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Science-policy briefing at the European Parliament

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Abstract	European Parliament, biodiversity, conservation, Earth observation, global changes.
Keywords	This document describes the policy brief meeting that took place at the European Parliament on September 27th 2018, co-organised by ECOPOTENTIAL, IUCN, WCMC.

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1. Introduction

ECOPOTENTIAL has produced a range of research on both the environmental state of Protected Areas and the challenges facing their managers in applying Earth Observation tools and methods for knowledge-based management. These findings have significant implications for EU environmental policy as well as national and local decision making. A science-policy briefing event was therefore organized by UN Environment, WCMC, CNR and other ECOPOTENTIAL project partners. For the meeting a policy brief document was prepared to collect input from the various workstreams of ECOPOTENTIAL relevant for EU policies and to share this information with policy makers.

New generations of satellites and scientific developments are opening vast opportunities for monitoring and understanding nature and biodiversity. As we approach 2020 when strategies such as the EU Biodiversity Strategy end, it is necessary to prepare the EU's future policy framework, in which science should play an important role. Some challenges in preserving biodiversity and achieving policy targets could be mitigated through further use of Earth Observation. This event will highlight findings of the ECOPOTENTIAL project, which supports the use of Earth Observation in Protected Areas across Europe, and present perspectives on future biodiversity frameworks and targets.

In 2011, the EU committed to "halting the loss of biodiversity by 2020 and restore it insofar as possible". The EU Biodiversity Strategy to 2020 was adopted, aiming to set the EU on the right track to meet this objective. Although the EU has advanced in some areas since 2010 –e.g. with the approval of the Regulation on Invasive Alien Species– there is still a lot to do, especially to enhance implementation of existing legislation and integration of biodiversity concerns into relevant EU policies. In fact, the mid-term review of this EU Biodiversity Strategy to 2020 signals that it will most likely be impossible to achieve the 2020 targets. As the EU aims to be "a leading proponent of international action on environment", the discussions of the post 2020 biodiversity targets should be knowledge-based and take into account the significant advances in Earth Observation technology. In particular, there is an opportunity to include innovative satellite, modelling and in situ monitoring tools in indicators for measuring progress.

2. Event summary

The event “Science for Post 2020 Environmental Targets – Insights form Earth Observation of Protected Areas” was officially hosted at the EU Parliament in Bruxelles by MEPs Ricardo Serrão Santos and Sirpa Pietkäinen on September 27th, 2018 and brought together key policy-makers and stakeholders to engage in an informed debate on the topic of ’Science for Post 2020 Environmental Targets’. This event highlighted findings of the ECOPOTENTIAL project, which supports the use of Earth Observation in Protected Areas across Europe and gather scientists, policy-makers, civil society and stakeholders to discuss perspectives on future biodiversity frameworks and targets.

This conference was co-organised by the ECOPOTENTIAL project, IUCN European Regional Office and the European Bureau for Conservation and Sustainable Development, which is serving as the secretariat for the EU Parliament Intergroup on Climate Change, Biodiversity and Sustainable Development.

Hosts and chairs have been:

- MEP **Sirpa Pietikäinen**, by video-message
- MEP **Serrão Santos**
- MEP **Guillaume Balas**, Co-rapporteur of the EP resolution on the CBD/COP14

Speakers and panellists:

- **Andrea Tilche**, Head of the Climate Action and Earth Observation Unit, DG Research and Innovation, European Commission;
- **Fiona Danks**, Senior Programme Officer for Science, UN Environment/WCMC;
- **Antonello Provenzale**, ECOPOTENTIAL Project Coordinator, National Research Council of Italy (CNR);
- **Humberto Delgado Rosa**, Director, Natural Capital, DG ENV, European Commission
- **Grégoire Dubois**, Project Leader GCAD (Global Conservation and Development), Joint Research Centre (JRC);
- **Guillaume Balas**, Co-rapporteur of the EP resolution on the CBD/COP14
- **Alberto Arroyo Schnell**, Senior Policy Manager, European Regional Office, IUCN.

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3. Summary of information provided by the speakers and panellists

MEP Serrão Santos opened the conference highlighting the need to expand the use of Earth observation to monitor and manage ecosystems' services, which are essential both for our economy and society.

In her video-message, **MEP Sirpa Pietikäinen** stressed the need for more and better science. While political support is fundamental, the advantage of such Intergroup meetings is that they can contribute to the development of new strategies at European level, according to the MEP. She also underlined that investment in the integration of remote sensing and in-situ measurements plays a key role.

In his presentation, **Andrea Tilche** from DG Research and Innovation emphasized the need for political action. From his point of view, addressing the need for more science cannot be an excuse for inaction on climate change. Mr. Tilche noted that we have to act urgently on the basis of already-existing knowledge. ''There is a lot of evidence deriving from science. We have to decrease carbon emissions in the atmosphere, as required by the Paris Agreement, and for that we have to find solutions''. Moreover, Mr. Tilche highlighted the progress achieved at European level through various projects; one of these being EUROGEOSS, which will allow Europe to position itself as a global force in Earth observation thanks to the vast knowledge gained through Copernicus. While observations' implementation is key to improving science, the urgency of climate change forces us to set clear objectives and proceed in taking action.

Antonello Provenzale, ECOPOTENTIAL Project Coordinator, presented the project highlighting its key elements; research on ongoing and future changes, supporting the use of Earth Observation tools in protected areas and development of a set of narratives motivated by protected areas' needs. Mr. Provenzale noted that natural ecosystems and consequently our societies are facing wide ranging challenges, that require a multi-component approach for their solution. For evidence-based management, data and their analysis are essential to observe and react to changes in Protected Areas. Data collection takes place from space and the air (remote sensing) and is then crucially complemented with field data. These help to analyse a wide range of factors relevant for Protected Areas: weather conditions, change in water surface and availability, extreme climate alterations, state of vegetation and invasive species' development. Another advantage of the project is the fact that data analysis and models can be used to make projections, and further predict ecosystem and environmental changes. Moreover, Mr. Provenzale stressed that open data are crucial to monitoring, understanding and predicting the effect of climate change. All in all, Mr. Provenzale identified that one of the main problems for fully applying Earth Observation in protected areas' management is the lack of resources and the need for increased competences.

Fiona Danks, Senior Programme Officer for Science at UN Environment World Conservation Monitoring Centre, addressed the audience providing some recommendations for policy-makers. These were developed on the basis of the main policy relevant findings of the ECOPOTENTIAL project. Ms. Danks highlighted the need to expand the use of Earth observation to monitor environmental changes and stressed the need to incorporate remote sensing indicators within environmental strategies. Investments are of key importance, according to Ms. Danks, and should target both remote and in-situ measurements. Moreover, there is a need to increase experience sharing and information flow among stakeholders, while new technologies can play a significant role in environmental management, and therefore need to be encouraged.

Representing DG ENV, **Humberto Delgado Rosa** reminded the participants that Natura2000 is the largest network of protected areas in the world and its biodiversity is under pressure. During his intervention, Mr. Delgado Rosa stressed the plethora of scientific evidence about climate change and its actual impacts on environment and society. "Biodiversity loss or land and ocean degradation are widely demonstrated but are perceived by policy-makers with less emphasis than climate change". From Mr. Delgado Rosa's point of view, although biodiversity targets are put in place, we need more verifiable indicators alongside progress on digital information. He suggested taking a set of better targets for communication, as it had been done for climate change. Summing up the above, Mr. Delgado Rosa underlined the need to improve new technologies, to enlarge knowledge on biodiversity, in order to ameliorate science as well as its role in developing biodiversity strategies post-2020.

Grégoire Dubois from the European Commission Joint Research Centre underlined the science-policy nexus with reference to environmental targets. He further stressed the importance of digital observation of protected areas

and explained how the Digital Observatory for Protected Areas (DOPA) responds to the need for a global reference information system regarding protected areas. Via integrating global datasets managed by various actors to generate key indicators, the JRC is able to access data about ecosystems and species, rendering it possible to understand, compare and predict changes in protected areas. One of DOPA's main objectives is to make information available for policy-makers. There is the need for ground proofing and cooperation with local actors, thus, integrating local knowledge is one of their biggest challenges.

Alberto Arroyo Schnell from IUCN stressed the central role of science in the post-2020 conservation strategies, mentioning that science-based targets should be the basis for political decisions. Mr. Arroyo Schnell reiterated the previously-mentioned call for action, alongside the need for resources – including the future Horizon Europe, which should cover the future biodiversity knowledge needs – to ensure we achieve our environmental targets. For Mr. Arroyo Schnell, "implementation" is one of the key words now and for the future, as biodiversity protection should have a prominent place at all levels.

During his intervention, **MEP Guillaume Balas** referred to the need for environmental protection mentioning that reforming governance and mainstreaming biodiversity loss are key elements, as "we cannot speak about biodiversity only in COPs". Biodiversity loss, just as climate change, has to be on the agenda of European and international fora. If the European Union wants to be a leading actor in nature conservation, it does not only need to respect the Paris Agreement, but come up with strong commitments, like tackling deforestation, as Mr. Balas underlined. Being a Co-rapporteur of the European Parliament's resolution on CBD COP 14, Mr. Balas highlighted that "the resolution addresses governance challenges, while its targets are already ambitious. Their implementation though needs to be properly monitored. It's the only way to make stakeholders accountable".

A key point outlined during the final discussion was the lack of integration and dialogue between the climate change and biodiversity community. In order to solve the actual environmental crises, we need transnational and transdisciplinary approaches, but also must realize the importance of improving methodologies, in order to have efficient monitoring of protected areas. Public actors need to be involved more in research efforts alongside research funding, so public awareness as well as proper education of new generations are fundamental towards this direction.

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4. Annex 1 – Programme of the event

Science for Post 2020 Environmental Targets:

Insights from Earth Observation of Protected Areas

Thursday, 27 September 2018
09:00-11:00
PHS 1C047
European Parliament, Brussels

Co-chaired by:

Ricardo Serrão Santos and Sirpa Pietikäinen,

Members of the European Parliament

In 2011, the EU committed to "halting the loss of biodiversity by 2020, and restore it insofar as possible". An EU Biodiversity Strategy to 2020 was adopted, aiming to set the EU on the right track to meet this objective. This Strategy is also our EU contribution to the global 2010 Aichi targets. Although the EU has advanced in some areas since 2010 –e.g. with the approval of the Regulation on Invasive Alien Species– there is still a lot to do, especially to enhance implementation of existing legislation and integration of biodiversity concerns into relevant EU policies. Actually, the mid-term review of this EU Biodiversity Strategy to 2020 signals that it will be most likely impossible to achieve the 2020 targets.
As the EU claims to be "a leading proponent of international action on environment", it can be expected it will show a high level of ambition for the discussions of the post 2020 biodiversity targets globally.

As we approach 2020, it becomes urgent to prepare the EU's future policy framework, where science should play an important role. New generations of satellites and scientific developments are opening vast opportunities for monitoring and understanding nature and biodiversity. Some challenges in preserving biodiversity and achieving policy targets could be mitigated through further use of Earth Observation. This event will highlight findings of the ECOPOTENTIAL project, which supports the use of Earth Observation in Protected Areas across Europe and gather scientists, policy-makers, civil society and stakeholders to discuss perspectives on future biodiversity frameworks and targets.

Contact: Stella Reschke, Intergroup Secretariat - stella.reschke@ebcd.org, + 32 2 230 30 70

DRAFT AGENDA

09:00-09:05	Welcome by **Ricardo Serrão Santos MEP**
09:05-09:10	Video message from **Sirpa Pietikäinen MEP**
09:10-09:20	**Opening by Mr Andrea Tilche, Head of the Climate Action and Earth Observation Unit, DG Research and Innovation**
09:20-09:45	**Fiona Danks,** Senior Programme Officer for Science, UN Environment/WCMC **Antonello Provenzale,** Project Coordinator, Italian National Research Council The Ecopotential project- summary for policy-makers
09:45-10:00	**Humberto Delgado Rosa, Director, Natural Capital, DG ENV, European Commission :** The position of the European Commission on the post 2020 biodiversity targets
10:00-10:15	**Grégoire Dubois, Project Leader GCAD (Global Conservation and Development), D6 Unit, Joint Research Centre (JRC):** DOPA, a Digital Observatory for Protected Areas
10:15-10:30	**Alberto Arroyo Schnell, Senior Policy Manager, European Regional Office, International Union for the Conservation of Nature** Defining the future biodiversity policy framework and targets: the role of science
10:35-10:40	**Reaction from Guillaume Balas MEP,** Co-sponsor of the EP resolution on the 14th meeting of the Convention on Biological Diversity (COP14)
10:40-10:55	**Questions and discussion with the audience**
10:55-11:00	Concluding remarks by **Ricardo Serrão Santos MEP**

Contact: Stella Reschke, Intergroup Secretariat - stella.reschke@ebcd.org, + 32 2 230 30 70

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5. Annex 2 – Policy brief background document

Earth Observation for Environmental Management

Science for post 2020 Environmental targets: Insights from Earth Observation of Protected Areas

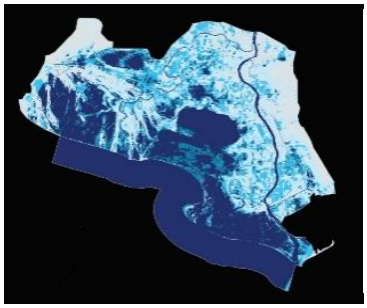
Introduction

Ecosystems provide essential goods and services to human society. Ecosystem services are those benefits that ecosystems provide to humans, such as clean air and water, raw materials, food, recreation and cultural values. Protected Areas, such as UNESCO Natural Heritage sites and national parks, often include critical, diverse and endangered ecosystems and play a central role for conservation in our rapidly changing environment. They also provide treasures of long-term ecological, environmental, climatic and socio-economic data, and support continuous field monitoring.

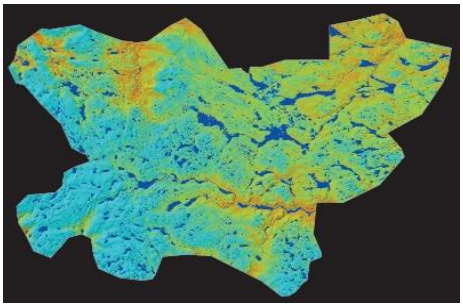
Peneda-Gerês National Park. Photo credit: Luis Borges

In the last decades, however, human pressures such as climate and land-use change, invasive species and pollution are threatening ecosystem integrity, potentially leading to loss of crucial ecosystem processes, functions and services. Knowledge-based conservation and management policies are necessary to preserve and improve the benefits that healthy ecosystems provide for our economy, health and well-being. Valuing natural ecosystems through the services they provide to humankind is one way to estimate the natural capital and to provide relevant conservation and management policy indications. However, the value of ecosystems should not be based only on economic estimates but should also include other aspects including landscape and ecosystem integrity and functionality, biodiversity conservation *per se*, cultural and spiritual values. This endeavour requires effective monitoring and understanding of ecosystem conditions, processes, dynamics and changes, fully accounting for the wide spectrum of interactions between society, geosphere, biosphere and climate.

Remote Sensing is data collected from drones, planes and satellites
Earth Observation includes both remote sensing data and in-situ data



Months under-water in Camargue Biosphere Reserve, on a scale from 0 months (white) to 12 months (dark blue)



Gross primary productivity in Hardangervidda national park, values on a scale from light blue (low) to dark orange (high)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

Earth Observation (which includes field measurements) and Remote Sensing (observations with drones, planes and satellites, such as the new EU Sentinel satellites) contribute substantial opportunities for science and policy. This Policy Brief highlights findings of the **Horizon 2020 ECOPOTENTIAL project**, which supports the use of Earth Observations in Protected Areas across Europe and beyond, and it offers perspectives on future ecosystem and biodiversity frameworks and targets. Protected Area managers and environmental scientists are connected through the development and application of reliable and practical indicators and the science-policy interface should facilitate the two-way flow between information need and information supply.

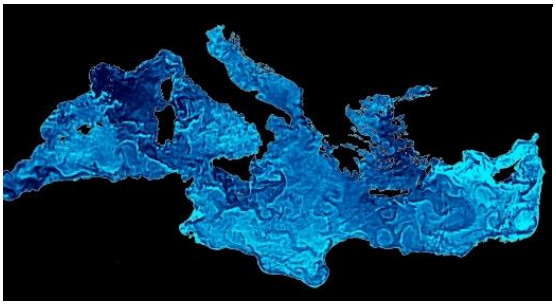
Samaria National Park. Photo credit: Dimitris Poursanidis/FORTH

New, big data on our environment are yet to be fully integrated in environmental management. Numerous opportunities exist, such as displaying Earth Observations in freely accessible online platforms, one important step for integration of data into decision making, such as pursued by the EU Copernicus programme. An additional challenge is the full exploitation of existing infrastructures such as LifeWatch ERIC and the related technical capacity to analyse and make best use of abundant Earth Observation data, something that ECOPOTENTIAL is addressing and that can be improved in future policy. Earth Observation is in fact relevant for implementing a range of EU environmental strategies, for example, the EU Biodiversity Strategy, which aims to halt the loss of biodiversity.

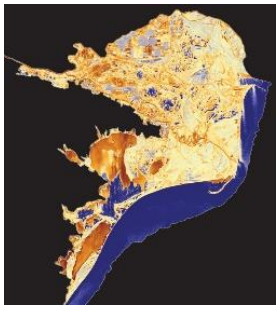
Earth Observation of ecosystems

New satellites, field measurements and scientific developments are opening vast opportunities for improved monitoring and understanding of nature, as already showcased in other documents such as the "*Future Brief: Earth Observation's Potential for the EU Environment", released* in February 2013). This event updates the situation five year later, with a more focussed lens on biodiversity and ecosystem functions and services.

Remote Sensing provides consistent and plentiful data about the environment, not possible with traditional, resource intensive ground measurements. On the other side, ground measurements are necessary for monitoring the many variables not measurable from space, as well as for validating Remote Sensing results. In Europe and globally, Remote Sensing



Locally adjusted temperature in the Mediterranean Sea Large Marine Ecosystem, low (dark blue) to high (light blue) values



Normalized Difference Water Index in the Danube Delta, low (dark blue) to high (dark orange) values

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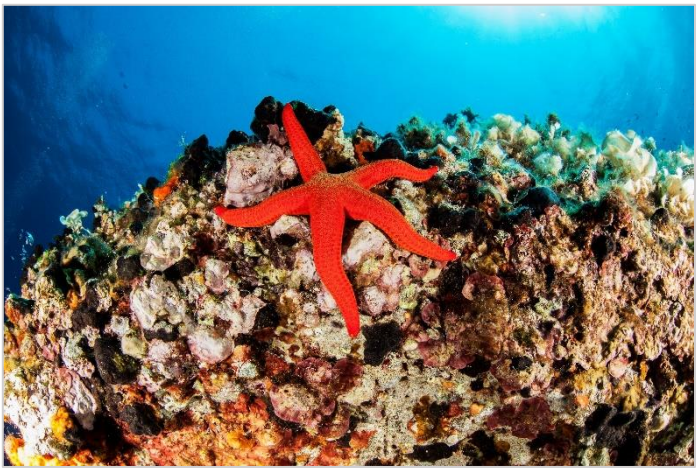
generates substantial data and usable products with wide applications to the environment, urban development, safety and health.

> The European Space Agency (ESA) budget for 2018 was about €5.6 billion of which the Earth Observation domain comprise 26% or €1.4 billion. The Copernicus Programme has cost the European Space Agency (ESA) about €7 billion since 2002. However, more effort is needed to promote the use of Earth Observation tools for practical environmental management.

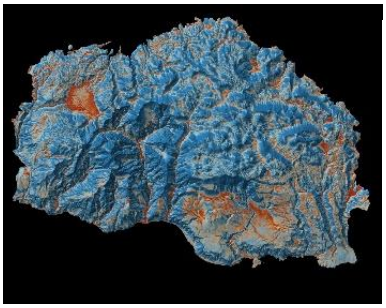
Earth Observation and ecosystem policy relevance

Existing Policies

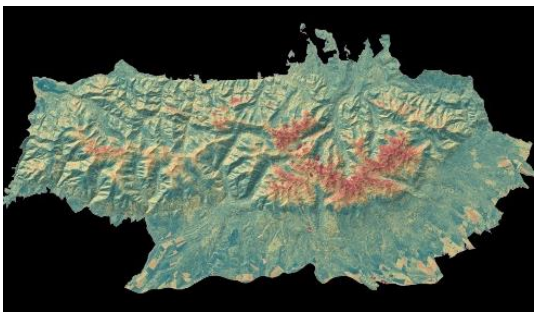


Mediterranean red seastar. Photo credit: Dimitris Poursanidis/FORTH

The Biodiversity Strategy 2020 addresses ecosystem services, e.g., with Mapping and Assessment of Ecosystems and their Services (MAES), but it does not mention Remote Sensing (or Earth Observation) explicitly. Other directives such as the Birds Directive, Habitat Directive, Regulation on Invasive Alien Species, do not mention Remote Sensing or ecosystem service. However, the Natura 2000 network, of which the Birds and Habitat Directives are a part, links at least to ecosystem services. In the marine realm, the Marine Strategy Framework Directive is the first to explicitly mention ecosystem services but does not address Remote Sensing or Earth Observation (preamble 8). The State of Europe's Seas report demonstrates a methodology to derive ecosystem services state based on information from assessment reporting under the Marine Strategy Framework Directive. Clearly, the potential exists for making full use of an integrated, not purely economic view of ecosystem services and of the quantitative data provided by Earth Observation, to improve and refine nature management and conservation policies as well as sustainable development strategies.



Suitability of lizard habitat in Samaria National Park, low (dark blue) to high (dark red) values



Vegetation cover in the Tatra Mountains, scaled from none (dark red) to high (dark green)

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Key ECOPOTENTIAL Policy-Relevant Findings

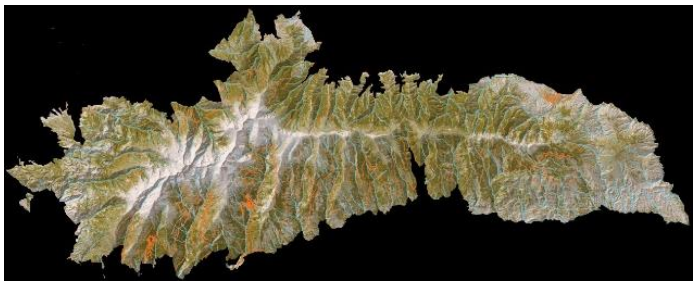
Lapporten, Abisko National Park. Photo credit: Scott Wilson

Based on the progress and results of ECOPOTENTIAL to date, a selection of policy-relevant findings is presented, including those extracted from a synthesis study, developed after a questionnaires and interviews with Protected Area managers, designed to identify the main challenges and needs in conservation and management of Protected Areas. In particular, we investigated whether and how Remote Sensing and the concepts associated with ecosystem integrity and services are of any relevance (and are used) for Protected Area management. The answers revealed that knowledge and appreciation of Remote Sensing was quite widespread but generally considered technically challenging, with most Protected Areas staff asking for further training in the practical use of Remote Sensing products, and also highlighting the need of development and support of innovative methods for field (in situ) measurements. On the other hand, the use of an ecosystem services framework by Protected Area managers was not common and sometimes considered scarcely useful for the practical conservation issues that Protected Areas have to face in daily management.

The ECOPOTENTIAL Project

ECOPOTENTIAL, a large, European-funded H2020 project, focuses on a targeted set of internationally recognised Protected Areas in Europe, European Territories and beyond, including mountainous, arid and semi-arid, and coastal and marine ecosystems. Building on knowledge gained in individual Protected Areas, the ECOPOTENTIAL project addresses cross-scale ecological interactions and landscape-ecosystem dynamics at regional to continental scales, as well as long-term and large-scale environmental and ecological challenges.

ECOPOTENTIAL considers the entire chain of ecosystem services, by developing and using field and Remote Sensing data (including from the Copernicus programme), modelling current and future ecosystems, and estimating current and future ecosystem services and benefits. The focus is on quantifying the changes in ecosystems and biodiversity, and developing site-specific questions and approaches, co-designed with the Protected Area staff in order to inform and addresses park management issues.



Live green vegetation cover in the Sierra Nevada, low (white) to high (dark brown) values

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An important finding was that many Protected Area managers feel the concept of ecosystem services is not always compatible with the needs of conservation, and that sometimes global frameworks are imposed in a top-down way without discussing the practical issues to be addressed. This clearly calls for a deeper involvement of technical and management staff working in the field in the definition of large-scale policies, as well as for creating frameworks (in this case, ecosystem services) that better represent the reality and complexity of European ecosystems.

To at least partially respond to these requests, in ECOPOTENTIAL a set of specific research activities were co-designed with the staff of the Protected Areas involved in the project, to tackle concrete and immediate management issues starting from the identification and critical analysis of ecosystem services and functions, biodiversity and the use of Earth Observation. For detailed examples of the use of Earth Observation in the project's Protected Areas, please see the Annex with case studies.

Doñana National Park. Photo credit: Héctor Garrido/EBD-CSIC

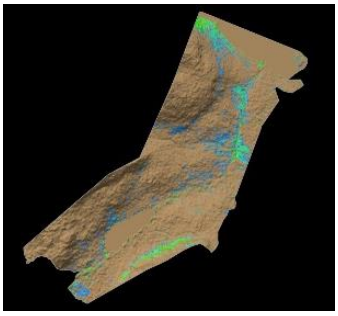
Recommendations

Expand the use of Earth Observation to monitor and manage ecosystem services

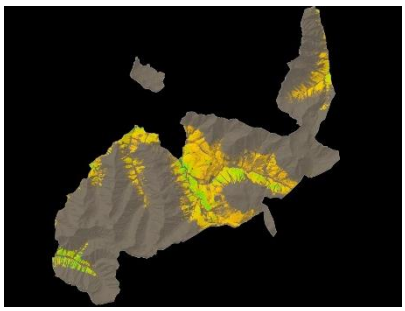
Nature provides essential services to the human society. Earth Observation, both Remote Sensing and in-situ measurements, offers great potential to monitor and manage these services in equitable and sustainable ways. The critical examination of the meaning and use of ecosystem services, the definition of easily measured and understandable relevant variables, and the use of Earth Observation to quantify ecosystem characteristics and services are important steps to improve sustainable management of natural ecosystems and nature conservation.

Invest in the integration of Remote Sensing and in-situ measurements

Many biologically-relevant variables cannot be measured remotely and require in-situ measurements. Most biodiversity indicators fall in this category, as well as soil-atmosphere fluxes and soil structure. It is thus of primary importance to design integrated monitoring activities, able to extract information from both Remote Sensing data and the wealth of



Tree cover density in Abisko National Park, low (brown) to high (green) values



Canopy height in the Swiss National Park, on a scale from 0 metres (brown) to 45 metres (green)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

existing and new field data, developing and supporting innovative and extended in-situ measurement networks, such as the eLTER RI, and virtual laboratory networks for data analysis and interpretation, such as the LifeWatch ERIC.

Incorporate Remote Sensing indicators in future environmental strategies

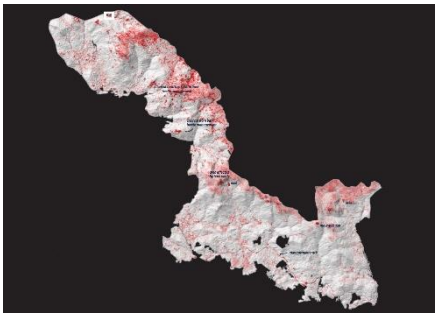
Remote Sensing is now mainstream in science, is reliable and has proven value and application. It can, therefore, be integrated into indicator development, identification of policy targets and definition of future strategies. Its utility and application should only increase in time with improving technology and data time series. Including Remote Sensing in indicators can also make reporting simpler, more accurate and comparable across Europe. Additionally, if managers and users feel that there is direct relevance in EU strategies, this might enable better alignment and more understanding and awareness of policies and policy impacts which might increase the uptake of EU strategies. ECOPOTENTIAL successes and impacts, notably in the site-specific research questions and in the pan-European analysis of ecosystem changes, demonstrate some of the benefits deriving from the quantitative use of Remote Sensing of natural ecosystems.

Support innovative ideas alongside proven mechanisms of impact and scientific advancement

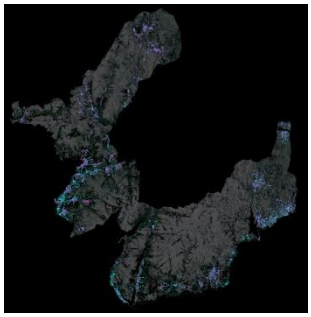
To stay at the forefront of impact and to achieve policy targets by means of improved knowledge, working on advancement innovative Earth Observation analysis methodologies is needed. Especially important is the definition of relevant variables and indicators (including, for example, Essential Variables) that can be measured by Remote Sensing and have the power to transform how we manage our environment. As an example, an ECOPOTENTIAL paper was recently published on the predictive ability of MODIS satellite-derived Ecosystem Functional Attributes (EFAs) as Essential Biodiversity Variables (EBVs), against traditional datasets (climate and land-cover) at several scales[1].

Increase experience sharing and information flow among stakeholders, and consider a coordinated capacity approach

Protected Area managers, scientists, policy-makers and other stakeholders could all benefit from improved information flow. Many Protected Areas management institutions do not have



Normalized Difference Vegetation Index in the Bavaria Forest National Park, low (white) to high (red) values

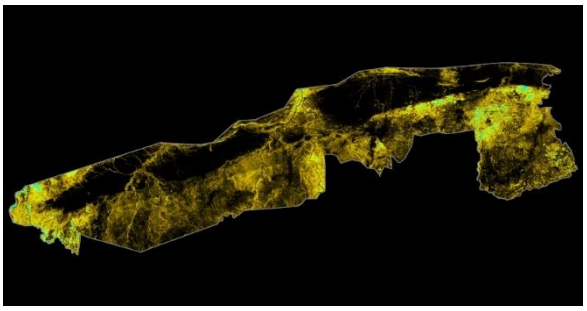


Coverage of species-rich grassland in Peneda-Gerês National Park, low (blue) to high (pink) values

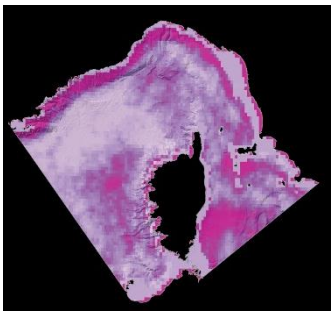
[1] Arenas-Castro S, Gonçalves J, Alves P, Alcaraz-Segura D, Honrado JP (2018) Assessing the multi-scale predictive ability of ecosystem functional attributes for species distribution modelling. PLoS ONE 13(6): e0199292. https://doi.org/10.1371/journal.pone.0199292

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

in-house technical capacity to take maximum advantage of remote sensing tools; it could be more effective and efficient to coordinate this capacity through European or national support mechanisms. For Protected Areas and ecosystem managers, virtual networks such as those created by the LifeWatch ERIC or by GEO/GEOSS can be useful for experience sharing. Along these lines, an Ecosystem Community of Practice is being established by ECOPOTENTIAL and should be further supported at European level after the end of the project. The results of ECOPOTENTIAL indicate that it is important that EU conservation strategies are co-designed and co-developed with the staff of Protected Areas working on local and concrete issues.



Tree biomass in Kruger National Park, low (brown) to high (blue) values



Quality of feeding habitat in Pelagos Sanctuary, low (light pink) to high (dark pink) values

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Annex 1 – Case Studies

Wadden Sea

The Wadden Sea is a productive estuarine area and among the largest coastal wetlands in the world. A network of national protected areas spreading across the North Sea coastline of the Netherlands, Germany and Denmark protects this remarkable area. The area is also a UNESCO World Heritage Site and is covered by the Natura 2000 network. The Wadden Sea is a biodiversity hotspot due to its unique location as a meeting point of land, fresh, brackish water and marine habitats. Wind, waves, tides and rivers have created unique coastlines, ranging from tidal mudflats and saltmarshes to deep tidal channels. More than 10 million birds live within and pass through the Wadden Sea, most on migratory routes between nesting grounds in the Arctic and wintering sites in Africa. They are attracted by the nutrients, brought by rivers emptying into the North Sea, which allow cockles and mussels and other food sources to flourish. However, over the last decade, nearly half of the breeding bird species have continued to decrease. There are some indications that over-fishing, as well as insufficient roosting and moulting areas, could be behind these dwindling populations. ECOPOTENTIAL uses 3D models to simulate how the birds' food sources are faring in the Wadden Sea. Satellites can detect the larger mussel and cockle colonies and the algae that support these molluscs. Including the satellite data in the models improves predictions of how the food sources develop across the Wadden Sea. Policy and management strategies can also be incorporated into the models to determine how future food supply may be impacted by these strategies.

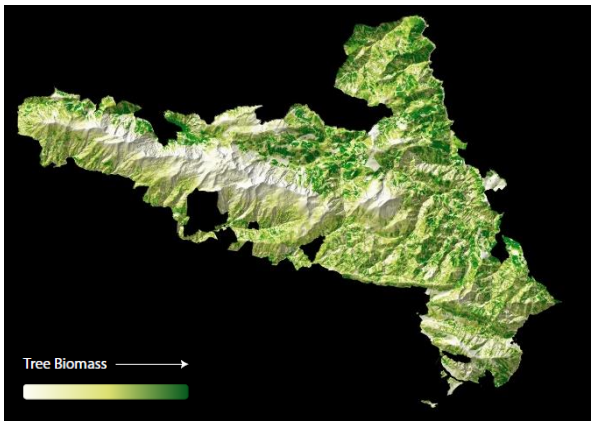
Seabird, Wadden Sea. Photo credit: Jan Veen

Wadden Sea RS-imagery

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

Kalkalpen

The mountain forests of Europe are important refuges for many vulnerable species. In addition to their ability to store carbon, acting as carbon sinks, they are also biodiversity hotspots and provide areas of recreation and outstanding natural beauty. The Kalkalpen National Park in Austria is a prime example. The park contains Central Europe's largest forest, characterized by mixed spruce-fir-beech forests, subalpine spruce forests, pastures and alpine habitats. Over 900 plant species are found here (one third of all plant species in Austria), along with one of the rarest mammals in Europe, the Eurasian lynx, which has been reintroduced into the park. Climate change is already altering mountain forest ecosystems across Europe, and will continue to do so. In the Kalkalpen National Park, higher temperatures increases the risk of bark beetle outbreaks and stronger winds are causing more damage. Certain tree species, such as Norway spruce, are dying faster than usual and new tree species



Tree biomass in Kalkalpen National Park

Fallen trees, Kalkalpen National Park. Photo credit: Erich Mayrhofer

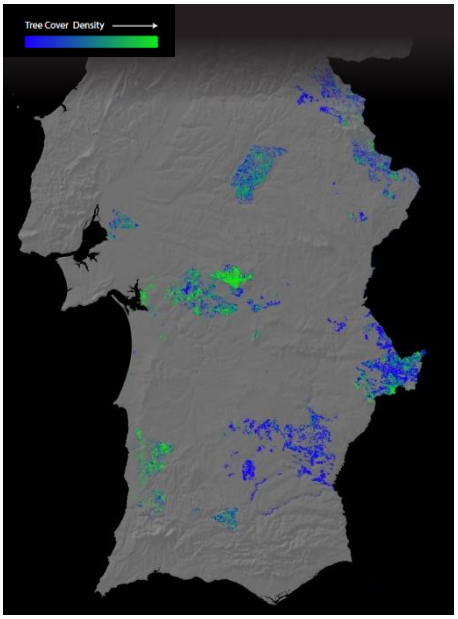
are taking their place. These disturbance release high amounts of carbon into the atmosphere and reduce the forest's capacity to retain pollutants. However, they can also increase biodiversity by creating diverse habitats, with deadwood in particular constituting a key habitat for many typical mountain forest species. Herein lies the challenge for politicians and managers of protected areas. Ecosystem models are used to assess the effect of storms and insect infestations on carbon loss to the atmosphere and nitrate loss to groundwater. At the same time, satellite data is analysed to improve forest vegetation inputs to the model for the entire park area also considering various climate change scenarios. Model results will provide guidance as to how bark beetle and wind disturbance should be managed to optimize both carbon sequestration and biodiversity.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

Montado

Montado is a traditional wood-pasture system where cork and holm oaks are the dominant trees. Rich in biodiversity, montados are listed under the EU Habitats Directive, constitute a key habitat in various sites in the Natura 2000 network, and are considered high nature value farmland. Cork, which is harvested every 9–12 years, is the most important forest product from montados, with Portugal producing 54 per cent of the world's cork. Livestock provides another source of income in these areas, while from a cultural and recreational perspective, montados are valued for their landscape aesthetics, natural values and cultural heritage. Water, nutrient cycles and soil erosion are important regulating services to be managed in montados, where the main threats are water stress due to more droughts and warmer summers, soil degradation from overgrazing and tillage, pests and disease. The current lack of regeneration and the death of adult trees are of serious concern and may lead to a loss of montados and replacement by shrub land. The correct management of soil, grazing and the overall habitat can counteract these threats. For example, protecting and restoring the soil is central for tree health. The ECOPOTENTIAL project is using indicators, such as Tree Cover Density or Leaf Area Index, to monitor changes in tree distribution and health. This information, combined with field data, allows researchers to better assess the age structure of montados, pasture growth, and soil and water dynamics. With this knowledge, the state of large areas of montado can be regularly assessed using Earth Observation, farmers can be better advised, and management practices can be continuously improved.

Montado in Southern Portugal



Tree cover density in Southern Portugal

Pisa, September 10th, 2018

Antonello Provenzale
Ecopotential Coordinator

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

Co-funded by the European Union

6. Annex 3 – Presentations of speakers

Presentations of the speakers who accompanied their speech with slides:

- **Antonello Provenzale**
- **Fiona Danks**
- **Alberto Arroyo Schnell**
- **Gregoire Dubois**

LTER LifeWatch GEO GROUP ON EARTH OBSERVATIONS

ECOPOTENTIAL: Improving future ecosystem benefits through Earth Observations

47 partners, period: 2015-2019

Coordination: CNR (Antonello Provenzale)
Co-coordination: University of Bayreuth (Carl Beierkuhnlein)
Project management and communication:
CNR (Carmela Marangi and Silvia Giamberini)

www.ecopotential-project.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

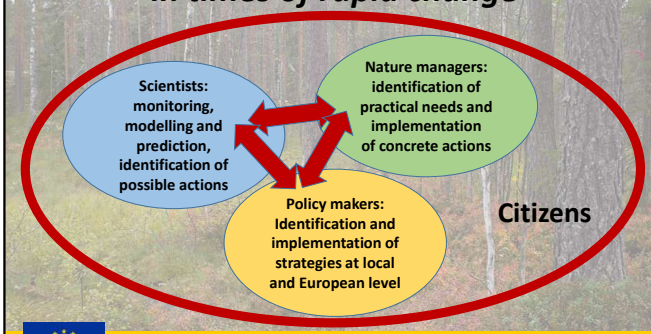
Protected Areas of Europe are the "family jewels" that host treasures of biodiversity and precious ecosystems

But natural ecosystems are subject to several anthropic pressures: climate change, land-use change, invasive species, pollution, over-exploitation of resources, …

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

Science-Policy Briefing
Brussels 27 September 2018

A multi-component approach to nature conservation and management in times of rapid change



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

Science-Policy Briefing
Brussels 27 September 2018

GEO GROUP ON EARTH OBSERVATIONS

ECOPOTENTIAL in a nutshell:

Make best use of Earth Observations to characterize the state and changes of ecosystems and improve management and conservation in Protected Areas and beyond

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

Science-Policy Briefing
Brussels 27 September 2018

GEO GROUP ON EARTH OBSERVATIONS

Keyword of the project:

Integration

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

Science-Policy Briefing
Brussels 27 September 2018

GEO GROUP ON EARTH OBSERVATIONS

Integration between Remote Sensing and field measurements adopting a multidisciplinary approach

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762

Science-Policy Briefing
Brussels 27 September 2018

GROUP ON EARTH OBSERVATIONS

LifeWatch

LTER

GEO ECO
The GEO Global Ecosystem Initiative

Integration between different programmes and initiatives: GEO ECO, GEO GNOME, GEO BON, EuroGEOSS, eLTER RI, LifeWatch ERIC

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Science-Policy Briefing
Brussels 27 September 2018

GROUP ON EARTH OBSERVATIONS

Integration of scientists interests and PA staff needs

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Science-Policy Briefing
Brussels 27 September 2018

Integration of nature conservation needs, sustainable development and policy making

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Science-Policy Briefing
Brussels 27 September 2018

ECOPOTENTIAL

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Working in partnership with **Protected Areas in Europe and beyond**

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Science-Policy Briefing
Brussels 27 September 2018

UN environment WCMC

United Nations Environment
World Conservation Monitoring Centre

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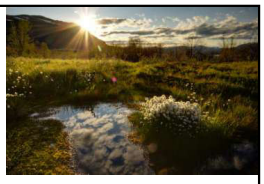
INSIGHTS FROM EARTH OBSERVATION IN PROTECTED AREAS – ECOPOTENTIAL PROJECT

Dr Fiona Danks

27 SEPT. 2018

RECOMMENDATIONS FOR POLICIES

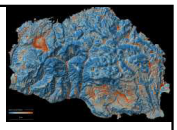


INCORPORATE

SUPPORT

INVEST

EXPAND



Recommendation **1**

Expand the use of Earth Observation to monitor and manage ecosystem services

- Ecosystem Services
  - Essential for economy & also society
- Earth Observation
  - New spectrums of understanding
    - Temporal
    - Spatial
    - Radiation

→ **Great potential of Remote Sensing & in-situ measurements**

- To quantify, assess, measure & monitor ecosystems, activities and ecosystem services
- To **INTEGRATE** Earth Observation with policy development and achievement

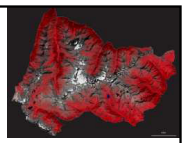
Recommendation **2**

Invest in the integration of Remote Sensing and in-situ measurements

- In-situ data are critical
  - Remote Sensing and in-situ data are complimentary
  - Some variables cannot be measured remotely

→ Opportunity for

- **INTEGRATION** of data, activities and knowledge
  - e.g., eLTER and Lifewatch ERIC



Recommendation **3**

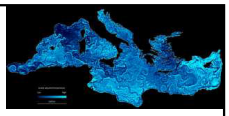
Incorporate Remote Sensing indicators in future environmental strategies

- Remote sensing data
  - Proven
  - Reliable

→ Potential to

- **INTEGRATE** into targets and indicators in future strategies
  - The utility will increase over time - more data & improved analysis
  - Remote sensing based indicators
    - cheap, simple, accurate and comparable
  - Can enhance compliance and alignment with policy goals

Recommendation **4**



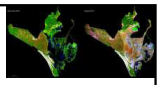
Support innovative ideas alongside proven mechanisms of impact and scientific advancement

- Potential for technological innovation in the use of Remote Sensing and Earth Observation
- Innovative methods and tools should continue

→ Opportunity exists

- for the INTEGRATION of environmental management and technology
- For the EU to stay on the forefront of innovative uses of satellites and other Earth Observation

Recommendation **5**



Increase experience sharing and information flow among stakeholders, and consider a coordinated strategy approach

- Disparities exist among environmental management institutions on the use of Earth Observation
  - Different levels of technical expertise and hardware access
- Mutual benefits are found in experience sharing
  - e.g., networks like LifeWatch, ERIC and GEO/GEOSS

→ Potential to create and support

- Communities of practice to INTEGRATE the varying levels and types of expertise
  - Centralized (EU wide/national/regional) technical capacity centres could support Protected Areas and decision makers with Earth Observation application

KEY MESSAGES

Earth Observation for Environmental Management

INCORPORATE

SUPPORT

INVEST

EXPAND

UN environment WCMC

United Nations Environment
World Conservation Monitoring Centre

THANK YOU VERY MUCH

Antonello, Fiona & the Ecopotential Team

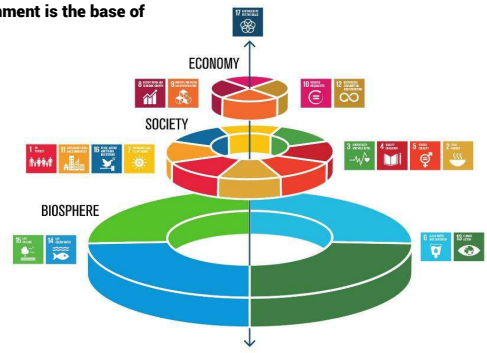
We put biodiversity at the heart of decision-making

- Providing authoritative information in a way/format that is useful to decision-makers
- There are many sorts of users of biodiversity data!
- Some users might appreciate a bit of "data packaging"

Local, regional and global scale biodiversity data are needed by:

National governments	Inter- & Non-Governmental Organisations	Corporate sector	Research bodies
Policy reporting, spatial planning, natural capital accounting, screening (to site concessions), …	Policy development & implementation, assessments (e.g. IPBES), indicators & targets (e.g. Aichi, SGD), spatial conservation planning, …	Screening (concession bidding), Environmental Impact Assessment, …	Mapping, species distribution modelling, blue carbon assessment, ecosystem service valuation, protected area design…

The Environment is the base of the SDGs



What are ecosystem services?

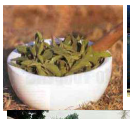
Benefits people obtain from ecosystems

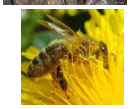
Millennium Ecosystem Assessment (2005)

Normally divided into four groups:

What are the main terrestrial and freshwater ecosystem services?

- Carbon
- Water supply
- Flood prevention
- Pollination
- Eco-tourism
- Non-timber and timber products
- Cultural stuff....





Title style

First level style, to be used for sub headings

- Second level, to be used for main bullet points

  Third level, to be used for supporting text to the bullet points

- Fourth level, to be used for sub bullet points

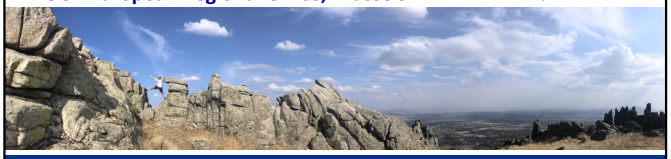
Fifth level, to be used for image or diagram captions

Defining the future biodiversity policy framework and targets:

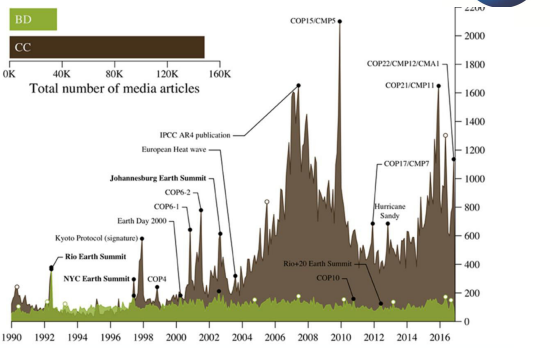
The role of science

Alberto Arroyo Schnell
Senior Policy Manager
IUCN European Regional Office, Brussels

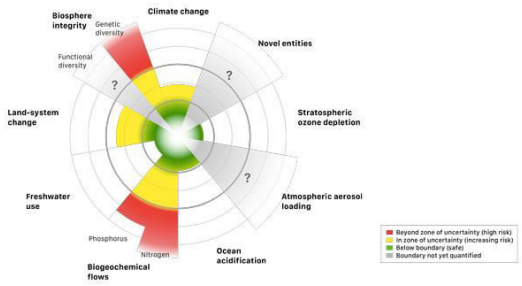
27 September 2018



Biodiversity and Climate Change in the media

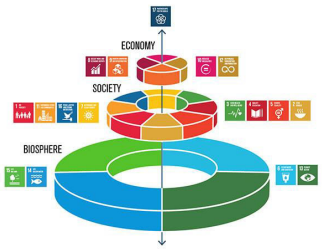


Some Facts



http://www.stockholmresilience.org/research/planetary-boundaries/planetary-boundaries/about-the-research/the-nine-planetary-boundaries.html

Some Facts

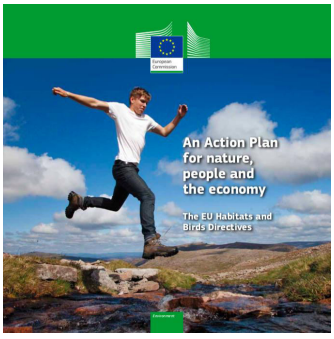


http://www.stockholmresilience.org/research/research-news/2016-06-14-how-food-connects-all-the-sdgs.html

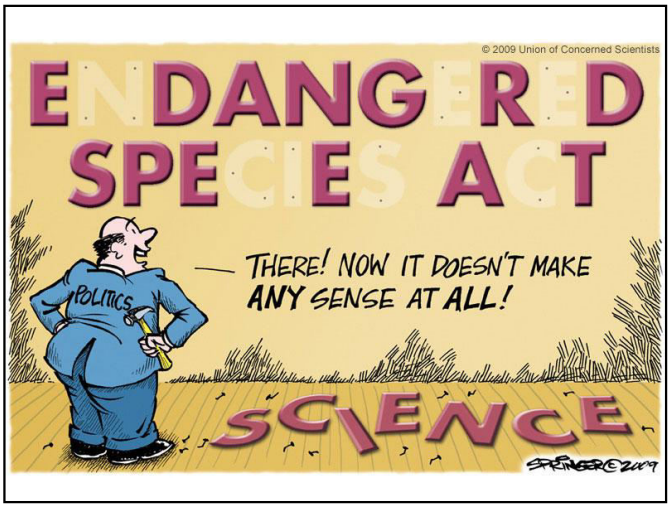
‘Science-based Targets’

- Theoretically achievable and implementable
- **Quantified** (*progress towards it is measurable*)
- Supported by a **clear, analytical rationale** (*why is the target set at a particular level?*)
- High-level of **ownership and buy-in** from all stakeholders

Implementation




IUCN
United for life and livelihoods
Thank you!
Alberto Arroyo Schnell
Senior Policy Manager
IUCN European Regional Office, Brussels
alberto.arroyo@iucn.org


© 2009 Union of Concerned Scientists
ENDANGERED SPECIES ACT
POLITICS
THERE! NOW IT DOESN'T MAKE ANY SENSE AT ALL!
SCIENCE
SPRINGER©2009

The Digital Observatory for Protected Areas (DOPA)

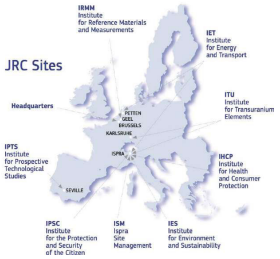
***Grégoire Dubois* (Ph.D.)**

http://dopa.jrc.ec.europa.eu

@EU_DOPA

What is the JRC?

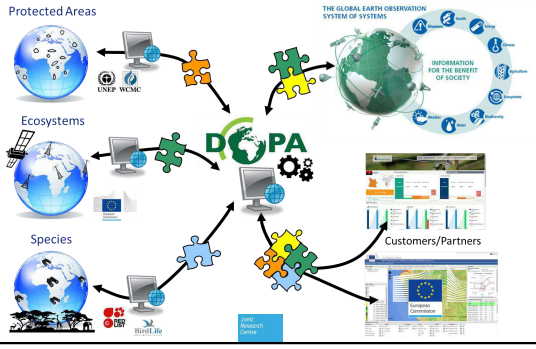
- European Commission (EC) = Executive Body of the European Union (EU) based in Brussels
- Joint Research Centre (JRC) = **In-house science service of the EC**; provides independent scientific and technical support to EU policy
- JRC established in 1957
- 7 Directorates in 5 countries with over 3,000 staff (35% short-term)
- Over 1,300 publications per year



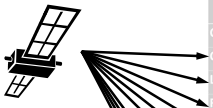
Why DOPA a global reference system focusing on protected areas?

- Need for **global reference information system** to support decision making. *Where are protected areas with highest biodiversity and exposed to highest threats? Which are the protected areas without financial support?*
- Need for **integrated information** taking into account species, ecosystems, pressures, funding which need to be available at Country, Ecoregion and Protected Areas level.
- Need for **free, open access** services to develop web based tool for different end-users.

DOPA integrates **global datasets managed by various actors** to generate key indicators



Key indicators provided by the DOPA



Key Indicators	Country	Ecoregions	Site level (50 km2)
Coverage by protected areas	☑	☑	-
Connectivity of protected areas	☑	☑	-
Land cover & change	☑	☑	☑
Forest cover & change	☑	☑	☑
Surface water & change	☑	☑	☑
Terrestrial Habitat Diversity	-	-	☑
Marine Habitat Diversity	-	-	☑
Species composition	☑	☑	☑
Built-up pressure			☑
Population pressure			☑
Agricultural pressure			☑
Population & road pressures			☑
Monthly climate	-	-	☑
EU funding for conservation	☑	-	☑

DOPA Explorer 2.0

A web-based open-access application assessing PAs globally through a set of indicators at three levels:

1) Country

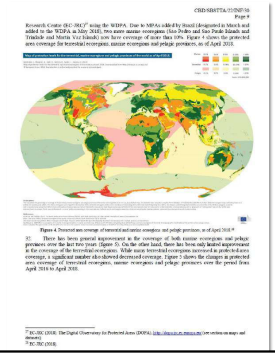
2) Ecoregion

3) Individual PAs

- ✓ All PAs of at least 50 km²
- ✓ ≈ 24000 PAs worldwide
- ✓ > 95% of global protected surface

http://dopa.jrc.ec.europa.eu/explorer

DOPA Explorer is mainly developed to support the **EC** & the UN Convention on Biological Diversity (**CBD**) for assessments & reporting

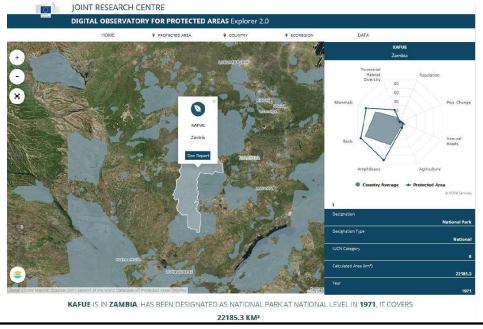


Target 6 of the EU Biodiversity strategy to 2020: Help avert global biodiversity loss

By 2020, the EU has steppe up its contribution to averting global biodiversity loss

Global information for comparisons

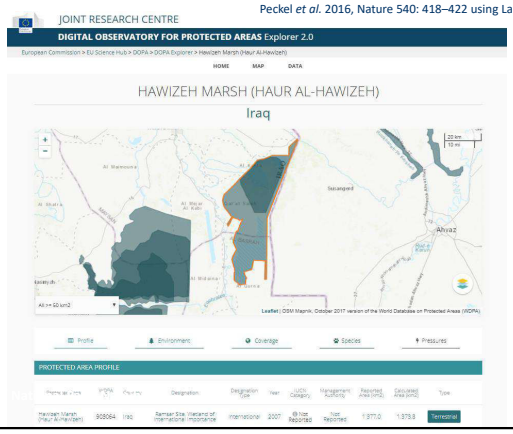
In DOPA Explorer, Protected Areas are **ranked** within the country according to a set of indicators, visually (radar plots, bar charts) and numerically.

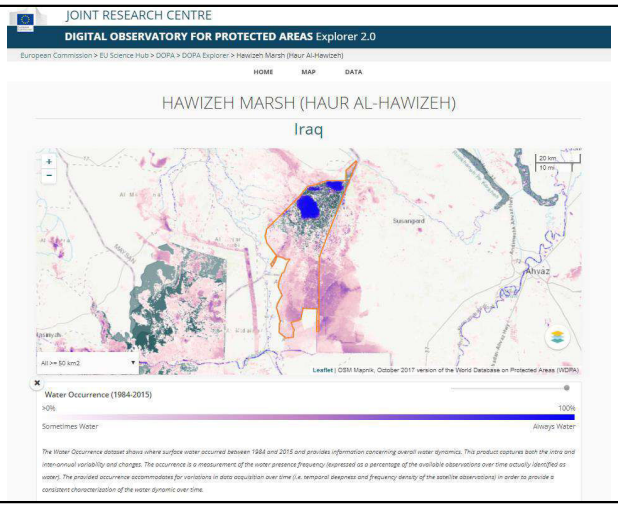


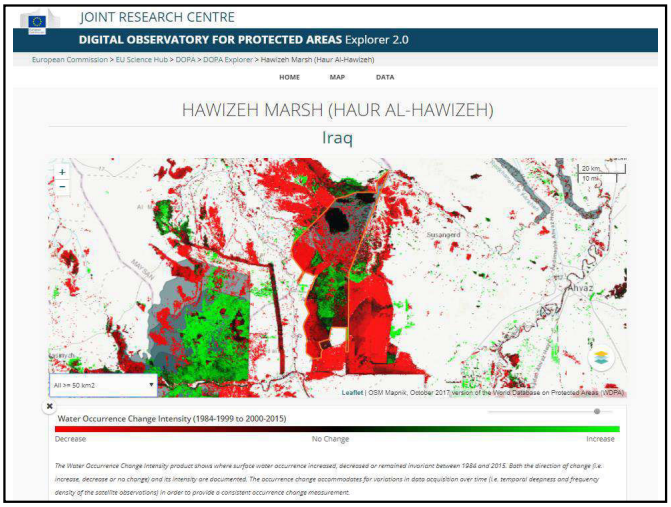
DOPA Explorer & Earth Observations

Use case 1 : Surface water

Peckel *et al.* 2016, Nature 540: 418–422 using Landsat (30 m)



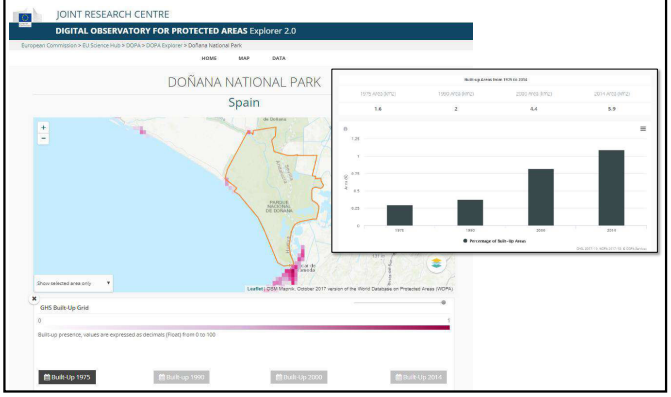




DOPA Explorer & Earth Observations

Use case 2 : Built up areas

Built-up areas are derived from the Global Human Settlement (GHS) built-up layer at 30 m resolution developed by the JRC for years 1975, 1990, 2000, 2014 (Pesaresi *et al.*, 2015)



Conclusions (1/2): Main challenges…

- DOPA uses only global datasets: it is a **compass**, not a GPS.
- DOPA is processing data automatically: **rubbish in = rubbish out**.
- DOPA is free and open access but many datasets managed by third parties present **licensing issues**.
- Earth observations are essential for large scale assessments but are not sufficient for effective decision making (e.g. local threats, empty forest syndrome, …). **Need for ground truth**
- Many new initiatives and platforms, clear **need for coordination and orchestration**

Conclusions (2/2): … and next steps

- **DOPA Explorer 3**. More indicators, more automation, higher resolution (November 2018).
- **Move towards Open DOPA ?** Most systems adopt a top-down approach. An additional bottom-up effort would improve information and develop bridges between actors on the ground and policy makers

"We are drowning in information, while starving for wisdom. The world henceforth will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely."

E. Wilson, 1998, Consilience

DOPA

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