



EKLIPSE/EPBRS/BiodivERsA Joint Foresight Workshop: « Social Innovation and Nature-based solutions » Brussels, 6-7 December 2016

Draft Workshop Report

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1. Introduction and context

EKLIPSE, EPBRS and BiodivERsA jointly organised a foresight workshop in Brussels on 6-7 December 2016 on « **Social Innovation and Nature-Based Solutions: What research is needed to face future societal challenges and emerging issues?** »

The aim of this participatory workshop was to explore how nature-based solutions (NBS) can be a response to, or a catalyst for, social innovation to address emerging issues in relation to:

- human well-being and health,
- governance strategies,
- land planning and management, and
- restoration.

Assessment of multiple benefits (environmental, social and economic) was considered a cross-cutting topic to be explored in the context of each of the four main areas above.

The aim of the workshop was for the identified emerging issues and research priorities to feed into current and future debates and reflections on research and innovation policy and priorities at EU level (e.g. in Horizon 2020 work programmes and in the BiodivERsA Strategic Research and Innovation Agenda, future R&I framework programmes), at Member State level as well as at international level (e.g. Belmont Forum, Future Earth).

Organisers:

[EKLIPSE](#) is a H2020 funded project that aims to develop an innovative and self-sustainable EU support mechanism for evidence-based and evidence-informed policy on biodiversity and ecosystem services. A major function covered by EKLIPSE is the identification of research needs and emerging issues.

[EPBRS](#) is an EU-based forum for natural and social scientists, policy-makers and other stakeholders.

[BiodivERsA](#) is the network of national and regional programmers and funders of research on biodiversity, ecosystem services and nature-based solutions from 21 European countries. It develops a strategic vision and implementation plan that identifies priority topics and actions to be jointly addressed over the coming years. BiodivERsA has been operating since 2005, and is currently funded under the Horizon 2020 programme as an ERA-NET COFUND scheme.

Framing:

After a short presentation of the organisers, the introduction session framed the key concepts of nature-based solutions (NBS) and social innovation.

The general objective of nature-based solutions is the sustainable management and use of nature for tackling societal challenges, while **simultaneously** providing **benefits for the environment, economy and society**. The concept refocuses on human benefits and integrates societal factors.



Several definitions are currently proposed but the two main ones are from IUCN¹ and the European Commission².

Table 1: Differing view points in the two major NbS definitions with main differences in bold text³

IUCN definition Actions	European Commission definition Solutions
to protect, sustainably manage and restore	inspired and supported by
natural or modified ecosystems	Nature
that address societal challenges	designed to address various societal challenges
effectively and adaptively	which are cost-effective
simultaneously providing human well-being and biodiversity benefits	simultaneously provide environmental, social and economic benefits, and help build resilience

But there is a common ground between definitions: promoting sustainability and increased role of natural, self-sustained processes relying on biodiversity, are inherent to NBS. They constitute actions seen as positive for a wide range of stakeholders, as they bring about benefits at the environmental, economic and social level. A solution inspired by nature but that would not bring any benefit for nature would not qualify as an NBS (e.g. Biomimicry).

Regarding Social Innovation, the workshop organisers used the **definition of the TEPsie project (http://tepsie.eu)**:

“Social innovations are new solutions (products, services, models, markets, processes etc.) that simultaneously meet a social need (more effectively than existing solutions) and lead to new or improved capabilities and relationships and better use of assets and resources. In other words, social innovations are both good for society and enhance society’s capacity to act” (Caulier-Grice et al., 2012).

There was also a presentation of some examples to illustrate social innovation related to environmental issues extracted from the in-depth report: *Science Communication Unit, University of the West of England, Bristol (2014). Science for Environment Policy In-depth Report: Social Innovation and the Environment. Report produced for the European Commission DG Environment, February 2014.* Available at: <http://ec.europa.eu/science-environment-policy>

These definitions aimed to frame the discussions to have a common understanding of the key concepts. The discussion was subsequently organized around three main questions:

1. What are important **emerging issues/ societal challenges** (these should possibly have a big impact 10 or 20 years from now in their respective area) to which **Nature-Based Solutions**

¹ Cohen-Shacham, E., G. Walters, C. Janzen, S. Maginnis (eds). 2016. Nature-based solutions to address global societal challenges. Gland, Switzerland: IUCN. Xiii + 97 pp. Downloadable from <https://portals.iucn.org/library/node/46191>

² European Commission. 2016. Horizon2020 Work Programme 2016-2017 – 12. Climate action, environment, resource efficiency & raw materials, 99 pp. (http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-climate_en.pdf)

³ https://en.wikipedia.org/wiki/Nature_Based_Solutions



- could be a response to?
2. What specific **Social Innovation approaches** exist and could be used to support the effective implementation (i.e. simultaneously providing environmental, economic & social benefits) of these NBS for tackling these emerging issues (or formulated in another way: what has to happen socially so that these NBS can be put into place in order to respond to the challenges)?
 3. What are the **research needs** to support the realization of these NBS and Social Innovations?

We provide a summary of the methodologies used for the participative sessions and report the main results (full detailed results are available in the annexes) and propose some further discussion on these results to feed into the evolution of the use and implementation of both concepts: Nature-based solutions and Social Innovation.

2. Process

Over the two days, there were 65 international attendees from academia and research institutes, EU institutions, national administrations as well as other civil society and business organizations. See Annex 2 for a list of participants and the results of the icebreaker asking questions on the participants' profile. See Annex 1 for a complete programme.

The workshop relied heavily on participatory and interactive approaches including icebreakers, working groups, optional artistic or outdoor activities (e.g. walks in parks, drawings, etc.), plenary dialogue circles, as well as electronic polling. Electronic polling was also used to gather some information on participant profile (Annex 3). On the first evening of the workshop there was also a social event promoting informal exchanges on participants' hobbies to allow for more networking including some musical performances.

During much of the workshop, participants were split in thematic groups (1-human well-being and health, 2-governance strategies, 3- land planning and management, and 4- restoration) to address the three main questions. Each thematic group had its own facilitator and rapporteur.

Step 1: Question 1 (What are important emerging issues/ societal challenges (these should possibly have a big impact 10 or 20 years from now in their respective area) to which Nature-Based Solutions could be a response to?) was addressed through open brainstorming in each thematic group, allowing participants to capture on individual cards what in their view were the most pressing emerging issues/societal challenges related to their theme and what would be in relation to each emerging issue a possible nature-based solution to tackle it. Participants were then asked to prioritize all identified "grouping" (one emerging issue/societal challenge + one or several NBS) using 3 voting sticky dots. They could choose to place the 3 dots on one grouping or split them between several.

Step 2: following this work, participants formed triads within each thematic group. Each triad could choose one of the prioritized groupings of "one societal challenge +NBS" to answer Question 2 ("What specific Social Innovation approaches exist and could be used in order to support the effective implementation of these NBS for tackling these emerging issues"). The triads had the



option of working indoors – and in this case also come up with an artistic expression (e.g. performance, drawing, etc.) for the presentation of their results – or to walk through nearby parks in order to think about the answers to Question 2. Each triad was provided with a template to capture their discussion results:

Photo of the triad discussion template and Photos of artistic expressions

At the end of the first day, reporting only focused on step 1 and each thematic group presented in plenary their identified societal challenges.

On the morning of Day 2 triads in each thematic group presented the results of their discussion including barriers and research needs. The thematic group was then invited to brainstorm further research needs and prioritize them across all triad topics. The list of the top 5 research needs per thematic group was transferred to the online voting application.

On the second day, participants were invited to use the electronic polling in plenary to prioritize research needs across all themes, and also voted on an additional question: “How do you assess the importance of nature-based solutions as a way to tackle identified emerging issues/societal challenges across the different themes?” Each choice was attached to a score between 0 and 3 (see below).

Choice	Score
Very important	3
Important	2
Less important	1
Not important	0

Of course these votes are just indicative and reflecting the profile of participants in the room. The resulting votes on research needs and on the importance of NBS as a way to tackle some societal challenges are available respectively in Annex 4 and 3.

Plenary final dialogue: Samoan circles

As a final brainstorm in the thematic groups, participant could suggest some topics to be further discussed in a facilitated plenary dialogue. All suggested dialogue topics were then prioritized in plenary by participants to identify which ones they wanted to discuss in priority. The top three were addressed using a Samoan circle process. "The Samoan circle is a leaderless method intended to help negotiations in controversial issues. While there is no ‘leader’, a professional facilitator can welcome participants and explain the seating arrangements, rules, timelines and the process. The Samoan circle has people seated in a circle within one or two concentric circles, however only those in the inner circle are allowed to speak. The inner circle should represent all the different viewpoints present, and all others seating outside this inside circle must remain silent. The process offers others a chance to speak only if they join the ‘inner circle » by seating on a free seat or if all seats are taken by standing behind a person who will then give his seat in the inner circle. The facilitator regularly summarizes the discussion main points and a note taker captures on a



computer all comments.

Photos Samoan circle

3. Results

3.1. “What are important emerging issues/ societal challenges that possibly have big impact 10 or 20 years from now to which nature-based solutions can be a response?”

The results of the first brainstorming in each thematic group were twofold: on the one hand, participants identified the most important emerging issues/societal challenges for them, and on the other hand for each emerging issue, potential NBS to meet these challenges. So the results are in fact groupings of an emerging issue/ societal challenge and one or several potential nature-based solutions to tackle it. We present here a summary of these key findings. Detailed results are available in Annex 3.

3.1.1. Human Well-Being and Health

The top five societal challenges prioritized by participants and associated NBS were:

- Air pollution linked especially to particulate matter (PM)
 - NBS contributing to air pollutant removal (e.g. Green roofs)
- Stress linked to our way of life (burn-out, acceleration, etc.) and resulting chronic diseases
 - NBS co-producing green spaces (e.g. shared gardens) to reconnect to nature and provide opportunities for relaxation. Urban gardening as a stress release activity.
- Losing a sense of community and the challenge of integrating of immigrants
 - NBS promoting mixed projects linking urban gardens and social integration. Green areas under a community ownership and management to give a “sense of place”
- Increasing situations of conflicts in coastal areas with increasing urban population resulting in increasing pressure on resources (e.g. water).
 - NBS to move from grey to green infrastructure to generate more win/win multilateral solutions with more “hybrid governance”
- Issues related to climate change especially rising temperatures in urban areas.
 - NBS to develop green corridors (for cool air flows towards city centers) maximizing urban green and blue spaces (including parks, street trees, green walls, roofs, lakes...)



Photos of the group

Previous identified societal challenges are obviously interrelated. With regard to potential NBS, in many cases, participants highlighted the role and development of innovative green urban spaces including gardens and (urban) agriculture as a way of also generating joint and participatory social projects.

1.1.2. Governance strategies

The top five societal challenges prioritized by participants and associated NBS were:

- Loss of social cohesion
 - NBS promoting urban gardening and farming to recreate social interactions
- Shift of political agenda from sustainability to growth
 - NBS representing innovative technologies and the possibility to create jobs while providing sustainable solutions
- Disconnect between people and nature
 - NBS promoting urban gardening and farming to recreate social interactions and promote educational projects
- Increased energy consumption and production
 - NBS creating alternative energy production or allowing the reduction of energy consumption, while potentially stimulating the decentralization of the energy production (e.g. local energy production projects).
- Integration of immigrants
 - NBS to include new immigrants in projects promoting (connection with) nature

Photos of the group

Some of the identified societal challenges are crosscutting with the previous theme on human health and as a consequence NBS are again quite focused on an increase in green spaces with both natural and social benefits (urban farms for example), but with the mention of NBS also addressing energy production issues. In terms of governance, the need for more participatory approaches was emphasized in several other cases in the full list of societal challenges/NBS (Annex 3).

1.1.3. Land planning and management

The top five societal challenges prioritised by participants and associated NBS were:

- Insufficient space to meet different societal needs (e.g. development, increasing food demands, ecosystem/ biodiversity conservation, flood management)
 - Integrated systems approach, combining different NBS that would integrate grey



and green infrastructure

- Unsustainable agriculture production and patterns, resulting in rising water levels, salinisation, soil degradation and soil biodiversity loss
 - Exploring NBS in complex hydrological management (e.g. salt tolerant crops)
- Climate-related flooding and associated destruction of crops
 - Promotion of catchment management that would integrate several NBS to address specific issues in a more holistic manner
- Human disconnect from nature
 - NBS that make use of biophilic design⁴ while improving also biodiversity
- Rural development and suburbanization
 - New business models using NBS (e.g. for zero energy housing that would also promote roof gardens)

Photos of the group

Several challenges refer to the conflicting uses and current unsustainable production systems, the identified potential NBSs are clearly along the line of more holistic/systemic approaches (e.g. flooding and storm water management through a catchment approach, develop cities as “ecosystems”, etc).

1.1.4. Restoration

The top five societal challenges prioritized by participants and associated NBS were:

- Overexploitation of renewable resources including food/ biomass production and distribution
 - NBS to promote ecosystem approaches and integrated production systems (E.g. Integrated multitrophic Aquaculture: IMTA)
- Decreasing water availability and possible resulting pandemics
 - NBS to promote restoration of wetlands
- Increasing urbanization
 - NBS to ensure the development of urban green and blue infrastructures and to restore polluted/“wasted” urban soil
- Biodiversity loss
 - NBS as restored protected areas aiming to conserve species and ecosystems while

⁴ « Biophilic Design is an innovative way of designing the places where we live, work, and learn. We need nature in a deep and fundamental fashion, but we have often designed our cities and suburbs in ways that both degrade the environment and alienate us from nature. The recent trend in green architecture has decreased the environmental impact of the built environment, but it has accomplished little in the way of reconnecting us to the natural world, the missing piece in the puzzle of sustainable development.”



addressing other pressures such as climate change

- Sea level rise and ocean acidification
 - NBS to support coastal habitat restoration and PH regulation

Photos of the group

This group remained at a more general level of societal challenges but did highlight the same type of interventions with the promotion of systemic approaches and the support to jointly developing green spaces to address several uses. NBS should also have a key role in the restoration of polluted urban waste lands and wetlands. The group mentioned agro-ecological approaches as a way to switch our production system towards more restorative practices.

1.1.5. Summary across themes

Several priority societal challenges common across the themes are related to increased pollution, overexploitation of natural resources as a consequence of urban intensification, human population increase and a disconnect between people and nature. In addition, some emerging issues identified in some groups are related to the loss of social cohesion and the challenge of immigration.

With regard to NBS, a strong focus was placed on the systemic approaches and the need to have more green and blue spaces developed by communities using participatory approaches to best fit a wide array of needs and uses. For example: urban gardening and farming could represent ways to create more social links (cohesion), promote local production and represent educational and leisure areas.

Groups also faced several challenges in clearly framing the concept of NBS (environmental benefits are as important as economic or social benefits; hence, solutions inspired by nature but not providing environmental benefits cannot be considered as NBS), and in going beyond general statements towards concrete proposals.

1.2. “What specific Social Innovation approaches exist and could be used in order to support the effective implementation of these NBS for tackling these emerging issues?”

We present here a summary of the key results across all topics. Detailed results topic by topic can be found in Annex 4.

1.2.5. Barriers to implementing NBS and/or to social innovation approaches

Barriers identified by participants were quite diverse. We report here only some of the categories in which these barriers could be classified.

- Barriers related to a lack of political and economic will (“somebody has to pay”)
- Uncertainty in government and administration about the beneficial effects of NBS or social innovation approaches
- Widespread mental concepts that do not integrate the importance of nature and



biodiversity for human wellbeing and sustainable economic and social existence (a lack of consciousness)

- The need for switching to approaches that are very different from current ways of development and management as they need to be participatory, based on social justice and inclusion, and promote common understanding and joint solutions.

1.1.2. Ideas for social innovation that may overcome the barriers

With regard to social innovation, one key suggestion from triads was the importance of not separating approaches but to work in an integrated way. This refers to using NBS for social innovation and vice versa. It also relates to integrating new economic, social, educational and nature-based approaches.

The following suggestions were mainly focused on **education and in a larger sense capacity building**:

- Society-nature-environment courses in school curricula - bringing nature to the kids in all school activities.
- Stakeholders must also be encouraged and empowered to learn from each other in social innovation and NBS projects (implying funding for cross-cutting projects and safe spaces for exchange)
- Improved awareness of consumption impacts beyond consumers own 'bubble' – highlighting extended impacts of consumer choice
- Increased education and awareness of the importance of soil resources to society, the environment, and the economy
- Further development of governance frameworks that enable stakeholders to understand and appropriately address issues related to biodiversity loss and decrease in ecosystem services (e.g. via policies like Payment for Ecosystem Service (PES))

There were many suggestions on **bottom-up, participatory and new governance approaches** including in government authorities:

- Neighborhood promotion of shared sustainable activities
- Urban labs to encourage co-development and ownership
- Participative design (of projects) and management
- Participatory urban planning
- Develop solutions at local level ("moving from government to governance")
- Foster work across sectors and departments in governments (e.g. create specific job positions for this)
- Increasing participation and transparency in policy and management; supporting existing social innovations & sharing of good practices
- Social innovation going beyond "just" community involvement: 1) more inclusion of excluded people in restoration actions, 2) stakeholder involvement in NBS development (e.g., for best practice support by policy makers, certification schemes, rewards for good practice)
- Participatory budgeting
- Participatory democracy (renewing democratic processes)

Furthermore many ideas focused also on **new economic approaches**. An important idea here was



to include the responsibility of business for green spaces that may foster social purposes.

- Urban labs to encourage co-development + ownership
- Promoting social entrepreneurship
- Capture and communicate economic (incl. non-monetary) values from green spaces such as increased residential and commercial property values and enhanced visitor economy (increased number and longer visits)
- New funding models via sponsorship by businesses and individuals; benefit from increased turnover of adjacent cafés and other businesses
- Models where businesses/industry pay for NBS (or: cities and large towns pay) > environment driven taxes, fiscal transfer
- Change of agricultural practices in sustainable ways (e.g. increased surface of grassland, better integration of nutrient cycling and other natural processes in practices to maintain soil quality and land long-term productivity with little to no chemical inputs)
- Changing insurance policies (e.g., drive change by costs for insurances, based on best practices)
- Develop new business models for the Commons
- Agriculture and Tourism should be part of the rethinking the cycle of production and consumption

Finally several suggestions emphasized the need to **integrate use of green spaces for both environmental and social purposes:**

- Innovative integrated green transportation systems (specific not given but might be fluvial, bicycle based or other). There was also the idea to create more blue urban spaces (waterways)
- Green solutions that promote safety
- Co-production of green spaces (there was a lot of focus on this including the rehabilitation of non-green spaces)
- Food growing and sustainable consumption groups including urban gardening and agriculture

1.3. “ What are the research needs to support the realization of these NBS and Social Innovations?”

Below, we report the list of research needs per thematic group. Some groups focused on their theme and provided also more general recommendations.

1.3.1. Health and well being

Participants reflected on research needs for the selected specific challenges related to their theme (Annex 4): “increase air pollution”, “Acceleration of life”, “Declining social cohesion + sense of community/sense of place”, “Rising temperature due to climate change (in particular in urban areas and at night)”.



Challenges	Research is needed on
<p>increase in air pollution and associate health damages</p>	<ul style="list-style-type: none"> • How to better model air-circulation in cities • How to better understand interactions between air pollutants and plants (Empirical studies) • How citizens perceive the use of innovative air cleaning/pollution mitigation solutions such as nbs. Studies on behavior (e.g. leverages of acceptance)
<p>Acceleration of Life</p>	<ul style="list-style-type: none"> • What are the physiological and psychological effects on human health of the acceleration of life • What are possible nbs to improve well-being especially in work-leisure combinations: e.g. Green to Natural offices <p>This research require more experiments (pilot sites) in real conditions and flexibility in the structure of research projects.</p>
<p>Declining social cohesion + sense of community/sense of place</p>	<ul style="list-style-type: none"> • How to design spaces to meet multiple needs, including possible conflicting activity, motilities and socio-economic challenges • What are success stories of initiatives promoting multi-cultural / multi-demographic uses of green spaces • How social cohesion improves through encouraging multiples uses of green spaces and how these uses change the ‘sense of space’ • How to develop a business case demonstrating the co-benefits of multi-functional green spaces • What is the potential added value of co-management of green spaces between recent migrants and long-term residents. • How to design/co-design process to foster balanced involvement of all stakeholders/users
<p>Rising temperature due to climate change (in particular in urban areas and at night)</p>	<ul style="list-style-type: none"> • How to best design NBS (green/blue spaces) in order to be most effective on little available space? • How to assess through cost-benefit analysis long-terms effects of nbs (compared to business as usual with no additional efforts) and compared to ‘grey/technical solutions). Including all related ‘co-benefits’ (eg. Recreational or health effects). • How to design blue spaces in order to reduce the spread of some pests • How to develop • eco-friendly bioenergy production



Finally, participants in the thematic group agreed on a list of cross-cutting research needs based on the list above :

- Research is needed in priority on:**
- How to design (or re-think) spaces to address multiple needs from different communities? (Physical, mental, physiological)
 - How to create better awareness and understanding of NBS in the local populations?.
 - How to evaluate effectiveness of NBS for promoting social cohesion, combating climate change, improving health , and creating co-benefits (Especially evaluating impact of using jointly NBS and social innovation)
 - What innovative funding models could help support active and multiple lifestyles in green spaces
 - How to assess enabling factors to attract/encourage multi-cultural use of green spaces and business case for benefits of eco-management of green spaces

Participants also identified a key enabling action for this research : More experimental research and evaluation of pilot studies should be conducted to investigate the effect of using jointly NBS and social innovation

1.1.2. Governance

Participants reflected on research needs for the selected specific challenges related to their theme (Annex 4): “Disconnection between people and nature”, “Shift of political agenda from growth to sustainability », « loss of social cohesion », « The reduction of energy consumption and production”

Challenges	Research is needed on
Disconnection between people and nature	<ul style="list-style-type: none"> • How urban policies impact the relationships between people and Nature : Comparative studies on urban policies. • How to explore social behaviour and incentive responses • Innovative design and planning of green spaces in cities • Evolution of education curricula to reconnect more to Nature • Impacts of Nature on well-being and mental/physical health including Historical studies on health & environment relationships •
Shift of political agenda from growth to	<ul style="list-style-type: none"> • How to capitalize on the wealth of existing knowledge in social and economic sciences, how to make this knowledge



<p>sustainability</p>	<p>easily accessible and easy to use</p> <ul style="list-style-type: none"> • How to develop good indicators that are more appropriate to support decision-making and help decision-makers understand the importance of the social sector <p>A key enabling action : More investment in transdisciplinary science</p>
<p>Loss of social cohesion</p>	<ul style="list-style-type: none"> • Which NBS help social cohesion? In which circumstances? Which communities can interact with another? • How to balance differences within communities, within society and between governments and communities? How can governments deal with this? • What is the potential of social enterprises to increase social cohesion? • What kind of social cohesion can be better enhanced by NBS and what else is needed? • How can different governments / departments work together efficiently?
<p>The reduction of energy consumption and production</p>	<ul style="list-style-type: none"> • What are the regulatory, social and institutional barriers to changing production and consumption systems and how can they be overcome? • How to Integrate the full life-cycle assessment into technological development <p>Some key enabling actions: it would be useful to Integrate more action research and adaptive governance / management (“learning by doing”) and to identify and analyse successful examples</p>

Finally, participants in the thematic group agreed on a list of cross-cutting research needs based on the list above:

<p>Research is needed in priority on:</p> <ul style="list-style-type: none"> • How could regulations support the social co-benefits of NBS? • How could the involvement of people in NBS be fostered to ensure social co-benefits? • What are the conditions/requirements for NBS to provide social co-benefits? • Under what circumstances could social entrepreneurship deliver social co-benefits of NBS? • How could transdisciplinary research help overcome institutional barriers within governments (sector-thinking)? • How can we ensure that technological development does not run ahead of social innovation?



As enabling action participants highlight the need to use more transdisciplinary approaches and to integrate more action research and adaptive governance / management (“learning by doing”). Identification and analysis of successful examples should also be promoted.

1.1.3. Land planning and management

Participants reflected on research needs for the selected specific challenges related to their theme (Annex 4): “Urban densification”, “Storm water/Flooding management», « Disconnection between Humans and Nature », “Sustainable agricultural intensification”

Challenges	Research is needed on
Urban densification	<ul style="list-style-type: none"> • How to capture values (monetary and non-monetary) of green infrastructure, especially considering multifunctionality • What are funding models and financial products to promote multifunctional green spaces • What are success factors for local governance of green spaces (best practices from examples and how they overcome difficulties) • How can citizen science projects help measuring change in green infrastructure and effectiveness of NBS implemented
Storm water / Flooding management	<ul style="list-style-type: none"> • How to develop an holistic view /systemic approach in catchment management • How to integrate in this holistic approach changing unsustainable agriculture practices, and promoting multiple benefits for humans, particularly for those living in the catchment area (recreation etc.) • How to engage people in thought and action: use of social media can create functional communities who can engage in real social innovation • What are financial and social approaches to deliver NBS to protect people and economy from flooding consequences and achieve natural gains, especially in terms of long-term gains over short-term interests. <p>Enabling action: promote evidence-based science practised in simple, repeatable, cost-effective, measurable, and long-term best-practice examples</p>
Disconnection between Humans and Nature	<ul style="list-style-type: none"> • How to better address inequalities and environmental justice approaches <p>Participants focused on enabling actions to improve the way research is carried on : more investment in post-normal science,</p>



	<p>more risk-taking in funding to support innovative projects, foster co-creative research and implementation approaches, research promoting collective and interdisciplinary “deep” learning</p>
<p>Sustainable agricultural intensification</p>	<ul style="list-style-type: none"> • How to evaluate NBS potential using transdisciplinary approaches in the context of implementing sustainable agricultural intensification? How can we assess simultaneous delivery of multiple-benefits that facilitate economic opportunities whilst providing effective intervention to stop soil degradation • How to increase effective awareness raising on the topic of soil: soil as an important good, rather than only “dirt” • How can we foster change of individual consumption patterns • How to further improve stakeholder engagement in the implementation of NBS.

<p>Research is needed in priority on:</p> <ul style="list-style-type: none"> • How to Improve effective catchment water management using holistic systematic approaches from upstream to downstream with engagement of local actors throughout the process • How to capture the multiple values (monetary and non-monetary) of green infrastructure development and investments especially in context where you have multi-functionalities • What are the success factors of local governance of green spaces? • How effective is citizen science in measuring change in green infrastructure and effectiveness of NBS? • What are examples of innovative governance for integrated catchment management and how can we learn from success stories?

Participants also identified as enabling actions the importance to promote Inter- and transdisciplinary research to assess multiple benefits of NBS in order to stimulate collective and interdisciplinary “deep” learning.

1.1.4. Restoration

Participants in the restoration group addressed the theme in a quite general way and reflected on research needs for the following challenges which do not relate directly to restoration (Annex 4):



“Humans disconnect from Nature: the need to reintroduce ecological principle in daily life” “Urban intensification”, “water crisis: the need for a local economy of water”, « Managed aquaculture: the need for more type 2 nbs”

Challenges	Research is needed on
Humans disconnect from Nature: the need to integrate ecological principles in our daily life and consumption/production systems	<ul style="list-style-type: none"> ● What are the incentives and mechanisms of behavioural change to promote more sustainable consumption and production patterns?
Urban intensification	<ul style="list-style-type: none"> ● How to achieve systemic change and true social innovation through implementation of NBS ● How to develop operational models for place-making, societal participatory visioning and story telling to engage habitants in urban planning of multifunctional green spaces ● What is the evidence base for linkages between urban NBS and impact on biodiversity
Water crisis: the need for a local economy of water”	<ul style="list-style-type: none"> ● How to create a local economy of water. This will require, fundamentally, the building of trust in science, which may be achieved through participative modelling, sensors and apps that allow transparent data collection and trust in scientists.
Managed aquaculture: the need for more type 2 nbs”	<ul style="list-style-type: none"> ● What are the requirements of various fish varieties for optimal development ● What are the cultural barriers to developing semi-natural (type 2 NBS) aquaculture sites and ways to address these barriers ● How can we document “Proof of concept” of these aquaculture nbs at farm scale ● What are appropriate Management systems for aquaculture type 2 NBS

Participants of this group did not provide priority cross-cutting research needs specific to the theme of restoration.



1.1.5. Prioritized research needs across all themes

Of all the research needs generated through the brainstorming in each thematic group, participants were invited to prioritise the ones that should be addressed most urgently to allow a better implementation of nature-based solutions in relation to social innovation in relation to all thematic areas:

Rank	Research is needed on :
1	How NBS can provide social co-benefits: what are the conditions/requirements?
2	More experimental research and evaluation of pilot studies of using NBS and social innovation together
3	Multiple values (monetary and non-monetary) of green infrastructure development and investments especially in context where you have multi-functionalities
4	Understanding how to achieve systemic change in urban planning to embody NBS
5	Effectiveness of NBS on social cohesion / temperature decrease / health increase / co-benefits etc.
6	Storm water/Flood management: research how to develop holistic systematic approaches for watershed management from upstream to downstream with engagement of local actors throughout the process
7	Research into success factors of local governance of green space
8	An evidence base of understanding linkages between biodiversity and NBS (in urban areas)
9	How can transdisciplinary research help overcome institutional barriers within governments (sector-thinking)?
10	How to design (or re-think) spaces to include different and multiple needs from different communities? (Physical / mental / physiological / environmental)
11	How can the involvement of people in NBS be fostered to ensure social co-benefits?
12	Awareness of perception and acceptance/understanding of NB in populations
13	How can regulations support the social co-benefits of NBS?
14	Explore funding models to support active lifestyles and de-acceleration in green spaces (e.g. from health organizations: social securities / insurance companies etc.)
15	Under what circumstances social entrepreneurship could deliver social co-benefits of NBS?
16	Innovative governance for integrated water catchment management (and learning from best examples)
17	The effective use of citizen science to measure change in green infrastructure and



	effectiveness of NBS
18	Investigate human barriers to consumptions of more ecological food items (sea weeds / insects etc.)
19	Identify economic and social case for developing managed aquaculture (to increase food production)
20	How to ensure that technological development does not run ahead of social innovation?

1.4. Samoan Circle discussions

Details on the Samoan circle methodology can be found in the section on Process. The topics listed below are the one proposed by participants from all thematic groups and concerned some key issues related to nbs that participants felt were still unclear, or the workshop itself.

Proposed discussion topics (number of votes⁵)

1. How to ensure the sustainability of the NBS? (15)
2. How do we make space for research on other types of NBS as much research is currently on artificial/engineered NBS? (11)
3. Natural scientists commenting on social innovation/under-representation of social scientists (10)
4. NBS: change cannot come about by a few good examples but only by general societal change (10)
5. Comprehensive classification system of all the nature-based solutions (including GI) (9)
6. How to ensure long-term commitment in social innovation? (8)
7. How can we define NBS to be able to research on NBS? (2)
8. How to ensure the sustainability of social innovation? (0)
9. Restoration often overlooked by restoration group because process of starting with societal challenges (0)

The first two topics were addressed in two sessions of the Samoan circle and full notes are available in Annex 5. We report on those topics in the final discussion session below.

⁵ Participants voted by raising hands and the number of votes reflect the number of people who wanted to discuss the topic in the samoan circle



4. Discussion and key outputs

The final plenary discussions addressed topics that came up throughout the workshop as key questions:

4.1. The added value of the concept of NBS

Participants emphasized that in many contexts (e.g. cities) the NBS concept is a way of labelling existing approaches that are usually managed in separate departments/sectors and to integrate them under the same “chapeau”. For example: green space management, green roof development, mobility schemes, etc. NBS as a concept provides the opportunity to bring together all these actions in a more systemic/holistic way and to highlight the multi-functionalities of some of these actions.

When asked to prioritize the societal challenges for which NBS have the highest potential to propose effective interventions, participants selected biodiversity loss, followed by the lack of water availability, the loss of social cohesion, the geographical and social inequity in food and biomass production and distribution, and the disconnect between people and nature (complete scores available in Annex 3). Workshop participants thought that NBSs were potentially good ways of addressing both key environmental issues (biodiversity and water crises) but also current and future social issues (e.g. social cohesion and social justice).

4.2. The challenge around the definition of NBS

Among the discussion points, a key aspect was related to the definition of NBS and the importance of including long-term environmental sustainability. Participants were sometimes confused on what NBS are or are not, especially when thinking of the notion of “inspired by nature” like biomimicry for example: In the current definitions, mimicking nature is not an NBS if it is not also supported by nature. In addition to some human benefits, a nature-based solution should also provide environmental benefits and improve the ecosystem/biodiversity. The creation of a new bacteria to deal with an oil spill cannot be considered an NBS as ultimately it does not improve biodiversity or the sustainability of ecosystems. However participants also emphasized the difficulty in being so strict in such a definition.

The conversation around the NBS definition showed the common dilemma regarding issues that are both a scientific “objective”, but also a social/cultural topic. There also is an ethical element that should be included in the debate.

Participants also discussed the typology of NBS that illustrate their diversity along two axes: 1/ the level and type of engineering of ecosystems, and 2/ the number of services and stakeholder groups targeted (i.e. the higher this number, the lower the maximization of delivery of key services). The three types are discussed in detail in Eggermont et al. 2015⁶; with intermediate types existing in both space and time. The big challenge is whether engineering is aiming at higher ecological resilience as well as economic and social benefits.

⁶ Eggermont, H., E. Balian, J. M.N. Azevedo, V. Beumer, T. Brodin, J. Claudet, B. Fady, M. Grube, H. Keune, P. Lamarque, K. Reuter, M. Smitt, C. Van Ham, W.W. Weisser, X. Le Roux. 2015. Nature-based solutions: New influence for Environmental Management and Research in Europe. *GAIA Ecological Perspectives* 24/4: 243-248.



4.3. The question of sustainability of NBS

The question on sustainability can be understood in many ways: is it the sustainability of the effectiveness of NBS which relates to monitoring and evaluation frameworks or are we talking about the sustainability of the concept itself as a tool currently used by policy makers but that can become “unfashionable” in a few years.

In the first case, it is critical to have frameworks to assess the effectiveness of the implemented NBS and this is difficult as they are multifunctional and should generate multiple benefits. In particular, the process dimension is hard to assess: NBS are usually implemented through involvement of multiple actors to address several goals. This process itself can sometimes be more important than the NBS and can generate relationships that are sustainable (e.g. adaptive management).

As a consequence, one of the priority research topics identified was indeed to explore criteria to assess sustainability of NBS effectiveness⁷. There is clearly room for further research on the term NBS and the criteria for sustainability.

In the second case, we are talking about the durability of the NBS as a tool, a useful concept in the face of changing needs and conditions. The durability aspect has much to do with economic models. What is included in NBS is also to propose new models for our society and economy, social and economic change can be triggered by NBS.

Finally participants highlighted the importance of not forgetting the word “solutions”: NBS are possible “solutions” to a specific problem and should not be overcomplicated.

4.4. Research priorities and recommendations

From the discussions and the brainstorming two key aspects emerged in terms of main research recommendations:

The urgent need for research on assessing effectiveness of NBS especially in terms of co-benefits (environmental, social and economic). This should include research on criteria for measuring effectiveness especially on the long-term (sustainability of NBS), but also trade-offs and synergies between impacts and benefits. The discussions often opposed the need for more classical research versus demonstration projects. However, participants seem to agree that both are needed and should feed into each other.

The second key aspect is the research on holistic/systemic and transdisciplinary processes to be both used by and catalysed by NBS in land, water, city planning and management.

Detailed research priorities presented in the results show also the importance of exploring further how to transform legal, psychological, social and economic contexts for NBS.

⁷ Raymond, C.M., Berry, P., Breil, M., Nita, M.R., Kabisch, N., de Bel, M., Enzi, V., Frantzeskaki, N., Geneletti, D., Cardinale, M., Lovinger, L., Basnou, C., Monteiro, A., Robrecht, H., Sgrigna, G., Munari, L. and Calfapietra, C. (2017) An Impact Evaluation Framework to Support Planning and Evaluation of Nature-based Solutions Projects. Report prepared by the EKLIPSE Expert Working Group on Nature-based Solutions to Promote Climate Resilience in Urban Areas. Centre for Ecology & Hydrology, Wallingford, United Kingdom



5. Ending remarks

Participants recognised that social innovation (SI) was particularly difficult to include in the discussions of this workshop because the proposed SI definition was related to modifying relationships, especially in institutions. In addition, several participants highlighted the lack of social scientists in the workshop to properly address social innovation questions. All discussion results should be considered with these limitations in mind.

Workshop participants highlighted a high potential for NBS to address environmental and social challenges such as loss of social cohesion, health, social inequity, loss of connection between people and nature, and inadequate governance models. Proposed NBS for example relating to mixed (answering to several uses) green and blue spaces in cities were also seen as multifunctional tools to reach many concurring benefits including educational, psychological, social and economic.

However, there are also limitations for NBS and these are not always understood in the same way. Another aspect is that NBS are not very well known as a concept by the wider public (though many NGOs may already be working on similar approaches under different names) and they would need more political and economic backing if they are to be used more widely.

NBS, despite the promise that it can doubtlessly make, appear a somewhat fledgling concept at this point in time (e.g. one important dialogue issue was how to ensure sustainability of NBS) against current prevailing paradigms such as endless economic growth. As a matter of fact, participants across all themes emphasized the need to further explore ways to change our consumption and production behaviour and associated economic and political systems to be able to fully implement approaches such as NBS that are based on valuing biodiversity, promoting participation and social cohesion, preserving long-term sustainability of our economies, and preserving human health and well-being.

Participants called on policy-makers and funders to further invest in research in order to improve the effectiveness of NBS in addressing multiple challenges. The need to support and promote inter and transdisciplinary approaches was highlighted throughout the discussions with as a consequence the requirement to adapt funding schemes and academic incentives. Research policy should indeed support innovative 'action research' focusing on finding solutions with local actors and adapting research and processes. The use of pilot sites and the identification and analysis of best practices and success stories were also key conditions to build the evidence base for effective joint action of nature-based solutions and social innovations.

Next steps

From this report, organisers will develop a research policy brief summarizing the key research recommendations. This policy brief will be disseminated to the relevant national, European institutions and funding bodies.

In addition the discussion topics generated during the workshop will be posted on our EKLIPSE forum for further debate and we would like to invite all participants to follow-up and contribute to these online debates