PROJECT REPORT ON TRANSDISCIPLINARY CAPACITY-BUILDING

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Led by Durham University, NATURVATION involves 14 institutions across Europe working in fields as diverse as urban development, innovation studies, geography, ecology, environmental assessment and economics. Our partnership includes city governments, non-governmental organisations and business. We will assess what nature-based solutions can achieve in cities, examine how innovation is taking place, and work with communities and stakeholders to develop the knowledge and tools required to realise the potential of nature-based solutions for meeting urban sustainability goals.

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CONTENTS

1. INTRODUCTION

This report provides an overview of the research executed in the framework of NATURVATION's Work Package 7 (WP7), specifically of Task 7.1 *Transdisciplinary Capacity Building*. The ambition of Task 7.1 was *"to create the capacity required to effectively deliver our transdisciplinary approach. We will work with all project partners to develop and learn from our transdisciplinary practices to iteratively improve our work and mitigate its risks"* (Bulkeley, 2016, NATURVATION project plan, p. 50). Among the research objectives that stemmed from this ambition, the one most relevant to this report consists of *"Undertake research on transdisciplinary practice that we will develop and deploy through the NATURVATION project by: (a) reviewing the state of the art; (b) following the progress of the project in two URIP cities*[1] *and selected participatory events in each WP; (c) analysing and publishing the findings."* (Ibid).

The post-doc assignment dedicated to advance these objectives started at the Netherlands Environmental Assessment Agency in March 2017 . Following the indications for Task 7.1[2] provided in NATURVATION's project plan and the inputs of project partners regarding the challenge of implementing the transdisciplinary approach in different work packages, for example in relation to the responsibilities of each partner regarding the process of knowledge co-production and the lines of communication among them that could have facilitated it, in the first months of the assignment some preliminary research questions were identified. Propaedeutic to their definitive formulation was the literature review on the notion and application of the transdisciplinary research approach that was executed between March and July 2017. The review facilitated the transition from the preliminary set of research questions to the identification of the four research themes that were finally investigated. These themes engendered the research activities and publications discussed in this report, namely:

1. **The different *concepts* and *conceptualisations* of transdisciplinary research in literature**. This theme constituted the object of the literature review executed in the first moths of the assignment. The review focused on the historical and methodological development of the concept and following conceptualisations of transdisciplinarity up to their application in urban sustainability studies. Researching on this theme was functional to strengthen

[1] The urban-regional innovation partnerships (URIPs) active in NATURVATION's consortium were established in Utrecht (The Netherlands), Győr (Hungary), Newcastle (UK), Leipzig (Germany), Barcelona (Spain), and Malmö (Sweden). Each of them was co-convened by local researchers, academics, policy makers and stakeholders involved in the search of nature-based solutions to pressing urban challenges in their urban region.

[2] Initially, this research objective was considered suitable for promoting a PhD research on the transdisciplinary co-production of knowledge on nature-based solutions to pressing social-environmental challenges. However, seen the complexity of the research setting that such a large international project would have posed for a PhD researcher, PBL took the decision to undertake Task 7.1 with a post-doctoral research assignment.

the theoretical and methodological robustness of the transdisciplinary approach implemented in NATURVATION's research practices. Findings from this research are collected in the intermediate project report on NATURVATION's transdisciplinary practice (Basta and Kunseler, 2018). The report provided the basis for writing a journal article on the theory and application of transdisciplinary research in urban sustainability studies (Basta, 2021; *peer-reviewed received, under revision*).

2. **The definition and application of the concept of transdisciplinarity in research projects funded by the H2020 research programme**. Investigating this topic was meant to provide an overview of the 'state of the art' of the application of the transdisciplinary approach in the framework of the EU structural research programme. Findings from this research were presented during the NATURVATION's plenary meeting held in Malmo in 2019, and are collected in a relevant journal article (Basta, 2021; *in progress*).

3. **The application of the transdisciplinary research quality criteria of inclusiveness, equity, flexibility and consistency as reflexive devices for empowering transdisciplinary collaboration**. This study constitutes the core of the research on the transdisciplinary practices in NATURVATION. This included the design and application of a monitoring and evaluation method aimed at enhancing the quality of the transdisciplinary collaboration in the framework of the URIPs' knowledge co-production events. By deploying this method during the four years of duration of the project, relevant information could be gathered, analysed, and collaboratively reflected upon. A dedicated journal article, which reflects also on the possible replicability of the monitoring and evaluation method in future transdisciplinary projects, was co-authored with multiple project's partners (Basta et al., 2021, *under peer-review*).

4. **A survey on the relevance, credibility, and legitimacy of the co-design process activated for delivering the integrated urban nature assessment framework (the Urban Nature Explorer).** This study is led by Sara Maia and Dora Almassy from Central European University (CEU) with support from the PBL research team. Relevant findings will be collected in a journal article (Maia et al., 2021, *in progress*).

This report provides a synthetic account of these studies and reflects on the overall experience of transdisciplinary capacity-building in NATURVATION to which they have contributed[3]. Such experience owes to the fundamental contribution of ICLEI in coordinating the knowledge-production and knowledge-exchange activities of the six URIPs which were part of NATURVATION's research consortium[4].

The report is divided into three sections. Section 2 describes the dynamics of collaboration among the researchers and stakeholders involved in Task 7.1 in the light of the roles and objectives of their respective organisations. This section clarifies the organisational setup and different responsibilities that characterised the interaction among the different contributors to the research activities conducted in the framework of the task. Following the four research themes listed above, a synthetic overview of the relevant outputs and deliverables is provided in Section 2.1. Such deliverables are not limited to the 'official' NATURVATION's deliverables listed in the project plan. They include the support documents generated during the project for guiding the design of specific activities, for example in the form of short guidance or methodological protocols, and the scientific publications that followed.

Section 3 provides a closer look at these latter publications by focusing on the four studies on transdisciplinarity which were here introduced. Finally, Section 4 distils the main 'lessons learnt' from the experience of transdisciplinary collaboration in NATURVATION and provides recommendations for the research-design and the monitoring and evaluation methods applicable to future European transdisciplinary research projects. Such recommendations are particularly relevant to the H2020 funding scheme and its upcoming follower and, as such, they address the respective European Commission coordinators.

[4] The URIPs were 'the operational units' of NATURVATION most relevant to the implementation of the transdisciplinary research approach.

2. PARTICIPANTS, ROLES, AND THEIR CONTRIBUTIONS TO OUTPUTS AND DELIVERABLES

As mentioned in the Introduction, the main objective of Task 7.1 was to undertake research on transdisciplinary research practices and inform NATURVATION's developments accordingly. Therefore, the task was not limited to generate scientific outputs in the form of congress papers and scientific articles. Rather, it was meant to convert the findings of research on transdisciplinary practices of knowledge production in methodological and practical advice relevant to NATURVATION's respective activities. The advice was provided both by means of direct interaction with the project's partners and by means of support documents. The latter documents were elaborated in such a way to provide guidance in managing collaborative activities among the project's partners, in particular in the framework of the six URIPs. Examples of these support documents are the *URIP Transdisciplinary Protocol – Guidance for Collaborating with Stakeholders* (Deliverable 7.1) and the methodological protocols for delivering the NBS integrated assessment framework, namely, the Urban Nature Explorer (D3.5).

Before describing how these deliverables have contributed to advance the objectives of Task 7.1, the roles of the project's participants who have contributed to them are shortly described. The most prominent role was played by the global alliance of local governments for sustainability ICLEI, a boundary organisation that supports local governments' sustainable development capacities (Frantzeskaki et al., 2019). In the framework of WP7, besides coordinating the URIP agenda the ICLEI's staff has led an iterative programme of knowledge-exchange that secured the accessibility of relevant progresses to all project participants. The iterative programme included plenary meetings with the URIPs and regular webinars. The respective record provided important material for distilling the 'lessons learnt' from the transdisciplinary collaboration within and among the URIPs reported in this report as well as in other project's outputs (e.g. Basta et al., 2021).

As part of the project's transdisciplinary capacity-building objectives of Task 7.1, the Netherlands Environmental Assessment Agency (PBL) has conducted research on the operationalisation of the transdisciplinary approach in NATURVATION's main activities. ICLEI and PBL have therefore been involved in WP7, and in Task 7.1 in particular, from different, albeit complementary, positions. By coordinating the works of the URIPs and by providing a platform for reflecting on them on regular basis, the ICLEI's staff has *enabled* transdisciplinary collaboration and the co-production of knowledge in NATURVATION. Differently, by monitoring the forms through which such collaboration developed, the PBL's staff has generated the studies described in this report, whose relevance extends to future transdisciplinary practices in the EU research programmes. To

do so, rather than from the position of *participants in* NATURVATION's transdisciplinary process, PBL's researchers have therefore acted as *observers of* such process. This distinction between the roles of ICLEI and PBL has secured the ability of the latter organisation to monitor and evaluate the quality of NATURVATION's transdisciplinary practices from a position of relative independency. It is from such position that this report is written.

Figure 1 illustrates the distinct roles of the project's partners involved in Task 7.1, including the 'operational role' of the six URIPs. In the following section, a first overview of the main deliverables that stemmed from the collaboration among these partners is reported.

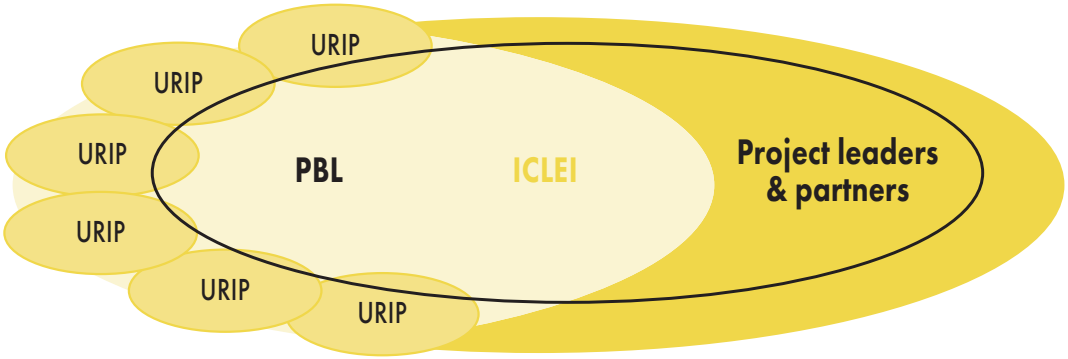

Figure 1: WP7: The roles of project partners and the 'learning circles' of their transdisciplinary collaboration (from Basta and Kunseler, 2018).

2.1 TASK 7.1: MAIN OUTPUTS AND DELIVERABLES

In this section we will define as 'outputs' all the materials generated in the framework of Task 7.1 that do not constitute part of the deliverables listed in NATURVATION's official project plan. The latter will be mentioned as such together with their respective number.

Overall, the outputs and deliverables of Task 7.1 can be divided into three groups. First, the support documents which guided the underlying design of the activities of the project relevant to the building of transdisciplinary capacities, and the record of the relevant results; second, the Working Papers and reports produced during the project, namely, the project's deliverables; and third, the conference papers and scientific articles that followed. All are listed in Table 1. The following section elaborates on the deliverables and studies listed in the table more in detail.

Table 1. Task 7.1 on Transdisciplinary Capacity-Building: Outputs and deliverables 2017-2020

	TITLE	WP	LEADING PARTNER
Support documents and outputs on transdisciplinary capacity building in NATURVATION	Basta C (2018) *From the Urban Nature ATLAS to the NBS Integrated Assessment Framework: Ideas for Co-design design*	WP3	PBL
	Record of the URIP webinars held bimonthly from 2017 up to the end of 2020	WP7	ICLEI
	URIP Summary Reports produced from 2017 up to the end of 2020	WP7	URIP coordinators
	Balenciaga, I. and Bach, M. (Eds.) (2021), *Making Nature Blow: Four years of partnering for nature-based solutions across Europe*	WP7	ICLEI
Deliverables/ Milestones	*URIP Transdisciplinary Protocol*	WP7, D7.1	ICLEI
	Basta, C. and Kunseler, E. (2018), Review of concepts to develop guiding-ideas for NATURVATION's transdisciplinary research design. NATURVATION Intermediate Report.	WP7, M7.5	PBL
	Final Report on Transdisciplinary Practice for NBS (this Report)	WP7, D7.5	PBL
Congress papers and scientific articles	Basta, C. (2017) "Transdisciplinarity in urban research: From 'preaching it to doing it'". Paper presented at the congress of the European Association of the Schools of Planning (AESOP), Prague	WP7	PBL
	Basta, C. (2018) Transdisciplinarity in urban sustainability studies: Theoretical relevance and research implications. Submitted to *Planning Theory, under revision*	WP3, WP7	PBL
	Basta, C. and Kunseler, E. (2019) "Exploring what makes co-design salient, legitimate, and credible for the stakeholders involved in a transdisciplinary project on nature-based solutions and urban innovation." Paper presented at the International Transdisciplinary Conference, Gothenburg	WP7	PBL
	Basta et al. (2021), Inclusiveness, equity, consistency, and flexibility as guiding-criteria for enabling transdisciplinary collaboration: Lessons from a European project on nature-based solutions and urban innovation. Submitted to *Frontiers in Climate*	WP7	PBL
	Maia et al. (2021) Relevance, credibility, and legitimacy as guiding-principles for co-designing an integrated assessment framework: Lessons learnt from the Urban Nature Navigator (UNN). *In progress*	WP3, WP7	Central European University

3. FOUR STUDIES ON TRANSDISCIPLINARITY

The following section reports on the four studies on the transdisciplinary research practice in NATURVATION that constitute the scientific output of Task 7.1. All of them draw on Milestone 7.5, the intermediate report on the transdisciplinary research (TDR) practice in NATURVATION delivered in the autumn of 2018 (Basta and Kunseler, 2018). The project milestone includes the findings of the literature review on the notion and application of transdisciplinary research mentioned in the Introduction. Executed between March and July 2017, the sources included in it were periodically updated up until the autumn of 2018. The following section reports a succinct account of the literature review and discusses the research questions that emerged from it. These questions are then discussed separately in the context of the respective studies on transdisciplinarity.

3.1 TRANSDISCIPLINARY APPROACHES TO RESEARCH: CONCEPTS, PRINCIPLES, AND CRITERIA

For distilling guiding-ideas on the transdisciplinary approach applicable in NATURVATION, the literature review conducted in the framework of Task 7.1 has inventoried different *concepts* and *conceptions* of transdisciplinarity (TD) and of transdisciplinary research (TDR) in the broad literature in the social-environmental sciences. The search of sources was non-systematic and open to multiple disciplinary domains. These included the humanities, among which epistemology and philosophy of science literatures, and multiple secondary sources, among which grey literature and final reports of projects funded by the EU research programmes.

Standard scientific repositories and search tools like SCOPUS and Google Scholar were employed in the search of titles and abstracts. Keywords like 'transdisciplinary methodology', 'knowledge co-production', 'transdisciplinary operationalisation' among others were used to detect relevant studies. From an initial set of several hundreds of titles, 96 sources on the theory and practice of transdisciplinary research were selected. These included both primary sources and grey literature. The selection was executed by quick-scanning abstracts and executive summaries. A second reading of the sources selected led to dividing them into two subsets. One subset grouped the studies dedicated to the historical and epistemological development of the concept of transdisciplinarity from its origins to date. The other subset grouped the studies on the operationalisation, monitoring, and evaluation of the practice of TDR in project-based researches. Both sets of studies were then discussed in respective sections of Milestone 7.5 (Basta and Kunseler, 2018).

Besides inventorying different definitions of 'transdisciplinary' as attribute of research, knowledge, process, etc. the literature review enabled the PBL researchers to re-construct how the very notion of trans-disciplinarity has emerged from the epistemological debate on the new frontiers of knowledge started in the '50 of the past century up to develop in the current understanding of research as practice extended to social actors other than scientists (e.g. Osborne, 2015). The first journal article that was derived from the literature review includes, therefore, a narrative account of how the notion of transdisciplinarity evolved up to penetrate contemporary practices in social-environmental research and the field of urban studies (Basta 2019)[5].

Albeit limited to circa 100 sources, the literature review has also enabled the detection of recurrent conceptual associations between the attribute of 'transdisciplinary' and those of 'collaborative' and 'participatory' approaches to research. These recurrent associations suggest that the general understanding of transdisciplinarity in the social-environmental sciences is that of methodological approach aimed at integrating multiple disciplinary, professional, and social perspectives in the practice of co-producing knowledge, as the attribute 'participatory' suggests, about socially relevant questions. Whilst the examined literature tends to associate such practices principally to the objective of advancing 'real world' solutions, it also supports the relevance of the approach to conceptual and theoretical inquiries.

The most important objective of the literature review remained the practical objective of distilling guiding principles that could have informed NATURVATION's research-design and the relevant practices, particularly in relation with the URIP's iterative programme of activities coordinated by ICLEI. An important reference for this goal has been Belcher et al. study (2015). Besides important theoretical clarifications, the study provides "*Effective research quality criteria ... to guide the funding, management, ongoing development, and advancement of research methods, projects, and programs*" (Belcher et al, 2015, p.1). These research quality criteria revolve around notions of salience (or relevance), legitimacy, credibility, and effectiveness. As such, they resonated with previous studies of the PBL's researchers involved in Task 7.1 (Kunseler et al., 2015), which corroborated the relevance of these four quality criteria to the knowledge co-produced by researchers, policy makers, and stakeholders.

By drawing on these references, a robust theoretical basis for NATURVATION's transdisciplinary practice could be therefore established. Table 2 below summarises the guiding-principles that were finally adopted as primary reference both for monitoring and evaluating such practice and building relevant capacities.

How these principles were operationalised in NATURVATION's different activities is discussed in the following section, which elaborates on the second study conducted in the framework of Task 7.1.

3.2 TRANSDISCIPLINARITY IN THE EU RESEARCH FRAMEWORK: A SURVEY

The literature review described in the previous sections detected several secondary sources relevant to the definition and/or application of the notion of transdisciplinary research in the social-environmental sciences. These included several final reports of EU projects funded in the framework of the structural research programme (e.g. Moulaert F. et al, 2010). Seen the objective of Task 7.1 of exploring 'the state of the art' of transdisciplinary research beyond NATURVATION, these sources inspired a dedicated study on how the notion of transdisciplinarity is defined and applied in the framework of projects funded by the EU structural research programmes.

The study, still in progress, is very ambitious. The main research question regards the definition and application of the transdisciplinary approach to research (TDR) in, specifically, the H2020 programme. To investigate that, the study draws on the CORDIS database of H2020 projects funded starting from 2016. By filtering a representative number of projects that make use the term 'transdisciplinary' in their description, the study examines:

[5] Submitted to the journal *Planning Theory* as Basta, C. (2019) Transdisciplinarity in urban sustainability studies: Theoretical relevance and research implications. *Peer-review received, manuscript under revision*

Table 2: Quality principle and evaluation criteria of TDR (elaboration from Belcher et al., 2015)

QUALITY PRINCIPLE	LEADING PARTNER
Relevance *Relevance is the importance, significance, and usefulness of the research project's objectives, process, and findings to the problem context and to society.*	• The appropriateness of the timing of the research, the questions being asked, the outputs, and the scale of the research in relation to the societal problem being addressed; • Researchers must demonstrate an in-depth knowledge of and ongoing engagement with the problem context in which their research takes place; • From the early steps of problem formulation and research design through to the appropriate and effective communication of research findings, the applicability and relevance of the research to the societal problem must be explicitly stated and incorporated.
Credibility *Credibility refers to whether or not the research findings are robust, and the knowledge produced is scientifically trustworthy.*	• Clear demonstration that the data is adequate, with well-presented methods and logical interpretations of findings; • High-quality research is authoritative, transparent, defensible, believable, and rigorous; traditional disciplinary criteria can be applied in TDR evaluation to an extent; • Additional and modified criteria are set that address the integration of epistemologies and methodologies and the development of novel methods through collaboration, the broad preparation and competencies required to carry out the research, and the need for reflection and adaptation when operating in complex systems; • Researchers are actively engaged in the problem context, which includes extra-scientific actors as part of the research process so that the relevance and legitimacy of the research are facilitated; • Heightened requirements of transparency, reflection, and reflexivity to ensure objective are carried out; • Transdisciplinary researchers must ensure they maintain a high level of objectivity and transparency while actively engaging in the problem context.
Legitimacy *Legitimacy refers to whether the research process is perceived as fair and ethical by end-users. Whereas credibility refers to technical aspects of sound research, legitimacy deals with socio-political aspects of the knowledge production process and products of research.*	• Genuine and appropriate inclusion and consideration of diverse values, interests, and the ethical and fair representation of all involved; regardless of the depth of participation, processes for effective and fair collaboration are present; • Societal actors are involved along a continuum of participation from consultation to co-creation of knowledge; • Researchers explicitly reflect on and account for their own position, potential sources of bias, and limitations throughout the process, and make the process transparent to those external to the research group who can then judge the legitimacy based on their perspective of fairness.

Effectiveness
Legitimacy refers to whether the research process is perceived as fair and ethical by end-users. Whereas credibility refers to technical aspects of sound research, legitimacy deals with socio-political aspects of the knowledge production process and products of research.
	• **Potential research effectiveness** can be indicated and assessed at the proposal stage and during the research process through a clear and stated intention to address and contribute to a societal problem, the establishment of the research process and objectives in relation to the problem context, and the continuous reflection on the usefulness of the research findings and products to the problem;
	  • ***Ex post* research effectiveness** can be measured 'conventionally' (outputs such as e.g. journal articles) but require additional indicators, for example:
	  • The contribution of the project to **social learning and change** (through e.g. capacity-building events);
	  • The contributions of the project to **changes in policy and practice** resulting in social, economic and environmental benefits.

a) how transdisciplinarity is defined in the project's framework,

b) how the approach is operationalised (e.g. through research methods), and,

c) whether and how the consistency between the definition of the approach and its operationalisation in the project's research practices is monitored and evaluated.

The third question is meant to investigate whether the EU projects selected have not only 'claimed' to use the transdisciplinary approach, but whether this was also object of monitoring and evaluation during or after the project's development. What motivates this question is deriving recommendations for the transdisciplinary research-design of future EU projects on the basis of the transdisciplinary research quality of the H2020 projects included in the study: an objective of sure interest for the coordinators of the EU structural research programmes that recommend the use of such approach for tackling socially relevant research questions.

To this scope, the study started with retrieving the Summary Reports of all H2020 projects uploaded in the CORDIS database up until September 2019. By using the key words 'transdisciplinary' and 'interdisciplinary', the initial dataset of 12,987 projects was reduced to 1,319. Of these, 45 projects citing the term 'transdisciplinarity' and or the attribute 'transdisciplinary'

in their Final Summary Reports were selected for further analysis. Finally, 43 projects within the environment cluster citing 'transdisciplinary' and/or 'interdisciplinary' were selected for further comparative analysis. Two research questions were then formulated, namely:

a) what differences between the interdisciplinary and transdisciplinary approaches emerge from the comparison of H2020 projects in the environment cluster?

b) what is the characterisation of the transdisciplinary approach in the selected projects? What methods are used to implement the approach?

Both questions converge toward the objective of formulating recommendations for the EU research programme regarding the requirements for and criteria of evaluation of project proposals and deliverables that adopt the transdisciplinary approach. The preliminary results emerging from the analysis of the selected Final Summary Reports are summarised in the following:

- TDR is characterised mostly as ***approach*** to research;
- The term 'transdisciplinary' is generally used as ***attribute*** of research processes inclusive of multiple disciplines and type of participants;
- The research design and the methods used for the implementation of the approach are not significantly different from established research methods in the social-environmental sciences;
- Only an insignificant minority of the projects examined apply research methods that document the inclusion and the synthesis of different knowledges during the research process;
- None of the examined projects implements evaluative frameworks for assessing the credibility, legitimacy, relevance, and effectiveness of the knowledge produced and/or synthesised throughout the research process.

This latter finding is quite striking. In fact, this study is likely to demonstrate that in the research projects funded by the EU structural programmes up until 2019 there is no systematic use of monitoring and evaluation methods apt to document the implementation of transdisciplinary research practices during their development, and the quality of their results. What this finding reveals is hence a rhetoric use of the term 'transdisciplinary' in the examined H2020 projects: in fact, 'transdisciplinary approach' is merely used as synonymous of projects 'inclusive of multiple types of participants'. Nothing really distinct from the attributes of 'interdisciplinary' and 'multidisciplinary', or 'participatory' and 'collaborative', all equally used to qualify projects that involve stakeholders in the process of research, and in which traditional methods of data-gathering and analysis are employed.

Considering the distinctiveness of the definition of transdisciplinarity as process of research inclusive of multiple actors and aimed at co-producing relevant, credible, legitimate, and effective knowledge, one preliminary recommendation emerged from this study is that the incorporation of a monitoring and evaluation method dedicated to document and verify the operationalisation of explicit TDR quality principles could become an explicit requirement for project proposals seeking to obtain EU funding. One additional criterion of evaluation of the quality of project proposals could become whether the project implements robust methods of knowledge synthesis (e.g. Pullin et al., 2016).

Task 7.1 has contributed to the challenges inherent in these recommendations for the EU funding agencies by designing a simple monitoring and evaluation method aimed at documenting the quality of the transdisciplinary collaboration in NATURVATION. The method enabled the collection of information regarding the TDR quality-principles that have informed the project's main collaborative activities. Approaching the end of the project in the second half of 2020, the general applicability and possible future improvements of such method were further reflected upon by the PBL researchers who have designed it in collaboration with the ICLEI's coordinators, and by the URIP coordinators who have applied it in their reporting practices during the entire duration of the project (Basta et al., 2021). This important achievement of the collaborative research conducted in the framework of Task 7.1 is described in the following section.

3.3 LEARNING FROM NATURVATION'S URIPS: OPERATIONALISING THE TRANSDISCIPLINARY APPROACH THROUGH THE CRITERIA OF INCLUSIVENESS, EQUITY, FLEXIBILITY, AND CONSISTENCY

The literature review that was shortly described in section 3.1 had confirmed, on the one hand, the prominence of the principles of relevance (or salience), credibility, legitimacy, and effectiveness (or applicability) as guiding-principles for designing transdisciplinary investigations. These principles were therefore elected as guiding-principles for NATURVATION's research-design. At the same time, the review had also revealed the scarcity of studies on how operationalising such principles in large projects that build-up upon different activities in multiple countries over several years (Hoffman et al., 2017). Rather than providing definite answers regarding the challenge of operationalising the transdisciplinary approach adopted in NATURVATION, therefore, the literature review supported the formulation of the following questions:

a) *what criteria* can facilitate the monitoring of the URIPs' knowledge co-production activities in such a way to assess their adherence to the principles of relevance, credibility, legitimacy, and effectiveness?

b) *how can these criteria* be operationalised in such activities in such a way to generate robust and consistent information and, at the same time, promote relevant reflections from the side of URIP members?

PBL researchers approached these questions as an opportunity for experimenting new criteria and methods: that is, for 'going beyond' literature, and tailoring a monitoring and evaluation method on the specific setup and research context of the six 'operational units' constituted by the URIPs. Something for which the literature examined did not offer directly applicable examples, and that would have therefore constituted an original output of the research on transdisciplinarity in the framework of NATURVATION.

In this spirit, approaching the summer of 2017 the PBL researchers held a number of brainstorming sessions aimed at identifying research quality criteria relevant to the four transdisciplinary guiding-principles. The idea was then to propose them to the URIP participants as 'reflexive devices' on the dynamics and results of the knowledge co-production events on their agenda[6]. The observations gathered would have enabled to reflect on the factors that had enhanced or undermined the quality of the TD collaboration among the URIP members. Such criteria should have been used for reporting on the URIPs' thematic events regarding their relevance, credibility, legitimacy, and effectiveness for participants.

The employment of this simple monitoring and evaluation method was endorsed by ICLEI and by the project's coordinators who participated in the identification of the quality criteria. Multiple brainstorming sessions contributed to it by involving participants in discussing questions like, "*what makes the questions discussed during a URIP thematic event relevant for those participating in it?*" or, "*what makes participation in the event effective for individuals?*". The writing of short answers to these questions – e.g. "*professional goals*"; "*ability to voice their opinion*", etc. – provided the basis for reasoning around the criteria most adapt for capturing the guiding-principles of transdisciplinarity as these would have 'worked' in the specific context of the URIP events.

These criteria were finally identified in the criteria of ***inclusiveness***, ***equity***, and ***consistency***. Each of them was meant to capture, respectively, the diversity of the participants in the URIP events; their effective participation in the relevant works; finally, the consistency of such works with the participants' expectations and goals. These criteria were meant both as *preventative* and as *active* measures for pursuing the relevance, credibility, and legitimacy of the knowledge co-produced

[6] Another hypothesis advanced for operationalising the four transdisciplinary quality principles of relevance, credibility, legitimacy and effectiveness in the framework of the URIPs' knowledge co-production activities consisted of inviting the URIP members to set individual learning-goals regarding the overarching project's theme of nature-based solutions and urban innovation. Such goals should have covered the entire project's duration and should have been object of reporting regarding their achievement on regular basis. This approach – inspired among others by the work of Roux et al. (2017) – was meant to generate information, from the side of the participants in the URIPs, regarding their achieved learnings. The idea was then to evaluate such learnings against the four TD guiding-principles. If, for example, learning new ways to minimise heat island effects in the city would have been an explicit learning goal for one or more participants, whether such goal would have been achieved during the project would have enabled the evaluation of the latter's outcomes in terms of its relevance to one explicit learning goal of participants. The PBL team would have then been in a position, at the end of the project, to produce robust observations on the adherence of its outcomes to principles of relevance as well as of credibility, legitimacy, and effectiveness. In the light of the complexity that this otherwise promising monitoring and evaluation method may have implied for the participants in the URIPs, the hypothesis of its implementation was discarded. Indeed, the approach would have implied adding one extra task on the agenda of the participants in the URIPs; who, due to the quite intensive project plan, had already flagged the risk of suffering from 'stakeholders' fatigue' (Baró et al., 2017).

during URIP events. For example, the criteria of inclusiveness and equity were meant to prevent a formal approach to the diversity of participants from the side of the URIP coordinators, i.e. that a diverse audience would be invited to attend URIP events without being empowered to participate in the respective works in concrete; at the same time, the same criteria were meant to encourage such concrete contribution from the part of the very participants in the URIP events.

Drawing on Bracken et al. (2015), the additional criterion of ***flexibility*** was included in the final set of four criteria. In this study on the perspective of stakeholders involved in large transdisciplinary projects, the flexibility of the schedule and content of knowledge co-production events is qualified as important factor of stakeholders' effective participation in them. Whilst none of the four criteria was matched with a corresponding guiding-principle, the criterion of flexibility seemed indeed an important criterion for capturing the effectiveness of stakeholders' participation in the URIP events. Comparable experiences of transdisciplinary research-design of Authors of this study (Kunseler et al., 2015; Wamsler et al., 2017) corroborated its relevance to the scope of the monitoring and evaluation exercise. This was finally grounded upon the use of the four criteria of inclusiveness, equity, flexibility and consistency as 'reflexive devices' for generating reflections on the transdisciplinary quality of the knowledge co-production events held in the framework of the URIPs' activities.

Having identified the four criteria, the next question became 'how putting them to work': that is, how 'administering them' to the members of the URIPs in such a way to gather relevant information. Here, a 'methodological dilemma' for the PBL researchers consisted of whether opting for 'intrusive' information-gathering approaches, like interviewing URIP members regarding the dynamics and outcomes of the main knowledge co-production events by revolving around the identified criteria, or opting for approaches that would have minimised their attendance of such events; thus, their direct interaction with URIP members. This latter concern was corroborated by inputs provided by some URIP coordinators regarding the risk, for stakeholders exposed to the direct monitoring of their work from the side of the PBL researchers, of feeling like "guinea pigs" (Baró et al., 2017).

In virtue of this and other practical difficulties, not at last some evident language barriers, the most effective strategy seemed that of establishing a systematic practice of reporting from the side of the coordinators of the six URIPs by means of the provision of a template Summary Report. This is shown in Table 3.

By filling in the template shown in the table above, URIP coordinators were required to report on 'quantitative' aspects of the thematic events – e.g. the number of participants – as well as on content-related aspects like the thematic sessions held, the information exchanged, the agreements reached, and so on. With the introduction of the four quality criteria of inclusiveness, equity, flexibility, and consistency as explicit points of reflection in the Summary Reports, starting from June 2017 the coordinators of the URIPs were therefore put in the position to generate information and reflections regarding both the 'quantitative' as well as more 'qualitative' aspects of each event.

The gathering of information by means of the provided template for the entire duration of the project and the sampling of a set of Summary Reports constitute the materials thanks to which a study dedicated to reflecting on the identification of four criteria of transdisciplinarity and their 'administration' to the participants in large projects by means of systematic reporting could be finally elaborated (Basta et al., 2021). Here below, the most relevant parts of this study are reported.

3.3.1 The use of transdisciplinary quality criteria as 'reflexive devices' on multi-disciplinary and multi-stakeholders knowledge co-production events: A self-assessment

The primary scope of the study described in this section did not consist of reflecting on the URIPs' thematic events in relation to the criteria of inclusiveness, equity, flexibility, and consistency mentioned above. Rather, scope of the study was self-assessing whether the identification and 'administration' of these criteria of transdisciplinarity as 'reflexive devices' for reporting on such events was experienced as effective monitoring and evaluation strategy – thus, as strategy replicable in future projects – by the URIP members who were involved in the exercise of reporting[7].

[7] The study was led by the PBL's researchers with the support of ICLEI's coordinators. Three URIP coordinators have participated in it as co-authors. The study was submitted to the Open Access journal Frontiers in Climate as Basta et al. (2021), Inclusiveness, equity, consistency, and flexibility as guiding-criteria for enabling transdisciplinary collaboration: Lessons from a European project on nature-based solutions and urban innovation (*status: re-submitted to the journal after the revision of the manuscript*).

Table 3: The template Summary Report provided to URIP coordinators for reporting on the URIP knowledge co-production events on nature-based solutions and urban innovation

Meeting number and theme:		
This report is authored by (name(s) and affiliation):		
Host of meeting:	**Place / venue of event**	**Date and time of event**
(1) DESCRIPTION OF THE EVENT		
Objective(s) Participants *(please list the names and affiliation of each participant)* Agenda Key points discussed *(e.g. identified priorities, difficulties, knowledge -gaps, findings on NBS)* Main outcomes *(e.g. agreements made, decisions taken, solutions found; please add timeline if applicable)*		
(2) REFLECTION ON THE EVENT		
General observations *Were the objective(s) set for the meeting achieved? What were the main* ***challenges*** *faced during the event (e.g. engaging participants, coordinating the discussion, agreeing on main points, keeping track of all contributions)? What general '****lessons learnt****' could be taken into consideration for organisin future events?* *Which follow-up actions (e.g. responsibilities/roles assigned, next meetings, events) have you identified? And by when should these actions be implemented, if applicable? Which issues/aspects/actions will you take into the next meeting?* *What kind of inputs/support does the URIP need from NATURVATION in the near future (e.g. in terms of research work or content provided, organisational support, input during workshop, update, communication)?*		
Observations on the transdisciplinary practice *The four criteria listed below, which make transdisciplinarity possible, are illustrated in the URIP guidance document. Please share your observations from the meeting.* *1. Inclusiveness* *How heterogeneous and representative in terms of interests, stake, and perspectives on NBS were the participants in the meeting? Were any disciplines, positions, interests and/or cultural groups over or underrepresented? Was the overall age and / or gender diversity of participants noticeable?* *2. Equity* *Besides being present at the meeting, did all participants have equal opportunities to voice their opinions, interests, needs and objectives? Could you give some examples? In case not all participants could be 'heard' (e.g. because of lack of time, or because of the 'predominance' of one or more participants' on others) what changes and or points of improvements could be considered for organising future events and ensuring all can participate equally?* *3. Flexibility* *Allowing for* ***changes****, remaining open to* ***feedback*** *and facilitating* ***learning*** *helps engage participants in the co-creation of knowledge on NBS – and acts as a motivational factor. Was flexibility evident in the organisation of the event? Can you describe how this was the case?* *4. Consistency* *Reflecting on the three criteria of inclusiveness, equity, and flexibility – and reporting on them critically and with integrity – is essential for securing consistency among and distilling 'lessons learnt' from the URIP.* *What practical measures have made the process and/or event consistent with a view on the criteria inclusiveness, equity and flexibility? What new measures and / or criteria would you recommend to consider and implement in the future?*		

The study consists of the document analysis of a sample of URIP Summary Reports produced between June 2017 and December 2019 (e.g. Bowen, 2009)[8]. The reports selected regard knowledge co-production events on nature-based solutions and urban innovation organised by each individual URIP following the common agenda of events coordinated

[8] The main advantage of this method consists of the verifiability of the sources included in the analysis; something that other methods of information-gathering, like e.g. participant observations methods, do not enable in full. One of the main disadvantages consists of the limitations intrinsic in the generation of information from the side of the document's writer, who filters it according to her subjectivity and contextual circumstances. This limitation is particularly relevant to the type of material analysed here. A further limitation consists of the mutual subjectivity of the analyst in detecting significant statements. For these reasons, rather than limiting the document analysis to the sections of text explicitly dedicated to comment on the four criteria of transdisciplinarity, the analysis included all the text and illustrations included in each Summary Report. Some of them, for example, included additional materials and photos that could support the interpretation of statements recurring in the text. The extraction included both quantitative (e.g. data) and qualitative statements (e.g. observations, reflections).

by ICLEI. For reasons of practicality, only a limited number of reports was included in the analysis. The URIPs examined were reduced to three, namely, to Barcelona, Malmö, and Utrecht[9]. For reasons of comparability, three reports per URIP of consistent density and quality of information were selected. The Summary Reports analysed are thus 9 in total. All refer to events held in the same period of the year in the three respective cities. To corroborate the statements and narratives extracted from these Summary Reports, additional materials were included in the analysis, among which Barcelona's URIP Yearly Report (2017) and two narrative reports relevant to the Stakeholders Dialogues held in Utrecht and Malmö (2018 and 2019 respectively).

To validate the relevance of the statements extracted from the examined reports to the scope of the study – which, it's worth repeating, consisted of self-assessing the effectiveness of the monitoring and evaluation method deployed rather than the adherence of the examined events to the four criteria of transdisciplinarity – the extraction was executed by one researcher and, subsequently, reviewed by a second researcher. Extracted statements were then submitted to the URIP members who participated in the study for further validation. Without the pretence of having executed a rigorous triangulation, the reliability of the statements extracted can therefore be considered high. These are reported in Table 4.

The statements collected in the table above provided the basis for discussing the way in which the reporting on the four criteria was experienced by the URIP members who participated in the study. To stimulate such discussion, some informal questions were proposed, both in written form and in person during an online meeting. These questions were:

1. Was the set-up of the transdisciplinary coordination effective? Was good and sufficient guidance provided?
2. Were the four criteria proposed for capturing the adherence of the process to explicit guiding-principles useful for reflecting on relevant aspects of the URIP meetings?
3. Would you, also just 'in your mind', reflect on them again in future projects?
4. What are the key lessons – positive and utterly critical – you can derive from the transdisciplinary process that you have led / in which you have participated?

The replies to these questions from the part of the URIP members who participated in the study were summarised in a form suitable for further discussion. Then, a first summary of the outcomes of the discussion was circulated among all the study's participants. All of them have had an opportunity to integrate and modify its content. From it, two types of reflections have emerged. One relative to the dynamics of collaboration in the URIPs' events examined that were captured by the four criteria; the other one, relative to the systematic reporting in which the criteria were incorporated. A short summary of both is reported below.

To start with, all the URIP members involved in the study acknowledged the exceptional quality of the coordination of the URIP's transdisciplinary process provided by the ICLEI's staff. Besides the agenda of thematic events on nature-based solutions and urban innovation and the periodic plenary sessions of knowledge-exchange, the devised iterative programme included regular webinars. These have provided an easily accessible platform for exchanging thoughts on the transdisciplinary process under development and adjusting it in time. Despite the fact that some participants experienced the iterative programme as rather rigid ("*There was too much top-down steering on the agenda and a much more open-ended reflexive approach could have been taken in which the URIPs were invited to respond more strongly to local ambitions and processes*"), generally "*the thorough guidance, structure and documentation of the URIP activities, which was very well coordinated by ICLEI, helped the URIP staff to not get lost in such a huge project*" was appreciated and helpful.

[9] As reported at the beginning of this report, in the light of the geographical spread and complexity of the organisational setup of NATURVATION, Task 7.1 could limit the most in-depth research on the TDR approach to the activities of two URIPs. For the mentioned reasons of practicality, which included also considerations of language and proximity, it was therefore decided to focus on the activities of the URIPs in Utrecht and Malmö. However, seen the scope of the study discussed in this section, it was decided to include in it also material relevant to the activities of the URIP in Barcelona. This seemed a valuable addition to the material relevant to the other two URIPs. The inclusion of a third URIP in a study aimed at self-assessing the monitoring and evaluation method applied in the framework of the activities of the six URIPs seemed also desirable for strengthening the robustness of the analysis. This and other choices made in relation to such analysis are discussed in a dedicated section of the journal article that collects the results of the self-assessment, the cited Basta, C. et al (2021).

Table 4: An extraction of significant statements from a sample of URIP Summary Reports (from Basta et al., 2021)

URIP	Quality criteria	2017	2018	2019
Barcelona	INCLUSIVENESS	*We could reach a fair variety of stakeholders (from public authorities to community-based organisations), including representatives of 4 levels of public administrations (regional, provincial, metropolitan and municipal).* *[However] SME and community or non-governmental organisations were clearly a minority.*	*Our group is overrepresented by public authority and academia. The main reason for this is the scheduled time for the meetings.* *In terms of age and gender diversity we think there is an acceptable balance*	*(...) sessions in breakout groups are clearly valuable because they facilitate the involvement of all participants in the discussions & allow to focus on specific topics or case studies in accordance to stakeholders' interests or expertise* *We plan to invite other stakeholders to present their initiatives, plans or policies in relation to NBS in future meetings since the online questionnaire results showed that many URIP members are ready and happy to do that.*
	EQUITY	*The unbalanced mix of stakeholders in the meeting had a direct impact on the prioritisation or "voting" process*	*All participants had equal opportunities to voice their opinions and interests.* *Small workshops foster the involvement of all participants*	*All participants had equal opportunities to voice their opinions and interests*
	FLEXIBILITY	*Flexibility measures in the organisation of next URIP sessions [are welcome/desirable]*	*A flexible approach is adopted in the organisation*	*(...) we try to engage with ongoing local policy processes or key topics (e.g., urban resilience in this case) related to NBS in order to raise interest and involvement among key participants.*
	CONSISTENCY	*(...) maintaining the engagement of some stakeholders during the whole URIP process will be challenging because of stakeholders' fatigue due to participation in other research or policy processes; critical view of NBS concept; feeling of "being used" by research projects but not getting any useful output in exchange.* *(...) to ensure that forthcoming meetings are also successful, we really need to keep fostering a transdisciplinary / co-creation process in which stakeholders feel that their interests and priorities are considered*	*Reaching full consistency is very challenging ...especially (for) the lack of policy mandate (stakeholders' participation is only based on their own interest and willingness)* *New criteria / measures should be clearly orientated toward mitigating stakeholders' fatigue*	*(...) the presentation of ongoing initiatives related to NBS and UGI by the stakeholders themselves (in this case the Barcelona Resilience Strategy) is clearly positive because: 1) it provides an opportunity to stakeholders to actively contribute to the URIP meetings; 2) it links the URIP process with policy or social initiatives that have a clear mandate or support; and 3) it has a beneficial effect in terms of mutual learning and knowledge exchange.*
Utrecht	INCLUSIVENESS	*Some sectors may have been underrepresented* *There was no noticeable underrepresentation in terms of age*	*All five Dutch partners were represented* *There was a reasonable gender and age distribution among the external partners who were represented*	*To improve inclusiveness, URIP Utrecht prepared posters announcing the event together*
	EQUITY	*All participants seemed to be able to voice their concern and opinions, perhaps aided by the informal setting*	*There was limited time for discussion* *A small number of people did not actively participate in the discussion. This could have been prevented with small-group discussions*	*There were plenty of opportunities to ask questions following the symposium and during the informal bicycle tour*
	FLEXIBILITY	*There was scope for questions Speakers were flexible, open to questions, provided ample explanations*	*The programme was changed during the event to allow for time for presentations* *The format for the discussion was very open*	*Different ideas for the event were discussed, leading to e.g. the decision to include a mini-symposium, to invite the alderman, and to visit examples of initiatives in disadvantaged parts of the city*
	CONSISTENCY	*The interactive and active mode of the meeting worked well in drawing in and engaging stakeholders*	*There was little time for discussion and little representation of external partners.*	*Planning the event with representatives of 3 different organisations, visiting disadvantaged areas during the bicycle tour, inviting citizens, not only professionals, organising it during the weekend to make it easier for citizens to participate, keeping the talks relatively short and at 'introductory' level.*

Table 4: An extraction of significant statements from a sample of URIP Summary Reports (from Basta et al., 2021)

URIP	Quality criteria	2017	2018	2019
Malmö	INCLUSIVENESS	*Need to increase the representatives from construction companies and business-oriented activities* *A female bias is in the group*	*The possible commercial developer was represented by one actor, the public (actors) of the two cases were not represented* *Many more women attended the meeting than men* *Mainly consultants, authorities and scientists were present at the event*	*The meeting lacked the perspective of the property developer* *Seven women and four men attended the meeting*
	EQUITY	*No problems with equity in the group, open climate*	*The moderator made sure all participants who wanted to contribute had a chance to do so*	*The mini workshops provided all participants the opportunity to actively reflect and discuss from the perspective of their roles and competencies*
	FLEXIBILITY	*Flexible agenda, no real time slots*	*All presentations allowed for discussion. This was very positive for knowledge exchange* *We experienced the meeting environment as equal and flexible – no problem for anyone to ask questions, share their thoughts / ideas*	*The meeting always allowed for open comments and/or questions which is positive from a learning and exchange perspective*
	CONSISTENCY			*We experienced the meeting environment as inclusive, equal and flexible*

Other important conclusions emerged from the study regarding the four criteria. All the participants in it experienced them as rather useful for stimulating reflection on aspects deeper than the mere heterogeneity of the participants in the URIP events. In this sense, the criteria were effective in stimulating reflections on the events' dynamics of participation. However, most of the participants in this study revealed limited knowledge of the background work that motivated the introduction of these criteria in the reporting system. The brainstorming sessions that have led to their identification, and the several hypotheses advanced by the PBL team for integrating them in the URIP activities, were from unfamiliar to unknown to the very URIP members who co-authored the study.

This unfamiliarity can be explained as due to the different timing of the activities of different teams in the indeed "*huge project*" that NATURVATION has certainly been. The selection of criteria, for example, has taken place in the early months of 2017, when several URIPs had not yet started organising and communicating about their works in full. On the other hand, such unfamiliarity with the rationale and scope of the monitoring and evaluation method to which the criteria have contributed is also result of the rigid separation of functions between the coordinators and the observers of the transdisciplinary process in NATURVATION, a separation explained earlier in this Report as consequent to the different objectives of the ICLEI and of the PBL staff in relation to the building of transdisciplinary capacities.

This lack of deeper 'background knowledge' regarding the use and scope of the criteria in the reporting system has led several participants in the URIPs to approach the relevant sections of the template Summary Report as a bureaucratic task of unclear added value to their learning experience. One remark captures this feeling of lack of clarity well: "*The systematic reporting on URIP meetings was a good initiative to show the evaluation of the knowledge exchange process over time, although it has never been completely clear to me whether this was simply to fulfil our bureaucratic duties or whether that would serve a broader learning purpose.*" Moreover, "*These four criteria were useful to critically reflect on aspects of the*

process but rather broad, and therefore could easily be interpreted in a selective way." As recommended by another study participant, "*My recommendation would be that the criteria should not only become a reporting task but actually something that gets explicitly discussed in the activities themselves.*"

Whilst these and other similar remarks mirror a general feeling of lack of clarity regarding the rationale of selection and utilisation of the four criteria of inclusiveness, equity, flexibility, and consistency in the reporting system, a consensus regarding the perspective of using at least some of them as guiding-criteria in future collaborative projects has emerged. For example, "*The URIP process made me appreciate the dimension of flexibility a bit more, because [by] taking a flexible approach we managed to engage many stakeholders and (hopefully) influence decision-making processes in the city relevant to urban nature*". In the words of another participant, "*The criteria we used are relevant and good for operationalising the overarching criteria…I would definitively use these criteria for future projects. I think that it is a relevant exercise to do this.*" What is needed though is "*(…) to make people understand what is only an academic exercise, and what is actually relevant for practice.*"

This latter remark anticipates part of the recommendations reported at the end of this report. In the following, the third study generated by the literature review on transdisciplinary research practices – and by the collaborative work conducted in the framework of Task 7.1 more in general – is described.

3.4 TRANSDISCIPLINARY COLLABORATION AND THE CO-DESIGN OF THE NBS ASSESSMENT FRAMEWORK: A SURVEY[10]

The study was initiated by Sara Maia and Dora Almassy from Central European University in 2019. It involves participants from several research institutes and organisations active in NATURVATION, including stakeholders who have participated in relevant activities in the framework of WP3. The study examines the adherence of the co-design process activated in the framework of NATURVATION's WP3 dedicated to deliver the NBS assessment framework with the overarching principles of relevance, credibility and legitimacy that have informed the project's knowledge-production practices. It does so by drawing on the results of a survey addressed, in the form of questionnaire, to a representative sample of participants involved in the co-design process. The latter developed in the two URIPs in Malmö and Utrecht. By doing so, besides meeting the general objectives of Task 7.1, the study also meets the objective stated in NATURVATION's project plan of monitoring the process of transdisciplinary capacity-building more closely in two URIPs.

The studies develop in three phases:

1. A questionnaire-based survey meant to collect feedback from the project's participants relevant to the scope of the study regarding how they experienced the co-design process activated in Utrecht and Malmö for delivering the Urban Nature Navigator;

2. Analysis of findings and their discussion in a follow-up focus group setting;

3. Writing and publication of the journal article.

At present, the preparation of phase 1 has concluded. As for most of the studies relevant to Task 7.1, it is expected to submit the final article to the chosen journal by the end of 2021.

[10] To be published in *European Planning Studies as Maia* et al., Relevance, credibility, and legitimacy as guiding-principles for co-designing an integrated assessment framework: Lessons learnt from the Urban Nature Navigator (UNN). (Status: *in progress*)

4. THE IMPACTS OF OUR RESEARCH ON TDR ON AND BEYOND NATURVATION: A FINAL REFLECTION

At the end of this overview of the studies that have been conducted in the framework of Task 7.1 *Transdisciplinary Capacity Building*, some conclusions relevant to the impacts that these have had on NATURVATION, will arguably have on future transdisciplinary research and on society at large can be derived.

In regard of this latter point, it is important to stress that Task 7.1 provided the framework for delivering impacts to a broader audience than only NATURVATION's participants. Such audience was constituted among others by the attendants of public events like the Open Day of the European Green Week held in Utrecht in May 2018. The event was organised by NATURVATION's PBL team and Utrecht's URIP coordinator following the granting of funds to the two respective organisations from the part of the DG Environment of the EU Commission. The event is an example of the multiple international and national collaborations activated by NATURVATION and of the reach of the respective impacts, which in the case of this event consisted of a one-day programme of activities relevant to the theme of Healthy Urban Living and nature-based solutions in the city of Utrecht in which hundreds of visitors have taken part[11].

Whilst this and other public events have extended the relevance of Task 7.1 to valuable social impacts, the main goal of the task remained advancing research on questions relevant to the TDR methodology, even when these were not directly relevant to the core innovation objectives of NATURVATION. The study on the 'state of the art' of the implementation of the transdisciplinary approach in projects funded by the H2020 research programme reported in Section 3.2. made the relevance of such ambition to future transdisciplinary research practices quite evident. The study has indeed revealed that the attention for the methodological aspects of transdisciplinarity from the side of the researches involved in projects funded by the H2020 programme has been, at least until recently, quite scarce. Such scarcity though appeared as a clear opportunity for 'using' NATURVATION as project through which advancing and testing transdisciplinary monitoring and evaluation methods capable of influencing future practices in the framework of the EU research structural programmes. Also in the light of the multidisciplinary character and the geographical spread of NATURVATION, the methodological reflections and the concrete results that this ambition has finally engendered are an important achievement.

This does not intend to suggest that the coexistence between a 'core' and a 'parallel' ambition of innovation in NATURVATION

[11] More information is available on the website of the DG Environment: https://ec.europa.eu/environment/archives/greenweek2018/eugreenweek.eu/daily-report-day-one.html (last visited: May 2021)

– regarding NBS and the TDR approach respectively – has not posed any challenges. On the contrary, as documented in the study reported in Section 3.3 on the transdisciplinary monitoring and evaluation method applied in the framework of the URIP activities, the perception that "*a merely academic exercise*" could have interfered with and eventually affected the work of the relevant stakeholders has always accompanied the initiatives taken in the framework of Task 7.1 by the author of this report. Indeed, several of such initiatives had to be revised or re-negotiated with those involved; some of them, like the idea of doing a DELPHI survey, toward the end of the project, for synthesising the learnings of different URIP members regarding the TDR process in which they had participated, had to be abandoned entirely. The main reasons for such periodic re-definition and re-negotiation of the ambitions of Task 7.1 can be summarised in two observations, one quite concrete, and one more general. The first observation is that in large international transdisciplinary projects the risks of "stakeholders' fatigue" and of making stakeholders "feel like guinea pigs" (Baró, 2017) are not hypothetical, but rather concrete: as such, they affect the choices of project's coordinators and participants in a substantial way. The second, more general reason is that researching on TDR in the framework of a social-environmental research innovation project like NATURVATION presupposes some interest in epistemology and in research methodology from the part of multiple participants; this, when these subjects are instead quite 'niche' – or, to use a more informal jargon, 'not core business' – in the very social-environmental sciences. Engaging participants from disciplinary fields and with professional backgrounds very distant from these niches is definitely a barrier for conducting relevant research: a barrier removable only by means of a coordinated effort of supporting and valorising the multiplicity of objectives that projects of the size and complexity of NATURVATION are meant to empower.

That is perhaps the most general, yet important lesson learnt from NATURVATION: indeed, building transdisciplinary capacities requires the continuous effort of valorising the multiplicity of perspectives and objectives that individuals embody and pursue by means of their participation in an extended community of scholars and practitioners. From this point of view, the ability of ICLEI to operate on the intersection of – thus, dialogue simultaneously with – science, policy, and multiple professional practices revealed one of the main project's assets. At the same time, the commitment of the PBL researchers to deliver methodological research of comparable impacts despite the mentioned barriers revealed equally crucial.

The most important results from this research consist of the suitability of the four transdisciplinary criteria of inclusiveness, equity, flexibility, and consistency included in the URIP reporting system to generate information able to capture the relevance, credibility, legitimacy, and effectiveness of the respective knowledge co-production process. Indeed, the study reported in Section 3.3 documented that such criteria are likely to be used by the project participants also in future collaborative projects. In the words of one participant in the study, "*The criteria we used are relevant and good for operationalising the overarching criteria…I would definitively use these criteria for future projects. I think that it is a relevant exercise to do this.*" This encouraging remark validates our intuition that deploying a monitoring and evaluation strategy in NATURVATION regarding the quality of the transdisciplinary collaboration in the URIPs was not only a valid research strategy, but also a fruitful capacity building exercise.

As anticipated in Section 3.2, such strategy is at the basis of our main recommendation for the EU research programmes coordinators. Our work has shown that the *conception* of transdisciplinary research cannot be limited to the creation of networks of research projects' participants with diverse backgrounds and goals. Such diversity alone, we mean, cannot guarantee the empowerment and synthesis of the different knowledges that the *concept* of transdisciplinary research has historically been concerned with. Such synthesis can only be achieved by deploying rigorous research methods and by promoting continuous reflection from the side of project's participants on each other's perspectives, and objectives. Such reflection, we showed, can be stimulated by means of simple monitoring and evaluation methods, while relevant learnings can be distilled by using traditional research methods of analysis. Our recommendation would then be to consider requiring the application of similar methods in all transdisciplinary project proposals that compete for EU funding. This may augment their quality, in particular by enhancing the credibility of their results, whose ultimate scope is providing solutions to the most pressing challenges of our societies within and beyond the EU: challenges for whose solution NATURVATION has constituted an incredibly fertile terrain.

ACKNOWLEDGMENTS

The research conducted in the framework of Task 7.1 was led by the author of this report in coordination with the WP leader professor Christine Wamsler (University of Lund) and the project coordinator professor Harriet Bulkeley (Durham University). I am particularly grateful to the former for having guided me through some of the uncertainties that I have experienced in relation to my research plan, and for having contributed enthusiastically to one of its most important outputs, which consists of the self-assessment of the transdisciplinary monitoring and evaluation method applied in the framework of the URIP's knowledge co-production events reported in Section 3.3.

At the Netherlands Environmental Assessment Agency PBL, I could always count on the collaboration of Dr Eva Kunseler, an internationally recognised expert in transdisciplinary research methods. Among other outputs, she co-authored NATURVATION's TDR intermediate report (Basta and Kunseler, 2018). PBL's NATURVATION coordinator Ton Dassen has been a priceless reference and irreplaceable 'problem solver for the entire duration of the project, particularly during the last year of sanitary emergency. Other PBL colleagues involved in different NATURVATION's work packages – Clara Veerkamp, Anton van Hoorn, Maarten van Schie and Ed Dammers – were also regularly involved in the activities discussed in this report. I am grateful to all of them for having rendered our disciplinary diversity and different professional backgrounds an opportunity for strengthening our cohesion, contributing by so doing to the transdisciplinary learning experience that NATURVATION was ultimately meant for.

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