Biodiversa+ Habitat quality & mapping
Outcomes Helsinki workshop 23rd and 24th of May 2023

This workshop, *"Habitat Quality & Mapping"* through remote sensing aimed to co-design with the Biodiversa+ partners, EuropaBON, a Biodiversa+ key collaborator, the EEA, GBIF, the European Commission DG Env and some habitat quality and remote sensing experts the planning of a possible new pilot. The workshop took place on the 24th of May afternoon and 25th of May morning both online and in Helsinki and gathered 41 participants.

This report summarises the main outcomes of the workshop.

I)   Day 1: 24th of May afternoon.
On the 24th of May afternoon, the workshop participants were split into 4 groups, including 3 on-site groups and 1 online group and addressed 4 questions in their group.

A. What habitats/habitat groups (annex 1 habitats/habitat groups) do the partners wish to use as showcases for a habitat quality indicator?
For the first question "What habitats/habitat groups (annex 1 habitats/habitat groups) do you wish to use as showcases for a habitat quality indicator?", several habitats or habitat groups were suggested, covering a wide range of habitats.

Interestingly two habitat types were mentioned by all the groups:
- **Grasslands**.
- **Wetlands**.

It is also worth mentioning that *forests* were also mentioned by three groups.

Other habitats mentioned were:
- *Alpine habitats*
- *Marine phanerogams*
- *Seashore*
- *Lakes*
- *Dunes and coastal areas*, possibly for mangroves. Dunes were mentioned by two groups.
- *Open landscapes* with agriculture fields

When it comes to the reasoning of selecting one or two habitats over others, several elements were brought on the table. The criteria can be synthesized as follow:

- *Feasibility* was mentioned several times as a reason for selecting one habitat. For example, for forests, it was argued that they are relatively simple and straightforward to monitor with lidars, Copernicus and remote sensing. Wide spreads areas were also identified as better suited for remote sensing techniques. Availability of in situ data is also important to ensure the feasibility of this pilot.
- *Relevance* of a habitat (including policy relevance of a habitat on EU policies, conservation status of a habitat, habitat facing pressures) is a second criterion. For example, it was flagged that grasslands and wetlands are very relevant for biodiversity restoration. Alpine habitats are also urgent habitats to focus on due to climate change.
- *Transnationality* was another criterion raised by the workshop participants. It was mentioned that choosing one habitat should not exclude some Biodiversa+ partners from joining the pilot. It was for example mentioned that all the EU member states have grasslands.

B. What method should we use in the pilot to showcase possible harmonisation and/or refinement of indicators for habitat quality?

This second question "What method should we use in the pilot to showcase possible harmonisation and/or refinement of indicators for habitat quality?" was also discussed in groups during the workshop.

As main outcomes, different methods were mentioned by the groups including:
- That **species should be looked at to monitor habitat quality**. Assessing the number and intensity of threats affecting the habitats or other methods which wan detect / quantify pressures and habitat disturbances can be a way to do so. Indeed, species can be a way to assess the good condition of a habitat.
- For the **technologies**: remote sensing with satellites, lidars and drones as well as machine learning were mentioned.
- **Essential Biodiversity Variables** (EBVs) as a final approach enabling the pilot participants to use their own monitoring to construct EBVs.
- Developing harmonisation of field plot data and its usage.

In this section, it was flagged that the ecosystem accounting framework should be taken into account.

C. What habitats/habitat groups (annex 1 habitats/habitat groups) and/or quality parameters do the partners wish to use as showcases?

This third question "What habitats/habitat groups (annex 1 habitats/habitat groups) and/or quality parameters do the partners wish to use as showcases in the pilot?" was then also tackled in four sub-groups. Here the answers from the groups seemed to indicate that the answer to this question should **be the same as for question 1** on showcases for habitat quality indicators. Hence, here again open habitats, wetlands and mired, grasslands and meadows, without forgetting forests were listed.

For the quality parameters to be used as showcases, the participants raised:

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- The stability of ecosystems,
- The comparison of the concerned areas from current and past sentinel images.
- To select a large geographical coverage and/or areas with difficulties to access with limited other data.
- To look into EBVs possibly to look at ecosystem functioning and to test remote sensing techniques and EBVs.

D. Possible methods to be used in the pilot to showcase possible harmonisation and/or refinement of remote sensing (RS) techniques for mapping and support to evaluate the quality of indicators

For this fourth question on the "possible methods to be used in the pilot to showcase possible harmonisation and/ or refinement of remote sensing techniques for mapping and support to evaluate the quality of indicators", the answers were diverse.

Here again, there seemed to be a consensus within the groups that the methods should **be the same as for question 2 on indicators**.

Additionally:
- trying to re-use data that are already produced within European countries with remote sensing would be important.
- focusing on aspects where methods can be harmonised and where there need to be national or regional specialisation could help. Here, the role of Copernicus to support harmonisation to avoid differences between member states was flagged.
- when it comes to technologies or approaches: satellite, airplane scanning, involving citizens were mentioned.

II)   Day 2: 25th of May morning

During this second day, the participants were once again split into sub-groups to address some questions aiming to better frame this candidate habitat quality & mapping pilot. There were three sub-groups, two physical groups and one online group.

A. For habitat quality indicators, do you know if there are already available datasets that can be used for the pilot in your country or sub-region?

List of available datasets mentioned for the national and sub-national scales:
- For Austria: Forest inventory data, forest structure and diversity. Patch size, species composition, structure, land use, dead wood, disturbance. Mapping habitat quality and extent. Database compiling mapping and existing data.

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- <u>For Czech Republic</u>: They have a software for habitat mapping "Mapovaní biotope" and have some data in this software. But there data is quite old and Czech Republic is interested in receiving support for grasslands.
- <u>For Finland</u>: one of the best LIDAR datasets available: whole country 0.5 p/m2, by 2026 whole country 5 p/m2. Finnish ecosystem observatory (FEO) has made inventory for satellite datasets and built mosaics too. A + - comprehensive list of current datasets for habitat monitoring is done in LUSEK project (report coming out 2023.
- <u>For France</u>: CarHab national mapping of habitats. National mapping of wetlands that uses remote sensing PatriNat. Ramsar has data on wetlands. Forests are quite well monitored in France with good quality indicators.
- <u>For Georgia</u>**:** There are data sets available for quality indicators on forests in Georgia (NFI).
- <u>For Italy</u>: Arpa, data release after 3 years. A new portal will be opened with new datasets, maybe this summer.
- <u>For Bolzano (Italy)</u>**:** Multispectral data, Shannon index, land use/land cover, lidar data
- <u>For the Netherlands</u>: at the species level, datasets are available to look at abundance, distribution and coverage. At the habitat level, datasets are available to look at connectivity and land-use. Structure elements, dead wood, open patches, etc. Qualifying species. Environmental and water conditions (N-deposition, connectivity etc). Used in N2000 and national protected areas, not outside those.
- <u>For Slovakia</u>: Phytocoenological relatives of all habitat types. Monitoring of invasive species, and presence. Monitoring and presence of targeted endangered species.
- <u>For Catalonia (Spain)</u>: Habitat structure maps (Lidar), remote sensing (IfN).
- <u>For Sweden</u>: NILS inventories. Swedish NFI. Swedish Board of Agriculture, delineated grasslands mostly relevant for habitat mapping with remote sensing. Available Lidar data, aerial imagery. Citizen science data were also mentioned for Sweden.
- <u>For Turkey</u>: They have water quality data.

    List of available datasets at European level:
- <u>EU Grassland Watch</u>. Monitoring Natura2000-sites since 1994. Mowing, ploughing occurring. In the next phase we will connect this with butterfly data. All data are available for free, easy to download. More interested in degradation, so a slightly different target. Working closely with Copernicus, EU-scale.
- <u>LUCAS grassland module</u>. Points in Natura2000 areas.
- It would help to look at the mapping exercise conducted by the EEA in January 2023 during the workshop co-organised with the EPA_DK and Biodiversa+.
- References to <u>JRC EU-wide methodology</u> to map and assess ecosystem condition and to the "Guidance for assessing and monitoring the condition of annex I habitat types of habitats directive.

Links with the MAMBO project could be made.

B. For using remote sensing methods, do you know if there are already available datasets that can be used for the pilot in your country or sub-region?

For this second question, the below elements were identified.

For Austria: Map of ecosystem types of Austria, compiling habitat mapping efforts + Corine LC and source. Paternoster et. al. → in situ mapping.

For Estonia: partly. University of Tartu observatory + different institutes: plant coverage remote sensing, used for forest inventory. Landscape monitoring: landscape diversity, clear cuts, reedbeds change.

For Finland: The same as info on data for habitat quality indicators, see above, plus: elevation models, typological and land cover mats, good ecological maps, modelling for peatlands and alpine region already done. Forest type polygons (16 * 16 m), have modelled for the whole country (but there are errors of course).

For Georgia: there are data sets available for remote sensing in Georgia (example: land cadastre)

For Bolzano (Italy): Lidar, NDVI, multi spectral data, soil moisture maps.

For the Netherlands: nitrogen deposition. NIR, lidar, RGB, NDVI

For Slovakia: datasets are currently produced and verified (no further info).

For Catalonia Spain: habitat mapping is performed but not too detailed (land cover mapping), datasets available, (calibration data sets available).

For Sweden: for many datasets: the whole country. High-resolution lidar: smaller areas, high-resolution LC. Maps: smaller areas. Drone image data: small areas.

From the European Commission:
- reference to EU grassland watch platform (EU level)
- knowledge centre on earth observatory of JRC, working on mapping wetlands.

    Additionally, it was mentioned that:
- the EPA_DK released a report looking at the costs of biodiversity monitoring techniques and their feasibility.
- In Lapland, they identified 20 remote sensing techniques.

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C. Present and place the post-its describing your national/ sub-national methods for habitat quality indicators / habitat mapping with remote sensing on a scale.

For this question, two group did the exercise. Screenshot of their answers are available below.
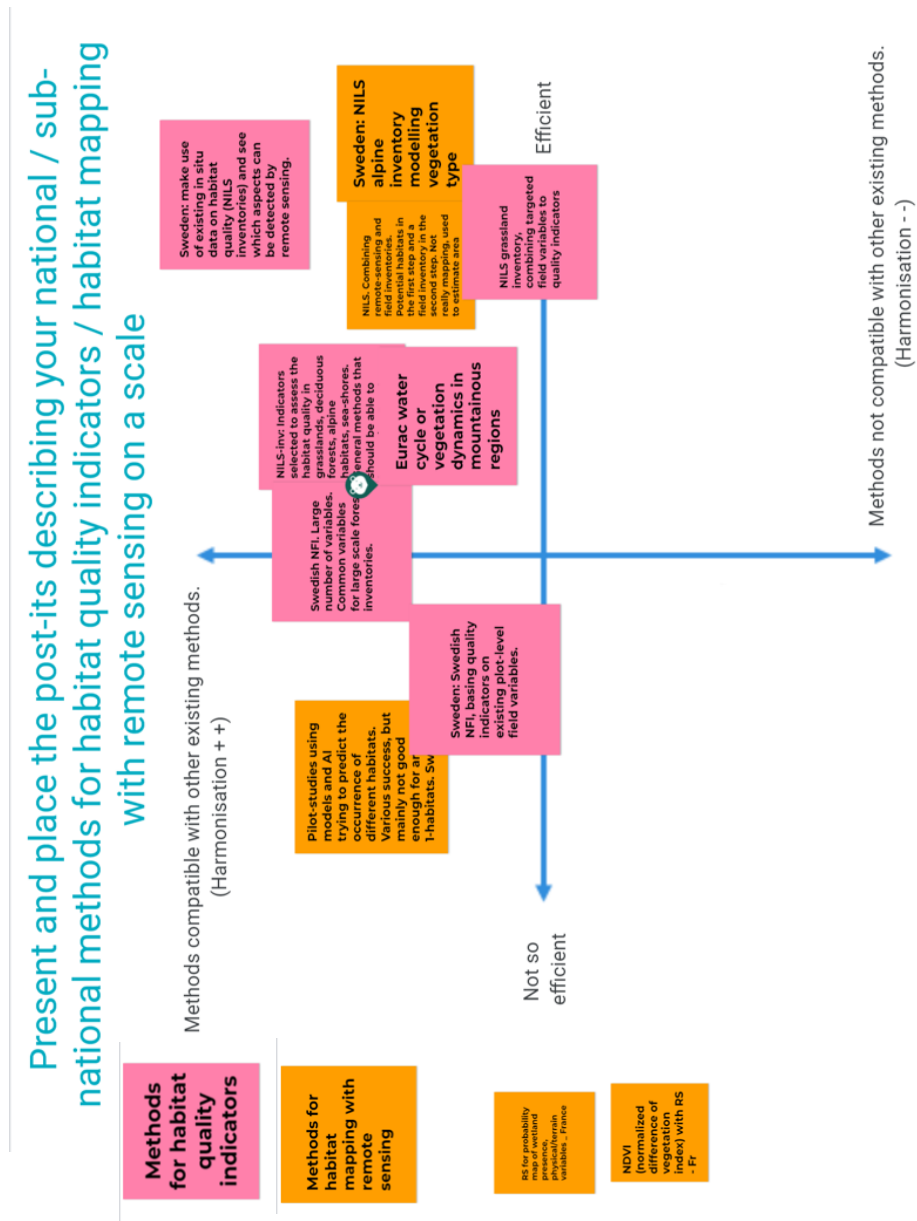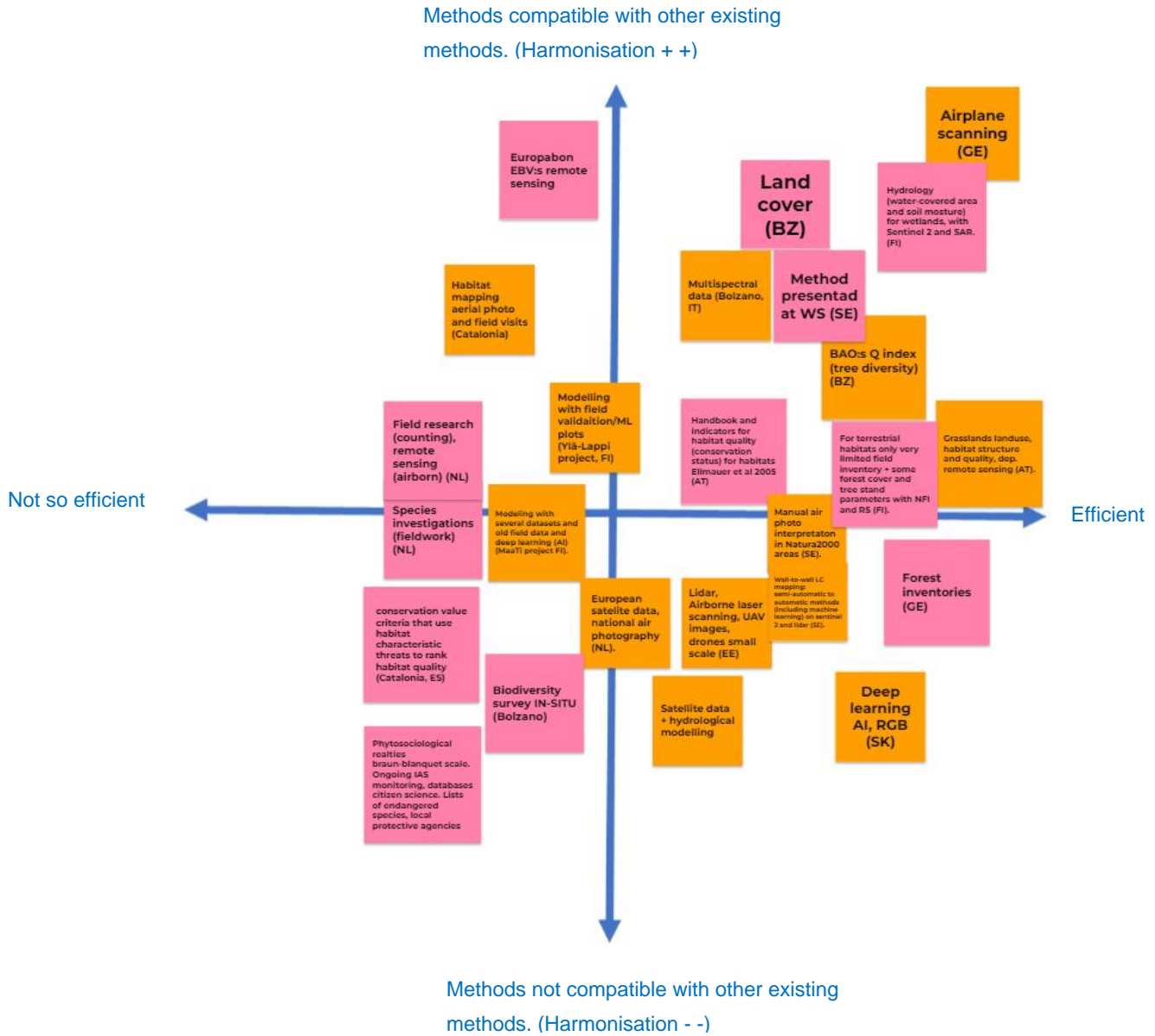

Fig 1: online group

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Methods compatible with other existing methods. (Harmonisation + +)

Airplane scanning (GE)

Europabon EBV:s remote sensing

Land cover (BZ)

Hydrology (water-covered area and soil mosture) for wetlands, with Sentinel 2 and SAR. (FI)

Habitat mapping aerial photo and field visits (Catalonia)

Multispectral data (Bolzano, IT)

Method presentad at WS (SE)

BAO:s Q index (tree diversity) (BZ)

Modelling with field validaition/ML plots (Ylä-Lappi project, FI)

Handbook and indicators for habitat quality (conservation status) for habitats Ellmauer et al 2005 (AT)

For terrestrial habitats only very limited field inventory + some forest cover and tree stand parameters with NFI and RS (FI).

Grasslands landuse, habitat structure and quality, dep. remote sensing (AT).

Field research (counting), remote sensing (airborn) (NL)

Not so efficient

Species investigations (fieldwork) (NL)

Modeling with several datasets and old field data and deep learning (AI) (MaaTi project FI).

Manual air photo interpretaton in Natura2000 areas (SE).

Efficient

Wall-to-wall LC mapping; semi-automatic to automatic methods (including machine learning) on sentinel 2 and lidar (SE).

Forest inventories (GE)

conservation value criteria that use habitat characteristic threats to rank habitat quality (Catalonia, ES)

European satelite data, national air photography (NL).

Lidar, Airborne laser scanning, UAV images, drones small scale (EE)

Biodiversity survey IN-SITU (Bolzano)

Satellite data + hydrological modelling

Deep learning AI, RGB (SK)

Phytosociological realties braun-blanquet scale. Ongoing IAS monitoring, databases citizen science. Lists of endangered species, local protective agencies

Methods not compatible with other existing methods. (Harmonisation - -)

Fig 2: Group 1 answers

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