	Work package	WP3
	Deliverable	D3.3.1 Practice-based menu of pathways for university strategists, educators and researchers in approaches to transdisciplinarity for sustainability
	Date	30/11/2024
	Type	Report (R)
	Dissemination	Public
	Lead	Lead: TU Berlin, Dr. Kathrin Wieck, Final report: NTNU, Lucy Chamberlin

Enhanceria: **a practice-based menu of pathways** *for university strategists, educators and researchers in approaches to transdisciplinarity for sustainability*



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

## Contents

Introduction .....	3
Enhanceria: Sustainable Development through Transdisciplinary Research .....	5
What do we mean by transdisciplinarity (TD)? .....	6
What do we mean by sustainable development (SD)?.....	6
What do we mean by the institutionalisation of transdisciplinarity for sustainable development? .	6
Methodologic approach for the Menu of Pathways .....	7
25 interviews, 7 universities, 3 areas of expertise.....	7
A snapshot of good practice: transdisciplinary initiatives at the 7 universities that focus on sustainable development.....	9
NTNU .....	9
TU Berlin .....	10
WUT .....	12
UPV .....	13
RWTH .....	14
Chalmers .....	15
Polimi .....	17
Challenges and barriers to the institutionalisation of transdisciplinarity .....	20
Lack of directed funding and resources.....	20
Rigid, siloed structures .....	20
Lack of rewards and recognition.....	20
Prejudice and difference: language and culture.....	20
How can universities encourage and facilitate transdisciplinarity for sustainable development? .....	21
What can strategists do?.....	21
Provide leadership through explicit support and institutional commitment .....	21
Consult and connect .....	22
Engage in and encourage directed funding .....	22
What can researchers and educators do?.....	22
Include criteria in teaching, recruitment and training.....	22
Create a culture of openness, trust and respect .....	23
Practical assets: 10 supporting methods and tools .....	24
Finally... ..	26



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806



Figure 1: the campus at TU Berlin

## Introduction

This document is intended for university employees in the areas of strategy, research and education and non-academic collaborators as a guide to increasing the practice of transdisciplinarity (TD) as a means for sustainable development (SD). It builds on previous work conducted by ENHANCERIA as part of the ENHANCE Alliance of European Technical Universities and is meant as a practical guide for action. Much of the theory behind the work and the collaborative approach for institutionalising transdisciplinarity of the ENHANCE Alliance has already been published in previous documents, which represent a foundation for the current guide:

[D3.1 Document discussing comparison, analysis including an enhanced glossary](#)

[D3.2.1 Catalogue of Joint Advisory for supporting transdisciplinary research](#)



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

[D3.4.1 Transformation Toolbox for the institutionalisation of transdisciplinarity](#)

[D7.4 Draft measures for piloting an ENHANCE platform on transdisciplinarity](#)

[Enhance communication channel on transdisciplinarity](#)

[Leurs, I., Rostek, K., Wieck, K., Backhaus, J., Orozco-Messana, J. \(2024\). Transdisciplinary Research for Sustainable Development: Diverse and Best Practice at European Technical Universities. \*Foundations of Management\*, 16\(1\), 41-58.](#)

These documents have already discussed the meaning and approaches to of transdisciplinarity in the Alliance, its relation to sustainable development and implementation at the ENHANCE Alliance. They have reported on the mapping, comparison and analysis of case studies at the various universities and give good practice examples of transdisciplinary initiatives at all of these institutions. Furthermore they recount some of the triggers, barriers and experiences and develop the concept of ENHANCE good practice as a unique output of the Alliance.

Whilst taking this groundwork into account, the Menu of Pathways presented here is the result of the analysis and synthesis of primary interview data obtained during 2023 and 2024 with representatives of strategy, research and education at each of the initial seven ENHANCE institutions (CHALMERS, NTNU, POLIMI, RWTH, TUB, UPV and WUT). The aim of these interviews was to discover the first-hand experience of individuals involved in implementing transdisciplinary projects or initiatives as part of a drive towards sustainable development, and to learn about the challenges they have faced as well as hearing their recommendations for improved practice. This Menu therefore represents a summary analysis of this empirical study by focusing on the barriers and the facilitating factors for conducting transdisciplinarity work for sustainable development experienced by all of these institutional groups.

A snapshot summary of the work of ENHANCERIA and the ENHANCE interpretations of transdisciplinarity and sustainable development is given first, followed by the methodology for this Menu of Pathways and a snapshot of example 'good practice' initiatives from each of the universities (max. 3 per institution). A number of the most common challenges to transdisciplinarity are then reviewed, followed by several recommendations for how strategists, researchers and educators can accelerate the institutionalisation of transdisciplinarity for sustainable development in their universities. Finally, ten of the most practical tools mentioned in the interviews as supporting this work are summarised.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806



Figure 2: the campus at NTNU

## Enhanceria: Sustainable Development through Transdisciplinary Research

The work of Enhanceria is concerned with the institutionalisation of knowledge exchange between science and society and seeks to promote understanding and support for transdisciplinary approaches as a normative research mode for solving grand societal challenges. The objectives of Enhanceria's Work Package 3 more specifically have been:

- 1) to take into account the different status of experiences with transdisciplinarity, different universities policies and strategies as well as different practices,
- 2) to develop an integrative process for achieving a joined knowledge and working base, and
- 3) to generate recommendations for institutional change within the alliance in terms of a gradual institutionalization of transdisciplinarity.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

Finally, and even more specifically, Task 3.3 (which this deliverable is part of) concerns the enactment of sustainability as a core goal for institutional transdisciplinarity and seeks to understand institutional, epistemic and practical barriers and enablers as well as to highlight potential strategies and pathways for university actors who make choices regarding strategy, research and education.

### What do we mean by transdisciplinarity (TD)?

The Enhance Alliance has defined transdisciplinary research as the interaction between various academic disciplines and non-academic stakeholders with the goal of generating new knowledge between science and society to tackle sustainable development challenges and bring about societal transformation. See documents D3.1 and D3.2.1 (referred to in the Introduction) for a more detailed description of the sources and evolution of this definition.

### What do we mean by sustainable development (SD)?

Sustainable development has been described as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’, and the UN has set out its well-known 17 sustainable development goals<sup>1</sup> (SDGs). The 2030 Agenda for Sustainable Development (UN, 2015) and the EU’s science policy both require more integrative and citizen-oriented approaches to research that anchor it in the significant and complex challenges of societal transformation.

### What do we mean by the institutionalisation of transdisciplinarity for sustainable development?

The institutionalisation of transdisciplinarity is a subject that has been addressed by various authors in the academic literature. It involves cultural, structural, methodological, value-oriented, governance and operational aspects of university systems, as well as the methods, instruments and knowledge exchange implicated in the co-production of knowledge and outcomes between science and society (Klein, 2010; Vienni-Baptista et al., 2023; Bammer et al., 2020; Dedeurwaerdere, 2024; Williams et al. DIT working paper 2, 2024). As an ambitious and normative principle, it builds on multi- and inter-disciplinary research and strives to create participatory and applied scientific cultures. In the context of sustainable development, its goal is to address the socio-ecological transformation challenges of the present with a collaborative and solution-oriented approach.

In the ENHANCE Alliance institutionalising transdisciplinarity is addressed to initiate participatory research and education projects and to match and integrate the knowledge of academic and non-academic actors more effectively in tackling sustainability challenges and societal transformation. It seeks to support these projects with advisory capacities, to network them in research and teaching, to build joint knowledge archives as well as to facilitate long-term cooperation models between research and society.

---

<sup>1</sup> <https://www.un.org/sustainabledevelopment/development-agenda/>



This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 101035806

## Methodologic approach for the Menu of Pathways

In simple terms, this Menu of Pathways is a practical guide for university strategists, researchers and educators, and their collaborators. Based on empirical data gathered from institutions and individuals already involved in the practice of transdisciplinarity for sustainable development, it provides illustrations and recommendations for those who are planning or starting such projects, building participatory teams between science and society or looking for access to theoretical and practical knowledge about conducting such initiatives.

### 25 interviews, 7 universities, 3 areas of expertise

The data was collected during 2023 and 2024 from seven technical universities of the ENHANCE Alliance: the Norwegian University of Science and Technology (NTNU), Technical University of Berlin (TUB), Warsaw Institute of Technology (WUT), Valencia Polytechnic University (UPV), Polytechnic University of Milan (Polimi), RWTH Aachen University (RWTH) and Chalmers University of Technology. As well as case studies and initiatives mapped as part of previous work by ENHANCERIA (see Introduction), 25 new interviews were conducted with individuals working in the 3 areas of strategy, education and research, and with experience of implementing transdisciplinarity. They were asked the following questions:

1. What is your understanding of transdisciplinary research or transdisciplinarity, and in particular its ability to address sustainable development?
2. In terms of strategy, research and education (whichever is most relevant to your work), how is the concept of sustainable development addressed at your university through transdisciplinary approaches and knowledge exchange between science and society (i.e. what are the good practice examples that could be shared with others)?
3. What challenges or barriers are involved in doing transdisciplinarity for sustainable development in your experience?
4. What advice would you have for other universities trying to do more transdisciplinarity for sustainable development?
5. Other topics for clarification or discussion

The interviewees discussed their understanding of transdisciplinarity, gave good practice examples of transdisciplinary initiatives at their institution, explained some of the barriers and challenges they had come across in this work and the kind of facilitating factors that had been helpful, and finally they gave advice to others trying to initiate transdisciplinarity, based on their own experiences. The interview data was analysed using open coding, themes were uncovered and cross-compared, and the following sections represent a synthesis of this work.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806



*Figure 3: the campus at UPV*



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806



## A snapshot of good practice: transdisciplinary initiatives at the 7 universities that focus on sustainable development

The tables below provide two or three examples per university of initiatives that include obvious elements of transdisciplinarity and sustainable development. They cover the gamut of strategy, research and education and represent focal points or areas of practice for the challenges, facilitators and recommendations that come afterwards.

### NTNU

Initiative	Type of initiative (research, strategy or education)	Funding	Methodologies and operation	Disciplines /departments involved	External partners	'level' of partner engagement	Incentive /recognition /reward
<a href="#">NTRANS</a>	An FME centre researching zero emission energy systems	Public (Norwegian Research Council) and partners from industry	user partners, user cases, workshops, research sprints, co-creation	STS, psychology, industrial economics, industrial ecology, electrical engineering, political science, business, innovation, technology	research partners, public actors and private industry	Collaboration and co-creation	Partners gain new insights and value for own projects
<a href="#">Experts in Teamwork (EiT)</a>	Education (compulsory masters course)	Internal NTNU	Interdisciplinary teams -'villages', working on real-world, project based challenges.	across whole university (>3000 students every year)	Various industry and public sector,	Consulting	7.5 ECTS for students. For partners, the value of project work and



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

			Practical setting, experience-based learning and group reflection		voluntary organisations		of master students as possible future workforce.
<a href="#"><u>Smart Sustainable Cities</u></a>	cross-disciplinary knowledge cluster (research, education and innovation)	various (internal, national and European)	Merger of transformative, technological, artistic and practice-based research: urban living labs, public-private partnerships and integrated design thinking	architecture, planning, design, art, engineering, ICT, social and economic sciences	many public, industry and municipalities across Europe, inc New European Bauhaus	Consulting, collaborating	

## TU Berlin

<b>Initiative</b>	<b>Type of initiative (e.g. research, strategy or education)</b>	<b>Funding</b>	<b>Methodologies and operation</b>	<b>Disciplines /departments involved</b>	<b>External partners</b>	<b>'level' of partner engagement (e.g. informing, consulting, collaborating, co-creating)</b>	<b>Incentive /recognition /reward</b>
<b><u>Office for Science and Society</u></b>	Strategic central facility for TD research and	Internal and external	Creating new partnerships with actors in society, supporting new methods and TD	All (university level)	Public authorities, civil society, research partners,	Informing, collaborating and co-creating. consulting	Established mode and strategies of transdisciplinarity at TUB, building an innovation



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

	knowledge exchange		activities, science communication and technology transfer		science management partners		ecosystem for circular knowledge transfer
<b>Stadtmanufaktur</b>	Strategic platform and network of (research focused) living labs	TU Berlin Centre for Technology and Society, Einstein Centre for Digital Futures and (initially) Berlin Senate Chancellery	Brings together existing living labs (which test and evaluate social transformations and transformative research) , provides circular exchange between science and society	All (university level)	Public authorities, entrepreneurs, civil society, research partners	consulting	Gathering transformation knowledge and science and society actors in Berlin-Brandenburg, promoting discourses, methods for urban transformation and sustainable development
Study courses in Urban Planning, Architecture, Landscape Architecture, Urban Design	Education	Internal	Specific courses and design studios in space-related disciplines for city administrators and societal / international stakeholders	Faculty VI Architecture, Planning and Environment	TUB researchers and students, public administration, civil society, small companies	Informing and collaborating	ECTS



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

WUT

Initiative	Type of initiative (e.g. research, strategy or education)	Funding	Methodologies and operation	Disciplines /departments involved	External partners	'level' of partner engagement (e.g. informing, consulting, collaborating, co-creating)	Incentive /recognition /reward
<a href="#"><u>Human Smart Cities</u></a>	Strategy/Research	external: Structural Fund Operational Programme	Various forms of communication and awareness-raising: picnics, seminars, workshops, outdoor meetings.	WUT Faculty of Building Installations, Hydraulics and Environmental Engineering	Rawicz Municipality Government and Citizens	informing, collaborating, co-creating, disseminating	The results developed form the basis of an innovative, multi-dimensional urban management model based on operational data from different sensory layers to enable short- and long-term decision making.
<a href="#"><u>WUT Innovation Incubator</u></a>	Strategy/Educational	Internal plus external business sponsorship	building a self-organised network with students, academics and business stakeholders	WUT Innovation Center	mainly businesses	knowledge exchange, consulting, collaborating	A broad programme of operational and development support, including fundraising



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

UPV

Initiative	Type of initiative (e.g. research, strategy or education)	Funding	Methodologies and operation	Disciplines /departments involved	External partners	'level' of partner engagement (e.g. informing, consulting, collaborating, co-creating)	Incentive /recognition /reward
<a href="#">City University Binomial</a>	Strategic cooperation and research agreement between UPV and the municipality of Valencia to achieve climate neutrality by 2030	Internal /municipality	a framework agreement, which includes existing collaborations – e.g. 12 chairs and different research structures – and will be developed through joint initiatives in the Living Lab that are replicable in the city.	various	City of Valencia; other public university	Collaborating, co-creating	N/A
<a href="#">UPV Living Lab</a>	On-campus research and education lab aiming to accelerate carbon neutrality	Internal: Projects have their indirect costs covered by the Vice-rectorate for Sustainable	sandbox' environment for testing, prototyping, scaling, teaching and learning. teaching content, internships, degrees and master projects, mobility	cross-university	business, public administration, citizens	consulting + collaborating + co-creating	partners and applicants gain access to university expertise and facilities



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

		Development of Campus.	programs, spaces for debate and reflection				
<a href="#">12 Chairs</a>	Strategic research and business alliance with objectives grouped around sustainability	Activities are financed with the collaboration of the institution and companies that sponsor them	The activities span the organization of Congress, or exhibitions, to research applied to specific problems of these sponsoring entities	various	Business, local institutions, public sector	collaborating	research funding, dissemination of results, public recognition

## RWTH

<b>Initiative</b>	<b>Type of initiative (e.g. research, strategy or education)</b>	<b>Funding</b>	<b>Methodologies and operation</b>	<b>Disciplines /departments involved</b>	<b>External partners</b>	<b>'level' of partner engagement (e.g. informing, consulting, collaborating, co-creating)</b>	<b>Incentive /recognition /reward</b>
<a href="#">BioTexFuture</a>	Innovation space on biobased textile research	Public	research-industry collaboration (project is co-led by adidas and RWTH Aachen University); the project can organise calls and select further collaborative projects for funding, thus continuously	Textile engineering	Business and industry	Co-creating	N/A



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

			expanding the network and focus				
<a href="#">Profile Areas</a>	Strategic and organisational measure	Project-based funding	establishment of large transversal organisational units around particular themes (e.g. Internet of Production; Built & Lived Environment) to strengthen ID and TD collaboration around the twin transition	All	Various (quadruple helix)		N/A
<a href="#">Leonardo</a>	Educational project			Human Technology centre – all faculties	Mainly NGOs		

## Chalmers

<b>Initiative</b>	<b>Type of initiative (e.g. research, strategy or education)</b>	<b>Funding</b>	<b>Methodologies and operation</b>	<b>Disciplines/ departments involved</b>	<b>External partners</b>	<b>'level' of partner engagement (e.g. informing, consulting, collaborating, co-creating)</b>	<b>Incentive /recognition /reward</b>
<a href="#">Areas of Advance</a>	Strategic thematic platforms, research-based partnerships	Internal funding by Chalmers foundation as well as external funding for	joint (transdisciplinary) projects, integrating research, research-education, and innovation	Various	partnerships with industries/ companies, City of	informing (hosting competence centres), collaborating (strategic partners	structure facilitates the possibility of sharing infrastructure,



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

	with companies (structure-level)	different projects (e.g., EU projects)			Gothenburg, research institutes	involved in developing new courses), signed partnership agreements	labs, industrial PhD students and Adjunct researchers
<a href="#">TRACKS</a>	Educational	Internal (funded by Chalmers' foundation with a 10 year grant 2019-2029). Government funding for running courses besides international students' tuition fees. Some funding from companies for executive courses	Tracks courses are elective, and do not belong to a specific program or department. They give students the opportunity to develop their interdisciplinary competence. The initiative reduces the time required to offer new educational content, in collaboration with academia, industry and society.	Various	Companies / industry Entrepreneurs International universities / research institutions	Tracks courses are held in close collaboration with representatives from industry, society and cutting edge of research.	Participants collaborate across program boundaries to learn by exploring societal and scientific challenges together. The initiative helps the university to be agile and adaptable to continue to be relevant.
<a href="#">HSB Living lab</a>	Research	Funded by three main partners	A collaboration project between Chalmers, HSB (cooperative	Mainly Architecture and Civil	Companies in the housing, construction,	Collaborative research projects	Test bed for researchers.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806



		(Chalmers, HSB, Johannesburg Science Park), in addition to 9 companies.	association for housing in Sweden), and other partners, developing new ways to build and shape the housing of the future. The tenants of the house live in a constantly changing and evaluated environment while the research is ongoing.	Engineering Department	electronics, energy and utilities sectors.		Providing accommodation for around 40 people, and tenants signed up to be part of the research. Collaborating with start-ups and research projects. Sharing knowledge.
--	--	-------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------	--------------------------------------------	--	------------------------------------------------------------------------------------------------------------------------------------------------------------------------

## Polimi

<b>Initiative</b>	<b>Type of initiative (e.g. research, strategy or education)</b>	<b>Funding</b>	<b>Methodologies and operation</b>	<b>Disciplines /departments involved</b>	<b>External partners</b>	<b>'level' of partner engagement (e.g. informing, consulting, collaborating, co-creating)</b>	<b>Incentive /recognition /reward</b>
<a href="#">Off Campus</a>	Strategy (part of the strategy for	Internal Polimi	University hubs are established in the city of Milan to facilitate the joint development of innovative	Departments: Architecture and Urban Studies; Design;	Municipality of Milan, local	Collaboration and co-creation	Partners implement and



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

	community engagement and proximity innovation of the university)		research, teaching and social responsibility activities, in collaboration with local communities	Architecture, Built Environment and Construction Engineering; Management, Economics and Industrial Engineering; Chemistry, Materials and Chemical Engineering  Schools: Design; Architecture, Urban Planning and Construction Engineering  Students' associations	community organizations, citizen associations, other universities located in Milan		strengthen own activities in collaboration with Polimi.  Polimi researchers from the involved Departments develop innovative research projects (community-based, living labs)
<a href="#">Polimi Ambassador</a>	Education (high level training courses)	Internal Polimi	Interdisciplinary "minors" for Master level students aiming at creating new professionals who -have skills in specific areas (green/smart/inclusivity/creative) -master enabling digital technologies	School of Architecture, Urban Planning and Construction Engineering; School of Design; School of Civil, Environmental and Land Management Engineering; School of Industrial and	N/A	N/A	10 ECTS for students. The Ambassador certification will be reported in the Student's Diploma



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

			-master interdisciplinary tools, methods, and aptitude for a systemic vision -can operate in interdisciplinary and multisectoral contexts	Information Engineering			Supplement and a digital badge will be issued by Politecnico di Milano
Interdisciplinary PhD Scholarships	Research, education	various (internal, national and European)	Interdisciplinary doctoral scholarship program to promote collaboration among Polimi Departments and the integration of complementary skills on social impact issues	All Departments; PhD School	Research partners	Consulting, collaborating	Departments and prospective PhD students can benefit from least 20 PhD scholarships funded each year under this program, in addition to ordinary PhD scholarships funding



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

## Challenges and barriers to the institutionalisation of transdisciplinarity

The following sections represent a summary analysis of the most common challenges to transdisciplinarity, as reported by interviewees at the 7 universities.

### Lack of directed funding and resources

By dint of its participatory, multi-sector nature, transdisciplinary work can take significant time and resource, but this is not always recognised by university management and therefore critical levels of funding can be lacking – sometimes leading to the failure or closure of a project. Moreover, internal funding for research projects as well as education programmes is often directed through departments or disciplines rather than being allocated to multi or transdisciplinary initiatives.

### Rigid, siloed structures

The disciplinary (and somewhat inflexible) structure of universities can lead to ‘lock in’, invisible walls or silos between research and education programmes and student associations that runs counter to the multi-faceted and complex challenges of future sustainable development. This mismatch can be the case both in financing and in legislative and regulatory systems as well as measurement and evaluation practices.

### Lack of rewards and recognition

Often there are no financial, career-based or curricular incentives to encourage staff or students to get involved in transdisciplinary projects, and the evaluation of research and teaching is conducted according to discipline. Transdisciplinary work is not seen to carry the same status as traditional science and can even represent a barrier to career progression as the most prestigious journals have tended to prefer mono-disciplinary publications. Similarly, students can feel that single discipline studies are more advantageous in terms of employment and recognition.

### Prejudice and difference: language and culture

Disciplinary experts can be suspicious of or even prejudiced against other scientific disciplines with different cultures, epistemologies and methodologies. They may have widely diverging worldviews to their non-academic partners and even view working with these stakeholders as losing precious research time rather than bringing added value. In addition, the partners in a transdisciplinary project often misunderstand one another: community partners may not understand the language of scientific researchers, whilst experts from one field often have a different disciplinary ‘language’ to those from another. Moreover, the understanding of and language around sustainability differs vastly between sectors and communities.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806



Figure 4: Chalmers university campus

How can universities encourage and facilitate transdisciplinarity for sustainable development?

What can strategists do?

Provide leadership through explicit support and institutional commitment

TD for SD requires leadership at the top strategic level of an academic organization. University management should put in place a governance model with the incentives, values and resources (especially finance) that explicitly support TD and provide an integrated approach across the institution. Interviews showed that having supportive management and institutional commitment can be vital for catalysing TD cooperation, and in particular where research silos represent barriers to action. Dedicated leadership teams or strategic roles with responsibility for implementing TD and SD can also enhance the visibility and status of TD within the institution – for example Polimi’s Vice Rector for Sustainable Development, or TU Berlin’s Office of Science and Society and Vice President for Sustainability. The formal organisation of Chalmers’s Areas of Advance programme, with a



This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 101035806

management group and individuals responsible for every sub section, has been key to its success, and UPV is looking to implement a similarly defined approach in its SIRVE strategy.

## Consult and connect

The enormous complexity of SD responses crises requires multiple communities to work together, understand and support each other. As well as encouraging TD co-creation and collaboration with external networks, it is crucial that strategists consult widely within the university community itself (academic staff from multiple departments as well as technical and administrative staff and students) to increase motivation and engagement with TD and SD plans. At certain institutions this has been seen to make the difference between the success and failure of TD strategy. Conversely, transdisciplinary communities can provide the 'bottom up' impetus for strategy change, and it was notable at Polimi that the collective responsibility for a response to the climate crisis felt by the community of teaching and administrative staff was the prompt for new SD policy. Certain interviewees recommended that the strategy for TD itself should be co-created with all of the partners involved, in order to build in resilience and equity as well as capacity. Finally, cultivating connections at European level and growing a supportive wider network of strategists and practitioners is also key to facilitating TD for SD in a university setting, as the interviews showed that these European-scale movements and networks can have a significant influence on the mindset of university management and staff.

## Engage in and encourage directed funding

Access to funding of course is key to the success of TD and SD projects, and in particular funding that allows for or is directed at the kind of collaborative, dynamic, impact-focused work that TD facilitates. Strategists need to both promote access to seed funding for developing TD ideas and research proposals as well as national schemes with a specific mission or scope that encompasses TD projects, for example the German Excellence Initiative or the Italian Resilience and Recovery Plan. Schemes with long term funding (such as Norway's FME Centres, funded for 8 years) represent particular potential for building a TD community through mutual understanding and integrated research. In addition of course, strategists must engage in EU and international funding instruments through networks such as Enhance that focus on research, innovation and societal impact and can play a role in influencing national governments too.

## What can researchers and educators do?

### Include criteria in teaching, recruitment and training

TD for SD must be included in the taught curriculum if it is to become institutionalised and its value recognised across the universities. This can be done, for example, through the award of ECTS or degree credits, greater focus on project-based teaching, and the design of master and PhD courses to include aspects of TD and SD. It is important to begin with the right people in place, both for research and teaching: people who are open to and understood TD and have the motivation and expertise to build a cohesive team or to open their classes to other disciplines. This means including



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

TD and SD criteria in the recruitment process and in contracts for new academic positions, requiring experience in stakeholder cooperation for example rather than just citations and publications. To facilitate and support the work of both early state and established researchers and educators, 'Train the trainer' programmes can provide TD principles and techniques and demonstrate value in practice (e.g. see the new ENHANCE+ Train the Trainer initiative led by Chalmers).

### Create a culture of openness, trust and respect

An environment of trust, respect and curiosity is essential for nurturing TD collaboration, encouraging stakeholders in the project or network to learn from each other and work productively together. Working across boundaries and acknowledging their own blind spots can be difficult for some experts, but over time trust and engagement with the value of others' work can be built up, along with a valuable interdisciplinary network. One of the most important yet simple tools remarked on by interviewees was to get research partners from different backgrounds to meet, listen to and get to know each other, and finding a conducive space for this meeting can be seen as a very practical first step. Particularly when it comes to the implementation of technology, it is also vital to understand the everyday context and practices of the 'non-expert' people interacting with it, and not just the success of its scientific aspects. Finally, in terms of teaching, encouraging students to be aware of their own disciplinary identities and have respect for the value of others is an essential skill that carries beyond education and into the world of employment.



Figure 5: WUT campus



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

## Practical assets: 10 supporting methods and tools

In addition to the above, interviewees described some very practical tools and methods they had used to facilitate TD for SD. You'll find some of them in the transformation toolbox for the institutionalisation of transdisciplinarity (D3.4.1 document). The main ones from the interviews are summarised here:

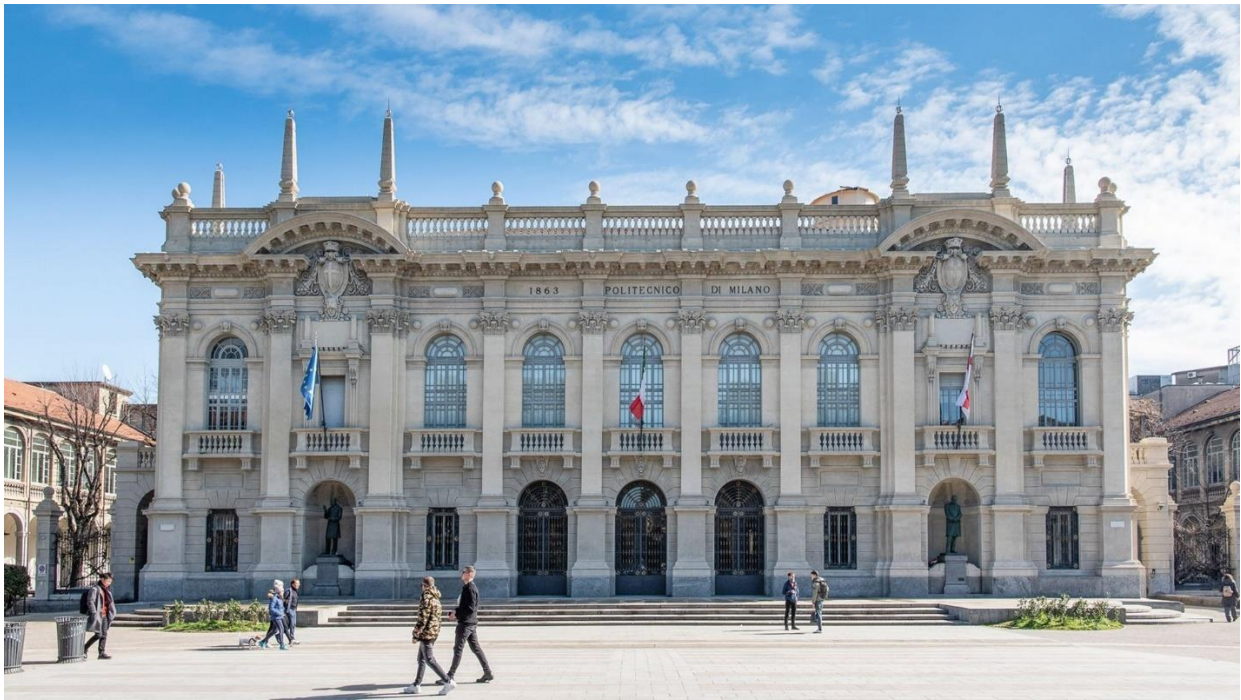
1. **Design Thinking** (e.g. at WUT, UPV) represents a methodology or tool that can release creativity and new ideas by asking better questions and focusing on human centred solutions. The culture of disciplines that routinely use design thinking, such as design and architecture, can also be more open to TD.
2. **Handbooks for TD teaching.** NTNU's Experts in Teamwork for example has produced a handbook outlining the programme's methodology, reflective practice and transdisciplinary principles for all of its staff, and it is hoped this will soon be published more widely.
3. **Creative meeting and learning places** can provide space and infrastructure to combine disciplines and open communications channels with wider society. These are exemplified by living labs such as those at TUB and UPV, or maker spaces such as at Chalmers Fuse (the physical location for TRACKS), a place where research, industry, education, public sector and the wider community can meet and test ideas. (The living labs are a crucial category of methods in the transformation toolbox due to combining strategic and project-led components).
4. **Contracts with external partners**, in teaching or research, can help to agree on the responsibility of each party at the start of a project, set rules and goals and manage expectations (e.g. TUB).
5. **Co-operation with social sciences** departments can be instrumental in helping other partners to understand and co-operate with people (e.g. NTNU and WUT)
6. **University outreach** or community and sustainability policies that enhance local neighbourhoods or the city can be used as a platform for education in TD for SD (e.g. TUB, Polimi).
7. **Support for student programmes** which are self-organised and often focused on TD and SD help to raise the profile and activity level (e.g. TUB)
8. **PhD projects with a TD for SD focus** can develop new researchers whilst combining different disciplines and resources, encouraging co-creation and building trust whilst raising the profile of TD for SD. NTNU's SusRes programme is an example of 50 such PhDs.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806



9. **Systems thinking and reflection** are less tangible competencies that nevertheless cultivate empathy, mutual learning and enhanced understanding amongst project partners especially when it comes to addressing multi-layered sustainability dynamics and connecting practical and theoretical aspects (e.g. UPV, NTNU).
10. **Funding for educational initiatives** in TD for SD was less in evidence, but Chalmers's TRACKS was perhaps singularly successful in compensating departments for time spent in the programme by paying salaries for any staff whilst they were taking part.



*Figure 6: Polimi university campus*



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

## Finally...

In closing it should be noted that this document is one of many that make up the outputs of Enhance work package 3 on sustainable development through transdisciplinary research. Whilst considering the most relevant challenges as reported by experienced internal voices, this Menu represents a specific perspective on practical pathways for implementing transdisciplinary projects fostering sustainable development in the areas of strategy, research and education. As such it complements the Transformation Toolbox (D3.4.1), which is the outcome of an investigative process of extracting tools from good practices in strategic, research and educational initiatives at the ENHANCE universities. Beyond the good practice tools the Transformation Toolbox also contains further recommendations as to how technical institutions can pursue implementation and stimulate transdisciplinary initiatives in a systematic way. This includes a compilation of jointly developed tools for creating a mutual learning environment as a step towards institutionalisation in the ENHANCE Alliance, and for future projects such as ENHANCE+. The ENHANCE+ project, funded by Erasmus+ in the period of 2023 to 2027, will integrate the research and innovation dimension of transdisciplinarity in work package 6 on 'Transdisciplinary Labs for Societal Transformation'. Here, the Transformation Toolbox and Menu of Pathways will be used to build long-term support for transdisciplinary initiatives in the Alliance: by further developing a portfolio of co-creative methods, by conducting joint transdisciplinary labs on specific topics and by offering trainings. Further information is available here: <https://enhanceuniversity.eu/>.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806

## References

- Dedeurwaerdere, T. (2024). *Transdisciplinary Research, Sustainability, and Social Transformation: Governance and Knowledge Co-Production*, Routledge
- Klein, J. (2010). Creating campus cultures. A model for strength and sustainability. *Springer*.
- Vienni Baptista, B. & Rojas-Castro, S., (2020). Transdisciplinary Institutionalisation in Higher Education: A two-level analysis, *Studies in Higher Education*, 45, 1075-1092
- Vienni Baptista, B., Fletcher, I. & Lyall, C., (2023). *Foundations of Interdisciplinarity and Transdisciplinary Research: A Reader*, Bristol University Press
- Williams, R., Wittmayer, J. M., Schöpke, N., Lawrence, M. & Loorbach, D. (2024). *Institutionalisation of Transdisciplinarity in Research Organisations - A Review of Key Dimensions*. DIT Working Paper #2. Rotterdam, Design Impact Transition Platform, Erasmus University Rotterdam.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035806