# In-Situ data for Monitoring, Modelling and Management

ECOPOTENTIAL aims to ease access to in-situ data enabling support of monitoring and management in protected areas by facilitating the use of remote sensing data and derived products as well as the results of modelling efforts. The documentation, harmonisation and the assessment of their representativity are important aspects to be tackled.

ECOPOTENTIAL efforts on in-situ data resulted in number of products which will be of future use not only for protected areas but also for a wider scientific community. Using the metadata platform DEIMS-SDR as well as building a catalogue integrating metadata from the protected areas a common and sustainable platform for data access was created.

## Overview on relevant in-situ datasets

Providing an overview and allowing access to relevant datasets from the protected areas as well as from other resources is important to facilitate analysis work flows. In a first step an overview of the data requirements from the different work packages in ECOPOTENTIAL was created in order to define the scope for the metadata catalogue. This included the data needs for models and remote sensing as well as a first evaluation of relevant data portal summarised as project report (Cazacu & Peterseil, 2016). The DEIMS-SDR metadata registry was used to document the protected areas as well as the data provided. This aimed to allow for the documentation of the sites, the resulting datasets and collection campaigns where easy access to metadata and data was not possible. Either by missing metadata catalogues at the local scale of the protected area or issues with translations to local languaes. A catalogue integrating DEIMS-SDR and metadata catalogues from protected areas (e.g. WaLTER WaddenSea Area) provides links to existing sources and is the main input to the ECOPOTENTIAL Virtual Labratory and providing end users access to information provided by the protected areas. Whereas DEIMS-SDR is fully functional the central metadata catalogue for protected areas is still in development.

Publications

*Cazacu, C. & Peterseil, J.* (2016) D5.1 Final list of data delivered by PAs. ECOPOTENTIAL Project (H2020 GANr. 641762) Deliverable. [online http://www.ecopotential-project.eu/images/ecopotential/documents/D5.1.pdf] 147pp.

Relevant links

DEIMS-SDR [online https://data.lter-europe.net/deims/] providing access to metadata and open datasets from the protected areas and a number of long term monitoring sites in Europe.

Reference to workplan: The work was carried out in task 5.1, task 5.4 and task 5.7 building the metadata catalogue.

## Standards for data documentation and provision

Sharing information and data across different communities (e.g. modelling or remote sensing) enhances the need for a common structure for the documentation and discovery of data. This not only includes metadata models but also the underlying semantics used to provide the information. ECOPOTENTIAL focused on the extension of metadata models for observation sites and datasets in order to comply with needs for the modelling and remote sensing community. This led to the adoption and extension of the LTER Europe Community profile (Oggioni et al. 2012) buildin on ISO19115/19139 and EML as the basic standards. In

addition a new community profile for data products based on the INSPIRE EF Activity concept was developed and implemented within DEIMS-SDR (Poursanides et al. 2017). Furthermore the need for the documentation of data quality and the related extension of ThemisE platform in order to assess the fitness for use of the datasets provides an important feature in the workflow (Alonso et al. 2017).

The extension of EnvThes, a common thesaurus for the ecosystem domain, to concepts with regard to remote sensing provides the basis for the annotation of metadata keywords as well as the annotation of in-situ observations. Applying SKOS as standard multilinguality can easily be featured and will be extended in the next period of ECOPOTENTIAL.

Publications

*Poursanidis, D., Peterseil, J., Wohner, C. , Chrysoulakis, N., Wetzel, F. , Alonso, J. , Castro, P. , Beierkuhnlein, C. , Bernd, A. , Zabala, A. , Masó, J. , Domingo, C. , Vetaas, O., Bargmann, T. , Bosch, S*. (2017). D5.2 Metadata for pre-existing datasets. ECOPOTENTIAL Project (H2020 GANr. 641762) Deliverable. [online http://www.ecopotential-project.eu/images/ecopotential/documents/D5.2.pdf] 116pp.

*Alonso, J., Castro, P., Martins, I. , Honrado, J.P., Calafate, M., Gonçalves, J. , Peterseil, J., Monteiro, A., Santos, C., Arenas-Castro, S., Marcos, B., Poursanidis, D., Prados, J., Pratola, Ch.* (2017). D5.3 Framework for user-oriented quality evaluation routines. ECOPOTENTIAL Project (H2020 GANr. 641762) Deliverable. [online http://www.ecopotential-project.eu/images/ecopotential/documents/D5.3.pdf]. 156pp.

*Fiore, N., Magagna, B., Goldfarb, D.* (2017) EcoPortal: Proposition for a Semantic Repository Dedicated to Ecology and Biodiversity. In: Alsayed Algergawy, Naouel Karam, Friederike Klan and Clement Jonquet (Eds) Proceedings of the 2nd International Workshop on Semantics for Biodiversity, co-located with 16th International Semantic Web Conference {(ISWC} 2017), Vienna, Austria, October 22nd, 2017.}, online http://ceur-ws.org/Vol-1933/poster-paper-13.pdf. 6pp.

Relevant links

EnvThes [online http://onto.nerc.ac.uk/evn/tbl/envthes.evn] providing terms for the annotation of metadata as well as the annotation of observed parameters.

ThemisE [online ] provides a platform to ealuate the fitnes for use of the data.

Reference to workplan: The work done was related to the tasks 5.3, 5.5, and 5.6 building a common framework for metadata and semantics.

## Collection and analysis of representativness of in-situ data

Evaluate existing in-situ data regarding their representativeness, standardise data quality where possible and fill existing data gaps. This also led to the collection and provision of in-situ datasets accross different protected areas (see Table).

Table: Relevant in-situ research by the Biogeography Department at University of Bayreuth in ECOPOTENTIAL

| In-situ Data / own studies | PA | Group Members | Status |
|---|---|---|---|
| Small-scale spatial patterns in alpine grasslands | Gran Paradiso | Laura Bethke<br>Carl Beierkuhnlein | Completed |
| Scale dependency of diversity measures in alpine grasslands | Gran Paradiso | Jonas Benner<br>Carl Beierkuhnlein | Completed |

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|---|---|---|---|
| Spatial gradients of endemic plant species in the alpine zone | Sierra Nevada | Pia Eibes<br>David Kienle<br>Carl Beierkuhnlein | Completed |
| Surface roughness in the alpine zone and its effects on remote sensing and species diversity | Hardangervidda | Edvinas Rommel<br>Carl Beierkuhnlein | Ongoing |
| Influence of grain and extent on distance decay | Hardangervidda | Viola Hipler<br>Carl Beierkuhnlein | Ongoing |
| Leaf coloration along an altitudinal gradient in subalpine shrublands and its reflectance in RS | Réunion | Esther Baumann<br>Carl Beierkuhnlein<br>Dominique Strasberg (LR)<br>Erwann Lagabrielle (LR) | Completed |
| Development of a marine protected area with increasing shark attacs | Réunion | Jan-Christopher Fischer<br>Carl Beierkuhnlein<br>Erwann Lagabrielle (LR) | Ongoing |
| Landscape metrics based on airborne habitat mapping | Bayerischer Wald | Alexander Obermaier<br>Marco Heurich<br>Carl Beierkuhnlein | Completed |
| Correlating diversity patterns and hyper-spectral earth observation | Bavarian Forest | Franziska Hauch<br>Marco Heurich<br>Carl Beierkuhnlein | Completed |
| Bark beetle outbreaks and inertia to natural forest regeneration | Bayerischer Wald | Philipp Kohler, David Kienle, Marco Heurich, Carl Beierkuhnlein | Ongoing |
| Spring mires as small habitats of high conservation value | Bayerischer Wald | Jamyra Gehler, David Kienle, Marco Heurich, Carl Beierkuhnlein | Ongoing |
| Spatial patterns of spruce regeneration after bark beetle outbreak in dependence of forest margins | Bayerischer Wald | Stephanie Propp, David Kienle, Marco Heurich, Carl Beierkuhnlein | Ongoing |
| Topography and climatic conditions influencing patterns of endemic species | La Palma | Severin Irl<br>Carl Beierkuhnlein | Completed |
| Climate change projections and consequences for nature conservation on an oceanic island | La Palma | Severin Irl<br>Carl Beierkuhnlein | Completed |
| Pennisetum setaceum as a problematic invasive grass species | La Palma | Anna Walentowitz<br>Barbara Zennaro<br>Severin Irl<br>Carl Beierkuhnlein | Ongoing |
| Elevational gradients of biodiversity in mountain protected areas | La Palma | Samuel Hoffmann<br>Severin Irl<br>Carl Beierkuhnlein | Completed |
| Fire Regime and Forest Regeneration | La Palma | Anke Jentsch<br>Carl Beierkuhnlein | Ongoing |
| Identifying drivers and changes of tree lines – climate vs. insect herbivory | Abisko | Frank Weiser<br>Carl Beierkuhnlein | Completed |
| Trends in alpine tree lines in mountain protected areas | various | Bernadette Menzinger<br>Carl Beierkuhnlein | Ongoing |

Changes in temperature and hydrology can have a significant impact on both terrestrial and aquatic ecosystems, which can in turn leads to feedbacks within the climate system. Understanding the hydrological evolution and producing quantitative estimates of hydrological variables such as precipitation, relative humidity and temperature, may lead to a better understanding of regional climatic changes and hydroclimatic variability. Well-dated high-resolution lacustrine proxy records are one of the best archives for the reconstruction of

the exact sequence of changes on the continents. The aim of this work is to produce high resolution climatic hydrological record of the last 200 years and a better understanding of mechanism and timing of hydroclimatic changes. Therefore, a dedicated dataset on the historic evolution of ecosystems in the Gran Paradiso National Park (Poto 2017) was generated in order to allow the comparision of mountain lakes across the different protected areas.

Publications

*Hoffmann, S.; Schmitt, T.; Chiarucci, A.; Irl, S.; Rocchini, D.; Vetaas, O.;Tanase, M.; Mermoz, S.; Bouvet, A.; Beierkuhnlein, C.* (subm. to Applied Vegetation Science): Beta diversity and remote sensing signals determine different plant community patterns in a semi-natural system

*Hoffmann, S.; Beierkuhnlein, C.; Field, R.; Provenzale, A.; Chiarucci, A.* (subm. to Scientific Reports): Uniqueness of Protected Areas for Conservation Strategies in the European Union

*Beierkuhnlein, C.* (2017) Inseln als globale Versuchsanordnung und natürliche Laboratorien der Vegetationsökologie., Berichte der Reinhold-Tüxen-Gesellschaft, 29 (2017)

*Irl, S; Schweiger, A; Medina, F M; Fernández-Palacios, JM; Harter, D; Jentsch, A; Provenzale, A; Steinbauer, MJ; Beierkuhnlein, C* . (2017) An island view of endemic rarity – environmental drivers and consequences for nature conservation, Diversity and Distributions, 1-11 (2017) doi:10.1111/ddi.12605

*Irl, S.* (2016). Plant diversity on high elevation islands – drivers of species richness and endemism, Frontiers of Biogeography, 8, e29717 (2016) doi:10.21425/F58329717

*Poto, L.* (2017). D5.4 Datasets on the historic evolution of ecosystems. ECOPOTENTIAL Project (H2020 GANr. 641762) Deliverable. [online http://www.ecopotential-project.eu/images/ecopotential/documents/D5.4.pdf]. 16pp.

Relevant links:

Documented datasets [online https://data.lter-europe.net/deims/dataset/15043e47-cf2e-420d-b846-5cbf27b331c2 linked dataset http://hdl.handle.net/11097/817ecf38-d4fe-46a0-91e3-11c7bd06a03e]

DEIMS-SDR [online https://data.lter-europe.net/deims/] providing metadata on documented datasets from protected areas.

Reference to workplan: The work was carried out by T5.2 dealing with the collection of data on the historic evolution of ecosystems and T5.4 dealing with aspects of representativness.