Co-Creation for enhanced stakeholder engagement in NBS

1. About this report

This report documents the co-creation workshop held during the City Blues project meeting in Stavanger in April 2025. Participants from municipal administrations, academic institutions, non-governmental organisations, and citizen representatives took part in the workshop and explored together how stakeholder engagement in nature-based solutions (NBS) can be strengthened across all stages of project implementation.

The purpose is to draw out the practical lessons that emerged and to offer them as a resource for the municipalities involved in City Blues, and for any other municipality approaching NBS implementation for the first time or looking to improve their existing practice.

The report is organised as follows. Section 2 describes how the workshop was structured. Section 3 presents the output of the work in groups. Section 4 compares stakeholder types and examines the differences. Section 5 brings a visual overview of where knowledge is strong and where gaps remain. Section 6 offers a phase-by-phase guide that municipalities can apply as a practical starting point.

2. How the workshop was structured

The workshop was built around a central tool: a matrix that cross-references two dimensions of NBS project work. Along the horizontal axis sits the participation ladder, which ranges from one-way information sharing to full stakeholder empowerment. Along the vertical axis sit the six phases of an NBS project lifecycle, from initial planning through to the retirement or repurposing of the solution at the end of its useful life.

The participation ladder draws on Arnstein's framework (Figure 1), which distinguishes between these five levels of engagement (inform, consult, involve, collaborate, and empower), forming the columns of the matrix.

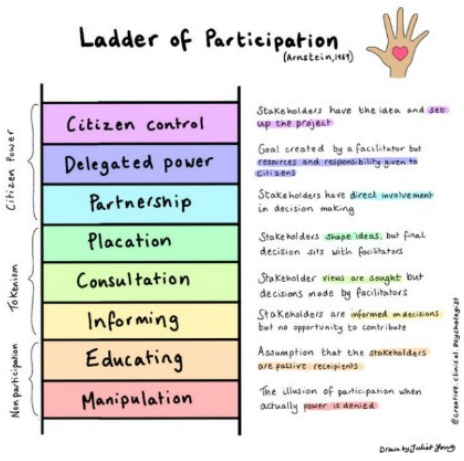

Figure 1. Arnstein's ladder of participation

The six NBS implementation phases that formed the rows were (1) planning (defining goals and assessing what is needed), (2) design (turning goals into specific plans and technical drawings), (3) construction (the actual building or installation work), (4) operation and maintenance (the ongoing care and upkeep of the NBS), (5) monitoring (tracking how the NBS performs over time), and (6) retirement or repurposing (deciding what happens when the NBS reaches the end of its intended life).

Participants in the workshop belonged to four stakeholder groups: public administration, citizens, academia, and NGOs. Then they were reorganised into two broader working groups to populate the matrix together. Each person was asked to think of real situations in which they had been involved or observed stakeholder engagement in an NBS or urban greening project, and to write these on sticky notes placed in the relevant cell in the matrix. After this individual contribution phase, groups discussed what they had gathered, identified challenges and shortcomings, and brainstormed better approaches. The result consisted of two independently produced matrices, each reflecting the priorities and direct experience of its participants.

3. What the groups brought to the matrix

3.1. Group 1

The first working group produced contributions shaped by concerns about community relationships and social trust. The ideas they placed on the matrix focused on the human side of NBS. This referred to how residents and neighbours experience projects, how they are informed, how they can be involved in the work, and how a sense of local ownership can be built and sustained over time.

In the planning phase, this group emphasised straightforward communication tools: sending information to neighbours, publishing plans on websites and in local newspapers, and holding formal hearings. They also stressed the importance of communicating the problem itself to stakeholders from the beginning. This ensures that local people can see and relate to the challenge being addressed, rather than just being told about a proposed solution. Under collaboration, they pointed to citizen dialogues and citizen councils as meaningful ways to incorporate local knowledge and expectations into early-stage decisions.

During design, the group raised a reflective question that deserves attention: are we actually reaching the right people with our communications, and if not, why not? They noted that encouraging residents and local businesses to join networks or associations makes the overall engagement process easier because an existing channel and audience are already in place. For involvement, they highlighted co-creation workshops, including hands-on approaches using tools like LEGO models, to make abstract plans concrete and to allow people to express preferences about how a space should look and function.

In construction, the focus was on transparency: informing people early about timelines, noise, and disruption, and organising field visits so that residents can see the work progressing and understand what is being built. Under collaboration, volunteer planting alongside construction teams was cited as an example that builds a direct personal connection between people and the NBS.

For the operation and maintenance phase, the group raised a practical question: to what extent are maintenance activities actually carried out by stakeholders rather than municipal staff? The collaborative cell showed real-world experience here. Local people are removing trash from submerged dams and structures, and residents are taking on specific responsibilities.

On monitoring, this group observed that stormwater management is essentially invisible to most people. When nothing goes wrong, the infrastructure goes unnoticed. When something does go wrong, the instinctive public reaction is to assume that a mistake was made. This creates a persistent challenge for

municipalities. How do you build appreciation for something that is only noticed when it fails? The group placed citizen science in the collaborative monitoring cell as one practical response to this challenge.

Table 1. Group 1 stakeholder engagement matrix

NBS phase	Inform	Consult	Involve	Collaborate	Empower
Planning	Newsletters and websites Informing neighbours Communicating existing problems Publishing plans in local newspapers	City council meetings	Voting on implementation options Early resident involvement	Citizen dialogues and councils Taking stakeholder ideas and experiences into account	—
Design	Are stakeholders being reached? Network and association membership makes engagement easier	—	Co-creation workshops LEGO-style tools Information meetings to build ownership	Volunteers and NGOs restoring a stream	—
Construction	Construction timeline, effects, and outcomes	—	Public consultation meetings – Field visits	Volunteer planting	—
Operation & maintenance	—	—	How extensively are maintenance activities done by stakeholders? (open question)	Locals removing trash from submerged dams Shared maintenance responsibility	—
Monitoring	Stormwater is a hidden issue: only noticed when something goes wrong	—	—	Citizen science	—
Retirement / repurposing	—	—	—	—	—

3.2. Group 2

The second group produced a different matrix. While group 1 was driven primarily by questions of trust, community buy-in, and the resident experience, group 2 brought a stronger focus on institutional processes, technical requirements, and the practical governance of NBS projects. Many of their contributions came from people who work directly with the planning, procurement, and performance management of NBS, and therefore, the inputs reflected this.

In the planning phase, group 2 stressed the value of mobilising expert knowledge early to define technical possibilities and to communicate clearly what the NBS will do and why it matters to different stakeholders. They highlighted the official hearing as an important formal engagement tool. Under consultation, they provided details about the process of designing a monitoring approach: site selection, sensor procurement, tender document preparation, and involvement in bid assessment. This level of procedural detail reflects a clear understanding that decisions made in planning shape what can be

measured and known about the NBS for the rest of its exploitation period. Under involvement, they underlined that early involvement of stakeholders in the planning phase leads to fewer changes in the later design phase, and fewer changes mean lower costs and less disruption.

In the design phase, group 2 identified the role of landowners, noting the importance of informing them specifically about how the NBS might use or affect their land. For example, how excess stormwater could be stored and reused for irrigation. They also highlighted biodiversity and recreational co-benefits as topics for formal public consultation. Under collaboration, they cited specific examples from the City Blues pilot projects: working with Wild Zone in Tampere to source local seeds and with KVVY to organise voluntary events to build brown trout spawning beds. Under empowerment group 2, a concrete and replicable idea was proposed: showing private citizens and landowners that implementing NBS on their property can increase its value, using economic incentives to drive voluntary adoption.

For construction, group 2 focused on communication management. What to tell people, when, and through which channels. They emphasised that the Nytorget project in Stavanger is a useful example of how proactive communication with neighbours prevented initial concerns from escalating into formal complaints. They also noted that consultation during the construction phase should help communities understand the blue-green system being built, rather than merely experiencing disruption.

Under operation and maintenance, group 2 produced a rich cluster of ideas in their matrix. They emphasised the need for formal agreements about who is responsible for which maintenance tasks. For example, who cleans the ditches, who irrigates the young trees, and who removes debris after a storm. They proposed skill-sharing workshops to help residents maintain private-property NBS features and suggested that identifying sponsors for specific NBS elements could help build both financial sustainability and community investment over time.

In monitoring, group 2 suggested using drone demonstrations to make NBS performance visible in an engaging and accessible way. They described structured feedback mechanisms, including formal reporting of structural failures and malfunctions, as a form of collaborative monitoring and highlighted BioBlitz events as a proven citizen-science format that generates both useful data and public enthusiasm.

Table 2. Group 2 stakeholder engagement matrix

NBS phase	Inform	Consult	Involve	Collaborate	Empower
Planning	Expert knowledge to define possibilities and challenges Official hearing Inform about NBS functionality and how it meets stakeholder needs	Site selection Sensor procurement Tender document preparation Involvement in bid assessment	Experts and engineers in solution planning Resident workshop to collect ideas for the general plan Early involvement leads to fewer design changes	Ask what community members expect regarding climate adaptation NGO partnership for local seeds and plants (Wild Zone example)	—
Design	Landowner briefs: storing excess stormwater and reusing it	Wetlands, river restoration, blue-green areas, recreational possibilities, and biodiversity as	Engagement most important during planning and design	NGO partnership to organise voluntary work events Building spawning bed for	Incentivise stakeholders through value creation

	Plantation on recreational areas to reduce surface runoff	consultation topics	Local information meetings to build ownership	brown trout (KVVY example)	Increased profits from NBS for private citizens
Construction	Nytorget park as example Press and social media updates What, when, and why	Blue-green connections River restoration	Ask locals about considerations for construction: noise, dust, accessibility	—	—
Operation & maintenance	Wetland references N+P (nitrogen and phosphorus) runoff Green areas with flood plains	—	—	Agree on responsibilities: who cleans ditches, who irrigates trees Skill-sharing workshops for residents Gain sponsors for specific NBS features	Locals monitoring NBS impacts: counting birds, frogs, biodiversity
Monitoring	Ongoing monitoring campaigns UAV and drone demonstrations for higher public acceptance On-site information signs	Water quality monitoring design Sensor selection Tender and procurement	Citizen feedback: what went well and where adjustments are needed	BioBlitz events Reporting failures and malfunctions	—
Retirement / repurposing	—	—	—	—	—

4. Comparing the two groups

The two matrices, read side by side, reveal important aspects about the challenge of stakeholder engagement in NBS. The two groups are not contradicting each other. They are looking at the same challenge from different perspectives and bring different kinds of knowledge to it.

Group 1 is oriented towards the lived experience of residents and communities. Their matrix is most densely populated in the cells dealing with how people learn about projects, how they get involved in decisions, and how they take on maintenance responsibilities. Their underlying concern is whether residents feel the NBS belongs to them or was imposed on their neighbourhood by the municipality. The key challenge they identified is the invisibility of stormwater management, and it is fundamentally seen as a problem of communication and perception.

Group 2 is oriented towards the institutional and technical requirements of delivering NBS. Their matrix is populated most densely in planning, monitoring, and the phases where decisions about systems, processes, and responsibilities are being made. Their underlying concern is whether the right people are involved at the right time to avoid costly mistakes, ensure technical quality, and create the conditions for long-term maintenance. Their key insight is that early engagement in planning reduces design changes later, which is an argument for efficiency and quality.

Both groups converge in several instances: the design phase and the operation and maintenance phase. These are the moments in the NBS lifecycle where technical decisions and community decisions intersect most intensely. A design that does not account for how residents will use and relate to the space will struggle to build ownership. A maintenance regime without agreed-upon shared responsibilities will eventually fail. The City Blues framework should treat these two phases as priority areas in which both perspectives must be held simultaneously.

The empowerment column is worth specific attention. Group 1 left it entirely empty. Group 2 contributed two concrete ideas. This gap is not a failure on the part of group 1. It likely reflects the reality that genuine empowerment in NBS is rare and difficult to achieve in practice. But it is a clear signal that the City Blues framework needs to develop this area, because empowerment is ultimately what makes an NBS resilient over the long term. And the retirement and repurposing phase was left empty by both groups, consistent with findings from the City Blues project. Municipalities have very little operational experience here because most NBS projects are still relatively new.

Table 3. Comparison between the two groups

Feature	Group 1: community and trust	Group 2: technical and governance
Main focus	Community relationships, social trust, and resident ownership	Technical feasibility, institutional processes, and governance efficiency
What drives the approach	Building public trust and long-term stewardship of the NBS	Reducing risk, managing costs, and ensuring technical quality
Strongest contributions	Construction, operation and maintenance, and design	Planning, monitoring, and design
Participation level emphasis	Involve and collaborate: working with communities	Inform and consult: engaging technical and institutional actors
Key insight	Stormwater infrastructure is invisible until it fails: communication must compensate for this	Early stakeholder involvement in planning prevents expensive changes in later phases
Approach to monitoring	Citizen science as community engagement and ownership building	Structured data collection, sensor management, and formal reporting
Approach to empowerment	Very limited: left mostly unaddressed by this group	Concrete proposals: value creation for landowners, biodiversity monitoring by locals
Retirement phase	Not addressed	Not addressed

Bringing the contributions from both groups together into a single matrix gives a clearer picture of where current knowledge is strong and where it is not (Table 4). The merged matrix below integrates the community-focused insights of group 1 with the institutional and technical insights of group 2. The result is a more rounded picture of what good stakeholder engagement can look like at each phase and each level of participation.

Table 4. Merged stakeholder engagement matrix

NBS phase	Inform	Consult	Involve	Collaborate	Empower
Planning	Newsletters and websites	City council meetings Site selection	Voting on options	Citizen dialogues and councils	—

	Informing neighbours Publishing plans in local media Official hearings Expert briefs on NBS functionality Communicating existing challenges	Sensor procurement Tender document preparation Bid assessment involvement	Resident workshops to collect ideas Expert and engineer co-planning Early involvement reduces design changes	Climate adaptation expectation mapping NGO partnership for local seeds and plants Securing project sponsors	
Design	Are stakeholders being reached? Network and association building Landowner briefs on stormwater reuse Plantation on recreational areas	Wetlands, river restoration, blue-green areas, recreational possibilities, biodiversity as consultation topics	Co-creation workshops using LEGO-style tools Information meetings to build ownership	NGO partnerships for stream restoration Voluntary work events Spawning bed construction	Incentivise citizens through value creation Profit potential from NBS for private landowners
Construction	Timeline, noise, and accessibility alerts Press and social media What, when, and why Nytorget park example	Blue-green connections River restoration topics	Field visits Public consultation meetings Noise, dust, and accessibility discussions	Volunteer planting	—
Operation & maintenance	Wetland examples N+P runoff communication Green areas and flood plains as references	—	How much maintenance can stakeholders realistically take on?	Responsibility agreements: who cleans ditches, who irrigates trees Skill-sharing workshops Securing sponsors for NBS features	Locals monitoring biodiversity: birds, frogs, green wall upkeep
Monitoring	Stormwater as a hidden issue UAV and drone demonstrations On-site information signs Ongoing campaign updates	Water quality monitoring design Sensor selection Tender and procurement involvement	Citizen feedback on what went well and what needs adjustment	Citizen science BioBlitz events Reporting failures and malfunctions	—
Retirement / repurposing	—	—	—	—	—

The table below translates the content density in each cell into a visual overview (Table 5). Cells with three or more distinct ideas are shown in red, indicating areas where practitioners have rich, ready-to-

use experience. Cells with around one or two ideas are shown in yellow, representing some knowledge but with room to grow. Empty cells are grey.

Table 5. Knowledge map

Phase	Inform	Consult	Involve	Collaborate	Empower
Planning					
Design					
Construction					
O&M					
Monitoring					
Retirement					

Note: *High Density (3+ methods)* | *Moderate (1-2 methods)* | *Knowledge Gap (Empty)*

5. Knowledge and gaps

The planning phase and the collaborate column are the warmest zones in the map. This is where practitioners across both groups showed the most confidence, the most variety of methods, and the most grounded examples. It reflects the reality that most NBS projects have invested heavily in co-design and community consultation at the start, and this investment has built up a genuine body of shared practice across the City Blues partner cities.

Operation and maintenance also show a warm area specifically in the collaborative column, driven by group 2's detailed thinking about responsibility agreements, shared stewardship, and skill-sharing. This is encouraging, because maintenance is often the phase where community engagement collapses once construction is finished and enthusiasm fades.

The empower column is the most consistent gap across the entire matrix. The workshop generated empowerment sparsely, incentivising private landowners through value creation in the design phase, and enabling local biodiversity monitoring in operation and maintenance. For every other phase, empowerment remains an aspiration. This is an area where City Blues can make a real contribution by identifying and sharing replicable approaches.

The retirement and repurposing row is entirely empty. Neither group had experience to contribute. It is understandable that most NBS projects are still within their first operational decade, but it means that municipalities currently have no guidance on how to plan for the end of life of green infrastructure. Given that some NBS features have lifespans of twenty to forty years, this gap needs to be addressed proactively.

The consult column is also sparse. Public consultation is a familiar and legally required step in most planning processes, yet the workshop generated relatively little specific content about how to do it well in an NBS context. This may reflect the fact that consultation is too often treated as a procedural box to tick rather than a genuine opportunity to improve the project, which is itself a finding worth acting on.

6. A guide for municipalities

The following section translates the workshop findings into a practical guide that any municipality can use as a starting point when planning stakeholder engagement for an NBS project. It is not a rigid prescription, and it offers a structured way of thinking through who needs to be engaged, when, and how.

6.1. Planning

The planning phase is about defining the problem, assessing feasibility, and setting goals that different stakeholders can align on. It is also where the foundations of trust are laid.

On the information side, the key task is to make the problem concrete and comprehensible. Stormwater flooding, water quality degradation, and biodiversity loss can be invisible or abstract to most residents. Technical data alone rarely changes this. Combining flood risk maps with drone footage of affected areas or showing before-and-after examples from other cities makes the challenge real in a way that invites engagement rather than indifference.

At the involvement and collaboration level, the most effective approach is to bring stakeholders into goal setting before technical decisions are locked in. Workshops that ask community members what they want from their local green space (safety, biodiversity, play space, aesthetic quality) can reveal priorities that improve the project and prevent resistance later. The evidence from both workshop groups is consistent: early involvement is not just good for community relations; it is also good for the technical quality of the project, because it reduces the number of costly changes that must be made in the design phase.

6.2. Design

The design phase is where abstract goals become specific plans. It is also where the gap between technical professionals and the wider public tends to be widest. Bridging this gap requires deliberate effort.

At the involvement level, physical co-creation methods (bringing residents into a room with maps, models, or hands-on building tools) can make technical designs more accessible and allow people to express their preferences in concrete terms. This is not about giving residents veto power over engineering decisions; it is about ensuring that the people who will live alongside the NBS have had a genuine opportunity to influence how it looks and how it fits into their daily lives.

For landowners in particular, a specific type of engagement is needed. Many NBS features can be implemented on private land, but only if landowners understand what is being asked and what they stand to gain. Demonstrating how an NBS feature on their property can reduce flood risk, lower maintenance costs, or increase the attractiveness or value of their land is a more effective approach than simply asking for compliance.

At the collaboration level, the design phase is an opportunity to draw in expertise that municipalities may not have in-house, particularly around biodiversity, native species, and ecological restoration. The City Blues pilots provide several concrete examples: the partnership with Wild Zone in Tampere for local seed sourcing, and the voluntary stream restoration work supported by KVVY.

6.3. Construction

Construction is the phase that most directly affects the daily lives of people living or working near an NBS site. It brings noise, dust, access disruption, and temporary degradation of public space. Managing this phase well requires honest, proactive, and frequent communication.

The key principle is to communicate before problems arise rather than in response to complaints. The Nytorget project in Stavanger showed what happens when this is done well: early conversations with neighbouring businesses about the construction timeline meant that concerns were addressed before they became formal objections. When this kind of communication is absent, even a well-designed project can generate lasting opposition.

Field visits during construction, such as inviting residents to walk the site with a project manager who can explain what is being built and why, are a relatively low-cost way of converting passive neighbours into interested and informed ones. People who have seen the structure being built and understand what it does are more likely to value and protect it once construction is complete.

6.4. Operation and maintenance

Operation and maintenance is where many NBS projects quietly lose momentum. Construction is finished, the opening event has taken place, and the budget and attention shift to the next project. Without deliberate effort, the community connection built during earlier phases can fade quickly.

The most durable maintenance arrangements are those where responsibility is explicit, agreed in writing, and shared between the municipality and local stakeholders. A simple agreement that defines which tasks the municipality will carry out, which tasks a local residents' group will take on, and how the two parties will communicate about problems can make a substantial difference to whether the NBS continues to function as intended.

Skill-sharing sessions, such as practical workshops where residents learn how to prune, weed, irrigate, or clear debris from NBS structures, serve a double purpose. They reduce the maintenance burden on the municipality and deepen residents' sense of ownership. When people have invested their own time and effort in maintaining something, they are more likely to care about its condition and to notice and report problems.

6.5. Monitoring

Monitoring is the phase that most directly addresses the invisibility problem identified by group 1. Because NBS performance (water retention, biodiversity levels, temperature reduction) is not visible in the way a building or a road is, it requires active effort to communicate.

On-site interpretation, including signs or information boards that explain what the NBS does, how it works, and what has been measured, is a low-cost but underused tool. A simple display showing how much rainfall a rain garden has absorbed in the past month, or how many species have been recorded in a restored wetland, gives residents a concrete sense of what they are living alongside and why it matters.

Citizen science initiatives offer a more intensive form of monitoring engagement. BioBlitz events, where community members spend a day recording all the species they can find in an area, are a proven format that generates both scientific data and genuine public enthusiasm. More structured schemes where trained volunteers regularly record water quality, species counts, or structural condition can produce valuable monitoring data at a fraction of the cost of professional survey programmes, while also creating a community of people with detailed knowledge of and attachment to a specific NBS site.

Where digital tools are available, structured feedback channels (ways for residents to report observations, problems, or damage) can supplement formal monitoring with real-time, ground-level information that technical systems may miss entirely.

6.6. Retirement and repurposing

As noted throughout this report, the retirement and repurposing phase is currently a blank space in NBS practice. Neither working group had meaningful experience to contribute, reflecting the broader reality that most NBS projects have not yet reached the point where end-of-life planning is urgent.

This is, however, precisely the moment to begin thinking about it. An NBS designed today will reach the end of its effective life in twenty, thirty, or forty years. If that endpoint has not been considered in the original design, the municipality will face a situation in which materials need to be removed, habitats need to be managed through a transition, and communities that have developed an attachment to the space need to be involved in decisions about its future. Integrating end-of-life thinking into the design phase is a form of responsible long-term planning that benefits everyone involved. This involves asking what this NBS will look like when it is mature, when it begins to function differently, and what we will do with it by then.

7. Conclusion

Drawing together the findings from both working groups and the phase-by-phase analysis above, the following recommendations are offered for municipalities planning or reviewing their approach to stakeholder engagement in NBS projects.

Invest in making stormwater visible. The single most consistent finding from this workshop is that stormwater infrastructure suffers from a perception problem: it is only noticed when it fails. Every phase of engagement should include a thoughtful effort to make the work and its benefits tangible, through visualisations, on-site interpretation, drone demonstrations, or citizen science data. Communities that understand what an NBS does are more likely to support, protect, and maintain it over the long term.

Engage early in planning. The efficiency case should motivate this: early stakeholder involvement reduces design changes, which reduces costs. But besides efficiency, early engagement lays the foundation of trust on which the rest of the project depends. Informing people about a decision that has already been made is not engagement; it is an announcement. Real engagement happens when there is still something meaningful to be decided.

Formalise maintenance responsibilities before construction is complete. Agreements about who does what in the operation and maintenance phase are much easier to negotiate when everyone is still enthusiastic about the project. Waiting until after construction is finished means negotiating at a point when municipal resources have moved on, and community energy has dispersed.

Develop the empowerment level deliberately. The workshop showed that genuine empowerment is rare but achievable. Value creation for private landowners and community-led biodiversity monitoring are two concrete examples that emerged from this workshop. The City Blues framework should compile and expand this set of examples, because empowerment at the right moment can transform an NBS from a piece of municipal infrastructure into a lasting community asset.

Begin planning for retirement and repurposing now. Even if no existing project is near the end of its useful life, the habit of thinking about end-of-life in the design phase needs to be built into standard

practice. This includes material reuse, ecological succession planning, and community involvement in transitions.

Use both perspectives simultaneously. The main lesson of comparing the two working groups is that municipalities need both the community and trust focus of group 1 and the technical and governance focus of group 2. Projects that are technically excellent but have no community buy-in will struggle with maintenance and long-term resilience. Projects that have strong community enthusiasm but weak technical foundations will underperform relative to their design objectives.

The City Blues framework, which is being developed, should help municipalities hold both perspectives simultaneously, providing tools and methods for both throughout every phase of implementation.