**A bottom-up practitioner-derived set of Essential Variables for Protected Area management.**

## **Supplement C. Example of survey 2018 on EV status in PAs**

**Example of the survey sent in 2018 to PA managers and EcoPotential scientists working on Protected Areas, inventorying the data availability and status for the Essential Variables (EVs).**

Explanation giving to the last column of the survey: You thus need not to valuate the usefulness or importance of the variable/proxy, because we all agreed that it are very important variables, yet if you could/would use this specific variable/proxy to measure the situation in your PA, how good or bad would then the score be?

1 = is very bad, i.e. the actual situation is very far from the desired situation, e.g. the environmental situation is at some parts highly impacted or even degraded, or an unacceptable socio-economic situation is created that impacts negatively the quality of the PA,

2 = still far from the desired situation but there is some hope for improvement,

3 = not good and not bad, i.e. almost acceptable but improvement can/should be made,

4 = good and almost, but not completely, the desired situation,

5 = very good, i.e. the desired situation (optimal reference level))

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|  | | **Variable** | | **Examples / Synonyms** | | **Indicators / proxies (to perform concrete measurements)** |  | **Do you have in your PA data for this variable and proxy** | **If yes, for which specific variable/proxy you have data** |  | **If you would valuate the situation or the quality in your PA by means of this variable how would the score for your PA then be**  (see explanation) **1 = very bad 2 = bad 3 = not good/not bad 4 = good 5 = very good** | |
|  | |  | |  | |  |  | Yes / No | Type of variable/proxy |  | Fill in a 1, 2, 3, 4 or 5 | |
| **Ecosystem Functions** | | | | | | |  |  |  |  |  |
| EF | | **Habitat Suitability** | | Habitat availability, Feeding and breeding grounds, Ecotypes | Habitat classification (e.g. EUNIS), Carrying capacity |  |  |  |  |  |
| **Biodiversity** | | Biodiversity status, Biodiversity changes, Endemism, Protected species | Shannon Index (H), Diversity Index |  |  |  |  |  |
| **Population Dynamics** | | Recruitment, Seed dispersal, Predation, Reproduction, Pollination, Succession, Grazing | Vegetation cover changes, Population structure (age, sexes) |  |  |  |  |  |
| **Primary Production** | | UNESCO World Heritage | Chlorophyll a, Net primary production |  |  |  |  |  |
| **Land- and Sea Scape** | |  | Habitat heterogeneity (EUNIS) |  |  |  |  |  |
| **Hydrodynamics** | | Currents, Water flow, Water regulation, Water retention | Snow depth & water content,Flow velocity, Tidal amplitude, Flood duration |  |  |  |  |  |
| **Gene Pool** | | Genetic resources | Genetic diversity |  |  |  |  |  |
| **Climate Dynamics** | | Change of microclimate | Land or Sea Surface Temperature, Air temperature, Relative humidity |  |  |  |  |  |
| **Weather** | | Temperature, Evaporation | Precipitation, Cloud cover, Wind speed, Air temperature, Snow depth |  |  |  |  |  |
| **Element Cycling** | | Biogeochemical cycling, Hydro-geo-eco processes | Nutrient budgets in soil, Mineralisation rates C,N, Element budgets |  |  |  |  |  |
| **Ecosystem services** | | | | | |  |  |  |  |  |
| ES | | **Leisure Activities** | | Recreation and tourism, Birdwatching | Number tourists + tourist days, Number of pleasure crafts |  |  |  |  |  |
| **Education and Research** | |  | Number of educational visits, Funding (on basis of GNP), Number of scientific projects, articles, studies |  |  |  |  |  |
| **Habitat for Feeding and Breeding** | |  | Number of offspring of indicator species, Breeding success of indicator species, Suitable habitat for indicator species |  |  |  |  |  |
| **Charismatic Landscape** | | Aesthetic values, Cultural heritage, Iconic landscapes | Density of charismatic landscape elements, Percentage of undisturbed view, Perception by inhabitants / visitors |  |  |  |  |  |
| **Biodiversity Conservation** | | Protection of species, Habitat and genetic resources | (Change in) Indicator species, Historical biodiversity index (HBI) |  |  |  |  |  |
| **Charismatic Species** | |  | Number of charismatic species |  |  |  |  |  |
| **Spiritual significance** | |  | Number of locations of spiritual significance |  |  |  |  |  |
| **Animals of Economic Use** | | Aquaculture, Bait, Beekeeping, Cattle, Fishing, Shellfish | Livestock biomass |  |  |  |  |  |
| **Climate Regulation** | | (incl. Carbon sequestration) | Oceanic carbon sink, Terrestrial carbon sink, Surface/Air temperature, Relative humidity, Light intensity, Windspeed |  |  |  |  |  |

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| **Threats** | | | |  |  |  |  |  |
| Threats | **Over-exploitation** | (Intensive agriculture, Overfishing, Too high tourist density) | Percentage fish below reproductive size, Fishing and harvesting above MSY, Reduction of adult size, Desertification, Number of visitors above desired amount |  |  |  |  |  |
| **Disturbance** | Anthropogenic disturbance, Off-road vehicles, Transport | Landscape disturbance, Noise disturbance (in ocean or at land), Number of dams, Number of vehicles, Soil sealing, Number of pleasure crafts |  |  |  |  |  |
| **Tourism** | Recreational activities | Number of visitors, Money spent by visitors, Spatial patterns of visitors, Crowd photos analysis |  |  |  |  |  |
| **Change in species** | Species loss, Successional stagnation, Aging of wild stocks, Food competition with cultured species, Prey decline | Species community composition |  |  |  |  |  |
| **Bad management** | Inappropriate water management | Quotum and harvest above MSY, Disproportional influence of stakeholders, Mismatch perception degree of corruption and political stability in PA vs country |  |  |  |  |  |
| **Exotic species** | Invading species | Invasive species |  |  |  |  |  |
| **Habitat loss** | Habitat fragmentation, Loss of connectivity, Forest decay, Reduction of salt-marshes | Reduction in habitat amount, Habitat fragmentation, Accessible habitat (connectivity), Number, size and isolation of patches |  |  |  |  |  |
| **Change in land use** | Abandonment of farming, Decrease of crops, Urbanisation, Harbour Extension | Detrimental land use/cover change, Rate of urbanisation |  |  |  |  |  |