



# Report on interdisciplinary conceptual and methodological approaches - Update

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## 1. Introduction

This report is a status update on the progress of deliverable 1.3, which aimed to improve the common understanding of how the trans4num project addresses NBS from an inter- and transdisciplinary perspective and how we can develop nested frames and approaches for the interdisciplinary analyses of NBS across sites and scales.

### 1.1 Objectives of task 1.3

Implementing NBS is a complex process and requires a comprehensive concept for intentional change at various societal levels of decision-making and intervention. In other words, a shift towards NBS in agricultural nutrient management implies a transformation of practices not only in agriculture and at the producer level but equally along value chains and among various other societal groups (e.g., functionaries, citizens, companies, consumers, etc.). As a basis, a nested conceptual framework is necessary to allow a broad scope of research and assessment on the inter- and transdisciplinary dimensions of the issue (Knierim et al. 2018). A systems approach is appropriate for studying situations that are adaptive and dynamic. The methodological core of trans4num is the development, adjustment, testing, and upgrading of sustainable nutrient supply and management innovations. trans4num will develop and implement a social-ecological transformation (SET) approach tailored for the inter- and transdisciplinary research on NBS for more sustainable nutrient management in regions with intensive farming systems.

In task 1.2, "Develop nested frames and approaches for the interdisciplinary analyses of NBS across sites and scales," the objective was to build upon and differentiate the conceptual framework of task 1.1. An important step in this direction was conducting a series of webinars from March to May 2023 that showed a range of approaches towards and practices of NBS. Task 1.2 developed a joint understanding of the approaches for the interdisciplinary analyses of NBS across sites and scales. The outputs of task 1.2 and Deliverable 1.3 have informed all trans4num NBS cases on how to design experiments, tools, and models to obtain results corresponding to expected internal and external use.

Deliverable 1.5 is a status update of the report on the interdisciplinary conceptual approach to the NBS site analysis, taking into account the various disciplinary and practice-related interests and expected outputs. The main objective of this deliverable 1.5 is to report on the update on interdisciplinary conceptual and methodological approaches used in the four NBS sites in Denmark, Hungary, the UK, and the Netherlands.

### 1.2 Purpose and development procedure of Deliverable 1.5

To achieve the objectives of task 1.2, we undertook a stocktake of how each partner/NBS site was working inter- and transdisciplinary with their NBS innovations. The inputs from both the webinars and from a survey/excel spreadsheet distributed to all NBS site partners (see [D1.3](#)), were used in the deliverable 1.3 report as material to understand these approaches. As part of updating this, we asked all NBS sites and partners to update on the progress and give inputs if any changes to the approach outlined in D.1.3 had changed.

### Development procedure

This deliverable was developed as part of WP1, with D 1.3 (Report on interdisciplinary conceptual and methodological approaches) led by AU. AU defined the basic structure and contents of the document with the support of UHOH, RRes, CFS, WU, SZE, FiBL, P4All, CAAS, HAAS, and SWU. This reporting was shaped through several online meetings and online webinars between the project partners, and the draft was uploaded to a common platform where partners could comment and add their input. The final document thus reflects the partners' shared insights on how they work interdisciplinary with their NBS interventions and is suitable for developing a common understanding that will guide the implementation of further project activities.

The procedure followed through online webinars and meetings, and a better understanding and clarification of analytical approaches and indicators for sites was developed. A survey/distribution of Excel spreadsheets to trans4num partners was supplied for this. The partners were asked to fill in information and answer questions from all four NBS sites and their NBS innovations. The aim was to collect information on the following questions:

- What do the partners understand with inter-disciplinary and/or trans-disciplinary?
- How do the partners work inter-disciplinary and/or transdisciplinary at their NBS site?
- How are interdisciplinarity and/or transdisciplinarity used in the partner NBS site?
- What kind of data will be collected in the NBS sites, and how are they inter-disciplinary?
- What type of analytical approaches will be conducted?

These findings provide the conceptual basis for developing joint approaches to interdisciplinary analyses of NBS across sites and scales. This deliverable is an update on D1.3.

The next four sections give an update on the implementation of NBS innovations in the four sites.

## 2. Update on NBS Sites

### 2.1 Update on the Danish NBS site

The Danish NBS site is running as planned. The inter- and transdisciplinary approach used at the Danish site is a dialogic and involving approach where all stakeholders are involved in co-creating the targeted transformation. The Danish partners use a mix of social and natural science methods. Stakeholder engagement activities and interviews have begun. One larger stakeholder workshop/meeting will be held in October 2024. The next step is finding 2-5 ambassador farmers as key informants. Interviews with biogas facilities and biorefineries in the area have been conducted, as well as with farmers and regulators. These outputs will be reported in 2025. For the quantitative assessment, the model is set up. The following steps are to start the calculation/modelling of biomass availability and nitrogen resources in a substance-flow modelling framework.

Regarding an update on report 1.3, we are planning to assess stakeholder responses to regulation and adapted regulation governing the NBS. Our stakeholder group has been broadened to include additional downstream value-creation stakeholders. We aim also to involve national public servants/regulators. We also aim to include more economical cost and revenue data at the farm and crop levels in our assessments and modelling.

### 2.2 Update on the NBS site in the Netherlands

The Dutch NBS sites are all running according to plan. At the Ebelsheerd location, the test fields (crop is winter wheat) are almost harvested, and the yield figures and crop observations can be processed. Construction is planned for the 2025-2026 growing season. Several interested actors (mainly growers) visited the test fields in the past growing season. The processed results will be shared in a lecture next winter.

The potato trial is in full swing at the Kollumerwaard location, and several observations still need to be made during the growing season. Due to the potato growers' busy schedules, a video explaining the results so far has been recorded from the test field. This video is shared via the email newsletter and on social media. The full results will also be shared via a webinar during the coming winter seasons.

Taking the various soil samples and leaf samples is going according to plan and is still in progress.

### 2.3 Update on the NBS site in Hungary

The Hungarian NBS site is running as planned. In 2024, the crops were rotated. All the crops, durum wheat, soya, and sorghum, were sowed. Monitoring and measurements are continuing this year as well. This May and June were extremely rainy, so sometimes there were delays in applications and sampling.

Further, during the growing, the trial is continuously monitored with soil, plant sampling, and remote sensing techniques, not only checking the trial but also helping to make the nutrient application decisions based on the measured nutrient status of the soil and plant. Soil samples from conventional and NBS sites are also taken for carbon-emission analysis. In September, a

larger stakeholder meeting and demonstration are planned. We are planning several demonstrations on the field during the event, like soil profile descriptions and checking the soil structure and vegetation on the trial field together.

#### 2.4 Update on the NBS site in the United Kingdom

Field trials at the Rothamsted Research North Wyke site have been hampered by both drought conditions (following the sowing of spring wheat and oat plants in April 2023) and extreme levels of over-winter rainfall (following the sowing of winter wheat and oat plants in September 2023). Whilst crop production was much lower than expected for the spring crops, a harvest has been taken and processed. The winter crops largely failed following germination over the winter 2023-24 period due to flooding of the field, and as such the plots were abandoned. New plots are planned for a winter crop to be harvested in 2025 and 2026 at two new locations close to the research site.

The Rothamsted Research Harpenden and Brooms Barns sites are running as planned. However, they too have been affected by the very wet winter and spring of 2023-2024. Late sowing of winter wheat to minimize Take-all and Blackgrass issues failed on the clay loam soil at Harpenden. Early October sown winter wheat looks good although disease control has been expensive in the damp spring conditions. Spring wheat replaced the late-sown winter wheat and struggled in the wet May weather. After 6 years of attempting late sowing of winter wheat, we will bring this technique to an end. The risk of crop failure is too great.

On the sandy loam soil at Broom's Barn the wheat crops fared better in the wet conditions. At both sites, the oilseed rape harvest is just days away. That harvest signifies the beginning of the most intense period of work as harvesting is followed by compost applications, cover crop and finally cash crop sowing.

The theory of planned behaviour is being used for quantitative social science analysis. Qualitative analysis will be conducted using ethnographic using ethnographic and semi-structured interviews. Along with workshop activities at stakeholder engagement events. The first event was held in May 2024 which involved a tour of the trial site in Harpenden and workshop activities in the afternoon. An online event will be held in November 2024, with 3 in-person events and 1 online event planned for 2025. These will be themed on soil carbon/soil health; pests, weeds and disease; compost management; and cover crops. Semi-structured interviews and ethnographic observations with farmers at their farms started in July 2024.

#### 2.5 Overall update on the assessment of interdisciplinary approaches and updates

In the trans4num project, we have now agreed on the following points for the future of the NBS innovations:

1. Joint approach for stakeholder engagement: We have now agreed on a comprehensive strategy for stakeholder engagement at local, regional, and (inter)national levels.
2. Testing of DSS: The Decision Support System (DSS) will be tested across four diverse sites, each involving a variety of stakeholders.

3. Connection between DSS and Agent-Based Modelling: We are exploring the potential integration of DSS and Agent-Based Modelling (ABM) through regional scenario design and stakeholder engagement.

4. Metrics for NBS assessment: We have developed metrics for assessing Nature-Based Solutions (NBS) across different sites, as detailed in the enclosed Word document. These metrics will also be applicable beyond the trans4num project, such as through the tags used for the online inventory.

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## References

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