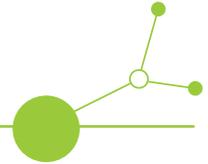# D2.1.2
Co-Design Workshop Report

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INTRODUCTION

In this deliverable, we report on the analysis of the co-design workshops planned for Period 3 and carried out in Periods 2 and 3. Following the methodology developed in Period 2 (described in Deliverable D2.1.1) and input from our case partners in Jablonec nad Nisou, we conducted three co-design workshops in Senica, Dresden and Poznań. We collected qualitative and quantitative data about the process and products of co-design with two objectives:

1. To evaluate and improve the effectiveness of the workshop methodology and set-up to engage stakeholders in the co-design process;

2. To distil design principles from the urban stream restoration solutions co-designed in the workshops.

In what follows, we describe the methodology in detail, report on our cross-case analytical findings, and discuss broader implications, limitations, and recommendations for next steps in the ReBioClim project based on our findings.

METHODOLOGY

Data collection

Deliverable D2.1.1 details the data collection methodology illustrated in Figure 1. In brief, the co-design workshops were designed to engage stakeholders around urban stream restoration in pilot case locations and to co-create possible solutions that integrate the needs and desires of citizens and expert knowledge. As such the workshops were set up as environments for the systematic collection of qualitative and quantitative data on those objectives. Importantly, participants were well informed about the assignment and were introduced a method for social-ecologically integrated urban stream restoration developed in the ReBioClim project.

To ensure consistency in data collection methods throughout the entire process, the team made minor adjustments to the methodology described in deliverable D2.1.1 and illustrated in Figure 1. These changes were introduced mainly to help local facilitators and participants understand clearly the process and ensure that all materials are handled exactly as the methodology described. These adjustments included:

- modifying the numbering system of the evaluation forms to avoid confusion between Section C of the form and Part C of the workshop methodology;

- adding further guidelines and steps in Poster B, indicating the details of the process;

- including additional material and examples of previous results into the methodology presentation to make the workflow easier for facilitators to organize and for participants to follow;

- slightly adjusting the available time allocated to each session; and

- introducing a more structured approach to the final session, including a more specific guiding question as an entry point to open up the discussion.
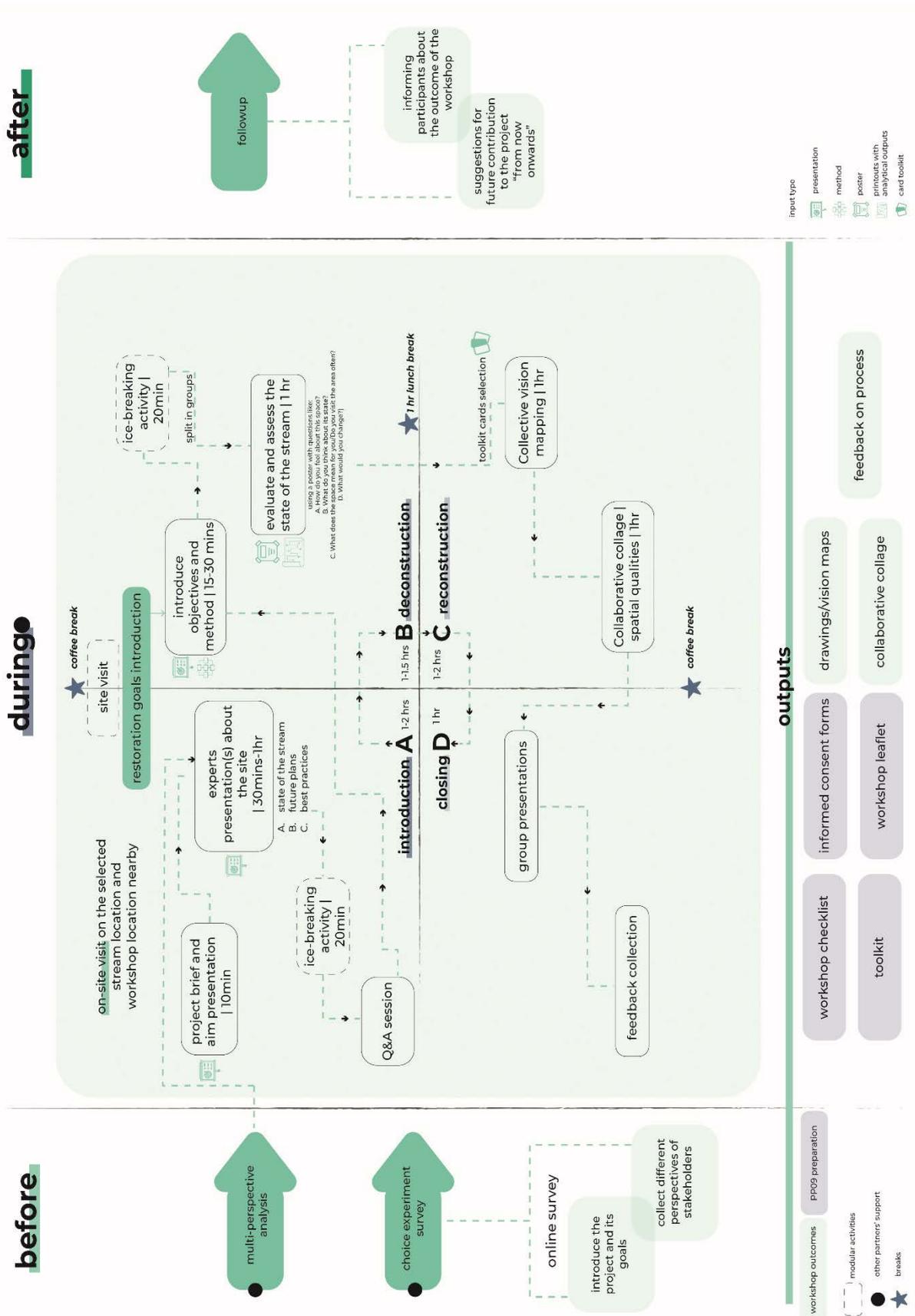
COOPERATION IS CENTRAL

after

followup

informing participants about the outcome of the workshop

suggestions for future contribution to the project "from now onwards"

input type
presentation
method
poster
printouts with analytical outputs
card toolkit

during

coffee break

site visit

restoration goals introduction

ice-breaking activity | 20min

split in groups

introduce objectives and method | 15-30 mins

evaluate and assess the state of the stream | 1 hr

using a poster with questions like:
A. How do you feel about this space?
B. What do you think about its state?
C. What does the space mean for you/Do you visit the area often?
D. What would you change?

1 hr lunch break

toolkit cards selection

Collective vision mapping | 1hr

B deconstruction

C reconstruction

Collaborative collage | spatial qualities | 1hr

coffee break

experts presentation(s) about the site | 30mins-1hr
A. state of the stream
B. future plans
C. best practices

ice-breaking activity | 20min

Q&A session

on-site visit on the selected stream location and workshop location nearby

project brief and aim presentation | 10min

introduction **A** 1-2 hrs

closing **D** 1hr

1-1.5 hrs

1-2 hrs

group presentations

feedback collection

before

multi-perspective analysis

choice experiment survey

online survey

introduce the project and its goals

collect different perspectives of stakeholders

outputs

feedback on process

drawings/vision maps

collaborative collage

informed consent forms

workshop leaflet

workshop checklist

toolkit

PP09 preparation

workshop outcomes

modular activities

other partners' support

breaks

Figure 1 Diagram illustrating the co-design workshop methodology, detailing data collection during the workshops.

The workshops

The workshop series was kicked off in Senica on 3 June 2025 and took place at a venue near the stream Teplica, which was the subject of restoration. The organisers from the Town of Senica (PP06) ensured high attendance both during the site visit and at the workshop location. The workshop was supported by experts from the Slovak University of Technology (PP05) and by the presence of a researcher from Delft University of Technology (PP09). The workshop gathered a diverse group of participants representing water authorities, fire brigade, leisure centre, nature-focused NGOs, elementary schools, social services, senior homes, cultural centres, municipal property management, the Slovak Technical University, as well as several experts form consultancy firms, NGOs and the municipality concerned with the restoration of the Teplica stream. Given the high attendance, participants were split into six groups.

Figure 2. Representative of PP06 introducing the co-design workshop to the six groups of participants in Senica.

The workshop in Dresden took place on 4 June 2025, in Bürgerhaus Prohlis and was hosted by Technische Universät Dresden (PP01), Leibniz Institute of Ecological Urban and Regional Development (PP02) and City of Dresden (Administration) (PP03) with the support and presence of a researcher from Delft University of Technology (PP09). After a welcome presentation and a project introduction, the participants walked along the Geberbach stream accompanied by experts introducing them to the characteristics and key elements of the stream, as well as challenges and limitations a restoration could face. Additionally, a group of researchers from PP01 collected samples from the stream and explained the organisms that find habitat there and their functions.

The third co-design workshop took place on 24 September 2025 in Poznań, Poland, hosted by Poznań University of Life Sciences (PP08) in collaboration with the City of Poznań (PP10) and Aquanet Retencja Sp. z o.o. (PP11), and with methodological support form a member of the team from Delft University of Technology (PP09). The workshop was highly attended by a diverse group of participants ranging from students to experts from different fields, representatives of civil society and residents from various age groups, including elderly citizens. As the workshop took place at the Poznań University of Life Sciences and access to the pilot stream location was made possible by a bus. As the pilot stream is mostly culverted in this case, an open neighbouring segment was also visited where local partners gave an on-site presentation and demonstration of how the biological quality of streams is assessed.

Figure 3 Site visit in Poznań. Experts in microhydrobiology searching for life in material extracted from an open section of the Teplica stream (left) and participants walking along the covered section of the stream (right).

During the site visits, the participants were already given the key questions included in poster of Part B regarding the site analysis, and when back at the venue, after an expanded and elaborate introduction to the methodology and the material, they discussed their findings with the group and worked on the poster. After a lunch break, the third part of the workshop took place, with the participants discussing the restoration toolkit measures, choosing the ones they considered suitable and using the collage to visualize their visions. Lastly, all the groups gathered in a plenary session for the presentations and a closing discussion about negotiations and challenges that occurred along the way (Figure 4).

Figure 4. Concluding presentations and discussions of the workshop in Dresden.

The researchers from PP09 made sure to support all facilitators and participants along the way, make notes of issues that occurred, as well as collect all materials needed to be translated and then used as input for the qualitative data analysis described in this deliverable.
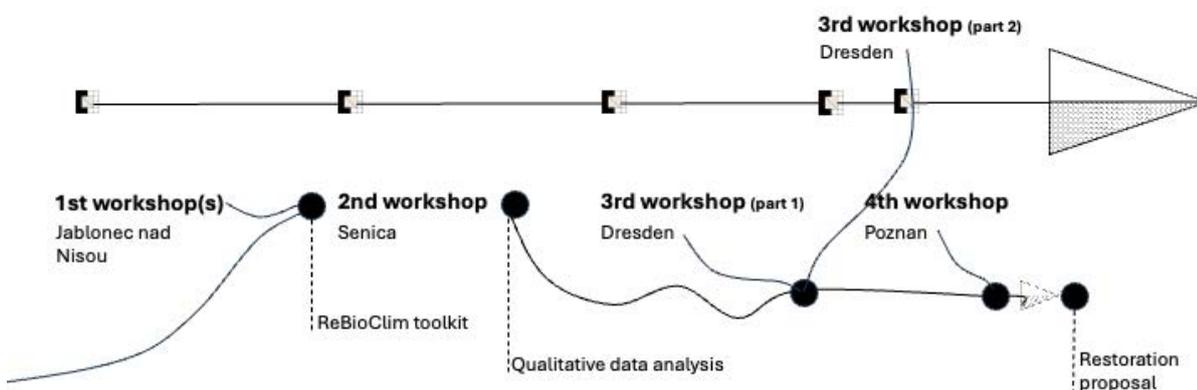

Figure 5. Timeline and workflow of workshops and data analysis

It is important to note that, as mentioned in deliverable D2.1.1, the workshop in Jablonec and Nisou was conducted prior to the development of the methodology, as part of the process of a local landscape architecture competition with a separate timeline, and was therefore used as input for the methodology and its materials. PP09 communicated with PP12 and collected useful material that was produced during the workshop. A key contribution was to the ReBioClim restoration toolkit, since the researchers incorporated measures that the participants in Jablonec and Nisou considered very important for restoration to the toolkit provided as a tool to the rest of the workshops. Additionally, PP12 ran a second workshop for

the Bílá Nisa restoration on 24 September 2025, in which representatives of UJEP (PP04), participants of the first co-design workshop and leaders of the teams invited to the competition further refined the details of the restoration plan. Considering that this workshop was organised at a refinement stage where solutions have already been defined by the participants, the ReBioClim methodology was not used. However, participants were acquainted with the ReBioClim project's outputs and social-ecological integration principles.

Data analysis

Under the two overarching objectives, the data analysis was guided by the five research questions listed in Figure 6. The questions were answered with a combination of summary statistics on quantitative data and qualitative data analysis.
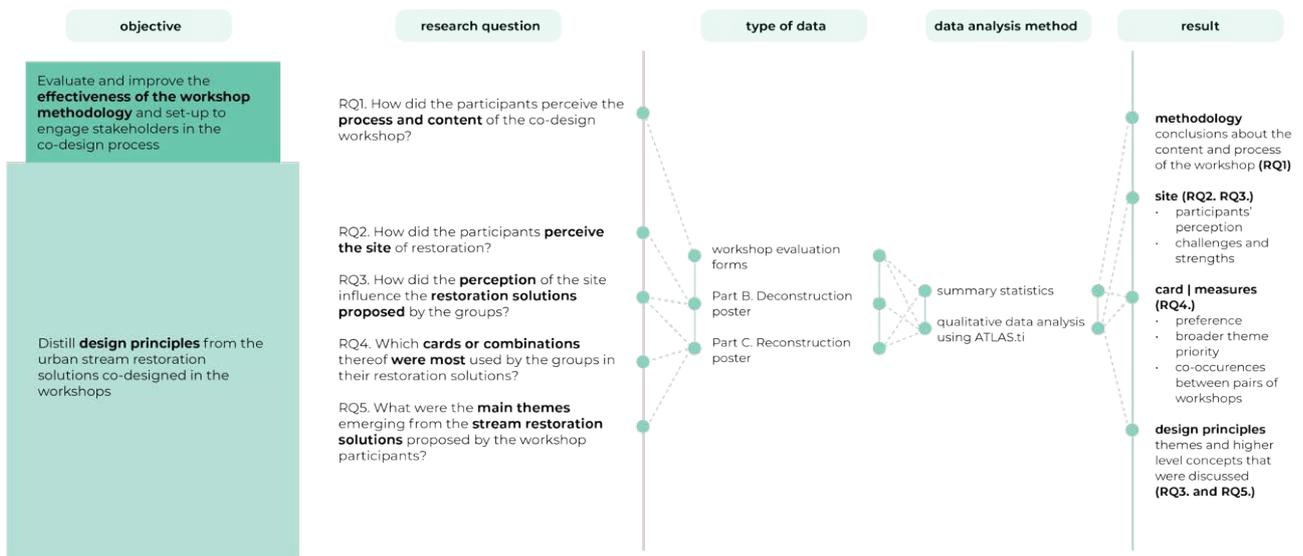

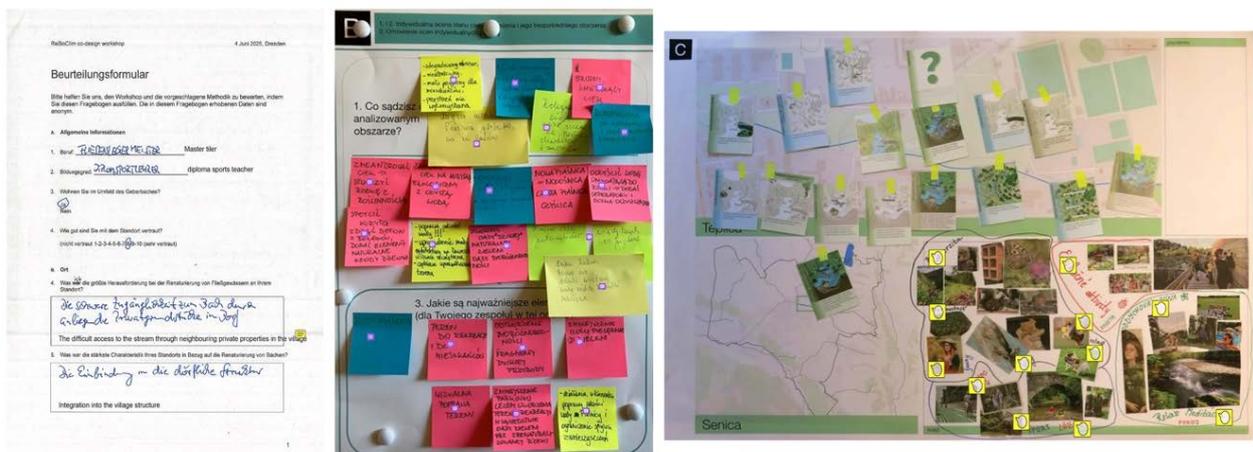*Figure 6. Qualitative data analysis methodology*

Figure 7. Qualitative data analysis data types, from left to right: Evaluation form, Part B poster, Part C poster

The data types collected from the workshops were (Figure 7):

1. The workshop evaluation forms (evaluating the process and methods of the workshop, as well as providing input for the site analysis).
2. Part B. Deconstruction poster (site analysis with two questions referring to individuals and one towards the group, combining the most important elements about the site).
3. Part C. Reconstruction poster (utilization of the restoration toolkit in two scales, as well as visualizing an ideal vision for the stream.

Table 1 provides a detailed summary of the methods, quantitative and (mostly) qualitative, used to answer the research questions.

Table 1 Overview of research questions and corresponding methods of analysis.

Question	Method
Objective 1. Evaluate and improve the effectiveness of the workshop methodology and set-up to engage stakeholders in the co-design process.	
RQ1. How did the participants perceive the process and content of the co-design workshop?	Summary statistics of closed-ended questions and QDA of open-ended questions with the codes:
	PRO-L or DL (process like or dislike)
	PRO-CHA (challenges in the process)
	CON-L (content like)
	CON-PROP (content proposal)
	TO-CON-L or -DL (toolbox content like or dislike)
	PO-CON-L or -DL (poster content like or dislike)
	COL-CON-L or -DL (collage content like or dislike)
	BEN (benefit)
	CHAL (challenge in restoration)
	COMS (comments)
Objective 2. Distil design principles from the urban stream restoration solution co-designed in the workshops.	
RQ2. How did the participants **perceive** the site of restoration?	QDA of **Part B posters** categorised under the three sections of the poster and **open questions 4 and 5 of the evaluation form**:
	PER (perception about the site)
	CHAN (change)
	DIS (dislike)
	LIK (like)
	CHAL (challenge in restoration)
	G-OBS-PR (group observations/ conclusions proposals)
	G-OBS (general group observations)

RQ3/4. Which **toolkit cards** or combinations thereof were **most/least used** by the groups in their restoration solutions?	Count of cards per poster Part C, with interpretation of: patterns within and across groups; patterns observed within and across cases.
RQ5. What were the **main themes emerging from the stream restoration solutions** proposed by the workshop participants?	QDA of **Part C collages and plans** conducted in ATLAS.ti, structured under the categories of biodiversity, climate adaptation, quality of life, as well as synergies and conflicts thereof: BIO (biodiversity) CA (climate adaptation) QL (quality of life) SEI (Socio-ecological integration) SYN (synergies) CONF (conflicts) PR (proposal) MTL (mystery cards – extra tools) COL-COMS (collage comments)

RESULTS

Workshop evaluation

RQ1. How did the participants perceive the process and content of the co-design workshop?

The anonymous workshop evaluation form was filled in overall by 55 participants across the three cases where the co-design workshop was conducted. As shown in Table 2, the workshops gathered participants with occupations in administration and management, education and research, and technical professions, as well as some students and skilled professionals, the majority of which were highly educated (48/55), relatively familiar with the site (42/55 above average), and with an equal representation of residents and non-residents.

Table 2 Overview of participants' profile.

Occupation	Count
Administration & Management	20
Education & Research	11
Technical Profession	9
Others	5
Students	4
Architecture, Landscape & Urbanism	4
Skilled Profession	2

Level of education	Count
Higher education	48
Secondary education	7

Familiarity with the site	Count
Greater or equal to 8	31
Between 5-7	11
Less or equal to 4	12

Resident of the site	Count
yes	27
No	28

Workshop Process

When asked to evaluate the workshop, participants valued it primarily for its well-structured and well-organised process, methods used, and the space it created for creativity. Many emphasised that the diversity of participants and the range of perspectives represented were central to their experience, since these allowed for rich discussions and enabled learning from peers. Collaboration and teamwork also appeared a positive element. The overall atmosphere was described as relaxed, and enjoyable. Participants also appreciated the opportunity to learn about the site and benefited from the presence of experts who added depth to discussions.

At the same time, some gaps were identified. The most common concern was limited or missing information about the site, which created some confusion during the workshop. A few suggested that more time would have enabled better understanding and would have made the process less tiring, and one pointed to the absence of residents from different age groups, which constrained representativeness. These missing

elements were also reflected in what participants found most difficult. Unfamiliarity with the site shaped many challenges, since it made it harder to assess feasibility or anticipate impacts. Others struggled with aligning multiple ideas within their teams, especially under tight time constraints, and some noted difficulties in synchronising working pace across group members or dealing with the inherent complexity of the task.

Despite these obstacles, the majority of 51/55 participants judged the workload to be appropriate. Final comments reinforced a general sense of satisfaction with engagement levels while also signalling curiosity regarding how the proposals might translate into real outcomes. Participants expressed interest in more detailed guidance to address existing knowledge gaps and asked for more time on the field to improve their understanding of site conditions.

Perception of the site

To understand how participants perceived the sites, we analysed the evaluation forms (BEN, CHAL), Part B posters (PER, CHAN, DIS, LIK) and group observations (G-OBS-PR, G-OBS).

Data from the evaluation forms and their relevant questions were coded in two rounds, resulting in observations related to benefits and challenges, and problematic elements associated with stream restoration. Among the most frequently mentioned benefits was the "harmonization of ecological and functional elements", highlighting the multifunctionality of the site as a mixed space for education, recreation, the strengthening of human-river interactions, and more. Additionally, "ecosystem services" were identified as a central benefit of stream restoration, suggesting that these spaces provide shade, water purification, flood protection, and other advantages. High importance was attributed to these spaces as "hubs that support biodiversity and species conservation" and wildlife within city borders. Other beneficial elements refer to existing conditions like the "excellent location" and the "willingness to act and existing knowledge" that play vital role in urban stream restoration projects.

Table 3. Extensive table of the BEN and CHAL codes, their groundedness and explanation

Code / subcode	Groundedness	Explanation
BEN	52	**Benefits of/for the area for restoration**
Harmonization of ecological and functional elements (multifunctionality)	20	Area that can have a multifunctional character such as educational, recreational, strengthening human-water interaction, public space and more.
Ecosystem services	14	Areas that provide a variety of ecosystem functions such as flood protection, shade, water purification etc.
Biodiversity and conservation	8	Refers to the importance of these areas for natural environment conservation and supporting biodiversity.
Excellent location, accessible, within the urban structure	7	Area integrated to the urban structure, well connected with public transport.
Willingness to act, cooperate with various city units, and existing knowledge	7	Willing stakeholders, well prepared and studied area, prior knowledge and specialists involved.
Other beneficial elements	2	Connection to the overall water system and the level of degradation allow for a wide range of actions.

CHAL	66	Potential challenges for restoration that relate to the current state of the site
Complete channelization and covering the stream	*14*	A stream that is channelized, highly manipulated area, but highlights that nature will act as it pleases.
Stream system	*13*	Refers to flow rate, periodic changes, pollution, water quality.
Acceptance and integration of residents' ideas - social conflict and political will	*11*	Refers to the social conflicts, lack of awareness, political will, and multi-stakeholder profile that is tough to navigate.
Limited opportunities and limitations	*8*	Refers to the challenge to increase the area for appropriate investments, financing of construction, and long-term maintenance.
Authorization procedure, ownership, aligned regulations	*7*	Land ownership structure and private land, land use, alignment with other regulations such as groundwater regulation.
Ignorance and neglection of watercourse and surrounded areas	*7*	A very neglected stream and watercourse, with need to maintain nearby greenery.
Flooding risk of the area	*4*	Susceptible to flooding area, need to ensure water does not overflow.
Other challenges	*3*	Such as ensuring nature conservation, and access, and navigating the fact that the area exists within urban structure.

*RQ2. How did the participants **perceive** the site of restoration?*

This part of the analysis was based on data originating from the poster of Part B of the workshop methodology, when the participants evaluate individually and during group discussion the state of the site. It is important to mention that the coding methodology for this part distinguishes insights derived from individuals (PER, DIS, LIK) and those derived from the group discussion (G-OBS), supporting that the insights resulting from the discussion are of higher importance.

Regarding the perceptions of individual participants, the main element that was highlighted most frequently was the fact that the streams were "degraded and not attractive areas, with difficult access", as well as areas of "great potential for improvement". Additionally, the "heavily anthropogenic" manipulation was recognized by many. On another note, a few commented on the fact that these areas are "green lungs and an oasis" within the urban environment, but sometimes quite "polluted streams" and often "unknown and forgotten" by the residents. A few highlighted "difficulties related to land ownership" as well as "poor stream characteristics" such as low water level and an eroded waterbed. When it comes to elements that they liked, the participants appreciate the fact that these sites are "full of life" and fauna, as well as "nice flora". As for the most disliked elements, "aesthetics" such as smell, lighting, litter as well as the "insufficient public access" were mentioned most often.

When it comes to the input from the group discussion, the main observations were the number of "limitations" the site has, such as the inefficient dialogue with residents creating social conflicts and the area characteristics. The participants also indicated that the segments chosen were "nice and peaceful" environments, where extensive "greenery maintenance" should be avoided.

Table 4. Extensive table of the G-OBS, PER, LIK and DIS codes, their groundedness and explanation

Code / subcode	Groundedness	Explanation
G-OBS	11	General group observations as a result of group discussion during Part B
Many limitations for restoration	4	The participants mentioned that there are multiple limitations that the area faces such as a lack in residents' dialogue, social conflict, and other area characteristics that make it difficult to be restructured
Nice and peaceful segment	3	Refers to observations that describe the site as nice, peaceful part of the city, ideal for relaxation
Greenery maintenance	2	The greenery maintenance needs to be reduced and it is very costly.
Potential to improve urban quality of life	1	-
Typical flora	1	-
PER	64	Individual participants' perception about the current state of the site
Degraded, not attractive area, difficult access	26	Many participants highlighted the poor and degraded condition of the site, where measures need to be taken to be restored, well-maintained, aesthetically pleasing, freed from invasive species, more accessible and clean.
Great potential for improvement	14	There is great potential for improvement due to the location and the multifunctionality that the space has (urban heat island effect mitigation, water retention, recreation opportunities).
Heavily anthropogenic area	9	The area is heavily transformed, with proximity to urban structures that limit its functions.
Green lung / oasis	6	Gives the impression of "wildness" in the city, an urban habitat for flora and fauna worth preserving.
Highly polluted stream	6	Its water is highly polluted due to sewage outlets and petroleum substances (mentioned for Piaśnica stream)
Uknown, forgotten stream	6	Some participants mentioned that the stream is not appreciated, and there is a lack of exposure and knowledge about it.
Difficulties related to land ownership	4	The dwelling patterns (e.g., multi-family housing) create different conditions for restoration.
Poor stream characteristics	3	Refers to low water level, shallow waters, channelized structure or erosion.

LIK	9	Elements that the participants liked on the site
Full of life (fauna)	4	Refers to mentions of fauna species that thrive on site such as fish, ducks, and birds that create a lively environment.
Nice flora	3	Nice colourful plants and flowers, meadows and green nature worth preserving.
Functional contribution	2	An area that support functions like physical activity and nature inside city limits.
DIS	18	Elements that the participants disliked on the site
Aesthetics	6	Refers to negative elements like smell, mud, darkness, unnoticeable, littering and overall neglection.
Insufficient public access	4	Refers to the fact that the stream is remote, not accessible and non-easily visible.
Stream geometry and characteristics	4	Concrete banks, steep slopes, straightened flow.
Invasive plants	2	Non-native vegetation, overgrown at the riverbanks.
Maintenance	2	Overgrown weeds, non-maintained public space infrastructure such as playgrounds.

After having discussed the state of the sites, participants individually and during group discussion suggested some preliminary changes (CHAN, G-OBS-PR) for the site before being exposed to the measures proposed through the toolkit. The main changes that emerged in the group discussion of Part B were related to "creating a multifunctional space for the community" that combines education, recreation, raises awareness, and neighbourhood identity, and the "renaturalisation of the watercourse and the surroundings to improve biodiversity". "Access to the water and the site" was important as well, along with the need to "reduce pollution and contamination" by removing outlets or reducing runoff of pollutants. Other changes suggested by the groups was creating "water retention spaces for flood protection" and "maintenance of existing and new elements".

As for individual input, the participants highly prioritized the "restoration of life inside and outside the stream" by removing invasive species, creating nesting opportunities for fauna species such as birds, and more. "Improving the water quality" emerged as an equally important goal, with the participants highlighting the need to remove sewage pipes, and water purification. Additionally, the need to have multiple "functional zones" for emergencies, recreation, and flood protection was mentioned from multiple individuals. "Geometry and in-stream elements" like deepening the banks, adding elements in the water, creating protective embankments, as well as "opening up the stream to enable controlled access" were highly ranked in participants' suggestions.

Related to stream geometry but in another direction, many participants stated that a more "naturalized stream geometry" was needed with meanders, non-concrete sections, opening up channelized sections, and others. Equally important, the need for "landscaping" to create paths, terrain variations, seating opportunities was highlighted but many participants mentioned the need to "reduce maintenance and landscaping of the shore", creating a conflict in the results. A few participants highlighted the need for "noise reduction" due to nearby traffic, as well as the need to reshape the "aesthetic harmony" in the area and create "educational opportunities" that would change the public attitude around such spaces.

Table 5. Extensive table of the G-OBS-PR and CHAN codes, their groundedness and explanation

Code /Subcode	Groundedness	Explanation
G-OBS-PR	68	Group proposals as a result of group discussion during Part B
Creating a multifunctional space for the community	18	Refers to creating multifunctional spaces that combine education, recreation, raise awareness, neighborhood identification.
Renaturalisation of the watercourse and the surroundings to improve biodiversity	16	Add vegetation reinforcements, remove invasive species, replant before cutting, restore biodiversity, create habitats and support natural processes.
Access to the water and the stream site	12	Ensure safe access to the stream for the public, create promenades, adding stairs to the water, remove fencing.
Reduce pollution and contamination	9	Remove outlets, reduce pollutants' runoff to the stream, improve water quality in the catchment.
Water retention space for flood protection	8	Refers to the creation of small lagoons, pools, islets, improving water balance and other measures that ensure flood protection with natural methods and preparedness to extreme weather conditions.
Maintenance of existing and new elements	4	Maintenances of existing trees, bushes, but also of the new elements that will be added.
Other proposals	3	Reduce noise, due to nearby traffic and parking.
CHAN	115	Suggested changes proposed by the individual participants during Part B
Restore life inside and outside the stream	21	Restore biodiversity of the stream, create green oases of "wild" biodiversity and greenery, create nesting opportunities for important bird species, reduce mowing, create herbaceous borders, introduce suitable species such as floodplain species and remove invasive species.
Improve the water quality	20	Improve water quality with self-purification ponds, vegetation that absorbs pollutants, reduce the supply of nutrients, install waste separators.
Functional zones	16	Create the necessary functional zones such as for emergency vehicles and maintenance, as well as recreation, flood protection.
Geometry changes and in-stream elements	15	Shallow the riverbed, deepen the banks, install small weirs, natural elements in the water, remove concrete base, check for potential expansion.
Open up stream, enable controlled access	14	Enable access to the water, install stairs, and open up some sections.
Landscaping (paths, benches, terrain variations)	10	Refers to adjustments that could be done when it comes to the terrain and the infrastructure at place. Adding benches or other small architectural elements, creating paths.

Renaturalised stream geometry	10	Removed hardened areas, open up stream, create meanders, uncover channelized parts.
Noise reduction and parking relocation	6	Reduce noise by removing traffic in proximity, greening the parking, relocating it, add a green buffer for noise reduction.
Reduce maintenance and landscaping of the shore	5	No to new construction and landscaping of the shore, reduce maintenance, no additional paths, only partial tidying up of the area.
Aesthetic harmony	4	Visual improvement of the area, improve aesthetics, allow more light to penetrate.
Education of the local community and public attitude	3	Create educational boards about the stream and the role of nature, shift public attitude, making ecosystem services understandable.
Other suggested changes	3	Creative solutions, proposals into practice, transparent communication.

Co-design analysis

The toolkit

Figure 8 The toolkit in use by one of the groups in Poznań.

RQ3/4. Which toolkit cards or combinations thereof were most/least used by the groups in their restoration solutions?

Participants appreciated the accessibility, clarity, and ease of use of the toolkit introduced in Part C, with the majority giving it a high ease-of-use score (Figure 9). According to them, it allowed them to familiarise themselves with the pilot site and helped them be creative in their thinking about solutions. Some considered the breadth of the toolkit to enable diverse views in the co-design process, where most of them met each other for the first time. Participants also appreciated the graphical qualities of the toolkit and enjoyed the card-based technique, as it facilitates collaboration and co-design.
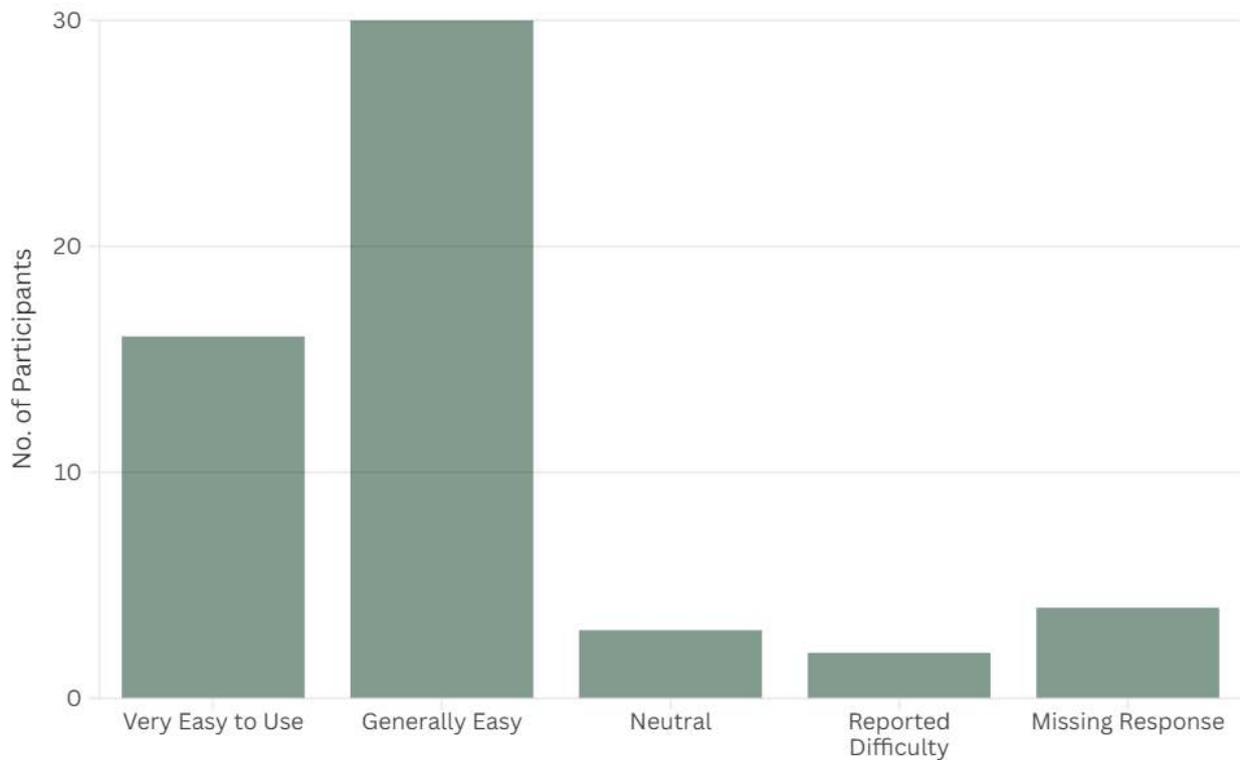
Figure 9 Reported ease of use for the co-design toolkit.

The cards used most (by 11 out of 13 groups) were "Provide access into the stream" (card 17), and "Integrate programme, e.g., leisure, education, swimming (card 30). Other highly used cards (by 8-10 out of 13 groups) included "Enable nature observation", "Add public space facilities", "Remove concrete channel", "Install fascines where necessary", "Add in-stream structures", "Remove wastewater inflow and stormwater run-off", and "Ensure continuous service buffer". The least used cards (by 1-3 out of 13 groups) included "Provide access to the area by public transport", "Provide accessibility across", "Urban afforestation", "Install green structures on building", "Build fish passage", "Reduce water extraction", "Remove weirs", and "Less frequent mowing".

Overall, all cards were used at least once. Approximately 40% of cards were used in all cases, which, per theme, covered 37% of biodiversity, 43% of Quality of Life, and 32% of Climate Adaptation out of the total potential use. The groups from Dresden picked cards from all themes almost equally, Senica focused most on Quality of Life and least on climate adaptation. Poznań also had nearly equal thematic focus, but the highest emphasis on climate adaptation amongst all three cases. Of the 13 groups, three reached around 50% card usage, and three used the least, around 30%.

Participants also indicated a few aspects of the toolkit that require improvement. Content-wise, some cards were found less suitable because they were either too narrowly focused on stream restoration, more suitable for larger streams, too similar, too open-ended, or missing essential measures. The mystery cards were then often used to fill in those gaps. More than half of the groups (7 out of 13) used the mystery cards for measures like "improve water quality affected by sewage" (SK), "remove parking" (PL), and "…" (DE). Two groups also expressed that more mystery cards could be added. In terms of physical format, some participants considered the cards to be too big or too many.

Restoration proposals

RQ5. What were the main themes emerging from the stream restoration solutions proposed by the workshop participants?

The coding of Part C posters was done mainly on the collages and comments left on posters by the participants. The cards which participants used were analysed separately. We were mainly interested identifying the main themes emerging from the stream restoration solutions proposed by the workshop participants. The codes Biodiversity, Climate adaptation and Quality of life were made similar to the themes of the cards. Additional to that were the theme of Socio-ecological integration, Synergies, Conflicts, Proposals and Comments on collage to note any other kind of ideas in the section.

Table 6 provides a detailed description of these codes and their sub-codes listed in reverse order of groundedness.

Participants' reflections on quality of life highlighted necessity of functional activities that would animate the site through activities like biking, canoeing, sports, playgrounds and other opportunities for active use. At the same time, people expressed a desire for spaces oriented toward calm and restoration, imagining quiet corners, resting areas and environments that allow for silence and relaxation. Practical considerations also played a central role, with several suggestions focusing on improving safety, facilities and maintenance through better lighting, seating, waste management and general upkeep, as well as education and awareness to ensure responsible use. Participants also envisioned better access to the stream, proposing walkways, stepping stones and other ways to bring people closer to the water. A smaller but notable strand of feedback pointed to the importance of identity, describing the site as a place that could hold emotional or social value for residents at the scale of the village, city or wider region.

In climate adaptation they focused mainly on how the area can handle water better in the future. Several comments pointed to the need for stronger flood protection and reminded that any new intervention should keep flood safety in mind. Others suggested ways to hold and save water through methods like rainwater harvesting, biofiltration or green roofs. A third group of ideas looked at how water moves through the site, proposing changes to the river's course, removing it from the stormwater ditch and adding elements that help guide or slow water so it can flow more naturally.

With Biodiversity, the key focus was on creating better habitats for all kinds of ecosystems like, Avian and pollinator for birds, bees, butterflies and other pollinators, along with the flowering plants that support them, aquatic systems for fish, ducks, beavers and other water-dependent species and land based systems like hedgehogs, foxes, squirrels and ground insects. But the avian and pollinator one was the most important one. it was also pointed for thoughtful landscape and vegetation management, including removing invasive species, encouraging more plant variety and reducing excessive maintenance. Suggestions also touched on adding more trees and greenery, restoring natural features such as wetlands and ecological corridors. A small number of remarks mentioned the importance of making sure animals can access water and move safely within their habitats.

In Socio-ecological integration suggestions were for simple community activities such as boating on the stream or community gardening, while others highlighted the value of experiencing the place more deeply and drawing inspiration from nature. A similar strand focused on human-nature interaction through education, exposure to ecological processes and respect for biological and social diversity while feedback on synergies emphasised on Education's importance for building awareness, encouraging responsible behaviour and helping people understand ecological relationships. It also noted the experiential value of such efforts, including intergenerational benefits and the sense that investing in nature yields meaningful returns. Others pointed to the high spatial value of the area, describing it as a place that can support work, activity, rest and biodiversity together.

Participants offered a range of proposals that centred on improving the ecological and social functioning of the river corridor. Major focus was on maintenance and care like stressing the need for cleaner upstream conditions, better control of pollution and the prevention of waste disposal. River restoration was another important suggestion, with suggestions like to restore the Bogdanka and Wierzbak valleys, deepen or re-shape the riverbed and support more natural river dynamics. Many supported the idea of natural embankments, including softer water edges and stepped banks that blend ecological and recreational goals. Social integration also appeared as an important direction, reflected in ideas such as planting edible species, encouraging community involvement and introducing small actions that bring life back to the area. Some inputs also pointed to river valley protection in planning and law, and a few comments stressed the need to consider the broader catchment when designing local measures.

The collage-based comments reinforced these themes. Suggestions on riverbed and stream restoration emphasised meandering and renaturalisation. Notes on ecological connectivity highlighted the value of linking recreational spaces with wildlife habitat. A few reflections captured a sense of urgency by pointing out the current poor condition and the need to act, while others called for consistent monitoring of environmental quality, including institutional oversight.

Table 6 Codes resulting from the qualitative data analysis of Part C posters.

Code/ Sub-code	Groundedness	Description
Quality of life (QL)	**57**	
Functional Activities	18	Refers to the various functional activities that can be added in the area. Examples: biking, canoeing, sports, playgrounds etc.
Relaxation and Recreation	13	refers to mentions about creating a calm, relaxing environment for people to go to for relaxation. Examples of comments are: resting zones, space of relaxation, we are here for silence
Safety, Facilities and Maintenance	13	Refers to various suggestions made to improve sense of safety of place and add more facilities through things like lighting, benches, dustbins, maintenance and even awareness and education.
Accessibility to the stream	8	Refers to the suggestions made about giving access to water through suggestions like walkways to water, stepping stones, contact with water etc.
Identity	5	refers to image of the place for people. For example: Place for your village, city and region, : place where you love to come back etc.
Climate Adaptation (CA)	**22**	
Flood Protection	8	Refers to all comments made about increasing flood protection. Examples: in any intervention, do not forget about flood protection, improve flood protection etc.
Water Retention and Conservation	8	refers to suggestions about reserving and storing water. For example: Bio-filtration of water, Rainwater Harvesting, green roofs etc.

Water Flow Management	6	Refers to comments made about flow and course of the river. For example: Reconstructing the river's course. Freeing the river from the stormwater ditch, riffles, water drainage etc.
Green and sustainable building design	1	-
Biodiversity (BIO)	**82**	
Avian and Pollinator Habitat	31	Refers to suggestions about creating habitats for avian creatures like birds, bees, butterflies and insects and the pollination ecosystem they create with flowering plants.
Landscape and Vegetation Management	17	Refers to comments about things like, remove invasive plant species, variability, Limiting greenery maintenance etc.
Aquatic Ecosystem	11	Refers to mentions of: aquatic animals, plants, fish, reptiles, ducks, beavers etc.
Afforestation and Greenery	7	Mentions of addition of trees, plantations, greenery
Ecological Restoration	7	Refers to things about restoration of natural elements like: protection and restoration of wetlands, Protection of river valleys - ecological corridors etc.
Land based Biodiversity	7	Refers to mentions of land based animals and rodents like: hedgehogs, moose, foxes, squirrels and even ground insects
Accessibility	2	Refers to accessibility of animals and insects to their habitats. For example: drinking water for animals
Socio-Ecological Integration (SEI)	**10**	
Community activities	3	Refers to suggestions of activities like boating in the stream, community gardening etc.
Experience of Place	3	refers to comments like: what nature has to offer, where do you get good ideas?
Human-Nature Interaction	3	refers to comments like: education about nature, biological, human and professional diversity
new parking	1	
Synergies (SYN)	**18**	
Education	6	refers to comments like: creating awareness of the interrelationships, education, monitor waste etc.
Experiential Value	6	refers to comments like: intergenerational, the effort is worth it

High Spatial Value	6	refers to comments like: work and activity space, space for relaxation, rest, biodiversity etc.
Proposal (PR)	**34**	
Maintenance and Care	8	refers to comments such as: Mechanical cleaning is necessary upstream of the catchment area, increasing the number of controls on river pollution, no waste disposal etc.
River Restoration	7	refers to comments such as: Restoration of the Bogdanka and Wierzbak valleys, deepening the riverbed, River Restoration - natural reconstruction of river beds etc.
Natural embankment	6	refers to all comments which suggest creation of natural embankments along the river edge: Natural water edges, stepped embankment etc.
Social Integration	6	refers to comments like: edible trees and shrubs, community engagement, bring back life with small interventions etc.
River Valley Protection	4	refers to comments like: Protection of river valleys in planning documents and the local law of Poznań, Shaping urban planning based on the protection of the river valley system etc.
Water Catchment	3	refers to comments like: consider the catchment area for local measures
Collage comments (COL-COMS)	**13**	
Riverbed and Stream restoration	6	refers to comments like: Meandering of the riverbed, Renaturalisation of the Piaśnica riverbed etc.
Ecological Connectivity	3	refers to comments like: Recreational areas by the water system, Wildlife enclaves etc.
Condition and Action	2	refers to comments like: the situation is bad, now is the time

Overall, a number of design principles, or characteristics thereof, emerge from sub-codes with strong groundedness, highlighting the aspects participants valued most. These principles include "functional programming", "spaces for relaxation and recreation", "enhancing a sense of safety", "provision of facilities such as lighting, benches, and waste bins", "flood protection measures", "water retention and storage strategies", "landscaping and afforestation", "supporting ecosystems, including avian, aquatic, and terrestrial species", "ongoing landscape management", and "restoration of riverbeds and streams".

Figure 10 Examples of collages produced in Dresden (top), Senica (middle), and Poznań (bottom).

DISCUSSION AND NEXT STEPS

The co-design workshops reveal important implications for how technical and community knowledge can be effectively combined in the ReBioClim project. A key challenge was establishing a shared language among stakeholders with diverse backgrounds, particularly when deciding which inputs should meaningfully shape the project and which aspects require specialised expertise. The workshops also highlighted the need to better align parallel engagement activities, as differences in goals and timelines across partners created occasional inconsistencies for participants.

Methodologically, several limitations emerged. The workshop design was initially developed by researchers unfamiliar with the local context, though iterative consultation with local partners helped mitigate misalignments. The diversity of participant groups required careful negotiation of expectations, and while the multimodal methods (maps, collage, drawing, text) supported inclusive participation, they also introduced interpretive complexity. In particular, the analysis of visual materials highlighted the need for more systematic documentation of participants' explanations to reduce researcher-driven interpretation.

Insights from this analysis will inform the identification of synergies and conflicts, formulation of strategies, and the further development of design principles in Work Package 3, while providing input to further engagement activities and guide refinements to the co-design methodology to strengthen inclusivity, contextual relevance and transparency in the next phases of the ReBioClim project.