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| <b>ENHANCERIA</b> | Work package  | WP3 Sustainable development through transdisciplinary research               |
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|                   | Lead          | Technische Universität Berlin, Dr. Kathrin Wieck (TUB)                       |

### D3.1 DISCUSSION, COMPARISON AND ANALYSIS OF TRANSDICIPLINARY APPROACHES IN ENHANCE PARTNER UNIVERSITIES

#### //ABSTRACT

In order to develop a transformation agenda for sustainable development in the ENHANCE alliance we will start with focus area 1, Sustainable development through transdisciplinary research, as a significant building stone. This document discusses the first exploration activity to provide and analyse better knowledge about the institutions' transdisciplinary approaches and initiatives fostering sustainable development. The paper discusses the first inventory of structures, strategies, practices and terminologies for knowledge exchange between research and society (see also deliverables D2.1 and D2.2 in WP2). The strategic level (top-down) of institutional support structures and the project level of study cases conducting transdisciplinary research (bottom-up) were used as search windows to identify, analyse and compare relevant and appropriate co-productive initiatives for the focus area. The methodology for comparison and analysis has been adapted to reveal common aspects of the ENHANCE Universities' profiles and to lead to an understanding of diversity, which is essential for creating synergies among them. The adjusted methodological approach focuses on three paths: 1) The range of possibilities, perspectives and understandings of transdisciplinary research within the ENHANCE Alliance to infer shared insights and joint research approaches. 2) The selection of different good practice examples that show specific aspects of transdisciplinary research for sustainable development in creativity and innovation. The type of research initiative, the alignment, the factor of societal impact and the levels of engagement play a crucial role in selecting good practice examples. 3) A glossary for transdisciplinary research for sustainable development that navigates the two previous paths. This glossary is a tool for a common understanding of transdisciplinarity. Here there are a variety of neighbouring terms for participatory research, collaboration, co-production, co-design, and so on. As a result, the document represents the broad understanding of transdisciplinarity as a research mode and as a principle at the ENHANCE partner universities, which has developed according to the existing research and university governance structures with their different orientations. The selected examples offer a fundamental basis for creating synergies for transfer and application in the respective universities. The variety of framing structures, strategies and concepts embedding participatory research approaches shows the need to institutionalise transdisciplinarity in order to provide better support and increase visibility and transparency.

This would favour a mutual learning environment to further develop and anchor such strategies across the ENHANCE alliance.

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### // PART I INTRODUCTION

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## 1. AIMS & OBJECTIVES

### 1.1 ENHANCERIA

The main objective of ENHANCERIA is to support and strengthen the research and innovation dimensions of ENHANCE, the European Universities of Technology Alliance, through developing a transformation plan for the Alliance focusing on the role of universities as drivers and enablers of sustainable development. ENHANCERIA will enable ENHANCE to include all core activities of modern universities – education, research and innovation (including service to society) – in the Alliance's activities. In developing an institutional transformation agenda, the partners will explore, exchange and establish measures toward the long-term vision of ENHANCE. We will drive responsible societal transformation by enhancing a strong alliance of European Universities of Technology, empowering people to develop and use science and technology to benefit society and turn global challenges into opportunities.

Sub-objectives of ENHANCERIA are to:

- Explore practices, ways of working and structures across the Alliance
- Establish and widen international networks of employees within research and innovation
- Develop models for collaboration and recommendations for implementation
- Disseminate and exchange models and practices
- Increase the internationalisation of research and innovation activities
- Identify challenges and barriers at the institutional, national and European levels
- Develop new initiatives to be funded through internal, national and international sources

ENHANCERIA will contribute to the aim of the European Universities: bringing together creative citizens to cooperate across languages, borders and disciplines to address societal challenges and contribute towards the modernisation of universities and the revised European Research Area (ERA).

ENHANCERIA will support and strengthen the research and innovation dimensions of ENHANCE, the European Universities of Technology Alliance, through developing a transformation agenda for the Alliance focusing on the role of universities as drivers and enablers of sustainable development. The focus will be on four areas: sustainable development through transdisciplinary research, sustainable entrepreneurship and innovation ecosystems, human resource development, and research infrastructures.

Broad exploration activity will be conducted, starting with the four focus areas to obtain better knowledge about the institutions. This exploration will reveal **common aspects** of their profiles as leading European Technology Universities but also lead to an understanding of **diversity**, which is essential for creating synergies among them. For the development of a transformation agenda and joint action plans, it is crucial to identify which practices within the different focus areas are most relevant and successful in the various institutions, which measures contribute to a sustainable impact, which models reflect individual institutional culture and which could be mainstreamed across the Alliance.

The focus areas are linked to the Transformation Modules; see graphic below. Through this project, ENHANCE will contribute significantly to the EU's proposed 2030 vision and objective for the future of universities in Europe. ENHANCERIA will focus mainly on TMs 2,3,4, and 6 but will also contribute to the other TMs.

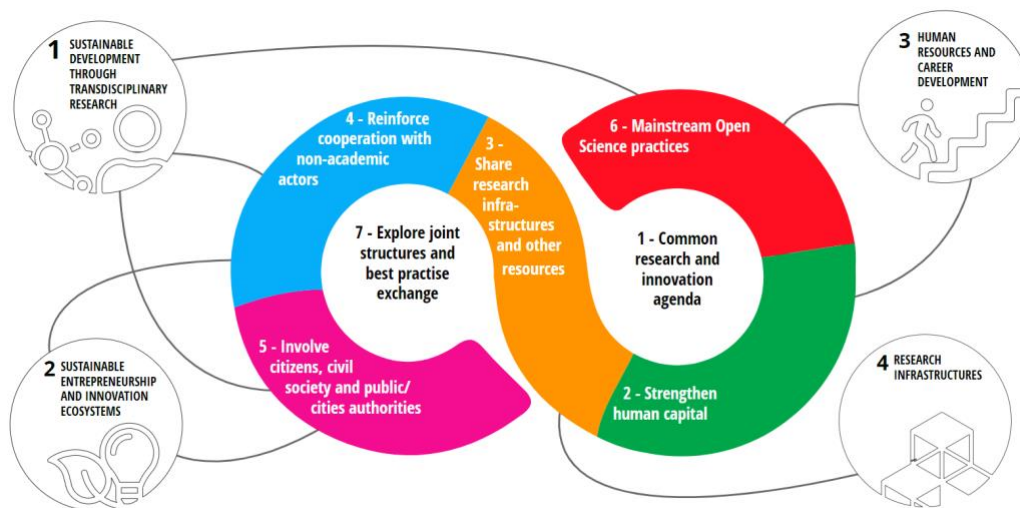


Figure 01. How the focus areas address transformation modules.

## 1.2 Focus area 1 and Work package 3

### Sustainable development through transdisciplinary research (Focus area 1 (FA1))

Universities address sustainability through their core missions: education, research and innovation. As an Alliance of technical universities, the ENHANCE partners have extensive experience collaborating closely across sectors on challenges with high industrial and societal relevance. However, there are significant differences in collaborative approaches, methods and structures within the universities and across institutions in different sectors regarding working on common challenges. The SDGs, the coming Missions in Horizon Europe, and the digital and green transitions require universities to work differently and collaborate more closely with the public sector, governments and citizens, and the private sector. Connected to the UN SDGs, multiple socially relevant impact factors will be considered in future research, engaging a broad network of stakeholders. This collaboration implies a more robust integration of social actors and non-scientific knowledge into research. Best practices will be identified to anchor transdisciplinary research and to increase interest in such research initiatives. In ENHANCERIA, we will explore the approaches, models, structures and practices the different universities pursue in addressing sustainability, particularly related to transdisciplinary research. This analysis will result in a better understanding, a platform for transdisciplinary research, and recommendations on how technical universities can work with sustainability and sustainable development in this context. Among the other important aspects that are also expected to be addressed through this focus area are open science practices, responsible research and innovation (RRI), organisation and facilitation of support services, new needs for skills and mindset, assessment and recognition frameworks for employees, and research and innovation infrastructures.

### Sustainable development through transdisciplinary research (Work package 3 (WP3))

**Objectives.** This work package aims to develop a menu of pathways for universities to address sustainable development through transdisciplinary research better. This will be embedded in ENHANCE's transformation agenda and potentially benefit the universities' research, innovation and education practices.

The work package is oriented to two main activity areas: structures, strategies, approaches and initiatives related to transdisciplinary research (1) and sustainable development (2). The specific objective is to:

Objective 3.1 Mainstream, optimise and provide structures for institutionalising the knowledge exchange between science and society by addressing structures, strategies and case studies/pilots within the Alliance

Objective 3.2 Promote and enhance the international knowledge exchange between science and society within the Alliance

Objective 3.3 Foster a common understanding of the relevance and encourage the transdisciplinary approaches of the ENHANCE universities as a way of solving wicked problems for sustainable development, including challenges and bottlenecks.

**Task 3.1** Analyse and categorise transdisciplinary approaches, including structures, strategies, study cases and terminology used for different transdisciplinary approaches. [M6-M12] [Lead: TUB]

This task will investigate and explore how the ENHANCE universities provide institutional supporting structures, integrating bottom-up activities and top-down strategies for integrative knowledge production of science with society within the Alliance. It also includes an analysis of good practices of cooperation models, methods and formats of citizen involvement and knowledge exchange between science and society across the different institutions. The task also includes an exchange activity to compare and categorise the various structures, strategies, terminology and practices mapped in WP2 and consists of a joint workshop and a report summarising the findings from the task.

## 2. LITERATURE REVIEW

Significant societal transformation challenges with their complex, wicked problems, and acknowledging these challenges, the 2030 Agenda for Sustainable Development (United Nations, 2015) require integrative research approaches and innovative approaches to anchor research in society. Strong impulses for a paradigm shift towards citizen-oriented research stem from the EU's science policy. With the Quadruple Helix and its reference to the Sustainable Development Goals, the Horizon Programmes call for multiple socially relevant impact factors to be taken into account in research and for this to be done in the broadest possible alliances. The report "Mission-Oriented Research and Innovation in the European Union" by Mariana Mazzucato (2018) programmatically shows the path of European science to societal stakeholders and gives important indications of where European funding policy will continue to develop. The quadruple innovation helix framework describes university-industry-government-public-(environment) interactions within a knowledge economy.

ENHANCERIA will support and strengthen the research and innovation dimensions of ENHANCE, the European Universities of Technology Alliance, through developing a transformation agenda for the Alliance focusing on the role of universities as drivers and enablers of sustainable development. The scientific disciplines should be more strongly oriented towards problem-oriented joint research and integrate external knowledge to achieve the goal of ENHANCERIA. The mode of transdisciplinary research is to increase social relevance and integrate practical knowledge by integrating various stakeholders into research, including the definition of research questions and goals, participation in the research process and the discussion of research results. Transdisciplinary research also includes the evaluation of research processes and outcomes.

Transdisciplinarity is not a method. Furthermore, it uses methods from different disciplinary and interdisciplinary scientific fields (mainly social and innovation research) and creates new methods and tools for co-production and collaboration. As a principle or research mode of integrative research between society and science, it addresses this need with a more complex and flexible way of researching sustainable development. It enables methodological paths for a solution and transformation-oriented research processes and translates wicked societal problems into questions that can be scientifically addressed developing common visions, problem solutions and transformation (Hirsch-Hadorn et al., 2008; Bergmann et al., 2010; Scholz, 2013; Giseke et al., 2015). Such a more reflexive and process-oriented research is being developed at eye level by various stakeholders as 'common sense' and implies both local knowledge and academic knowledge on sustainable development challenges.

Transdisciplinarity gained a broader relevance in the last few years by enabling knowledge exchange between scientific and non-scientific stakeholder communities and by providing a systemic way of addressing societal problems (Hirsch-Hadorn et al., 2008; Bergmann et al., 2010; Jahn et al., 2012; Giseke et al., 2015; Bergmann et al., 2016). Methodologically important is the need for different forms of knowledge production within a transdisciplinary research process, including system knowledge, target knowledge, and transformation knowledge. Transformation knowledge means to change the problem in practice and simultaneously anchoring scientific integrated knowledge about transformation and transferability (Hirsch-Hadorn, 2008; Wieck et al., 2015, p 51). For different approaches to transformation thinking, transdisciplinary

methods by the active involvement of various stakeholder groups can provide more integrative knowledge about transformation potential, transformation needs, possible future scenarios and problem solutions (Scholz, 2011; Schneidewind and Brodowski, 2013; Schneidewind and Augstein, 2016; Defila and Di Gulio, 2018; Bruns, 2019). There are several definitions depending on the perspectives and context of different transdisciplinary communities. Three examples are given here that are relevant to the ENHANCERIA project and outline the different orientations.

- 1) Transdisciplinarity is a reflexive research approach that addresses **societal problems** through interdisciplinary **collaboration** and collaboration between researchers and extra-scientific actors; it aims to enable **mutual learning** processes between science and society; integration is the primary cognitive challenge of the research process (Jahn, Bergmann and Keil, 2012).
- 2) Transdisciplinary research aims at transgressing boundaries between scientific disciplines and between science and practices to **develop integrated knowledge** that can help solve societal problems. This will be conducted by co-producing different types of knowledge during the entire research process: system knowledge, target knowledge and transformation knowledge. Three questions are related to this: systems knowledge answers the question, 'what is?', target knowledge addresses the question, 'what ought to be?', transformation knowledge defines 'how to?' (*Td-net*).
- 3) "Transformation science refers to a science that not only observes and describes **social transformation** processes from the outside, but also initiates and catalyses these processes of change itself, and thus learns about these changes as an actor in transformation processes" (Schneidewind, 2015).

Scholars differentiate three phases of collaboration in "ideal-type transdisciplinary processes [...]: co-design, co-production, and re-integration" (Bergmann et al., 2012; Schöpke et al., 2018, p. 87). These are related to the phases of joint problem framing, knowledge integration and dissemination and reflection on transferability:

- Co-design includes developing a shared understanding of the problem at hand, aims and questions of a research project.
- Co-production refers to the generation of new knowledge.
- Re-integration refers to the diffusion and (potential) uptake of generated knowledge in societal and research spheres. (Bergmann, 2021).

While there are already various methods and instruments for conducting transdisciplinary research, networked and supportive structures for promoting transdisciplinary research at universities are still few and far between, in addition to the growing discourse. The institutionalisation of transdisciplinarity, understood as a broadly existing support and anchoring at the content and structural level at Universities is not yet fully developed and visible. There are engagements at several Universities to enact transdisciplinary policies but also hints to become a widespread practice (Vienni Baptista and Rojas-Castro, 2020). More presence of transdisciplinarity in structural and development planning is shown above all by the young, newly configured universities. An expansion of interdisciplinarity and transdisciplinarity towards a future concept of universities as well as systematic science-based training for transdisciplinarity are still necessary steps on the way to a comprehensive institutionalisation of transdisciplinarity as a research and teaching principle. With the further development of formats for knowledge exchange between science and society, an essential building block for the institutionalisation of transdisciplinarity at universities is being achieved. However, it is precisely from the political sphere that even stronger impulses will be needed in the future to promote more effective interfaces for sustainability issues (SDGs) and the necessary integration of knowledge.

## // PART II PREPARATORY WORK: COMPARISON & ANALYSIS

### 3. WP3 WORK PROCESS, METHODS & TOOLS

#### 3.1 Work process, tools & techniques

With the start of the project in September 2021, the work process of WP3 has begun. This follows a work plan (see Figure 03) that is continuously adapted and contains the following work steps and tools:

### Work process with tools

- 1) **Mapping cases** (see Chapter 3, 4), Output: Samples top-down & bottom-up approach.
- 2) **Bi-weekly jour fix working group WP3** (starting March 2022), Output: organisational exchange, documentation by protocols.
- 3) **Workshops WP2 + WP3** (WP2/3 (RWTH) on 28<sup>th</sup> Oct 2022, Output agreement on mapping methodology and another working process, WP3 (TUB) on 19<sup>th</sup> May 2022, Output: Discussion mapping rounds, synopsis categories + framework, understanding transdisciplinarity, selecting keywords, problems and needs, documented on Miroboard, <https://miro.com/app/board/uXjVO2k6-2A=/>).
- 4) **Walk & Talks Series** WP3 (in preparation, 1st Meeting (on site) at 15<sup>th</sup>/16<sup>th</sup> September 2022 at TU Berlin, Output: presenting first results, representing TU Berlin and transdisciplinary initiatives (structures/top-down level and projects/bottom up level). The projects are related to Campus Charlottenburg's development toward a real-world lab (see preliminary program attached).
- 5) **Once-a-month lunch series** (start in 2023)

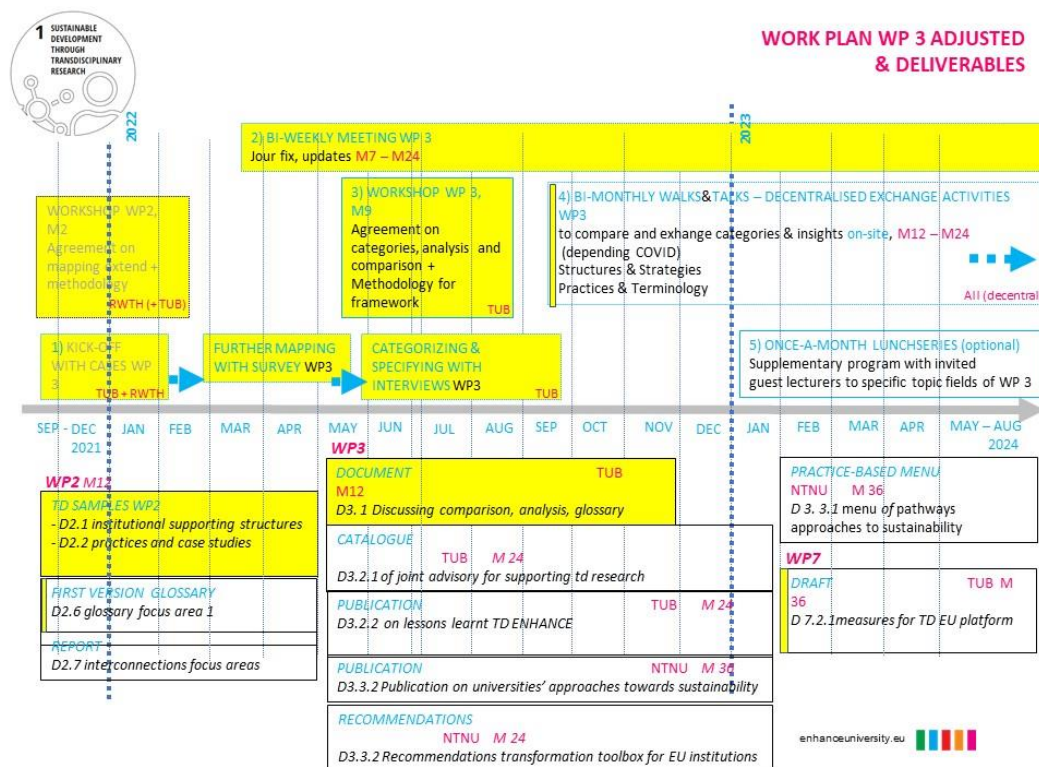


Figure 02. Work plan WP3, Schedule and Deliverables. In process is marked in yellow.

### Miroboard as working technique

The working group WP3 has developed a working platform on Miro.

The Miroboard includes mainly:

- the documentation of the workshops (program, results, discussion)
- general information on the project and the WP3 working process (adapted work plan, mapping material for survey, interviews, definitions on transdisciplinarity)
- specified information on mapping activities (collection of first mapped cases, survey questions, interview questions and consent form)

- space to use as an interactive platform, providing boxes for discussing next steps, wishes, needs, reflections
- growing document as a joint glossary (with keywords on transdisciplinarity for sustainable development), output mind map as an enhanced glossary for WP3

### 3.2 Description of the work process concerning Work package 2

With a focus on the first sub-goal of ENHANCERIA - Exploring practices, ways of working and structures within the Alliance – the first phase consisted on gaining an overview of structures and practices providing sustainable development through transdisciplinary research at the ENHANCE Universities. The first step was to find the relevant contact persons at the individual institutions to obtain the necessary information. This work step was carried out in the first six months as part of WP2 Exploration, identifying and mapping different practices and approaches, including Task 2.1 Identifying and mapping other institutional **supporting structures** that foster sustainable development through transdisciplinary research in the various universities (**top-down strategies**), and task 2.2. Identifying and mapping **study cases of transdisciplinarity and cross-sectorial knowledge transfer** from the different institutions that provide a complementary perspective of **bottom-up approaches**. These tasks have included an initial agreement on the mapping extent and methodology through a joint workshop. The workshop was carried out to agree on extending the mapping, methodology, and how to work together. One of the primary outcomes of the workshop was that the four focus areas will work with different mapping methods and will have to create different frameworks and levels of knowledge. Regarding WP3, the discussion clarified different understandings of what transdisciplinary research is and how to practice it in relation to sustainable development at the universities. These differences were also revealed by a long search for suitable contact persons at the ENHANCE universities providing information to supporting structures and study cases of transdisciplinarity.

### 3.3 Differentiation of identification process for transdisciplinary initiatives (WP2 and WP3)

To reach common ownership for providing the next steps in Work package 2 (mapping activities) and for Work package 3 (developing search windows for comparison and analysis of mapped cases), a Miro board has been established as a collaborative working platform and a differentiation of the mapping activities has been made. These steps have sharpened the information and deepened the knowledge about the different transdisciplinary approaches. The differentiation of the identification process has been conducted as follows: the deliverables represent the results of mapping rounds 1 and 2 in WP2: D2.1 Sample of institutional supporting structures (top-down strategies) and D2.2 Sample of transdisciplinary practices and case studies that support transdisciplinary research.

**1. Clustering of search groups** as a basis for discussion and approximation in the first workshop of WP2 for WP3. This discussion includes the identification of 'objects' (practice, activity, policy, infrastructure...), keywords and defining first categories (structures, methods, topics, see Figure 03).

**2. Mapping round 1: applying short project descriptions** for transdisciplinary initiatives on a top-down and bottom-up level (additional content see Chapter 4.1). All seven Universities submitted a total of twenty cases.

**3. Mapping round 2: surveying** with specified questions related to the submitted cases and gathering new cases as transdisciplinary initiatives. The seven Universities submitted forty cases, some of which specified the information of the already identified case studies.

**4. Mapping round 3: conducting structured interviews** to specify the contribution of the identified projects for in-depth information regarding comparison and analysis and to identify further transdisciplinary initiatives and relevant contact persons involved.

**5. Evaluation:** The differentiated process and the outcomes have been reflected jointly in workshop sessions of WP3 on 18th May 2022 and the PMG workshop in Brussels on 8th June 2022. It has been further evaluated for this document.



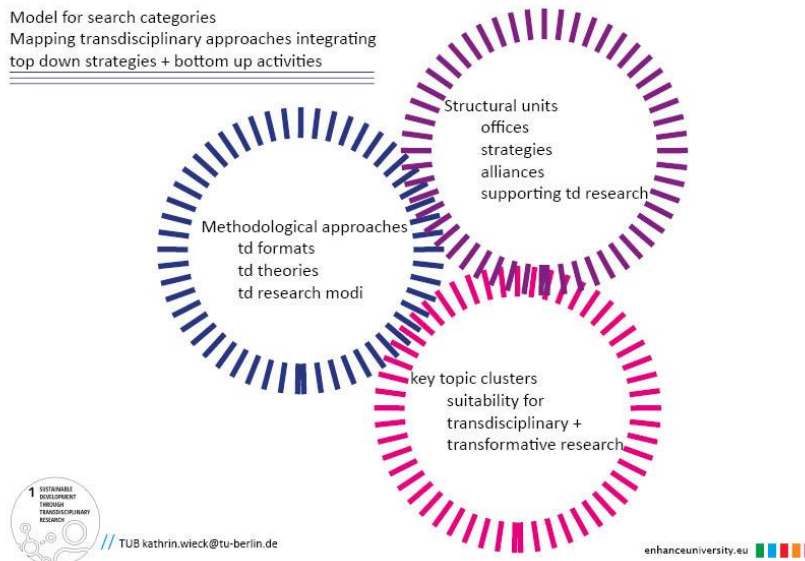


Figure O3. Model for search categories as first clustering. Mapping transdisciplinary approaches integrating top-down strategies + bottom-up activities

#### 4. BASIC MATERIAL FOR COMPARISON & ANALYSIS

The mapping of different transdisciplinary initiatives of the ENHANCE Universities on the top and bottom levels provides the first inventory of structures, strategies, practices and terminologies for knowledge exchange between research and society (see also deliverables in WP2, D2.1 and D2.2). The structural level (top-down) and the project level (bottom-up) were used as search windows to identify relevant and appropriate co-productive initiatives for the focus area. The top-down level has been mapped through searching for institutional supporting structures (top-down strategies), including models, methods and formats that support transdisciplinary research, citizen involvement and knowledge exchange between science and society. The bottom-up level is represented by the search for transdisciplinary practices and case studies that support transdisciplinary research, citizen involvement and knowledge exchange between science and society.

Another feature was the central importance of methodological approaches. The examples, the survey and the interviews represent a first overview of possible transdisciplinary activities on sustainable development at the institutions and form the information basis for a comparative consideration and analysis (see Part 3). The following is a list of the main content areas for each mapping round.

##### 4.1 First mapping round: study cases

In the first round of mapping, we asked for one-pagers related to 2-3 cases of sustainability research and transdisciplinary activities, projects, research, platforms, and structures of the ENHANCE institutions. The study cases should contain the following information:

- goals
- short project description (processes, components of projects or structures, principles)
- formats, methods or tools
- keywords

##### 4.2 Second mapping round: survey

Based on the identified transdisciplinary study cases regarding sustainable development, the second mapping round aimed to specify information and support the identification of further transdisciplinary initiatives in each ENHANCE University. Consequently, a survey was performed including the following topics (beyond the short project description, goals and methods):

- Thematic approaches (including 1-3 keywords)
- Top-down level/bottom-up level
- Type of transdisciplinary initiative
- Involved stakeholders
- Drivers (mainly responsible for carrying out the initiative)
- Initial funding
- Methodologic approaches
- Core mission
- Characteristics for transdisciplinary potential (knowledge production and dissemination)

#### 4.3 Third mapping round: interviews

The third mapping round was conducted as structured interviews. The interview questions served to specify the contribution of the identified projects to sustainable development through transdisciplinary research at the ENHANCE universities. They were structured into basic superordinate questions about the established knowledge exchange between science and society. The specific questions about the institutionalisation of transdisciplinarity (top-down level of structures/strategies/formats) and transdisciplinary research processes (bottom-up level of pilot projects, case studies, practices). Representative and exemplary projects have been selected for the interviews to characterise the top-down and the bottom-up levels. In addition, the interview questions have been used to collect further projects at the institutions.



FA1 /WP2 + WP3 Framework for interview questions



Figure 04. Scheme for the direction of interview questions concerning the top-down level (structures) and bottom-up level (practices) of transdisciplinary initiatives

The interview questions were structured as follows:

1) Superordinate questions to

- Alignment (understanding/definition of transdisciplinarity and innovation, positioning to top-down level or bottom-up level) - Innovation for sustainable development through transdisciplinarity
- Participation - Which stakeholders are involved in the project, and how
- Challenges and problems

2) Specific questions to

- The top-down level: Methodological approaches to institutionalisation, such as anchoring transdisciplinarity as a research principle of the projects. This approach includes a question to project genesis, link to existing structures, normative forms, steps to institutionalise supporting structures fostering transdisciplinarity, communication strategies, evaluations, and link to teaching.

- Bottom-up level: Methodological approaches for conducting transdisciplinary research. These questions include framing principles, different types of knowledge production, method and tools, types of data, experimentation, dissemination, evaluation, and links to teaching.

### PART III RESULTS: COMPARISON & ANALYSIS

#### 5. METHODOLOGICAL PROCEDURE FOR COMPARISON & ANALYSIS

The methodologic approach for comparison and analysis has been adapted throughout the mapping process. The ultimate goal was to compare institutionalised structures, strategies and formats supporting transdisciplinary research for sustainable development (top-down level). On the other hand, the pilots, projects and practices of transdisciplinary research for sustainable development (bottom-up level) have been readjusted. The decision was taken jointly during the WP3 workshop discussions for several reasons:

- In the Alliance, there are very different perspectives on the definition and implementation of transdisciplinary research and transdisciplinarity as a research principle, which are explained in more detail in Chapter 6.
- Due to these divergent views, it was impossible to classify which transdisciplinary research activities related to sustainable development should be assigned to the top-down or bottom-up levels (see below and 6.1).
- Discussions in the working group were related to the objective of the transformation agenda to develop: both a joint profile development and a working out of the diversity of the transdisciplinary approaches for a synergy development in the sense of learning from each other should be considered.

Furthermore, there are also very different framework conditions with the various strategic orientations of the ENHANCE universities (excellence strategies, strategic partnerships, concept of knowledge transfer, funding instruments and strategies, etc.), with the governance structure of the institutions (Executive Boards, services, faculties, etc.) as well as with the experiences and genesis for the establishment of structures and projects for the exchange of knowledge between research and society. The adjusted methodological approach, therefore, focuses on the following paths:

- Firstly, to show the range of possibilities, perspectives and understandings of transdisciplinary research within the ENHANCE Alliance to derive shared insights and joint research approaches from this (see Figure 05).
- Furthermore, secondly, to present a selection of different good practice examples that demonstrate specific aspects of transdisciplinary research for sustainable development in terms of creativity and innovation and represented as possible role models for the other institutions.
- Moreover thirdly, as navigation through these two paths, the glossary for transdisciplinary research for sustainable development with a variety of neighbouring terms on participatory research, collaboration, co-production, co-design etc., will be created as a growing document on the Miro working platform. The glossary will constantly expand as the work in this focus area progresses and will highlight and address links between the terms.

The path as approaches for comparison will be introduced and discussed in the following Chapter.

#### 6. PATHS/APPROACHES FOR COMPARISON

As a result of the workshop discussions and concerning the everyday aspects (coherence) of the ENHANCE Universities profile and in terms of diversity to creating synergy effects, the WP3 working group has discussed a broadly shared understanding of transdisciplinarity including keywords as well as a selecting of good practice examples at the interface of strategic supporting structures and projects of transdisciplinary research for sustainable development.

### 6.1 Discussing common understanding of transdisciplinarity

Based on introductory discussions accompanying the inventory of transdisciplinary initiatives on sustainable development, exploring the motivations and expectations for achieving a collaborative understanding of transdisciplinarity as a research principle at the ENHANCE Universities was necessary. In the process, it was apparent that transdisciplinarity is not so popular at Technical Universities. However, it has to be stated that the ENHANCE Universities provide very different approaches to conducting and supporting transdisciplinarity. As a basis for this, a common understanding of the need for shared learning from the partner universities on this research principle was discussed, even if it is titled with other keywords like participatory research, co-production, collaboration or co-design. These approaches go hand in hand with the common concern for providing better access to participation for academics (researchers and students) and non-academic stakeholders and fostering the University's role as the foundation for working and knowledge exchange with society and circular knowledge transfer. Another common fundamental expectation of the ENHANCE Alliance is linked to transdisciplinary research: the production of new knowledge aligned with the **societal impact**. The societal impact as added value by addressing societal problems has been defined as a significant indicator of a shared understanding of transdisciplinarity. However, defining these values more precisely and concerning a transdisciplinary project design and process has to be characterised as part of the differences in the perspectives.

Related to the **European Platform for Transdisciplinary Research to prepare** (see task 7.2 common platform of European transdisciplinary research within ENHANCE), the common ground on Transdisciplinarity with a long-term perspective is formulated more concretely. The areas of interest discussed in such a platform could include the following topics:

- **Overview** of existing platforms informing about transdisciplinary competencies, methods, research activities and enabling networking and knowledge exchange, among others, by providing a navigation
- **Capacity building** by providing a knowledge base for transdisciplinarity and clarifying what it means in the ENHANCE Alliance (including a range of practices, stakeholders, research cultures and strategies, including entrepreneurial initiatives and partnerships etc.)
- **Information services** by providing access to knowledge, competencies and tools for doing and enabling transdisciplinary research
- **Community building** by (further) developing alliances for long-term foundations and sustainable engagement and European transdisciplinarity networks, including providing funding opportunities

A characterisation for a common understanding of transdisciplinarity is set up, the first analysis on a categorisation of the mapped transdisciplinary initiatives was made, and a few guiding questions were given:

What is transdisciplinarity for sustainable development for you?

What definition do you use?

Why is transdisciplinarity relevant?

What problems and challenges will be addressed?

What outcomes/innovations for sustainable development should be produced?

The first indicators were derived from this, which relate to a differentiation (or specification) of the top-down level and the bottom-up level, **a range from interdisciplinary, multidisciplinary and transdisciplinary approaches**, a degree of addressing societal challenges by collaboration and co-design to co-producing societal impact and by different levels of participation and engagement by involving various academic and non-academic stakeholders.

#### Differentiating top-down and bottom-up level

There is no coherent distinction and no explicit assignment of the identified cases to the top-down level of supporting structures fostering transdisciplinary research on sustainable development or the bottom-up level of transdisciplinary practices. The lack of distinction is due to a different understanding of the underlying frameworks for the assignment. The interviewees mention various factors, such as funding, guidelines/leading

strategies of the universities, and structural developments. Therefore, the interview questions also include requests for the genesis of the transdisciplinary initiatives concerning existing University structures or programmes, etc. The survey and factsheets (see WP2, D2.1, D2.2) give an overview of transdisciplinary initiative types and how this further characterises services, alignment and capacities. Here are some examples of the range of initiatives between top-down and bottom-up levels, their alignment and the status of inter-, multi-, or transdisciplinarity (see Figure 05).

|   |  |   |  |   |
|---|--|---|--|---|
| <b>Cooperation model (transdisciplinary)</b><br><br>--> structure-related providing long-term alliances   | <b>Research Centre (inter- and transdisciplinary)</b><br><br>--> topic- and process-related, providing transdisciplinary processes   | <b>Social engagement programme (transdisciplinary)</b><br><br>--> method-related providing teaching and research training   | <b>Interdisciplinary network (Eng., Architecture and Design)</b><br><br>--> process-related + project-driven, providing interdisciplinary knowledge production in science, technology and innovation | <b>Research laboratory/maker space (multidisciplinary)</b><br><br>--> method-, process-related providing knowledge production and experimentation with enterprises + institutions   |
| <b>Sustainability and University Governance Office (interdisciplinary)</b><br><br>--> structure-related, providing governance change and transdisciplinary agenda setting | <b>Research project with inter- and transdisciplinary agenda</b><br><br>--> topic-, process-related, providing multifaceted toolbox, methods and dialogue with regional partners | <b>Strategic (real-world-lab) platform (transdisciplinary)</b><br><br>--> structure-related, providing knowledge exchange, testing and evaluating transformation              | <b>Transdisciplinary formats</b><br><br>--> method-related, providing a framework, processes, methods for knowledge integration, exchange  | <b>Strategic projects (on inter- and transdisciplinary agenda)</b><br><br>--> method-, structure-related, providing research, methods, networks and participation models  |
| <b>Research program (interdisciplinary)</b><br><br>--> method-related, providing alliances between researchers with a technological profile                               | <b>Research teams (inter- and multidisciplinary)</b><br><br>--> structure-, topic-related  | <b>Business models and teams (interdisciplinary, technology transfer)</b><br><br>--> process-related, project-driven, providing business models and scientific business teams | <b>Partnerships (including industries) (inter- and transdisciplinary)</b><br><br>--> structure-, topic-related providing interdisciplinary engagement of PhD candidates in development work          | <b>Central facility (inter- and transdisciplinary knowledge transfer)</b><br><br>--> structure-, method-related, providing knowledge base, developing and implementing pilot projects, linking projects, centres and services for transdisciplinarity |

Figure 05. Examples of the range of initiatives differentiating top-down and bottom-up level (including type of transdisciplinary initiative, status and alignment)

### Addressing/co-producing societal challenges and impacts

The characteristic of inter-, multi- or transdisciplinarity is given primarily through the initiative types, alignment, and the relation to the societal impact.

The societal impact for Focus area 1 in the WP3 group is described as added value and, therefore, as a wide range of linkages to addressing and solving societal problems. Depending on the orientation of the identified transdisciplinary initiative, as well as following the University's strategic alignment, the societal impact as an added value can be achieved:

- Through a transdisciplinary process design, beginning with co-framing the joint societal problem, co-producing (new, integrated) knowledge and reiterating/reflecting on the transferability for potential upscaling in the scientific and societal sphere.
- By providing and enabling knowledge exchange and knowledge integration for transdisciplinary research processes and projects in a long-term perspective.
- Addressing societal challenges and co-creating problem solutions through advanced research areas/programmes and co-designing research ideas/prototypes/pilot projects and new values in strategic partnerships (e.g. with industries and companies).
- Raising awareness in society about the need of co-design solutions integrating research and business teams with other stakeholders

**Levels of engagement**

Another important factor in characterising inter-, multi- or trans-disciplinary status (beyond type, alignment and social impact) is the extent to which and the different academic and non-academic stakeholders are involved in the research processes and which **levels of engagement/participation** can and should be strategically promoted at the ENHANCE Universities. Following the non-hierarchical types of engagement by The European Science Engagement Association EUSEA (<https://eusea.info/news/show-and-tell-science-communication-and-public-engagement-training/>) three circles of participatory levels are given: **informing/inspiring, consulting and collaborating**, all of them are linked to further attributes of engagement. As we learned from the questionnaires and interviews, the mapped initiatives represent a broad scope of engagement according to different groups of stakeholders involved:

- in the scientific sphere: researchers from one or different disciplines, from various sciences, researchers and coordinators from science management, bachelor/master students, PhD students, other research institutes
- as non-academic-stakeholders/societal stakeholders: business, industries, administrations, municipalities, civil society organisations, and the public.

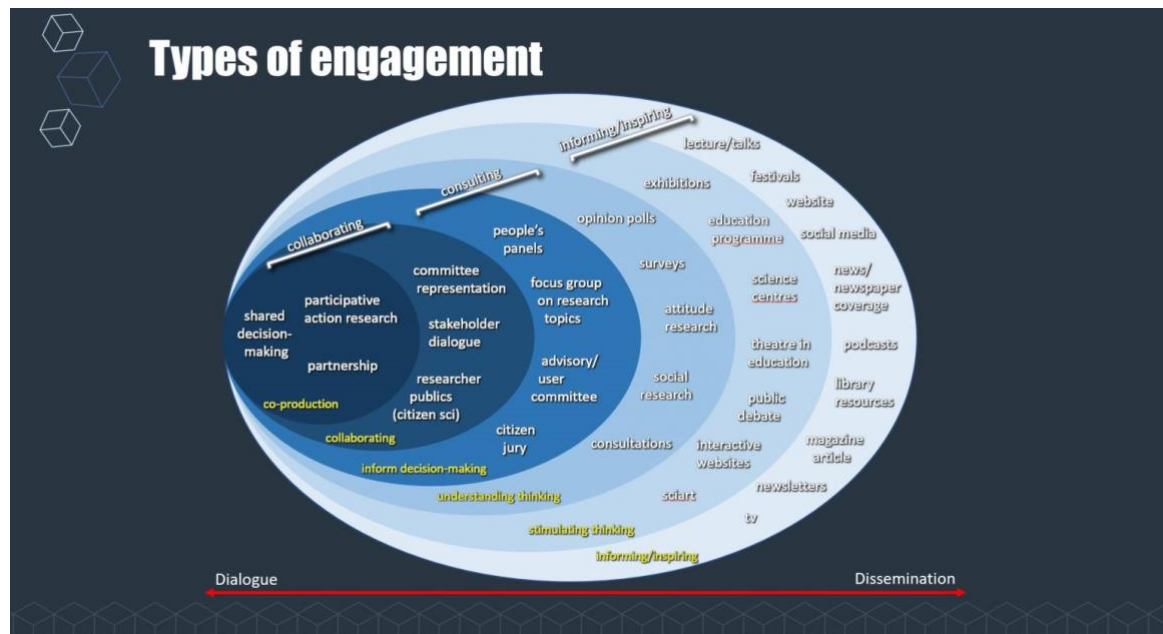


Figure 06. Types of engagement. The European Science Engagement Association EUSEA

**6.2 Discussing different good practices**

The second path to investigate and compare the identified transdisciplinary initiatives is the exploration of **good practice examples**. They are characterised as role models for providing successful cases and represent approaches for mutual learning and synergies according to approaches to sustainable development between

the ENHANCE partner Universities. They also represent the view on projects by recognising the variety and diversity of what is understood as **innovative and creative transdisciplinary initiatives** related to the alignment concerning the structural level and the level of practice. The good practice examples are also essential to raise awareness on the differences in research cultures, frameworks, policies and in the principal strategic guidelines at the ENHANCE Universities. As discussed in WP3 workshops, they could also serve as tools for translating theoretical approaches to transdisciplinarity into institutional practices.

Guiding questions for selecting good practice examples have been the following:

- What are the characteristics of good practice examples?
- What role do the good practice examples play in establishing a European platform and developing a transformation toolbox?

Beyond giving a perspective on a joint and wide range understanding of transdisciplinary approaches at the ENHANCE Universities (including interdisciplinary and transdisciplinary co-production and co-designing approaches towards societal problem solutions), the type of research initiative, the alignment, the factor of societal impact and the levels of engagement play also a crucial role for **selecting good practice examples**. This document is primarily a selection of projects from every University representing one specific aspect regarding **creativity, innovation and further development status** concerning the abovementioned factors. In the different processes of evaluating and analysing the identified transdisciplinary initiatives and all the information conveyed in the interviews, a specified selection of good practice examples will be possible. It aims to extract and elaborate methodological approaches and tools that can work towards a stimulating interaction between university structures that promote transdisciplinarity and transdisciplinary research projects.

The approach of selecting good practices adapts the strategic approach of the ENHANCERIA project as written in the proposal: 'In order to develop a transformation agenda and joint action plans, it is essential to identify which practices within the different focus areas are most relevant and successful in the different institutions, which measures contribute to a sustainable impact, which models reflect individual institutional culture and which could be mainstreamed across the alliance.' In order to achieve this goal, we will select good practice examples considering a broad range of approaches (on the structural/strategic level and the project level). The selection will be accordingly take into how they could be further translated and integrated into existing transdisciplinary approaches and structures at the ENHANCE Universities or if they could serve as role models for a joint research approach or conceptual strategy. A question to create synergies among the ENHANCE Universities to foster the role as drivers for sustainable development is how to guide, promote and mobilise the knowledge gathered by the mapping activities in Focus area 1 for future processes, e.g. for the European platform on transdisciplinary research. It includes a reflection on the role models at the organisational level of the ENHANCE Universities and to what extent and with which tools the new knowledge (from theories and best practices) could be put into practice. It can be used as a component for the transformation toolbox, another deliverable in WP3.

A selection of good practice examples will be introduced in the next Chapter.

## 7. SELECTION OF GOOD PRACTICE EXAMPLES

A selection of good practice examples will be represented with a sample from each ENHANCE University regarding the type of initiative, alignment to top-down or bottom-up levels (as explained in Chapter 6.1), and perspective on transdisciplinarity, social impact and levels of engagement. They have been selected to demonstrate the range of transdisciplinary understandings and approaches and the variety in innovation and creativity. For an extensive sample of transdisciplinary structures and practices from the different ENHANCE University partners, please see WP2, deliverables D2.1 and D2.2.

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| <b>NTNU</b>                              | <b>UNIVERSITYCITY TRD3.0 (Example for University-municipality cooperation)</b>  |
| <b>Type</b>                              | Cooperation model / strategic partnerships  |
| <b>Alignment</b>                         | structure-/topic-related, providing long-term alliances   |
| <b>Outline</b>                           | In 2018, The Norwegian University of Science and Technology (NTNU) and Trondheim municipality entered a partnership agreement to develop a University City jointly. A national pilot based on five thematic focus areas; Education and Early Development, Health and Welfare, Urban Development, Innovation and Smart City. The pilot, referred to as UniversityCity TRD3.0, is project-organised, with an initial duration of four years. It builds on a long-term collaboration between Trondheim municipality and NTNU, aiming at moving the collaboration "one step up" towards a more holistic approach to education, research and innovation. Accordingly, the University City's ambition is to develop a model for innovation and restructuring in the public sector through research, innovation, education and participation in development projects of strategic importance to the public sector.   |
| <b>Understanding Transdisciplinarity</b> | <p>Stig Larssæter</p> <ul style="list-style-type: none"> <li>- NTNU sustainability is one of four thematic areas of focus (beyond oceans, health, and energy)</li> <li>- 'The University-municipality collaboration is a kind of <b>institutional framework</b> that the University uses to strengthen its ability and willingness to enter into <b>long-term-commitments with external actors</b>'</li> <li>- University municipalities (Trondheim, Oppdal, Alesund, Baerum) include transdisciplinary practice in terms of working across sectors and out into society</li> <li>- <b>expert-in-teams format</b> (students in transdisciplinary practice situations)</li> <li>- the students in experts in the team model (at least many of them) solve tasks for external actors and have a role as "consultants" (except that they do not receive any form of payment or remuneration for the work)</li> </ul> <p><b>Investigations</b></p> <ul style="list-style-type: none"> <li>- access to relevant and updated knowledge and competence demanded by municipalities</li> </ul> |
| <b>Societal impact</b>                   | <ul style="list-style-type: none"> <li>- University's <b>contribution to societal development</b></li> <li>- arenas for research-based education, continuing education and training, relevant placement for students, doctoral programmes and research and innovation within areas of strategic importance for the sector</li> <li>- <b>a new model for continuous mutual competence and knowledge transferral</b> between academia and municipality</li> </ul>   |
| <b>Levels of engagement</b>              | <ul style="list-style-type: none"> <li>- <b>level of co-production and cooperation through partnerships University-Municipalities</b></li> <li>- <b>long-term commitment with external actors</b></li> <li>- <b>Expert-in-teams</b> as experienced-based learning for students</li> </ul> <p>The management of the university municipality takes place at two levels, where a steering group led by the municipal director, together with the vice-rector for innovation at NTNU, defines the general guidelines for the work. The priorities with direct consequences for academic goals and activities within various subject and business areas are delegated to five "<b>innovation committees</b>".</p>  |
| <b>CHALMERS</b>                          | <b>AREAS OF ADVANCE</b>   |
| <b>Type</b>                              | Organisational structure  |
| <b>Alignment</b>                         | structure-/topic-related, providing research-based partnerships with companies (and society) and collaborative projects with strategic partners (mixing top-down and bottom-up levels)  |



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| <b>Outline</b>                           | <p>The concept of Areas of Advance involves an ever-changing, ongoing exchange of expertise across disciplines, between students and teachers, and alongside partners from industry and society – beneficial to all.</p> <p>The Areas of Advance are organised as strong, challenge-driven thematic platforms for strategy and long-term collaboration that hunt down specific challenges, often directly relevant to industry and society. They also offer common access to cutting-edge research infrastructures and several targeted centres. At the same time, our departments represent a continuous source of expertise.</p>  |
| <b>Understanding Transdisciplinarity</b> | <p>The operations are organised in a matrix, where departments are intertwined by Areas of Advance and education's areas, all to promote an <b>interdisciplinary approach</b>. While our departments provide a solid base of knowledge and expertise, our Areas of Advance – all of which have the goal of sustainable development at their core – <b>target complex societal challenges</b>.</p> <ul style="list-style-type: none"> <li>- Åsa Valadi: "<b>Working with academia and industry as well as society to solve challenges together</b>. To get a holistic view and cover complex societal challenges, those need to be addressed in a very broad sense with representatives from many different organisations and fields."</li> <li>- Jörgen Sjöberg: 'transdisciplinary is when you <b>involve partners outside the academic field, while interdisciplinarity is between different disciplines</b>, which could be confined to academia only'.</li> <li>- Jörgen Sjöberg: 'The areas of advance were not structured to promote only transdisciplinarity, they are for the <b>collaboration addressing global challenges</b>').</li> </ul> |
| <b>Societal impact</b>                   | <p>Åsa Valadi:</p> <ul style="list-style-type: none"> <li>- Chalmers has seven thematic areas called Areas of Advance (Energy, ICT, Health Engineering, Material Sciences, Nanotechnology, Production and Transport). Several have extensive money to initiate research projects, educational activities and other initiatives, e.g., with external partners.</li> <li>- We have strategic partnerships with industries/companies, The City of Gothenburg, and research institutes. Together we run joint projects on research and innovation to handle societal challenges. We also have joint educational activities, including lifelong learning.</li> <li>- In our competence centres, many transdisciplinary activities are ongoing, and the structure facilitates the possibility of sharing infrastructure, labs, etc.</li> </ul>  |
| <b>Levels of engagement</b>              | <p>Åsa Valadi:</p> <ul style="list-style-type: none"> <li>- The management of the Areas of Advance is <b>hosting the competence centres and the strategic partners</b>.</li> <li>- Representatives from the strategic partners might be <b>involved in developing new courses and the strategic research agenda</b>.</li> <li>- <b>The president is signing the strategic partnership agreements</b>, and there is a strong commitment from Chalmers.</li> </ul>  |

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| <b>UPV</b>       | <b>ISALAB</b>  |
| <b>Type</b>      | Cooperation Model + Research teams + project   |
| <b>Alignment</b> | structure-process-and topic-related, providing interactive disciplinary work providing the development of joint research projects (top-down because addressing and solving problems)   |
| <b>Outline</b>   | The goal of ISALab is to create a collaborative network on transdisciplinary research, with a focus on ENHANCE key topics. It has launched two and three transdisciplinary projects coordinated with local stakeholders for joint MAster's thesis or PhDs. UPV has coordinated the development of research projects through teams of master thesis students and PhD candidates from complementary disciplines focussing on the joint |

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|  | development of research projects. The teams were supervised by academics from their home Universities and developed complete projects through interactive disciplinary (interdisciplinary) work.   |
| <b>Understanding Transdisciplinarity</b> | <ul style="list-style-type: none"> <li>- Collaborative team development.</li> <li>- Stakeholder involvement.</li> <li>- Research and academic development</li> <li>- <b>problem-focused approach</b></li> <li>- collaborate to provide a solution</li> </ul> <p>Javier Orozco: 'We <b>define it as the joint development</b> of any knowledge or project which brings together different parts and obtains results <b>beyond the knowledge available between the different parts</b>. It must be differentiated from interdisciplinarity, a characteristic of projects in which different disciplines converge, and each one does its part, and in the end, it all comes together. <b>Transdisciplinarity implies growing beyond the simple addition of the different parts and creating new knowledge and results</b>'.</p> |
| <b>Societal impact</b>                   | <ul style="list-style-type: none"> <li>- <b>collaborative action research workshop</b> for transdisciplinary sustainability science</li> <li>- selection of an adequate research paradigm to tackle real sustainability challenge designing a transdisciplinary research plan</li> <li>- <b>building interaction with stakeholders, society, and the environment</b></li> <li>- reflection on the results and the research process itself</li> <li>- the <b>key result is the problem-solving actions</b></li> </ul>   |
| <b>Levels of engagement</b>              | <ul style="list-style-type: none"> <li>- an initiative comprising many levels</li> <li>- for some EU projects, need for contracts</li> <li>- the project is co-designed by professors of different Universities and executed through the <b>collaboration and co-creation of students/professors/supervisors</b></li> </ul>  |

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| <b>POLIMI</b>                            | <b>POLIFACTORY</b>  |
| <b>Type</b>                              | Laboratory/University Makerspace  |
| <b>Alignment</b>                         | project-driven, method-and process-related, providing knowledge production and experimentation with enterprises, and institutions, providing manufacturing methods by future scenarios of manufacturing, designing, and prototyping   |
| <b>Outline</b>                           | Polifactory is an interdepartmental research laboratory that explores the relationship between design and new digital manufacturing processes, promoting a new culture of making. The overall goal is to investigate the possible future manufacturing scenarios: distributed design and production models, urban scale manufacturing, design and prototyping of smart product-service systems, and open design and hardware of technical systems.  |
| <b>Understanding Transdisciplinarity</b> | <ul style="list-style-type: none"> <li>- multidisciplinary platform at POLIMI</li> <li>- Massimo Bianchini: 'The theme of multi-inter-transdisciplinarity from my point of view is part of an evolutionary journey . On a general level, we can say that Polifactory and its practices are in an evolutionary phase from multidisciplinary to interdisciplinarity. On specific projects where there is a relationship between disciplines that have a good level of complementarity such as design, electronics and computer science (e.g. Polifactory and the lab of the Department of Electronics and Computer Science) it has been possible to push inter- and trans-disciplinarity also by collaborating with companies. This was possible because joint participation in similar projects involving iterative cycles of co-design and co-production makes it possible to improve collaborative practices and integrate approaches, cultures, practices and also overcome bureaucratic processes that can often be an obstacle to inter- and trans-disciplinarity'.</li> <li>- Massimo Bianchini: 'Transdisciplinarity is what we can define as a research strategy that aims to connect <b>more than one discipline to develop an innovative approach</b></li> </ul> |

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|                             | <p><b>and innovation processes characterised by a systemic approach and holistic vision.'</b></p> <ul style="list-style-type: none"> <li>- Massimo Bianchini: 'two kinds of Transdisciplinarity: top-down and bottom-up transdisciplinary: Polifactory has been created hybridising a formal academic model of Transdisciplinarity (a top-down, multidisciplinary group made by designers and engineers (mechanics, computer science, ...) with an informal transdisciplinary provided by a grassroots movement (Makers Movement and Fab Lab Networks, community-based on transdisciplinary collaboration, connected to STEM culture, to open and citizen science).'</li> <li>- <b>multidisciplinarity with inclusiveness and creativity</b></li> <li>- Massimo Bianchini: '<b>We are talking about transdisciplinarity when the innovation challenges become systemic.'</b></li> <li>- <b>the role of design as a transdisciplinarity enabler.</b> In recent decades, design has been evolving its expertise from a strategic to a systemic dimension. <b>Systemic-Design or System Oriented Design</b> (design to study and approach complex systems), <b>Transition Design</b> (design to stimulate the transition from a linear to a circular system), <b>Distributed Design</b> (design to work with and in distributed systems).</li> </ul>   |
| <b>Societal impact</b>      | <p>Massimo Bianchini:</p> <ul style="list-style-type: none"> <li>- <b>multidisciplinary maker space</b> that hosts design, electronics, computer science, mechanics</li> <li>- start to connect better, and the <b>integrated design, electronics, and computer science - working on ambitious projects to develop solutions related to digital transformation and circular transition.</b></li> <li>- implementing some projects collaborating with the Department of Electronics, Information and Bioengineering and exploring the potential of 5G technologies to implement solutions for smart cities. Year after year, we improve this collaboration through other projects.</li> <li>- Third Mission (openness to market and society: consultancy with companies, entrepreneurial start-ups, citizen engagement, patents. Polifactory has four pillars of activities. The first one is competitive research. In this field, we can collaborate with public and private stakeholders. The second is a consultancy with local, national and international stakeholders such as large-scale companies, SMEs, foundations and various associations. The third one is the preincubation of talents and ideas. The fourth one concerns cultural initiatives.</li> </ul>   |
| <b>Levels of engagement</b> | <p>Massimo Bianchini:</p> <ul style="list-style-type: none"> <li>- connected to <b>local networks or fab labs in Milan, designers, craftspeople, makers</b></li> <li>- interested in collaborating <b>with the municipality</b> of Milan in the field of urban manufacturing</li> <li>- connected with the Municipality of Milan because it implements a policy on urban manufacturing. It is more than one formal level of interaction and collaboration. We share ideas, visions, missions, values</li> <li>- Polifactory has four pillars of activities: 1) <b>competitive research</b>; we can collaborate with public and private stakeholders in this field. 2) <b>consultancy</b> with local, national and international stakeholders such as large-scale companies, SMEs, foundations and various associations. 3) <b>preincubation</b> of talents and ideas. 4) concerns <b>cultural initiatives.</b></li> </ul> <p>At the same time, Polifactory is also starting <b>a joint research process</b> with other universities (<b>sharing</b> the complexity of work)</p> <ul style="list-style-type: none"> <li>- <b>co-creation</b> is more related to a specific activity we <b>implement within research projects within consultancy.</b> We can involve institutions, citizen and patient associations, and user groups. So, we have involved them in European research projects with a common co-creation and co-design layer.</li> </ul> |

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| <b>WUT</b>                               | <b>AKCELERATOR PW</b>   |
| <b>Type</b>                              | Business/Research teams/Business Models   |
| <b>Alignment</b>                         | process-related, project-driven   |
| <b>Outline</b>                           | <p>The main objective of the program is to increase the readiness of business teams in three dimensions:</p> <ol style="list-style-type: none"> <li>1. market readiness, understood as increasing the supported business teams' awareness of customers, competition, possible business models, etc.;</li> <li>2. Team readiness - understood as increasing the level of organisation of supported business teams in the area of management, go-to-market market schedules, business modelling etc.;</li> <li>3. Formal readiness - understood as building a spin-off/spin-out company model of functioning with other stakeholders.</li> </ol>  |
| <b>Understanding Transdisciplinarity</b> | <p>Łukasz Sztern</p> <ul style="list-style-type: none"> <li>- transdisciplinarity is different bundles of knowledge related to other disciplines within one project. Łukasz Sztern</li> </ul> <p><b>Different bundles of knowledge related to other competencies</b> are more technological, soft, or economic. This is how they have combined within one project; thanks to this, they build their advantage. They make a synergy effect, possibly developing it, not so tunnel-like.</p> <ul style="list-style-type: none"> <li>- BUT: usually, they are teams that work together within a department, a faculty, an institute, etc. <b>Our transdisciplinarity is to add to those technological competencies they have and other competencies they need to develop that project.</b></li> <li>- our transdisciplinarity also means building relations between the world of science and business reality</li> </ul> |
| <b>Societal impact</b>                   | <p>- <b>socio-economic impact, technology transfer</b></p> <p>The action aims to support <b>the initiation, incubation, and acceleration of start-up companies</b>, which are created as a result of scientific and research activities of WUT employees and students and operate in their environment in the spin-off or spin-out formula.</p>   |
| <b>Levels of engagement</b>              | <p>Łukasz Sztern</p> <ul style="list-style-type: none"> <li>- The participants in our program are project teams. The plural in that phrase is important because we are looking for <b>project teams that want to create companies</b> based on <b>technology commercialisation</b> and that technology should be at the centre of that <b>business model</b>.</li> <li>- The second target group is student groups that carry a little more knowledge, so these are research clubs or teams that come from some kind of student projects where technology is also essential.</li> <li>- And outside the University of Technology, they can be teams with backgrounds in other universities, other institutions, or other research institutes that operate in Poland.</li> </ul>   |

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| <b>RWTH</b>      | <b>LIVING LABS INCUBATOR</b>   |
| <b>Type</b>      | Strategic project on inter- and transdisciplinary agenda setting, cooperation model  |
| <b>Alignment</b> | method-, structure-related, providing knowledge production and experimentation, providing research, methods, information, participation model, knowledge exchange, transfer  |
| <b>Outline</b>   | <p>The Living Labs Incubator was set up in the context of measure five of the Excellence Strategy developed by the RWTH Aachen University: "Collaborate in LivingLabs". The LLI is part of the Human Technology Center (HumTec), which coordinates inter-and</p> |

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|  | trans-disciplinary activities of the RWTH Aachen. The project is organised on six pillars: Research, Analyse, Inform, network, enable participation, support   |
| <b>Understanding Transdisciplinarity</b> | <p>Stefan John</p> <ul style="list-style-type: none"> <li>- this textbook definition <b>that scientific and non-scientific experts</b> are working together in a <b>knowledge production setting</b></li> <li>- at RWTH, Transdisciplinary can also happen in a <b>business setting</b></li> <li>- we are somewhat like an observatory for the Transdisciplinarity happening in living labs at and around the RWTH. However, we are located in HUMTEC, the hub for interdisciplinarity.</li> <li>- <b>method development for transdisciplinary knowledge production, evaluation and transfer</b></li> </ul>  |
| <b>Societal impact</b>                   | <ul style="list-style-type: none"> <li>- the Living Labs Incubator collects information on projects and institutions to support networking and exchange experience.</li> <li>- developing <b>indicators</b> for characterising transdisciplinary knowledge production and evaluation in and through real-world labs (RWL) and <b>testing</b> them in participatory Rethinking data-information</li> <li>- there is first a need to design architectures of <b>methods to make each living lab unique</b>, enabling collaborative innovation in a context-sensitive, situation-related participative way. Second, there is a need to develop <b>new data management methods</b> to conduct this kind of tailored inter-methods investigation.</li> <li>- Stefan John: 'Challenges of <b>societal transformation to sustainability</b> are addressed by the project.'</li> </ul> |
| <b>Levels of engagement</b>              | <ul style="list-style-type: none"> <li>- Stefan John: 'sustainability mainly comes from <b>co-designing, co-producing and co-evaluating knowledge</b> for these innovations.</li> <li>- enabling and fostering <b>co-creation, participation, and transdisciplinary knowledge exchange</b>.</li> </ul> <p>The LLI supports interdisciplinary collaboration and transdisciplinary approaches to knowledge and value creation at the core of the RWTH's aim to become an Integrated Interdisciplinary University for Science and Technology.</p>   |

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| <b>TUB</b>                               | <b>OFFICE FOR SCIENCE AND SOCIETY</b>  |
| <b>Type</b>                              | Central facility/office for transdisciplinarity, knowledge exchange science and society and circular transfer  |
| <b>Alignment</b>                         | method-, structure-related, providing research, methods, networks and participation models, transdisciplinarity as part of the transfer strategy (mix of top-down and bottom-up level)   |
| <b>Outline</b>                           | The office is responsible for the strategic and operative work to systematically develop new ways of knowledge exchange at the TU Berlin in cooperation with science communication and knowledge and technology transfer. The focus is on new partnerships with actors in urban society, strengthening new methods and formats of transdisciplinary work such as living labs, citizen science and research forums, and internationalisation in science and society. The office initiates or strategically supports central activities of the TU Berlin in the area of research with society and provides them to the Excellence Alliance. The organisational positioning at the Executive Board increases the awareness and reputation of the research university with its numerous interdisciplinary and transdisciplinary competencies |
| <b>Understanding Transdisciplinarity</b> | <p>Audrey Podann</p> <ul style="list-style-type: none"> <li>- not only to communicate with society but to <b>do joint research</b>, to work on common research questions, to go <b>through different phases of research</b>, especially the co-creation of the research design on eye level</li> <li>- a common understanding of the problem and shared problem solving</li> </ul>   |

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|                             | <ul style="list-style-type: none"> <li>- <b>knowledge integration</b> is a significant issue in this research type</li> <li>- to find better solutions for wicked problems, especially for the grand transformation</li> <li>- foster transdisciplinary research in the Berlin University Alliance, and that could be related to different topics</li> </ul>  |
| <b>Societal impact</b>      | <ul style="list-style-type: none"> <li>- The Office for Science and Society acts as an <b>advisor and service provider</b> for all members of the TU Berlin, especially for the departments and external target groups with interest in participatory research, multidirectional transfer and transdisciplinarity.</li> <li>- The office also manages <b>national and international networking activities</b> in Science and Society - research with society.</li> <li>- developing <b>strategic goals</b></li> <li>- implementing <b>pilot projects</b> with high value for TUB</li> <li>- linking existing transdisciplinary projects, centres and services by providing an <b>innovation ecosystem</b> (connecting top-down and bottom-up levels)</li> <li>- important funded projects and strategies: Stadtmanufaktur' - our living lab platform and the Berlin University Alliance research forums.</li> </ul> |
| <b>Levels of engagement</b> | <p>Audrey Podann</p> <ul style="list-style-type: none"> <li>- innovation is to get into <b>new processes of co-production and co-design</b> with society and to work together to get significantly faster, more sustainable and better solutions</li> <li>- <b>scouting, monitoring and consulting</b> – building a knowledge database for transdisciplinary research at TUB</li> <li>- an open door for stakeholders from society</li> <li>- trying to get into new professional careers, '<b>integration experts</b>' in projects, between research and working with societal partners</li> <li>- doing much <b>information</b></li> <li>- and for transformation, it has to be <b>co-design (including asking the right questions and doing the research design)</b>, but: the results of the research must be science driven</li> </ul>   |

// PART IV ENHANCED GLOSSARY

8. MIND MAP AS A GROWING DOCUMENT OF KEY TERMS

Instead of a glossary of the key terminology used in the different ENHANCE Universities within Focus area 1 (see also WP2 deliverable D2.6) and for WP3 in this document, the working group has started the development of a living document, a mind map on the Miro board (<https://miro.com/app/board/uXjVORxvOCE=/>). It includes identified keywords for Focus area 1 and towards the transdisciplinary approaches to sustainable development bundled from the mapping activities (cases, survey, interviews, see Chapter 4) and related to scientific references. The decision of a growing document as a mind map for an enhanced glossary was taken as a result of the last WP3 workshop due to the following reasons:

- The concept of transdisciplinarity for sustainable development are covered by several approaches and, therefore, by different key terms. This has been discussed in Chapter 6.1 and represented a further understanding of transdisciplinarity in terms of definition, research attitudes, institutional frameworks and strategic principles, i.e., at the ENHANCE Universities. The key term 'transdisciplinarity' can be understood as process of co-production, participatory research, action research, etc. The visualisation in a mind map helps to clarify the widespread understandings and the use of these terms.
- The mind map of key terms provides different channels for linking keywords, showing relationships and additional information and representing sub-categories. In this mind map, various keywords are mapped together in to show their connection to each other. For example, co-design, co-production, and co-creation are different forms of collaboration and are therefore placed together in the collaboration category. Each sub-category consists of various keywords that are related in some way.

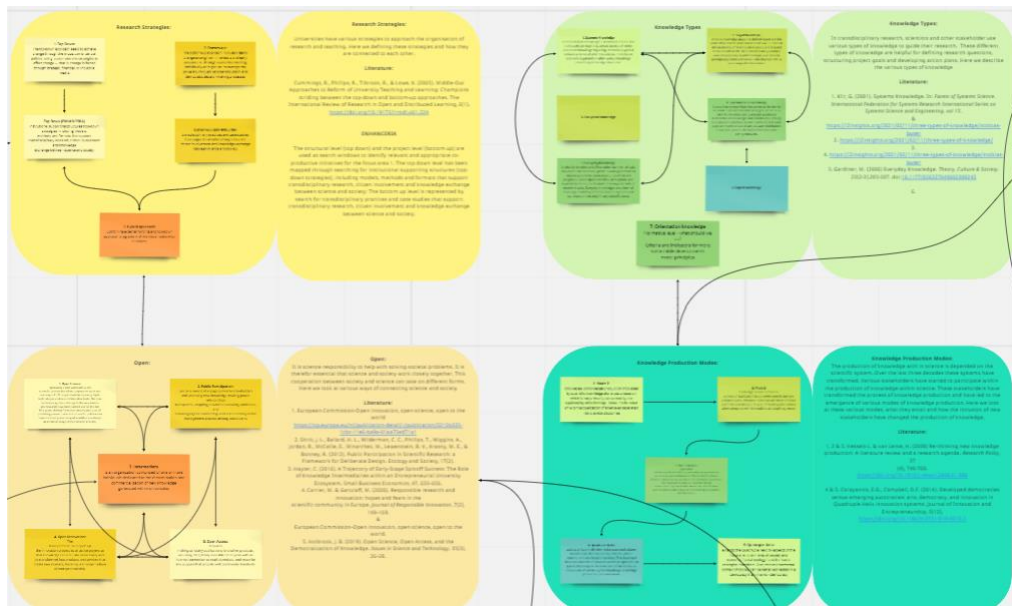


FIGURE 07. Glossary as a live document in a mind map (snapshot, May 2022), classification of keywords and linkages, extract from [Miro board](#)

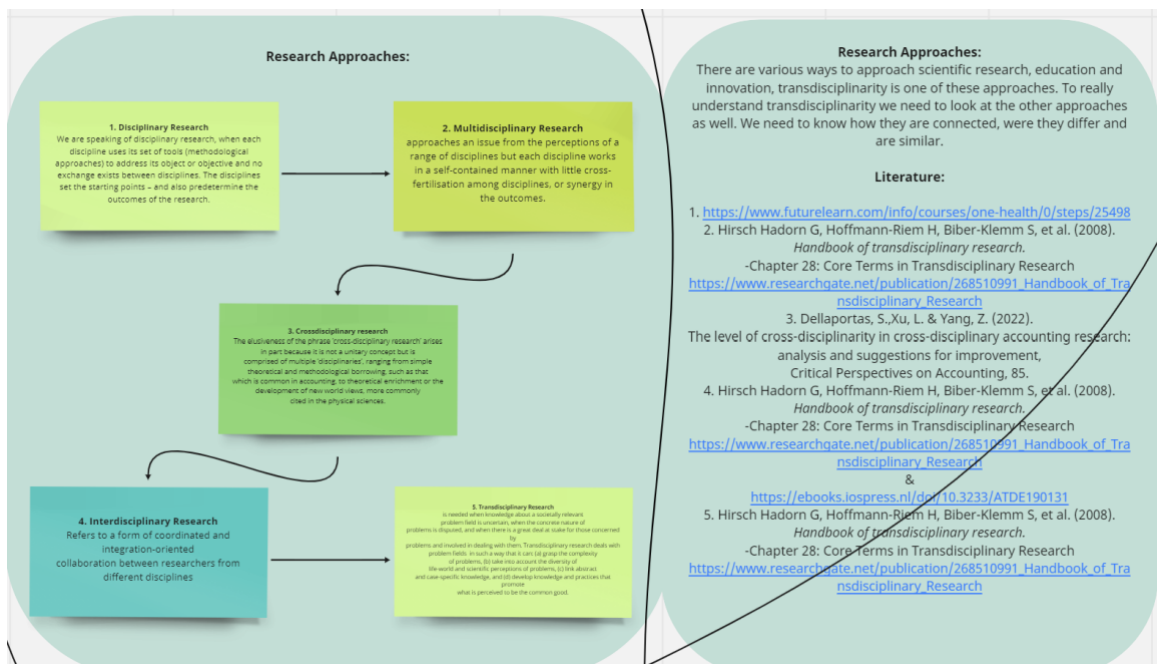


FIGURE 08. Close-up from a sub-category in the glossary on the [Miro board](#)

//PART V CONCLUSIONS

9. OUTLOOK AND FURTHER STEPS

The inventory of transdisciplinary approaches and initiatives of the individual ENHANCE Universities and the knowledge exchange in the working rounds of WP3 has resulted in a extensive overview of the concepts and structures of the thematic focus 1. An important conclusion in the need to take into account the various understandings of transdisciplinarity as a research mode and principle at ENHANCE universities, according to the different orientations of existing research cultures and university governance structures. The concept can

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refer to interdisciplinary approaches, to research addressing of social challenges, to cooperation models with companies and city administrations, to co-design for product and technology developments at the interface of science, design and entrepreneurship, to the slowly established knowledge exchange between research and society, to the inclusion of societal actors in the entire transdisciplinary research process, etc. This broad range is seen as a gain for the ENHANCE Alliance to promote better transdisciplinary practices at the project and structural levels as a way to foster sustainable development. The selected good practices and initiatives offer excellent opportunities for exchange and mutual learning, and can be a fundamental basis for synergies and transfer among the different universities. The inventory of a variety of framing structures, strategies and concepts for embedding participatory approaches represents an additional generated value for the ongoing knowledge exchange between science and society.

This is a first step to institutionalise transdisciplinary approaches, to promote visibility and transparency of existing practices and to provide a mutual learning environment for anchoring such strategies at the ENHANCE alliance. Furthermore, the interviews enabled a basis for shared knowledge about transdisciplinary initiatives, as discussed in this document, that will be further processed in subsequent WP3 activities yielding to the establishment of a European Platform of Transdisciplinary Research.

Further steps are necessary to anchor transdisciplinary research for sustainable development at the ENHANCE universities as an innovation ecosystem (such as at the TU Berlin), to name the structural and strategic requirements for it, to develop joint projects and to share and implement the common knowledge. They are summarised here preliminary discussions in the working group:

- to identify the critical relevant topics that would require a transdisciplinary approach and develop these approaches under a challenge-solving perspective. During the working process, it could be further analysed how the topics maximise the potential of transdisciplinary approaches in mission-driven strategies
- to define more precisely what is the impact on society, governance, administrations
- concerning further EU calls, which group would be fitting to proposed topics
- to facilitate contacts, to join forces to maximise the possibilities of the Alliance, not only to share models and practices for collaboration but to develop them further and provide recommendations for implementation
- to train to be more competitive for funding and therefore increase chances for funding
- to perform methods, tools and techniques to enable better, support and conduct transdisciplinary research and mainstream it for sustainable development in the ENHANCE alliance
- to create synergies between the different focus areas (see also WP2 deliverable D2.7)
- to further develop transdisciplinary research in its various approaches as modus operandi for societal changes.



## // BIBLIOGRAPHY

Bergmann, M., Schöpke, N., Marg, O. et al. (2021) Transdisciplinary sustainability research in real-world labs: success factors and methods for change. *Sustain Sci* 16, 541–564 <https://doi.org/10.1007/s11625-020-00886-8>

Bergmann, M., Jahn, T., Knobloch, T., Krohn, W., Pohl, C. and Schramm, E. (2010) *Methoden transdisziplinärer Forschung: Ein Überblick mit Anwendungsbeispielen*, Campus-Verlag, Frankfurt am Main

Bruns, A. (2019). Das Anthropozän und die große Transformation – Perspektiven für eine kritische raumwissenschaftliche Governance- und Transformationsforschung. In M. Abassiharofteh, J. Baier, A. Göb, I. Thimm, A. Eberth, F. Knaps, V. Larjosto & F. Zebner (Hrsg.), *Räumliche Transformation – Prozesse, Konzepte, Forschungsdesigns* (Forschungsberichte der ARL 10, S. 53–64): Hannover: Verlag der ARL. URN: urn:nbn:de:0156-0891043. Zugriff: 12.01.2021.

Defila, R/A Di Giulio (2018) *Transdisziplinär und transformativ forschen. Eine Methodensammlung*. Springer VS: Wiesbaden.

Giseke, U/M Gerster-Bentaya/F Helten/M Kraume/D Scherer/G Spars/A Adidi/F Amraoui/S Berdouz/M Mohamed/M Mansour/M Mdafai (eds) (2015) *Urban Agriculture for Growing City Regions. Connecting Urban-Rural Spheres in Casablanca*. Oxon/ Abingdon/New York: Routledge.

Hirsch-Hadorn, G/H Hoffmann-Riem/S Biber-Klemm/D Grossenbacher-Mansuy/C Pohl/U Wiesmann (2008) *Handbook of transdisciplinary research*. Springer: Dordrecht.

Jahn, T/M Bergmann/F Keil (2012) *Transdisciplinarity: Between mainstreaming and marginalisation*, *Ecological Economics*. Vol 79, 1–10.

Mazzucato, M. (2018). *Mission-Oriented Research & Innovation in the European Union. A problem-solving approach to fuel innovation-led growth*, Luxembourg: Publications Office of the European Uni.

Schöpke, N., Stelzer, F., Caniglia, G., Bergmann, M., Wanner, M., Singer-Brodowski, M., Loorbach, D., Olsson, P., Baedeker, C., & Lang, D. J. (2018). Jointly experimenting for transformation? Shaping real-world laboratories by comparing them. *GAIA – Ecological Perspectives for Science and Society*, 27 (S1), 85 -96

Schneidewind, U/K Augenstein (2016) *Three Schools of Transformation Thinking*. *GAIA – Ecological Perspectives for Science and Society*, 25, 2, 88–93.

Schneidewind, U. (2015). *Transformative Science – Driving Force for Good Science and a Living Democracy* *GAIA* 24/2 (2015): 88 – 91, accessed 19th Sep 2021, [https://epub.wupperinst.org/frontdoor/deliver/index/docId/5924/file/5924\\_Schneidewind.pdf](https://epub.wupperinst.org/frontdoor/deliver/index/docId/5924/file/5924_Schneidewind.pdf)

Schneidewind, U., & Singer-Brodowski, M. (2013). *Transformative Wissenschaft: Klimawandel im deutschen Wissenschafts- und Hochschulsystem*. Marburg: Metropolis Verlag

Scholz, R. W. (2013) 'Transdisciplinarity', in H.A. Mieg and K. Töpfer (eds) *Institutional and Social Innovation for Sustainable Urban Development*, Routledge, Abingdon, New York, pp305–322

Scholz, R (2011) *Environmental Literacy in Science in Society*. Cambridge University Press: New York.

td-net, <https://transdisciplinarity.ch/en>

---

Vienni Baptista, Bianca and Rojas-Castro, Silvia (2020) Transdisciplinary institutionalisation in higher education: a two-level analysis. *Studies in Higher Education*. 45. 1075-1092.10.1080/03075079.2019.1593347).

Wieck, K., Giseke, U. and Martin Han, S. (2015) Remarks on transdisciplinary research. A3 The methodology, In Giseke, U. et al. (eds) *Urban Agriculture for Growing City Regions. Connecting Urban-Rural Spheres in Casablanca*. Oxon/ Abingdon/New York: Routledge, pp 50-51

## // FIGURES

Figure 01 Reference to EC Policy report Towards a 2030 Vision on the Future of Universities in the field of R&I in Europe

Figure 02 Kathrin Wieck

Figure 03 Kathrin Wieck

Figure 04 Kathrin Wieck

Figure 05 Kathrin Wieck

Figure 06 EUSEA (<https://eusea.info/news/show-and-tell-science-communication-and-public-engagement-training/>)

Figure 07 Inge Leurs

Figure 08 Inge Leurs