Report on NBS professional Skill Gaps

CONEXUS

Urban nature connects us
Conectados por la naturaleza urbana
Conectados pela natureza urbana

Document Information

Deliverable title:	Report on NBS professional skill gaps
Authors:	Priscila Franco Steier, Daniela Rizzi & Roger Roger Roca Vallejo – ICLEI Europe
Deliverable number:	D.1.5
Work package:	WP 1, Task 1.3.a
Lead partner:	ICLEI Europe
Due date of deliverable:	Month 22
Submission date:	29.06.2022
Dissemination Level	Public
Reviewed by	Tom Wild - USFD

Version	Date	Modified by	Modification reasons
(e.g. D1 for First Draft or R1 for first review)	Date	Name	e.g. Add changes from review

Contents

Executive Summary

This report identifies nature-based solutions (NBS) professional skill gaps in order to give guidance on how Nature-based Thinking (NBT) can be better integrated into higher education and professional training. To identify the skill gaps, two different approaches for data collection were deployed: two workshops addressing specific target audiences (students and young professionals; and NBS specialists), and an online survey. The data were analysed through content analysis, employing two Code Systems – one based on grounded theory, and one based on the Societal Challenges identified by Dumitru & Wendling et al, 2021[1]. To interpret the data, more focus was given to the codes related to Soft and Technical skill gaps.

The results showed that students, young professionals or specialists have a strong call toward a more inclusive and diverse conception of NBS, which also accounts for indigenous Cosmo visions and experiences from the Global South. The need for more transdisciplinary and for the ability of the concept's translation according to different contexts were also recurring answers. Often the professionals lack the skills to navigate through different knowledge systems and political contexts, which hinders their capacity for cross-sector and transdisciplinary engagement, as well as the capacity to communicate and make the case for NBS to different stakeholders.

Alongside NBS implementation and knowledge literature gaps, the results of the survey highlighted the need for NBS evidence and its valuation against Grey Infrastructure. Data analysis - development of ecological, economic and social metrics; and data modelling skills were also mentioned. Another shared claim among different respondents was the need for more context-based NBS education and knowledge production, especially in the social-ecological settings of the Global South. This means designing and systematising solutions that are adapted to local ecological, economic and social conditions. In terms of NBS stewardship and ecosystem management, emphasis was given in providing context-based technical training, guiding materials, and evaluation tools addressing local communities.

Anticipating the discussion on Curricula Change (Task 1.3.b), inspired by the contributions of the youth and student respondents, this report builds on a preliminary review of the decolonial pedagogy literature. It understands that Curricula is beyond a syllabus and needs to be discussed uncovering epistemologies and power structures, which they reinforce. Resonating with the students' claims, decolonial pedagogy literature, and the NBS approach; this report points to the need for higher education organisations to adopt a pedagogic approach connected to real life problems and engaged towards a more just and inclusive society. It also emphasises the needs of promoting horizontal exchange between research/higher education organisations and on-the-ground actors such as communities, public managers and policy makers. Lastly, it calls attention for greater protagonism of students on defining learning topics and methods, as well as on NBS knowledge generation and dissemination.

The present report will support the content of CONEXUS products and outcomes related to capacity building such as Guidelines (D.4.3), Capacity Building Materials (D.1.4) and NBS joint Masters Programme (M33). In this sense, its results present key messages to be considered when developing capacity building materials, as well as higher education and training programmes.

[1] Dumitru & Wendling, 2021. Evaluating the Impact of Nature-based Solutions: A Handbook for Practitioners. Publications Office of the European Union. doi:10.2777/244577.

1. Introduction

The 'CO-producing Nature-based solutions and restored Ecosystems: transdisciplinary neXus for Urban Sustainability' — 'CONEXUS' project aims to demonstrate through evidence-based and multipurpose pilot initiatives both in Europe and in Latin America, how Nature-based Solutions (NBS) can deliver a wide range of benefits in urban and peri-urban ecosystems. The project is developed within the framework of the European Union's Horizon 2020 Programme for the strengthening of international cooperation between European countries (EU) and the countries of the Latin American and Caribbean Community (CELAC) in the field of sustainable urbanisation.

The objective of the consortium, made up of 33 institutions from both regions, is to co-produce, structure and promote access to shared and contextualised knowledge to help cities and communities to co-create NBS and restore urban ecosystems, driving incremental changes in urban policies and practices in EU and CELAC countries. Founded on place-based (Wild et al, 2008[2]; Dempsey et al, 2012[3]) and Nature-based Thinking – NBT[4] (Randrup et al, 2020[5]) approaches, the project is structured in seven crosscutting and articulated Work packages (Figure 1).

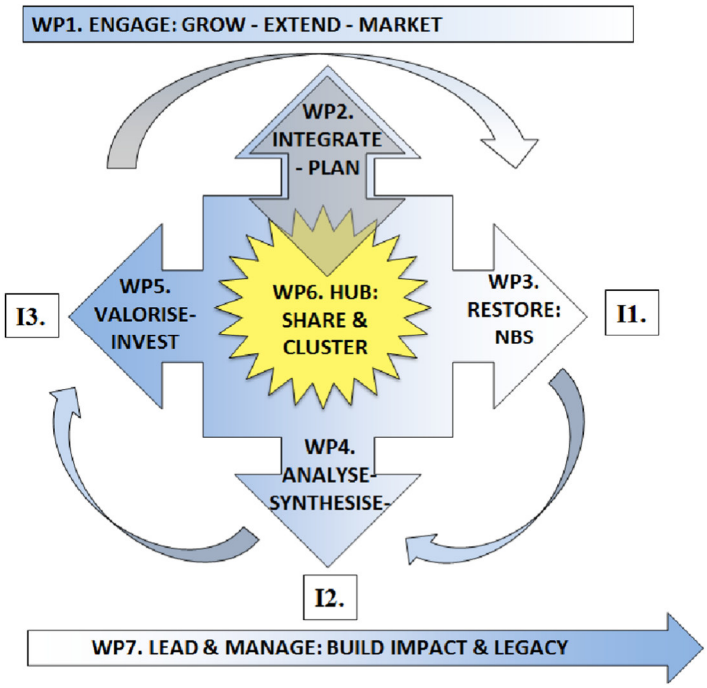

Figure 1: CONEXUS Framework. WP – Work packages/ I – Impacts. Source: CONEXUS' Grant Agreement.

[2] Wild TC et al. 2008. An innovative partnership response to the management of urban river corridors – Sheffield's river stewardship company. 11th Int. Conf. On Urb. Drainage, AHR/IWA, Edinburgh.

[3] Dempsey N et al. 2012. Defining place-keeping: the long-term management of public spaces. Urban For Urban Green 11:11–20.

[4] NBT is an approach to urban inclusive planning, being inspired by nature to act socially, environmentally as well as economically in the transition towards sustainable cities.

[5] Moving beyond the nature-based solutions discourse: introducing nature-based thinking. Urban Ecosystems (2020) 23:919–926. https://doi.org/10.1007/s11252-020-00964-w.

To date the lack of knowledge and skills on how to implement, maintain and measure the effectiveness of NBS has been a major challenge increasing the perception of higher risks related to NBS and hampering larger scale implementation. The present report is a deliverable from Work Package (WP1), which has the overall goal to catalyse NBS partnerships between EU and CELAC cities, engaging stakeholders to share inspiration, knowledge, skills and processes, using better evidence to maximise capacity to restore and enhance urban ecosystems. WP1 is responsible for: (1) increase levels of skills connected with NBS; (2) engaging future NBS professionals and local people (including civil society, investors and municipalities staff) in co-creation of NBS; and (3) inspire changes to curricula and technical assistance towards urban NBS.

Within WP1, Task. 1.3 aims to identify NBS professional skill gaps in order to give guidance on how NBT can be integrated into education and training practices, preparing the ground to overcome existing barriers that are impeding the planning/implementation of NBS. It aims to recommend capacity-building work and curricula change for NBS implementation in different scales and contexts. Anchored on the gaps identified by key stakeholders such as practitioners, researchers and engaged citizens (T.1.3.a), CONEXUS will propose a curriculum for NBS professional training and high educational programmes tailored to strategic and local priorities, while addressing major global societal challenges (T.1.3.b). The current report is an output of subtask T.1.3.a - NBS professional skill gaps, as the project deliverable D.1.5. Its results and key messages will support the content development of CONEXUS products and outcomes such as Guidelines (D.4.3), Capacity Building Materials (D.1.4) and NBS joint Masters Programme (M33).

This report describes the methodology deployed in T.1.3.a and analyses the results of the skill gap survey in dialogue with the handbook for practitioners "Evaluating the impact of Nature-based Solutions" produced by the European Commission's NBS Task Force 2 and the publication of the European Commission's Directorate-General for Research and Innovation, "Nature-based solutions: state of the art in EU-funded projects" (Dumitru & Wendling, 2021; and Wild et al, 2020), as well as scientific literature. Finally, it also discusses the results of the recent findings on NBS knowledge gaps of another EU funded project - NetworkNature.

2. Method

In order to collect information over the NBS professional skill gaps, complementary approaches were deployed: (i) two online workshops with specific target audiences; and (ii) an online survey. The discussions and results deriving from the workshops served as guidance to prepare the survey questionnaire. In both approaches, the question about professional skill gaps on NBS were framed around the categories of societal challenges defined by the NBS Evaluation Handbook (Dumitru & Wendling op citi, pg. 117), namely:

1. Climate Resilience
2. Water Management
3. Natural and Climate Hazards
4. Green Space Management
5. Biodiversity Enhancement

6. Air Quality
7. Place Regeneration
8. Knowledge and Social Capacity Building for Sustainable Urban Transformation
9. Participatory Planning and Governance
10. Social Justice and Social Cohesion
11. Health and Wellbeing
12. New Economic Opportunities and Green Jobs

All the qualitative data collected through online workshops and the survey were analysed through content analysis (Hsieh & Shannon, 2005[6]), employing grounded-theory[7] (Nobel & Mitchel, 2016[8]). A set of open and thematic codes (Flick, 2009[9], p. 305, 427) were generated in order to enable synthesis, interpretation and comparison between the different qualitative data sources. The following sessions bring methodologic details of each approach.

2.1. Workshops with target audience

The CONEXUS project led online session's to discuss professional skill gaps related to NBS with two different audiences – (i) students, and (ii) NBS professionals from the CONEXUS consortium. The appraisal of the professional skill gaps in the current project will inform a tentative curriculum. It is therefore relevant to understand not only the perspective from the professionals, but also the expectations and aspirations from students and young professionals towards NBS. Listening to those voices helps to understand how NBS are currently conveyed in high education organizations and professional training courses.

2.1.1. Studienstiftung des deutschen Volkes e.V – 'Sustainable Europe' event

NBS concepts and practices have been developed by a small group of experts. These voices have been drawn from a limited palette of not very diverse backgrounds, and particularly lacking early career researchers and professionals (Wild et al, op cit). A particular area of concern for the future development of nature-based approaches is around skills development and professional training. In innovating with nature-based approaches, there is a need to develop new ways of listening to young people, gathering feedback, and seeking to understand different perspectives of global and societal challenges, as well as potential responses using NBS.

Addressing this need, ICLEI Europe in collaboration with the University of Sheffield co-organised an online workshop with the Studienstiftung with outstanding undergraduate students granted by the scholarship agency. A two-hour workshop took place on the 14th of September 2021 and was attended by 46 participants. During the workshop the students were presented to the NBS approach both on the ground (through the experiences and initiatives of the City of Lisbon), and from a European Policy

[6] Hsieh & Shannon. 2005. Three Approaches to Qualitative Content Analysis. Qualitative Health Research, 15(9), 1277–1288. https://doi.org/10.1177/1049732305276687

[7] Grounded theory is a general methodology for developing theory that is grounded in data which is systematically gathered and analysed. In this method, categories and analytic codes are developed from data and pre-existing conceptualisations are not used.

[8] Nobel & Mitchel. 2016. What is grounded theory? In: Evidence Based Nursing.

[9] Flick. 2009. An Introduction to Qualitative Research. (4th ed.). Sage Publications.

perspective. Students were invited to discuss how young people and early career researchers and professionals perceive global and societal challenges in relation to NBS, and how to bring this perspective into the conception, framing and development of educational and capacity-building programmes.

The participants were then separated in four virtual rooms where they approached the discussion through one of the given knowledge fields: social (15 participants), cultural (9 participants), economic (12 participants) and environmental (10 participants). The working groups were conducted as facilitated discussions about co-creative futures and how educational programmes might be developed to support transformative change. The following questions framed the discussions:

- What is the role of your discipline in NBS and how does it relate to education?
- Do you know any good examples of educational programmes in your area that are relevant for NBS?
- Have you encountered any gaps in your study programmes in relation to NBS? How could these be addressed to better define, study, and implement NBS?
- What should a good educational curriculum in your area include for better studying and working on NBS?

The outputs of each group were collected in the form of virtual whiteboards, as the example displayed in Figure 2. The digital murals and related comments are analysed within this session, in order to gather the feedback from the audience and extract take-away messages.

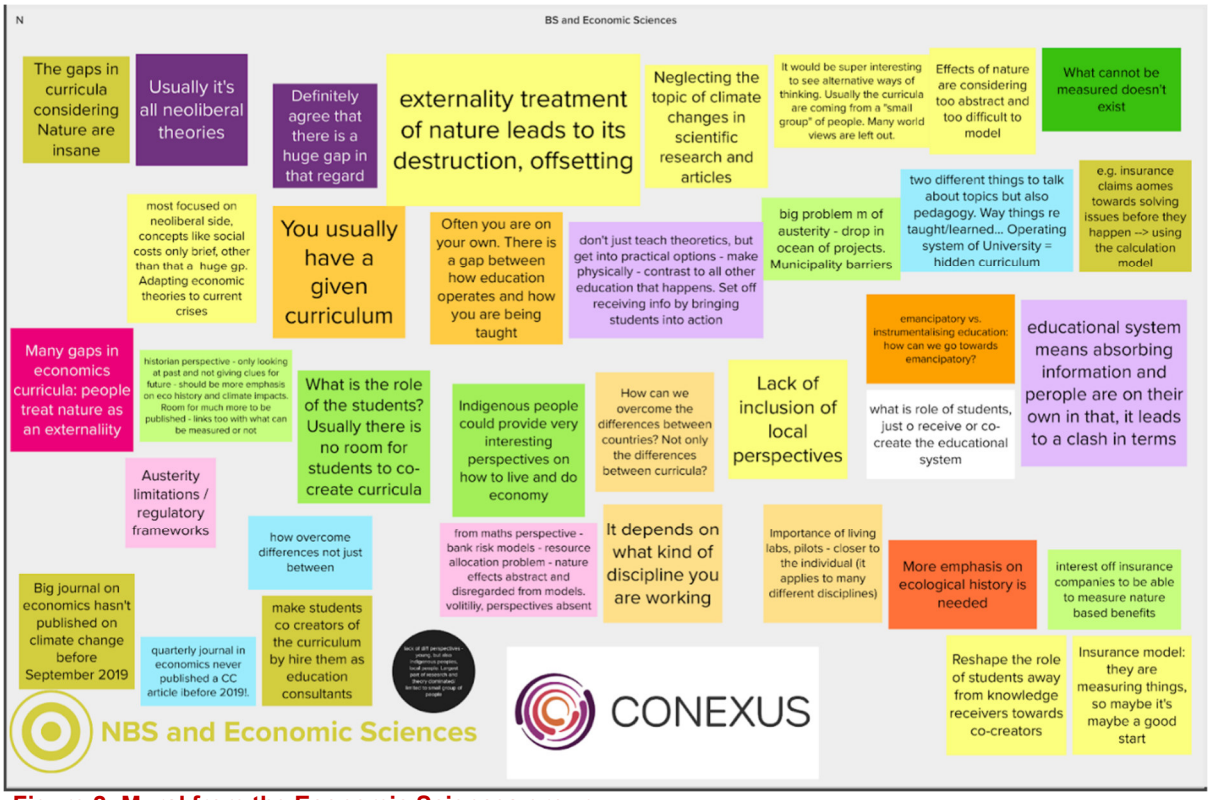

Figure 2: Mural from the Economic Sciences group.

For the analysis, each digital panel was transcribed in spreadsheets and explored through content analysis in two different steps. In the first step, the contributions of each whiteboard were coded through

open coding. In the second step, all posts classified as “curriculum” were coded against the categories identified in the content analysis done for the Bogotá Workshop (for details, see session 2.1.2. and Table 2 and 3). The mural posts not identified as curriculum were interpreted in ways to inform and give insights of the students’ claims and perspectives on how to improve NBS education and training. In this report, only the contributions classified as “curriculum” will be analysed, given the focus of this deliverable. A more comprehensive analysis of the workshop will be featured in the upcoming Deliverable 1.6 report, foreseen for month 42.

2.1.2. Bogotá Workshop

The second workshop was attended by the CONEXUS consortium and partners, as part of the Conexus General Assembly, which took place on 13th October 2021. Due to the Covid-19 pandemic, the event was held online. Over 100 participants registered for the event and on average there were 70 attendees from across Latin American and European cities involved in the different sessions.

The one-hour session “Screening professional skill gaps” related to NBS in the environmental, social/cultural and economic professional fields focused on the screening of professional skill gaps on NBS to give task leaders and partners a basis for the design of the Task 1.3a’s skill gap questionnaire.

The participants were divided into 3 breakout rooms according to language proficiency and field of expertise. The dynamic of the workshop was based on a “pressure-cooker” approach, allowing fast-paced interactions and discussions and ensuring timely interactions covering different topics, supported by the collaborative digital tool MURAL. The questions about professional skill gaps on NBS spun around the three sustainability pillars and six out of the 12 societal challenges of the NBS Evaluation Handbook (Dumitru & Wendling, op cit):

- Climate Resilience
- Green Spaces Management
- Participatory planning and Governance
- New economic opportunities and Green jobs
- Health and well-being
- Social Justice and Cohesion

The digital murals collected the comments from the breakout room attendees and enabled the extraction of take-away messages by the ICLEI team. Later, the digital murals were also analysed through content analysis, in the frame of grounded theory (Nobel & Mitchel, op. cit.). The results of the workshop are presented in session 3.2.

2.2. Online NBS Professional Skill Gap Survey

NBS are transdisciplinary endeavours that require collaboration and engagement from different stakeholders. NBS are capable of addressing numerous societal challenges while providing a range of co-benefits across multiple expert domains. Hence, experts with different backgrounds view NBS through various disciplinary lenses (Sgrigna et al, 2021 – p.18). While the survey was primarily focused on expert individuals and groups involved in creating, implementing, and evaluating NBS coming from different domains and contexts, it also aimed to reach out for a critical appraisal of a non-professional audience

who interacts with professional experts, or may participate, benefit or get impacted by the different stages of NBS delivery.

In this sense, aligned with the guidelines that framed this screening, the online survey targets NBS stakeholder groups identified in WP1's Milestone 1 (M1) – Stakeholder Mapping (SM), with the addition of the corporate sector:

- local/city governments,
- corporate sector,
- citizens/communities,
- research institutions/universities,
- consultancy/private sector,
- educational organisations,
- non-governmental organisations,
- international organisations,
- financial sector.

The target audience was reached out by contacting partners from EU Funded NBS Projects by email, as well as through social media and multiple professional networks related to NBS, with a special but not exclusive focus on Europe and Latin America. A few domains of the professional contacted networks were: water management, biodiversity conservation, landscape architecture, environmental education, environmental justice.

The online survey was available from 3rd February – 11th March 2022 as a Google Form written in English (see annex 1). Although the survey call explained how to translate the form, our team received recurring feedback regarding the language barrier, particularly in accessing non- NBS professionals such as citizens/communities.

Table 1: Approaches for scanning NBS skill gaps – T.1.3.a.

Target audience	Audience profile	Data collection	Data analysis
Youth	Outstanding undergraduate and graduate students from the fields of humanities, economics, natural sciences and health	Online panel with facilitated discussion on how to bring youth perception on societal challenges in to the conception, framing and development of NBS educational and capacity-building programmes	Content analysis

CONEXUS consortium and partners	Professionals from different domains with expertise in NBS	Online panel with facilitated discussion over *Screening professional skill gaps related to NBS in the environmental, social/cultural and economic professional fields*	Content analysis
Key Stakeholders	Professionals, students and engaged citizens, from different expertise domains.	Online survey disseminated through NBS partners and professional networks.	Content analysis

To analyse the responses to the open questions, a content analysis was performed with the support of the software MAXQDA 2022. The content analysis counted with two codes systems: “Skill Gaps” (divided in Technical and Soft skills and their respective sub codes; and Societal Challenges (divided accordingly to six selected societal challenges listed on the NBS Evaluation Handbook (Dumitru & Wendling, op. cit.).

In order to enable a cross-analysis and coherence with the mentioned approaches, the survey analysis was based on the Skill Gap-code system created for analysing the results of the Bogotá Workshop. However, the data were also analysed against the Societal Challenges-code system. For this code system some of the societal challenges listed on the Handbook were clustered under the code “ecosystems & biodiversity”, as shown in Table 2.

Table 2: Societal Challenges codes adapted from Dumitru & Wendling, op cit.

Societal Challenges	**Codes**
Climate Resilience Water Management Natural and Climate Hazards Green Space Management Biodiversity Enhancement Air Quality	Ecosystems & biodiversity
Place Regeneration	Urban and Place Regeneration

Knowledge and Social Capacity Building	Knowledge and Social Capacity Building
Participatory Planning and Governance	Participatory Planning and Governance

Furthermore, some new sub-codes were created for responses that were not fitting to aforementioned code systems, or to allow better refinement of the codes. Just the segments that could be related to NBS professional skill gaps were coded. Additionally, there was no methodological restriction in classifying a segment with more than a sub-code and code system.

3. Analysis

3.1. Students Workshop – Studienstiftung Sustainable Europe Event

From the 90 contributions collected in the four different online panels, 42 were identified as related to curricula and analysed against the code systems for Skill Gaps (Table 3) and for Societal Challenges (Table 2). Moreover, some of the responses were coded through open-coding. The results of each code system are analysed below.

3.1.1. Skill Gaps code system

From the Skill Gaps code systems, the responses were classified into the following codes and related sub codes:

- Soft Skills: (i) transdisciplinary, (ii) inclusion, (iii) political context, and (iv) translating.
- Technical Skills: (i) data analysis, (ii) economy, and (iii) design & engineering, (iv) psychology, (v) funding landscape.

Soft Skills

"Transdisciplinary" was the code with the higher number of sub codes between both code systems. This code accounted for responses related to the level of collaboration between natural sciences and practical philosophy; the inclusion of environmental sustainability and environmental history in the curricula of humanities; the promotion of transdisciplinary student's workshops related to NBS; and the engagement of students from different disciplines.

The code "Inclusion" raised relevant hot-topics in regards to critiques over NBS. The answers criticised a Eurocentric point of view and called for including voices and perceptions of the youth, marginalised groups and "peripheral" countries in the concept's discussion. Building on the academic debate of the Anthropocene, a student highlighted the inclusion of species other than humans or, to use a term from anthropology, more-than-human (biological and spiritual) beings (Danowski & Viveiros de Castro[10], 2014; Tsing, 2019[11]).

[10] Danowski & Viveiros de Castro. 2014. Há mundo por vir? Diálogos sobre os medos e os fins. 1a ed. Instituto Socioambiental. 176 p.
[11] Tsing. 2019. *Viver nas ruínas:* paisagens multiespécies no Antropoceno. Brasília: IEB Mil Folhas. 284 p.

For the code “Political Context”, a participant suggested closer cooperation of undergraduate and graduate programmes with decision makers. Finally, for the code “Translating” an answer was related to the role of Journalism in convening to the public positive aspects of NBS. Another answer highlighted the possibility of transferring theoretical approaches and conceptual frameworks from one field to another.

Technical Skills

Regarding the technical skills, the code “Data Analysis” accounted for responses related to training in climate change and risk assessment and modelling, as well as to the programming language Python. For the code “Ecology & Management” the responses were mainly related to the inclusion of key environmental debates into the humanities curriculum. The code “Economy” clustered responses related to the predominant focus on neoliberal theories in Economy high education organisations and faculties, and the need to incorporate theories and frameworks that account for “social costs” and externalities. For the code “Design & Engineering”, the answers were related to a need for addressing waste and energy management, as well as a better understanding of the barriers of designed NBS, such as green roofs. Finally, the code “Psychology” relates to the perspective that NBS knowledge should be embedded in emotional perspectives and sensory experience with nature.

3.1.2. Societal Challenges code system

Regarding the Societal Challenges code system, only the codes “Participation & Governance” and “Well-being & Spirituality” were applied, accounting for one response each. The code “Participation & Governance” was related to the call for incorporating citizen science in curricula. In the code “Well-being & Spirituality”, the answer emphasised the role of arts and education in “Nature Curation”, resonating the debate on how can contemporary art and ‘landscape-based’ curating [12] enhance ecological awareness and local identities.

3.1.3. Open coding

A set of open codes was created to better interpret the curricula-related responses from the Students Workshop. Those closely related open codes are: (i) curricula co-creation, (ii) pedagogy, and (iii) critical thinking. Many respondents flagged that the students are not considered active agents in terms of curricular development within higher education organisations and that they should be co-creators of the curriculum.

Along with the claims for more protagonism in educational processes, some students directly criticise what the Brazilian educator and pedagogy expert Paulo Freire called “bank education”, in contrast with a “liberating education”. Freire, in the “Pedagogy of the Oppressed” (2000[13]), one of the most influential pedagogy books in the world (Stephans, 2022[14]; Green, 2016[15]), first launched in 1968, described the conventional and hegemonic education (bank education) as a process where the teacher sees the student as an empty chest to be enriched by the “knowledge” deposited by the teacher.

[12] https://www.rug.nl/education/summer-winter-schools/knowledge_of_the_curator/?lang=en

[13] Freire. 2000. Pedagogy of the Oppressed (30th anniversary ed.). New York: Bloomsbury.

[14] Stephan. 2022. 100 Jahre Paulo Freire. Zur Aktualität einer Pädagogik der Befreiung als dialogische Praxis. In: Jahrbuch der Luria-Gesellschaft 2021 (pp.S. 61-68).Lehmanns Media Berlin.

[15] Green. 2016. What are the most-cited publications in the social sciences (according to Google Scholar)? Impact of Social Science Blog. https://blogs.lse.ac.uk/impactofsocialsciences/2016/05/12/what-are-the-most-cited-publications-in-the-social-sciences-according-to-google-scholar/

"Bank education" serves an instrumental rationality of pragmatism and utilitarianism of dominant classes, and shapes the students to be assimilated by the market. Its method and epistemology are hierarchical, unidirectional and disengaged from the realities and existential context of the students. In contrast, emancipatory pedagogy, as advocated by Freire, is a political practice that opens space for dialogue, communication, the raising of problems, questioning and reflection on the current state of affairs. Through its critical thinking approach and active engagement with real life problems, emancipatory pedagogy seeks to enable students (young or adults, in formal or informal settings) to act towards a more just and inclusive society.

The responses coded as "critical thinking" and "pedagogy" directly addressed the problematic described by Freire, even on his terms, which shows how actual and relevant is this educational debate, especially in the perspective of inclusive and pluralist approaches to NBS and NBT that aim to foster societal changes.

3.2. Bogotá Workshop

The analysed data of the Bogotá Workshop were based on the systematisation of the discussions held during the panel *'Screening professional skill gaps related to NBS in the environmental, social/cultural and economic professional fields',* where in total 59 skill gaps were identified by the consortium partners. Those data were classified into two major categories: Soft and Technical skills. Within each category, the data were qualified through content analysis (see Table 3).

3.2.1. Skill Gaps code system

For Soft Skills, 34 responses were grouped into the following sub codes: (i) Transdisciplinary; (ii) Inclusion; (iii) Translation (communication, translation to different audiences and negotiation); (iv) Political Context (experience with policy implementation and situated decision-making); (v) Business; and (vi) Non-Utilitarian.

For the Technical Skills, the 24 responses were classified in the sub codes: (i) Design & Engineering; (ii) Economy; (iii) Data Analysis and Modelling; (iv) Evaluation and Monitoring; (v) Ecosystem Management; (vi) Inclusion through data; (vii) Funding Landscape; (viii) Stakeholder Mapping; (ix) Psychology (impacts of nature on perceived safeness and boundedness).

Table 3: Skill gaps code system resulted from the content analysis of Bogotá Workshop

Skill Gaps Code System	Skill Gaps Code System
Soft skills	**Technical skills**
Transdisciplinary	Transdisciplinary
Inclusion	Inclusion
Translating	Translating

Political context	Political context
Business	Business
Non-utilitarian	Non-utilitarian
	Transdisciplinary
	Inclusion
	Translating

Soft Skills

Among the Soft Skills, the subcategory “Inclusion” has the majority of occurrences, accounting for 13 cases. This category stands for: environmental justice and inclusion of marginalised groups; economic, political and technical inclusion of local communities; bottom-up approaches and informal governance arrangements; indigenous and local peoples' knowledge; and language skills.

Following that, the sub code “Translation” had nine occurrences. This category stands for ability to communicate, translate, engage and persuade different audiences, such as politicians, local governments, communities, and individuals. It also encompasses mediation, negotiation and conflict management skills.

The third subcategory with more cases was “Transdisciplinary”, accounting for six occurrences. This category calls for critical and systemic thinking, through the ability to integrate different professional and academic fields, namely: biology, engineering, economy, design and planning, health and well-being, social/political sciences and political geography. The response of Indigenous and local people’s knowledge, classified as “Inclusion”, could also be added into the transdisciplinary category.

The subcategory “Political Context” accounted for four cases. This subcategory stands for knowledge and experience with policy implementation, enabling to set realistic goals that consider the policy landscape. This means also understanding different governance structures and decision-making drivers set in place for local governments.

Lastly, the subcategory “Business” and “Non-Utilitarian” accounted for one occurrence each. The subcategory “Business” highlights the understanding of the role of business and corporate sector as players in the NBS arena. The subcategory “non-utilitarian” calls for perceiving nature beyond the utilitarian approach inspired by non-colonial Cosmo visions.

Technical Skills

Among the Technical Skills, the two sub codes “Data Analysis” and “Ecosystem Management” have the majority of occurrences, accounting for five cases each. The subcategory “Ecosystem management” stands for ecological and ecosystem knowledge applied to the management of invasive species, soils,

natural and naturalised environments; as well as to restoration of landscapes, habitats or ecosystems. Regarding the subcategory “Data Analysis”, one of its occurrences could also be classified as “Ecosystem Management” as it refers to ecological knowledge to analyse biodiversity data. The subcategory “Data Analysis” also accounts for climate/flood modelling; GIS; scientific training in general; and NBS valuation models.

The subcategory “Evaluation and Monitoring”, which accounts for two occurrences, can be seen overlapping the category “Data Analysis”, but was considered separately due to its clear focus on evaluation and monitoring. This category stands for the capacity to establish physical and mental health indicators; and, more broadly, evaluation and monitoring skills.

Another subcategory overlapping “Data Analysis” was “Inclusion through Data”, which has two occurrences. This subcategory stands for the use of data technology in participatory approaches; as well as data analysis and tools tailored to the needs of a broader non-scientific audience. Although concerned with Data Analysis, those two responses had a specific concern on the democratisation and stewardship of data, in its collection, analysis and utilisation. This is highlighted in the report to give emphasis on deploying citizen science methods for societal engagement and knowledge generation.

The second subcategory with more occurrences was “Funding Landscape”, holding four cases. This category stands for understanding EU Taxonomy for project acquisition and skills for writing proposals. It also calls for an inclusive dimension of project acquisition through the understanding of funding schemes, incentives, and mechanisms to deliver fair and equitable distribution of project resources, as well as setting funding lines that enable the access of less structured groups or even community-based initiatives.

The sub codes “Design and Engineering”, “Economy” and “Psychology” hold two occurrences each. The subcategory “Design and Engineering” accounts for inclusive dimensions - i.e. designing accessible greens spaces; and knowledge to design green infrastructure that can replace grey infrastructure. The subcategory “Economy” accounts for knowledge in environmental economics and NBS economic valuation. The subcategory “Psychology” calls for tools and theoretical background to understand environmental psychology, and more specifically people's safety perception due to green spaces. Lastly, the subcategory “Stakeholder Mapping” holds one occurrence and stands for the capacity to perform actor mapping.

3.3. Online Survey

3.3.1. Respondents profile

The online survey achieved 58 respondents from all the nine target sectors, except for the financial sector (see Figure 3). The two most represented sectors - Research Institutions/Universities and Local Governments, accounted together for over 62% of the total responses. The least represented sectors, besides the Financial Sector, which had no response, were the Corporate Sector and Educational Organisations, with only one respondent each. This uneven participation of the different target audiences might be a reflection of the network of the CONEXUS consortium, once the survey dissemination strategy built mainly on professional networks from the organisations that compose the consortium.

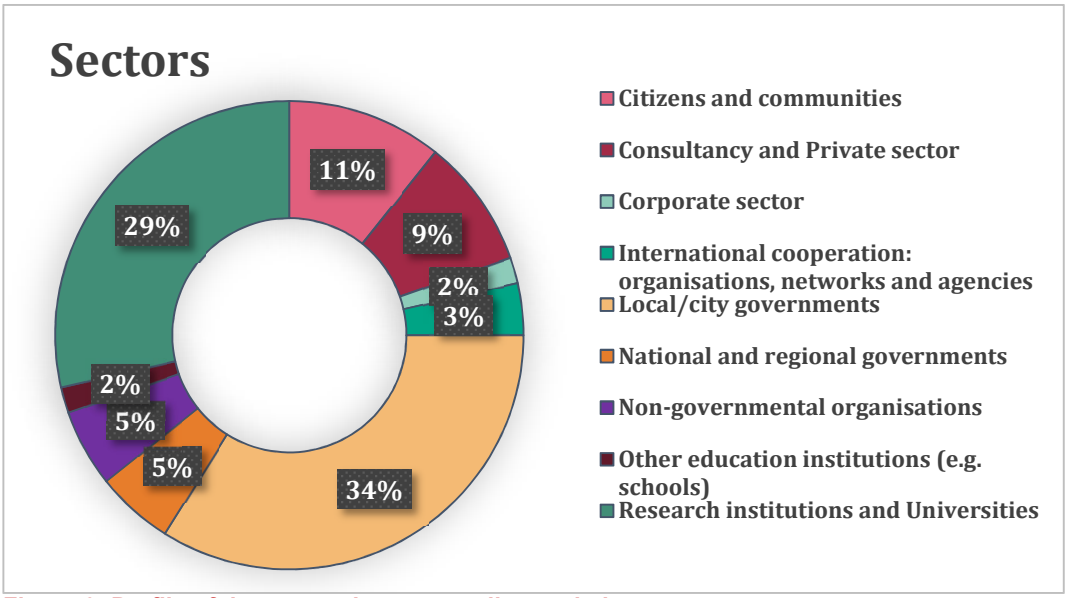

Figure 3: Profile of the respondents according to their sectors.

Most of the respondents were from Europe (50%) and Latin America (41%), and few participants were from Africa (4%) and Oceania (5%) (Figure 4). Brazil was the country with the higher number of responses (25%), followed by Italy (14%) and Spain (9%). Over 42% (24) of the total respondents came from the consortium's organisations, from which 41 % (10) represented local governments engaged in the project.

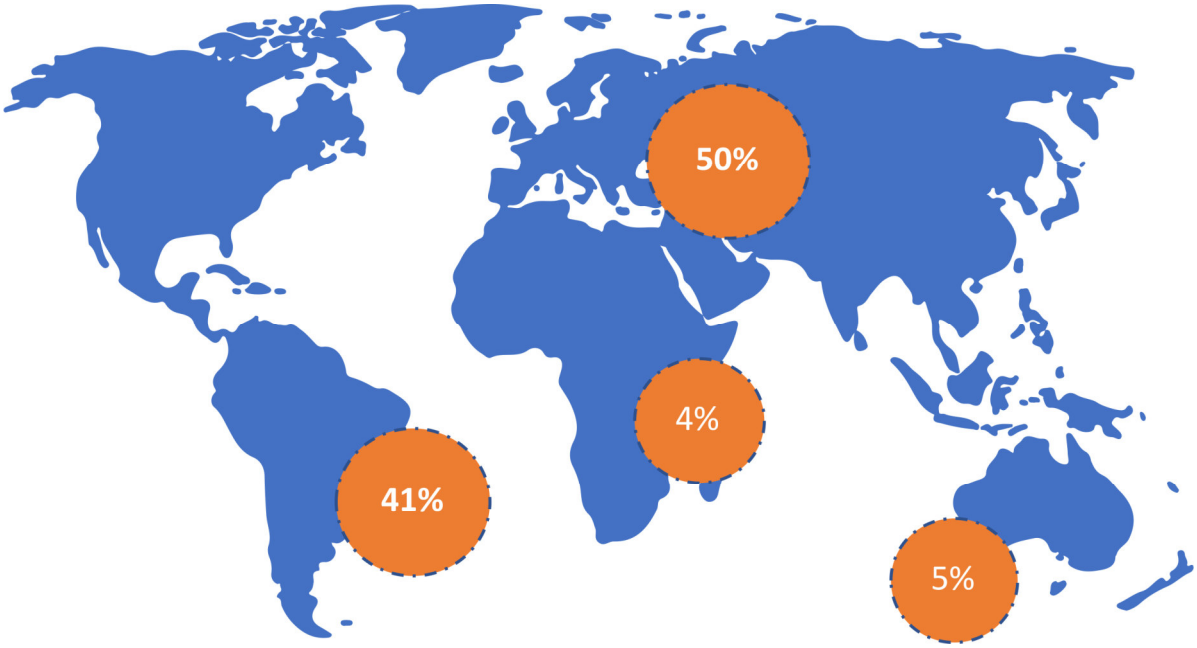

Figure 4: Distribution of respondents by continent.

Regarding the professional background, the majority of respondents came from ecology/environmental sciences and built environment background (Figure 5), accounting together for over 60% of the total responses. Built environment professionals are one specific target audience of the CONEXUS project. Therefore, this report also identifies the sector from built environment respondents (Figure 6). This information might subsidise the design of exploitable products addressing this specific audience, such as

Guidelines, capacity-building materials and Policy-briefs, as provided by the Milestone 4 of the project (M4).

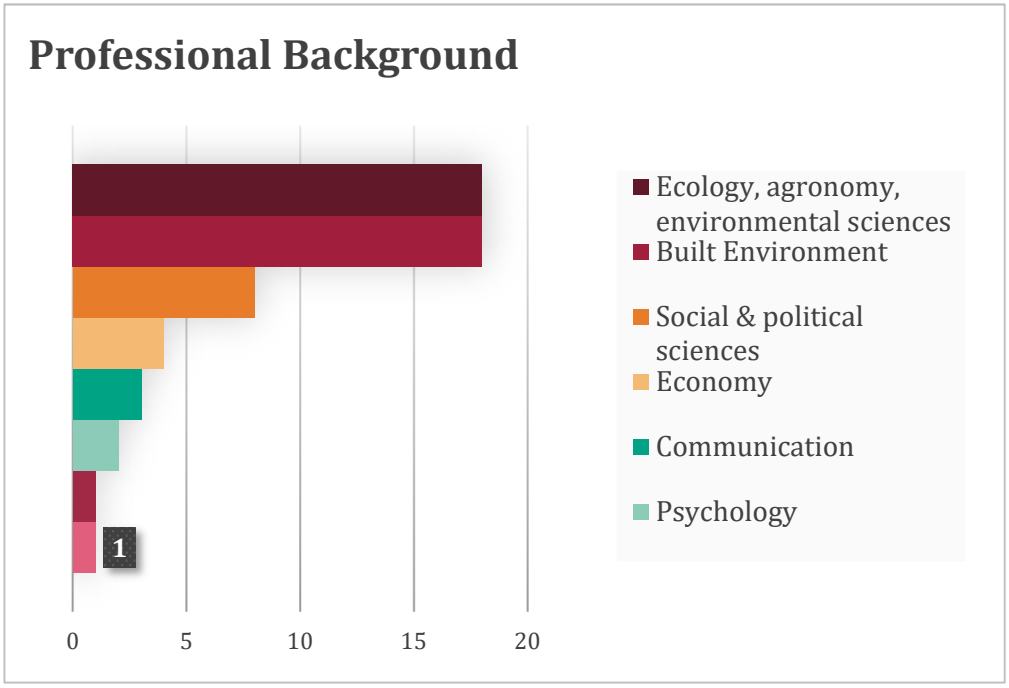

Figure 5: Respondents profile according to professional background.

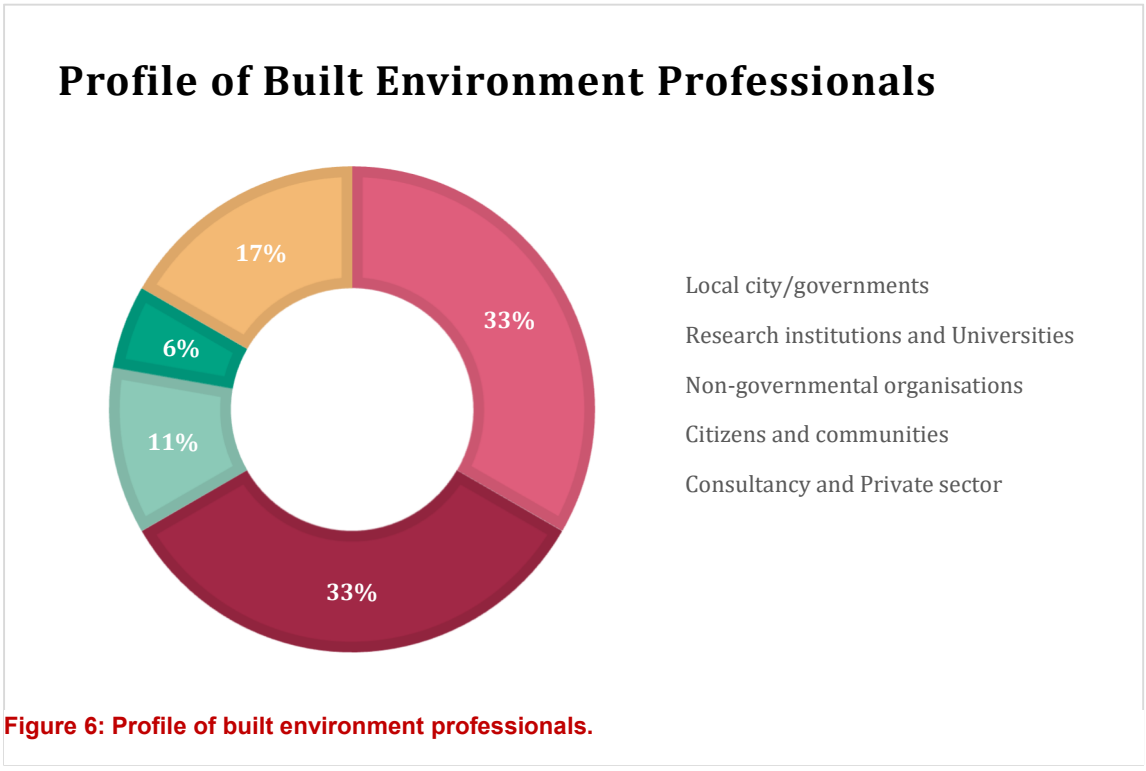

Figure 6: Profile of built environment professionals.

3.3.2. Content Analysis

The responses to the open questions of the Online Survey transcribed below were analysed through Content Analysis:

Q.1. Brief title that describes the gap - Please provide a concise overview of the identified gap, and consider briefly describing the context for this gap, its relative importance or how it is hampering the development or NBS planning / implementation.

Q.2. Which skill gaps do you think are undermining NBS to be more diverse, equitable and inclusive?

Most of the answers of Q.2. were a complement of Q.1 and did not address Equity, Diversity & Inclusion (EDI) aspects as expected. Therefore, the response for both questions were analysed together, and only the answers for Q.2. that effectively addressed EDI aspects were separately considered. As previously explained in session 2.2., the answers were analysed through employing the Skill Gaps and Societal Challenges code systems. In this session, the survey results derived from both systems are analysed (Figure 7). The comparison between the content analysis insights from the Bogotá Workshop and the Survey is done on session 3.3.2.2 of this report.

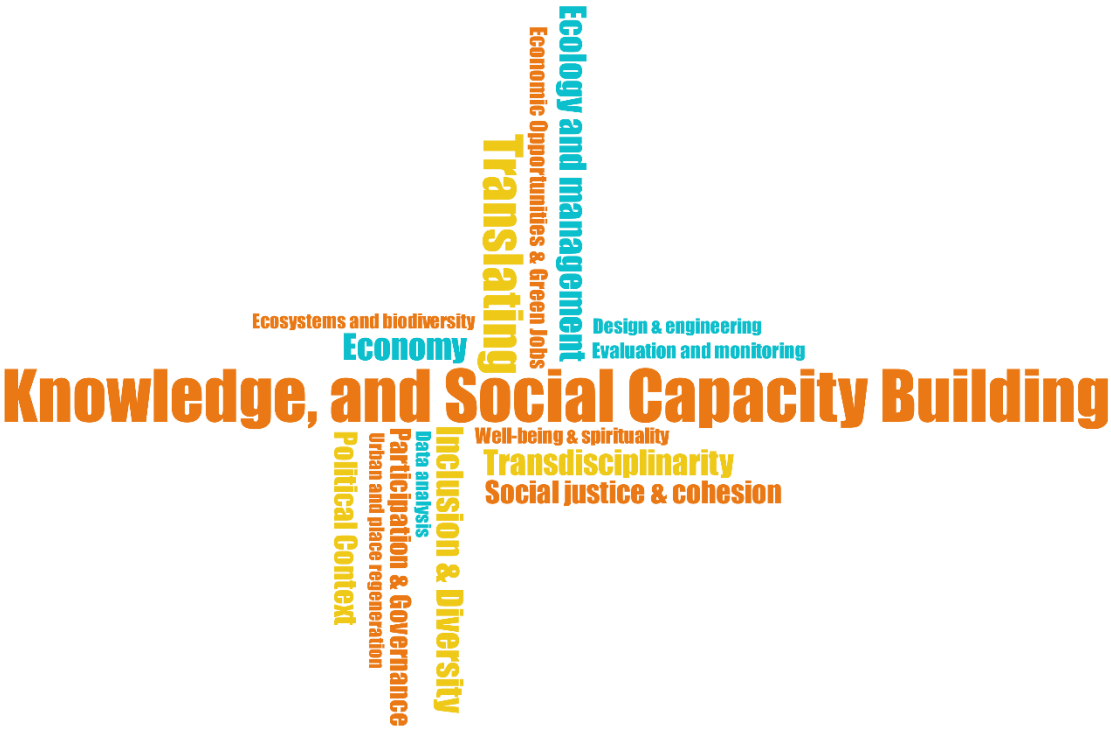

Figure 7: Code cloud generated by MAXQDA 2022 displaying occurrences of two code systems and their respective sub codes (Yellow and blue – Skill Gaps; Orange – Societal Challenges).

3.4. Analysis of the Skill Gaps code system

Soft Skills

As detailed in session 3.2.1, the Soft Skills codes derived from the Bogotá Workshop analysis were: Transdisciplinary, Political Context, Inclusion & Diversity, Translation, and Non-Utilitarian. Their respective responses are synthesised below.

The code “Transdisciplinary” calls for holistic, inter and transdisciplinary approaches, as follows:

- more holistic, interdisciplinary view on NBS;
- integration of multiple knowledge and skills; involve diverse stakeholders with different knowledge, knowledge gaps and diverse perspectives on NBS;
- provide environmental science background to ESG & sustainability professionals in the private finance sector for better integration of NBS;
- understand the dynamics of the socio-cultural contexts within NBS as well as how to cope with transformative human and social learning and change processes;
- knowledge/training for 'on the ground' local authorities to deliver/implement/maintain NBS suitable to their regional area (climate, physical landscape, culture, public consultation and engagement)
- integrated approach to tackle socio-environmental urgent problems through NBS, especially in low-income communities in the Global South.

In the responses of the Skill Gaps online survey, the code “Inclusion & Diversity” comprises the following gaps:

- lack of acknowledgement of local sociocultural contexts and different actors perspectives, including those of citizens and indigenous communities;
- lack of strategies for re-orienting NBS with ancestral-cosmo vision thinking (also coded as non-utilitarian);
- challenging use of concepts and frameworks in the Global South, considering that the concepts are usually developed and disseminated from Europe and the USA;
- lack of recognition of civil society as an important part of research and decision-making (also coded as Governance and Social Participation in the Societal Challenges code system);
- lack of social representativeness of professionals due to lower access of economic vulnerable people to pursue financing and business careers[16];
- predominant technical approach undermines practices that are more inclusive.

[16] Original response: “traditional finance is seen as a very middle- to upper-class profession, where networks get you ahead. This attitude (& subsequently the reality it produces) excludes people from lower socio-economic backgrounds from seeking out these career paths & subsequently we lose diverse viewpoints and experiences from the finance sector that could bring values beyond profit.”

For the code “Political Context”, the responses included challenges with implementation, decision-making, relations with citizens and policy-makers, as follows:

- difficulty to understand political context to mediate community-based solutions with local governments and decision-makers;
- difficulty with mainstreaming NBS into policies for social and economic development;
- brokerage over project centralisation;
- challenges on how to mobilise aspects that influence decision-makers (such as tax revenue) to favour NBS implementation;
- lack of ability to understand and navigate on political agenda and government priorities;

The code “Translation” referred to the need to facilitate board spanning across sectors, through translation of different knowledge and perspectives, and mediation across different stakeholders, and planning strategies, as follows:

- facilitating exchange across technical bodies/city officials and citizens/communities;
- identify how to communicate in effective, comprehensible way and in non-technical language to different audiences, in the context of NBS dissemination and advocacy;
- lack of tools and means for communicating NBS-related science, including different techniques, language, access to different media, access to decision makers;
- capacity to frame a shared vision and vocabulary between citizens and decision makers to tackle difficult practical, technical NBS matters;
- translation of NBS economic benefits to decision-makers and corporate sector;
- holistic language in NBS and urban planning;
- capacity to incorporate scientific NBS knowledge into planning;
- difficulty in framing NBS and related practices in urban planning and design.

Technical Skills

As explained in session 3.2.1, Technical Skills codes derived from the Bogotá Workshop analysis were: Data-Analysis, Design & Engineering, Ecology & Management, Evaluation & Monitoring, and Funding Landscapes. The results for those codes are detailed below.

The code “Data-Analysis” referred to:

- training in methods and technologies (such as machine learning and remote sensing), which allow to map and calculate indices, on a regular and automatic basis, for different applications, i.e. establish robust NBS KPI; set science-based NBS targets, inform decision-making.
- quantify and monetise ecosystem-service benefits and co-benefits produced by NbS (also coded as economy);

- lack of capacity to analyse the available data and information related to NBS effectivity.

The code “Design & engineering” accounted for:

- lack of technical knowledge for design operation and maintenance;
- design and execution of sustainable structures usually lack the consideration of biological knowledge

All those responses were also coded as “Ecology and Management” as it was not clear from the full answer if the maintenance aspects referred to natural ecosystems or built environments. The other responses coded as “Ecology and Management” were:

- communities/final users of NBS lack the skill to appropriate, manage and sustain the solution;
- lack of background in environmental science for ESG professionals to understand NBS relevance in business;
- need for agronomic and ecological technical knowledge to choose appropriate plant species, and maintenance needs of each single NBS;
- need for better knowledge on native plants and interaction of fauna and flora in regeneration strategies in tropical landscapes.

The code “Economy” accounted for the following gaps:

- comprehensive tools for NBS economic valuation and cost-benefit analysis (now & for the future) compared to Grey Infrastructure, including externalities to support decision makers;
- economic valuation of social and health NBS impacts;
- tools to quantify and monetise ecosystem-service benefits and co-benefits produced by NBS;
- understanding possibilities for NBS financial implementation.

The code “Evaluation and monitoring” accounted for:

- lack of knowledge to perform quantitative evaluation of benefits and impacts for climate resilience and water management;
- gap in identifying proper indicators and metrics for the social–ecological effectiveness of nature-based interventions.

The code “Financial landscape” accounted for the lack of financial opportunities, depending only on non-refundable financial resources. This was not considered as a skill gap, but rather an implementation challenge. However, the response was taken into account in this report in terms of its linkage to the skill gap x implementation gap discussion that will follow. The synergies and complementarities from both the Bogotá Workshop and the Skill Gaps Survey will be explored in Session 3.3.2.2.

3.5. Analysis of the Societal Challenges code system

Following the Survey content analysis it was employed also the code Societal Challenges, as previously detailed in session 2.2. As shown in Table 2, the Societal Challenges code system encompasses the following sub-codes: “Ecosystems & Biodiversity”, “Urban and Place Regeneration”, “Participation & Governance”, “Social Justice & Cohesion”, “Well-being & Spirituality”, “Economic Opportunities & Green

Jobs", "Knowledge, and Social Capacity Building". Those codes had strong overlaps and correspondences with the Skill Gaps codes as illustrated in Table 4. Therefore, for the sake of objectivity, this analysis will focus on the key remarks that qualify the findings beyond the rationale of the Skill Gaps codes.

For the code "Urban and Place Regeneration" there was an interrelation between place regeneration and citizen stewardship, not only in terms of providing maintenance feasibility, but also in terms of the necessary sense of belonging while empowering citizens and fomenting their participation in policy implementation. This interlinkage is also stressed in answers from the code "Social Justice & Cohesion" with the call for building local NBS identity. For the code "Well-being & Spirituality" a remark was given to the answer of "developing nature-based therapy interventions for wellbeing" as a theme that deserves more attention within the NBS agenda.

Table 4: Correspondences between Societal Challenges and Skill Gaps code systems.

	SOCIETAL CHALLENGES						
	Ecosystems & biodiversity	Urban & place regeneration	Participation & Governance	Social justice & cohesion	Well-being & spirituality	Economic Opportunities & Green Jobs	Knowledge, and Social Capacity Building
SKILL GAPS							
Soft Skills							
Inclusion							
Non-utilitarian							
Translating							
Transdisciplinary							
Technical Skills							
Design & engineering							
Ecology and management							

Some answers from private sector/community respondents gave emphasis to green jobs, and were coded with "Economic Opportunities & Green Jobs". Specifically related to skill gaps, some of those answers highlighted the need for deeper technical knowledge in the field of plant nursery and organic agriculture.

The code "Knowledge, and Social Capacity Building" comprised all the segments related to knowledge gaps and capacity building. The remarks beyond the rationale of the Skill Gaps code were: the need for

continuous update in the NBS field, the need to train local authorities and planners to improve technical skills, and the need for concrete evidence and examples at the city level.

3.6. Synergies and complementarities from the different approaches

This session aims to wrap up and assess synergies and complementarities between the Bogotá Workshop and the Skill Gap Survey for each category (code) of skill gaps. This discussion will be revisited in the forthcoming Report on Curricula Building (D.1.6).

Soft Skills

The code “Translation” – both sources highlighted the need for skills for communication, translation, facilitation, engagement and persuasion of different audiences. More specifically, the survey stressed out the need for mediating dialogues between citizens and decision-makers, as well as the need for capacity to communicate economic benefits to decision-makers and the corporate sector; and a need for a better integration of scientific knowledge into planning.

The code “Transdisciplinary” - both sources highlighted the necessity of critical and systemic thinking through the ability to integrate different professional and academic fields. The need to integrate specific fields was pointed out: built environment – ecology; built environment – social/political sciences; ecology-finance; ecology-economy. The survey also stressed the need for interdisciplinary training to local authorities.

The code “Inclusion” – both sources acknowledged the skills of mobilising sociocultural diversity, with particular emphasis in indigenous cosmo visions, and to steer bottom-up approaches. The Bogotá Workshop gave particular emphasis on environmental justice dimensions, while in the survey some responses stressed the need for challenging NBS concepts and frameworks arising from developed countries.

The code “Political Context” – both sources acknowledged the need for understanding policy implementation challenges and governance structures. Furthermore, the survey also had answers around the need to better mainstream NBS into local policymaking, and to catalyse community-based solutions.

The code “Non-Utilitarian” – both sources highlighted the need for perceiving nature beyond the utilitarian approach, taking into account the indigenous Cosmo visions.

The code “Business” – in both sources the responses were around understanding the role of business and the corporate sector as players in the NBS arena.

Technical Skills

The code “Design & Engineering” – the content of this code on each source was different, yet complementary. The Bogotá Workshop emphasised the inclusive dimension of designing accessible green spaces, as well as knowledge in designing green infrastructure that are a cost-effective alternative to grey infrastructure. The answers from the survey, on the other hand, highlighted the need for technical knowledge for operation and maintenance of NBS. It also flagged the need for NBS design to be guided by biological/ecological knowledge.

The code “Economy” – regarding this code, both sources acknowledged the need for better understanding on environmental economics and NBS economic valuation. The survey achieved more specific answers related to cost-benefits analysis against grey infrastructure; quantify and monetise ecosystem-service benefits and co-benefits produced by NBS and economic valuation of social and health NBS impacts.

“Data Analysis & Modelling” – regarding this code, both sources identified the need for training to manage data and models, including biotic, abiotic, social and economic data. The Bogotá Workshop highlighted specific topics where skills need to be improved: climate/flood modelling and biodiversity data analysis. A better understanding of data tools such as GIS and machine learning were also acknowledged in both sources.

The code “Evaluation & Monitoring” – the content of this code on each source was different, yet complementary. The Bogotá Workshop highlighted the need to understand and develop physical and mental health indicators. The respondents from the survey, in turn, identified specifically the need for skills related to evaluation of NBS impacts on climate resilience and water management.

The code “Ecology & Management” – for this code both sources identified the need for ecological and biological knowledge for the management and maintenance of NBS, more particularly on landscape and soil restoration, natural ecosystems and naturalised environments. Some responses of the survey, complementary emphasised local communities need to receive ecological training for management and stewardship of NBS interventions.

The code “Funding Landscape” – this code was more emphasised in the source of Bogotá Workshop where it identified the need for understanding EU Taxonomy for project acquisition and skills for writing proposals. In the survey, one respondent mentioned the need to understand different possibilities for financing NBS implementation.

The code “Stakeholder Mapping” – as a tool, Stakeholder Mapping can be considered as Technical Skill gap, yet it has not appeared in the Survey. On the other hand, many answers emphasised participatory and social justice aspects that were mostly covered by the rationale behind the “translation” and “inclusion” codes.

The code “Psychology” – this code did not appear in the analysis of the Skill Gap survey.

4. Discussion

> ***“How can I present a proposal intended not to say what is, or what ought to be, but to provoke thought; one that requires no other verification than the way in which it is able to “slow down” reasoning and create an opportunity to arouse a slightly different awareness of the problems and situations mobilizing us?”***

ISABELLE STENGERS, IN “THE COSMOPOLITICAL PROPOSAL”

NBS is a concept that emerged from the science-policy-practice interface (Nesshöver et al, 2020[17]) and more recently started to gain momentum within Europe, through the programme for research and innovation 'Horizon 2020' (European Commission, 2015[18]). The broad frame and flexibility of the concept as provided by the EC is under scrutiny and criticism by both academic and social movements circles, especially on what refers to the lack of protagonism of indigenous peoples and vulnerable groups within the discussion, as well as for the purposeful misuse of the concept by the corporate sector and other coalitions (Melanidis et al, 2022[19]). Some critical voices also raise concerns on the ethical implications of the utilitarian appropriation of nature (Kotsila et al, 2020[20], Eggermont et al, 2015 [21]). In short, the criticism of the NBS concept is a claim for a more explicit inclusive approach.

The need for a more comprehensive and inclusive definition of NBS appears frequently in the responses from the survey and therefore it will be a highlighted subject of D.1.6 by ICLEI Europe. For the discussion regarding skill gaps, a strong difference can be highlighted between the deployed approaches referring to the results of the Bogotá Workshop, which show a stronger concern in terms of EDI than the survey's answers. Those explicit concerns are mostly coded as "Inclusion", but also appear related to technical skills such as inclusive design, inclusive data analysis, and financial mechanisms that accounts for the code "Inclusion".

As previously mentioned, this cross-cutting inclusive perspective motivated the ICLEI team to add a question in the survey addressing specifically which skill gaps have been undermining NBS to be more equitable, diverse and inclusive. Hence, the question seemed to be not properly understood by most of the respondents. Additionally, most of those who understood the question replied to it in elusive terms such as "listening" to unheard voices. Due to this, the EDI dimension could not be further deeply explored in this report. However, considering its relevance in the current debate, especially in the setting of cooperation between European and Latin America organisations, it is strongly advised that the CONEXUS upcoming products related to capacity building take into account contents and formats that address and are informed by the knowledge of non-privileged groups.

Regarding the dispute of hegemonic or utilitarian discourses and their perspectives over nature, the results show that a parcel of professionals and students engaged in NBS initiatives are aware of the need for more inclusive approaches in terms of design and implementation, but also considering the very epistemological basis of nature's conception, which is often taken for granted in more homogenous

[17] Nesshöver et al, 2020. The science, policy and practice of nature-based solutions: An interdisciplinary perspective. Science of the Total Environment 579 (2017) 1215–1227. http://dx.doi.org/10.1016/j.scitotenv.2016.11.106

[18] In: Innovation, D.-G.F.R.A. (Ed.), Towards an EU Research and Innovation Policy Agenda for Nature-based Solutions & Re-naturing Cities - Final Report of the Horizon 2020 Expert Group. European Commission, Directorate- General for Research and Innovation, Brussels, p. 74.

[19] Melanidis et al, 2022. Competing narratives of nature-based solutions: Leveraging the power of nature or dangerous distraction? Environmental Science and Policy 132 (2022) 273–281. http://doi.org/10.1016/j.envsci.2022.02.028

[20] Nature-based solutions as discursive tools and contested practices in urban nature's neoliberalisation processes. EPE: Nature and Space 0(0) 1–23. DOI: 10.1177/2514848620901437

[21] Nature-based Solutions: New Influence for Environmental Management and Research in Europe. *GAIA* 24/4 (2015): 243 – 248. http://dx.doi.org/10.14512/gaia.24.4.9

settings. Few students flag the need for NBS to acknowledge *perspectivism* (Viveiros de Castro, 2014[22]) - a cosmopolitical perspective of indigenous people that shifts away from the vectors of Nature-Culture as perceived by western modern societies. This epistemological reorientation of NBS, in dialogue with the Anthropocene debate and with the NBT concept has the potential to be as inclusive to incorporate more-than-human beings, as recently proposed by Maller (2021)[23] and narrated by the anthropologist Tsing (op. cit.).

Concerning technical skills, the results evidence a close relation to the debate of "Implementation Challenges" and "Knowledge Gaps". Frequently the responses given in both the workshops and the survey were referring to difficulties of implementation or pointing to fields where knowledge needs to be further developed. Therefore, often they would need to be interpreted in terms of what capacities would enable NBS professionals to overcome implementation barriers or how those professionals could be better qualified to address the knowledge gaps.

This finding of the close relation between skill gaps and implementation barriers resonates with literature. Kappos et al (2019)[24] identify "technical challenges and capacity gaps" as one of the barriers to NBS implementation, along with "limited availability and accessibility of knowledge and evidence". The authors ascertain that "the skills needed to identify and implement NBS are not normally included in the training of the professionals often involved in designing and implementing adaptation solutions (e.g. engineers)" and that project teams "are rarely diverse enough to encompass skills and knowledge from relevant disciplines".

Moreover, the understanding of what skills are required by NBS professionals is, per se, a knowledge gap, as illustrated by this question extracted from Kabisch et al (2016)[25]:

"What technical knowledge and skills are required for multifunctional urban planning and how can this knowledge be included and interlinked with knowledge on environmental and social systems to produce the best possible synergies for, e.g., climate adaptation and mitigation?"

Contributing to address the aforementioned question, one clear technical skill gap identified in the present study relates to data analysis for modelling, evaluating and monitoring, both in environmental, social and economic domains (i.e. human health and livelihoods, food and energy security, ecosystem rehabilitation and maintenance, climate adaptation and resilience, and biodiversity). Moreover, within the grey zone between technical knowledge and skills, another finding of this study relates to the need for more comprehensive metrics (i.e. standards and indicators) to evaluate and communicate NBS effectivity. This

[22] Viveiros de Castro, 2014. Cannibal metaphysics: for a post-structural anthropology (Tradução de Peter Skafish). Minneapolis: Univocal.

[23] Maller, 2021. Re-orienting nature-based solutions with more-than-human thinking. Cities 113 (2021) 103155. https://doi.org/10.1016/j.cities.2021.103155

[24] Kapos, et al, 2019. The Role of the Natural Environment in Adaptation, Background Paper for the Global Commission on Adaptation. Rotterdam and Washington, D.C.: Global Commission on Adaptation.

[25] Kabisch, et al. 2016. Nature-based solutions to climate change mitigation and adaptation in urban areas: perspectives on indicators, knowledge gaps, barriers, and opportunities for action. *Ecology and Society* 21(2):39. http://dx.doi.org/10.5751/ES-08373-210239

finding resonates with the implementation literature, to mention just a few: Kapos, op. cit.; OECD, 2020[26]; CISL, 2022[27].

Additionally, the present study also identifies the lack of contextualised technical knowledge (i.e. regional impacts on climate regimes in tropical urban ecosystems), as well as the need for recognition by scholars or researchers of local barriers and enablers when designing project interventions. These calls for more grounded science and practice echoed in all the three approaches applied in this study and may indicate a need to improve embeddedness in NBS related knowledge/science production and application.

This brings back the relevance of inter and transdisciplinary in NBS practice and implementation. Kapos et al (op. cit.) for example, refers to interdisciplinary teams, communities of practices and professional networks, as possible solutions to fertilise the NBS professional environment with transdisciplinary knowledge and a multiple pallet of skills. Similarly, Browder et al (2019)[28] point leveraging cross-sector partnerships as a strategy to bring in skills from different societal sectors and professional domains to green infrastructure planning.

Connecting soft and technical gaps, a strong emphasis was given to the capacity to translate, interconnect and communicate with different domains and perspectives. This means, for example, translating science to policy makers and communities, integrating political and practical reality into science, integrating ecological and climate science in engineering and design practices, stepping up and communicating the NBS evidence base, and making the case for NBS to different audiences – from communities to business.

This study also identifies that translation skills are relevant to facilitate stakeholder engagement and social participation. Further, it highlights that the ability to navigate among and communicate with different disciplinary domains, cultural/political contexts and epistemologies is the core to catalyse inclusive, equitable and diverse NBS initiatives, both in research, policy, and practice.

5. Conclusions and key messages

The present report should support defining the content of CONEXUS products and outcomes related to capacity building - namely Guidelines (D.4.3), Capacity Building Materials (D.1.4) and NBS joint Masters Programme (M33). In this sense, the ICLEI team presents in this session the key messages to be considered in the design of the potential products that have been mapped in the frame of the ongoing Engine Room[29] (Task 6.3.a).

---

[26] OECD, 2020. Nature-based solutions for adapting to water-related climate risks: Policy Perspectives. Environment Policy Paper No. 21

[27] The University of Cambridge Institute for Sustainability Leadership (CISL). (2022). Decision-making in a nature positive world: a corporate diagnostic tool to advance organisational understanding of nature-based solutions projects and accelerate their adoption. Cambridge: The University of Cambridge Institute for Sustainability Leadership.

[28] Browder, G. et al. 2019. Integrating green and grey: creating next generation infrastructure. World Bank and World Resources Institute.

[29] https://miro.com/app/board/uXjVOF6795M=/?share_link_id=903958238236

5.1. Contents for capacity building related materials and products

For the products Guidelines and Capacity Building materials, a set of three themes were identified in the Engine Room: (i) Technical aspects; (ii) Economic valuation; and (iii) Governance & Participation. Based on the results presented in this report, the ICLEI team suggests the capacity building products to be thematically organised and to approach, among others, the following contents:

Technical aspects

Conceptualising: debate different epistemologies to embrace indigenous, non-utilitarian and non-colonial perspectives over Nature.

Creating: technical knowledge for design, operation and maintenance of green infrastructure, adapted to Latin America context, including constructive solutions as well as ecologic requirements/performance of species and ecosystems;

Evaluating: discuss measurable indicators and comprehensive evaluation methods that take into account administrative and implementation barriers, addressing: (a) social benefits and co-benefits (e.g. physical and mental health, social cohesion); and (b) environmental benefits – specifically climate resilience and water management of NBS.

Data analysis: software and sources for environmental and social quantitative data analysis and modelling.

Economic valuation

Comprehensive and context sensitive guidance for cost-benefits analysis of NBS and green infrastructure against grey infrastructure;

Approaches to quantify and monetise ecosystem-services benefits and co-benefits of NBS;

Indicators for economic valuation of social and health NBS impacts.

Governance & participation

Engaging: approaches to engage stakeholders, specially communities and vulnerable groups, as well as the corporate sector; tools for stakeholder mapping and cross-sector collaboration.

Evaluating: empowering local citizens with data and tools for participatory monitoring.

5.2. First insights for academic programmes in NBS and Curricula Building

Higher Education curricula has been recently challenged by the decoloniality debate, in an actualization from Freire's claims in the Pedagogy of the Oppressed and the globally spread students movements from the late sixties (Morreira et al, 2020[30]). On these circles, curricula, pedagogy and the political project it reflects and reinforces are discussed together (Hayes et al, 2021[31]). Accordingly to Hayes et al (op. cit), building on southern theorists, "the decolonial theory involves contesting the hegemony, legacy and

[30] Morreira, S. et al. 2020. Confronting the complexities of decolonising curricula and pedagogy in higher education, Third World Thematics: A TWQ Journal, DOI: 10.1080/23802014.2020.1798278.

[31] Hayes, A. et al. 2021. Possibilities and complexities of decolonising higher education: critical perspectives on praxis, Teaching in Higher Education, 26:7-8, 887-901, DOI: 10.1080/13562517.2021.1971384

limitations of Eurocentric epistemologies, Northern control of knowledge production, the 'coloniality' of the cultures, languages and disciplines of institutions of higher education and interrogating whose interests are served by this knowledge and its practices".

Education, including higher education, should be seen beyond a syllabus that delimitates capacities and skills to achieve optimal performance required in the labour setting. Education institutions, especially higher education, are (or ought to be) an arena for create, practice, feel, experiment, embody, think, envision, design, dream, encounter, debate paths for societal change. Those essential experiences cannot be fully encompassed by even the most comprehensive and inclusive transdisciplinary syllabus. Beyond content gaps, the method, the pedagogy, and the (often hidden) political project need to be uncovered. This does not mean to dismiss the central role that knowledge generation, and even transferability, play in higher education. It is about a critical debate on the premises of how different types of knowledge are generated, socialised and legitimised.

In this sense, besides the contents that could be related to skill gaps, additional codes were created, aiming to shed light on further aspects that can hinder NBS education and professional training. As illustrated in Figure 8, the open codes unveiled relevant aspects not directly related to skills, but closely associated with NBS knowledge production and education.

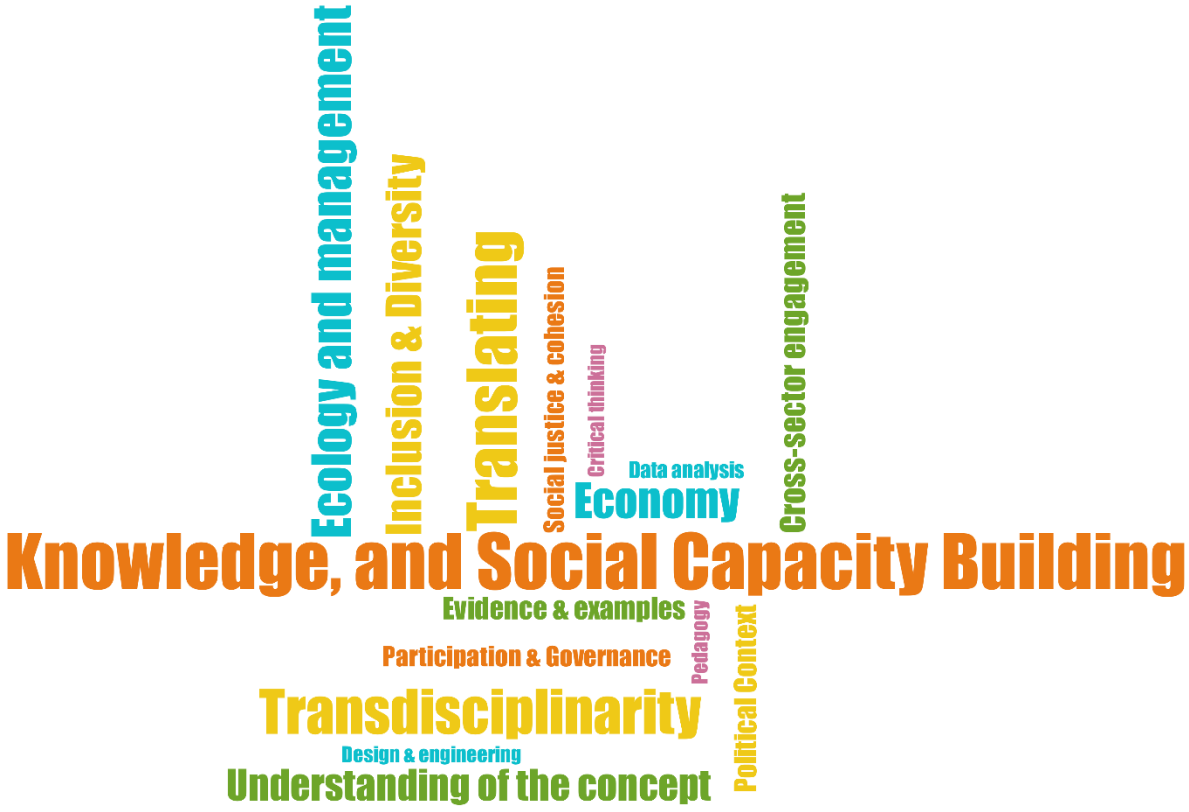

Figure 8: Skill Gaps content analysis main results. In orange – Societal Challenges code system. In blue – technical skill gaps. In yellow – Soft skill gaps. In pink and green – open codes.

Those codes were: (i) “Understanding of the concept”, (ii) “Evidence & Examples”, (iii) “Cross-Sector Engagement”, (iv) “Co-Creative Curricula”, (v) “Critical Thinking”. The aforementioned codes refers respectively to:

- the need for developing a NBS concept framework that accounts for non-European experiences in policy and practice, as well as decolonial perspectives over nature;
- the need for concrete evidence of the effectivity of nature-supported and nature-inspired infrastructure;
- the need for promoting horizontal exchange between research/higher education organisations and on-the-ground actors such as policy makers, public managers, and communities;;
- greater protagonism of students on defining learning topics, methods and to actively participate on NBS knowledge generation and dissemination;
- a pedagogic approach more connected to real life problems and engaged towards a more just and inclusive society.

The findings of the present report identified skill and educational gaps that can support reframing syllabus content, as well as curricula and pedagogic approaches on NBS training in higher education organisations. In short, the key findings from this report is that NBS education and training must be grounded, evidence based, inclusive, transdisciplinary and cross-sectoral.

Moreover, the NBS implementation literature revised for this study evidences that capacity building is not only about professional training. It is also about recruiting NBS professionals and stakeholders with different capacities, skills and experience towards collaboration. This means strengthening multidisciplinary and diverse teams. In this context, higher education and professional training programmes should offer real life platforms for students to interact across domains and societal sectors, preparing professionals to navigate on plural teams and collaborative work.

To conclude, this report meets the Strategic Agenda of CONEXUS project by directly addressing A.5 “Valuing transdisciplinary and disciplinary contributions to NBS knowledge”, and A7. “Developing knowledge and skills.” Moreover, its findings highlight the relevance of integrating NBS education and training with a wider range of citizens (A.2), with policy and practices on the ground (A.3) and to open opportunities for cross-disciplinary and cross-sector collaborative interactions (A.6).

6. Annexes

Nature Based Solutions Professional Skills Gaps Survey

Nature-based Solutions encompass a set of practices aiming to simultaneously deliver environmental, social, and economic benefits and operate on different scales. To achieve long-term sustainable transformation, NBS must be inclusive, locally embedded, and bring on board not only different knowledge, but also different ethos that shape our relation with place and nature. Find more about NBS here.

The CONEXUS project, by adopting systemic thinking, aims to demonstrate through evidence-based and multipurpose pilot initiatives, both in Europe and Latin America, how nature-based solutions can deliver a wide range of benefits in urban and peri-urban ecosystems. Find more about CONEXUS here.

In the frame of this EU funded project, one structuring goal is to screen in detail the existing NBS professional skill gaps in order to recommend capacity-building work to boost successful NBS implementation in different scales and contexts. Anchored on the gaps identified by key stakeholders such as practitioners, researchers and engaged citizens, CONEXUS will propose curricula-change recommendations for NBS training and high educational programmes tailored to strategic and local priorities while addressing major global societal challenges.

Some examples of professional skill gaps on the NBS field could be:

- Community communication skills; knowledge on ecosystem-habitat restoration-recovery; knowledge on new participatory processes technologies; lack of NBS Evaluation and monitoring skills, etc.

Therefore, ICLEI Europe invites you to take part in this survey by answering the following questionnaire, which will take approximately 5 minutes of your time.

DATA MANAGEMENT AND PRIVACY

By answering this survey, you accept that we will collect your contact details and your sector of activity to better analyse your answers and contact you later on, if needed.

This data will be securely processed and stored in compliance with the European General Data Protection Regulation 2016/679 and used only for the purposes of this survey. To know more about the project and this task, please check the following document.

At any time you will have the possibility to consult, modify, update or delete your personal data by contacting CONEXUS, processor of your personal data, at the following email address: daniela.rizzi@iclei.org

- Name, Organisation and Country
- Email address
- Academic background, including title, if applicable
- Sector
  - Local/city governments
  - National and regional governments
  - International cooperation: organisations, networks and agencies
  - Non-governmental organisations
  - Citizens and communities
  - Consultancy and Private sector
  - Financial sector
  - Corporate sector
  - Research institutions and Universities

- Other education institutions (e.g. schools)

1. Brief title that describes the gap
2. Professional skill gap description: Please provide a concise overview of the identified gap, and consider briefly describing the context for this gap, its relative importance or how it is hampering the development or NBS planning / implementation.
3. Do you know of any supporting literature/documentation of the mentioned gaps? Please provide the link.
4. Can you point out a sector that is most affected by the gap?
   - Local/city governments
   - National and regional governments
   - International cooperation: organisations, networks and agencies
   - Non-governmental organisations
   - Citizens and communities
   - Consultancy and Private sector
   - Financial sector
   - Corporate sector
   - Research institutions and Universities
   - Education institutions
   - Not sure
   1. Select the main societal challenges addressed by the suggested type of "NBS Professional Skill Gap" (NBS Handbook)
      - Climate Resilience
      - Water management
      - Natural and Climate Hazards
      - Green Space Management
      - Biodiversity Enhancement
      - Air quality
      - Place Regeneration
      - Knowledge, and Social Capacity Building for Sustainable Urban Transformation
      - Participatory Planning and Governance
      - Social Justice and Social Cohesion
      - Health, Well-being and Cultural context

- New Economic Opportunities & Green Jobs
- Other

2. Which skill gaps do you think are undermining NBS to be more diverse, equitable and inclusive?

Thanks a lot for your time and responses!

Bogota Workshop MURAL Boards

Figure 9: Bogota workshop Mural Boards

Students Workshop – Studienstiftung Sustainable Europe Event

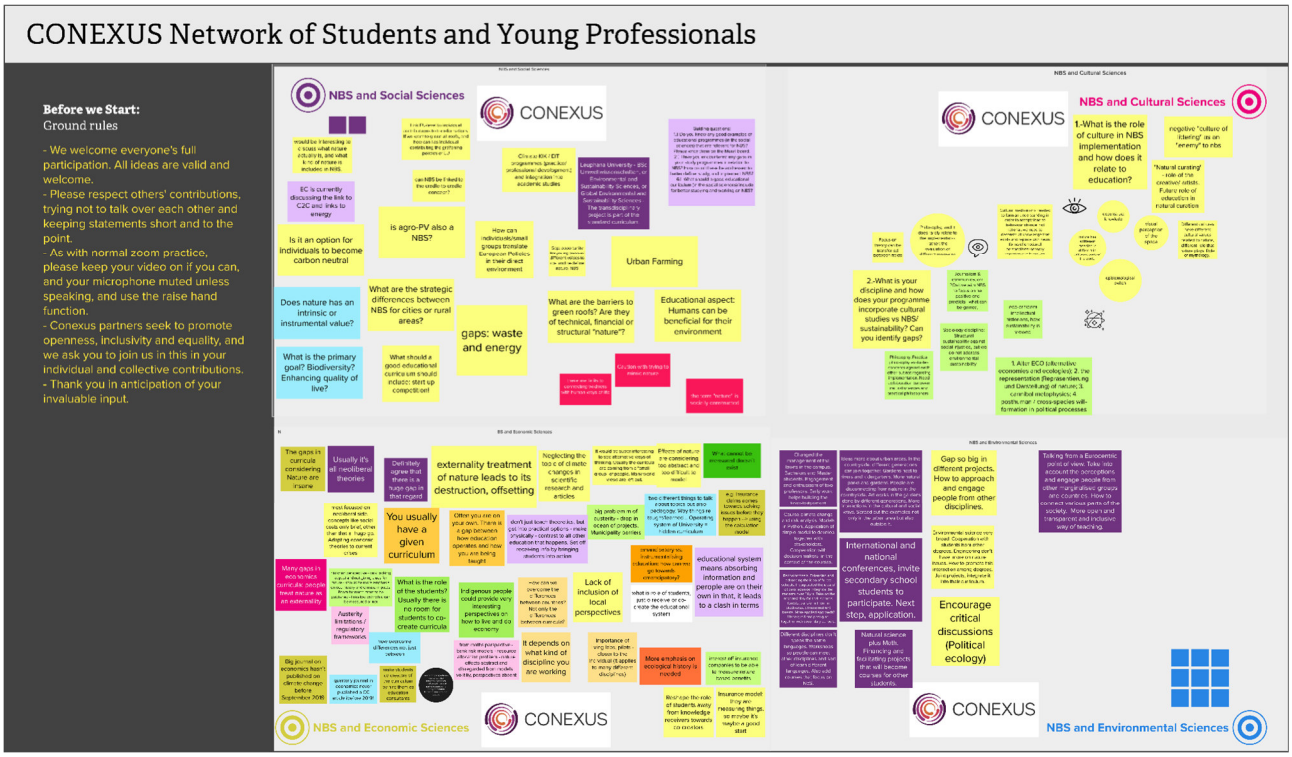

Figure 10: Studienstiftung Sustainable Europe Event board

Project Partners

The University Of Sheffield.
SLU
oppla
ICLEI Local Governments for Sustainability
Pontificia Universidad Javeriana Colombia
Università degli Studi Firenze
Instituto Humboldt Colombia
Lisboa Câmara Municipal
ICS Instituto de Ciências Sociais
Universidad de Chile
Technische Universität München
USP
CONICET
UBA, FADU. Universidad de Buenos Aires. Facultad de Arquitectura Diseño y Urbanismo
EUKN
Living Cities
Wageningen University & Research
BR Barcelona Regional Agència Desenvolupament Urbà
CREAF
Buenos Aires Ciudad
Food and Agriculture Organization of the United Nations
Grupo Verde Urbanismo Ambiental Arquitectura del Paisaje
Universidad Mayor para espíritus emprendedores
USC Universidade de Santiago de Compostela
indsoft intelligent industry
stgo Gobierno Regional Metropolitano de Santiago
San Martín
Città di Torino
PERIFERIA
Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen
Programa Cidades Sustentáveis

CONEXUS

Urban nature connects us
Conectados por la naturaleza urbana
Conectados pela natureza urbana

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 867564