseases	Forest pests	Biotic
Diseases	Forests pests	Biotic
Diseases	Pests	Biotic
Diseases	Pests and diseases	Biotic
Disturbance	Anthropogenic disturbance	Anthropogenic
Disturbance	Disturbance	Anthropogenic
Disturbance	Disturbance by humans	Anthropogenic
Disturbance	Human actions	Anthropogenic
Disturbance	Human disturbance	Anthropogenic
Disturbance	Off-road Vehicles	Anthropogenic
Disturbance	Transport	Anthropogenic

Encroachment	Heath and scrub encroachment	Biotic
Encroachment	Tree Encroachment	Biotic
Eutrophication	Eutrophication	Anthropogenic
Eutrophication	Hypertrophic conditions	Anthropogenic
Eutrophication	Nitrification	Abiotic
Eutrophication	Eutrophication	Anthropogenic
Exotic species	Alien species	Biotic
Exotic species	Exotic Species	Biotic
Exotic species	Invading species	Biotic
Exotic species	Invasive Species	Biotic
Fire	Forest fire	Abiotic
Fire	Forest fires	Abiotic
Fire	Uncontrolled burning	Abiotic
Fire	Wildfires	Abiotic
Fisheries	Bycatch in gill nets	Anthropogenic
Fisheries	Fisheries	Anthropogenic
Fisheries	Shellfish fisheries	Anthropogenic
Fisheries	Fishing	Anthropogenic
Habitat loss	Aging of marshes	Abiotic
Habitat loss	Forest decay	Biotic
Habitat loss	Fragmentation	Anthropogenic
Habitat loss	Habitat change	Abiotic
Habitat loss	Habitat loss	Abiotic
Habitat loss	Habitat reduction	Abiotic
Habitat loss	Reduction of area	Abiotic
Habitat loss	Reduction of intertidal area	Abiotic
Habitat loss	Reduction of salt marshes	Abiotic
Habitat loss	Urban development	Anthropogenic
Habitat loss	Isolation	Abiotic
Habitat loss	Landscape fragmentation	Abiotic
Harmful Algae	Algal blooms	Biotic
Harmful Algae	Toxic algae	Biotic
Hydrological changes	Decrease of sediment transport	Abiotic
Hydrological changes	Deepening shipping lanes	Anthropogenic
Hydrological changes	Dredging	Anthropogenic
Hydrological changes	Hydraulic	Anthropogenic
Hydrological changes	Hydraulic modification	Anthropogenic
Hydrological changes	Hydroperiod reduction	Anthropogenic
Hydrological changes	Increased turbidity	Abiotic
Hydrological changes	Increasing hydrodynamics	Anthropogenic
Hydrological changes	Increasing sediment loads	Abiotic
Hydrological changes	Increasing turbidity	Abiotic
Hydrological changes	Increasing wave action	Anthropogenic
Hydrological changes	Reduced tidal energy	Anthropogenic
Hydrological changes	Storm surges	Abiotic
Hydrological changes	Underground water extraction	Anthropogenic

Hydrological changes	Water management	Anthropogenic
Hydrological changes	Water quantity	Abiotic
Increased salinization	Groundwater salinisation	Abiotic
Increased salinization	Hypersaline conditions	Anthropogenic
Landscape disturbance	Gas exploitation	Anthropogenic
Landscape disturbance	Visual ruining of landscape	Anthropogenic
Overexploitation	Harvesting	Anthropogenic
Overexploitation	Intensive agriculture	Anthropogenic
Overexploitation	Intensive Grazing	Anthropogenic
Overexploitation	Negative impact becoming larger than profits	Anthropogenic
Overexploitation	Overexploitation	Anthropogenic
Overexploitation	Overfishing	Anthropogenic
Overexploitation	Overgrazing	Anthropogenic
Overexploitation	Over-tourism	Anthropogenic
Overexploitation	Too high boat density	Anthropogenic
Overexploitation	Forestry	Anthropogenic
Overexploitation	Other biological resource extraction	Anthropogenic
Pollution	Air pollution	Anthropogenic
Pollution	Atmospheric Pollution	Anthropogenic
Pollution	Increased pollution	Anthropogenic
Pollution	Pesticides	Anthropogenic
Pollution	Pollution	Anthropogenic
Pollution	Water pollution	Anthropogenic
Pollution	Pollution	Anthropogenic
Pollution	Sonar and sound pollution	Anthropogenic
Predation	Predation	Biotic
Sediment dynamics changes	Avalanches	Abiotic
Sediment dynamics changes	Embankments within wetlands	Anthropogenic
Sediment dynamics changes	Erosion	Abiotic
Sediment dynamics changes	Port dredging	Anthropogenic
Sediment dynamics changes	Sediment disturbance	Anthropogenic
Sediment dynamics changes	Siltation	Abiotic
Sediment dynamics changes	Soil loss	Abiotic
Tourism	Hiking impact	Anthropogenic
Tourism	Mountaineering, rock climbing, speleology	Anthropogenic
Tourism	Recreation	Anthropogenic
Tourism	Recreational activities	Anthropogenic
Tourism	Tourism	Anthropogenic
Tourism	Tourism	Anthropogenic

8.7 Appendix 7. List of mistakes and corrections

List of mistakes made in the first and second surveys and the ways used to correct them (after Hummel et al 2017). Categories are Ecosystem Services (ES), Ecosystem Functions and Structures (EF), Threats (Thr), and Ecosystem Types (ETy). The variable which was originally indicated ("between quotation marks") is followed by our Remark on it (unless it may have been renamed). For the Actions taken: Split means that the term is split into two or three new terms, Rename means that the original term was renamed (and with its new name entered into the harmonization tables of Appendix 6), Omitted means the term was not used in the analysis (and in case of duplications one of the two terms was omitted). In the column 'Renamed in', the new name for the variable used in the analysis is given.

Area	*Category*	*"Original variable" and Remark*	*Action*	*Renamed in*
Camargue	ES	"Flood retention" is no service, but a function (buffering is the service)	Rename	Buffering floods
Camargue	ES	"Waterfowl hunting, fishing, cattle" are separate services	Split	
Camargue	EF	"Climate change attenuation, Sea level rise attenuation" have (as EF) no clear relation with the ES "sunbathing and swimming" nor with the Thr "destruction due to massive touristic frequentation"	Rename	Climate regulation
Camargue	EF	"Water epuration" (F: Epurification) is a service and not a function (nutrient cycling would have been better)	Rename	Element cycling
Curonian lagoon	ES	"Nutrient and toxic substance removal" are not the same. Therefore, split into nutrient control and toxicity control	Split	
Curonian lagoon	ES	Denitrification is not a service but a function	Rename	Waste and Toxicant mediation
Danube	EF	"Biological productivity" is not specific enough	Rename	Primary production
Danube	EF	"Landscape opportunity" is not a clear function nor structure	Rename	Charismatic landscapes
Doñana	Thr	"Phytophtora infestation" is too specific	Rename	Diseases
Doñana	Thr	"None" is not a useful term in the threats section	Omitted	
Eastern Scheldt	EF	"Breeding grounds for birds" is a service not a function	Rename	Habitat suitability
Eastern Scheldt	EF	"Salt water" is not a function, nor a service	Rename	Habitat suitability
Gran Paradiso	ES	"Cultural ecosystem services" is an indistinct, too much overarching, term	Omitted	
Gran Paradiso	EF / Thr	"Tree encroachment" is duplicated as function and threat; it is a threat	Omitted as EF	
Hardangervidda	ETy	"Reindeer Lichens Interaction"; an interaction is not an Ecosystem Type	Rename	Lichen fields
Hardangervidda	ETy	"Sheep and Browsing-grassing resources interaction"; an interaction is not an Ecosystem Type	Rename	Grass lands
Hardangervidda	ETy	"Grouse and shrub structure interaction"; an interaction is not an Ecosystem Type	Rename	Shrub lands
High Tatra	EF	"Water supply" is a service and not a function	Rename	Water regulation
High Tatra	ES / EF	"Climate regulation" is indicated as both service and function; function is renamed	Rename	Change of Microclimate
High Tatra	Thr	"B02.06" is a specification of B02	Omitted	

High Tatra	EF	"Genetic resources" and "Pharmacological resources" are not functions but services	Rename	"Gene pool" and "Primary production"
High Tatra	ES / EF	"2.3.1.1 - Pollination" is indicated as service and function; as function renamed	Rename	Population dynamics
High Tatra	ES	"3.2.2.1 Other cultural outputs – Existence" is an indistinct term	Rename	Charismatic habitat and species
High Tatra	EF	"Landscape opportunity" is a service not a function	Rename	Landscape
High Tatra	Thr	"Dispersed habitation" and "Urbanisation", are merely duplications	Omitted	
High Tatra	ES	"3.1.1.1 Physical and intellectual interactions with biota, ecosystems, and landscapes" is too indistinct	Rename	Tourism
High Tatra	ES	"3.2.2.1 Other cultural outputs – Existence" is too indistinct	Rename	Tourism
High Tatra	ES / EF	"2.3.3.1 - Soil formation" is indicated as a function as well as a service; as service renamed	Rename	Sedimentological regulation
Oros Idi	EF	"Olive oil production" is a service, not a function	Rename	Primary production
Samaria	EF	"Biodiversity" and "Sea scape formation" are different functions	Split	
Samaria/Oros Idi	EF	"Habitat provision" is not a function nor structure	Rename	Habitat
Samaria/Oros Idi	EF	"Pollination" is not a function for beekeeping but a result of beekeeping	Rename	Population dynamics
Samaria/Oros Idi	EF	Water treatment is not a function but a service	Rename	Hydrodynamics
Sierra Nevada	ES / EF	"Hydrological cycle" and "Water supply" are switched as service and function	Rename	"Hydrological regulation" and "Hydrodynamics", resp.
Sierra Nevada	ES / EF	"Pollination" is indicated as service and function; renamed for EF	Rename	Population dynamics
Sierra Nevada	EF	"Evapotranspiration" is merely a duplication of "Evaporation"	Omitted	
Sierra Nevada	EF	"Water supply" is not a function and merely a duplication of "Water regulation"	Omitted	
Western Scheldt	EF	"Secondary production" to obtain plants as Sea-aster should have been primary production	Rename	Primary production
Western Scheldt	EF	"Raw materials" is not a function to obtain sand and gravel (but the service itself)	Rename	Habitat suitability

8.8 Appendix 8. List of PAs visited in third survey - 2017

Protected Areas visited during the 3rd series of EcoPotential surveys during summer-autumn 2017, and consulted scientists during the 4th survey in January 2018. Core Interviewers: Herman Hummel (NIOZ), Yolande Boyer (UMontpellier), Christiaan Hummel (NIOZ), Rutger de Wit (UMontpellier); occasional assistants to the interviews: Louise Bienfait (NIOZ), Lisette Luif (VU Amsterdam), Alessandra Nguyen Xuan (ISPRA), Laura Soissons (NIOZ), Orhideja Tasevska (HIO) (Underlined = contact person at PA authority, ES = External Scientist linked to EcoPotential helping in 3rd survey, ES 4th = External Scientist linked to EcoPotential consulted in 4th survey, all others interviewed in 3rd survey in summer-autumn 2017 at their own PA, except of Izak Smit of Kruger NP who was contacted in May 2017 in Pisa, Italy).

Date of 3rd survey	Protected Area	City, Country of interview	Interviewed persons
Wednesday 3 May	Kruger National Park	Pisa, Italy	Izak Smit (only part B of survey 3), Abel Ramoelo (ES 4th)
Tuesday 11 July	Regional Nature Park of Camargue, and Camargue Gardoise	Arles, France	Philippe Isenmann, Clarisse Brochier, Brigitte Poulin (ES)
Wednesday 12 July	Etangs Palavasiens et étang de l'Estagnol	Villeneuve les Maguelone, France	Hélène Fabrega, Julien Caucat
Tuesday 18 July	Bavarian Forest National Park	Neuschönau, Germany	Marco Heurich, Christian Binder, Teresa Schreib, Florian Porst
Thursday 20 July	National Park Kalkalpen	Molln, Austria	Franziska Pöpperl, Hartmann Pôlz, Elmar Prôll, Regina Buchriegler, Simone Mayrhofer, Angelika Stûckler, Christoph Nitsch, Johannes Kobler (ES), Johannes Peterseil (ES), Thomas Dirnboeck (ES 4th)
Thursday 20 July	Hardangervidda National Park	Bergen, Norway	Stein Byrkjeland
Wednesday 26 July	Swiss National Park	Zernez, Switzerland	Christian Rossi, Ruedi Haller, Anna Stritih (ES 4th)
Thursday 27 July	Gran Paradiso National Park	Noasca, Italy	Ramona Viterbi, Bruno Bassano, Christiana Cerrato
Tuesday 1 August	Samaria National Park	Chania, Greece	Antonis Barnias, Antonis Tsakirakis, Dimitris Kontakos, Dimitris Poursanidis (ES, ES 4th)
Wednesday 2 August	Parc National de La Réunion	Plaine des Palmistes,Reuniion, France	Arthur Herbreteau
Tuesday 8 August	Curonian Spit National Park	Nida, Lithuania	Zilvinas Grigatis, Lina Diksaite, Arturas Razinkovas Baziukas (ES), Rasa Morkūnė (ES)
Thursday 10 August	Nemunas Delta Regional Park	Rusné, Lithuania	Robertas Kubilius, Jūratė Dulkytė, Arturas Razinkovas Baziukas (ES), Rasa Morkūnė (ES), Edgaras Ivanauskas (ES)
Tuesday 22 August	Danube Delta Biosphere Reserve	Tulcea, Romania	Irina Baran, Aurel Nastase, Cristina Despina, Adrian Burada, Mihai Marinov, Mihai Adamescu (ES, ES 4th), Mihai Doroftei, Diana Bota, Eugenia Cioaca, Alexe Vasile, Constantin Cazacu (ES)
Tuesday 29 / Wednesday 30 August	En Avdat National Park (Har Hanegev Nature Reserves)	Midreshet Ben Gurion	Asaf Tsoar, Amir Shafir, Daniel Orenstein (ES)

Thursday 7 September	Montado (Alentejo Natura 2000 network)	Evora, Portugal	Pedro Azenha Rocha, Fernanda Rodrigues, Guilherme Santos, Vânia Proença (ES), Tiago Domingos (ES 4^{th})
Tuesday 12 September	Sierra Nevada Nature Area (National Park and Natural Park)	Pinos Genil, Spain	Carmen Cabrera, Blanca Ramos Losada
Tuesday 12 September	Lake Ohrid	Ohrid, Macedonia	Havza Redzep Kakel, Antonio Baleski, Jasminka Trajkovska Momiroska, Orhideja Tasevska (ES, ES 4^{th}), Goce Kostoski (ES), Sasha Trajanovski (ES), Dafina Guseska (ES), Suzana Patcheva (ES), Elizabeta Veljanoska Sarafiloska (ES), Trajce Talevski (ES)
Wednesday 13 September	Lake Prespa (Ezerani)	Resen, Macedonia	Ajman Al Malla, Orhideja Tasevska (ES, ES 4^{th}), Goce Kostoski (ES), Dafina Guseska (ES), Suzana Patcheva (ES), Elizabeta Veljanoska Sarafiloska (ES)
Tuesday 19 September	Doñana National Park	Matalascañas, Spain	José Juan Chans Pousada, Guyonne Janss (ES), Pablo Mendez (ES 4^{th})
Thursday 21 September	World Biosphere Reserve La Palma (incl. National Park de Caldera de Taburiente and Nature Parks	Santa Cruz de La Palma, Spain	Felix Manuel Medina, Antonio San Blas Alvaros, Angel Palomares Martinez, Juan Antonio Bermejo
Wednesday 11 October	Wadden Sea Nature Monument and Biosphere Reserve	Leeuwarden, Netherlands	Gerard Janssen, Lies van Nieuwerburgh, Sander Wijnhoven (ES 4^{th})
Thursday 26 October 2017	Castelli Romani Regional Park	Rocca di Papa, Italy	Paolo Lupino, Stefano Cresta, Emiliana Valentini (ES, ES 4^{th}), Anna Chiesura (ES), Federico Filipponi (ES)
Thursday 26 October 2017	Appia Antica	Rome, Italy	Fabrizio Piccari, Alma Rossi, Alessandra Nguyen Xuan (ES), Marzia Mirabile (ES), Astrid Raudner (ES), Emiliana Valentini (ES 4^{th})
Tuesday 3 November	Penda Geres National Park	Geres, Portugal	Armando Loureiro, Luisa Jorge, Henrique Carvalho, Alexandre Oliveira, Ana Fontes, Claudia Santos (ES), Salvador Arenas-Castro (ES), Antonio Monteiro (ES)
Wednesday 13 December	Oosterschelde National Park	Middelburg, Netherlands	Leo Adriaanse, Kees van Westenbrugge, Sander Wijnhoven (ES 4^{th})
Tuesday 19 December	Pieniny National Park	Spišská Stará Ves, Slovakia	Vladimir Klc, Anton Potas, Stanislav Rak, Margareta Malatinova, Juraj Svajda (ES, ES 4^{th})

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8.9 Appendix 9. Overview of suggested indicators and metrics for the EF, ES and Threats variables

Selection of indicators, and their metrics, for the EF, ES and Threats variables, judged to be the best for further harmonisation (blue emphasised variables are the EESVPA and ESVPA (the top), and of highest importance to be measured, especially in comparisons between PA and in time; green variables are important variables (sub-top); orange and red variables are not advised to be taken into account in large-scale comparisons because of only in a few PA important as a factor; Ch = for this variable there is often a focus on changes in time)

Category / Variables	Ch	Alternatives / Examples	Selected Indicator	Reference	*In situ*	RS	Metric Unit	Remarks
ECOSYSTEM FUNCTIONS AND STRUCTURES								
Habitat suitability		Habitat availability, Feeding and breeding grounds, Ecotypes, Salinity	Suitable niche theories of ecosystem engineers	Hirzel & Le Lay (2008)	*In situ*		%	
			Habitat classification	Lucas et al. (2007)		RS	Class type	In fact to be combined with the characteristics of the organism, their needs, and habitat availability
			EUNIS: Habitat classification	Moss (2018)	*In situ*		Class type	In fact to be combined with the characteristics of the organism, their needs, and habitat availability
			Carrying capacity	Larson et al. (2004)	*In situ*		%	
Biodiversity	Ch	Status, Changes, Endemism, protected species	Shannon Index (H)	Peet (1974,1975)	*In situ*		H	H = -SUM [(pi) * ln(pi)] E=H/Hmax Where, SUM = Summation pi= Number of individuals of species i/total number of samples S = Number of species or species richness Hmax = Maximum diversity possible
	Ch		Diversity Index	Rocchini et al. (2017)		RS	RAO's Q	Rao's Q: diversity based on digital imagery > Shannon Index
Population dynamics	Ch	Recruitment, Seed dispersal, Reproduction, Pollination, Succession, Resilience, Grazing, Predation, Species distribution	Vegetation cover changes	Homer et al. (2015)		RS	%	
	Ch		Population structure (age, sexes)	Skalski et al. (2010)	*In situ*		ratio of age/sex classes	Change in composition

Primary production			Chlorofyl a	Yentsch & Menzel (1963); Cannizzaro & Carder (2006)	*In situ*		wavelength mu	Highly sensitive optical system of the turner fluorometer
			Phytoplankton + microphytobenthos	Kromkamp & Peene (1995)	*In situ*		g C/m^2/y	
			Net primary production	Rafique et al. (2016)	*In situ*	RS	g C/y	
Land- and sea-scape		UNESCO World Heritage	Habitat heterogeneity (following EUNIS)	expert opinion	*In situ*	RS	nr of habitats / ha	
Hydrodynamics		Currents, Water flow, Water regulation and retention	Snow depth & water content	"http 3"	*In situ*		mL	Melting snow sample (set size)
			Flow velocity	Kostaschuk et al. (2005)	*In situ*		m/s	Acoustic Doppler current profiler; debiet in m^3/s divided by surface of section in m^2
			Tidal amplitude	Frisch and Weber (1980)	*In situ*	RS	m	Doppler radar system
			Flood duration	Richter et al. (2008)	*In situ*		h/year	
Gene pool		Genetic resources	Genetic diversity	Nei (1972); Nei (1978)	*In situ*		H_0, Fst, D	
Climate regulation	Ch	Change of microclimate	Land Surface Temperature	Tomlinson et al. (2011); "https 2"; "https 3"		RS	°C	Satellite based sensors; through thermal infrared - the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite.
	Ch		Sea Surface Temperature	Rayner et al. (2013)		RS	°C	Satellite based sensors; a two-stage reduced space optimal interpolation procedure, HADMATI dataset
	Ch		air temperature	Zhu et al. (2013); Kotchi et al. (2016)	*In situ*	RS	°C	Estimation of minumum and maximum air temperature / Use of hygrothermometers
	Ch		relative humidity	Manabe (1967)	*In situ*		%	Use of hygrometer
Weather	Ch	Temperature, Evaporation	Precipitation	Weather station reports	*In situ*		mm	Rain gauge
	Ch		Cloud cover	Weather station reports	*In situ*		oktas	Cloud base recorder
	Ch		Wind speed	Weather station reports	*In situ*		m/s	Anemometer
	Ch		air temperature	Weather station reports	*In situ*		°C	
	Ch		Snow depth	"http 3"	*In situ*		mm	To be measured daily
Element cycling		Biogeochemical cycling, Hydro-geo-eco processes	Nutrient budgets in soil	Hussain et al. (2007)	*In situ*		mg/kg	LIBS method (Laser Induced Breakdown Spectroscopy)

			Mineralisation rates C, N	Fornara et al. (2009); Hansen (1991)	*In situ*		g/kg	
			Element budgets	Moreno-Jimenez et al. (2011); Tyler & Olsson (2001)	*In situ*		µMol	(Carbon, Nitrogen, Phosphor, Silicium e.d.)
Secondary production	Ch		Standing stock of secondary producers	Daskalov et al. (2007); Odum (1986)	*In situ*		g/m^2	
			P/B ratio	Kimmerer (1987)	*In situ*		g. y^{-1} g^{-1}	Growth / biomass
Carbon cycle		Storage, Sequestration	Soil carbon	Hagedorn et al (2010)	*In situ*		mg C m^{-2} h^{-1}	CO_2-efflux from soils
			Carbon fluxes	Fuentes et al. (2006)		RS	g C m^{-2} d^{-1}	Net CO_2 flux
			Aboveground carbon stock	Fuchs et al. (2009)		RS	t/ha	Stratified sampling, quickbird, aster
			Aboveground biomass	Psomas et al (2011)		RS	kg. m^{-2}	Estimating aboveground biomass in grassland habitats by spectral reflectance
Food chain energy transfer		Energy flow	Food Chain Length	Sokolowski et al. (2012)	*In situ*		FCL	FCL = (Max δ 15Nconsumer - δ 15Nbaseline)/3.4 +2
			Efficiency of production (10% law)	Lindeman (1942); Steele (1976)	*In situ*		Ratio	Starts with primary production
Nutrient regulation			Nutrient budget (N, P,K, Si)	Hussain et al. (2007); Nixon et al. (1996) Ocean; "https 4"; "http 2"	*In situ*		g/g; Mol/m^2/y	
Sediment characteristics		Soil composition, structure and formation, sediment transport, erosion	Soil Organic Matter (SOM)	"https 1"	*In situ*		G	Weight loss on ignition method
			Soil permeability	"http 4", "http 5"	*In situ*		cm/hour	Proxy: % porosity: 1- (bulk density/ particle density) *100
			Pore water tension	"http 6"	*In situ*		piezometric head	Piezometer
			Soil moisture tension	"http 7"	*In situ*		Bar	Tensiometer
			Acidity	"http 8"	*In situ*		pH	
			Nutrients (N, P,K)	Hussain et al. (2007)	*In situ*		Mol	LIBS
			Soil texture and grain size	Teixeira et al. (2015); "http 9"	*In situ*		% clay, silt, sand	
		Albedo	Snow cover and snow depth	Dietz et al. (2012)	*In situ*		M	

Water surface characteristics			Albedo	Schaaf et al. (2002)		RS	lux ratio (0 to 1)	The Bidirectional Reflectance Distribution Function (BRDF)
Raw materials		Sand, Pebbles, Amber	Extraction of raw natural products	expert opinion	*In situ*		tonnes/year	
ECOSYSTEM SERVICES								
Leisure activities		Recreation and tourism, Birdwatching	Number of tourists + tourist days	expert opinion	*In situ*		days/year	
			Number of pleasure crafts	Smallwood et al. (2011); Jensen & Cowen (1999)	*In situ*	RS	nr/ha	Aerial observations
Education and research			Number of educational visits	Smith et al. (2013)	*In situ*		nr/year	
			Funding (on basis of GNP)	expert opinion	*In situ*		euro/y/ha	
			Number of scientific projects, articles, studies	"http 10"	*In situ*		nr/year	Through googlescholar
Habitat for feeding and breeding			Number of offspring of indicator species	expert opinion	*In situ*		nr/ha	
			Breeding success of indicator species	Nisbet & Drury (1972)	*In situ*		nr/breeding pair	Includes juvenile mortality as proxy for feed abundance
			Suitable habitat for indicator species	Hirzel & Le Lay (2008)	*In situ*	RS	%	
Charismatic landscape		Aesthetic values, Cultural heritage, Iconic landscapes	Density of charismatic landscape elements	Ode et al. (2008); Kleban et al. 2009; Li et al. (2013); Gliozzi et al. (2016); Sessions et al. (2016); Dunkel et al. (2015)	*In situ*	RS	nr/ha	Geocoded picture density; in EcoPotential contact Ioannis Manakos and Guy Ziv
			Percentage of undisturbed view	Ode et al. (2008); Filova et al. (2015)	*In situ*	RS	%	Contact Ioannis Manakos
			Perception by inhabitants and visitors	Isendahl, Dewulf & Pahl-Wostl (2010)	*In situ*		Likert-scale	By means of questionnaires
Biodiversity conservation	Ch	Protection of species, habitat and genetic resources	(Change in) Indicator species	Carignan & Villard (2002); Coppolillo et al. (2004); Caro & Odoherty (1999)	*In situ*		Shannon index	

	Ch		Historical biodiversity index (HBI)	Boero & Bondsdorff (2007)	*In situ*		HBI	HBI= realised biodiversity/potential biodiversity > deviation from desired situation
Charismatic species			Number of charismatic species	Verissimo et al. (2011)	*In situ*		nr/ha	Article explains how to select flagship species
Spiritual significance			Number of locations of spiritual significance	Plieninger et al. (2013)	*In situ*		nr/ha	Through enquetes
Animals of economic use		Aquaculture, Bait, Beekeeping, Cattle, Fishing, Shellfish	Livestock biomass	expert opinion	*In situ*		g/ha/year OR kg/m^3/year	
Climate regulation		incl. Carbon sequestration	Oceanic carbon sink	RS: Landschutzer et al. (2014); Sabine et al. (2004); Psomas et al. (2011)	*In situ*		Mol/m^2	
			Terrestrial carbon sink	Petrokofsky et al. (2012); "http 11"	*In situ*	RS	g C/m^2	
			Surface + Air temperature	Tomlinson et al. (2011); "https 2"; "https 3"; Rayner et al. (2013); Zhu et al. (2013); Kotchi et al. (2016)	*In situ*	RS	°C	
			Relative humidity	Manabe (1967)	*In situ*		%	
			Light intensity	"https 5"	*In situ*	RS	lux	
			Windspeed	Weather station reports	*In situ*		m/s	
Food provision for animals		Grazing, Fodder	Vegetation biomass	Madsen (1993); Vashum & Jayakumar (2012)	*In situ*		kg/ha	
			Livestock density index	"http 1"	*In situ*		LSU/ha	stock animals converted into livestock units per hectare of utilized agricultural area
			Landcover	Shalaby & Tateishi (2007); Rawat et al. (2014); Zhu et al. (2014); Tewkesbury et al. (2015);	*In situ*	RS	% of cropland	Does not include natural forest products and livestock for meat

			Carrying capacity	Larson et al. (2004)	*In situ*		%	In aquatic systems by means of primary production
Hydrological regulation		Water flow maintenance	Macrophyte coverage	Clarke (2002)	*In situ*		%	
			Inundation frequency	Bockelmann et al. (2002)			times/year	
			Flood plain coverage	expert opinion		RS	m^2	
			runoff	Ranzi et al. (2003)	*In situ*		mm	Streamgauge
			flow rate	Guo et al. (2000); Kremen (2005)			m/s	
			Discharge flow-through	expert opinion	*In situ*		m^3/s	
Waste and Toxicant mediation		Denitrification, Wastewater treatment, Nutrient regulation, Pest and disease control	Waste treatment	Costanza et al. (2014); Watson et al. (2016)	*In situ*		m^3/ha/year	Originally also expressed as euros/ha/year
			Denitrification	Tsukuda et al. (2015); Hofstra & Bouwman (2005)	*In situ*		g N removed/m^3/d	
Water regulation	Ch	Fresh water, Water storage, Supply of drinking water	Acquifer storage	Gehman et al. (2009)	*In situ*		m	(Change in) Groundwater level
	Ch		Water abstracted for drinking, irrigation	expert opinion	*In situ*		L/ha/year	
Flood and coastal protection		Flood and erosion protection, Coastal protection	Replacement value for cost of coastal and flood protection/avoidance cost	Bishop & Heberlein (1990); Adamowicz (1991)	*In situ*		euros/ha/year	Related to frequency and duration of floods/ GNP/ value of flood control: nr of households in riparian zone
			Vegetation cover in riparian zone	Chan et al. (2006)	*In situ*		%	
			Ecosystem engineering species	Borsje et al. (2011); Bouma et al. (2009); Ysebaert et al. (2011)	*In situ*		m^2	
Food provision for humans		Food collection	Wild edible plants	expert opinion	*In situ*		kg/ha/year OR kg/m^3/year	
			Animal products (meat, honey, milk, meat)	expert opinion	*In situ*		kg or L/ha/year	
			Landcover	Shalaby & Tateishi (2007); Rawat et al. (2014); Zhu & Woodcock	*In situ*	RS	% of cropland	Does not include natural forest products and livestock for meat

				(2014); Tewkesbury et al. (2015);				
Prevention of erosion			Normalized multi-band drought index (NMDI)	Wang & Qu (2007)		RS	index	Landsat measurement on desertification
			Sediment fixing engineer species	Ghestem et al. (2014); Reise (2002)	*In situ*		nr/m^2	
			Soil retention	Egoh et al. (2008)	U		%	
			Vegetation cover	Rawat et al. (2015); Zhu et al. (2014); Tewkesbury et al. (2015)		RS	%	Distinction vegetation, agriculture, barren and built-up land
Sedimentological regulation		Maintenance of soil fertility, Soil formation	Microbial biomass	Schloter et al. (2003)	*In situ*		mg/g	
			Soil enzymatic activity	Schloter et al. (2003)	*In situ*		Mol/g/h	
			Soil retention	Egoh et al. (2008)	*In situ*		%	
Pollination		Seed dispersal	Pollen deposition per flower	Kremen & Ostfeld (2005)	*In situ*		nr/flower	
			Pollinator diversity	Liss et al. (2013)	*In situ*		nr	
Plants of economic use		Agriculture, Cork, Fruits, Timber, Mushrooms, Berries	Plant biomass	Pearce & Moran (2013)	*In situ*	RS	kg/ha	Medicinal, timber, mushroom e.d.; RS landcover
Transport facilitation		Shipping lanes	Road length	Shi & Zhu (2002)		RS	km/ha	Paved roads
			Number of shipping lines and boats		*In situ*		nr/year	
Hunting		Selling licenses	Hunting quotum	rijnsdorp; frans van beek;	*In situ*		catch/year	
			Number of hunting licenses		*In situ*		nr/year	
Fire Protection		Wildfire regulation	Fire risk	Helman et al. (2015)		RS	risk level	1/ha of wildfires
Materials of economic use		Mining, Salt, Amber extraction	Volume extracted (sand, gas, salt, shells, oil, amber)	expert opinion	*In situ*		m^3; kg	
Energy production		Hydropower, Wind farms, Geothermic water	Energy production	expert opinion	*In situ*		megawatts/per year	
Raw materials		Sand, gravel, shell extraction	Volume extracted (sand, gas, salt, shells, oil, amber)	expert opinion	*In situ*		m^3; kg	

THREATS								
Overexploitation		Intensive agriculture, Overfishing, Too high tourist density	Percentage fish below reproductive size	Usseqlio et al. (2016)	*In situ*		%	
			Reduction of adult size	Pauly et al. (1998)	*In situ*		%	
			Desertification	Han et al. (2015)		RS	%/year	Landsat (MSAVI+ Albedo + LST + TVDI + FVC combi index
			Number of visitors above desired amount	Arnberger et al. (2005)	*In situ*		%	
			Fishing and harvesting above MSY	Milner-Gulland & Akcakaya (2001); "http 12"	*In situ*		%	
Disturbance		Anthropogenic disturbance, Off-road vehicles, Transport	Landscape disturbance	Bourbonnais (2017)		RS	%	
			Noise disturbance (ocean)	Can (2015)	*In situ*		pascal, decibel, SPL, ESL	
			Noise disturbance (land)	Merchan et al. (2014)	*In situ*		decibel	
			Number of dams	Dare et al. (2002) (RS)	*In situ*	RS	nr/km	
			Number of vehicles	Muhar et al. (2002)			nr/ha/day	
			Soil sealing	Shalaby & Tateishi (2007); "https 6"	*In situ*	RS	%/ha	Copernicus land monitoringservices/ corine land cover, urban atlas >> RS: Corine Land Cover (CLC)
			Number of pleasure crafts	Smallwood et al. (2011); Jensen & Cowen (1999)	*In situ*	RS	nr/ha	Aerial observations
Tourism		Recreational activities	Number of visitors	Arnberger et al. (2005)	*In situ*		nr	
			Money spent by visitors	Knaus & Backhaus (2014)	*In situ*		euros	
			Spatial patterns of visitors	Monz et al. (2010)	*In situ*		nr/ha	No model present yet; to assess hotspots in PA
			Crowd photos analysis	"https 7"	*In situ*		nr	
Change in species	Ch	Species loss, Successional stagnation, Aging of wild stocks, Food competition with cultured species, Prey decline	Species community composition	Symstad et al. (1998); Godinho & Rabaca (2011)	*In situ*		Shannon-index	

Climate change	Ch	Change in precipitation or snow cover, Droughts, Sea level rise, Global Warming	Acidification (change in)	Appelhans	*In situ*		pH	digital pH meter
			Sea level	Colburn et al. (2016); Kostiuk (2002) RS; Yang et al. (2013)	*In situ*	RS	m	tide gauge/ satellite
			Hectares of wildfires	Klos et al. (2015)	*In situ*	RS	ha	
			Precipitation	Ramos et al. (2015)	*In situ*		mm	
			Temperature	Weather station	*In situ*		°C	
			Snow cover	Yang et al. (2013); Notarnicola et al. (2013)	*In situ*		mm	
Bad management		Inappropriate water management	Quotum and harvest above MSY	"http 13"	*In situ*		tonnes	Maximum sustainable yield (MSY)
			Disproportional influence of stakeholders	Bienfait et al. (2018, in prep.)	*In situ*		Si	
			Mismatch perception degree of corruption and political stability in PA vs country	Hummel et al. (2018, in prep.)	*In situ*		index	
Exotic species	Ch	Invading species	Invasive species	Kostoski et al. (2004); Talevski et al. (2010)	*In situ*		Shannon-index	
Habitat loss	Ch	Habitat fragmentation, Loss of connectivity, Forest decay, Reduction of salt-marshes	Habitat fragmentation	Wang et al. (2014)	*In situ*			
	Ch		Accessible habitat (connectivity)	Eigenbrod et al. (2008)	*In situ*		%	
	Ch		Reduction in habitat amount	Liu et al. (2001)	*In situ*		ha	
	Ch		Number, size and isolation of patches	Liu et al. (2001); Molianen & Nieminin (2002); Winfree et al. (2005); Kindlmann & Buran (2008)	*In situ*		nr; km^2; nearest neighbour index	
Change in land use	Ch	Abandonment of farming, Decrease of crops, Urbanisation, Harbour Extension	Detrimental land use/cover change	Rawat et al. (2014); Zhu et al. (2014); Tewkesbury et al. (2015);		RS	% land cover	Distinction vegetation, agriculture, barren and built-up land

	Ch		Rate of urbanisation		*In situ*	RS	%	Rate of change in the size of the urban population over a given period of time.
(Illegal) human activities		Poaching, Picking of plants, Illegal logging, Illegal fisheries	Number of ceased fishing nets/gears	expert opinion	*In situ*		Nr	
			Number of penalties by police/guards	expert opinion	*In situ*		Nr	
			Deforestation	Sánchez-Azofeifa et al. (2001)		RS	km^2/year	Landsat
Pollution		Pesticides, Atmospheric Pollution, Sonar and sound pollution	Pollution indicator lichen	Nash & Gries (1991); Tommervik et al (1995)	*In situ*		ha; % cover	Need to make predictive model
			Benthic habitat quality (HBI)	Nehring (1976); Hilsenhoff (2017); Nilsson & Rosenberg (1997); Borja & Dauer (2008)	*In situ*		degrees of organic pollution	
			Air Pollution Index	Khanna (2000)	*In situ*		API	multi-tracers approach combining fatty acid (FA) and stable isotope (SI) analyses
			Waste	expert opinion	*In situ*		g/ha/year	
			Metal bio-accumulation	Le croizier et al. (2016)	*In situ*		ppm dw	
Diseases			Area and severity of insect attack	Gillis et al. (2005)	*In situ*		ha	Forest damage monitoring
			Area and severity disease infestation	Gillis et al. (2005)	*In situ*		ha	Forest damage monitoring
			Presence of introduced diseases	Daszak et al. (2000)	*In situ*		Nr	
Eutrophication		Hypertrophic conditions	Trophic state index	Watanabe (2015)		RS	classification	
			Chlorophyll a	Watanabe (2015); Brezonik et al. (2005)		RS	ug/m^3	
Agriculture		Pests	Surface of arable land	Costa et al. (2009)		RS	ha	
			Quantity of used fertilizers and pesticides	UNESCO ROSTE (2004)	*In situ*		kg/ha/year OR kg/m3/year	
Fire			Fire extent	Lentille et al. (2006)		RS	ha/year	
			Fire frequency	Lentille et al. (2006)		RS	nr/year	

Hydrological changes	Ch	Deepening shipping lanes, Hydraulic modification, Increased turbidity, Increased wave action, Ground-water extraction	Acquifer storage	Gehman et al. (2009)	*In situ*		m groundwater change	
			Flow velocity	Kostaschuk et al. (2005)	*In situ*		m/s	acoustic Doppler current profiler; debiet in m3/s divided by surface of section in m2
			Flood duration	Richter et al. (2008)	*In situ*		nr of floods per … year	
Landscape disturbance		Visual ruining, Gas platforms	Nr of visual disturbance objects	Manakos (in progress)	*In situ*		nr/ha	
Civil engineering		Increased number of dams	Number of dams without bypasses for fauna				nr/km	
Sediment dynamics changes	Ch	Avalanches, Erosion, Embankments within wetlands, Dredging, Siltation	Landslides and avalanches	Metternicht et al. (2014)	*In situ*	RS	nr/year	
			Sediment plume	Shi & Wang (2010)	*In situ*	RS	km^2	
Encroachment			Woody encroachment	Kraaij & Ward (2006)	*In situ*	RS	km^2/year	
Predation		Incl. by exotic species as rats and cats	Predator: Prey density	Mchich et al. (2007)	*In situ*		ratio	reference not 100% relevant
Harmfull Algae		Algal blooms	Number of harmful algal blooms	Graneli et al. (2008); Anderson (2009)	*In situ*	RS	nr/year	
Extreme weather		Storm surges	Number of heavy storms and hurricanes	Weather station reports			nr/year	
			Amount of heavy rainfall	Weather station reports			mL	
Fisheries		Bycatch in gill nets	Biomass of bycatch	Grafton et al. (2007)	*In situ*		tonnes/year	
			Surface of aquaculture plots	expert opinion	*In situ*	RS	ha	
			Fishery status	Branch et al. (2011)	*In situ*		% of collapse	
Increased salinisation			Total dissolved solids	"https 8"	*In situ*		ppm	

Addendum A: EcoPotential WP9 – third survey form - 2017

ECOPOTENTIAL

Improving future ecosystem benefits through Earth Observations

Questionnaire for Work Package 9, on requirements of protected areas
and for Work Package 12, on dissemination of results, and citizen science in protected areas

Date	
Name of the represented Protected Area (PA)	

Questionnaire structure:

Privacy: In the survey you are requested to provide certain personal data to EcoPotential (namely: name, email, telephone, address details, affiliation). EcoPotential and its partners respect the privacy of all the participants to the survey and ensures that all personal information which you will give us, will be dealt with following the rules below.
The collected personal data information will never be provided to third parties without your explicit unambiguous consent. Although eventually all data in EcoPotential will be available for open access, the (personal) data will be excluded in case you did not agree on sharing those data. To this end, at the start of the survey we ask you to indicate which option you want to follow for using the personal data and the (other) general data on your PA.

You can indicate the following options:

Questionnaire respondents	Data can be used by EcoPotential partners				Data can be used by third parties				Remarks
	Personal data (authorise the use of the answers to the survey and appearance of personal name in the acknowledgements as data provider)		General data (authorise the use of the data but stay anonymous)		Personal data		General data		
	Yes	No	Yes	No	Yes	No	Yes	No	
	☐	☐	☐	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	☐	☐	☐	

At any moment you can request to remove your personal data out of our files.

Disclaimer: The content of this survey has been compiled with the utmost care in the frame of the EcoPotential project. Responsible partners for this survey are Christiaan Hummel MSc and Prof.Dr. Herman Hummel (lead) of the Royal Netherlands Institute for Sea Research (NIOZ), Yerseke, the Netherlands, and Yolande Boyer MSc (main author) and Dr. Rutger de Wit of the University of Montpellier (UMontpellier), France. Although EcoPotential and the responsible partners aim to keep the information of the survey in its repositories permanently as accurate and up-to-date as possible, changes to the information are always reserved. EcoPotential and its partners are in no way responsible and shall not be liable for any claims or damages that are the direct or indirect consequence of or in connection with the use of the information available in this survey.

Preface to the interview during our visit to your Protected Area

For your orientation we do send the questionnaire on beforehand of our visit to you. This may also help to decide who might additionally participate in the interview in order to properly answer the questions
The interview will touch in principle upon all questions in the questionnaire. Yet, for some questions it might be decided that it is better to pre-fill them (already before our visit) or to enter the answers at a later stage (e.g. after consultation of a colleague).

Therefore, you may find the following elements in the questionnaire:

- In blue boxes are factual questions that can be prefilled by you, or eventually completed and verified in a later stage (but please before 30 September) (during the interview we may decide NOT to spend attention to these questions, if you already filled them in or if you will fill them in at a later stage)
- In yellow boxes are factual questions that we will ask during the interview and can be completed either during our visit to you, or (if you are not sure on the answer) after the interview
- Blank questions (outside the boxes) will be discussed during our visit, since these need the point of view of the interviewed PA managers
- Following a * and in *orange italic* are examples

For all questions holds that:
- discussions should NOT last too long. The chair of the visiting team will ask after 1 or 2 minutes to come to a conclusion for each question.
- the opinion of the PA managers prevails above that of the scientists. A note will be made of major different answers to questions (eventually multiple answers to a question will be noted)

PART A: Protection measures, governance and management

A.1 Territory protection measures

A.1.1 Protection measures (some can overlap)

Category	Type of protection*	Site name	Creation date	Surface (ha; estimate)	IUCN category
International					
European					
National					
Regional					
Provincial					
Municipal					

(RAMSAR, Natura 2000, National Nature Reserve, Hunting and Wildlife Reserve, ….)*

A.1.2 Regulations / restrictions areas in the PA

	Surface of the (total) PA (ha)
Area where entry is not allowed	
Area where hunting is not allowed	
Area where fishing is not allowed	
Area where agriculture and livestock farming are not allowed	
Area where constructions are not allowed	
Area where mining, quarrying or factories are not allowed	

A.2 EcoPotential studied Protected Area

A.2.2 EcoPotential PA (study perimeter)

PA	
Name of the management structure	

A.2.3 Property regimes

	% of surface	Owners	Surface (ha)	Number of owners
Private property		Individual owners		
		NGOs aiming to protect the PA		
Public property		State		
		Regional body		
		Provincial body		
		Municipality		

A.3. Existential reasons of PA

A.3.1 Original main reason(s) at the moment of PA creation

		Importance					
		0 Not present	1 Very small	2 Small	3 Mode-rate	4 High	5 Very high
A	Safeguard outstanding areas of living richness, natural beauty	☐	☐	☐	☐	☐	☐
B	Safeguard outstanding areas of cultural significance	☐	☐	☐	☐	☐	☐
C	Maintain the diversity of ecosystems, species, genetic varieties, and ecological processes	☐	☐	☐	☐	☐	☐
D	Protect genetic variation and species which are needed to meet human needs	☐	☐	☐	☐	☐	☐
E	Provide homes to human communities with traditional cultures and knowledge of nature	☐	☐	☐	☐	☐	☐
F	Protect landscapes reflecting the history of human interaction with the environment	☐	☐	☐	☐	☐	☐
G	Provide for scientific, educational, recreational and spiritual needs of societies	☐	☐	☐	☐	☐	☐
H	Provide benefits to local and national economies	☐	☐	☐	☐	☐	☐
I	Other (please specify)	☐	☐	☐	☐	☐	☐

A.3.2 Current main reason(s) of preserving the PA

Currently, the status and existence of the PA mainly depend on:	Specify *	Importance					
		0	1	2	3	4	5
Natural environmental values		☐	☐	☐	☐	☐	☐
Value of specific Ecosystem Services		☐	☐	☐	☐	☐	☐
Value of specific socio-cultural elements		☐	☐	☐	☐	☐	☐
Other specific value		☐	☐	☐	☐	☐	☐

* *Natural environmental values: Presence of specific species (e.g. whales) or habitats (rocky mountains)…*
Specific Ecosystem Services: Tourism, fishing…
Specific social/cultural elements: Presence of a castle, old salt-mine…

A.3.3 Factors influencing the protection level of the PA

Protection legal level is mainly influenced by *	Importance				
	1	2	3	4	5
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
Protection effective level is mainly influenced by*					
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

** Level of primary production, socio-economic activities as ship-building, central management policies, political decisions, propriety rights, vulnerability level…*

A.3.4 What is required to strengthen the protection of your PA in the future

What factor is important to strengthen the protection of your PA	Importance				
	1	2	3	4	5
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

** Stronger / healthier functioning of ecosystem (what, how), more or less of some habitats / structures (which), less disturbances (what kind of), stronger political support, less economic exploitation (which), less / more PA management, funding, ownership…*

A.4 PA management structure

A.4.1 Management structure type

	public	private
Type of PA management structure	☐	☐

	the State	Regional authorities	Provincial authorities	Municipal authoriti
If it is a public structure, what is the level on which it depends?	☐	☐	☐	☐
Comments				

A.4.2 Local community involvement in the management structure

	Yes	No
Is the local community directly involved in the PA management structure?	☐	☐

A.4.3 Initial purpose/targets of the PA management structure

Have the objectives and the purpose/targets of the PA clearly been identified?	Yes	☐	No	☐
If yes: can they be described in a few sentences?				

A.5 Funding, competences and equipment

A.5.1 Sources and allocation of funding (last 5 to 10 years)

Average total funding / year (or latest year's funding)	

Most important sources of funding (5 maximum)	Origin		Occurrence		Duration	Total funding per source: (average importance /year in the past 10 years)	Main allocation funding
	Public	Private	Recurrent	Additional funding from fund-raising (i.e. EU Life, Med and Interreg projects, ...)			
	☐	☐	☐	☐			
	☐	☐	☐	☐			
	☐	☐	☐	☐			
	☐	☐	☐	☐			
	☐	☐	☐	☐			

A.5.2 Partnerships

10 most important partnerships that support the PA

Partner	Association /NGO	Public organisation	Company	Other	Partnership importance listing (1=most important)	Type of agreement: sign contract or memorandum understanding (MOU)? (spec if possible)
	☐	☐	☐	☐		
	☐	☐	☐	☐		

	☐	☐	☐	☐			
	☐	☐	☐	☐			
	☐	☐	☐	☐			
	☐	☐	☐	☐			
	☐	☐	☐	☐			
	☐	☐	☐	☐			
	☐	☐	☐	☐			

A.5.3 Number and competences of PA staff

How many persons are currently employed by the PA management structure?	

Can you provide a breakdown in terms of professional categories, specialised tasks, skills and funding?

Professional categories	Number of employees	Specialised tasks or responsibilities	Education-training levels and skills	Contracts	
				Short-term	Long-term/ continui
				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐

A.5.4 Training programmes

Are specific training programs offered for the PA managers?

NO ☐

YES ☐	Type of programmes	How many times a year	Duration

Are specific training programs needed for the PA managers?

NO ☐

YES ☐

What are the needs in training?

A.5.5 Facilities and equipment

Type of PA facilities used for management (garage, office etc.)	Size		
	Small: 0 to 50m²	Medium: 50 to 300m²	Big: more than 300m
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐

Other PA facilities and important equipment	Number	For management	For research	Use in general (not possible to differentiate management and research)	Frequency of (days/year)
Ships		☐	☐	☐	
Cars		☐	☐	☐	
Others (tractors, snowmobiles…):		☐	☐	☐	
Comments:					

A.5.6 Communication within the PA staff

	Yes	Type of meeting	Frequency	Comments
Formal meetings that involve all PA staff	☐			
Informal meetings or other ways of communication that involve all PA staff	☐			
Separated meetings for a common group of the PA staff	☐			

A.5.7 Regulations and law enforcement

	Belonging to the PA management structure	External to the PA managem structure but operating on the territ
How many park rangers or other kind of police are present to help enforcing laws, rules and regulations?		
How many can give fines?		
How many do carry firearms?		
How often is there a situation where a ranger has to arrest someone or aim his rifle?		

A.5.8 Advisory boards

Are you assisted in your work by advisory boards as e.g., a Scientific Council of the PA?			
No ☐			
Yes ☐	Type of board	Number of persons involved	Where are the persons from
Comments:			

A.5.9 Level of funding

Is the level of funding that the PA receives enough to correctly manage the PA?			
Not at all: There is a critical lack of funding	No: The PA management can go on but there is still a big lack of funding	Not completely: The principal actions are paid but funding lacks for less urgent requirements	Sufficiently: It is sufficient to pay for the main actions/ jobs/ maintenance
☐	☐	☐	☐
Comments:			

most important sectors to which you would allocate additional funding	most important (fill in only one)	second most important (fill in only one)
Staff	☐	☐
Investment in new equipment	☐	☐
Maintenance	☐	☐
Environmental education	☐	☐
New action project	☐	☐
Continuation of current projects	☐	☐
Other:	☐	☐
Comments:		

Usually how many months or years do the PA managers know in advance that the PA will receive funds?
For how many months/years is it possible for PA managers to plan the PA projects in the future?

A.5.10 Contribution of volunteers and students to the management

Does the PA benefit from the help of:	No	Yes	If yes:				
			Number /year	Average number of months / person	Are they paid?	If paid, which organisation funds them:	
						the PA managing structure	Another organisation
Students	☐	☐			Yes ☐ No ☐		
Volunteers	☐	☐			Yes ☐ No ☐		
Comments:							

A.6 Management plan(s)

A.6.1 Management targets

	No	Yes	If yes, which ones in particular?
Does it target the sustainable use of natural resources?	☐	☐	
Does it contribute to the control or mitigation of natural hazards (fires, inundation, etc.)?	☐	☐	
Does it target the conservation of specific species?	☐	☐	
Comments:			

A.6.2 Management frameworks

	No	In progress (emerging)	Yes
Does the PA management structure use an Ecosystem Service framework?	☐	☐	☐
If no, why not?			
If yes, which concept (CICES, TEEB, other)			

	No	In progress (emerging)	Yes
Does the PA management use the principle of adaptive management (assess-plan-implement-monitor-evaluate-adjust)?	☐	☐	☐
If the PA implements adaptive management, duration of a cycle:			
Comments:			

A.6.3 Connectivity

	No	In progress (emergent project)	Y
Are criteria for connecting protected populations (connectivity) an important asset for the PA?	☐	☐	☐

If yes:	National scale	Regional scale	Smaller sca (specify)
Is the management strategy the PA uses (on connectivity) relevant at:	☐	☐	☐
At which scale would the criteria for connecting protected populations (connectivity) be an important asset for the PA?	☐	☐	☐
What kind of measures are taken to improve connectivity:			
Comments:			

* e.g. viaducts for animals, hydrological redirections

A.6.4 Master plans (management strategy plans)	Yes	No
Does a single or several Master Plans exist for the management of the PA?	☐	☐

Title	Since when	Duration of validity	Comments

A.7 Monitoring and research

A.7.1 PA involvement	Yes	No
Is the PA involved in biodiversity and environmental variables monitoring?	☐	☐
Is the PA involved in scientific research?	☐	☐

A.7.2 Importance of PA management team for determining needs	Yes	No
Have the major needs for scientific research and monitoring been determined by the PA management team?	☐	☐
If no, can you indicate what/who determined the research/monitoring (e.g. Natura 2000 legislation, minist external scientists, …):		

A.7.3 Detection methods for threats	Yes	No
Is there a specific method to detect and describe the threats to allow preventive action by the PA?	☐	☐
If yes, can you give more information?		

A.8 Involvement of stakeholders

A.8.1 Key stakeholders

Stakeholders	Not involved	Somewhat involved (are informed of the decisions)	moderately involved (are present at part of meetings, take sometimes part in decisions)	Involved (are present to meetings, take part to decisions)	Very involved (do actions, their opinion is needed to take decisions)	Main stakeholders (must always be represented, main "voices" at meetings, are the ones who do the most actions)	Level of implication difficult to assess
Municipal government(s)	☐	☐	☐	☐	☐	☐	☐
Provincial government(s)	☐	☐	☐	☐	☐	☐	☐
Regional government(s)	☐	☐	☐	☐	☐	☐	☐
National government(s)	☐	☐	☐	☐	☐	☐	☐
Private companies	☐	☐	☐	☐	☐	☐	☐
Local community	☐	☐	☐	☐	☐	☐	☐
Visitors	☐	☐	☐	☐	☐	☐	☐
NGOs	☐	☐	☐	☐	☐	☐	☐
Scientific institutions	☐	☐	☐	☐	☐	☐	☐
Public at large / citizens	☐	☐	☐	☐	☐	☐	☐
Others :	☐	☐	☐	☐	☐	☐	☐

	Yes	No
Do some stakeholders have disproportionate influence in decision making processes?	☐	☐

IF YES:

Who	For which reason?				Importance of their influence		
	Ownership	Political power	Representation of a very numerous interest group	Funding	Can block actions	Can make taking decisions difficult	Other:
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐

A.8.2 Stakeholders training

Do stakeholders benefit from information and / or training during their involvement in the PA's projects?

PART B: Environment

In Part B we will follow the Card game as developed for the Pisa meeting (for those who were present at the Pisa meeting the results will be prefilled by the interview-team)

B.1. Most important Ecosystem Functions and Ecosystem Structures

Can you indicate the most important Ecosystem Functions and Ecosystem Structures that play a role in your PA:

Ecosystem Structure or Function	Specify (if possible)	Importance					
		Very high	High	Average / moderate	Small	Very small	Not present / not mentioned
Biodiversity	Status, Changes, Endemism, protected species	☐	☐	☐	☐	☐	☐
Carbon cycle	Storage, Sequestration	☐	☐	☐	☐	☐	☐
Climate regulation	Change of microclimate	☐	☐	☐	☐	☐	☐
Element cycling	Biogeochemical cycling, Hydro-geo-eco processes	☐	☐	☐	☐	☐	☐
Food chain energy transfer	Energy flow	☐	☐	☐	☐	☐	☐
Gene pool	Genetic resources	☐	☐	☐	☐	☐	☐
Habitat suitability	Habitat availability, Feeding and breeding grounds, Ecotypes	☐	☐	☐	☐	☐	☐
Hydrodynamics	Currents, Water flow, Water regulation and retention	☐	☐	☐	☐	☐	☐
Land- and sea-scape	UNESCO World Heritage	☐	☐	☐	☐	☐	☐
Nutrient regulation		☐	☐	☐	☐	☐	☐
Population dynamics	Recruitment, Seed dispersal, Reproduction, Pollination, Succession, Resilience, Grazing, Predation, Species distribution	☐	☐	☐	☐	☐	☐
Primary production		☐	☐	☐	☐	☐	☐
Raw materials	Sand, Pebbles, Amber	☐	☐	☐	☐	☐	☐
Secondary production		☐	☐	☐	☐	☐	☐
Sediment characteristics	Soil composition, structure and formation, sediment transport, erosion	☐	☐	☐	☐	☐	☐
Weather	Temperature, Evaporation	☐	☐	☐	☐	☐	☐
Water surface characteristics	Albedo	☐	☐	☐	☐	☐	☐

* Examples of Ecosystem functions and structures are: Biodiversity, Carbon cycling, Nutrient dynamics, Climate regulation, Element cycling, Food chain energy transfer, Gene pool, Habitat (heterogeneity, suitability), Primary

production (plants), Secondary production (animals), Population dynamics (density or growth of trees, recruitment of animals, flowering), Raw materials, Sediment characteristics, Salinity, Water dynamics

B.2. Most important Ecosystem Services

Can you indicate the most important Ecosystem Services that play a role in your PA, and what the benefits are:

Ecosystem Service	Specify the ES (and its benefit) if possible	Importance					
		Very high	High	Average / moderate	Small	Very small	Not present / not mentioned
Animals of economic use	Aquaculture, Bait, Beekeeping, Cattle, Fishing, Shellfish	☐	☐	☐	☐	☐	☐
Biodiversity conservation	Protection of species, habitat and genetic resources	☐	☐	☐	☐	☐	☐
Charismatic landscape	Aesthetic values, Cultural heritage, Iconic landscapes	☐	☐	☐	☐	☐	☐
Charismatic species		☐	☐	☐	☐	☐	☐
Climate regulation	incl. Carbon sequestration	☐	☐	☐	☐	☐	☐
Education and research		☐	☐	☐	☐	☐	☐
Energy production	Hydropower, Wind farms, Geothermic water	☐	☐	☐	☐	☐	☐
Fire Protection	Wildfire regulation	☐	☐	☐	☐	☐	☐
Flood and coastal protection	Flood and erosion protection, Coastal protection	☐	☐	☐	☐	☐	☐
Food provision for animals	Grazing, Fodder	☐	☐	☐	☐	☐	☐
Food provision for humans	Food collection	☐	☐	☐	☐	☐	☐
Habitat for feeding and breeding		☐	☐	☐	☐	☐	☐
Hunting	Selling licenses	☐	☐	☐	☐	☐	☐
Hydrological regulation	Water flow maintenance	☐	☐	☐	☐	☐	☐
Leisure activities	Recreation and tourism, Birdwatching	☐	☐	☐	☐	☐	☐
Materials of economic use	Mining, Salt, Amber extraction	☐	☐	☐	☐	☐	☐
Plants of economic use	Agriculture, Cork, Fruits, Timber, Mushrooms, Berries	☐	☐	☐	☐	☐	☐
Pollination	Seed dispersal	☐	☐	☐	☐	☐	☐
Prevention of erosion		☐	☐	☐	☐	☐	☐
Raw materials	Sand, gravel, shell extraction	☐	☐	☐	☐	☐	☐
Sedimentological regulation	Maintenance of soil fertility, Soil formation	☐	☐	☐	☐	☐	☐

Spiritual significance		☐	☐	☐	☐	☐	☐
Transport facilitation	Shipping lanes	☐	☐	☐	☐	☐	☐
Waste and Toxicant mediation	Denitrification, Wastewater treatment, Nutrient regulation, Pest and disease control	☐	☐	☐	☐	☐	☐
Water regulation	Fresh water, Water storage, Supply of drinking water	☐	☐	☐	☐	☐	☐

* Examples of Ecosystem Services are: Aesthetic qualities: Animals of economic use (cattle, fish aquaculture of oysters), Biodiversity conservation, Charismatic landscape, Charismatic species, Climate regulation, Education and research, Energy production, Fire Protection, Flood and coastal protection, Food provision for animals, Food provision for humans, Habitat for feeding and breeding (for fish or birds), Hunting, Hydrological regulation, Leisure activities, Materials of economic use (mining, salt), Plants of economic use (timber, fruits, grain), Pollination, Prevention of erosion, Raw materials (sand, gravel, shells), Resilience, Sedimentological regulation (soil protection, land incrementation), Spiritual significance, Transport facilitation, Waste and Toxicant mediation, Water regulation (fresh water storage)

B.3. Most important pressures

Can you indicate the most important pressures in your PA, that can form a threat to the afore mentioned Ecosystem Functions and Structures (question B1) or to the Ecosystem Services (question B2):

Pressure	Specify the pressure (if possible)	Importance					
		Very high	High	Average / moderate	Small	Very small	Not present / not mentioned
(Illegal) human activities	Poaching, Picking of plants, Illegal logging, Illegal fisheries	☐	☐	☐	☐	☐	☐
Agriculture		☐	☐	☐	☐	☐	☐
Bad management	Inappropriate water management	☐	☐	☐	☐	☐	☐
Change in land use	Abandonment of farming, Decrease of crops, Urbanisation, Harbour Extension	☐	☐	☐	☐	☐	☐
Change in species	Species loss, Successional stagnation, Aging of wild stocks, Food competition with cultured species, Prey decline	☐	☐	☐	☐	☐	☐
Civil engineering	Increased number of dams	☐	☐	☐	☐	☐	☐
Climate change	Change in precipitation or snow cover, Droughts, Sea level rise, Global Warming	☐	☐	☐	☐	☐	☐
Diseases	Pests	☐	☐	☐	☐	☐	☐
Disturbance	Anthropogenic disturbance, Off-road vehicles, Transport	☐	☐	☐	☐	☐	☐

Encroachment		☐	☐	☐	☐	☐	☐
Eutrophication	Hypertrophic conditions	☐	☐	☐	☐	☐	☐
Exotic species	Invading species	☐	☐	☐	☐	☐	☐
Extreme weather	Storm surges	☐	☐	☐	☐	☐	☐
Fire		☐	☐	☐	☐	☐	☐
Fisheries	Bycatch in gill nets	☐	☐	☐	☐	☐	☐
Habitat loss	Habitat fragmentation, Loss of connectivity, Forest decay, Reduction of salt-marshes	☐	☐	☐	☐	☐	☐
Harmfull Algae	Algal blooms	☐	☐	☐	☐	☐	☐
Hydrological changes	Deepening shipping lanes, Hydraulic modification, Increased turbidity, Increased wave action, Ground-water extraction	☐	☐	☐	☐	☐	☐
Increased salinisation		☐	☐	☐	☐	☐	☐
Landscape disturbance	Visual ruining, Gas platforms	☐	☐	☐	☐	☐	☐
Overexploitation	Intensive agriculture, Overfishing, Too high tourist density	☐	☐	☐	☐	☐	☐
Pollution	Pesticides, Atmospheric Pollution, Sonar and sound pollution	☐	☐	☐	☐	☐	☐
Predation	Incl by exotic species as rats and cats	☐	☐	☐	☐	☐	☐
Sediment dynamics changes	Avalanches, Erosion, Embankments within wetlands, Dredging, Siltation	☐	☐	☐	☐	☐	☐
Tourism	Recreational activities	☐	☐	☐	☐	☐	☐

* Examples of Pressures/Threats are: (Illegal) human activities, Agriculture, Bad management, Change in land use, Change in species, Civil engineering, Climate change, Diseases, Disturbance, Encroachment, Eutrophication, Exotic species, Fire, Fisheries, Habitat loss, Harmful Algae, Hydrological changes, Increased salinisation, Industry, Landscape disturbance, Local policy and politics, Overexploitation, Pollution, Predation, Sediment dynamics changes, Tourism

PART C: Economic development

Number of permanent residents	Population density (hab./km²)	Year of data

C.1 Territory use

What is the use of the territory implemented in the PA?

Use of territory	Percentage of PA surface where this territory use is implemented	Number of jobs provided					Employment of lo community (%)			
		0-50	50-250	250-500	500-1000	>1000	0-25	25-50	50-75	75 10
Mining and quarrying		☐	☐	☐	☐	☐	☐	☐	☐	☐
Water and waste treatment		☐	☐	☐	☐	☐	☐	☐	☐	☐
Energy production		☐	☐	☐	☐	☐	☐	☐	☐	☐
Industry and manufacturing		☐	☐	☐	☐	☐	☐	☐	☐	☐
Transport, communication networks		☐	☐	☐	☐	☐	☐	☐	☐	☐
Construction		☐	☐	☐	☐	☐	☐	☐	☐	☐
Commerce, finance, business		☐	☐	☐	☐	☐	☐	☐	☐	☐
Residential		☐	☐	☐	☐	☐	☐	☐	☐	☐
Arable land		☐	☐	☐	☐	☐	☐	☐	☐	☐
Permanent crops		☐	☐	☐	☐	☐	☐	☐	☐	☐
Pastures		☐	☐	☐	☐	☐	☐	☐	☐	☐
Heterogeneous agricultural areas		☐	☐	☐	☐	☐	☐	☐	☐	☐
Forestry		☐	☐	☐	☐	☐	☐	☐	☐	☐
Aquaculture and fishing		☐	☐	☐	☐	☐	☐	☐	☐	☐
Public services*		☐	☐	☐	☐	☐	☐	☐	☐	☐
Recreation, sport, tourism		☐	☐	☐	☐	☐	☐	☐	☐	☐
No-entry area		☐	☐	☐	☐	☐	☐	☐	☐	☐
Unused area Nature zone		☐	☐	☐	☐	☐	☐	☐	☐	☐
Other, specify:		☐	☐	☐	☐	☐	☐	☐	☐	☐

* including hospitals, schools, town hall

C.2 Surrounding area territory use

Relevant surrounding area	Area (ha)	Number of permanent residents	Year of data

What are the territory use implemented in the surrounding area of the PA?

Territory use categories	Percentage of the surface where this territory use is implemented
Artificial surfaces	
Agricultural areas, forestry, aquaculture and fishing	
service	
industry	
transport	
Recreation, sport, tourism	

Other, specify:	

In your opinion, what are the most important economic sectors in the PA?	
In number of jobs	Money wise
In your opinion, what are the most important economic sectors in the surrounding area of the PA?	
In number of jobs	Money wise
Comments:	

C.3 Pressures and threats

C.3.1 Legal resource exploitation demand and tensions

	Importance					
Demand for legal resource exploitation*	Not present	Very small	Small	Moderate	High	Very high
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

- *Hunting, fishing…*

Are there tensions regarding territory ownership, usage rights or resource exploitation?

C.3.2 Illegal activities

		Importance					
		Not present	Very small	Small	Moderate	High	Very high
Presence of illegal activities	Building of infrastructure	☐	☐	☐	☐	☐	☐
	Extraction of non-renewable natural resources (sand, mining etc.)	☐	☐	☐	☐	☐	☐
	Timber extraction	☐	☐	☐	☐	☐	☐
	Agriculture and farming	☐	☐	☐	☐	☐	☐
	Poaching	☐	☐	☐	☐	☐	☐
	Fishing	☐	☐	☐	☐	☐	☐
	Extraction of other biological resources	☐	☐	☐	☐	☐	☐
	Vandalism of cultural resources	☐	☐	☐	☐	☐	☐
	Squatting*	☐	☐	☐	☐	☐	☐
	Recreational sports (disregard of regulations against leaving paths, base jumping, climbing, caving, etc.)	☐	☐	☐	☐	☐	☐
	Motorized access	☐	☐	☐	☐	☐	☐
	Open fires	☐	☐	☐	☐	☐	☐
	Drone flights	☐	☐	☐	☐	☐	☐
	Other :	☐	☐	☐	☐	☐	☐
Difficulty in monitoring illegal activities within the PA		☐	☐	☐	☐	☐	☐

*squatting: action of occupying an abandoned or unoccupied area of land or a building, usually residential, that the squatter does not own, rent or otherwise have lawful permission to use

C.3.3 Political stability and corruption issues

The "corruption perception index" from the Transparency International NGO ranks countries based on how corrupt their public sector is perceived to be. In 2016, your country (XXX) was ranked as xxx / 176, with a score of x,xx (scores go from 0 (very corrupted) to 100 (no corruption)). Do you think this reflects the situation to which the PA is confronted?
The "political stability index" issued from the World Bank, ranks countries by reflecting the likelihood of social conflicts and tensions. In 2015 your country (XXX) was ranked as xx / 194 with a score of x,xx (scores go from -2,5 (weak political stability) to 2,5 (strong political stability)). Do you think this reflects the situation to which the PA is confronted?

C.4 Sustainable development

C.4.1 Ecolabels and Protected origin labels

List of Ecolabels and "Protected Origin" labels

C.4.2 Organic farmers

List of "organic" farmers	Size of exploitation in hectares				
	[0; 10[	[10; 50[	[50; 100[	[100; 150[	More than 150
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

C.4.3 Contribution of commercial tour operators to PA management

Do commercial tour operators contribute to protected area management?	No ☐ Yes ☐

IF YES :

How?	To a Low degree	To a Medium degree	To a High degree
Funding	☐	☐	☐
Communication on PA	☐	☐	☐
Monitoring	☐	☐	☐
Other (specify)	☐	☐	☐

C.4.4 Contribution of fees to PA management

If fees (i.e. entry fees, parking fees or fines) are applied, do they help the PA management?	No ☐ Yes ☐

IF YES :

How?	To a Low degree	To a Medium degree	To a High degree
Funding	☐	☐	☐
Communication on PA	☐	☐	☐
Monitoring	☐	☐	☐
Other (specify)	☐	☐	☐

PART D: Social and cultural development

D.1 Recreational activities

D.1.1 List and rate of importance of recreational activities in the PA

	Importance of the activity in the PA						Ranking of the importance of the activities in comparison with each other in the PA, the activity ranked "1" is most practiced
	Not present	Very small	Small	Moderate	High	Very high	
Hiking	☐	☐	☐	☐	☐	☐	
Biking	☐	☐	☐	☐	☐	☐	
Horseback riding	☐	☐	☐	☐	☐	☐	
Kayaking / canoeing	☐	☐	☐	☐	☐	☐	
Surfing / kite surfing	☐	☐	☐	☐	☐	☐	
Paragliding	☐	☐	☐	☐	☐	☐	
Fishing	☐	☐	☐	☐	☐	☐	
Hunting	☐	☐	☐	☐	☐	☐	
Diving / snorkeling	☐	☐	☐	☐	☐	☐	
Animal watching	☐	☐	☐	☐	☐	☐	
Others :	☐	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	☐	

D.1.2 Issues related to cultural ecosystem services of special interest for the management of the PA

	Please tick checkbox, (multiple answers possible) on level of interest					
	Not present	Very small	Small	Moderate	High	Very high
Spatial distribution of visitors	☐	☐	☐	☐	☐	☐
Hotspots of visitor interest	☐	☐	☐	☐	☐	☐
Socioeconomic characteristics of user groups	☐	☐	☐	☐	☐	☐
Cultural ecosystem services searched by PA-visitors	☐	☐	☐	☐	☐	☐
Threat to PA due to overcrowding or unsustainable use	☐	☐	☐	☐	☐	☐
Other (specify)	☐	☐	☐	☐	☐	☐

D.1.3 Interest in spatial distributions of cultural ecosystem services in the PA

Would you be interested to get information on the spatial distribution of cultural ecosystem services?	YES ☐	NO ☐
If yes, for what purpose would you like to use these data?		

D.1.4 Number of visitors

Number of visitors last year	

D.1.5 Available data on visitor counts

What kind of data are available on visitor counts for your PA?

	Please tick checkbox (multiple answers possible and provide links of contact:
Visitor count data/surveys	☐
Footpath loggers	☐
Visitor center or car park counts	☐
Website visitor numbers	☐
Guided tour participants	☐
Local hotel bookings	☐
Other:	☐

D.1.6 PA staff devoted to the attendance of visitors

Full time equivalent (FTE) of PA staff devoted to the attendance of visitors	

D.1.7 Available trails for visitors

Number of kilometers of arranged and signposted footpaths/hiking trails		
Number of kilometers of canopy walk		
Are geo-data (maps, coordinates, shapefiles, etc.) available on this topic?	YES ☐	NO ☐

D.1.8 Available observatories for visitors

Number of observatories / signposted viewpoints (for fauna or landscape observation)	

D.1.9 Available infrastructures for visitors

Tourism offices, information centers, natural parks houses and other infrastructures for visitors: Specify type of infrastructure	Size			Could you provide geodata (maps, coordinates, shapefiles) on the location of these infrastructures?	
	Small: 0 to 50m²	Medium: 50 to 300m²	Big: >300m²		
	☐	☐	☐	YES ☐	No ☐
	☐	☐	☐	YES ☐	No ☐
	☐	☐	☐	YES ☐	No ☐

D.1.10 Satisfaction of visitors

Does the PA have a measure of visitor's satisfaction?	YES ☐	NO ☐
If yes, can you specify this visitor's satisfaction (please provide any reports)?		

D.1.11 Communication with visitors, local community and other stakeholders

	Yes	No
Is there a responsive system for handling comments about the PA decisions?	☐	☐
If yes, what system?		
If no, what would you suggest?		

D.1.12 List of organisations linked to recreational activities in the PA

Clubs/associations/organisations linked to recreation activities in the PA:

D.2 Landscape and monuments

Unusual/attractive landscapes features, patrimonial/ attractive monuments and places with historical value	Comparative level of visit					
	None	Very small	Small	Moderate	High	Very high
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

D.3 Artistic work linked to the area

	Fame level	Number				
		[0; 30[	[30; 60[	[60; 90[	[90; 120[	> 120
Books in which the PA is an important location / has an important role	Famous internationally	☐	☐	☐	☐	☐
	Famous in the country	☐	☐	☐	☐	☐
	Famous in the region	☐	☐	☐	☐	☐
Paintings on the PA landscape / seascape	Famous internationally	☐	☐	☐	☐	☐
	Famous in the country	☐	☐	☐	☐	☐
	Famous in the region	☐	☐	☐	☐	☐
Movies taking place in the landscape of the PA	Famous internationally	☐	☐	☐	☐	☐
	Famous in the country	☐	☐	☐	☐	☐
	Famous in the region	☐	☐	☐	☐	☐
Handcraft or traditional local products	Famous internationally	☐	☐	☐	☐	☐
	Famous in the country	☐	☐	☐	☐	☐
	Famous in the region	☐	☐	☐	☐	☐

Which are the most important to your opinion and why?

Famous books/paintings/movies linked to the area
Local techniques / skills

Local events	Number of participants

D.4 Spiritual beliefs

What are the most important local values and beliefs?

D.5 Threats to socio-cultural values

Threats to socio-cultural values and elements	Importance of threat					
	Not present	Very small	Small	Moderate	High	Very high
Progression of urban development	☐	☐	☐	☐	☐	☐
Progression of industry	☐	☐	☐	☐	☐	☐
Conflict between different social groups	☐	☐	☐	☐	☐	☐
Inappropriate use of cultural sites or buildings	☐	☐	☐	☐	☐	☐
Over use / visitation pressure (tourism, recreation)	☐	☐	☐	☐	☐	☐
Vandalism	☐	☐	☐	☐	☐	☐
Fire	☐	☐	☐	☐	☐	☐
Vegetation (encroachment)	☐	☐	☐	☐	☐	☐
Erosion	☐	☐	☐	☐	☐	☐
Weathering (wind and water)	☐	☐	☐	☐	☐	☐
Pests (e.g. termites)	☐	☐	☐	☐	☐	☐
Management limitations	☐	☐	☐	☐	☐	☐
Others (specify):	☐	☐	☐	☐	☐	☐

D.6 Social recognition for ecosystem functions and services delivered

D.6.1 Most important species and places in the PA for local residents and for tourists

What are the most important:	For local residents (what do they need, use and want to preserve the most)	For tourists (what do they want to see the most)
Species in the PA		
Places or landscapes of the PA		
Products/handcrafts		

D.6.2 Species and places most valued by the PA management

In your opinion, what are the species and places that the PA values the most?

D.6.3 Associations and NGOs involved in the PA uses and protection

Which locally active associations and NGOs are involved in the PA uses and protection?

D.6.4 Public awareness

What is your opinion about:	Level of respect					
	None	Very small	Small	Moderate	High	Very high
Tourists respect on PA regulations	☐	☐	☐	☐	☐	☐
Local residents respect on PA regulations	☐	☐	☐	☐	☐	☐
Local residents knowledge of natural history and environmental awareness	☐	☐	☐	☐	☐	☐
Local residents awareness of PA's benefits	☐	☐	☐	☐	☐	☐

D.7 Communication

D.7.1 PA staff devoted to outreach

Full time equivalent (FTE) of PA staff devoted to communication / outreach	

D.7.2 PA environmental education courses

Does the PA provide environmental education courses?	YES ☐	NO ☐	
If yes, for what kind of public			
How often?			

D.7.3 PA corporate design

Does the PA have a corporate design easily recognizable by the public?	YES ☐	NO ☐

D.7.4 PA outreach elements

	Number
PA websites	
PA brochures produced or distributed	
PA informative panels	
Scientific publications linked to the PA	
PA books	
Other products	

PART E: What does your PA need from EcoPotential?

E.1 Already requested products for your PA to EcoPotential project

In the past, has your PA already requested products from the EcoPotential project?

- NO ☐
- YES ☐

IF YES:

Did you start to receive some elements from the project?		YES ☐	NO ☐
If yes, can you specify which ones?			
Are some answers to the requests missing?		YES ☐	NO ☐
If yes, can you specify which ones?			

E.2 New requests and general interest for EcoPotential products

Are you / your PA interested in products from EcoPotential?

- NO ☐
- YES ☐

IF YES:

In what kind of data / products would your PA be interested?*	In what form of data would your PA be interested?		
	Products not requiring additional work (e.g. graphs, maps, precise results already analysed, communication outcome)	Easy to use tools	Training and more complex techniques
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐

* Examples:
- Specific products: maps, graphs, environmental or specific RS data…
- Communication products: booklet, information on the PA website…
- Specific models, Bayesian belief networks…
- Instructional video for some tools…

E.3 Remote sensing products

Are you especially interested in remote sensing products, tools or techniques that are developed by EcoPotential?

- NO ☐
- YES ☐

IF YES:

1. How would you foresee your PA generating new up-to-date products, using the EcoPotential tools, once the project has finished?
   - ☐ I would update the products using our own software/tools
   - ☐ I would update the products online using EcoPotential tools (software/data services).
   - ☐ I would not require updated products
2. How often would you expect to update your own products?
   - ☐ Every few months
   - ☐ Every year
   - ☐ Every several years
   - ☐ N/A

3. What type of products are of most value to your PA
    - ☐ Remote sensing products (e.g. land-cover maps)
    - ☐ Model outputs (e.g. Ecosystems services)
    - ☐ Both remote sensing and model outputs
4. Would you expect the EcoPotential tools to be maintained (kept up-to-date with security patches and bug fixes)?
    - Yes ☐
    - No ☐
5. Would you expect online support when using this tool
    - Yes ☐
    - No ☐
6. If EcoPotential tools were accessible online, would you be willing to pay for access?
    - ☐ I would not expect to pay for this service because it should be free
    - ☐ I would be willing to pay for access to a service by
        - ☐ pay per use (charged per product output)
        - ☐ subscription (monthly/annual charge)

E.4 Training on use of EO tools for PA management

ECOPOTENTIAL is organizing a 2 days hands-on workshop on Earth Observation tools, including a face-to-face training, in the first quarter of 2018, to train PA staff from PAs involved in the project. The programme will be aimed at the practical use of Remote Sensing and modelling software for PA management.

Would your PA like to send staff to this kind of training event?

1. NO ☐
2. YES ☐

IF YES:

Please indicate on what kind of EO tools for PA management would you like to receive training:		What is the level of proficiency of the participating staff?			
		Basic	Intermediate	Advanced	Unknown
Remote Sensing:	Yes ☐; No ☐	☐	☐	☐	☐
Modeling	Yes ☐; No ☐	☐	☐	☐	☐
In situ data analysis	Yes ☐; No ☐	☐	☐	☐	☐
Other, please specify:	Yes ☐; No ☐	☐	☐	☐	☐

PART F: Information on citizen science in the PA

F.1 Information of ongoing and planned Citizen Science in the PAs for integration across EcoPotential

F.1.1 Existing / planned citizen science projects

Are citizen science projects planned or already taking place or in your protected area?		
YES ☐	PLANNED ☐	NO ☐

IF YES / PLANNED :

Project title(s)
Website link or any other information
Please let us know the potential point(s) of contact (name, email, telephone number)
Are you planning to implement (an) additional Citizen Science programme(s) and how could we get in contact?

F.1.2 Existing / planned smartphone apps

Do you plan to implement or already provide a smartphone app for your PA?		
YES ☐	PLANNED ☐	NO ☐

IF YES / PLANNED:

App name(s)
What information is provided/collected by the App?
Who is responsible for the development and implementation of the app in your PA (name, email, telephone nr.)?

F.1.3 Environmental education programmes engaged with visitors and stakeholders

Do you offer environmental education programmes / material within your PA to engage with visitors/ stakeholders
YES ☐ NO ☐

IF YES :

What kind of facilities / materials do you use in these programmes:		Do you include citizen science (volunteers) in the programmes (yes or no)	Can EcoPotential be of help
Visitor centres	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
Guided tours	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
Natural history groups	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
Education programmes	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
Educational online material/kits for individual use	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
Website	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
Other:	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
Please let us know the potential point(s) of contact (name, email, telephone number)			

F.2 Characteristics of (potential, planned, or realized) Citizen Science programmes

F.2.1 Motivations about citizen science

As a manager, what are your motivations for doing / planning / thinking about citizen science in your PA?

Motivation / purpose of applying citizen science	Not present	Very small	Small	Moderate	High	Very high
Data collection	☐	☐	☐	☐	☐	☐
Environmental education	☐	☐	☐	☐	☐	☐
Outreach to visitors (learning/awareness raising)	☐	☐	☐	☐	☐	☐
Outreach to visitors (fun/something to do)	☐	☐	☐	☐	☐	☐
Involvement of local residents/stakeholders in conservation management processes	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐

F.2.2 Possible topics of citizen science

What topics would you be interested in to assess by citizen science in your PA

Topic	(tick which topics you are interested in)
Species monitoring (sightings)	☐
Measuring environmental parameters (e.g. water pH, temperature, radiation, tree diameter at breast height, trophic level)	☐
Reporting of ecological problems / environmental degradation (e.g. erosion, invasive species, fire)	☐
Helping with image classification of earth observation data (e.g. air photos) or old maps	☐
Reporting visitor perception and values of protected area	☐
Measuring visitor usage patterns	☐
Reporting of practical issues (e.g. damages, need for management actions)	☐
Other (specify):	☐
None	☐

F.2.3 Contribution of citizens to the PA

Possible activities	How strong is the contribution from Citizens?					
	Not present	Very small	Small	Moderate	High	Very high
Species monitoring (sightings)	☐	☐	☐	☐	☐	☐
Measuring environmental parameters (e.g. water pH, temperature, radiation, tree diameter at breast height, trophic level)	☐	☐	☐	☐	☐	☐
Reporting of ecological problems / environmental degradation (e.g. erosion, invasive species, fire)	☐	☐	☐	☐	☐	☐
Helping with image classification of earth observation data (e.g. air photos) or old maps	☐	☐	☐	☐	☐	☐
Reporting visitor perception and values of PA	☐	☐	☐	☐	☐	☐
Measuring visitor usage patterns	☐	☐	☐	☐	☐	☐

Reporting of practical issues (e.g. damages, need for management actions)	☐	☐	☐	☐	☐	☐
Other (specify):	☐	☐	☐	☐	☐	☐

What other volunteering activities does your PA provide to citizens?

F.2.4 Potential of data collection activities through Citizen Science

Rate potential of (possible) data collection activities through Citizen Science programmes for the work of your PA:

Possible activities	Level of Potential of data collection activities					
	Not present	Very small	Sma ll	Moderat e	High	Very high
Data from (smartphone)sensors carried by participants (movement patterns of visitors, temperature – passive contribution)	☐	☐	☐	☐	☐	☐
Data entries in smartphone app by the user (e.g. sightings, measurements, photo uploads - active contribution)	☐	☐	☐	☐	☐	☐
Reporting on-paper protocols / maps	☐	☐	☐	☐	☐	☐
Group activities together with citizens (e.g. mapping workshops, conducted projects)	☐	☐	☐	☐	☐	☐
Citizen Science projects developed by citizens / groups	☐	☐	☐	☐	☐	☐
Other activities	☐	☐	☐	☐	☐	☐

F.2.5 Available capacities for citizen science

What capacities (type and FTE) do you have available/ or need to establish for citizen science programs in your PA?

F.2.6 Usefulness of different technical application(s) of Citizen Science

Please rate the usefulness of different (potential) technical application(s) of Citizen Science for your PA

Technical application(s)	Usefulness					
	None	Very small	Small	Moderat e	High	Very high
Smartphone app	☐	☐	☐	☐	☐	☐
Electronic devices for measurements/data logging (e.g. camera trap)	☐	☐	☐	☐	☐	☐
Paper protocols / surveys / maps on paper	☐	☐	☐	☐	☐	☐
Samples collected (material samples / photos)	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐
What are criteria making an application useful or useless?						

F.2.6 Results implementation

Where do you implement the results/findings from the citizen science programs?

F.2.7 Target groups

What are your target groups for citizen science programs and why?

F.2.8 Challenges / barriers

What challenges or barriers do you face at your PA when implementing / planning a Citizen Science project?

Possible challenges	Degree of the challenge					
	not present	Very small	Small	Moderate	Highe	Very high
Budget constraints	☐	☐	☐	☐	☐	☐
Lack of PA staff or other personnel to supervise	☐	☐	☐	☐	☐	☐
Lack of interest of PA staff	☐	☐	☐	☐	☐	☐
Participants engagement low due to difficult spatial structures in PA (not easy access etc.)	☐	☐	☐	☐	☐	☐
Low interest of people to participate	☐	☐	☐	☐	☐	☐
Other …	☐	☐	☐	☐	☐	☐

Addendum B: Basic data on relative importance of variables in all surveys – 2015 - 2018

Addendum B: Relative importance of variables as obtained from EcoPotential scientists and PA managers in the surveys held from 2015 to 2018 (EF= Ecosystem function or structure, ES= Ecosystem services, TW= Transitional waters, Mo= Mountains, A= variable of abiotic nature, B= variable of biotic nature, S= variable of socio-economic or cultural nature, SD= Standard deviation, SE= Standard error)

EF TW - Scientists 2015	B/A/S	Camargue	Curonian	Danube	Donana	Eastern Scheldt	Nemunas	Samaria	Wadden Sea	Western Scheldt		Average	SD	SE
Biodiversity	B	49,0	4,8	0,0	20,0	6,5		25,0	3,2	3,6		14,0	15,6	5,5
Carbon cycle	A	10,2	0,0	0,0	0,0	0,0		0,0	0,0	0,0		1,3	3,4	1,2
Climate regulation	A	0,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,0	0,0	0,0
Element cycling	A	6,1	7,2	14,3	0,0	0,0		0,0	0,0	0,0		3,5	5,0	1,8
Food chain energy transfer	B	0,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,0	0,0	0,0
Gene pool	B	0,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,0	0,0	0,0
Habitat suitability	A	6,1	41,0	0,0	0,0	37,7		25,0	20,6	25,0		19,4	15,0	5,3
Hydrodynamics	A	14,3	3,6	7,1	0,0	6,5		0,0	3,2	7,1		5,2	4,4	1,5
Land- and sea-scape	A	0,0	0,0	28,6	4,0	0,0		25,0	0,0	0,0		7,2	11,4	4,0
Nutrient regulation	A	0,0	0,0	0,0	0,0	0,0		25,0	3,2	5,4		4,2	8,1	2,9
Population dynamics	B	0,0	0,0	0,0	32,0	0,0		0,0	0,0	0,0		4,0	10,6	3,7
Primary production	B	0,0	12,0	42,9	28,0	10,4		0,0	25,4	21,4		17,5	13,8	4,9
Raw materials	A	0,0	10,8	0,0	0,0	1,3		0,0	0,0	0,0		1,5	3,6	1,3
Secondary production	B	6,1	16,9	0,0	0,0	36,4		0,0	42,9	35,7		17,2	17,2	6,1
Sediment characteristics	A	8,2	0,0	7,1	16,0	0,0		0,0	0,0	0,0		3,9	5,6	2,0
Weather	A													
Water surface characteristics	A	0,0	3,6	0,0	0,0	1,3		0,0	1,6	1,8		1,0	1,2	0,4
average average and SD												6,3	7,2	
coefficient of variation												1,15		

ES TW - Scientists 2015	B/A/S	Camargue	Curonian	Danube	Donana	Eastern Scheldt	Nemunas	Samaria	Wadden Sea	Western Scheldt		Average	SD	SE
Animals of economic use	B	22,4	1,2	35,7	0,0	27,3		0,0	17,5	12,5		14,6	12,7	4,5

Biodiversity conservation	B	0,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,0	0,0	0,0
Charismatic landscape	A	10,2	1,2	0,0	0,0	2,6		0,0	3,2	1,8		2,4	3,2	1,1
Charismatic species	B	0,0	0,0	0,0	0,0	5,2		0,0	4,8	3,6		1,7	2,2	0,8
Climate regulation	A	0,0	0,0	0,0	8,0	0,0		0,0	0,0	0,0		1,0	2,6	0,9
Education and research	S	0,0	0,0	0,0	40,0	0,0		0,0	0,0	0,0		5,0	13,2	4,7
Energy production	S													
Fire Protection	B	0,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,0	0,0	0,0
Flood and coastal protection	A	6,1	8,4	0,0	0,0	3,9		0,0	3,2	3,6		3,1	2,9	1,0
Food provision for animals	B	0,0	0,0	7,1	20,0	15,6		0,0	0,0	0,0		5,3	7,6	2,7
Food provision for humans	B	0,0	0,0	0,0	0,0	2,6		0,0	0,0	0,0		0,3	0,9	0,3
Habitat for feeding and breeding	A	12,2	59,0	0,0	0,0	20,8		25,0	55,6	51,8		28,1	22,8	8,1
Hunting	S	22,4	0,0	0,0	0,0	0,0		0,0	0,0	0,0		2,8	7,4	2,6
Hydrological regulation	A	0,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,0	0,0	0,0
Leisure activities	S	6,1	12,0	28,6	0,0	16,9		50,0	7,9	8,9		16,3	15,0	5,3
Materials of economic use	A	2,0	1,2	0,0	0,0	0,0		0,0	0,0	3,6		0,9	1,3	0,4
Plants of economic use	B	12,2	7,2	0,0	0,0	0,0		0,0	0,0	1,8		2,7	4,3	1,5
Pollination	B	0,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,0	0,0	0,0
Prevention of erosion	A	0,0	0,0	7,1	0,0	0,0		0,0	0,0	0,0		0,9	2,4	0,8
Raw materials	A	0,0	0,0	0,0	0,0	1,3		0,0	0,0	1,8		0,4	0,7	0,2
Sedimentological regulation	A	2,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,3	0,7	0,2
Spiritual significance	S													
Transport facilitation	S	0,0	0,0	0,0	0,0	3,9		0,0	4,8	5,4		1,8	2,3	0,8
Waste and Toxicant mediation	A	0,0	9,6	21,4	32,0	0,0		25,0	3,2	5,4		12,1	11,6	4,1
Water regulation	A	4,1	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,5	1,3	0,5
average average and SD												4,3	5,0	
coefficient of variation												1,15		

ES TW - Managers 2015	B/A/S	Camargue	Curonian	Danube	Donana	Eastern Scheldt	Nemunas	Samaria	Wadden Sea	Western Scheldt		Average	SD	SE

Animals of economic use	B	7,6	4,2	5,0	5,2		7,5		8,3			6,3	1,6	0,6
Biodiversity conservation	B	0,0	0,0	9,1	2,3		0,0		0,0			1,9	3,3	1,4
Charismatic landscape	A	5,8	1,7	9,1	5,8		5,7		8,3			6,1	2,4	1,0
Charismatic species	B	0,0	0,0	0,0	0,0		0,0		0,0			0,0	0,0	0,0
Climate regulation	A	4,7	10,1	3,7	9,3		15,1		3,3			7,7	4,2	1,7
Education and research	S	11,7	6,7	9,1	11,7		9,4		16,7			10,9	3,1	1,3
Energy production	S	2,3	8,4	0,9	1,2		0,0		8,3			3,5	3,5	1,4
Fire Protection	B													
Flood and coastal protection	A	11,7	0,0	1,8	4,7		18,9		0,0			6,2	6,9	2,8
Food provision for animals	B	0,0	0,0	0,0	0,0		0,0		13,3			2,2	5,0	2,0
Food provision for humans	B													
Habitat for feeding and breeding	A	3,5	6,7	4,6	5,8		0,0		15,0			5,9	4,6	1,9
Hunting	S													
Hydrological regulation	A													
Leisure activities	S	11,7	3,4	9,1	11,7		18,9		16,7			11,9	5,0	2,1
Materials of economic use	A	3,9	11,2	0,0	0,0		0,0		0,0			2,5	4,1	1,7
Plants of economic use	B	5,5	5,6	5,5	6,2		0,0		0,0			3,8	2,7	1,1
Pollination	B	2,3	16,8	5,5	7,0		0,0		0,0			5,3	5,8	2,4
Prevention of erosion	A													
Raw materials	A													
Sedimentological regulation	A	4,7	3,4	9,1	11,7		15,1		10,0			9,0	4,0	1,6
Spiritual significance	S	11,7	13,4	9,1	11,7		0,0		0,0			7,7	5,6	2,3
Transport facilitation	S													
Waste and toxicant mediation	A	1,2	8,4	9,1	0,0		0,0		0,0			3,1	4,0	1,6
Water regulation	A	11,7	0,0	9,1	5,8		9,4		0,0			6,0	4,6	1,9
average average and SD												5,6	3,9	
coefficient of variation												0,70		

Threats TW - Scientists 2015	B/A/S	Camargue	Curonian	Danube	Donana	Eastern Scheldt	Nemunas	Samaria	Wadden Sea	Western Scheldt		Average	SD	SE
(Illegal) human activities	S	0,0	0,0	14,3	0,0	2,6		0,0	0,0	0,0		2,1	4,7	1,7
Agriculture	S	2,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,3	0,7	0,2
Bad management	S	10,2	0,0	0,0	0,0	0,0		0,0	0,0	0,0		1,3	3,4	1,2
Change in land use	S	0,0	0,0	7,1	0,0	0,0		0,0	3,2	1,8		1,5	2,4	0,8
Change in species	B	0,0	10,8	0,0	8,0	5,2		0,0	1,6	5,4		3,9	3,9	1,4
Civil engineering	S	2,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,3	0,7	0,2
Climate change	C	12,2	2,4	14,3	20,0	0,0		66,7	0,0	0,0		14,5	21,0	7,4
Diseases	B	0,0	0,0	0,0	4,0	1,3		0,0	0,0	0,0		0,7	1,3	0,5
Disturbance	S	0,0	10,8	0,0	0,0	3,9		33,3	6,3	5,4		7,5	10,4	3,7
Encroachment	B	0,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,0	0,0	0,0
Eutrophication	A	10,2	12,0	0,0	0,0	2,6		0,0	0,0	3,6		3,6	4,6	1,6
Exotic species	B	10,2	2,4	0,0	4,0	19,5		0,0	14,3	12,5		7,9	6,8	2,4
Extreme weather	A													
Fire	A	0,0	0,0	7,1	0,0	0,0		0,0	0,0	0,0		0,9	2,4	0,8
Fisheries	S	0,0	4,8	0,0	0,0	0,0		0,0	6,3	0,0		1,4	2,4	0,9
Habitat loss	A	2,0	6,0	7,1	0,0	15,6		0,0	20,6	19,6		8,9	8,0	2,8
Harmfull Algae	B	0,0	2,4	0,0	0,0	5,2		0,0	0,0	0,0		1,0	1,8	0,6
Hydrological changes	A	2,0	13,3	7,1	20,0	20,8		0,0	1,6	35,7		12,6	11,6	4,1
Increased salinisation	A	16,3	0,0	0,0	0,0	0,0		0,0	0,0	0,0		2,0	5,4	1,9
Landscape disturbance	S	0,0	0,0	0,0	0,0	0,0		0,0	20,6	0,0		2,6	6,8	2,4
Overexploitation	S	10,2	16,9	35,7	20,0	16,9		0,0	19,0	14,3		16,6	9,4	3,3
Pollution	S	14,3	15,7	7,1	12,0	3,9		0,0	1,6	1,8		7,0	5,8	2,0
Predation	B	0,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0		0,0	0,0	0,0
Sediment dynamics changes	A	4,1	2,4	0,0	12,0	0,0		0,0	3,2	0,0		2,7	3,8	1,4
Tourism	S	4,1	0,0	0,0	0,0	2,6		0,0	1,6	0,0		1,0	1,5	0,5
average average and SD												4,2	4,9	
coefficient of variation												1,19		

Threats TW - Managers 2015	B/A/S	Camargue	Curonian	Danube	Donana	Eastern Scheldt	Nemunas	Samaria	Wadden Sea	Western Scheldt		Average	SD	SE
(Illegal) human activities	S	6,7	0,0	5,3	0,0		3,6		5,1			3,4	2,6	1,1
Agriculture	S	13,3	5,6	10,5	16,2		14,3		5,1			10,8	4,2	1,7
Bad management	S													
Change in land use	S													
Change in species	B	13,3	11,1	10,5	16,2		0,0		10,3			10,2	5,0	2,0
Civil engineering	S													
Climate change	C	8,9	5,6	10,5	10,8		14,3		15,4			10,9	3,3	1,3
Diseases	B													
Disturbance	S	13,3	16,7	10,5	10,8		7,1		5,1			10,6	3,8	1,5
Encroachment	B													
Eutrophication	A	8,9	16,7	10,5	10,8		14,3		15,4			12,8	2,8	1,2
Exotic species	B													
Extreme weather	A													
Fire	A													
Fisheries	S	13,3	11,1	15,8	5,4		21,4		15,4			13,7	4,9	2,0
Habitat loss	A	6,7	5,6	2,6	5,4		3,6		0,0			4,0	2,2	0,9
Harmfull Algae	B													
Hydrological changes	A													
Increased salinisation	A													
Landscape disturbance	S													
Overexploitation	S	4,4	8,3	7,9	8,1		3,6		7,7			6,7	1,9	0,8
Pollution	S	6,7	2,8	5,3	5,4		3,6		5,1			4,8	1,3	0,5
Predation	B													
Sediment dynamics changes	A													
Tourism	S	4,4	16,7	10,5	10,8		14,3		15,4			12,0	4,1	1,7
average average and SD												9,1	3,3	
coefficient of variation												0,36		

EF MO - Scientists 2015	B/A/S	Gran Paradiso	Hardangervidda	High Tatra	Kalkalpen	La Palma	Oros Idi	Peneda-Geres	Samaria	Sierra Nevada	Swiss NP		Average	SD	SE
Biodiversity	B	20,5	0,0	0,0	33,3		22,6	0,0	0,0	0,0			9,6	12,8	4,5
Carbon cycle	A	0,0	0,0	0,0	0,0		19,4	0,0	20,0	0,0			4,9	8,5	3,0
Climate regulation	A	0,0	0,0	5,7	0,0		0,0	0,0	0,0	0,0			0,7	1,9	0,7
Element cycling	A	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Food chain energy transfer	B	0,0	0,0	0,0	0,0		0,0	8,3	0,0	0,0			1,0	2,8	1,0
Gene pool	B	0,0	0,0	17,1	0,0		0,0	0,0	0,0	0,0			2,1	5,7	2,0
Habitat suitability	A	5,1	0,0	28,6	0,0		0,0	10,0	13,3	0,0			7,1	9,4	3,3
Hydrodynamics	A	0,0	0,0	5,7	0,0		9,7	20,0	20,0	5,6			7,6	7,8	2,8
Landscape	A	0,0	0,0	11,4	0,0		22,6	0,0	13,3	0,0			5,9	8,2	2,9
Nutrient regulation	A	0,0	0,0	0,0	0,0		0,0	0,0	0,0	8,3			1,0	2,8	1,0
Population dynamics	B	41,0	11,1	8,6	0,0		9,7	30,0	20,0	29,6			18,8	12,9	4,6
Primary production	B	23,1	88,9	8,6	16,7		9,7	31,7	0,0	23,1			25,2	25,8	9,1
Raw materials	A	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Secondary production	B	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Sediment characteristics	A	10,3	0,0	14,3	50,0		6,5	0,0	13,3	31,5			15,7	16,0	5,6
Weather	A														
Water surface characteristics	A	0,0	0,0	0,0	0,0		0,0	0,0	0,0	1,9			0,2	0,6	0,2
average average and SD													6,3	7,2	
coefficient of variation													1,15		

ES MO - Scientists 2015	B/A/S	Gran Paradiso	Hardangervidda	High Tatra	Kalkalpen	La Palma	Oros Idi	Peneda-Geres	Samaria	Sierra Nevada	Swiss NP		Average	SD	SE
Animals of economic use	B	0,0	0,0	0,0	0,0		19,4	0,0	20,0	5,9			5,7	8,3	2,9
Biodiversity conservation	B	21,8	0,0	0,0	0,0		0,0	26,7	13,3	0,0			7,7	10,5	3,7
Charismatic landscape	A	0,0	11,1	8,6	0,0		19,4	0,0	0,0	0,0			4,9	6,9	2,4
Charismatic species	B	25,6	11,1	0,0	0,0		0,0	0,0	0,0	0,0			4,6	8,7	3,1
Climate regulation	A	0,0	0,0	17,1	66,7		19,4	15,0	20,0	3,9			17,8	20,1	7,1
Education and research	S	0,0	0,0	0,0	16,7		0,0	0,0	0,0	0,0			2,1	5,5	1,9

Energy production	S														
Fire Protection	B	0,0	0,0	0,0	0,0		0,0	35,0	0,0	0,0			4,4	11,6	4,1
flood and coastal protection	A	0,0	0,0	0,0	0,0		0,0	6,7	0,0	0,0			0,8	2,2	0,8
Food provision for animals	B	0,0	11,1	0,0	0,0		0,0	0,0	0,0	8,8			2,5	4,4	1,5
Food provision for humans	B	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Habitat for feeding and breeding	A	0,0	0,0	0,0	0,0		0,0	16,7	0,0	0,0			2,1	5,5	1,9
Hunting	S	0,0	66,7	0,0	0,0		0,0	0,0	0,0	0,0			8,3	22,0	7,8
Hydrological regulation	A	0,0	0,0	5,7	0,0		0,0	0,0	0,0	2,0			1,0	1,9	0,7
Leisure activities	S	52,6	0,0	20,0	16,7		25,8	0,0	13,3	0,0			16,0	16,7	5,9
Materials of economic use	A	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Plants of economic use	B	0,0	0,0	25,7	0,0		0,0	0,0	0,0	19,6			5,7	9,9	3,5
Pollination	B	0,0	0,0	8,6	0,0		0,0	0,0	0,0	9,8			2,3	4,0	1,4
Prevention of erosion	A	0,0	0,0	11,4	0,0		0,0	0,0	0,0	20,6			4,0	7,3	2,6
Raw materials	A	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Sedimentological regulation	A	0,0	0,0	2,9	0,0		6,5	0,0	13,3	23,5			5,8	8,0	2,8
Spiritual significance	S														
Transport facilitation	S	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Waste and Toxicant mediation	A	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Water regulation	A	0,0	0,0	0,0	0,0		9,7	0,0	20,0	5,9			4,4	6,8	2,4
average average and SD													4,3	7,0	
coefficient of variation													1,60		

ES MO - Managers 2015	B/A/S	Gran Paradiso	Hardangervidda	High Tatra	Kalkalpen	La Palma	Oros Idi	Peneda-Geres	Samaria	Sierra Nevada	Swiss NP		Average	SD	SE
Animals of economic use	B	1,8	7,8	2,0	2,5	3,4			5,4		1,7		3,5	2,1	0,8
Biodiversity conservation	B	7,2	6,9	4,0	10,0	6,0			4,3		8,9		6,8	2,0	0,8
Charismatic landscape	A	9,0	6,9	10,1	10,0	8,6			8,7		11,2		9,2	1,3	0,5
Charismatic species	B														
Climate regulation	A	5,4	8,7	10,1	10,0	8,6			4,3		6,7		7,7	2,1	0,8

Education and research	S	9,0	7,8	10,1	8,0	8,2			7,6		11,2		8,8	1,3	0,5
Energy production	S	5,4	5,2	2,0	2,0	3,4			4,3		6,7		4,2	1,6	0,6
Fire Protection	B														
Flood and coastal protection	A	7,2	8,7	4,0	10,0	7,7			8,7		2,2		6,9	2,6	1,0
Food provision for animals	B														
Food provision for humans	B														
Habitat for feeding and breeding	A	9,0	8,7	10,1	10,0	8,6			6,5		11,2		9,1	1,4	0,5
Hunting	S														
Hydrological regulation	A														
Leisure activities	S	9,0	8,7	10,1	10,0	8,6			10,8		11,2		9,8	1,0	0,4
Materials of economic use	A														
Plants of economic use	B	3,0	4,6	2,0	2,0	4,3			7,9		2,2		3,7	2,0	0,8
Pollination	B	9,0	3,5	4,0	0,0	7,7			8,7		4,5		5,3	3,0	1,1
Prevention of erosion	A														
Raw materials	A														
Sedimentological regulation	A	7,2	5,2	6,1	6,0	8,6			6,5		8,9		6,9	1,3	0,5
Spiritual significance	S	7,2	3,5	8,1	10,0	8,6			6,5		8,9		7,5	2,0	0,7
Transport facilitation	S														
Waste and toxicant mediation	A	3,6	5,2	8,1	0,0	1,7			4,3		2,2		3,6	2,4	0,9
Water regulation	A	7,2	8,7	9,1	10,0	6,0			5,4		2,2		6,9	2,5	0,9
average average and SD													6,7	1,9	
coefficient of variation													0,28		

Threats MO - Scientists 2015	B/A/S	Gran Paradiso	Hardangervidda	High Tatra	Kalkalpen	La Palma	Oros Idi	Peneda-Geres	Samaria	Sierra Nevada	Swiss NP		Average	SD	SE
(Illegal) human activities	S	0,0	0,0	2,9	0,0		38,7	0,0	40,0	0,0			10,2	16,9	6,0
Agriculture	S	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Bad management	S	0,0	0,0	0,0	0,0		0,0	5,0	0,0	0,0			0,6	1,7	0,6
Change in land use	S	0,0	0,0	20,0	0,0		0,0	10,0	0,0	13,0			5,4	7,4	2,6

Change in species	B	0,0	11,1	20,0	0,0		0,0	0,0	0,0	3,7			4,4	6,9	2,5
Civil engineering	S	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Climate change	C	60,3	33,3	8,6	100,0		0,0	0,0	0,0	20,4			27,8	33,6	11,9
Diseases	B	0,0	0,0	0,0	0,0		12,9	0,0	0,0	13,0			3,2	5,6	2,0
Disturbance	S	10,3	0,0	0,0	0,0		0,0	0,0	0,0	0,0			1,3	3,4	1,2
Encroachment	B	14,1	0,0	0,0	0,0		0,0	20,0	0,0	0,0			4,3	7,5	2,7
Eutrophication	A	0,0	0,0	0,0	0,0		0,0	0,0	0,0	3,7			0,5	1,2	0,4
Exotic species	B	7,7	0,0	0,0	0,0		0,0	15,0	0,0	0,0			2,8	5,2	1,9
Extreme weather	A														
Fire	A	0,0	0,0	0,0	0,0		38,7	25,0	40,0	16,7			15,0	16,5	5,8
Fisheries	S	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Habitat loss	A	0,0	11,1	17,1	0,0		0,0	10,0	0,0	13,0			6,4	6,7	2,4
Harmfull Algae	B	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Hydrological changes	A	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Increased salinisation	A	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Landscape disturbance	S	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0			0,0	0,0	0,0
Overexploitation	S	0,0	22,2	0,0	0,0		9,7	15,0	20,0	4,6			8,9	8,6	3,0
Pollution	S	7,7	0,0	8,6	0,0		0,0	0,0	0,0	7,4			3,0	3,8	1,4
Predation	B	0,0	22,2	0,0	0,0		0,0	0,0	0,0	0,0			2,8	7,3	2,6
Sediment dynamics changes	A	0,0	0,0	5,7	0,0		0,0	0,0	0,0	0,9			0,8	1,9	0,7
Tourism	S	0,0	0,0	17,1	0,0		0,0	0,0	0,0	3,7			2,6	5,6	2,0
average average and SD													4,2	5,8	
coefficient of variation													1,40		

Threats MO - Managers 2015	B/A/S	Gran Paradiso	Hardang ervidda	High Tatra	Kalkalpe n	La Palma	Oros Idi	Peneda-Geres	Samaria	Sierra Nevada	Swiss NP		Average	SD	SE
(Illegal) human activities	S	0,0	11,8	7,7	11,8	7,7			10,3		0,0		7,0	4,7	1,8
Agriculture	S	12,1	0,0	7,7	11,8	15,4			10,3		0,0		8,2	5,6	2,1
Bad management	S														
Change in land use	S														

Change in species	B	0,0	11,8	7,7	11,8	7,7			10,3		0,0		7,0	4,7	1,8
Civil engineering	S														
Climate change	C	18,2	17,6	7,7	35,3	15,4			10,3		33,3		19,7	9,9	3,7
Diseases	B														
Disturbance	S	12,1	17,6	7,7	0,0	0,0			10,3		50,0		14,0	15,9	6,0
Encroachment	B														
Eutrophication	A	12,1	0,0	7,7	11,8	7,7			5,1		0,0		6,3	4,6	1,7
Exotic species	B														
Extreme weather	A														
Fire	A														
Fisheries	S	6,1	11,8	0,0	0,0	0,0			5,1		0,0		3,3	4,2	1,6
Habitat loss	A	12,1	5,9	7,7	0,0	23,1			10,3		0,0		8,4	7,4	2,8
Harmfull Algae	B														
Hydrological changes	A														
Increased salinisation	A														
Landscape disturbance	S														
Overexploitation	S	9,1	0,0	7,7	5,9	15,4			7,7		0,0		6,5	5,0	1,9
Pollution	S	6,1	5,9	15,4	0,0	0,0			5,1		0,0		4,6	5,1	1,9
Predation	B														
Sediment dynamics changes	A														
Tourism	S	12,1	17,6	23,1	11,8	7,7			15,4		16,7		14,9	4,6	1,7
average average and SD													9,1	6,5	
coefficient of variation													0,72		

EF TW - Scientists 2018		Danube	Doñana	Eastern Scheldt	Wadden Sea		Average	SD	SE
Biodiversity	B	7,6	8,3	7,7	7,0		7,7	0,5	0,2
Carbon cycle	A	7,6	5,0	1,9	1,8		4,1	2,4	1,2
Climate regulation	A	7,6	5,0	3,8	3,5		5,0	1,6	0,8
Element cycling	A	7,6	8,3	3,8	5,3		6,3	1,8	0,9

Food chain energy transfer	B	7,6	6,7	7,7	8,8		7,7	0,7	0,4
Gene pool	B	6,1	8,3	5,8	7,0		6,8	1,0	0,5
Habitat suitability	A	7,6	8,3	7,7	7,0		7,7	0,5	0,2
Hydrodynamics	A	7,6	0,0	7,7	7,0		5,6	3,2	1,6
Land- and sea-scape	A	7,6	6,7	9,6	8,8		8,2	1,1	0,6
Nutrient regulation	A	7,6	8,3	5,8	5,3		6,7	1,3	0,6
Population dynamics	B	6,1	8,3	5,8	7,0		6,8	1,0	0,5
Primary production	B	3,0	8,3	5,8	5,3		5,6	1,9	0,9
Raw materials	A	0,0	0,0	3,8	5,3		2,3	2,3	1,2
Secondary production	B	4,5	6,7	7,7	7,0		6,5	1,2	0,6
Sediment characteristics	A	4,5	3,3	7,7	7,0		5,6	1,8	0,9
Weather	A	6,1	8,3	3,8	3,5		5,4	1,9	1,0
Water surface characteristics	A	1,5	0,0	3,8	3,5		2,2	1,6	0,8
average average and SD							5,9	1,5	
coefficient of variation							0,26		

EF TW - Managers 2018	B/A/S	Camargue	Curonian	Danube	Donana	Palavasiens	Nemunas	Eastern Scheldt	Wadden Sea		Average	SD	SE
Biodiversity	B	8,5	7,4	6,7	5,9	8,1	7,4	8,5	7,0		7,4	0,8	0,3
Carbon cycle	A	6,8	4,4	6,7	5,9	6,5	4,4	3,4	5,6		5,5	1,2	0,4
Climate regulation	A	5,1	5,9	4,0	5,9	8,1	5,9	1,7	5,6		5,3	1,7	0,6
Element cycling	A	5,1	4,4	6,7	5,9	6,5	5,9	5,1	5,6		5,6	0,7	0,2
Food chain energy transfer	B	5,1	7,4	6,7	5,9	0,0	7,4	8,5	7,0		6,0	2,5	0,9
Gene pool	B	3,4	5,9	6,7	5,9	6,5	7,4	3,4	1,4		5,1	1,9	0,7
Habitat suitability	A	8,5	7,4	6,7	5,9	8,1	7,4	8,5	7,0		7,4	0,8	0,3
Hydrodynamics	A	8,5	7,4	6,7	5,9	8,1	7,4	8,5	7,0		7,4	0,8	0,3
Land- and sea-scape	A	6,8	7,4	6,7	5,9	6,5	7,4	6,8	7,0		6,8	0,5	0,2
Nutrient regulation	A	6,8	4,4	6,7	5,9	8,1	5,9	8,5	4,2		6,3	1,4	0,5
Population dynamics	B	8,5	7,4	6,7	5,9	6,5	7,4	6,8	7,0		7,0	0,7	0,3
Primary production	B	3,4	4,4	6,7	5,9	6,5	4,4	8,5	5,6		5,7	1,5	0,5

Raw materials	A	5,1	2,9	2,7	5,9	3,2	1,5	0,0	4,2		3,2	1,8	0,6
Secondary production	B	5,1	4,4	6,7	5,9	6,5	2,9	8,5	7,0		5,9	1,6	0,6
Sediment characteristics	A	5,1	7,4	5,3	5,9	4,8	4,4	8,5	7,0		6,1	1,3	0,5
Weather	A	3,4	5,9	4,0	5,9	6,5	5,9	1,7	5,6		4,9	1,5	0,5
Water surface characteristics	A	5,1	5,9	4,0	5,9	0,0	7,4	3,4	5,6		4,7	2,1	0,7
average average and SD											5,9	1,4	
coefficient of variation											0,23		

ES TW - Scientists 2018	B/A/S	Danube	Doñana	Eastern Scheldt	Wadden Sea		Average	SD	SE
Animals of economic use	B	3,7	6,9	6,8	5,6		5,8	1,3	0,7
Biodiversity conservation	B	6,2	6,9	5,5	5,6		6,0	0,6	0,3
Charismatic landscape	A	6,2	6,9	5,5	6,9		6,4	0,6	0,3
Charismatic species	B	6,2	6,9	5,5	5,6		6,0	0,6	0,3
Climate regulation	A	6,2	5,6	1,4	2,8		4,0	2,0	1,0
Education and research	S	6,2	6,9	4,1	4,2		5,3	1,2	0,6
Energy production	S	0,0	0,0	4,1	2,8		1,7	1,8	0,9
Fire Protection	B	3,7	0,0	0,0	0,0		0,9	1,6	0,8
Flood and coastal protection	A	3,7	5,6	6,8	6,9		5,8	1,3	0,7
Food provision for animals	B	2,5	6,9	2,7	1,4		3,4	2,1	1,1
Food provision for humans	B	3,7	6,9	6,8	4,2		5,4	1,5	0,7
Habitat for feeding and breeding	A	4,9	6,9	5,5	6,9		6,1	0,9	0,4
Hunting	S	1,2	0,0	4,1	2,8		2,0	1,6	0,8
Hydrological regulation	A	6,2	4,2	5,5	2,8		4,6	1,3	0,6
Leisure activities	S	4,9	6,9	5,5	5,6		5,7	0,7	0,4
Materials of economic use	A	0,0	0,0	2,7	5,6		2,1	2,3	1,2
Plants of economic use	B	1,2	6,9	2,7	2,8		3,4	2,1	1,1
Pollination	B	2,5	1,4	2,7	2,8		2,3	0,6	0,3
Prevention of erosion	A	4,9	1,4	4,1	5,6		4,0	1,6	0,8

Raw materials	A	0,0	0,0	2,7	4,2		1,7	1,8	0,9
Sedimentological regulation	A	3,7	0,0	1,4	2,8		2,0	1,4	0,7
Spiritual significance	S	4,9	6,9	4,1	4,2		5,0	1,1	0,6
Transport facilitation	S	6,2	0,0	4,1	2,8		3,3	2,2	1,1
Waste and Toxicant mediation	A	6,2	5,6	4,1	4,2		5,0	0,9	0,4
Water regulation	A	4,9	0,0	1,4	1,4		1,9	1,8	0,9
average average and SD							4,0	1,4	
coefficient of variation							0,35		

ES TW - Managers 2018	B/A/S	Camargue	Curonian	Danube	Donana	Palavasiens	Nemunas	Eastern Scheldt	Wadden Sea		Average	SD	SE
Animals of economic use	B	4,3	5,4	4,8	4,4	4,8	5,4	7,9	4,9		5,3	1,1	0,4
Biodiversity conservation	B	7,2	6,8	6,0	4,4	6,0	5,4	4,8	6,1		5,8	0,9	0,3
Charismatic landscape	A	4,3	6,8	6,0	4,4	6,0	5,4	6,3	6,1		5,7	0,8	0,3
Charismatic species	B	5,8	4,1	6,0	4,4	6,0	4,3	6,3	4,9		5,2	0,8	0,3
Climate regulation	A	0,0	0,0	3,6	4,4	6,0	5,4	1,6	3,7		3,1	2,2	0,8
Education and research	S	7,2	5,4	6,0	4,4	4,8	5,4	6,3	6,1		5,7	0,8	0,3
Energy production	S	0,0	1,4	1,2	0,9	0,0	0,0	6,3	1,2		1,4	2,0	0,7
Fire Protection	B	0,0	6,8	1,2	4,4	0,0	0,0	0,0	0,0		1,5	2,4	0,9
Flood and coastal protection	A	4,3	6,8	4,8	4,4	4,8	5,4	4,8	6,1		5,2	0,8	0,3
Food provision for animals	B	5,8	2,7	6,0	4,4	6,0	5,4	7,9	3,7		5,2	1,5	0,5
Food provision for humans	B	4,3	2,7	4,8	4,4	2,4	1,1	7,9	3,7		3,9	1,9	0,7
Habitat for feeding and breeding	A	7,2	6,8	6,0	4,4	3,6	5,4	7,9	6,1		5,9	1,3	0,5
Hunting	S	7,2	0,0	0,0	4,4	3,6	3,3	0,0	1,2		2,5	2,5	0,9
Hydrological regulation	A	5,8	0,0	2,4	4,4	6,0	5,4	3,2	3,7		3,9	1,9	0,7
Leisure activities	S	5,8	6,8	6,0	4,4	4,8	5,4	7,9	6,1		5,9	1,0	0,4
Materials of economic use	A	4,3	0,0	1,2	2,7	0,0	5,4	0,0	6,1		2,5	2,4	0,8
Plants of economic use	B	4,3	4,1	2,4	4,4	3,6	3,3	3,2	1,2		3,3	1,0	0,4
Pollination	B	0,0	5,4	3,6	4,4	3,6	4,3	0,0	1,2		2,8	2,0	0,7

Prevention of erosion	A	4,3	6,8	3,6	4,4	4,8	1,1	3,2	4,9		4,1	1,5	0,5
Raw materials	A	0,0	0,0	2,4	0,9	0,0	0,0	0,0	3,7		0,9	1,3	0,5
Sedimentological regulation	A	0,0	2,7	2,4	4,4	4,8	5,4	0,0	4,9		3,1	2,0	0,7
Spiritual significance	S	5,8	6,8	3,6	4,4	4,8	3,3	4,8	3,7		4,6	1,1	0,4
Transport facilitation	S	2,9	6,8	4,8	2,7	3,6	3,3	7,9	6,1		4,7	1,9	0,7
Waste and toxicant mediation	A	4,3	2,7	6,0	4,4	4,8	5,4	1,6	3,7		4,1	1,3	0,5
Water regulation	A	4,3	2,7	4,8	4,4	6,0	5,4	0,0	1,2		3,6	2,0	0,7
average average and SD											4,0	1,5	
coefficient of variation											0,39		

Threats TW - Scientists 2018	B/A/S	Danube	Doñana	Eastern Scheldt	Wadden Sea		Average	SD	SE
(Illegal) human activities	S	5,0	7,0	2,6	3,1		4,4	1,7	0,9
Agriculture	S	3,8	7,0	6,5	4,7		5,5	1,3	0,7
Bad management	S	6,3	7,0	6,5	6,3		6,5	0,3	0,2
Change in land use	S	3,8	7,0	1,3	1,6		3,4	2,3	1,2
Change in species	B	5,0	4,2	5,2	4,7		4,8	0,4	0,2
Civil engineering	S	5,0	0,0	2,6	3,1		2,7	1,8	0,9
Climate change	C	3,8	4,2	6,5	6,3		5,2	1,2	0,6
Diseases	B	2,5	5,6	5,2	3,1		4,1	1,3	0,7
Disturbance	S	3,8	0,0	3,9	6,3		3,5	2,2	1,1
Encroachment	B	5,0	2,8	2,6	1,6		3,0	1,3	0,6
Eutrophication	A	5,0	4,2	2,6	4,7		4,1	0,9	0,5
Exotic species	B	3,8	5,6	5,2	4,7		4,8	0,7	0,4
Extreme weather	A	2,5	0,0	2,6	3,1		2,1	1,2	0,6
Fire	A	2,5	2,8	0,0	0,0		1,3	1,3	0,7
Fisheries	S	2,5	2,8	3,9	6,3		3,9	1,5	0,7
Habitat loss	A	5,0	4,2	6,5	3,1		4,7	1,2	0,6
Harmfull Algae	B	5,0	5,6	2,6	3,1		4,1	1,3	0,6
Hydrological changes	A	5,0	0,0	6,5	3,1		3,7	2,4	1,2

Increased salinisation	A	3,8	4,2	3,9	4,7		4,1	0,4	0,2
Landscape disturbance	S	1,3	0,0	2,6	4,7		2,1	1,7	0,9
Overexploitation	S	5,0	7,0	3,9	4,7		5,2	1,2	0,6
Pollution	S	3,8	5,6	3,9	4,7		4,5	0,7	0,4
Predation	B	2,5	5,6	2,6	4,7		3,9	1,3	0,7
Sediment dynamics changes	A	5,0	2,8	6,5	3,1		4,4	1,5	0,7
Tourism	S	3,8	4,2	3,9	4,7		4,1	0,4	0,2
average average and SD							4,0	1,3	
coefficient of variation							0,32		

Threats TW - Managers 2018	B/A/S	Camargue	Curonian	Danube	Donana	Palavasiens	Nemunas	Eastern Scheldt	Wadden Sea		Average	SD	SE
(Illegal) human activities	S	5,7	2,1	5,4	1,6	3,8	1,4	4,2	1,1		3,2	1,7	0,6
Agriculture	S	7,5	0,0	5,4	0,0	3,8	5,6	1,4	5,5		3,7	2,7	0,9
Bad management	S	7,5	2,1	5,4	8,1	5,1	4,2	1,4	4,4		4,8	2,2	0,8
Change in land use	S	7,5	4,3	4,3	8,1	6,3	5,6	1,4	4,4		5,2	2,0	0,7
Change in species	B	0,0	5,3	4,3	1,6	0,0	7,0	5,6	5,5		3,7	2,6	0,9
Civil engineering	S	9,4	0,0	3,3	8,1	5,1	7,0	5,6	5,5		5,5	2,7	1,0
Climate change	C	5,7	4,3	4,3	8,1	3,8	7,0	6,9	5,5		5,7	1,4	0,5
Diseases	B	0,0	2,1	3,3	8,1	3,8	4,2	6,9	4,4		4,1	2,4	0,8
Disturbance	S	7,5	5,3	5,4	1,6	5,1	4,2	4,2	4,4		4,7	1,6	0,5
Encroachment	B	0,0	5,3	2,2	0,0	2,5	5,6	0,0	1,1		2,1	2,2	0,8
Eutrophication	A	0,0	5,3	5,4	3,2	5,1	4,2	0,0	3,3		3,3	2,1	0,7
Exotic species	B	7,5	5,3	5,4	8,1	5,1	2,8	4,2	5,5		5,5	1,6	0,6
Extreme weather	A	0,0	4,3	3,3	0,0	5,1	2,8	1,4	4,4		2,6	1,9	0,7
Fire	A	0,0	5,3	4,3	3,2	0,0	2,8	0,0	0,0		2,0	2,1	0,7
Fisheries	S	0,0	5,3	5,4	1,6	3,8	4,2	5,6	5,5		3,9	1,9	0,7
Habitat loss	A	9,4	5,3	2,2	3,2	0,0	7,0	6,9	3,3		4,7	2,9	1,0
Harmfull Algae	B	1,9	5,3	5,4	8,1	0,0	5,6	6,9	3,3		4,6	2,5	0,9
Hydrological changes	A	0,0	5,3	5,4	8,1	6,3	5,6	1,4	5,5		4,7	2,5	0,9

Increased salinisation	A	2,8	5,3	1,1	1,6	3,8	0,0	0,0	0,0		1,8	1,9	0,7
Landscape disturbance	S	1,9	4,3	0,0	1,6	3,8	1,4	5,6	5,5		3,0	1,9	0,7
Overexploitation	S	7,5	5,3	4,3	1,6	6,3	4,2	6,9	5,5		5,2	1,7	0,6
Pollution	S	9,4	1,1	3,3	4,8	6,3	2,8	4,2	3,3		4,4	2,4	0,8
Predation	B	0,0	1,1	1,1	3,2	3,8	0,0	5,6	3,3		2,3	1,9	0,7
Sediment dynamics changes	A	4,7	5,3	4,3	4,8	6,3	2,8	6,9	5,5		5,1	1,2	0,4
Tourism	S	3,8	5,3	5,4	1,6	5,1	1,4	6,9	4,4		4,2	1,8	0,6
average average and SD											4,0	2,1	
coefficient of variation											0,52		

EF MO - Scientists 2018	B/A/S	Appia Antica	Castelli Romani	Kalkalpen	Ohrid	Pieniny	Prespa	Samaria	Swiss NP		Average	SD	SE
Biodiversity	B	2,7	4,5	8,5	9,4	11,9	10,2	7,1	10,2		8,1	2,9	1,0
Carbon cycle	A	2,7	6,8	6,8	3,8	7,1	4,1	7,1	6,1		5,6	1,7	0,6
Climate regulation	A	10,8	9,1	6,8	3,8	7,1	4,1	7,1	2,0		6,4	2,7	1,0
Element cycling	A	10,8	9,1	6,8	5,7	4,8	6,1	7,1	6,1		7,1	1,8	0,7
Food chain energy transfer	B	8,1	6,8	3,4	5,7	4,8	6,1	3,6	8,2		5,8	1,7	0,6
Gene pool	B	2,7	4,5	3,4	7,5	9,5	8,2	7,1	6,1		6,1	2,2	0,8
Habitat suitability	A	13,5	6,8	8,5	9,4	11,9	10,2	7,1	8,2		9,5	2,2	0,8
Hydrodynamics	A	2,7	4,5	5,1	5,7	4,8	4,1	7,1	4,1		4,8	1,2	0,4
Land- and sea-scape	A	8,1	6,8	8,5	9,4	4,8	4,1	7,1	10,2		7,4	2,0	0,7
Nutrient regulation	A	5,4	4,5	5,1	3,8	4,8	4,1	3,6	2,0		4,2	1,0	0,4
Population dynamics	B	2,7	4,5	8,5	7,5	4,8	8,2	7,1	6,1		6,2	1,9	0,7
Primary production	B	8,1	9,1	8,5	7,5	4,8	8,2	7,1	8,2		7,7	1,2	0,4
Raw materials	A	0,0	2,3	1,7	3,8	4,8	4,1	0,0	2,0		2,3	1,7	0,6
Secondary production	B	8,1	6,8	5,1	5,7	4,8	6,1	3,6	8,2		6,0	1,5	0,5
Sediment characteristics	A	2,7	2,3	3,4	3,8	2,4	4,1	3,6	2,0		3,0	0,7	0,3
Weather	A	10,8	9,1	8,5	3,8	4,8	4,1	7,1	6,1		6,8	2,4	0,8
Water surface characteristics	A	0,0	2,3	1,7	3,8	2,4	4,1	7,1	4,1		3,2	2,0	0,7

average average and SD		5,9	1,8	
coefficient of variation		0,31		

EF MO - Managers 2018	B/A/S	Appia Antica	Bayerische Wald	Castelli Rom-ani	Gran Paradiso	Hardangervidda	Kalkalpen	Ohrid	La Palma	Peneda Geres	Pieniny NP	Prespa	Reunion NP	Samaria	Sierra Nevada	Swiss NP		Average	SD	SE
Biodiversity	B	6,8	15,2	6,7	11,1	7,8	7,1	10,4	10,4	7,3	8,9	9,4	8,1	8,3	6,5	7,0		8,7	2,2	0,6
Carbon cycle	A	9,1	6,1	6,7	0,0	4,7	5,7	4,2	8,3	9,1	5,4	7,5	6,5	6,7	6,5	4,2		6,0	2,2	0,6
Climate regulation	A	9,1	3,0	6,7	8,9	6,3	5,7	10,4	10,4	9,1	7,1	3,8	6,5	6,7	6,5	5,6		7,0	2,1	0,5
Element cycling	A	6,8	3,0	6,7	0,0	1,6	5,7	4,2	2,1	5,5	5,4	7,5	6,5	5,0	6,5	5,6		4,8	2,1	0,5
Food chain energy transfer	B	6,8	3,0	5,0	0,0	7,8	4,3	0,0	2,1	3,6	5,4	5,7	4,8	5,0	5,2	7,0		4,4	2,2	0,6
Gene pool	B	2,3	15,2	5,0	8,9	6,3	7,1	8,3	8,3	7,3	8,9	1,9	8,1	6,7	6,5	7,0		7,2	3,0	0,8
Habitat suitability	A	4,5	12,1	6,7	11,1	7,8	7,1	8,3	8,3	5,5	8,9	3,8	8,1	6,7	5,2	7,0		7,4	2,2	0,6
Hydrodynamics	A	4,5	9,1	5,0	8,9	7,8	5,7	8,3	6,3	7,3	7,1	9,4	8,1	6,7	6,5	5,6		7,1	1,5	0,4
Land- and sea-scape	A	9,1	0,0	6,7	8,9	7,8	7,1	6,3	4,2	3,6	8,9	7,5	8,1	6,7	6,5	5,6		6,5	2,3	0,6
Nutrient regulation	A	6,8	9,1	5,0	0,0	4,7	5,7	10,4	2,1	3,6	7,1	3,8	3,2	5,0	6,5	5,6		5,2	2,5	0,7
Population dynamics	B	4,5	15,2	6,7	8,9	7,8	5,7	2,1	8,3	1,8	8,9	1,9	6,5	6,7	6,5	7,0		6,6	3,3	0,8
Primary production	B	9,1	3,0	5,0	6,7	6,3	7,1	4,2	10,4	9,1	1,8	5,7	3,2	6,7	5,2	7,0		6,0	2,3	0,6
Raw materials	A	0,0	0,0	5,0	4,4	0,0	2,9	6,3	0,0	3,6	1,8	7,5	1,6	3,3	3,9	2,8		2,9	2,3	0,6
Secondary production	B	6,8	0,0	5,0	6,7	7,8	7,1	2,1	2,1	3,6	1,8	5,7	3,2	6,7	5,2	4,2		4,5	2,3	0,6
Sediment characteristics	A	4,5	3,0	6,7	4,4	4,7	5,7	0,0	10,4	5,5	3,6	7,5	6,5	5,0	3,9	7,0		5,2	2,3	0,6
Weather	A	6,8	3,0	6,7	6,7	6,3	7,1	6,3	6,3	7,3	7,1	3,8	4,8	5,0	6,5	7,0		6,0	1,2	0,3
Water surface characteristics	A	2,3	0,0	5,0	4,4	4,7	2,9	8,3	0,0	7,3	1,8	7,5	6,5	3,3	6,5	4,2		4,3	2,5	0,7
average average and SD																		5,9	2,3	
coefficient of variation																		0,39		

ES MO - Scientists 2018	B/A/S	Appia Antica	Castelli Romani	Kalkalpen	Ohrid	Pieniny	Prespa	Samaria	Swiss NP		Average	SD	SE
Animals of economic use	B	8,8	5,2	0,0	8,1	3,4	9,3	6,0	0,0		5,1	3,4	1,2
Biodiversity conservation	B	1,8	3,4	10,2	8,1	8,6	9,3	6,0	10,6		7,2	3,0	1,1

Charismatic landscape	A	8,8	8,6	10,2	8,1	6,9	5,6	6,0	10,6		8,1	1,7	0,6
Charismatic species	B	0,0	0,0	10,2	8,1	6,9	7,4	6,0	8,5		5,9	3,6	1,3
Climate regulation	A	7,0	6,9	8,2	3,2	5,2	3,7	6,0	6,4		5,8	1,6	0,6
Education and research	S	8,8	8,6	8,2	6,5	6,9	7,4	6,0	8,5		7,6	1,0	0,4
Energy production	S	0,0	0,0	0,0	4,8	0,0	1,9	0,0	6,4		1,6	2,4	0,8
Fire Protection	B	0,0	0,0	2,0	1,6	0,0	1,9	4,5	0,0		1,2	1,5	0,5
flood and coastal protection	A	0,0	0,0	2,0	1,6	3,4	1,9	3,0	4,3		2,0	1,4	0,5
Food provision for animals	B	7,0	3,4	2,0	1,6	5,2	1,9	6,0	6,4		4,2	2,1	0,7
Food provision for humans	B	7,0	6,9	0,0	6,5	3,4	7,4	6,0	0,0		4,6	2,9	1,0
Habitat for feeding and breeding	A	5,3	5,2	2,0	6,5	6,9	7,4	6,0	6,4		5,7	1,6	0,5
Hunting	S	0,0	0,0	0,0	0,0	3,4	0,0	1,5	0,0		0,6	1,2	0,4
Hydrological regulation	A	3,5	1,7	6,1	3,2	3,4	3,7	6,0	2,1		3,7	1,5	0,5
Leisure activities	S	8,8	8,6	8,2	8,1	6,9	7,4	6,0	10,6		8,1	1,3	0,5
Materials of economic use	A	0,0	1,7	0,0	1,6	1,7	1,9	0,0	0,0		0,9	0,9	0,3
Plants of economic use	B	7,0	8,6	0,0	0,0	3,4	0,0	1,5	0,0		2,6	3,3	1,2
Pollination	B	3,5	3,4	6,1	0,0	3,4	0,0	3,0	2,1		2,7	1,9	0,7
Prevention of erosion	A	1,8	3,4	2,0	0,0	3,4	0,0	3,0	2,1		2,0	1,3	0,5
Raw materials	A	1,8	1,7	0,0	0,0	0,0	0,0	0,0	0,0		0,4	0,8	0,3
Sedimentological regulation	A	1,8	6,9	6,1	0,0	1,7	0,0	3,0	2,1		2,7	2,4	0,8
Spiritual significance	S	8,8	6,9	4,1	8,1	6,9	7,4	4,5	8,5		6,9	1,6	0,6
Transport facilitation	S	0,0	0,0	0,0	4,8	1,7	3,7	4,5	0,0		1,8	2,0	0,7
Waste and Toxicant mediation	A	3,5	3,4	6,1	1,6	3,4	1,9	0,0	4,3		3,0	1,7	0,6
Water regulation	A	5,3	5,2	6,1	8,1	3,4	9,3	6,0	0,0		5,4	2,6	0,9
average average and SD											4,0	1,9	
coefficient of variation											0,49		

ES MO - Managers 2018	B/A/S	Appia Antica	Bayerische Wald	Castelli Rom-ani	Gran Paradiso	Hardangervidda	Kalkalpen	Ohrid	La Palma	Peneda Geres	Pieniny NP	Prespa	Reunion NP	Samaria	Sierra Nevada	Swiss NP		Average	SD	SE

Animals of economic use	B	1,8	0,0	3,9	4,2	7,9	2,9	4,7	1,6	4,2	1,4	5,0	3,7	5,3	4,5	0,0		3,4	2,1	0,5
Biodiversity conservation	B	5,4	9,6	5,2	7,0	7,9	7,2	6,3	8,2	7,0	7,1	5,0	6,2	6,7	5,6	7,7		6,8	1,2	0,3
Charismatic landscape	A	8,9	7,7	6,5	7,0	7,9	5,8	6,3	6,6	5,6	7,1	4,0	6,2	6,7	5,6	6,2		6,5	1,1	0,3
Charismatic species	B	1,8	7,7	2,6	7,0	7,9	7,2	6,3	6,6	7,0	4,3	4,0	4,9	5,3	5,6	7,7		5,7	1,8	0,5
Climate regulation	A	7,1	1,9	5,2	5,6	6,3	7,2	6,3	1,6	2,8	4,3	3,0	4,9	5,3	5,6	7,7		5,0	1,8	0,5
Education and research	S	8,9	9,6	5,2	7,0	6,3	7,2	4,7	1,6	5,6	5,7	5,0	6,2	5,3	5,6	7,7		6,1	1,8	0,5
Energy production	S	0,0	3,8	0,0	4,2	0,0	0,0	7,8	1,6	4,2	1,4	3,0	1,2	2,7	2,2	6,2		2,6	2,3	0,6
Fire Protection	B	5,4	3,8	5,2	0,0	0,0	4,3	4,7	1,6	4,2	1,4	5,0	3,7	2,7	4,5	0,0		3,1	1,9	0,5
Flood and coastal protection	A	0,0	1,9	1,3	2,8	1,6	5,8	4,7	8,2	4,2	1,4	4,0	6,2	5,3	3,4	1,5		3,5	2,2	0,6
Food provision for animals	B	3,6	3,8	3,9	2,8	7,9	4,3	3,1	3,3	4,2	2,9	4,0	2,5	5,3	3,4	7,7		4,2	1,6	0,4
Food provision for humans	B	1,8	1,9	2,6	2,8	6,3	0,0	3,1	1,6	2,8	5,7	4,0	2,5	4,0	3,4	0,0		2,8	1,7	0,4
Habitat for feeding and breeding	A	7,1	9,6	3,9	7,0	7,9	7,2	1,6	4,9	5,6	5,7	4,0	3,7	5,3	5,6	7,7		5,8	2,0	0,5
Hunting	S	0,0	0,0	0,0	0,0	7,9	0,0	0,0	0,0	2,8	1,4	4,0	4,9	0,0	4,5	0,0		1,7	2,4	0,6
Hydrological regulation	A	5,4	5,8	3,9	5,6	0,0	5,8	7,8	6,6	4,2	7,1	3,0	6,2	4,0	5,6	4,6		5,0	1,8	0,5
Leisure activities	S	8,9	9,6	6,5	5,6	6,3	5,8	7,8	4,9	5,6	7,1	5,0	6,2	6,7	5,6	6,2		6,5	1,3	0,3
Materials of economic use	A	0,0	0,0	1,3	0,0	0,0	0,0	1,6	3,3	1,4	2,9	4,0	0,0	1,3	1,1	0,0		1,1	1,3	0,3
Plants of economic use	B	3,6	1,9	6,5	4,2	3,2	1,4	3,1	3,3	4,2	5,7	4,0	3,7	4,0	3,4	0,0		3,5	1,5	0,4
Pollination	B	7,1	3,8	5,2	4,2	3,2	5,8	1,6	6,6	5,6	1,4	2,0	2,5	4,0	4,5	3,1		4,0	1,7	0,4
Prevention of erosion	A	0,0	3,8	5,2	5,6	1,6	5,8	4,7	8,2	4,2	4,3	5,0	6,2	4,0	4,5	1,5		4,3	2,0	0,5
Raw materials	A	0,0	0,0	0,0	1,4	0,0	0,0	0,0	3,3	1,4	1,4	2,0	0,0	1,3	1,1	0,0		0,8	1,0	0,3
Sedimentological regulation	A	7,1	1,9	5,2	1,4	1,6	5,8	0,0	8,2	4,2	2,9	5,0	4,9	4,0	3,4	0,0		3,7	2,4	0,6
Spiritual significance	S	7,1	3,8	6,5	5,6	4,8	4,3	6,3	0,0	1,4	7,1	4,0	4,9	4,0	3,4	6,2		4,6	2,0	0,5
Transport facilitation	S	0,0	0,0	1,3	0,0	3,2	0,0	0,0	0,0	1,4	1,4	4,0	2,5	2,7	0,0	6,2		1,5	1,8	0,5
Waste and toxicant mediation	A	3,6	1,9	6,5	2,8	0,0	5,8	0,0	0,0	1,4	1,4	5,0	1,2	0,0	2,2	4,6		2,4	2,1	0,6
Water regulation	A	5,4	5,8	6,5	5,6	0,0	0,0	7,8	8,2	4,2	7,1	3,0	4,9	4,0	5,6	7,7		5,1	2,4	0,6
average average and SD																		4,0	1,8	
coefficient of variation																		0,45		

Threats MO - Scientists 2018	B/A/S	Appia Antica	Castelli Romani	Kalkalpen	Ohrid	Pieniny	Prespa	Samaria	Swiss NP		Average	SD	SE
(Illegal) human activities	S	2,1	8,2	2,9	7,7	2,1	7,8	14,3	0,0		5,6	4,4	1,6
Agriculture	S	2,1	2,0	0,0	4,6	4,2	7,8	3,6	5,9		3,8	2,3	0,8
Bad management	S	2,1	2,0	0,0	4,6	4,2	4,7	7,1	0,0		3,1	2,3	0,8
Change in land use	S	8,3	8,2	0,0	6,2	6,3	6,3	10,7	0,0		5,7	3,6	1,3
Change in species	B	2,1	4,1	8,6	6,2	6,3	6,3	7,1	5,9		5,8	1,8	0,6
Civil engineering	S	0,0	0,0	0,0	4,6	4,2	0,0	0,0	11,8		2,6	3,9	1,4
Climate change	C	2,1	2,0	11,4	4,6	6,3	4,7	3,6	17,6		6,5	5,0	1,8
Diseases	B	4,2	4,1	11,4	1,5	4,2	1,6	3,6	5,9		4,5	2,9	1,0
Disturbance	S	8,3	8,2	2,9	7,7	4,2	7,8	10,7	17,6		8,4	4,2	1,5
Encroachment	B	6,3	4,1	2,9	0,0	4,2	0,0	0,0	0,0		2,2	2,3	0,8
Eutrophication	A	0,0	2,0	5,7	6,2	4,2	6,3	0,0	0,0		3,0	2,7	0,9
Exotic species	B	6,3	4,1	5,7	6,2	4,2	6,3	7,1	0,0		5,0	2,1	0,8
Extreme weather	A	2,1	2,0	5,7	0,0	2,1	0,0	3,6	11,8		3,4	3,6	1,3
Fire	A	8,3	8,2	2,9	0,0	2,1	0,0	7,1	0,0		3,6	3,5	1,2
Fisheries	S	0,0	0,0	0,0	4,6	0,0	4,7	0,0	0,0		1,2	2,0	0,7
Habitat loss	A	6,3	4,1	5,7	4,6	8,3	4,7	3,6	0,0		4,7	2,2	0,8
Harmfull Algae	B	0,0	2,0	0,0	1,5	0,0	4,7	0,0	0,0		1,0	1,6	0,6
Hydrological changes	A	2,1	2,0	2,9	3,1	2,1	3,1	0,0	0,0		1,9	1,2	0,4
Increased salinisation	A	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0
Landscape disturbance	S	4,2	4,1	2,9	6,2	6,3	4,7	0,0	0,0		3,5	2,3	0,8
Overexploitation	S	8,3	6,1	0,0	7,7	6,3	7,8	0,0	0,0		4,5	3,6	1,3
Pollution	S	8,3	6,1	8,6	6,2	6,3	7,8	0,0	0,0		5,4	3,3	1,1
Predation	B	6,3	6,1	5,7	0,0	2,1	0,0	0,0	0,0		2,5	2,8	1,0
Sediment dynamics changes	A	0,0	2,0	8,6	0,0	2,1	0,0	3,6	5,9		2,8	2,9	1,0
Tourism	S	10,4	8,2	5,7	6,2	8,3	3,1	14,3	17,6		9,2	4,5	1,6
average average and SD											4,0	2,8	
coefficient of variation											0,71		

Threats MO - Managers 2018	B/A/S	Appia Antica	Bayerische Wald	Castelli Rom-ani	Gran Paradiso	Hardangervidda	Kalkalpen	Ohrid	La Palma	Peneda Geres	Pieniny NP	Prespa	Reunion NP	Samaria	Sierra Nevada	Swiss NP		Average	SD	SE
(Illegal) human activities	S	2,9	6,2	6,9	4,8	2,4	13,2	7,7	4,5	5,1	4,2	4,0	6,9	8,3	5,3	8,8		6,1	2,6	0,7
Agriculture	S	4,4	4,6	1,4	6,3	2,4	0,0	1,5	1,5	3,4	1,4	2,7	4,2	5,0	2,6	0,0		2,8	1,8	0,5
Bad management	S	5,9	3,1	6,9	6,3	2,4	5,3	7,7	7,6	6,8	6,9	1,3	5,6	5,0	5,3	14,7		6,0	2,9	0,8
Change in land use	S	5,9	6,2	6,9	7,9	0,0	5,3	1,5	4,5	6,8	6,9	2,7	6,9	5,0	3,9	0,0		4,7	2,5	0,6
Change in species	B	4,4	7,7	4,1	4,8	9,5	10,5	6,2	7,6	6,8	6,9	4,0	6,9	6,7	2,6	8,8		6,5	2,1	0,6
Civil engineering	S	4,4	4,6	2,8	6,3	0,0	2,6	3,1	1,5	6,8	5,6	6,7	0,0	0,0	2,6	0,0		3,1	2,4	0,6
Climate change	C	2,9	7,7	4,1	4,8	11,9	13,2	4,6	3,0	1,7	2,8	5,3	4,2	3,3	6,6	2,9		5,3	3,2	0,8
Diseases	B	5,9	1,5	4,1	4,8	11,9	5,3	3,1	3,0	5,1	2,8	1,3	2,8	5,0	3,9	5,9		4,4	2,4	0,6
Disturbance	S	7,4	6,2	6,9	4,8	7,1	2,6	6,2	4,5	6,8	5,6	2,7	5,6	5,0	6,6	8,8		5,8	1,6	0,4
Encroachment	B	4,4	1,5	1,4	4,8	7,1	2,6	3,1	6,1	0,0	6,9	1,3	1,4	0,0	3,9	0,0		3,0	2,4	0,6
Eutrophication	A	4,4	7,7	4,1	3,2	2,4	2,6	4,6	3,0	0,0	1,4	5,3	1,4	0,0	3,9	11,8		3,7	2,9	0,8
Exotic species	B	5,9	6,2	4,8	4,8	9,5	5,3	1,5	7,6	8,5	5,6	1,3	6,9	3,3	2,6	5,9		5,3	2,3	0,6
Extreme weather	A	2,9	1,5	2,8	3,2	0,0	5,3	0,0	0,0	1,7	2,8	6,7	2,8	3,3	3,9	0,0		2,5	1,9	0,5
Fire	A	5,9	1,5	4,1	0,0	2,4	5,3	3,1	6,1	8,5	1,4	6,7	5,6	8,3	6,6	2,9		4,6	2,5	0,6
Fisheries	S	0,0	0,0	0,0	1,6	9,5	0,0	7,7	0,0	0,0	1,4	6,7	4,2	3,3	1,3	0,0		2,4	3,1	0,8
Habitat loss	A	4,4	6,2	4,1	7,9	2,4	0,0	6,2	7,6	8,5	6,9	5,3	5,6	6,7	3,9	8,8		5,6	2,3	0,6
Harmfull Algae	B	0,0	0,0	2,8	0,0	0,0	0,0	0,0	0,0	0,0	1,4	1,3	0,0	1,7	1,3	0,0		0,6	0,9	0,2
Hydrological changes	A	0,0	4,6	5,5	3,2	0,0	0,0	6,2	1,5	0,0	5,6	5,3	2,8	3,3	5,3	0,0		2,9	2,4	0,6
Increased salinisation	A	0,0	0,0	0,0	0,0	0,0	0,0	0,0	6,1	0,0	0,0	5,3	0,0	3,3	1,3	0,0		1,1	2,0	0,5
Landscape disturbance	S	5,9	7,7	5,5	4,8	0,0	0,0	6,2	3,0	5,1	6,9	6,7	5,6	5,0	3,9	0,0		4,4	2,5	0,6
Overexploitation	S	5,9	1,5	6,9	4,8	2,4	5,3	4,6	6,1	3,4	5,6	2,7	4,2	6,7	5,3	0,0		4,3	1,9	0,5
Pollution	S	7,4	7,7	2,8	1,6	7,1	2,6	7,7	0,0	1,7	2,8	5,3	4,2	1,7	3,9	11,8		4,5	3,1	0,8
Predation	B	2,9	0,0	4,1	0,0	2,4	0,0	0,0	7,6	5,1	0,0	5,3	4,2	1,7	1,3	0,0		2,3	2,4	0,6
Sediment dynamics changes	A	0,0	1,5	0,0	3,2	0,0	5,3	0,0	1,5	5,1	1,4	2,7	2,8	1,7	5,3	0,0		2,0	1,9	0,5
Tourism	S	5,9	4,6	6,9	6,3	7,1	7,9	7,7	6,1	3,4	6,9	1,3	5,6	6,7	6,6	8,8		6,1	1,8	0,5
																		4,0	2,3	
coefficient of variation																		0,58		

EF SA - Scientists 2018	B/A/S	Har Ha Negev	Kruger	Montado		Average	SD	SE
Biodiversity	B		6,5	7,2		6,9	0,4	0,3
Carbon cycle	A		5,2	5,8		5,5	0,3	0,2
Climate regulation	A		6,5	5,8		6,1	0,3	0,2
Element cycling	A		6,5	7,2		6,9	0,4	0,3
Food chain energy transfer	B		6,5	5,8		6,1	0,3	0,2
Gene pool	B		6,5	7,2		6,9	0,4	0,3
Habitat suitability	A		6,5	7,2		6,9	0,4	0,3
Hydrodynamics	A		5,2	4,3		4,8	0,4	0,3
Land- and sea-scape	A		3,9	7,2		5,6	1,7	1,2
Nutrient regulation	A		6,5	7,2		6,9	0,4	0,3
Population dynamics	B		6,5	7,2		6,9	0,4	0,3
Primary production	B		6,5	7,2		6,9	0,4	0,3
Raw materials	A		2,6	2,9		2,7	0,2	0,1
Secondary production	B		6,5	5,8		6,1	0,3	0,2
Sediment characteristics	A		5,2	2,9		4,0	1,1	0,8
Weather	A		6,5	7,2		6,9	0,4	0,3
Water surface characteristics	A		6,5	1,4		4,0	2,5	1,8
average average and SD						5,9	0,6	
coefficient of variation						0,10		

EF SA - Managers 2018	B/A/S	Har Ha Negev	Kruger NP	Montado		Average	SD	SE
Biodiversity	B	8,5	8,1	7,4		8,0	0,5	0,3
Carbon cycle	A	5,1	3,2	5,9		4,7	1,1	0,6
Climate regulation	A	5,1	3,2	7,4		5,2	1,7	1,0
Element cycling	A	8,5	6,5	4,4		6,4	1,7	1,0
Food chain energy transfer	B	5,1	6,5	5,9		5,8	0,6	0,3

Gene pool	B	6,8	4,8	4,4		5,3	1,0	0,6
Habitat suitability	A	8,5	8,1	7,4		8,0	0,5	0,3
Hydrodynamics	A	8,5	8,1	7,4		8,0	0,5	0,3
Land- and sea-scape	A	8,5	6,5	7,4		7,4	0,8	0,5
Nutrient regulation	A	1,7	6,5	5,9		4,7	2,1	1,2
Population dynamics	B	8,5	8,1	7,4		8,0	0,5	0,3
Primary production	B	6,8	8,1	5,9		6,9	0,9	0,5
Raw materials	A	6,8	4,8	5,9		5,8	0,8	0,5
Secondary production	B	6,8	6,5	5,9		6,4	0,4	0,2
Sediment characteristics	A	1,7	3,2	4,4		3,1	1,1	0,6
Weather	A	1,7	8,1	5,9		5,2	2,6	1,5
Water surface characteristics	A	1,7	0,0	1,5		1,1	0,8	0,4
average average and SD						5,9	1,0	
coefficient of variation						0,17		

ES SA - Scientists 2018	B/A/S	Har Ha Negev	Kruger	Montado		Average	SD	SE
Animals of economic use	B		4,7	5,7		5,2	0,5	0,3
Biodiversity conservation	B		5,9	5,7		5,8	0,1	0,1
Charismatic landscape	A		5,9	5,7		5,8	0,1	0,1
Charismatic species	B		5,9	5,7		5,8	0,1	0,1
Climate regulation	A		4,7	4,5		4,6	0,1	0,1
Education and research	S		5,9	5,7		5,8	0,1	0,1
Energy production	S		1,2	0,0		0,6	0,6	0,4
Fire Protection	B		3,5	1,1		2,3	1,2	0,8
Flood and coastal protection	A		3,5	4,5		4,0	0,5	0,4
Food provision for animals	B		5,9	5,7		5,8	0,1	0,1
Food provision for humans	B		2,4	5,7		4,0	1,7	1,2
Habitat for feeding and breeding	A		5,9	5,7		5,8	0,1	0,1

Hunting	S		2,4	2,3		2,3	0,0	0,0
Hydrological regulation	A		3,5	3,4		3,5	0,1	0,0
Leisure activities	S		5,9	5,7		5,8	0,1	0,1
Materials of economic use	A		0,0	1,1		0,6	0,6	0,4
Plants of economic use	B		0,0	5,7		2,8	2,8	2,0
Pollination	B		5,9	3,4		4,6	1,2	0,9
Prevention of erosion	A		5,9	2,3		4,1	1,8	1,3
Raw materials	A		0,0	1,1		0,6	0,6	0,4
Sedimentological regulation	A		5,9	4,5		5,2	0,7	0,5
Spiritual significance	S		5,9	5,7		5,8	0,1	0,1
Transport facilitation	S		0,0	1,1		0,6	0,6	0,4
Waste and Toxicant mediation	A		5,9	4,5		5,2	0,7	0,5
Water regulation	A		3,5	3,4		3,5	0,1	0,0
average average and SD						4,0	0,6	
coefficient of variation						0,14		

ES SA - Managers 2018	B/A/S	Har Ha Negev	Kruger NP	Montado		Average	SD	SE
Animals of economic use	B	4,9	5,7	5,4		5,3	0,3	0,2
Biodiversity conservation	B	6,1	9,4	5,4		7,0	1,8	1,0
Charismatic landscape	A	6,1	9,4	5,4		7,0	1,8	1,0
Charismatic species	B	6,1	9,4	4,3		6,6	2,1	1,2
Climate regulation	A	0,0	3,8	4,3		2,7	1,9	1,1
Education and research	S	6,1	9,4	4,3		6,6	2,1	1,2
Energy production	S	4,9	0,0	2,2		2,3	2,0	1,2
Fire Protection	B	0,0	0,0	3,2		1,1	1,5	0,9
Flood and coastal protection	A	6,1	0,0	2,2		2,7	2,5	1,5
Food provision for animals	B	2,4	9,4	3,2		5,0	3,1	1,8
Food provision for humans	B	4,9	0,0	2,2		2,3	2,0	1,2

Habitat for feeding and breeding	A	6,1	0,0	5,4		3,8	2,7	1,6
Hunting	S	0,0	0,0	4,3		1,4	2,0	1,2
Hydrological regulation	A	6,1	5,7	5,4		5,7	0,3	0,2
Leisure activities	S	6,1	9,4	5,4		7,0	1,8	1,0
Materials of economic use	A	6,1	0,0	2,2		2,7	2,5	1,5
Plants of economic use	B	4,9	0,0	5,4		3,4	2,4	1,4
Pollination	B	4,9	3,8	4,3		4,3	0,5	0,3
Prevention of erosion	A	1,2	5,7	4,3		3,7	1,9	1,1
Raw materials	A	6,1	0,0	2,2		2,7	2,5	1,5
Sedimentological regulation	A	2,4	0,0	4,3		2,2	1,8	1,0
Spiritual significance	S	6,1	9,4	4,3		6,6	2,1	1,2
Transport facilitation	S	0,0	0,0	2,2		0,7	1,0	0,6
Waste and toxicant mediation	A	1,2	5,7	4,3		3,7	1,9	1,1
Water regulation	A	1,2	3,8	4,3		3,1	1,3	0,8
average average and SD						4,0	1,8	
coefficient of variation						0,46		

Threats SA - Scientists 2018	B/A/S	Har Ha Negev	Kruger	Montado		Average	SD	SE
(Illegal) human activities	S		5,7	5,5		5,6	0,1	0,1
Agriculture	S		0,0	5,5		2,7	2,7	1,9
Bad management	S		5,7	5,5		5,6	0,1	0,1
Change in land use	S		0,0	5,5		2,7	2,7	1,9
Change in species	B		5,7	3,3		4,5	1,2	0,9
Civil engineering	S		0,0	2,2		1,1	1,1	0,8
Climate change	C		5,7	4,4		5,1	0,7	0,5
Diseases	B		5,7	4,4		5,1	0,7	0,5
Disturbance	S		5,7	4,4		5,1	0,7	0,5
Encroachment	B		5,7	3,3		4,5	1,2	0,9

Eutrophication	A		5,7	3,3		4,5	1,2	0,9
Exotic species	B		5,7	4,4		5,1	0,7	0,5
Extreme weather	A		3,4	2,2		2,8	0,6	0,4
Fire	A		5,7	4,4		5,1	0,7	0,5
Fisheries	S		3,4	2,2		2,8	0,6	0,4
Habitat loss	A		5,7	4,4		5,1	0,7	0,5
Harmfull Algae	B		5,7	4,4		5,1	0,7	0,5
Hydrological changes	A		0,0	1,1		0,5	0,5	0,4
Increased salinisation	A		0,0	3,3		1,6	1,6	1,2
Landscape disturbance	S		0,0	3,3		1,6	1,6	1,2
Overexploitation	S		4,6	5,5		5,0	0,4	0,3
Pollution	S		4,6	4,4		4,5	0,1	0,1
Predation	B		5,7	4,4		5,1	0,7	0,5
Sediment dynamics changes	A		3,4	3,3		3,4	0,1	0,1
Tourism	S		5,7	5,5		5,6	0,1	0,1
average average and SD						4,0	0,9	
coefficient of variation						0,22		

Threats SA - Managers 2018	B/A/S	Har Ha Negev	Kruger NP	Montado		Average	SD	SE
(Illegal) human activities	S	6,7	9,3	6,2		7,4	1,4	0,8
Agriculture	S	6,7	3,7	7,7		6,0	1,7	1,0
Bad management	S	5,3	5,6	7,7		6,2	1,1	0,6
Change in land use	S	6,7	3,7	7,7		6,0	1,7	1,0
Change in species	B	6,7	1,9	4,6		4,4	2,0	1,1
Civil engineering	S	5,3	0,0	4,6		3,3	2,4	1,4
Climate change	C	2,7	5,6	7,7		5,3	2,1	1,2
Diseases	B	2,7	3,7	6,2		4,2	1,5	0,8
Disturbance	S	6,7	3,7	3,1		4,5	1,6	0,9
Encroachment	B	0,0	7,4	1,5		3,0	3,2	1,8

Eutrophication	A	2,7	7,4	1,5		3,9	2,5	1,5
Exotic species	B	5,3	9,3	1,5		5,4	3,2	1,8
Extreme weather	A	0,0	1,9	1,5		1,1	0,8	0,5
Fire	A	0,0	0,0	6,2		2,1	2,9	1,7
Fisheries	S	0,0	0,0	1,5		0,5	0,7	0,4
Habitat loss	A	6,7	1,9	6,2		4,9	2,2	1,2
Harmfull Algae	B	0,0	1,9	1,5		1,1	0,8	0,5
Hydrological changes	A	0,0	9,3	4,6		4,6	3,8	2,2
Increased salinisation	A	5,3	0,0	0,0		1,8	2,5	1,5
Landscape disturbance	S	6,7	5,6	4,6		5,6	0,8	0,5
Overexploitation	S	6,7	5,6	7,7		6,6	0,9	0,5
Pollution	S	5,3	5,6	3,1		4,7	1,1	0,6
Predation	B	6,7	0,0	0,0		2,2	3,1	1,8
Sediment dynamics changes	A	2,7	1,9	1,5		2,0	0,5	0,3
Tourism	S	2,7	5,6	1,5		3,3	1,7	1,0
						4,0	1,8	
coefficient of variation						0,46		

Addendum C: Complete list of proposed Indicators for the Essential Variables

Indicators for Essential Variables as obtained in the 4th EcoPotential WP9 survey, as obtained through the 4th survey (appendix 4). Indicators are sorted for those meaurabel in-xsitu and those by Remote sensing (RS). The entries are coded per PA, and sorted according category of variable (EF, ES, Threats; within a category the variables are sorted in alphabetic order) and domain (Semi-Arid = A = yellow, Mountains = M = grey, Transitional Water = blue; Lakes =L = grey. because of their location amidst mountains)(PA codes: A1 = Montado, A2 = Kruger National Park, M1 = Pieniny NP, M2 = Kalkalpen, M3 = Parco Regionale dei Castelli Romani, M4 = Parco Regionale dell'Appia Antica, M5 = Swiss National Park, M6 = Samaria, L1 = Lake Ohrid, L2 = Lake Prespa, W1 = Doñana, W2 = Danube Delta, W3 = Wadden Sea, W4 = Eastern Scheldt)

	Indicator by *in situ* observation				Indicator by RS		
Group Variable	Area- Code	Name of Indicator	Literature reference		Area-- Code	Name of Indicator	Literature reference
Ecosystem Functions and Structures							
Biodiversity	A1	Species abundance	Godinho & Rabaça 2011		A2	extent/phenology	Cho et al. 2017
	A2	species types/ vege/animals			A2	diversity	Madonsela et al. 2018
	M1	abundance of bird species	BirdLife International (2004)		M1	plant community composition	Baldeck et al. (2014)
	M1	distribution of species	Thomas et al. (2004)		M1	invertebrates - butterfly species richness	Kumar et al. (2009)
	M2	Fauna and Flora (status and trends)			M6	Diversity indices	Rocchini et al 2017
	M6	Number of species					
	W1	waterbird and herbivore diversity	http://editorial.csic.es/publicaciones/libros/12417/978-84-00-09845-2/censos-aereos-de-aves-acuaticas-en-donana-cuarenta.html and Protocols of EBD's Monitoring Program (in Spanish, available upon request)		W2	Number and diversity of water birds	Bibby et al., 1992
	W3	Bird species presence/abundance			W3	Habitat mapping (presence/diversity)	

	W4	Bird species presence/abundance			W4	Habitat mapping (presence/diversity)	
	W3	Macrobenthos species presence/abundance					
	W4	Macrobenthos species presence/abundance					
	L1	Species richness					
	L2	Species richness					
	L1	Abundance and distribution of selected species					
	L2	Abundance and distribution of selected species					
Carbon cycle	A1	Soil organic matter	Teixeira et al. 2015		A2	biomass (tree and grass)	Naidoo et al. 2015; Mathieu et al. 2013; Main et al. 2016; Ramoelo et al. 2015
	A2	biomass					
	A2	cover, tree dbh, height					
	M1	soil C storage	De Deyn et al. (2011)		M1	carbon fluxes	Fuentes et al. (2006)
	M2	Carbon sequestration	UNFCCC reporting http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/7116.php		M1	forest aboveground carbon	Fuchs et al. (2009)
	M3	Biomass			M2	Gross Primary Production	MODIS GPP Product (DOI: 10.1038/sdata.2017.165)
	M3	Evapotraspiration Flux			M3	Fraction of Vegetation Cover	
	M5	Soil carbon	Hagedorn et al 2010		M3	Leaf Area Index	
	M5	Aboveground biomass	Wsl 2010		M5	Aboveground biomass (LiDAR)	Koch 20110
	M6	Forest extend			M5	Hyperspectral indices	Psomas et al 2011
					M6	Forest extend / forest biomass	
	W1	CO2 fluxes	http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0071456 and http://onlinelibrary.wiley.co		W1	CO2 fluxes	http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0071456 and http://onlinelibrary.wiley.co

			m/doi/10.1002/2017JG003793/pdf				m/doi/10.1002/2017JG003793/pdf
Climate regulation	A2	climate variables					
	M1	air temperature	Kotchi et al. (2016)		M1	temperature humidity index	Ige et al. (2017)
	M1	relative humidity	Kotchi et al. (2016)		M3	Fraction of Vegetation Cover	
	M2	Forest water cycle an energy budget	e.g. Eddy covariance		M3	Land Surface Temperature	
	M3	Weather conditions			M4	Fraction of Vegetation Cover	
	M4	Weather conditions			M4	Land Surface Temperature	
	M6	weather station data					
	W1	CO_2 fluxes	http://icts.ebd.csic.es/monitoring-program-primary-production		W1	CO_2 fluxes	http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0071457
Element cycling	A2	nutrients			A2	leaf nitrogen/ nutrients	Ramoelo 2012; 2015; 2018
	M2	Element budgets			M3	Crop Land Cover	
	M3	Soil properties			M3	Inland water color	
	M3	Water quality			M4	Crop Land Cover	
	M4	Soil properties			M4	Inland water color	
	M4	Water quality			M3	Habitat mapping	
	W3	Nutrient levels			W3	Water colour (chlorophyl concentrations)	
	W3	Macrobenthos species presence/abundance					
Food chain energy transfer	M3	Species and individuals abundance estimates			M4	Habitat mapping	
	M3	Shannon Index					
	M4	Species and individuals abundance estimates					
	M4	Shannon Index					
	W3	Primary production to Consumer ratios			W2	Flood duration (hydroperiod)	Clement et al 2017, and Murray-Hudson et al., 2015
	W4	Primary production to Consumer ratios					

	W4	Shellfish production (commercial + natural stocks)					
Gene pool	M1	number of species	Brown et al. (2008)		M1	areal coverage of vegetation features supporting pollination	Dicks et al. (2015)
	M6	Endemic species					
	W3	Genetic diversity for focal species					
	W4	Genetic diversity for focal species					
	L1	Diversity of species and sub-species, phylogenetic distance					
	L2	Diversity of species and sub-species, phylogenetic distance					
	L1	Biodiversity Index					
	L2	Biodiversity Index					
Habitat suitability					A2	habitat maps	Hughes et al. 2017
	M1	canopy cover	Zouaoui et al. (2014)		M1	general habitat categories	Adamo et al. (2014)
	M1	organic layer depth	Zouaoui et al. (2014)		M2	Forest habitat distribution	n.a.
	M2	Status and trend in protected habitats			M3	Habitat mapping	
	M2	Dead wood	n.a.		M3	Land cover	
	M3	habitat characteristics			M5	Habitat classification	Lucas et al 2015
	M3	trophic resources presence			M5	Forest structure	Zellweger et al 2013
	M5	Species observation data	atlasnationalpark.ch		M6	Modelling of species distribution	Guillera-Arroita, G. (2017)
	M5	Habitat maps	Haller & Hauenstein 2013				
	M6	Number of habitats - quality of habitats					
	W3	Macrobenthos species presence/abundance			W1	Habitat diversity and suitability derived from RS parameters as hydroperiod, depth, vegetation cover (combined with *in situ* parameters as those from piezometers, limnological)	Protocols of EBD's Monitoring Program (in Spanish, available upon request)
	W4	Macrobenthos species presence/abundance			W3	Habitat mapping (presence/diversity)	
	W3	Fish species presence/abundance			W3	Habitat mapping (presence/diversity)	

	W4	Fish species presence/abundance					
	L1	feeding ground, spawning grounds, nesting sites			L1	habitat diversity (reed belts, macrophytes etc)	
	L2	feeding ground, spawning grounds, nesting sites			L2	habitat diversity (reed belts, macrophytes etc)	
	L1	ecological and chemical condition					
	L2	ecological and chemical condition					
Hydrodynamics	A1	Leaf water potential (model)	David et al. 2007				
	M2	Runoff			M6	Snow cover extend	
	M6	Snow cover extend					
	W1	piezometer			W1	hydroperiod	
	W3	Water current measurements			W2	Flood duration (hydroperiod)	Clement et al 2017, and Murray-Hudson et al., 2015
	W4	Water current measurements			W3	Habitat mapping (presence/diversity)	
	W3	Sediment characteristics			W4	Habitat mapping (presence/diversity)	
	W4	Sediment characteristics			W3	Water colour (sediment and chlorophyl in water column)	
					W4	Water colour (sediment and chlorophyl in water column)	
Land- and sea-scape					A1	Forest canopy density	Godinho et al. 2014
					A1	Tree decline	Costa et al. 2010
	M3	View Points			M2	Land use classification	n.a.
	M3	Geocoded Picture Density			M5	Viewshed	
	M4	View Points					
	M4	Geocoded Picture Density					
	M6	Actual status in UNESCO					
	W3	Perception by inhabitants and visitors (enquete)			W3	Aerial pictures/satelite observation (habitation and high structures)	
	W4	Perception by inhabitants and visitors (enquete)			W4	Aerial pictures/satelite observation (habitation and high structures)	

	W4	Monitoring number of recreants (pleasure craft, swimmers, divers, surfers, pleasure fishermen etc)					
					L1	Land diversity	
					L2	land diversity	
Nutrient regulation	A1	Soil nutrients	Carranca et al. 2015		A2	grass nutrients	Ramoelo 2012; 2015; 2018
	A2	grass nutrients	Ramoelo 2012; 2015; 2018				
	M2	Leaf nutrient concentration			M3	Land cover	
	W3	Nutrient levels			W3	Habitat mapping (presence salt marshes)	
	W4	Nutrient levels			W4	Habitat mapping (presence salt marshes)	
	W3	Phytoplankton composition			W3	Water colour (chlorophyl concentrations/algal blooms)	
	W4	Phytoplankton composition			W4	Water colour (chlorophyl concentrations/algal blooms)	
Population dynamics	A2	animal and tree species					
	M2	Species abundance			M6	Species density	
	M5	Species observation data	atlasnationalpark.ch				
	M6	Species abundance					
	W3	Fish species presence/abundance			W3	Aerial pictures/satelite observation (vegetation)	
	W4	Fish species presence/abundance			W4	Aerial pictures/satelite observation (vegetation)	
	W3	Bird species presence/abundance					
	W4	Bird species presence/abundance					
Primary production					A2	vegetation indices	
					A2	biomass	
	M2	Tree growth			M2	Gross Primary Production	MODIS GPP Product (DOI: 10.1038/sdata.2017.165)
	M3	Density and Cover percent			M3	Leaf Area Index	

	M4	Density and Cover percent			M4	Leaf Area Index	
	M6	Vegetation extend and diversity			M5	Vegetation indices	Schweiger et al 2015
					M6	Vegetation extend	
	W2	Chlorophyll a	Yentsch & Menzel 1963		W1	Biomass production using NDVI	http://www.mdpi.com/2072-4292/9/4/392 and Protocols of EBD's Monitoring Program (in Spanish, available upon request)
	W3	Measurements of primary production			W2	Chl a concentration	Cannizzaro & Carder 2006
	W4	Measurements of primary production			W3	Water colour (chlorophyl concentrations)	
	W3	Chlorophyl biomass			W4	Water colour (chlorophyl concentrations)	
	W4	Chlorophyl biomass					
	L1	algae biomass					
	L2	algae biomass					
	L1	nutrient concentration					
	L2	nutrient concentration					
Raw materials					A1	Cork production (tree biomass)	Sousa et al. 2013 (tree biomass)
	W3	Reportings of volumes extracted			W3	Aerial pictures/satelite observation (excavation/extraction sites)	
	W3	Sediment characteristics					
Secondary production	M3	Cattle census			M3	Habitat mapping	
	M3	Species and individuals abundance estimates			M3	Land cover	
	M4	Cattle census			M4	Habitat mapping	
	M4	Species and individuals abundance estimates			M4	Land cover	
	M5	Species observation data	atlasnationalpark.ch				
	M6	Number of heterotroph species					

	W3	Macrobenthos species presence/biomass			W2	Protocols of EBD's Monitoring Program (in Spanish, available upon request)	
	W4	Macrobenthos species presence/biomass					
	W3	Fish species presence/biomass					
	W4	Fish species presence/biomass					
	L1	zooplankton biomass					
	L2	zooplankton biomass					
	L1	fish biomass, fish abundance					
	L2	fish biomass, fish abundance					
Sediment characteristics	A1	Soil texture	Teixeira et al. 2015				
	M6	Soil quality and type			M6	Soil type	
	W3	Multi-beam or side-scan sonar			W3	Aerial pictures/satelite observation (sedimentation/erosion)	
	W4	Multi-beam or side-scan sonar			W4	Aerial pictures/satelite observation (sedimentation/erosion)	
	W3	Sediment characteristics					
	W4	Sediment characteristics					
Weather	A2	temperature					
	A2	rainfall					
	M2	Trends in climatic parameters			M3	Crop Land Cover	
	M3	Soil properties			M3	Inland water color	
	M3	Water quality			M4	Crop Land Cover	
	M4	Soil properties			M4	Inland water color	
	M4	Water quality			M5	Snow cover	Notarnicola et al 2013
	M5	Weather station data	Meteoswiss; SLF		M6	Land Surface Temperature	Kalma et al 2008
	M6	Weather station timeseries					
					W1	Temperature, precipitation	Protocols of EBD's Monitoring Program (in Spanish, available upon request)

Water surface characteristics					A1	MODIS BRDF/Albedo	Schaaf et al., 2002
					A2	water bodies extent	
	M6	Snow cover and snow depth			M6	Snow cover	Dietz et al 2012
Ecosystem Services							
Animals of economic use	A1	Livestock density index	Eurostat, 2011				
	A1	Grazing livestock density	Forleo et al., 2017				
	M3	Cattle Census			M3	Land Cover	
	M3	Economic/Statistical Census Data			M4	Land Cover	
	M4	Cattle Census					
	M4	Economic/Statistical Census Data	http://www.istat.it/en/				
	M6	Number of cattles, bees under the carrying capacity concept					
	W3	Fish and shellfish (species presence/biomass)			W3	Aerial pictures/satelite observation (commercial musselplots)	
	W4	Fish and shellfish (species presence/biomass)			W4	Aerial pictures/satelite observation (commercial aquaculture plots)	
	W3	Fish and shellfish (extraction/landing data)					
	W4	Fish and shellfish (extraction/landing data)					
	L1	Fish production (catch in tonnes by commercial and recreational fisheries)					
	L2	Fish production (catch in tonnes by commercial and recreational fisheries)					
	L1	Status of fish population (Species composition, Age Structure, Biomass kg/ha)					
	L2	Status of fish population (Species composition, Age Structure, Biomass kg/ha)					

Biodiversity conservation	A1	Species abundance	Godinho & Rabaça 2011		A1	Habitat extent	Godinho et al. 2014
	A2	species types (animal and trees)			A1	Habitat conservation status	Simonson et al. 2013
					A2	diversity	Madonsela et al. 2017;2018
	M1	indicator species	Mathur et al. (2010)		M1	habitat quality	Zlinszky et al. (2015)
	M1	rare species	Lawler et al. (2002)		M1	spatial heterogenity	Rocchini et al. (2015)
	M2	Fauna and Flora (status and trends)			M5	Habitat classification	Lucas et al 2015
	M5	Species observation data	atlasnationalpark.ch		M5	Forest structure	Zellweger et al 2013
	M5	Habitat maps	Haller & Hauenstein 2013				
	M6	Number of endemic species and extend of protected habitats					
	W3	Bird species presence/abundance			W3	Habitat mapping (presence/diversity)	
	W4	Bird species presence/abundance			W4	Habitat mapping (presence/diversity)	
	W3	Fish species presence/abundance					
	W4	Fish species presence/abundance					
	L1	Species diversity or abundance, endemics or red list species					
	L2	Species diversity or abundance, endemics or red list species					
	L1	Ecological status					
	L2	Ecological status					
Charismatic landscape	M1	density of landscape elements	Ode et al. (2008)		M1	landscape heterogenity	Forzieri et al. (2013)
	M1	heterogenity	Ode et al. (2008)		M2	Forest habitat distribution	no real reference, mostly LiDAR applications or CORINE
	M6	Locations of landmarks			M6	landscape indices	Kupfer 20??
	L1	Number of visitors			L1	sites with recognised cultural & spiritual value	
	L1	Tourism revenue			L2	sites with recognised cultural & spiritual value	
	W3	Perception by inhabitants and visitors (enquete)			W3	Aerial pictures/satelite observation (habitation and high structures)	

	W4	Perception by inhabitants and visitors (enquete)					
Charismatic species	M1	number of charismatic species	Verissimo et al. (2010)				
	M2	Fauna and Flora (status and trends)					
	M5	Species observation data	atlasnationalpark.ch				
	M6	abundance of species					
	W3	Bird species presence/abundance					
	W4	Bird species presence/abundance					
	W3	Marine mammals (species presence/biomass)					
	W4	Marine mammals (species presence/biomass)					
	L1	Endemic species					
	L2	Endemic species					
	L1	Iconic species					
	L2	Iconic species					
Climate regulation	M2	Carbon sequestration	UNFCCC reporting http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/7116.php		M2	Gross Primary Production	MODIS GPP Product (DOI: 10.1038/sdata.2017.165)
	M2	Forest water cycle an energy budget	e.g. Eddy covariance		M3	Fraction of Vegetation Cover	
	M3	Weather conditions			M3	Land Surface Temperature	
	M5	Soil carbon	Hagedorn et al 2010		M4	Fraction of Vegetation Cover	
	M5	Aboveground biomass	Wsl 2010		M4	Land Surface Temperature	
					M5	Aboveground biomass (LiDAR)	Koch 2010
					M5	Hyperspectral indices	Psomas et al 2011
Education and research	M1	number of educational trails	Sureda et al. (2010)				
	M1	number of research studies	??				
	M3	Number of programmes per year					

	M3	Number of participants					
	M4	Number of programmes per year					
	M4	Number of participants					
	M5	Number of research projects	FSN, 2015				
	M6	number of schools for education					
	W3	Monitoring number of research projects (papers/reports on the PA)					
	W4	Monitoring number of research projects (papers/reports on the PA)					
	W3	Number of visitors to visitor centres and guided tours					
	W4	Number of students on schools/studies with some (in)direct connection to the PA					
	L1	Monitoring sites (by scientists)					
	L2	Monitoring sites (by scientists)					
	L1	Number of scientific projects, articles, studies					
	L2	Number of scientific projects, articles, studies					
Energy production	M5	Energy production					
	W4	Megawatts produced (tidal power - and wind energy)					
	L1	Number of hydropowers					
	L1	energy production					
Fire Protection					A1	Fire risk	Helman et al. 2015
					A2	Fire extent	
	M6	number of fires per year			M6	burned area extend	Chuvieco et al 2016
Flood and coastal protection					A1	Bare soil	Godinho et al. 2014

	W3	Modelling exposure of coast without a natural barriersystem			W3	Coastline	
	W4	Modelling exposure of coast without a natural barriersystem			W4	Coastline	
Food provision for animals					A1	Pasture productivity	
					A2	Grass biomass	
	M1	biomass production	Alvarenga et al. (2013)		M1	biomass production	Malmstrom et al. (2009)
	M3	Cattle census			M3	Crop Land Cover	
	M4	Cattle census			M3	Land cover	
	M6	habitat quality/composition			M4	Crop Land Cover	
					M4	Land cover	
					M5	Vegetation indices	Schweiger et al 2015
Food provision for humans	M3	Economic/Statistical Census Data			M3	Crop Land Cover	
	M4	Economic/Statistical Census Data			M3	Land cover	
	M6	habitat quality/composition			M4	Crop Land Cover	
					M4	Land cover	
	W3	Fish and shellfish (extraction/landing data)					
	W3	Monitoring permits for collectors					
	W4	Aquaculture (tons produced)					
	W4	Fisheries (tons fish landed)					
	L1	Fish production (catch in tonnes by commercial and recreational fisheries)					
	L2	Fish production (catch in tonnes by commercial and recreational fisheries)					
	L1	Status of fish population (Species composition, Age Structure, Biomass kg/ha)					
	L2	Status of fish population (Species composition, Age Structure, Biomass kg/ha)					

Habitat for feeding and breeding					A1	Tree cover density	Gallego et al., 2016
					A2	vegetation cover	
	M1	habitat suitability	Mora et al. (2011)		M1	habitat quality	Zlinszky et al. (2015)
	M3	trophic resources presence			M3	Habitat mapping	
	M4	trophic resources presence			M3	Land cover	
	M5	Species observation data	atlasnationalpark.ch		M4	Habitat mapping	
	M6	habitat quality/composition			M4	Land cover	
					M5	Vegetation indices	Schweiger et al 2015
					M6	extend of suitable habitats	
	W3	Bird species presence/abundance			W3	Habitat mapping (presence/suitability for focal species)	
	W4	Bird species presence/abundance			W4	Habitat mapping (presence/suitability for focal species)	
	W3	Macrobenthos species presence/abundance					
	W4	Macrobenthos species presence/abundance					
	L1	Species diversity or abundance, endemics or red list species and spawning location			L1	spawning grounds	
	L2	Species diversity or abundance, endemics or red list species and spawning location			L2	spawning grounds	
	L1	Status of fish population (Species composition, Age Structure, Biomass kg/ha)			L2	nesting sites	
	L2	Status of fish population (Species composition, Age Structure, Biomass kg/ha)					
Hunting	W4	Monitoring number of fishing licences (of inhabitants and visitors)					

Hydrological regulation	M2	Runoff					
	M6	flow measurements in creeks					
	W4	Semi-open connection to North Sea					
Leisure activities	A1	PA visitors/social media photos	Oteros-Rozas et al. 2017				
	A2	number of tourists					
	M1	tourist arrivals	Torres-Delgado & Saarinen (2013)				
	M1	length of stay	Torres-Delgado & Saarinen (2013)				
	M2	Number of visitors					
	M3	Number of recreational events					
	M3	Geocoded Picture Density					
	M4	Number of recreational events					
	M4	Geocoded Picture Density					
	M5	No of visitors	Knaus & Backhaus 2014				
	M6	number of visitors					
	W3	Monitoring number of visitors (guided tours)			W3	Aerial observation (numbers of pleasure craft)	
	W4	Monitoring number of visitors (guided tours)			W4	Aerial observation (numbers of pleasure craft)	
	W3	Monitoring number of hotelnights in region					
	W4	Monitoring number of hotel- and campingnights in region					
	L1	bathing areas and number of beaches					
	L2	bathing areas and number of beaches					
	L2	birdwatching areas					
	L1	Number of visitors					
	L2	Number of visitors					
Materials of economic use	W3	Volumes of gasextraction					

Plants of economic use	M3	Timber production statistics			M3	land cover	
	M3	Economic/Statistical Census Data			M3	Crop land cover	
	M4	Timber production statistics			M4	land cover	
	M4	Economic/Statistical Census Data	http://www.istat.it/en/		M4	Crop land cover	
Pollination							
Prevention of erosion					A1	Bare soil index (BSI)	Wentzel, 2002
					A1	LS-factor (Slope Length and Steepness factor)	Desmet & Govers, 1996
	W3	Modelling exposure of coast without a barriersystem			W3	Aerial pictures/satelite observation (sedimentation/erosion)	
	W4	Barrier responsible for erosion/reefs and marshes migth reduce erosion			W4	Aerial pictures/satelite observation (sedimentation/erosion)	
	W3	Multi-beam or side-scan sonar					
	W4	Multi-beam or side-scan sonar					
Raw materials	W3	Reportings of volumes extracted			W3	Aerial pictures/satelite observation (excavation/extraction sites)	
Sedimentological regulation	A1	Soil organic matter	Teixeira et al. 2015				
	M3	Soil properties			M3	land cover	
	M3	Presence of bio-indicators in soil			M3	Soil texture	
	M3	Number of sites of interest					
Spiritual significance	M1	number of sacred places/items	??				
	M1	number of visitors in sacred places	??				
	M4	Number of sites of interest					
	M6	number of locations of spiritual significance					
	W3	Monitoring the PA mentioned in literature/on television					
	W4	Monitoring the PA mentioned in literature/on television					

	W3	Perception by inhabitants and visitors (enquete)					
	W4	Perception by inhabitants and visitors (enquete)					
	L1	Number of sites with recognised cultural & spiritual value			L1	sites with recognised cultural & spiritual value	
	L1	Number of visitors			L2	sites with recognised cultural & spiritual value	
Transport facilitation	M6	Number of shipping lines					
	W4	Monitoring number of boats through sluices			W4	Aerial observation (numbers of boats and pleasure craft)	
Waste and Toxicant mediation	M2	Nitrogen retention					
	W3	Modelling bulkloads in compartments and in- and output			W3	Habitat mapping (presence salt marshes)	
	W4	Modelling bulkloads in compartments and in- and output			W4	Habitat mapping (presence salt marshes)	
Water regulation					A2	extent of water bodies	
	M2	runoff quality and change			M3	land cover	
	M3	Water quality			M3	Inland water color	
	M4	Water quality			M4	land cover	
	M4	Private company profits	http://www.egeria.it/en/egeria-park/		M4	Inland water color	
	M6	Quantity of water in the aquifer			M6	Number of artificial ponds / water extend	
	L1	Water abstracted for drinking					
	L2	Water abstracted for drinking					
	L2	Water abstracted for irrigation					
	L1	water quality					
	L2	water quality					

Threats							
(Illegal) human activities	M3	camera traps			M3	Land cover	
	M3	police/guard notification					
	M6	number of poachers/illegal persons that have accuse with penalty					
	L1	catch in tonnes by ilegal fisheries					
	L2	catch in tonnes by ilegal fisheries					
	L1	number of seized fishing nets and gear					
	L2	number of seized fishing nets and gear					
Agriculture					A1	Agricultural land	Costa et al. 2009
					M6	extend of agriculture fields	
	W3	Volumes of shellfish imported from abroad					
	W3	Trends in number of exotic species related to aquaculture					
	W4	Trends in number of exotic species and shellfish diseases related to aquaculture					
	W4	Monitoring nutrient levels					
	L2	surface of arable land			L1	arable land	
	L2	quantity of used fertilizers and pesticides	UNESCO ROSTE, 2004		L2	arable land	
Bad management	W3	Efficiency of fisheries regulations			W3	Aerial observation (signs of seafloor disturbing activities)	
	W3	Macrobenthos species presence/abundance (impact of different types of fisheries)					
	W4	Macrobenthos species presence/abundance (impact of aquaculture)					
	W4	Insufficient management to challenge sandhunger					
	L1	dysfunctional wastewater system					

	L2	dysfunctional wastewater system					
	L1	number of illegal landfills					
	L2	number of illegal landfills					
Change in land use	M1	fragmentation	Hanski (2005)		M1	land cover	Petrou et al. (2014)
	M1	duration of farming	Wang et al. (2017)		M1	habitat quality monitoring	Zlinszky et al. (2015)
	M3	number of permissions to build			M3	Land cover / Land use change	
	M4	number of permissions to build			M3	soil sealing	
	M6	number of abandonded fields			M4	Land cover / Land use change	
					M4	soil sealing	
					M6	land cover changes	
	L1	rapid urbanisation (shoreline degradation)			L1	shoreline changes	
	L1	land conversion			L2	shoreline changes	
	L2	land conversion					
Change in species	A1	Species community composition	Godinho & Rabaça 2011				
	M1	extinct species	Armon (2014)		M1	habitat loss	Evans & Li (2017)
	M2	Fauna and Flora (status and trends)			M2	Forest habitat distribution	no real reference, mostly LiDAR applications or CORINE
	W3	Trends in numbers of exotic species					
	W4	Trends in numbers of exotic species					
	W3	Macrobenthos species presence/abundance (impact of different types of fisheries)					
	W4	Macrobenthos species presence/abundance (impact of aquaculture)					
	L1	decrease in endemic trout population					
	L1	introduction of alien species					
	L2	introduction of alien species					

Civil engineering	L1	number of dams					
Climate change					A1	Precipitation	Ramos et al. 2015
					A2	vegetation indices	
	M1	sea level	Colburn et al. (2016)		M1	sea level	Yang et al. (2013)
	M1	wildfires	Klos et al. (2015)		M1	snow cover	Yang et al. (2013)
	M2	Trends in climatic parameters			M5	snow cover	Notarnicola et al 2013
	M5	Weather station data	Meteoswiss; SLF				
	W3	Fish species presence/abundance (indicator species moving to North Sea)			W3	Aerial pictures/satelite observation (sealevel/intertidal area)	
	W3	Macrobenthos species presence/abundance ('southern' to 'northern' species ratio)			W4	Aerial pictures/satelite observation (sealevel/intertidal area)	
	W4	Bird species presence/abundance (decrease in waders)					
	L1	The raising temperatures					
	L2	The raising temperatures					
	L1	changes in water quality	Matzinger et al., 2007				
	L2	changes in water quality	Matzinger et al., 2007				
Diseases					A1	Tree decline	Costa et al. 2010
	M2	Forest damage monitoring	National forest inventory standards		M2	Global Forest Cover Change	http://science.sciencemag.org/content/342/6160/850
	M3	number of dead plants/trees			M3	NDVI	
	M3	decrease in fruit production			M3	Fraction of Vegetation Cover	
	M4	number of dead plants/trees			M4	NDVI	
	M4	decrease in crop production			M4	Fraction of Vegetation Cover	
	W4	Monitoring diseases/pest species introduced with aquaculture					
Disturbance	M4	air pollution measurements			M3	soil sealing	
	M4	noise measurements			M4	soil sealing	
	M5	Number of vehicles			M6	landcover/landscape changes	

	M6	number of off-road visitors					
	W3	Number of visitors in focal areas			W3	Aerial observation (numbers of pleasure craft in focal areas)	
	W4	Number of visitors in focal areas			W4	Aerial observation (numbers of pleasure craft in focal areas)	
	W3	Noise levels					
	W4	Noise levels					
	L1	Number of vessels (speed boats, water scooters)					
	L1	number of tourists (tourist facilities)					
Encroachment					A2	tree cover	
	M4	police/guard notifications			M4	Land cover / Land use change	
					M4	soil sealing	
Eutrophication	W3	Nutrient levels			W3	Water colour (chlorophyl concentrations/algal blooms)	
	W3	Phytoplankton (species composition/biomass)					
	W4	Phytoplankton (species composition/biomass)					
	L1	ecological status			L1	chlorophyl a concentration	
	L2	ecological status			L2	chlorophyl a concentration	
	L1	changes in communities					
	L2	changes in communities					
Exotic species	M4	Species presence					
	W3	Trends in numbers of exotic species			W3	Aerial pictures/satelite observation (e.g Pacific oyster reefs or exotic macroalgae in the future)	
	W4	Trends in numbers of exotic species			W4	Aerial pictures/satelite observation (e.g Pacific oyster reefs or exotic macroalgae)	
	W3	Macrobenthos species presence/abundance ('southern' to 'northern' species ratio)					

	W4	Macrobenthos species presence/abundance					
	L1	number of invading species					
	L2	number of invading species					
	L1	invading species traits	Kostoski et al., 2004; Talevski et al., 2010				
	L2	invading species traits	Kostoski et al., 2004; Talevski et al., 2010				
Extreme weather							
Fire					A2	fire extent	
					A2	fire frequency	
	M3	air pollution measurements			M3	Fire severity	
	M3	burnt area extent			M3	Fraction of Vegetation Cover	
	M4	air pollution measurements			M4	Fire severity	
	M4	burnt area extent			M4	Fraction of Vegetation Cover	
Fisheries	W3	Macrobenthos species presence/abundance (impact of seafloor disturbance)					
	W3	Fish species presence/abundance (overexploitation)					
	W4	Fish species presence/abundance (overexploitation)					
	L1	Status of fish population (Species composition, Age Structure, Biomass kg/ha)					
	L2	Status of fish population (Species composition, Age Structure, Biomass kg/ha)					
	L1	inproper fishing gear					
	L2	inproper fishing gear					
Habitat loss					A1	Habitat loss; 2) Landscape fragmentation	Costa et al. 2009, Godinho et al. 2014

					A1	Landscape fragmentation	García-Gigorro & Saura, 2005
					A2	tree cover	Naidoo et al 2015
	M1	connectivity	Turner (2001)		M1	fragmentation analysis	Tang et al. (2012)
	M1	wood decay fungi	Luana et al. (2015)		M1	forest connectivity	Martın-Martın et al. (2013)
					M4	Land cover / Land use change	
					M4	Habitat mapping	
	L1	destruction of coastal habitats			W4	Habitat mapping (presence salt marshes and tidal flats)	
	L1	changes in the spawning grounds	Spirkovski and Ilic-Boeva, 2004		W4	Satelite observation (Steepness and duration of exposure)	
Harmfull Algae					A2	chl concentrations	
Hydrological changes					W4	Habitat mapping (presence salt marshes and tidal flats)	
					W4	Satelite observation (Steepness and duration of exposure)	
Increased salinisation	W3	Salinity measurements (lack of salt- to freshwater gradients)					
	W4	Salinity measurements (lack of salt- to freshwater gradients)					
	W3	Macrobenthos species presence/abundance (reduced presence of estuarine species)					
	W4	Macrobenthos species presence/abundance (reduced presence of estuarine species)					
Landscape disturbance	M1	number of facilities in area			M1	landscape disturbance index	Cardoso et al. (2013)
	W3	Monitoring number of objects/man-build structures in PA			W3	Aerial pictures/satelite observation (high structures)	
	W3	Monitoring perception of inhabitants and visitors					
	L1	rapid urbanisation	Watzin et al., 2002				

Overexploitation	M1	% of fish below reproductive size	Usseqlio et al. (2016)		M3	Crop mapping	
	M1	trail parameters	So et al. (2003)		M4	Crop mapping	
	M3	tons of waste					
	M3	number of limited entry days					
	M4	tons of waste					
	M4	number of limited entry days					
	W3	Fish species presence/abundance (overexploitation)			W3	Aerial pictures/satelite observation (area of natural musselreefs and seagrass meadows)	
	W3	Macrobenthos species presence/abundance (impact of seafloor disturbance)					
	W4	Ratio area and biomass of cultured to natural bivalves					
	W4	Macrobenthos species presence/abundance					
	L1	overfishing					
	L2	intensified agriculture					
Pollution	M1	lichens	Nash & Gries (1991)		M1	light	Chalkias et al. (2006)
	M1	noise	Can (2014)		M1	aerosol optical depth	Palve et al. (2016)
	M3	air pollution measurements			M3	Land cover	
	M3	noise measurements			M4	Land cover	
	M4	air pollution measurements					
	M4	noise measurements					
	W3	Noise levels					
	W3	Contaminant levels in different compartments					
	W4	Contaminant levels in different compartments					
	L1	ecological status					
	L2	ecological status					

	L1	phosphorus concentration					
	L2	phosphorus concentration					
Predation	A2	number of predators					
	M3	Species and individuals abundance estimates					
	M3	camera traps					
	M4	Species and individuals abundance estimates					
	M4	camera traps					
	W3	Monitoring egg predation in breeding colonies					
Sediment dynamics changes					W4	Habitat mapping (presence salt marshes and tidal flats)	
					W4	Satelite observation (Steepness and duration of exposure)	
Tourism	A2	tourism data (gate entries)					
	A2	bed occupancy					
	M1	soil loss	Monz et al. (2010)		M1	water quality	Turqeon et al. (2013)
	M1	spatial patterns of visitors	Monz et al. (2010)		M1	land use	Beattie & Wenner (2009)
	M3	number of information point access			M6	landscape disturbance	Bourbonnaise 2017
	M4	number of information point access					
	M5	No of visitors	Knaus & Backhaus 2014				
	M6	number of visitors					
	W3	Number of visitors in focal areas			W3	Aerial observation (numbers of pleasure craft in focal areas)	
	W4	Number of visitors in focal areas			W4	Aerial observation (numbers of pleasure craft in focal areas)	
	W3	Monitoring of flight behavior (birds and marine mammals)					
	W4	Monitoring of flight behavior (birds and marine mammals)					
	L1	number of tourists (tourist facilities)					

	L1	increasing boat traffic					
	Area-Code	Area					
	A1	Montado					
	A2	Kruger National Park					
	M1	Pieniny NP					
	M2	Kalkalpen					
	M3	Parco Regionale dei Castelli Romani					
	M4	Parco Regionale dell'Appia Antica					
	M5	Swiss National Park					
	M6	Samaria					
	L1	Lake Ohrid					
	L2	Lake Prespa					
	W1	Doñana					
	W2	Danube Delta					
	W3	Wadden Sea					
	W4	Eastern Scheldt					