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Recommendations for transformation pathways

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Table of Abbreviations

AI4EO	Artificial Intelligence for Earth Observation
AKIS	Agricultural Knowledge and Innovation System
CAP	Common Agricultural Policy
CNM	Circular nutrient management
DST	Decision Support Tool
EU	European Union
IFSA	International Farming Systems Association
NBS	Nature-based Solutions
PR	Periodic Report
SET	Social-ecological Transformation
SISA	Smart Info-Media Systems in Asia
UHOH	University of Hohenheim
WP	Work Package

The project context

The project “transformation for sustainable nutrient supply and management” (trans4num) aims to substantiate and broadly promote Nature-based Solutions (NBS) for sustainable agriculture in Europe and China, with a particular focus on nutrient management, bio-based nutrient sources, sustainable crop rotations and optimisation of nutrient flows. The project combines biophysical, technological, economic, social and institutional perspectives and applies a systemic approach to farm-level NBS innovations in regions characterised by intensive farming systems.

A central premise of trans4num is that the performance and uptake of NBS depend not only on technical effectiveness but also on the socio-economic and environmental conditions under which innovations are implemented. These conditions include local soils and climate, farm-business realities, markets and value chains, regulation, advisory capacity, institutional arrangements and collaboration among actors. Multi-actor engagement is therefore a prerequisite to develop, spread and institutionally embed innovations and to prepare for transformation pathways that can support wider acceptance, adaptation and scaling.

Deliverable D5.5 synthesises learning generated through regional and international events, exchanges between the European and Chinese consortia, clustering with related Horizon Europe and national projects, stakeholder workshops and field-based engagement. It connects this event-based learning with evidence from other trans4num deliverables and derives recommendations for strengthening NBS transformation pathways. The recommendations are organised around three interdependent questions:

- what nutrient management innovative NBS work where and under which conditions?
- how can NBS innovations become a viable choice for farmers and value-chain actors? and
- how can collaboration, knowledge infrastructures and governance support learning and scaling?

1. Introduction

In the course of the trans4num project (2022-2026), meetings, workshops, field visits, demonstrations, conferences, seminars, hackathons and project-to-project exchanges created opportunities to compare experiences, discuss barriers and enabling factors, test tools and reflect on the conditions required for NBS implementation. These activities involved project partners, farmers, advisors, researchers, businesses, policymakers, regional planners, civil-society actors and partners from related European and Chinese initiatives.

This deliverable has two connected purposes. First, it documents the principal regional and international exchange and learning activities undertaken during the project, including exchanges between the European and Chinese consortia and clustering with related projects. Second, it aggregates the insights from these activities together with evidence from trans4num documents and deliverables into recommendations on how NBS transformation pathways can be strengthened.

The analytical logic of the report is therefore: exchange and engagement generate or test insights; these insights are interpreted together with project evidence; recurring barriers and enabling conditions are identified; and recommendations are formulated for transferability, scaling and longer-term transformation.

2. Methodology

2.1 Evidence base

The report draws on two complementary bodies of evidence. The first is the portfolio of project events and exchanges, including General Assemblies and Steering Committee discussions, regional stakeholder events, field demonstrations, international conferences, EU-China exchanges, and collaboration with related projects. The second is the documented evidence generated in trans4num deliverables and documents used to interpret the event learning.

Sources reviewed for the event portfolio included the periodic project reports (PR1: 01/12/2022–31/05/2024; PR2: 01/06/2024–30/11/2025), reports and minutes from General Assemblies and Steering Committee meetings, project website announcements, stakeholder engagement reports and communications on participation in international events.

For the synthesis of insights on transformation pathways, the review also drew on D1.2 and D1.4 on stakeholder involvement; D2.2, D2.3 and D2.5 on NBS implementation and transdisciplinary evaluation; D2.4 on NBS innovations using AKIS and value-chain frames; D4.1 on social innovations and institutional change in China and the EU; and on D5.3 and D5.7 practice abstracts.

2.3 Analytical approach

Events were characterised by date, topic, format, location or delivery mode, target groups, available participation information, principal content, and documented insights. The purpose was not to treat every event as equivalent evidence, but to identify where exchange activities contributed to mutual understanding, practical learning, validation of project findings or connections with wider NBS initiatives.

The synthesis was structured around three questions:

- What works, where and under which conditions? This question addresses farm-level performance, adoption and the contextual conditions that influence the transferability of NBS.
- How can NBS become a viable choice? This question addresses markets, incentives, regulation, investment, risk and the economic conditions needed to move from demonstrations to durable implementation.
- Which collaboration, knowledge and governance arrangements support learning and scaling? This question addresses advisory systems, intermediaries, multi-actor coordination, institutional continuity and links between local experimentation and wider policy processes.

3. Regional and international exchange and learning activities

International, national and regional trans4num events harmonised understanding across European and Chinese partners, exposed project teams to different NBS contexts, brought research findings into dialogue with practitioners and policy actors, tested tools and messages, and connected trans4num with related initiatives. The most relevant activities are summarised below (in Table 1), with an inventory provided in Annex 1.

3.1 EU-China and international partner exchange

Table 1: Overview of EU-China exchange events

Event	Date	Format	Contribution to learning
China partnership meeting and field visits, Beijing & Inner Mongolia	Sep 2024	Field visits/partnership meeting	Exchange on nutrient-management strategies, modelling approaches and farmer engagement; comparison of implementation contexts.
Sino-German Conference, Chengdu	Sep 2024	Conference	High-level discussion of transformation of intensive farming systems and positioning of trans4num within wider sustainability debates.
International Academic Exchange Conference and field trips, Henan	4-7 Nov 2025	Conference / field visits	Scientific exchange and field-based learning on sustainable agricultural development.
China-EU Symposium on Sustainable Agricultural Development, Zhengzhou	Nov 2025	Symposium	Exchange on nutrient management, soil health, carbon sequestration and green transition pathways; strengthened EU-China scientific collaboration.
Henan & Rothamsted Partnership Workshop	19-28 Jul 2025	Workshop	Strengthened scientific partnership and exchange between European and Chinese research teams.
Chinese Agricultural University seminars and meetings, Beijing	2 Nov 2025	Seminars/ meetings	Exchange with Chinese academic partners on project-relevant research.
Field trips to Yucheng and Fanxian	5-6 Nov 2025	Field visits	Connected conference discussion with observation of agricultural practices and NBS-relevant sites.
Southwest University seminars and field trips, Chongqing	8-9 Nov 2025	Seminars/field visits	Extended international exchange to additional research and field contexts.

Across these activities, a recurring lesson was that NBS cannot be transferred as standardised packages. Exchange across countries made differences in biophysical conditions, institutional settings, farm structures and policy environments visible, while also revealing common needs for long-term evidence, trusted intermediaries, economic viability and strategies that connect local experimentation with wider governance.

3.2 Clustering with Horizon Europe and national initiatives

Table 2: Overview of events in collaboration with Horizon Europe and international initiatives

Activity	Date	Format	Learning function
ECONUTRI, trans4num, and PESTNU conference, Agricultural University of Athens	27 Sep 2024	Joint conference	Shared approaches to sustainable nutrient management and NBS addressing environmental, economic and societal needs.
Joint stakeholder conference, Athens	Sep 2024	Stakeholder conference	Supported EU-China dialogue and cross-project exchange on NBS for nutrient-pollution reduction.
Joint trans4num & AMAIZE-P excursion, Denmark	Jun 2025	Excursion/ field learning	Hands-on learning at NBS sites on nutrient recycling, soil health and regenerative fertilisation pathways.
TRANS4NUM & Óvár Scientific Day, Hungary	Nov 2025	Scientific day/ DST testing	Combined project-result exchange with testing of the nutrient-management DST by researchers, farmers, advisors and policymakers.
Green Connections kick-off, Baden, Austria	May 2026	Project exchange	Connected trans4num results with a new NBS initiative and explored cross-border research–practice cooperation.

These exchanges broadened the project's reference base beyond its own cases. They reinforced the importance of combining agronomic evidence with economic, regulatory and organisational conditions, and demonstrated the value of field-based and tool-based formats for making differences between contexts explicit.

3.3 Stakeholder engagement, demonstrations and tool development

Stakeholder activities were particularly important for connecting research evidence with farm-level decision-making. Examples included Research Insight days at North Wyke and Harpenden (UK); farmer meetings at Ebelsheerd and Kollumerwaard (NL); Hungarian demonstrations on nature-based farming, no-till, soil profiles, organic farming and precision agriculture; soil-carbon events at Rothamsted (UK); workshops with Danish farmers, advisors and regional planners; and Decision Support Tool workshops in Hungary and Denmark.

The events show that engagement was most useful when participants could relate evidence to concrete decisions. Field tours and demonstrations made soil, crop and management effects observable; farmer-researcher discussions exposed operational constraints; workshops with advisors and planners connected technical options to advisory and regional decision processes; and user-experience workshops helped translate stakeholder needs into DST design. This supports an understanding of engagement as part of innovation development and adaptation, rather than as dissemination after technical work is complete.

3.4 Conference presentations and scientific reflection

Trans4num findings and concepts were presented at Tropentag 2023, IGLS 2024, IFSA 2024, Landscape 2024, the SISA Workshop 2024, the European Geoscience Union General Assembly 2025 and AI4EO 2025. These activities presented the trans4num's transformation-pathway framing, stakeholder-engagement approaches and technical developments to wider scientific communities. They also provided opportunities to position the project's case evidence within broader debates on sustainable nutrient management, transformative change, remote sensing and decision support.

3.5 Events planned after preparation of this deliverable

At the October 2026 preparation date, several final events are planned but have not yet taken place: the Nature-based Solutions International Congress at Sorbonne University (2–6 November 2026), a policy conference in Brussels (12 November 2026), the second trans4num/INSPIRE Hackathon (22–23 November 2026) and an EUFRAS Lunch Meeting (26 November 2026). Because their outcomes were not yet available, they are not used as evidence for the recommendations below. They are expected to provide final opportunities for dissemination, validation and discussion of project results.

4. Implications for NBS transformation pathways towards circular nutrient management

The cross-case evidence confirms that transformation pathways are combinations of practices, actors, infrastructures, market arrangements and governance conditions rather than linear routes from research result to adoption. The four European cases illustrate distinct configurations and therefore provide a basis for identifying transferable principles.

Table 3: Summary of key findings from the cross-country evaluation of the trans4num NBS cases

Dimension	Denmark	Hungary	Netherlands	UK
Main nutrient-circularity pathway	Perennial biomass, biorefining and cascading nutrient use	Integrated soil and nutrient-management NBS	Plant-based fertilisation and local biomass recycling	Reduced tillage and organic amendments
Key technical/ environmental finding	Potential regional integration of biomass and nutrient flows	Positive soil-health and nutrient-cycling trends while maintaining crop nutrition	Long-term evidence of maintained soil functioning under reduced external nutrient inputs	Long-term improvements in soil carbon and aggregate stability
Main technical constraint	Biomass logistics, processing and side-stream utilisation	Soil heterogeneity and crop/year-dependent performance	Nutrient-release timing, yield response and environmental variability	Transition-period yield effects and soil-dependent responses
Key social/ governance consideration	Coordination, regulation and risk distribution across the value chain	Farmer confidence and economic uncertainty	Regulatory fit and advisory capacity	Confidence in medium- to long-term cost-benefit
Main scalability constraint	Biomass–processor coordination and facility location	Site-specific adaptation and advisory needs	Land and biomass requirements, farm-business integration and site-specific adaptation	Organic amendment availability and markets for diversification crops
Key enabling factor	Strong knowledge base, intermediaries and emerging policy opportunities	Trusted local intermediaries and practical demonstrations	Long-term platform and farmer-researcher collaboration	Long-term experimental infrastructure
Long-term support needs	Markets, investment, regulation and risk-sharing	Advice, monitoring and peer learning	Evidence, advisory support and enabling policy	Economic evidence, decision support and transitional policy support

Source: D2.5, 32-33

4.1 What works where? Conditions for farm-level NBS adoption

No single agricultural solution can be expected to perform consistently across the diverse biophysical, socio-economic and institutional contexts represented in trans4num. The project evidence supports a portfolio of NBS and complementary approaches, including crop diversification, improved rotations, biological nutrient recycling, bio-based fertilisers, soil-management practices and integrated combinations of practices and technologies. The key question is therefore not whether an NBS "works" in a field trial, but under which conditions it performs sufficiently well to become feasible and credible for farmers.

Denmark

The Danish pathway centres on perennial biomass production, green biorefining for protein extraction and cascading recovery and use of nutrients across interconnected regional value chains. Its potential lies in linking low-leaching biomass production, new processing technologies, nutrient recovery and downstream uses, supported by spatially explicit decision-support tools. The main constraints are biomass logistics, processing requirements, side-stream utilisation, infrastructure location and most importantly market competitiveness-where environmental benefits of production are currently not included sufficiently in agricultural policies.

Scaling and broadening should therefore both focus on technological advancements and adapted market frameworks. This includes place-based configuration rather than replication of a single facility or business model, biomass availability, nutrient flows, land use, environmental pressures, processing capacity and transport requirements, which need to be assessed together. DSTs can support this process by making spatial, economic and environmental trade-offs explicit to multiple actors. It also includes adapting policy frameworks to incentivise economic pathways which make actions to reduce nutrient losses via cropping choices viable.

Hungary

The Hungarian pathway centres on integrated soil and nutrient-management NBS. Positive trends in soil health and nutrient cycling coexist with strong variation by soil conditions, crop type and growing season. This context dependence, together with farmers' need for timely information on yield stability, costs and production risk, limits the usefulness of uniform prescriptions.

Scaling should therefore rely on site-specific adaptation supported by soil and crop monitoring, practical demonstrations, trusted local advisors and peer learning. Environmental performance needs to be assessed together with input costs, labour requirements, yield stability and potential savings from reduced external inputs.

Netherlands

The Dutch pathway centres on plant-based fertilisation and local biomass recycling, supported by the long-term Planty Organic platform and close farmer-researcher interaction. Long-term evidence indicates potential to maintain soil functioning under reduced external nutrient inputs, but nutrient-release timing, yield response, environmental variability, labour and transport requirements, and dedicated land needs influence feasibility.

Adaptation to soil, crop demand, biomass availability and farm-business structure is essential. Gradual transition strategies, potentially combining plant-based nutrient sources with faster-

acting sources where appropriate, and continued monitoring may help manage implementation risks while longer-term evidence accumulates.

United Kingdom

The UK pathway centres on reduced tillage and organic amendments and benefits from long-term experimental infrastructure. Evidence indicates improvements in soil organic carbon and aggregate stability, while also showing that responses vary by soil and management conditions and that transition-period yield effects can be important. Availability and spatial distribution of organic amendments and markets for diversification crops further constrain scaling.

Transferability therefore depends on translating long-term experimental evidence into locally relevant information on yields, economic risks and management options. Scaling also requires viable commercial pathways for amendments and diversification, alongside transitional support where environmental benefits emerge over longer time horizons than farm-business decisions.

4.2 Making NBS a viable choice: markets, incentives and regulation

Across the cases, technical feasibility alone is insufficient for introducing change. Farmers, processors and other actors need economic propositions that do not disfavour NBS value chains compared to current practises, manageable transition risks and regulatory arrangements that recognise circular nutrient practices. Where NBS create public environmental benefits that are not internalized in market structures, market development may need to be complemented by targeted public or collective support and policy frameworks which function to equalize competition between NBS and current value chains.

In **Denmark**, commercial biorefinery development and scaling depends on equal market competition between biorefinery products and their alternatives, contractual arrangements, multi-year supply-chain logistics and substantial upfront investment. Potential strategies include production and investment support, policies that internalize environmental externalities in the market economy, advisory capacity, improved data access and arrangements for allocating investment and operational risks.

In the **Netherlands**, plant-based nutrient management requires biomass production, harvesting, transport and application, as well as sufficient land for biomass production. At the same time, some improvements in soil functioning may only become evident over longer time periods, while farmers need to manage short-term uncertainties related to nutrient availability and crop yields. Transitional support could therefore help manage risks during the transition. Regulatory recognition of plant-based nutrient inputs, with appropriate agronomic and environmental safeguards, could further support wider implementation.

In **Hungary**, the time lag between improvements in soil functioning and economic returns creates uncertainty. Advisory expertise, monitoring, peer learning and locally visible demonstrations can reduce information-related risk, while targeted incentives or risk-sharing may be relevant where farmers carry additional short-term operational or production risks.

In the **UK**, spatial separation between livestock and arable production and the economic requirements of new nutrient-recovery value chains create logistical and commercial barriers. Potential strategies include transition-period investment support, catchment or landscape-level coordination, infrastructure that enables nutrient redistribution, and regulation that facilitates safe use of bio-based fertilisers and circular nutrient products.

4.3 From individual action to coordinated nutrient management

The cases show that the contribution of NBS innovations to promising transformation pathways depends on institutional arrangements that connect scientific expertise with practical and local knowledge. The configurations differ: Denmark has a distributed multi-actor arrangement spanning regional value chains and policy; Hungary links research, agricultural practice and local stakeholder engagement through demonstration farms and advisory services; the Netherlands relies on a long-term research-field partnership embedded in regional farmer networks; and the UK is strongly anchored in established experimental research infrastructure.

Despite these differences, the cases point to a common challenge: many NBS provide environmental and social benefits, but these benefits are not fully reflected in agricultural markets. Farmers often bear the costs and risks of adopting NBS, while much of the benefit goes to wider society. Without adequate financial returns, compensation or other economic incentives, farmers may have limited reasons or resources to adopt these practices, even when they recognise their environmental value. Creating the right economic conditions is therefore central to enabling wider adoption and long-term change.

However, economic incentives alone may not be enough. The cases also highlight three conditions that shape how effectively NBS can be developed, adopted and scaled up. First, the involvement of different actors needs to match the scale and complexity of the solution. While farmers and researchers often play central roles, wider adoption may also depend on processors, advisors, municipalities, policymakers and civil-society organisations. These actors can help address practical barriers, connect different interests and create opportunities for implementation. Second, access to knowledge, technical support and stable funding is important for helping farmers test, adapt and maintain new practices. Short-term projects can initiate experimentation, but lasting change often requires continued support beyond individual project cycles. Third, effective coordination and trusted intermediaries are needed to connect local learning and cooperation, such as exchanges between farmers, with decisions and support at regional, national and European levels. These connections can help translate practical experience into wider institutional and policy support.

These findings suggest that economic incentives are essential for encouraging farmers to adopt NBS, while the involvement of different actors, continued support and effective coordination help turn initial adoption into lasting change. The trans4num activities show how these supporting conditions can be strengthened in practice. Field demonstrations and excursions allowed participants to learn from real-world examples, while stakeholder workshops helped identify practical challenges and farmers' needs. Exchanges between the EU and China highlighted how solutions need to be adapted to different local conditions, and joint activities with ECONUTRI, PESTNU and AMAIZE-P provided opportunities to learn from a wider range of NBS experiences. Workshops on decision support tools (DSTs) also brought different actors together to discuss their assumptions, compare options and explore possible solutions. Taken together, these experiences suggest that such activities are most useful when they support ongoing collaboration, learning and adaptation, rather than being organised as isolated events.

5. Recommendations for strengthening NBS nutrient management

The four European cases show that NBS can help improve nutrient management, but their wider adoption depends on more than scientific evidence or technical performance. Farmers need solutions that work under local conditions and make economic sense, while advisors, businesses, researchers and public authorities need to provide suitable knowledge, infrastructure, incentives and support.

The trans4num learning and exchange events (Annex 1-5) provide practical insights into these challenges. Across the events, five lessons stand out: (1) field demonstrations and farmer discussions showed the importance of testing solutions under real farming conditions and considering practical constraints; (2) workshops with farmers, advisors and other stakeholders highlighted the need for information and opportunities to exchange knowledge; (3) exchanges between European and Chinese partners, together with discussions on trans4num tools and models in the UK, Netherlands, Denmark and Hungary, highlighted the importance of local farming conditions and institutional differences; (4) joint activities with ECONUTRI, PESTNU and AMAIZE-P demonstrated opportunities for sharing experience across projects and connecting different parts of the agricultural sector; and (5) decision-support workshops showed that tools become more useful when farmers, advisors and planners help shape their design and application. These lessons inform eight recommendations for strengthening NBS nutrient management.

i. **Start with locally relevant NBS and develop policies that support their wider adoption.** Regional authorities, agricultural policymakers, researchers and farm advisors should identify nutrient management solutions that address local farming and environmental challenges. This means considering soil types, rainfall, water availability, nutrient sources, farming systems, infrastructure and market conditions before promoting wider adoption. National and regional policies should allow for these differences and provide incentives that make suitable NBS economically attractive to farmers. For example, fertiliser guidance could better reflect regional soil and weather conditions rather than relying mainly on uniform national recommendations. This responds to the risk of promoting solutions that work in one region but are unsuitable or too costly elsewhere. The EU-China exchanges, particularly the field visits and discussions with farmers in Inner Mongolia, provided opportunities to compare different farming practices and contexts. The November 2025 workshop in Hungary also identified institutional differences that could affect the use of a decision-support tool developed in Denmark.

ii. **Show both the environmental benefits and the economic value for farmers.** Researchers, farm advisors and agricultural businesses should assess and communicate how NBS affect soil health, nutrient losses and environmental quality alongside crop yields, input costs, labour requirements, farm income and financial risks. Farmers need practical information on the costs and benefits of changing practices, including how long it may take to see results. Research and advisory organisations should work towards consistent ways of recording these outcomes at farm level, while policymakers should use this evidence to design payments or other incentives that recognise environmental benefits not rewarded by markets. At the Hungarian stakeholder roundtable in April 2024, participants discussed the practical advantages and disadvantages of NBS. The Rothamsted events on soil carbon and organic amendments also provided opportunities to examine scientific evidence and

its relevance to farming decisions. These activities support the need to connect research findings with practical choices, although further farm-level economic evidence is needed. Progress could be assessed by more trials reporting both financial and environmental results, the availability of understandable farm-level cost-benefit information, and the use of this evidence in agricultural advice and support schemes.

iii. **Support long-term research, on-farm trials and farmer-to-farmer learning.** Research institutions, agricultural authorities, farmer organisations and funding bodies should support long-term field experiments, monitoring programmes and practical demonstrations. These should be linked to farmer-led trials and regular exchanges between farmers, researchers and advisors. At farm and regional levels, this would allow farmers to compare NBS with existing practices and assess their performance under familiar conditions. Stronger connections between initiatives such as Innovative Farmers and established research organisations, including ADAS, Rothamsted Research and the John Innes Centre, could help make research more relevant to practical farming needs. This addresses the limited long-term evidence and the difficulty of translating research into everyday practice. In trans4num, field meetings at Ebelsheerd and Kollumerwaard in the Netherlands brought trial results into discussions with farmers, while Rothamsted field visits allowed participants to examine crop rotations, soil carbon and organic amendments. Participant feedback indicated that these visits helped broaden understanding of NBS implementation.

iv. **Strengthen farm advisory services and trusted connections between research and practice.** Agricultural authorities, research institutions, farmer organisations and professional advisory bodies should provide ongoing training and practical resources for farm advisors. Training should cover NBS, regenerative farming, nutrient management, farm economics and the use of digital tools. For example, existing FACTS- and BASIS-qualified advisors in the UK could receive additional training on emerging NBS practices. Advisory organisations should also create regular opportunities for farmers to share their experience with researchers and policymakers, helping ensure that future research and advice respond to practical needs. This addresses gaps between scientific knowledge and farm-level implementation, as well as the limited capacity of some advisory services to support unfamiliar practices. At the North Wyke stakeholder workshop in June 2023, farmers and advisors discussed the need for accessible NBS terminology. The February 2025 Rothamsted soil-carbon workshop involved advisors and farmers in discussions about practical evidence and knowledge gaps. The Athens stakeholder conference in September 2024 also brought together growers, advisors, industry representatives, researchers and public-sector actors.

v. **Make NBS economically viable and share financial risks across the value chain.** Policymakers, agricultural businesses, processors, retailers and farmer organisations should work together to reduce the financial barriers to NBS adoption. This could include transitional payments, shared investments, longer-term contracts, price premiums for products produced using NBS, and support for new nutrient-recycling or biomass-processing businesses. At regional and value-chain levels, such measures should be designed alongside the infrastructure and market demand needed to make new practices economically sustainable. This may address a central barrier: farmers often bear the costs and risks of adopting NBS, while environmental benefits are shared more widely and may

not be rewarded through agricultural markets. However, evidence on the effectiveness of specific market incentives and risk-sharing arrangements needs to come from further economic analysis and implementation experience.

vi. **Align agricultural policies, funding and regulations with environmental and economic goals.** National and regional policymakers, agricultural and environmental authorities, and funding bodies should develop consistent incentives and regulations that support sustainable nutrient management. Funding should reward measurable environmental benefits while recognising farmers' investment costs and practical needs. Regulatory authorities should also establish clear, evidence-based routes for approving safe nutrient-recycling practices, including the use of suitable agricultural by-products as fertiliser inputs. Agricultural, environmental and water policies should be better coordinated so that farmers receive clear and predictable signals when making long-term investments. This addresses inconsistent regulations, uncertain financial support and restrictions that may hinder useful innovations. The trans4num webinars on closing phosphorus cycles and fertilisers produced from livestock by-products provided a basis for discussing alternative nutrient sources and also illustrated the need to connect technical innovation with suitable rules and incentives.

vii. **Coordinate nutrient management beyond individual farms.** Regional authorities, water-management bodies, farmer organisations and agricultural businesses should work together to manage nutrient flows beyond individual farms. At river-catchment and regional levels, this could involve shared monitoring of nutrient sources and losses, assessment of livestock production intensity, joint planning of nutrient-recycling infrastructure and cooperation between farms with different nutrient needs. Trusted local organisations can help coordinate these efforts and balance the interests of farmers, water managers and other stakeholders. The June 2025 Denmark excursion included the Nørreå Valley phosphorus filtration system and other examples of regional nutrient management. The March 2025 Danish workshop with regional planners also explored how decision-support tools could reflect regional goals and practical constraints.

viii. **Use digital decision-support tools to support shared learning and practical decisions.** Researchers, tool developers, advisory services and public authorities should involve users throughout the design, testing and application of digital tools. Tools should use reliable local data and help users compare practical options, including nutrient applications, crop rotations, soil management and environmental trade-offs. They should be easy to understand, flexible enough to reflect local conditions and integrated into farm advice and regional planning rather than developed as standalone technical products. This addresses the limited usefulness of tools that do not reflect farmers' needs or local decision-making conditions mentioned at the Danish workshops.

6. Conclusions

Trans4num shows that wider adoption of NBS for circular nutrient management requires more than developing new technologies or demonstrating their environmental benefits. Farmers need clear economic incentives and manageable financial risks, while researchers, advisors, businesses and policymakers need to provide the knowledge, infrastructure and policy support

that make adoption possible. The project's regional and international events helped bring these actors together to share practical experiences, compare different approaches and explore how solutions could work under different local conditions.

Across the four European cases, a key lesson is that wider adoption does not mean simply copying successful solutions from one region to another. NBS need to fit local soil and climate conditions, farming systems and economic realities. Their wider use also depends on reliable long-term evidence, trusted advice, viable markets, supportive regulations and cooperation among different actors. These findings highlight that lasting change requires both economic incentives that encourage farmers to adopt NBS and reliable access to practical knowledge, advisory services, suitable infrastructure and supportive policies that help them implement and maintain these solutions over time.

7. Annexes

Annex 1: Description of EU-China exchange events

Date	*Format*	*online / presence*	*Organiser*	*Topic*	*No. of participants*	*Activities undertaken / insights gained*
26.03.2024	webinar	online	FiBL	Introduction to Agent-based Modelling	20	Introductory technical webinar for trans4num China partners covering NetLogo and agent-based modelling.
10.04.2024	webinar	online	FiBL	Introduction to Food system modelling	20	Introductory technical webinar for trans4num China partners covering SOLm and food-system modelling.
05-07.09.2024	conference	presence	DIC-CAAS / Sino-German Agricultural Centre; hosted by IUA-CAAS, BIOMA, NASC and Sichuan Tianfu New Area Administrative Committee	Sino-German Conference in Chengdu	>400	Large Sino-German conference on innovative approaches for agriculture and food systems. trans4num contributed the presentation 'Transformation for sustainable nutrient supply and management in intensive farming systems', linking the project to high-level discussion on sustainable agricultural transformation.
07-14.09.2024	partnership meeting, field visit	presence	trans4num EU & China consortia / CAAS and partner institutions	China partnership meeting and field visits - Beijing & Inner Mongolia	Not specified	Joint seminar, workshop and field tour focused on sustainable agriculture and Europe-China knowledge exchange. Beijing sessions covered nutrient-management strategies, soil health, Food-System Modelling (FSM) and Agent-Based Modelling (ABM). In Inner Mongolia, participants attended soybean presentations, joined a farmer panel, and visited soybean trials and demonstration farms, gaining practical insights into tillage, varieties and farmer education.
07-14.09.2024	workshop	presence	trans4num EU & China / CAAS and partner institutions	Workshop between trans4num EU and trans4num China	Not specified	The EU-China workshop/meeting programme combined technical presentations, modelling exchange, field tours and stakeholder interaction. Topics included nutrient management, soil health, FSM and ABM; field activities in Inner Mongolia included soybean cultivation presentations, a local-farmer panel and visits to trial and demonstration farms.

Date	*Format*	*online / presence*	*Organiser*	*Topic*	*No. of participants*	*Activities undertaken / insights gained*
02.11.2025	seminars and meetings	presence	China Agricultural University / trans4num partners	Chinese Agricultural University - Seminars & Meetings, Beijing	Not specified	Seminars and meetings in Beijing included presentations titled 'Ecological Intensification and the Sustainable Use of Fertilisers' and 'Resilience & Tipping Points in Agroecosystems', supporting Europe-China exchange on NBS, resilient farming and sustainable fertilisation.
03-07.11.2025	symposium and field visits	presence	Henan Academy of Agricultural Sciences / Chinese Academy of Agricultural Sciences / trans4num European partners	China-EU Symposium on Sustainable Agricultural Development - Henan	Not specified	The China-EU Symposium on Sustainable Agricultural Development combined keynote presentations, scientific exchange, poster sessions and field visits to NBS demonstration sites. Discussions focused on soil health, nutrient circularity, carbon sequestration and climate-smart farming, strengthening cooperation between European and Chinese trans4num partners.
03-07.11.2025	symposium	presence	Henan Academy of Agricultural Sciences / Chinese Academy of Agricultural Sciences / trans4num European partners	China-EU Symposium on Sustainable Agricultural Development - Zhengzhou	Not specified	China-EU Symposium on Sustainable Agricultural Development with keynote presentations, scientific exchanges, poster sessions and field visits to NBS demonstration sites. Discussions focused on soil health, nutrient circularity, carbon sequestration and climate-smart farming. European partners from RRes, AU, UHOH, SZE, FiBL and WU took part.
04-07.11.2025	conference and field trips	presence	Henan Academy of Agricultural Sciences / CAAS / trans4num partners	International Academic Exchange Conference on Sustainable Agricultural Development and Field Trips - Henan	Not specified	International conference and field-visit programme on sustainable agricultural development. Documented presentations included 'Benefits of nature-based solutions observed on a new Rothamsted long-term experiment', 'Deciphering environmental change impacts on agriculture through long-term evidence', and the PCI framework 'From Framework to Futures: Scaling Nature-Based Solutions for Agricultural Transformation'. Scientific exchange focused on NBS, soil health, nutrient circularity and long-term evidence.
05-06.11.2025	field trips	presence	trans4num / Chinese NBS-site partners	Field Trips to Yucheng and Fanxian - Henan	Not specified	Field trips to Yucheng and Fanxian were carried out alongside the International Academic Exchange Conference, providing direct exposure to Chinese NBS demonstration sites and supporting exchange on sustainable agricultural practices and implementation.

Date	*Format*	*online / presence*	*Organiser*	*Topic*	*No. of participants*	*Activities undertaken / insights gained*
08-09.11.2025	seminars and field trips	presence	Southwest University / trans4num partners	South West University Seminars & Field Trips - Chongqing	Not specified	Seminars and meetings in Chongqing included presentations on 'Ecological Intensification and the Sustainable Use of Fertilisers', 'Resilience & Tipping Points in Agroecosystems', and the PCI framework 'From Framework to Futures: Scaling Nature-Based Solutions for Agricultural Transformation'. The event supported exchange with Chinese NBS-site partners on sustainable nutrient management and transformation.

Annex 2: Description of events in collaboration with Horizon Europe and international initiatives

Date	*Format*	*online / presence*	*Organiser*	*Topic*	*No. of participants*	*Activities undertaken / insights gained*
26-27.09.2024	conference	presence	ECONUTRI / TRANS4NUM / PESTNU; satellite event of ISHS symposium at Agricultural University of Athens	Sustainable nutrient management in agriculture	Not specified	The joint stakeholder conference brought together growers, advisors, industry representatives, researchers and public-sector actors to foster collaboration, knowledge exchange and innovation on NBS for sustainable nutrient management and reduction of nitrogen and phosphorus pollution.
26-27.09.2024	stakeholder conference	presence	TRANS4NUM / ECONUTRI / PESTNU; ISHS / Agricultural University of Athens	Stakeholder conference in Athens	Not specified	Satellite stakeholder conference on nature-based solutions for sustainable nutrient management, designed to connect actors from different parts of the agricultural production chain. It promoted Europe-China knowledge exchange among growers, advisors, industry, researchers and public-sector representatives.
11-13.06.2025	excursion / field visit	presence	UHOH with AU, ICOEL, CFS and AMAIZE-P	Joint trans4num & AMAIZE-P excursion in Denmark	Not specified	Cross-project excursion for doctoral researchers, postdoctoral researchers and project coordinators. Visits included the Nørreå Valley phosphorus filtration system, ICOEL plant-based fertiliser production, Ausumgaard clover-protein extraction and biogas system, Askov Experimental Station and CFS Denmark. Feedback was very positive: 75% rated the excursion excellent (100% excellent/good) and 81% said it changed their perspective on NBS implementation.

Date	*Format*	*online / presence*	*Organiser*	*Topic*	*No. of participants*	*Activities undertaken / insights gained*
12.11.2025	scientific day / dedicated session	presence	trans4num EU / ECONUTRI; Hungarian partners	TRANS4NUM & Óvár Scientific Day - Hungary	Not specified	The 'From Research to Practice' TRANS4NUM & Óvár Scientific Day presented project results to research and practice audiences. The report confirms WU presented results from the three-year NBS soil-health investigation, while a Decision Support Tool workshop in Hungary involved AU, CO, FiBL and SZE to demonstrate and discuss the tool with stakeholders.
May 2026	kick-off meeting	presence	Green Connections kick-off, Baden, Austria	the trans4num project		Connected trans4num results with a new NBS initiative and explored cross-border research–practice cooperation.

Annex 3: Description of stakeholder engagement, demonstrations and tool development events

Date	*Format*	*online / presence*	*Organiser*	*Topic*	*No. of participants*	*Activities undertaken / insights gained*
14.06.2023	field visit	presence	Rothamsted Research (RRes)	Research Insight day at North Wyke trial site	Not stated	local stakeholder-engagement events, including a workshop with farmers and farm advisors about accessible NBS terminology and a pilot event for the D1.4 method.
13.12.2023	farmers' meeting	presence	SPNA	Farmers' meeting at Ebelsheerd - winter wheat trials	around 50	to discuss winter-wheat trials: trial-field results were presented and practical applications with farmers as key NBS stakeholders and end-users were discussed.
Nov 2023-Jan 2024	user experience workshop	not stated	Karakun, Switzerland	User experience workshop for the Decision Support Tool	Not stated	Insights about applicability to improve and finetune the tool
18.01.2024	Research Insight day	presence	Rothamsted Research (RRes)	Research Insight day at North Wyke	Not specified	local stakeholder-engagement event to present and share research findings
03.04.2024	stakeholder event / demonstration	not stated	Pisztráng Kör Association (PKE/PKA) with Széchenyi István University (SZE)	What results can be achieved through nature-based farming?	Not specified	Round-table discussion with local farmers, researchers and project partners on the applicability of NBS in Szigetköz agriculture. The discussion examined practical advantages and disadvantages of introducing NBS; farmer-researcher Mihály Lajos and farmer-teacher Gábor Jenőffy were the main dialogue partners in the first session.

Date	*Format*	*online / presence*	*Organiser*	*Topic*	*No. of participants*	*Activities undertaken / insights gained*
18.04.2024	stakeholder event / demonstration	not stated	PKE, HU	No-till and non-cultivation method	Not stated	Training event with demonstrations of nbs
26-27.09.2024	stakeholder conference	presence	TRANS4NUM / ECONUTRI / PESTNU; ISHS / Agricultural University of Athens	Nature based solutions for sustainable nutrient management in agriculture - Greece	Not specified	Joint stakeholder conference on NBS for sustainable nutrient management and reducing nitrogen and phosphorus pollution. It brought together growers, advisors, industry, researchers and public-sector representatives to foster collaboration, knowledge exchange and innovation.
04.09.2024	demonstration	not stated	PKE, HU	Soil section demonstration	Not stated in technical reports	No matching description of this 4 September 2024 demonstration was found in the PR2B technical report.
16.10.2024	demonstration	not stated	PKE, HU	Organic farm demonstration	Not stated in technical reports	
13.11.2024	stakeholder engagement event	online	Rothamsted Research (RRes), UK	Engagement event on soil carbon	21	Online soil-carbon stakeholder event with the presentation 'Soil Carbon – What Are the Knowledge Gaps'. The engagement formed part of a consistent project-wide stakeholder process and communicated evidence on soil carbon and NBS with local stakeholders.
27.11.2024	stakeholder event / demonstration	not stated	PKE, HU	Forest grazing and bird protection in the Szigetköz Region	Not stated in technical reports	
Dec 2024	field meetings	presence	SPNA, NL	Field meetings at Ebelsheerd and Kollumerwaard	counts not stated	These meetings presented trial results and discussed practical implications with farmers.
12.02.2025	workshop and field tour	presence	Rothamsted Research, UK	Exploring Soil Organic Carbon at Rothamsted Research	25	In-person workshop and field tour focused on soil organic carbon. Participants were primarily advisors, including five farmers. Discussions covered measuring and managing soil carbon, the role of NBS and regenerative agriculture in soil health, and practical evidence from Rothamsted experiments. The associated presentation was 'Soil Carbon – What Are The Knowledge Gaps'.

Date	*Format*	*online / presence*	*Organiser*	*Topic*	*No. of participants*	*Activities undertaken / insights gained*
21.02.2025	stakeholder event	presence	Pannon-Mag-Agrár Kft. (PMA) with SZE and PKE	Introducing agricultural digitalization into sustainable crop production	Not specified	Event for representatives of agricultural companies on agro-digitalisation and NBS. András Vér presented trans4num and SZE activities; Attila Kovács introduced the AEDIH programme; Dr Zsolt Domonkos presented implementation of agro-digitalisation and NBS at Dan-Slovakia Agrar. The event was opened by Dr Balázs Ásványi and guests were welcomed by Zsolt Kovács-Csomor.
February 2025	workshop	presence	AU / CFS / CO / ICOEL	Workshop with farmers and advisors	Not specified	First stakeholder testing of the Danish Decision Support Tool with farmers and advisors. Feedback was used to improve usability and design, including moving from single crops to crop rotations and making recommendations less prescriptive for farmers.
March 2025	workshop	presence	AU / CFS / CO / FiBL / ICOEL	Workshop with regional planners	Not specified	Workshop with regional planners to gather feedback for improving the Decision Support Tool and showcase its implementation in the Danish region. The broader DST testing process focused on usability, regional optimisation goals and realistic constraints.
15.04.2025	stakeholder event	not stated	PKE	Innovative nature-based solutions in precision farming	Not stated	
21.05.2025	field event / focus group	presence	Rothamsted Research	4th UK NBS Event at the Large-Scale Rotation Experiment (LSRE) Site - Suffolk	15	Guided tour of the Large-Scale Rotation Experiment, scientific presentations on pest, weed and disease pressures in regenerative systems, and a focus-group discussion. Participants explored how cover crops, reduced/zero tillage and compost affect pest and disease dynamics and what crop-protection strategies can support NBS for soil health and nutrient balance.
12.11.2025	DST workshop	presence	AU / CO / FiBL / SZE	DST workshop in Hungary	Not specified	Hungarian stakeholder workshop demonstrated the trans4num Decision Support Tool, collected feedback on usability and relevance, and discussed how the Danish tool concept could be adapted to Hungary. Stakeholders actively engaged and highlighted structural differences,

Date	*Format*	*online / presence*	*Organiser*	*Topic*	*No. of participants*	*Activities undertaken / insights gained*
						including the lack of regional decision-making and challenges around farmer collaboration.
13.11.2025	professional day	presence	SZE / PKE / PannonMag Agrár	trans4num professional day	Not specified	PR2B describes a 'Field Visit and Learning' event on the same date in Dunasziget and Mosonmagyaróvár. Participants visited a PannonMag NBS site to see nutrient-management practices at scale, then the PKE Ecopark for ecological education and demonstrations of NBS tools explaining ecosystem functions and soil-health challenges.
19.11.2025	workshop and field tour	presence	Rothamsted Research	Discover the Power of Organic Amendments	12	Full-day event bringing together farmers, advisors, scientists and policy stakeholders to examine how organic amendments support resilient and sustainable farming. The programme combined expert talks, group discussion and a field tour. Documented presentations were 'Short & Long Term Benefits of Organic Amendments' and 'Growing Arable and Grassland Crops with an alternative Phosphorus Fertilizer'.
03.12.2025	stakeholder event	presence	PKE	Innovative nature-based solutions in precision farming	Not covered	
Dec 2023-Dec 2024	field meetings	presence	SPNA	Field meetings at Ebelsheerd and Kollumerwaard		These meetings presented trial results and discussed practical implications with farmers.

Annex 4: Description of online webinars

Date	*format*	*online / presence*	*organiser*	*topic*	*no of participants*	*Activities undertaken / insights gained*
15.03.2023	webinar	online	trans4num / WP2	Inter- and transdisciplinary research on NBS; Agroecology, circular agriculture and the role of NBS	Not stated	information on NCM in general and possible nbs practices to support the selection of cases
22.03.2023	webinar	online	trans4num / WP2	Sustainable nutrient management in fertigated horticultural crops; Optimising	Not stated	information on NCM in general and possible nbs practices to support the selection of cases

Date	*format*	*online / presence*	*organiser*	*topic*	*no of participants*	*Activities undertaken / insights gained*
				nutrient management of fertigated soil-grown vegetable crops		
29.03.2023	webinar	online	trans4num / WP2	Lexbio: Optimising bio-based fertilizers in agriculture; Reflection on NBS understanding and inter-/transdisciplinary research	Not stated	information on NCM in general and possible nbs practices to support the selection of cases
05.04.2023	webinar	online	trans4num / WP2	Closing phosphate cycles at different scales; Implementation of testing of NBS in Hungary	Not stated	information on NCM in general and possible nbs practices to support the selection of cases
12.04.2023	webinar	online	trans4num / WP2	NBS in the Netherlands; Upscaling Agroforestry in the EU	Not stated	information on NCM in general and possible nbs practices to support the selection of cases
19.04.2023	webinar	online	trans4num / WP2	iSQAPER soil-quality assessment; NBS in the Netherlands	Not stated	information on NCM in general and possible nbs practices to support the selection of cases
26.04.2023	webinar	online	trans4num / WP2	Thallo fertiliser from livestock by-products; Data-driven decisions	Not stated	information on NCM in general and possible nbs practices to support the selection of cases
03.05.2023	webinar	online	trans4num / WP2	Crop rotations investigated through the Rothamsted Large Scale Rotation Experiment	Not stated	information on NCM in general and possible nbs practices to support the selection of cases
17.05.2023	webinar / plenary discussion	online	trans4num / WP2	A common understanding of NBS	Not stated	discussions to achieve a common understanding of NBS
26.03.2024	webinar	online	FiBL	Introduction to Agent-based Modelling	20	Introductory technical webinar for trans4num China partners covering NetLogo and agent-based modelling.
10.04.2024	webinar	online	FiBL	Introduction to Food system modelling	20	Introductory technical webinar for trans4num China partners covering SOLm and food-system modelling.

Annex 5: Description of conference presentations and scientific reflection

Date	*Format*	*online / presence*	*Organiser*	*Topic*	*No. of participants*	*Activities undertaken / insights gained*
20-22.09.2023	conference poster	presence	Tropentag	Sustainable nutrient management: Exploring transformation pathways across intervention levels		Presented initial findings from Task 1.3 on transformation pathways and factors influencing sustainable nutrient-management transitions across intervention levels; an abstract was published in the conference proceedings.
12-16.02.2024	conference oral presentation	presence	IGLS Conference	Dynamics of transformation barriers and pathways across intervention levels for sustainable nutrient management innovations		
02.07.2024	conference oral presentation	presence	IFSA	Transforming Nutrient Management in Agriculture: Barriers, Pathways, and Implications for Sustainability	Not specified	PR2B confirms presentations at IFSA 2024 under Tasks 1.1 and 2.1, but this exact title is not stated in the technical reports.
02.07.2024	conference presentation	presence	IFSA	Main findings from the literature review on Nature-Based Solutions	Not specified	Presented the main findings from the Nature-Based Solutions literature review at the IFSA special session 'Nature-based Solutions for Transformative Change in Agricultural Nutrient Management'; the extended abstract was included in the conference proceedings.
02.07.2024	conference presentation	presence	IFSA	Transitioning Agricultural Nutrient Management through Nature-Based Solutions	Not specified	Presentation of the draft work 'Transitioning Agricultural Nutrient Management through Nature-Based Solutions' at the IFSA special session on transformative change in agricultural nutrient management.
16-20.09.2024	conference special session	presence	Landscape 2024	Sustainable Nutrient Management in Intensive Farming: Stakeholder Engagement & Nature-Based Solutions	Not specified	Special session at Landscape 2024 titled 'Sustainable Nutrient Management in Intensive Farming: Stakeholder Engagement & Nature-Based Solutions', contributing to scientific dissemination and international networking around NBS and sustainable nutrient management.
October 2024	workshop poster	presence	SISA Workshop	How transformative can a research project on circular agriculture be? A case of circular	Not specified	

Date	*Format*	*online / presence*	*Organiser*	*Topic*	*No. of participants*	*Activities undertaken / insights gained*
				nitrogen and phosphorus management		
May 2025	conference presentation	presence	European Geoscience Union (EGU) General Assembly	Concepts for the trans4num remote-sensed data pipeline	>20,000 registered conference attendees	Presented initial concepts for the trans4num remote-sensing data pipeline at the European Geoscience Union General Assembly in Vienna. The broader work aims to improve extraction of robust crop-growth and phenology information from satellite time series.
September 2025	conference presentation	presence	AI4EO Conference	Advancing the utility of satellite time series using AI strategies	Not specified	Presented initial ideas for using AI strategies to improve the utility of satellite time-series data at the AI4EO conference in Rennes, building on the trans4num remote-sensing pipeline work.

References

Emery Steven, Oyetunde-Usman Zainab (2023): Field Manual for Stakeholder Involvement on NBS Sites. Deliverable D1.2 of the project Transformation for sustainable nutrient supply and management (trans4num). Rothamsted Research.

Emery Steven, Oyetunde-Usman Zainab (2024): updated Field Manual for Stakeholder Involvement on NBS Sites. Deliverable D1.2 of the project Transformation for sustainable nutrient supply and management (trans4num). Rothamsted Research.

Graversgaard Morten and Qirui Li (2024). 1st report on NBS cases' implementation and transdisciplinary evaluation in Hungary/ Denmark/ Netherlands/ UK. Deliverable 2.2 of the project Transformation for sustainable nutrient supply and management (trans4num)

Graversgaard Morten, Storkey Jonathan, Dunn Robert, Vona Viktória, Dilling Margriet, Westerhof Henk, Moore Oli, Qirui Li (2024). 2nd report on NBS cases' implementation and transdisciplinary evaluation in Hungary/ Denmark/ Netherlands/ UK. Deliverable 2.3 of the project Transformation for sustainable nutrient supply and management (trans4num)

Amorim Leitão Inês, Soltani Tehrani Rozita, Harkes Paula, Storkey Jonathan, Dunn Robert, Dilling Margriet, Graversgaard Morten, Folkmann Pia, Dalgaard Tommy, Kau Lægsgaard Madsen August, Vona Viktória, Fűzfa Zoltán, Vér András, Qirui Li (2026). 3rd Report on NBS cases´ implementation and transdisciplinary evaluation in Denmark, Hungary, the Netherlands, and the UK. Deliverable D2.5 of the project Transformation for sustainable nutrient supply and management (trans4num).

Selensky Friederike, Graversgaard Morten, Vér Andras, Dzudzor Maxwell, Kau Lægsgaard Tidemand August, Vona Viktoria, Qirui Li, Knierim Andrea (2026). Assess NBS innovations using AKIS and value chain frames. Deliverable D2.4 of the project Transformation for sustainable nutrient supply and management (trans4num).

Ion Elena, Redman Mark, Alexa Alina (2025). Practice abstracts for farmers, 1st batch. Deliverable D5.3 of the project Transformation for sustainable nutrient supply and management (trans4num).

Qirui Li, Knierim Andrea (2026). Comparative assessment of social innovations, institutional change related with NBS in China and the EU. Deliverable D4.1 of the project Transformation for sustainable nutrient supply and management (trans4num).