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Workshop Report

4th European Biodiversity Observation Network (EU BON) Stakeholder Roundtable: Pathways to sustainability for EU BONs network of collaborators and technical infrastructure

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Abstract

Background

EU BON - Building the European Biodiversity Observation Network (www.eubon.eu) is a project funded under the EU FP7 framework. It presents an innovative approach towards the integration of biodiversity data and information systems, both from in-situ and remote sensing data sources. The aim is to address policy and information needs in a timely manner, customized for various stakeholders on different levels - from local test sites to European and international policy. The Stakeholder Roundtables are a specific task and part of a Work Package in the project (WP6) that focuses on the stakeholder engagement and the science-policy dialogue. The main aim of the Stakeholder Roundtables is to carry out regular engagement with relevant political authorities and other stakeholders at

European and national level in support of the delivery of the EU BON project. Furthermore, the Roundtables seek to build up a stakeholder dialogue with exemplar sector-specific user communities to incorporate feedback loops for the products of EU BON (data, tools and models) as well as to develop improvements of existing biodiversity data workflows and to discuss sustainability issues.

New information

The 4th EU BON Stakeholder Roundtable aimed to present current achievements and products of the project EU BON, which can be assigned to three categories: firstly to tools and infrastructure, secondly to the consortium and its network of collaborators and thirdly to (biodiversity) monitoring and scientific forecasting. The last Stakeholder Roundtable - in contrast to the former Roundtables which addressed European policy (Wetzel et al. 2016), citizen science and the EU BON citizen science gateway (Vohland et al. 2016, Runnel et al. 2016) and local research networks (Vohland et al. 2016b) – focused on sustainability issues of the different components of the European biodiversity observation network. The guiding question of the Roundtable was how to achieve sustainability for the products of EU BON after the project will end. It was also discussed what - among the many different products such as tools, software, scientific knowledge, models and infrastructure - are the most essential components of the project for the specific stakeholders (e.g. agencies, citizen science, researchers) and what is needed for the future (adjustments, sustainability for development, funding). One of the central questions was how the essential components could be sustained, by which institutions or networks and how they can be used in the best way for the European and national policy and research needs (e.g. monitoring, reporting) as well as for the global level (e.g. for the Group on Earth Observations, GEO). Finally, and not to forget, another essential aspect was how a European Biodiversity Network as a whole, with its different components, can be further sustained for fulfilling its goals as a central infrastructure for generating biodiversity data and information on a European scale. Here we report the outcomes and discussions of the meeting and also highlight the main messages.

Keywords

sustainability, biodiversity infrastructure, EU BON, business plan, products and tools, biodiversity observation networks

Introduction

The 4th EU BON Stakeholder Roundtable took place on 17 November 2016 in the Museum für Naturkunde in Berlin on the topic of “Pathways to sustainability for EU BONs network of collaborators and technical infrastructure”. Thirty-five participants discussed key questions

with regards to the sustainability of the EU BON network and products, and shared their rich expertise, coming from different backgrounds ranging from science to policy.

The Roundtable brought together key European users and stakeholders, such as the European Environment Agency (EEA), UNEP GRID, and the GEO (Group on Earth Observations) Secretariat, with the EU BON network, including 27 different institutions and organisations, as well as European funded projects', infrastructures and networks that share the EU BON objectives (Hoffmann et al. 2014) of assembling biodiversity and ecosystem-related data and knowledge, such as Lifewatch, the European Citizen Science Association (ECSA), ECOPOTENTIAL, EKLIPSE and others.

The final EU BON Stakeholder Roundtable discussed the future and sustainability of the European biodiversity observation network and key questions were:

- How can the many different EU BON products be sustained and further developed after the project ends in May 2017?
- Which institutions will host the products in the future and what key products could be further developed by EU BON to meet European and global policy and research needs?
- How can a European Biodiversity Network as a whole be sustained in order to serve as a central infrastructure and pool of expertise for generating biodiversity data and information on a European scale?

EU BON achievements: products and infrastructure

The morning talks presented the current achievements and products of the project, which include data analysis tools and infrastructure, the consortium and its network of collaborators, and biodiversity monitoring and scientific forecasting tools. The project Work Package leads presented their output and products to give the participants information that was needed for the discussions in the afternoon. Projects related to the work of EU BON also presented some key facts on their aims as well as on how their work is linked to the EU BON goals.

Katrin Vohland (MfN), as task lead for the EU BON Stakeholder Roundtables, outlined the aims of the fourth and last Stakeholder Roundtable as well as the lessons learnt from the first three Stakeholder Roundtables that targeted policy makers, citizen scientists and local (test) sites that collect biodiversity data. As the discussions at the Roundtable showed, a challenging task still remains to appropriately address the needs of local researchers and data collectors and provide useful tools and products to them. In turn, Christoph Häuser highlighted the key products of EU BON in terms of data, models, tools and the portal in order to give an overview of the diverse achievements of the project.

The link from EU BON products to stakeholders was presented by Lauren Weatherdon, UNEP-WCMC and David Rose of the University of Cambridge. They provided a framework

for how products could be clearly communicated to users and decision-makers (see Fig. 1) and outlined key chracteristics for decision support tools (Rose et al. 2016).

Figure 1.

How do we get from data to decisions? Extract from a presentation by Lauren Weatherdon (UNEP-WCMC). Credit: Scriberia, CC BY 4.0

Bill Kunin from the University of Leeds illustrated the range of different tools and models developed in the project. The discussion showed that some challenges still remain, e.g. how to make data uniformly harmonized and compatible across countries and applications and how to effectively bring the newly developed scientific products (modelling or upscaling/downscaling methods) to experts that are working for policy makers.

Dirk Schmeller (UFZ), in collaboration with Katherine Despot-Belmonte (UNEP-WCMC), presented a business plan for the project, stressing the fact that EU BON is one of the few EU-funded projects to have such a plan in their Description of Work (DoW). There are different models how the products and the network can be sustained (Thalmann 2016, Pan 2015) for example with establishing an EU BON core so that basic services could be still delivered (Fig. 2) and developing (optional) components for offering additional products. One of the key questions is how to fund the development of a European Biodiversity Observation Network during the transition from the EU BON project through a nurturing stage in which it can grow into a mature network. The OPPLA (www.oppla.eu) platform and business plan was suggested as a helpful model for the EU BON planning. The project EKLIPSE (www.eklipse-mechanism.eu) also offers an EU-wide platform through which policy questions will be answered and research needs identified with a focus on nature-based solutions. Both platforms have a need for access to biodiversity data and expertise to use it to inform policy.

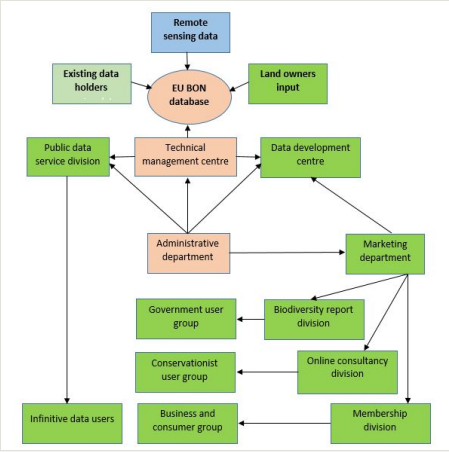

Figure 2.

Potential organizational structure of a future EU BON, e.g. with a 'core EU BON' (blue rectangle). Presentation Dirk Schmeller (UFZ) in collaboration with Katherine Despot-Belmonte (UNEP-WCMC). (Credits: Pan X., 2015, CC BY 4.0)

Christos Arvanitidis, representing both EU BON and Lifewatch, raised some key questions for EU BON sustainability planning in his presentation (co-authored by Wouter Los). The EU BON products and services that should be sustained can be grouped into: intellectual products, networks, (online) services, physical infrastructure/software and the branding. He highlighted criteria to prioritize the tools for further development, for example with respect to their attractiveness and "selling value" to the private sector. The greatest asset of Lifewatch is its network of people, and the people and their expertise are also one of basic elements and "powers" of EU BON. He also outlined in his talk important points to consider for the products of EU BON with respect to its sustainability, for example: (1) Who owns the respective products / services to sustain? (2) What are the maintenance activities and associated annual costs? (3) Are the owners prepared to maintain its developed products/ services, and pay for it, or generate payments by customers? (4) If not, which other organisation (existing or newly established) can take over responsibility and generate funding/income for this? (5) What is the market interested to utilize EU BON products and services? (6) Can this generate income? If yes, with what payment models? (7) Are there competitors? If yes, compete or join forces? (8) Which agreements and IPR licenses should come into place?

Gary Geller from the GEO Secretariat in Geneva pointed to some key questions of sustainability of EU BON that need to be answered. There should be a focus on operationalizing such a regional BON, as often projects generate data resources, solutions and tools but institutions see problems in actually utilizing them in policy making. Moreover, good access to the wealth of collected data seems not an individual problem (at a given institution) – it's rather a structural problem that could be solved with the help of a Biodiversity Network. EU BON needs to be very clear about who the key users of the tools and services are and where the national governments fit in. A key argument for a European

Biodiversity Network is that it helps national governments with their internal and international (reporting) commitments. To structure the sustainability planning he presented his outline of a concept paper for a Biodiversity Observation Network for the European Region.

Florian Wetzel (MfN) illustrated the achievements of EU BON with regards to data mobilisation, curation and providing open access of data. One crucial aspect for showing the relevance of a Biodiversity Observation Network for addressing policy needs is to deliver long-term data with an adequate spatial coverage. The provision of data in adequate quantities, high qualities and providing open access (Wetzel et al. 2015) will be one of the key success factors of such a network, in combination with a social network that has established functional data workflows. This will be one of the core products. In addition to that, rewarding mechanisms will be needed if a network of collaborators should be sustained. EU BON has developed motivation and rewarding mechanisms that are already increasing the mobilisation and use of biodiversity data, e.g. data papers that offer citations for researchers and data visualisation tools that help scientists to evaluate observation data. Mobile apps and repositories for citizen science data can motivate volunteers, as they can manage their data with tools that help to upload, curate and manage their data in a project space (PlutoF).

Tim Robertson (GBIF) gave an overview of the most important products, service and tools available on the EU BON European Biodiversity Portal (Figs 3, 4 biodiversity.eubon.eu). The EU BON portal offers several key products, for example the decision support tool Aquamaps, the spatial dataset browser and species population trend browser, the Citizen Science Gateway as well as a complete EU BON product list that provides information on the developed products.

Figure 3.

Screenshot of the beta version of the EU BON European Biodiversity Portal (biodiversity.eubon.eu).

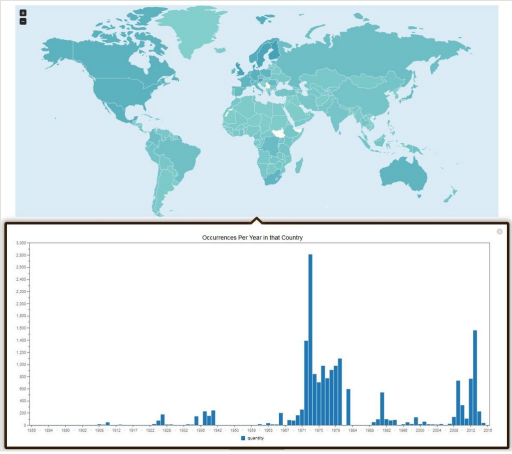

Figure 4.

Visualisation of Lepidoptera density occurences: World Map (darker colors indicate a higher number of occurrences) and Lepidoptera occurences chart bar per year, exemplified with the country data of Germany (EU BON European Biodiversity Portal, beta version 11/2016).

Perspectives from EU BON stakeholders and potential users

Beate Werner, lead of the biodiversity group at the **European Environment Agency (EEA),** explained the aims of the EU Biodiversity strategy and EEA's work on the Biodiversity Information System for Europe (BISE, http://biodiversity.europa.eu). The EEA mainly receives data reported by Member States under EU legislation or policy requirements. For example, the biggest biodiversity data set curated by the EEA and the European Topic Centre for Biodiversity (ETC-BD) is the species and habitat reporting under the EU Birds Directive (Article 12 reporting) and Habitats Directive (Article 17 reporting). This information is in the form of species and habitat assessments and large-scale (10x10km) distribution maps are submitted by Member States. The actual biodiversity data remain at the national level and are not available to the EEA. An important goal of the EEA is to make the information provided by the different European countries comparable. They also need access to information and data against which they can assess the quality and accuracy of Member State reporting. BISE does not have the capacity to be a "one-stop-shop" that serves all user needs for biodiversity data and information, and therefore relies on pointing users to other existing data platforms, for example to water or climate data and information portals. From the perspective of the EEA, which is a key biodiversity data stakeholder in the EU, it is of primary importance to know who are the people or networks behind a tool or model that is presenting biodiversity information, so that the data can be trusted. It is more important to have access to the people behind the data than to be able to go to a portal or download a model without knowing who stands behind it. From the EEA perspective, it would be helpful if EU BON were linked to the OPPLA platform, as EEA has an agreement with OPPLA to pass on requests. Research and biodiversity observation

networks should respond to policy needs, but it is important to bear in mind that policy goals are constantly moving and there is no fixed set of policy needs.

Tim Robertson and other participants representing the **Global Biodiversity Information Facility (GBIF)** said that EU BON is already providing tools that make the current GBIF data sets much more useful, and GBIF are about to launch a new web platform that integrates many of the EU BON applications. In future EU BON could contribute much more to data mobilisation and constitute a focused network that collects the data required to comprehensively describe the status and trends of biodiversity in Europe. There is a clear need for a strategy for data mobilisation from the gap countries which do not currently collect biodiversity datasets at the national level and/or do not supply biodiversity data to GBIF. Biodiversity observation networks are generally set up to generate data records. Over time, the number of such records increases, implying increasing species (observations) abundance. But in reality we lose species. So, do we have suitable tools that map and quantify species losses and declines – rather than just records showing new observations? In the discussion it turned out that this could be a general problem, and efforts should be put in place to also record absence and disappearance. And there are indeed statistics which can show decline in abundance, so evidence for European biodiversity loss is available, but good tools to precisely quantify these losses are still quite poor. As an additional solution, better systems can be designed and implemented for selected taxonomic groups whose collections are better standardized (e.g. butterflies).

Bernat Claramunt on behalf of the **European Citizen Science Association** highlighted citizen science approaches to biodiversity research and gave an overview over citizen-science and community-based monitoring. There is still a high spatial and taxonomic heterogeneity in citizen science data (Chandler et al. 2016). Another challenge is to provide open access to the data, as data provision to GBIF is quite poor (Groom et al. 2016). Only around 10% of Citizen Science projects give their data to GBIF. Solutions are there, e.g. experiences and best-practice examples of successful initiatives need to be shared with other projects. Furthermore, data gap analyses are needed to see for which Essential Biodiversity Variables (EBVs) more data is needed in order to overcome existing gaps.

GEO BON

EU BON has a clear mandate from the European Commission to be the European contribution to GEO BON (Group on Earth Observation Biodiversity Observation Network). At the same time, EU BON has a wider mission to make biodiversity data accessible and useable in ways that can inform policy and nature conservation in the EU. A close collaboration of GEO BON and EU BON, as a regional initiative, is important. EU BON's biodiversity portal and GEO BON's 'BON in a Box' could be used as a registry for developed tools, so that researchers have a central access point to obtain more information on developed tools and products. However, ways still need to be found to link such registries to governmental agencies and political consultants.

Pathways to sustainability of EU BON network and products

The afternoon session was dedicated to intensive, interactive group discussions on the pathways to sustainability of EU BON network and products (Fig. 5). After the break-out groups discussed their specific topics and after a debriefing the final discussion focused on the projects sustainability plans (Fig. 6). The most important points raised in the discussions are listed below.

Figure 5.

Group 2 discussion: Strategies, Business Plan and EU BON sustainability (Credits: F. Wetzel)

Figure 6.

Participants of the 4th EU BON Stakeholder Roundtable (Credits: F. Wetzel).

Infrastructure and networks – and EU BON sustainability

The discussion (led by Corinne Martin and Heather Bingham, UNEP-WCMC; David Rose, UCAM) used a conducted analysis of biodiversity informatics networks in Europe and globally as a way of positioning the sustainability of the EU BON portal and experts. This highlights what EU BON is contributing to biodiversity data networking and accessibility, demonstrating the impact EU BON is having on existing data flows, and what information flows would be lost if the EU BON portal and network were to disappear. It could also better highlight the niches that have not been filled yet in order to identify future roles for EU BON. Participants' feedback was:

- The demonstrated figure shows a mapping of the key components and linkages within the global and European biodiversity informatics landscape (Bingham et al., in preparation to be published in RIO). Participants stated that it is thought-provoking, good for someone new to the informatics landscape, or policy-level (i.e. useful for non-specialist person), for example to explain the links between elements of the landscape, missing links, duplication of effort, etc.
- The participants suggested improvements of the chart, for example to show the flow of raw data but also to highlight all important components of EU BON.
- A spin-off idea was to 'map in' the EU BON tools/products to show where they have an impact.
- The demonstrated figure could be improved so that it highlights the components that are critical to EU BON's sustainability and will be published separately. Particular components that might be lost if not sustained could be highlighted and a field in the metadata of each element could be added to indicate its funding mechanism (core-funding, project-dependence), to gain an idea of what proportion of the landscape is strong in terms of sustainability.

Strategies, Business Plan – and EU BON sustainability

The discussion (led by Gary Geller, GEO Secretariat; Dirk Schmeller, UFZ; Katherine Despot-Belmonte, UNEP-WCMC) focused on the sustainability and business planning for the "flagship products" of EU BON. There are two key users of EU BON products: scientists and policy agencies. The group agreed that the products and tools developed by EU BON could be used to address policy needs or answer policy questions via platforms such as OPPLA and EKLIPSE. The EU BON tools enable two processes: 1) data aggregation and 2) data filtering and organization so that it can be used to answer a question. EU BON visualizations are also very important for making findings from the data more transparent and understandable.

- The discussion showed that the value of EU BON lies in its network and experts. The primary aim of the EU BON project wasn't to deliver answers to policy or research questions but the group agreed that the collective knowledge of the network and the tools developed can be very useful to address policy needs. OPPLA and EKLIPSE, for example, aim to provide a network of experts who can

answer specific policy-relevant questions, but these experts require access to biodiversity data and tools in order to do so, and EU BON could provide them with this service.

- The EU BON portal needs to clearly state at which scale and resolution each tool is most useful, as decision-makers need to know at which scale of decision making they can find answers from the data. As the EU BON portal aims to provide access to the finest scale of data available, which can then be combined, the scale at which the findings are most useful is defined primarily by the data gaps and uncertainty associated with the data.
- Decision-makers need both the results from scientific analysis of the data and the implications for policy. They also need to know that findings are based on robust comprehensive datasets that have no significant data gaps. However, with the currently available biodiversity data, it is not possible to deliver data sets with comprehensive EU coverage for groups other than birds and butterflies. Decision-makers also need to be able to understand the scale at which the data are most useful, as determined by the resolution and the uncertainty, so that they can clearly see the level of policy decision making at which it can be used (local, regional, national, EU). The dicussion showed that engaging with decision-makers should be a priority before the project ends in May 2017 in order to make use of the products/ tools developed by the network.

Monitoring and forecasting, tools for critical biodiversity assessment

The group (led by Klaus Henle, UFZ; Bill Kunin, UnivLeeds; Piotr Mikołajczyk, UNEP/ GRID-Warsaw) focused on the monitoring and forecasting part of the products and discussed important elements for future programs that need to be considered in order to improve monitoring and forecasting as well as to overcome existing problems.

I. For monitoring, these points need to be considered to make data recording useful for future applications:

- proper time and space (georeferencing) indication of collected records / in situ data is urgently needed to make observations useful for further analysis;
- defining the nature of an observed event – developing appropriate “meta-language”, methodological layers and metadata standards;
- proper design of monitoring procedures/methodology (sampling design, resolution, stratification, temporal scheme, etc.);
- quality and credibility of collected data (e.g. taxonomic confidence) – esp. with regard to e.g. citizen science activities, volunteer work, etc.
- it is important to decide what should actually be measured and what species or habitats should be monitored (e.g. whether data for some key species or some indicator species should be collected). It could be useful to define and employ appropriate, sensible Essential Biodiversity Variables. The goal is to provide

credible and comparable data and analyses and, at the same time, to avoid a too strict streamlining as this poses the threat to lose important information;
- fulfilling geo-statistical standards (e.g. stemming from EU bird / habitat directives), but simultaneously still focus on the purpose of use and provide information that is interesting and valuable for the society;
- Citizen science – let's be careful and distinguish haphazard, opportunistic, random observations and biased approaches from sound, methodologically credible citizen science activities.

II. For forecasting and future scenarios, these points need to be considered to improve current/existing approaches:

- infer/define and characterize main drivers of changes;
- trying to answer questions such as: why is it changing? Where is it going? Is this a stable trend? Or we (may) deal with thresholds and "tipping points"?
- the drivers may change in time, so in the future they may not be the same as defined today (e.g. decreased or increased pesticide use). So good forecasting models do account for potential changes in drivers (selection and/or magnitude) – as well as their interactions;
- another thing to consider is the speed of species response (sensitivity / resilience);
- forecasting should involve / permit building alternative scenarios;
- taken into consideration should be projected future use of data (both near and far future);
- good prognoses require considering many factors, knowledge on drivers, etc. – in short, good data. So, too much above-mentioned streamlining (taking into account too few factors, drivers and variables) and extrapolation may possibly lead to errors and non-credible forecasting;
- importance of good data documentation / metadata resources.

Main messages

Some of the main responses to the questions about EU BON's sustainability that arose from the workshop were:

1. How can the many different EU BON products be sustained and further developed after the project ends in May 2017?

- Select, develop and communicate clear flagship products of the project (selected from the rich variety of EU BON products, tools and services), and promote them more actively and to demonstrate the value for sponsors/champions. EU BON will further develop some showcases of tools that produce policy-relevant answers, and that demonstrate the power behind the network.
- EU BON will establish clear agreements with partners on how the products of EU BON are labelled or branded, so that components that were developed in the project are recognized as an EU BON product (e.g. with GBIF).

- Take the “points to consider” from the Lifewatch presentation (Arvanitidis/Los) for developing the sustainability roadmap for EU BON and apply it for EU BON products.

- Invest in the EU BON brand to sustain the network or partners in the long term.

2. Which institutions will host the products in the future and what key products could be further developed by EU BON to meet European and global policy and research needs (e.g. for monitoring, reporting)?

- The flagship products of EU BON need to address some key users and need to develop marketing strategies.
- A communication strategy should differentiate between the different user groups (science, policy, practitioners, citizen scientists), use specific communication channels to promote the specific flagship products – and avoid to merely talk in acronyms.
- A concept paper for a Biodiversity Observation Network for the European Region will be written that clearly sets out what a biodiversity observation network for Europe will look like and what EU BON has already developed towards implementing such a network.

3. How can a European Biodiversity Network as a whole be sustained in order to serve as a central infrastructure and pool of expertise for generating biodiversity data and information on a European scale?

- The network of experts is one of the most precious assets of EU BON, but it needs resources to sustain it. The sustainability of the network of people is a key component of the business and sustainability planning.
- The Enspiral network (http://enspiral.com/network-overview/) provides a model for how a network can be sustained using a decentralized organizational structure that avoids power hierarchies and is characterized by a flexible structure.
- Possible concrete next steps: submit a COST proposal to set up a future EU BON network as charity/foundation. Explore in more detail the needs of prospective users. Use the final EU BON meeting to follow-up on the sustainability discussions.

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