Challenges on the use of remote sensing for biodiversity estimates

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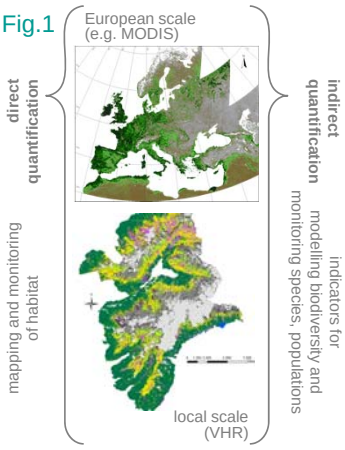
Biodiversity and EU BON

Biodiversity is threatened worldwide. In order to protect biodiversity, knowledge has to be collated, integrated and analysed to facilitate informed decisions and with relevance for a number of political processes and legislations in Europe (e.g. Horizon 2020, Habitat Directive, CAP, Water Framework Directive). To achieve that, one integration point between technological networks of IT infrastructures and social networks and of science will be EU BON.

Mapping and monitoring of biodiversity is a central point. However, covering large areas, large number of species and large time periods is challenging and depending on the scales involved quickly becomes impossible with conventional methods. Furthermore, analyses across ecosystems, freshwater, marine and terrestrial, is challenging and complex. Therefore, one of the most important tools is remote sensing (RS), especially for realising a large spatial coverage.

Fig.1



How can RS in EU BON help to map and monitor biodiversity and its trends?

RS allows land cover observations from local to large scales, thus can integrate across scales, and offers the option to detect changes in the past. In EU BON, two approaches are used to assess biodiversity and its trends (see fig. 1).

A) Mapping and monitoring of habitats based on the development of indicators which are related to habitat extension and distribution, habitat heterogeneity or fragmentation through time.

B) Linking earth observation based environmental parameters (spatial or spectral information) to species occurrences, abundances and richness.

In EU BON, both approaches are employed. The project makes use of existing concepts developed in previous projects (e.g. BIO_SOS, MS.MONINA). It also aims to assess the potential of incorporating RS approaches for marine environments, by using acoustic data instead of optical imaging.

What tools are developed in EU BON to improve RS approaches?

EU BON will refine existing RS data by combining high temporal and high spatial resolution data. This can be achieved for example by contrasting high resolution DEM with more coarse land cover. Furthermore, a novel machine learning classification method is developed, integrating RS and environmental data while accounting for the pre-defined hierarchical structure of most national and international habitat classification schemes (e.g. EUNIS). The main improvements will be a more transparent method and a reduction of severe errors. In all possibilities it is important to automatize established workflows and make them transparent to everyone [Rocchini & Neteler (2012) TREE 27:310–311].

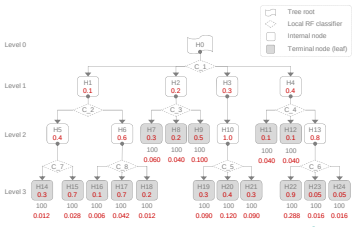
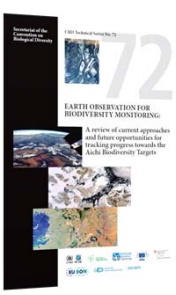


Fig.2



How can RS contribute to EBVs and the Aichi targets?

Essential Biodiversity Variables (EBV) were recently proposed to facilitate the evaluation of biodiversity. In total six classes were formed and linked to the Aichi targets [Pereira et al (2013) Science 339:277-278]. A review showed that, 11 targets and 54 indicators could be, at least partially, derived from RS data (out of 20/99 respectively). Clear suggestions to overcome difficulties in the implementation of RS towards Aichi targets were summarised in detailed factsheets. The main obstacles can be grouped in four categories: (i) difficult data access, (ii) problems in generating derived products and training to do that is lacking, (iii) no general agreement on methodological procedures and (iv) temporal scales do not match needs, keywords are low temporal resolution and insecure long term funding. [Secades et al. (2014) SCB Technical Series No. 72].

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