TRANSFORMING OPEN RESPONSIBLE RESEARCH AND INNOVATION THROUGH CHARM

TORCH

DELIVERABLE D7.1 – TORCH: STIMULATING CO-CREATION OF CHALLENGE DRIVEN R&I

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EXECUTIVE SUMMARY: STIMULATING CO-CREATION OF CHALLENGE DRIVEN R&I

Public engagement and transdisciplinary science are crucial to realizing open science and in making progress towards excellence and challenge-driven research and innovation. Many universities around the globe, including European universities, are navigating their ways to develop an understanding of the concepts of public engagement and transdisciplinary science and to integrate these into their core mandate as a university and operationalize these in their research and education activities.

The objective of this report is to present the results from TORCH project WP7 research on public engagement and transdisciplinary science, especially on Task 7.1: Collect and share existing modalities and practices for stimulating co-creation of challenge-driven research and innovation with societal stakeholders.

We have conducted empirical analysis at the five partner universities of CHARM-EU: Utrecht University (UU), Eötvös Loránd University Budapest (ELTE), Trinity College Dublin (TCD), University of Barcelona (UB), University of Montpellier (UM). We have studied 31 good practices, conducted 66 semi-structured interviews, 10 focus group discussions, and analysed university policy and project documents related to open science, public engagement and transdisciplinary science.

Initiatives presented in this report are considered as "good practices" which includes wide ranges of research, education, and the interface between education and research-related activities, networking platform, programmes, structural and policy innovation, all to contribute to solving societal challenges, especially within the research domain of sustainability. These good practices presented us important lessons to be learned, especially in terms of incentives and disincentives of public engagement and transdisciplinary sciences at the different levels and challenges ahead for truly realising the vision of open science. We conducted analyses of incentives and disincentives at four levels: the individual level, the university level, the systemic levels, and the level of stakeholders.

The results show that many universities have, to some extent, incorporated public engagement and transdisciplinary science as part of the wider agenda for opening up science. However, not all universities have a centralised or dedicated university policy and structure in place concerning open science, public engagement, and transdisciplinary science. The findings show that good practices on public engagement and transdisciplinary science (both research and education) are abundant. The existing initiatives, however, are fragmented and rely heavily on bottom-up, individual/team leaderships in initiating public engagement and transdisciplinary science.

Though universities vary quite a lot in terms of attention paid and progress made towards open science, public engagement and transdisciplinary science, universities show similarities in terms of incentives and disincentives for conducting public engagement and transdisciplinary science. The most prominent incentives at the individual level are peer support and internal motivation, while disincentives are mostly related to lack of capacity and rewards and recognition for scientists to

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pursue a career through public engagement and transdisciplinary science. Regarding the university level, the existing structure and policies such as university strategic visions on open science and ambition to leverage the role of the university to address societal problems in place are an incentive. This includes rewards and recognition systems, existing infrastructures and the work of pioneer institutions in leading the public engagement and transdisciplinary science initiatives. Disincentives at the university level ranged from a lack of resources to a lack of physical space/infrastructure that can allow collaboration, visibility, operationalization, mainstreaming of the open science programme to facilitate public engagement and transdisciplinary science. In addition, a lack of attention to vulnerable and marginalised groups was also mentioned as a disincentive for public engagement and transdisciplinary science at the university level (UB).

In terms of societal stakeholders, incentives include availability of networks, opportunities for lifelong learning and also access to scientific information and financial support. Meanwhile, disincentives for societal stakeholders to be engaged in public engagement and transdisciplinary science-related activities are the excessive bureaucracy of the university, lack of interest from the university partners to deal with topics related to inclusiveness. At the systemic level, current funding systems at the regional (EU) and national level have been served as important incentives. However, several disincentives at the systemic level were reported, including the lack of quality assurance, especially related to the evaluation of "good" public engagement/transdisciplinary science, competition across initiatives, the divergence of EU and national policies, lack of national policies, which shows lack of political interests on this topic, and lack of institutionalisation. The COVID-19 crisis was also mentioned as an important hindrance at the systemic level. It blocks the access of communication among stakeholders and science and reduces the effectiveness of public engagement and transdisciplinary science-related work.

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1. INTRODUCTION

In this section, we will describe a general introduction of the objective, corresponding task and deliverables of the TORCH WP7 research on public engagement and transdisciplinary science.

1.1 Objectives, corresponding tasks, and deliverables

This report reflects the achievement of objective 7.1: To collect and share existing modalities and practices for stimulating co-creation of challenge-driven research and innovation with societal stakeholders.

To achieve objective 7.1, three sub-tasks have been conducted:

Task 7.1 Collecting best practices of public engagement from all partner universities, focusing on identification of, and retrospective reflections on the (dis)incentives for stimulating public engagement in science.

Task 7.1 will focus on incentives and barriers (from now on referred to as (dis)incentive) in addressing the abovementioned challenges and to stimulate the co-creation of challenge-driven knowledge and promote the democratisation of science. Starting with an inventory of different types of incentives, retrospective reflections will be done to evaluate the underlying contexts and barriers to stimulate public engagement.

Task 7.1.1 Existing experiences: transdisciplinary research (M1 January 2021- M15 March 2022)

In Task 7.1.1 we have collected experiences related to the individual (researcher), university, societal stakeholders, and systemic types of (dis)incentives that are relevant to realize transdisciplinary science in the sustainability science domain. We looked into different types and levels of good practices (e.g. originated from different domains or disciplines, type of societal stakeholders involved, and level of engagement). The scope of (dis)incentives of each level can be found below:

1) **Individual (dis)incentives**. Individual (dis)incentives relate to intrinsic (personal) and extrinsic (professional, including inter-personal aspect) (dis)incentives that can change behaviour at the individual level, including related to skills, commitment, leadership, professional development, disciplinary characteristics, and support from peers and coaching by supervisors.

2) **University (dis)incentives**. This relates to the type of (dis)incentives at the different levels within the university (research teams, departments, faculties, and universities). For example, it could include certain structures that could enable public engagement (e.g. dedicated public engagement departments and mechanisms, reward and assessment systems, hiring systems).

3) **Societal actors' (dis)incentives**. These will be (dis)incentives from the viewpoint of the societal stakeholders, such as related to awareness-raising, visibility, networking, additional resources (e.g. finances, human capital) for their projects, etc. We are also interested in how (dis)incentives

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are shaped based on contextual conditions, including diverse inter-cultural, socio-economic, and political contexts, as well as corresponding dilemmas regarding the ethical issues of involving or excluding certain types of stakeholders (e.g. minority groups, indigenous people, business sectors, etc).

4) **Systemic (dis)incentives**. This relates to (dis)incentives on the science systems as a whole (at the national, EU, and global levels). It includes governmental policies, requirements by funding agencies, publishing policies and cultures, ways of working by assessment committees, etc.

Task 7.1.2 Existing experiences: the democratisation of science (M1 January 2021- M10 October 2021)

In Task 7.1.2, we have analysed the findings from Task 7.1.1, focusing on experiences in optimising the engagement of societal groups to reach the goal of the democratisation of science. This includes analysis of relationships between the different types of incentives, including any synergies and contradictions between them. The contextual conditions based on the different types and levels have been considered in our analysis (e.g. geographical, socio-cultural, accessibility, originated from different domains or disciplines, types of stakeholders and level of engagement). The results of task 7.1.1 and 7.1.2 are discussed under the section 3.

Task 7.1.3 Best practices in transdisciplinary research (M1 January 2021- M15 March 2022)

Based on the results of Task 7.1.1 and 7.1.2, we retrospectively discussed and evaluated the underlying contexts and barriers, including, but not limited to: the types of motivation such as demand-pull or technology push, types of societal problems addressed, and types of social actors involved. Again, we paid specific attention to diverse contexts such as (geographical, socio-cultural, accessibility, originated from different domains or disciplines, types of stakeholders and level of engagement). The results of task 7.1.3 are discussed under the section 4.

Activities conducted under task 7.1 have led to the production of this report D7.1 which will present the inventory of the types of incentives and disincentives for stimulating public engagement and transdisciplinary science.

This report is structured as follows: In section 1, we outline the introduction which includes the scope and objective of the report. In section 2, we then present a summary of the research methodology used by the five partner universities. Section 3 presents the results of the university level analysis on university structure and policies relevant to public engagement and transdisciplinary science, good practices, incentives and disincentives on public engagement and transdisciplinary science in different levels (individual, university, societal stakeholder, and systemic level). Finally, section 4 provides a general reflection of the collective university findings on good practices in transdisciplinary science.

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2. METHODOLOGY

There were five university partners participating in this research: UU Utrecht University (UU), Eötvös Loránd University Budapest (ELTE), Trinity College Dublin (TCD), University of Barcelona (UB), University of Montpellier (UM). The WP leader (UU) has set a general guideline to conduct the research based on previous consultations with all five university partners. This general guideline was not set in stone, as the WP7 team agreed that each university partner should have the freedom to interpret and operationalize the guideline according to their context and situations. We will explain the methodology used for the TORCH WP7 research in three subsections: data collection, data analysis, and validity and reliability. Summary of methods used by partner universities can be found in Table 1.

Table 1. Summary of methods used by each university

University	Methods
UU	7 good practices 21 semi-structured interviews 3 focus group discussion with experts
ELTE	6 good practices 6 online questionnaires 3 focus group discussion with experts 6 focus group discussion with 37 participants
TCD	5 good practices 12 semi-structured interviews
UB	5 good practices 15 semi-structured interviews 1 focus group discussion with experts
UM	8 good practices 15 semi-structured interviews 1 workshop
Total	31 good practices 66 semi-structured interviews 6 online questionnaires 7 focus group discussions with experts 6 focus group discussions with diverse academic and extra academic actors 1 workshop

2.1 Data collection and analysis

Data has mainly been collected from content analysis (e.g. university policy/vision documents, websites, project documents, grey documents, etc), semi-structured interviews, questionnaires, focus group discussions and a workshop.

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2.1.1 Good practices

We identified good practices that consist of initiatives, a method, or a tool to support transdisciplinary science and public engagement, that has been accepted as a practice to learn from. These can be practices that are successful or less successful. They do include any types of initiatives, including an embedded structure or mechanism within the university/faculty/department systems, certain tools that could help to support transdisciplinary science, flagship projects, and other initiatives that could serve as a good example of incentives to transdisciplinary science. We included good practices in transdisciplinary science, by which we mean research as well as transdisciplinary education. We also looked for a diversity of initiatives, for example, initiatives that started from challenge-driven or technology-driven motivation, initiatives that are coming from different fields of science/disciplinary, which may influence the type of societal stakeholders they are engaging with, etc. This diversity would allow us to come up with different contextual factors/conditions that could explain why certain initiatives work or do not work. Our assessments of what constitutes good practice are subjective, as we are aware that one practice can be seen as good/less good according to different standards/perspectives.

2.1.2 Document analysis

Good practices have also been derived from a review of documents and websites, including university policy/strategic plan documents, public engagement websites, project documents and websites, and other grey documents. These documents have also helped the researchers in identifying (dis)incentives, structures, and policies in place for promoting public engagement and transdisciplinary science.

2.1.3 Semi-structured interviews

Semi-structured Interviews have been done with researchers, experts, and societal stakeholders engaged with public engagement/transdisciplinary science activities and open science debate. Annex 1 shows general guidelines on expected questions to be asked during the semi-structured interviews. In the operationalization, interviewers were allowed to adjust the questions according to the context of the initiatives/interview targets.

2.1.4 Questionnaires

At ELTE, an online questionnaire including questions based on those suggested for the semi-structured interviews (see Annex 1) was prepared and circulated among focus expert group members to explicitly ask for their own experiences and views on public engagement and transdisciplinary science. This was meant to complement the expert's insights which they shared during expert groups meetings.

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2.1.5 Focus Group Discussion

During the first meeting, all WP7 partner universities agreed to organise a focus expert group within each university. The objective of having this expert group is to support each university during the research process. Each group consisted of five to eight members who are the experts in public engagement and transdisciplinary science, for example, the public engagement officers/ management-level officers at the university, several champions in public engagement/transdisciplinary science. The WP7 team agreed to try to be more inclusive by engaging scientists from different disciplinary backgrounds, stages of career, and gender. The expert groups have helped the researchers to think along about the selection of good practices and interviewees, as well as to validate and discuss the results of the research. The expert group meeting has been used to gather data and allow broader expansion of knowledge (input and output) within each university structure.

2.1.6 Workshop

UM has conducted a workshop instead of conducting individual interviews. The workshop has enabled the researchers from UM to gather different perspectives of diverse actors, including scientists, students, and societal stakeholders.

The results of the interviews, questionnaires, focus group discussions, and the workshop was transcribed and stored in a safe and internal database of each university. In some cases, coding was done through platforms (e.g., Microsoft excel/other software) according to the preference of the individual university researchers. The results were analysed qualitatively.

2.2 Validity, Reliability and Ethical issues

This study is limited in that it only covered several good practices within the scope of the university. Good practices also differ, in terms of type, topic scope, objective, and scale. In addition, the topic covered is purposively selected based on the availability of contacts and their time in giving the interviews. Therefore, this study is not aimed to fully represent a high variety of initiatives at the different levels of the university. We also did not focus on 'failed practices'.

The interviews have been conducted with experts who are experienced in public engagement and transdisciplinary science. Since this research can be considered exploratory research, there are potentially multiple biases. To increase the consistency of the interpretation of the results, university partners followed the agreed research framework and general operationalization guidelines. We also adhered to the principle of anonymity and informed consent. Participants in this study were given adequate information about the project to allow them to make an informed decision as to whether they would like to participate in the research. The quotation is only used according to the consent of the participants. We did keep a record of all the information in case it is needed to validate our research results.

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3. University Level Analysis

3.1 Utrecht University (UU)

3.1.1 Existing university structure and policies relevant to public engagement and transdisciplinary science

In this section, we will provide a general overview of the structure and policies of UU relevant to promoting public engagement and transdisciplinary science and how public engagement and transdisciplinary science are being defined. Many initiatives have been taken, from the level of the university to the inter-faculties, faculty, department, and department levels. We will only present the major initiatives up to the faculty level. Important to mention is that Dutch university systems are generally relatively decentralised, as every level within the university has its own autonomy.

Many of the initiatives at Utrecht University can be seen in light of wider national and international trends and initiatives. At the national level, Utrecht University's focus on open science has evolved within the context of the larger Open science movement in The Netherlands, which relates back to the *Science in Transition* initiative[1] started in 2013. This initiative is organised by scholars from the University of Amsterdam, Utrecht University, and University Medical Centre Utrecht[2]. The goal of the Science in Transition initiative is to reform the science system, moving away from bibliometric parameters to measure the quality of science and to improve the societal relevance of science[3,4]. Similarly, the Universiteiten van Nederland (formally VSNU), an umbrella organisation of Dutch universities, published a position paper that was signed by all Dutch universities to call for a recognition and reward system based on diversification in science, including through open science, rather than based on impact factors alone[5].

At the European level, Utrecht University, along with CHARM-EU partner Trinity College Dublin, is a member of the League of European Research Universities (LERU), an association consisting of 23 research-intensive and outspoken European universities founded in 2002. The objective of this network is to influence the European policy agenda in the field of research, education, and innovation by promoting collaborations. LERU has an explicit mission to 'advocate education through an awareness of the frontiers of human understanding; the creation of new knowledge through basic research, which is the ultimate source of innovation in society; and the promotion of research across a broad front in partnership with industry and society at large'[6]. Within the scope

[1] Miedema, F. (2022). Open Science: the Very Idea (p. 247). *Springer Nature*.
[2] https://scienceintransition.nl/en/about-science-in-transition
[3] Ibid.
[4] Miedema, F. (2022). Open Science: the Very Idea (p. 247). *Springer Nature*.
[5] VSNU, NFU, KNAW, NWO, ZonMw (2019). Room for everyone's talent: towards a new balance in the recognition and awards of academics. https://www.universiteitenvannederland.nl/recognitionandrewards/wp-content/uploads/2019/11/Position-paper-Room-for-everyone's-talent.pdf
[6] https://www.leru.org/about-leru

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of LERU, the topic of balancing disciplinarity, multi-disciplinarity, inter-, and transdisciplinarity is very much on the agenda. In the report published by LERU in 2016 for example, transdisciplinarity is seen as a type of interdisciplinarity, which is manifested in the form of both instrumental and critical interdisciplinarity[7]. The same report suggested that EU universities should perceive interdisciplinarity (thus, also including transdisciplinarity), as a driver of the progress of knowledge creation needed for the evolution and reconfiguration of the scientific disciplines. Several recommendations from the report are to provide an integrated strategy to overcome obstacles, create an enabling environment for interdisciplinary research and education, provide enough financial support, and make a significant and lasting impact. The report identifies that: 1) university governance, 2) science policy, evaluation, and funding, and 3) publication and valorisation of interdisciplinary research are the main targets where actions need to be taken[8].

In addition to these existing national and regional networks, UU is also part of several international university-to-university networks. Two main networks mentioned under the university central website are China Scholarship Council, which provide a grant to students from China to a grant to complete their PhD in Utrecht and Cooperation Toronto & Hong Kong, which is working on the field of public health, migration, and city science[9].

University level

Compared to other universities in the Netherlands and across the world, Utrecht University pays great attention to public engagement, mainly in the form of open science and alternative recognition and reward systems that go beyond merely scientific output. Public engagement and transdisciplinary science are understood and interpreted differently at different levels within UU. The term public engagement is mostly used at the university level under the wider open science discussion. Meanwhile, transdisciplinary science has not been explicitly used in any published documents at the university level[10,11].

[7] LERU report: https://www.leru.org/publications/interdisciplinarity-and-the-21st-century-research-intensive-university. In this report, two definitions by Klein (2010) are used: transdisciplinarity as a revolutionary idea of knowledge unification and concomitant disappearance of the disciplines. Unlike interdisciplinarity built based on disciplines, transdisciplinarity is built based on topics of interest. The second definition implies an opening of academic disciplines to players outside the academic world to include and integrate knowledge produced outside the academic system.

[8] Ibid.

[9] https://www.uu.nl/en/collaborate/partnerships/partners

[10] Although the term transdisciplinary science has been indirectly mentioned as a note to the reader at the UU strategic plan 2025 document: "In this Strategic Plan, we use the term 'multidisciplinary'. Multidisciplinarity is the basis from which we realise various forms of cooperation, both between employees working in different disciplines and between the University and society. These connections may also be interdisciplinary and transdisciplinary in nature" accessed from: https://www.uu.nl/en/organisation/strategic-plan-2025/the-strategic-plan

[11] TORCH WP7 has operationally defined transdisciplinary science as "a science that integrates knowledge across academic disciplines and with non-academic stakeholders to address societal challenges, guided by

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The overall mission and vision of Utrecht University closely relate to public engagement and societal impact through science. Considering this vision, the new university pay-off was introduced in September 2021: *Sharing science, shaping tomorrow*[12] (previously *Bright minds, better future*). This reflects UU's guiding principle of being 'open', with openness being in the "DNA of our institution"[13].

The strategies selected in the strategic plan respond directly to societal challenges, including complex societal issues such as inequality, and recently, the COVID-19 Pandemic. Besides open science, the key principles in UU's strategic plan 2021-2025 are sustainable development with a focus on achieving the Sustainable Development Goals (SDGs), collaboration across borders, future-proof teaching culture, and close-knit community (see Figure 1).

Figure 1. Five guiding principles of UU's strategic plans[14]

Most closely related to public engagement is the principle of Open Science. The **Open Science Programme**[15] is a direct manifestation of the UU Strategic plan 2021-2025. The programme is organised at the university level and stimulates public engagement and transdisciplinary science debates. Utrecht University aims to make science more open and even more reliable, efficient, and relevant to society[16]. To achieve this ambition, the Rector Magnificus commissioned a task force to draft an open science programme (2018-2021), which has been approved and launched by the executive board of Utrecht University to stimulate and facilitate open science into practice[17].

the principle that scientific rigour meets societal relevance. This corresponds with the definition adopted by OECD (2020). Addressing societal challenges using transdisciplinary research. OECD Science, Technology and Industry Policy Papers No. 88. Paris: OECD Publishing.

[12] https://www.uu.nl/en/organisation/corporate-identity/brand-policy/our-pay-off
[13] https://www.uu.nl/en/organisation/corporate-identity/brand-policy/our-pay-off
[14] https://www.uu.nl/en/organisation/strategic-plan-2025/strategy#5
[15] https://www.uu.nl/en/research/open-science
[16] https://www.uu.nl/en/research/open-science
[17] Ibid.

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The foci of open science from UU's perspective are to produce impact, increase transparency, reduce the distinction between academic and support staff, support multidisciplinary and inclusive teams, stimulate open access, develop new staff evaluation criteria, encourage cooperation, leadership, and involvement of society (See Figure 2). Initially, there were four pillars established under the open science programme: 1) **open access, 2) fair data and software, 3) public engagement, and 4) recognition and rewards.** More recently, the **open science in education** pillar has been established as the fifth pillar within the open science programme. Structurally, each pillar has a specific leader, which together with the working group, shapes the direction of their respective pillar. Open science fellows are recruited under each pillar to represent diverse faculties and serve as role models to help stimulate open science. At least one Fellow per pillar also takes a seat in the Faculty Open Science Team (FOST), to provide pillar-specific input[18].

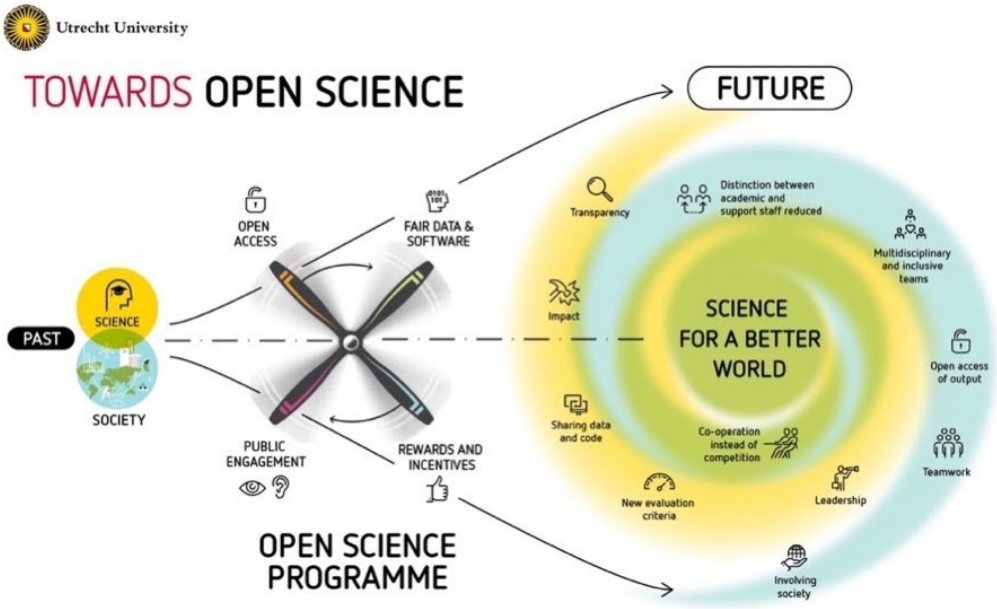

Figure 2. UU Open science programme[19]

All four pillars are relevant to public engagement and transdisciplinary science as a focus of TORCH WP7's work to explore incentives and disincentives for public engagement and transdisciplinary science. However, we will highlight the three most relevant pillars for public engagement and transdisciplinary science i.e., public engagement, rewards and recognitions, and open science in education.

The **public engagement** pillar defines **Public engagement as a myriad of ways in which the activity and benefits of higher education and research can be shared with the public**[20]. Engagement is a two-way process, involving interaction and listening, to generate mutual benefit. The pillar serves

[18] https://www.uu.nl/en/research/open-science/about-us/open-science-fellows
[19] https://www.uu.nl/en/research/open-science
[20] https://www.uu.nl/en/organisation/public-engagement-at-utrecht-university/what-is-public-engagement

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as an inter-faculty platform to raise interest in research that includes citizens and society in setting research priorities, engaging them within the research process, but also in terms of translation and communication of outcomes to a non-scholarly public to participate in public debate[21,22]. The public engagement pillar forefronts the interaction between science and society using a range of approaches, including science communication, citizen science, stakeholder engagement, and co-creation (see Figure 3). The public engagement fellows work together and develop initiatives supporting and advocating public engagement. An example of their joint work is the joint report entitled 'Open Science & Stakeholder Engagement: Why, how, and what could be improved?'. The report and publication describes the goal of engaging stakeholders, the degree to which that goal is achieved; the criteria for selecting and involving stakeholders in Utrecht University's activities; the limiting and facilitating factors in stakeholder engagement; and recommendations for the UU to facilitate stakeholder engagement[23] and reflections on how to do 'good' public engagement[24].

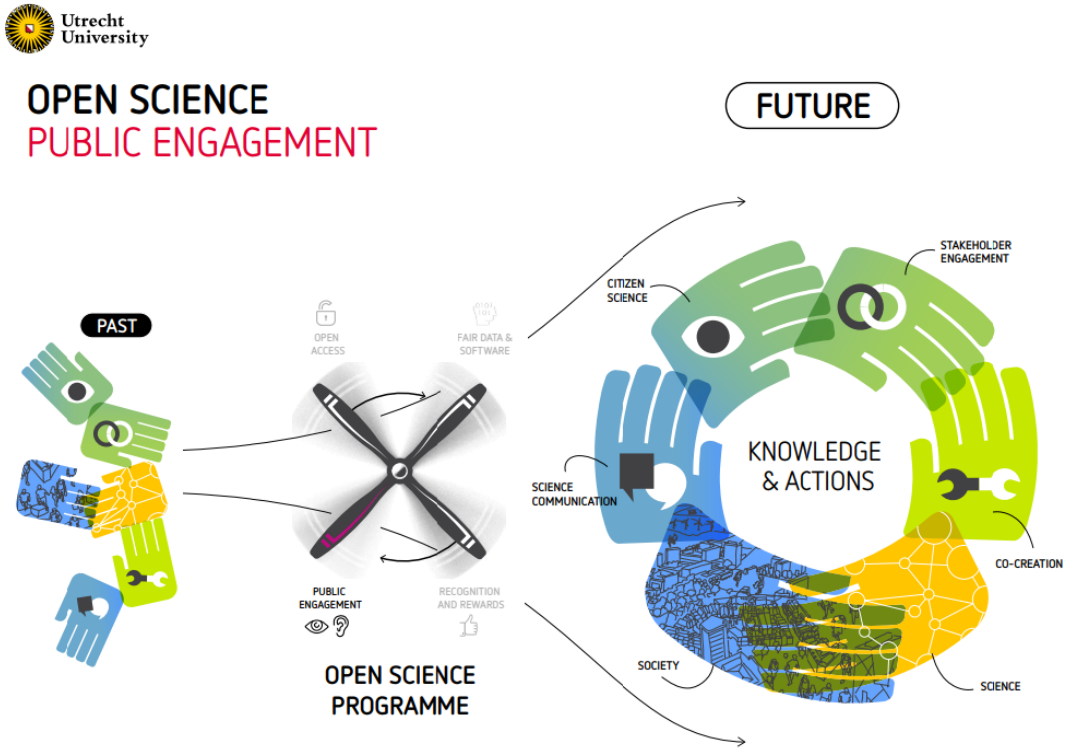

Figure 3. UU Public engagement pillar within the open science programme[25]

[21] Ibid.
[22] There is a close connection between this open science-public engagement platform and the Centre for Science Communication and Culture that is part of the university's central office. Two members of the centre's management team are involved in the coordination of the PE pillar in the Open Science Programme.
[23] Boon et al. (2020). Open science & stakeholder engagement, why, how, and what could be improved? Accessed from https://www.uu.nl/sites/default/files/Open%20Science%20Stakeholder%20Engagement%20-%20exploratory%20study%20report.pdf
[24] Boon et al. (2022). Meaningful public engagement in the context of open science: reflections of early and mid-career academics (pre-print). Accessed from https://zenodo.org/record/5839905#.Ye_PEy8w1mA
[25] https://www.uu.nl/en/research/open-science/tracks/public-engagement

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In addition to the public engagement pillar, the **recognition and rewards pillar** is also relevant to the discussion on incentives and disincentives in doing public engagement/transdisciplinary science. Rewards and recognition systems affect the change towards open science, which consists of an evaluation and incentive system for scientists to conduct science. In their vision, the rewards and recognitions pillar highlights team efforts and diversification of skills needed for open science, i.e., education, research, impact, leadership, and professional performance (such as patient care, in reference to the medical field). The challenge faced by this specific pillar is to break with the conventional science system and culture, which is still based on bibliometric scales, including impact factors, publisher brands, and H indexes[26,27,28] (see also Figure 4). Within this pillar, the development of a new evaluation model is advocated. A notable addition to the existing evaluation model is the requirement for scientists to present the narratives and indication of societal impact. The University Medical Centre Utrecht (UMCU) and other institutions under UU have already changed their promotion and tenure system[29]. Some articles even claim that Utrecht University abandons the scientific impact factor altogether in its hiring and promotion processes[30]. Like the Public engagement pillar, recognition and rewards pillar also has a fellow system[31].

The goal of the newly established **open science in education** pillar is to better integrate research and education, forefronting the value of an open attitude and bringing education and society closer together[32]. A manifesto has been developed, laying the foundation of this new open education pillar, by de Knecht et al (n.d) entitled (Re)shaping the academic self: connection education with open science. This manifesto explicated the motivation why it is important to connect open science and education, i.e., to bring education closer to reality, be more inclusive and make sure that future generations of graduates will bring meaningful contributions to society[33]. The manifesto also described four faces of open education: 1. open science mindset; 2. open science skillset; 3. open educational resources, and; 4. recognition and rewards[34]. It is expected that the open science in education pillar will further develop the current scope and focus based on these four faces of open education. However, since it is at its earlier stage of development, there is less information available.

[26] https://www.uu.nl/en/research/open-science/tracks/recognition-and-rewards

[27] Benedictus, R., Miedema, F., & Ferguson, M. W. (2016). Fewer numbers, better science. *Nature News*, 538(7626), 453.

[28] See an article in Nature Magazine: University drops impact factor: Staff at Utrecht University will be assessed through a commitment to open science. Accessed from https://www.nature.com/articles/d41586-021-01759-5

[29] Other examples can also be found in: https://www.uu.nl/en/research/open-science/good-practices/recognition-and-rewards

[30] See an article in Nature Magazine: University drops impact factor: Staff at Utrecht University will be assessed through a commitment to open science. Accessed from https://www.nature.com/articles/d41586-021-01759-5

[31] https://www.uu.nl/en/research/open-science/tracks/recognition-and-rewards

[32] https://www.uu.nl/en/news/good-that-education-is-finally-part-of-the-open-science-programme

[33] ibid.

[34] https://www.uu.nl/sites/default/file/210401%20-%20White%20Paper%20Open%20Science%20Education.pdf

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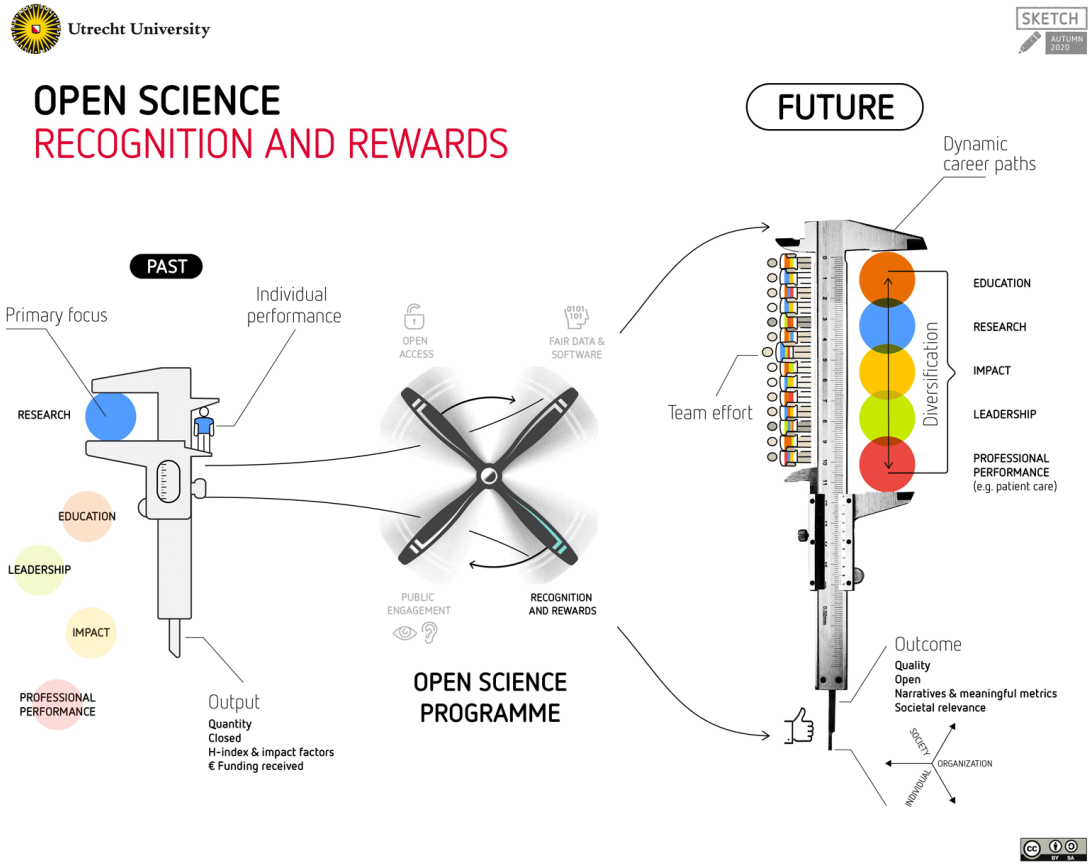

Figure 4. Recognition and rewards within the open science programme[35]

Inter-faculty level

Historically, Utrecht University has put a lot of emphasis on scientific excellence, especially for the individual level. When the UU strategic plan was introduced in 2014, more attention was paid to research cooperation, interdisciplinarity and societal impact of research. **Multidisciplinary strategic themes** are a form of inter-faculty and inter-institutional collaborations. The first guiding principle of UU's strategic plan is collaboration across borders, to address large-scale and complex societal challenges (See Figure 2). To realize this collaboration principle, four strategic themes are developed namely: 1) Dynamics of Youth; 2) Institutions for Open Societies; 3) Life Sciences and 4) Pathways to Sustainability (See Figure 5). Each consists of different faculties, research centres and institutes, and the private sector. They showcase an excellent disciplinary focus which enables a substantive multidisciplinary and natural extension of collaboration to private sectors, governmental agencies, and civil society organizations. The strategic research themes harbour fourteen hubs, which focus on tackling key societal challenges. These hubs facilitate and initiate collaboration between the university and societal partners. They act as an ultimate representation of a new way of thinking:

[35] ibid.

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one that is not based on the application or 'valorisation' of previously acquired academic knowledge but on joining forces with others to ponder research questions and strategies[36,37].

One of the multi-disciplinary themes within UU has used the term transdisciplinary science. The Pathways to Sustainability theme for example developed a guide called the transdisciplinary field guide. This is a website-based step-by-step guideline for researchers who would like to do transdisciplinary science[38]. The guide includes a variety of resources such as academic resources covering the topic of public engagement and transdisciplinary science, practical toolkits to engage societal stakeholders, and common misconceptions and field stories to inspire researchers to do transdisciplinary science.

The meaning of transdisciplinary research has been mentioned in the guide: "*Transdisciplinary research means engaging stakeholders in significant ways throughout the research process, rather than collecting data, informing stakeholders or valorising knowledge afterwards*[39]". The guide carried the mission of the Pathways to Sustainability to:" create a vibrant community fostering new research collaborations to explore pathways to sustainability, guided by the principle that scientific rigor meets societal relevance"[40].

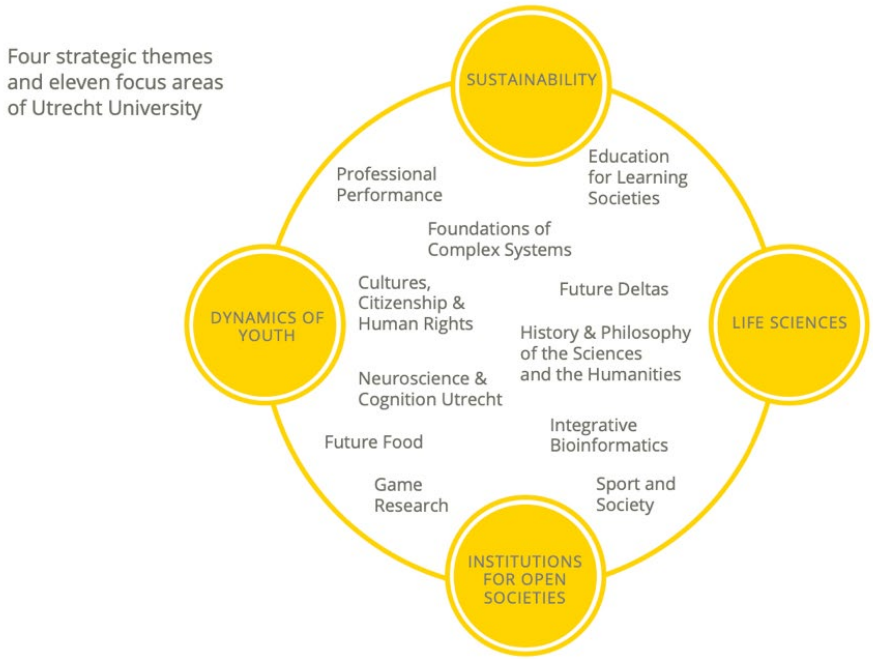

Figure 5. Multidisciplinary strategic themes within UU strategy to increase collaboration across borders

[36] https://www.uu.nl/en/research/profile/strategic-themes
[37] https://www.uu.nl/en/research/profile/collaboration-within-hubs
[38] https://www.uu.nl/en/research/transdisciplinary-field-guide
[39] https://www.uu.nl/en/research/transdisciplinary-field-guide/get-started/what-is-transdisciplinary-research
[40] Ibid.

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In terms of support system, the Pathways to Sustainability theme also established a unique position called "Transacademic Interface Manager" (TIM) which was established within the Pathways to Sustainability Theme, UU[41]. The TIM is responsible for facilitating collaboration and exchanges among scholars and stakeholders in transdisciplinary research projects. The function of the TIM position, to some extent overlaps with the Research Support Office (RSO), which is established at the faculty level (see more information about RSO under the section 1.3 below). However, TIMs are focusing more on the aspect of brokering and collaborations between science and societal stakeholders.

In addition, funding opportunities for public engagement and transdisciplinary science-related activities are also available at the level of the multidisciplinary pathways. For example, the seed-money projects funding systems within the hubs structure fund collaborative and applicative projects with a maximum of 25,000 Euros per project.

Faculty level

At the faculty level, different terminologies for public engagement are used based on disciplinary interpretation. They are mostly relevant to/interchangeable with the focus of public engagement and transdisciplinary science. Annex 4 gives an overview of relevant terms used in all faculty parts of the strategic plan (i.e., interpretations by each faculty of the university strategic plan).

As seen in Annex 3, all faculties focus on areas related to public engagement, such as a vision for sustainability, open science, societal impact, multidisciplinary, life-long learning education, international focus, diversity, and inclusion. Public engagement seems to be mainstreamed across all faculties, with some diversity; for example, the medical faculty/University Medical Centre Utrecht (UMCU) used a specific field-based terminology such as patient participation. The vision of interdisciplinarity is quite commonly adopted by all faculties. However, transdisciplinary terminology is only used by the Faculty of Science in its strategic plan document.

There are several examples of structural arrangements at the faculty level which are enabling and further promoting public engagement and transdisciplinary science. For example, the establishment of the position of Vice-dean on impact at the Faculty of Law, Economy, and Governance[42]. In some faculties, such as the Faculty of Geosciences, although there is no dedicated structural position on impact, it has been considered as a responsible area for the vice dean of research. Recently a professor was also appointed on public engagement and oceanography, which is shared by the Institute for Marine and Atmospheric research Utrecht (IMAU) and the Freudenthal Institute (FI) at the Faculty of Science[43]. In terms of a support structure, each faculty has a research support office (RSO) that supports researchers in the entire process to acquire grants through providing advice, information, reading, examples, budget assistance, data management, ethical questions,

[41] https://www.uu.nl/en/research/transdisciplinary-field-guide/in-practice/who-team-tims
[42] https://www.uu.nl/staff/MNoordegraaf/Profiel
[43] https://www.uu.nl/en/news/erik-van-sebille-appointed-as-professor-of-oceanography-public-engagement

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administrative data[44]. The support includes information on grant calls, examples of proposals, budget assistance, data management, support with ethics procedures, administrative data, and advice on how to engage with external partners.

3.1.2 Overview of good practices on transdisciplinary science and public engagement

We have selected 7 good practices to learn from within Utrecht University. These practices have diverse disciplinary origins, thematic foci, societal stakeholders involved, and activities (in terms of research, education, and their interplays). We have also selected one practice that reflects the use of citizen science as means to engage society. Table 1 below summarizes our selection of practices to learn from, and in turn, we will provide an overview of these practices.

Table 2. List of UU's good practices

#	Good practices	Education/Research/both	Website
1	UU Community-engaged learning	Education	https://www.uu.nl/en/education/community-engaged-learning
2	Sustainable industry lab	Research and education	https://www.sustainableindustrylab.nl/
3	Mixed classroom	Education	https://www.uu.nl/en/research/urban-futures-studio/initiatives/mixed-classroom-techniques-of-futuring
4	Citizen science: collaboration on monitoring nature-based solutions for coastal protection in Surinam and The Netherlands	Research	https://www.uu.nl/en/news/new-recipients-of-public-engagement-seed-fund https://www.coastsnap.com/
5	Thematic Interdisciplinary Challenge Course (TIC)	Education	https://tic-to-tic.sites.uu.nl/en/
6	Galapagos plastic-free		https://galapagosplasticfree.nl/
7	Land Governance for Equitable and Sustainable Development (LANDAC)	Research and education	https://www.landgovernance.org/

UU community-engaged learning

Community-Engaged Learning (CEL) at Utrecht University enriches and strengthens classical university-based teaching, through direct dialogue with society. In CEL, a community of shared concerns, consisting of students, teachers, and social partners, raises hard questions about societal issues, large and small, and seeks creative solutions through sustained contact and reciprocal commitment to each other. This form of shared exploration and mutual learning is a means to a

[44] https://www.uu.nl/en/collaborate/contact-regarding-collaboration

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larger end: connecting university and society in a long-term relationship. Research, teaching, and learning cannot exclusively be defined or conducted within the confines of the university but must also find fruition in direct dialogue with society. Therefore, Community Engaged Learning is based on reciprocal relationships between students, teachers, and social partners, with each learning from the other. For students, CEL offers the possibility to reflect upon hands-on experience but a formative experience about how they might in the future engage with society. For teachers, it is an opportunity to learn from new partners and to conceive new ways of teaching and researching. For community leaders, it is a chance to gain new insights and approaches to the problems they face - and to teach others about the issues of shared concern. Important about Community Engaged Learning is the focus on cooperation with external partners and learning from each other. Reciprocity is a core concept in CEL, which creates learning experiences for both students and our partners and thereby decrease the gap between the university and society[45].

Sustainable industry lab

The Sustainable Industry Lab (SIL) distils important choices and their consequences of the industrial sustainable transformation between 2020 and 2050. Using synthesizing academic and expert knowledge, SIL aims to improve the quality of the societal and political debate to reach a carbon-neutral Dutch industry by 2050. SIL furthermore aims to reach this goal by realizing a visualization of possible industry futures, fitting into the global sustainability agenda as well as the Dutch economic aspirations. Over the next five years, SIL will work on academic and policy papers, informing society and policymakers on the consequences of certain choices. SIL's vision is the acceleration of the industrial transformation that matches national economic aspirations with the global sustainability agenda. SIL'S mission is to 'articulate and visualize the consequences of important choices by combining academic and expert knowledge; raise the level of societal and political debate on the choices related to the transformation of Dutch industry and imagine and visualize the futures implied by the choices.' In terms of strategy, SIL frontlines the cooperation between academia, industry, government, and societal partners, to synthesize and unlock knowledge necessary for the choices ahead. Through futuring techniques, collaborations between academia and stakeholders, and a creative process, the Sustainable Industry Lab will fulfil an independent position in the societal and political debate. Our activities are aimed at offering knowledge and policy recommendations to untangle essential societal dilemmas.[46]

Mixed classroom

The Mixed Classroom concept is based upon a democratic understanding of research and education as a form of inquiry: supportive of public debate and political decision-making, concerning long-term challenges. For this reason, the composition of the course (mixed classroom) has been developed in close connection to its content (imagination of the future) and form (off-campus education and the involvement of designers and artists). This course aims to give participants, both

[45] https://www.uu.nl/en/education/community-engaged-learning
[46] https://www.sustainableindustrylab.nl

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students and professionals, a better understanding of the available techniques to deal with inherently uncertain futures by imagining what cities of the future may look like, and how they will be experienced by their future inhabitants. During the course, students develop a conceptual and practical understanding of the available techniques for imagining the future. Such as design thinking, scenarios, creative writing, and the staging of public participation. The course offers a mix of (guest) lectures, interviews, case exercises, and discussions. Using the mixed classroom format, students learn to apply the acquired theoretical knowledge in case studies on future cities. Participation in this course offers you the possibility to gain hands-on experience in connecting ideas to action in collaboration with policymakers, on topics that are both scientifically innovative and societally urgent. In addition, you get taught innovative forms for doing research and presenting research.[47]

CoastSnap

CoastSnap is a global citizen science project to capture our changing coastlines. CoastSnap relies on repeat photos at the same location to track how the coast is changing over time due to processes such as storms, rising sea levels, human activities, and other factors. Using a specialised technique known as photogrammetry, CoastSnap turns photos collected from citizens into valuable coastal data that is used by coastal scientists to understand and forecast how coastlines might change in the coming decades. Photogrammetry enables the position of the coastline to be pinpointed from participants' snaps to an accuracy similar to that of professional coastal survey teams. The project asks citizens to capture photos at the same location (by using one of the official CoastSnap camera cradles or a do-it-yourself adaptation) and record the precise photo time in the App. The more photos the project has of a particular site, the better our understanding becomes of how that coastline is changing over time. Two "CoastSnap" sites are arranged by researcher from UU, i.e., in Paramaribo, Suriname and Egmond aan Zee, NL. The idea stems from the UNSW in Sydney and over the past 2-3 years this concept has found its way to various countries and locations[48]

Thematic interdisciplinary challenge course (TIC)

TIC is a challenge-based course for year-3 Bachelor's students, Master's students, and lifelong learners from all disciplines and backgrounds. The course promotes interdisciplinary and cross-level collaboration while solving real-world problems. The course allows participants to experience how their knowledge and specific skills can be used in the search and implementation of solutions for pressing social issues. No substantive background knowledge is required to join this course[49].

Galapagos plastic-free

This project develops a predictive clean-up tool to allow the efficient removal of plastics from beaches on the Galapagos Islands. A particle tracking software has been used to combine ocean current data with wind, tides, and wave models to accurately track the movement of particles that

[47] https://www.uu.nl/en/research/urban-futures-studio/initiatives/mixed-classroom-techniques-of-futuring
[48] http://www.coastsnap.com/
[49] https://tic-to-tic.sites.uu.nl/en/

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resemble plastics through the oceans. This project is part of the Plastic Pollution Free Galapagos, which is an international alliance of experts working to combat the threat plastic pollution poses to the unique biodiversity of Galapagos, Ecuador. Oceanographers, marine biologists, ecotoxicologists, environmental psychologists, policymakers, and even archaeologists are working together to identify major sources of pollution, to understand and address the risks to wildlife, and to test solutions to decrease the impacts of plastic waste in the region. Results underpin coordinated education, outreach, and advocacy efforts aiming to make the Galapagos Marine Reserve the first marine protected area to be free from the threat of plastic pollution. Technologies, processes, and approaches developed within the program will be made available to support the efforts of island nations and archipelagos worldwide to tackle this global challenge[50].

LANDAC

LANDac, the Netherlands Land Academy, is a partnership between Dutch organizations and their Southern partners working on land governance for equitable and sustainable development. The LANDac network brings together actors, conducts research, and distributes information, focusing on new pressures and competing claims on land and natural resources. To understand and address new and existing types of land-related conflicts, LANDac brings together stakeholders who might not otherwise meet – particularly academic researchers, private sector and civil society representatives, and policymakers in the field of land governance and development. Pressing themes that are addressed under LANDac II include the impact of large-scale land deals in agriculture for food production and biofuels, infrastructure development, women's land rights, post-conflict and urban land governance challenges, climate adaptation, and migration. LANDac believes that a multi-stakeholder and participatory approach is the best way to ensure human well-being is at the centre of the land agenda.

3.1.3 Incentives and disincentives

In this section, we will present insights from the experiences of the individual (researcher), university, societal stakeholders, and systemic types of (dis)incentives that are relevant to realising transdisciplinary science in the sustainability science domain. Diverse types and levels of good practices have been collected and analysed, for example, good practices that are originated from different domains or disciplines, the type of societal stakeholders involved, and level of engagement (see Section 3).

3.1.3.1 Individual level

Incentives

Based on our interviews, the core individual incentives to promote transdisciplinary science and/or public engagement lies in the **intrinsic moral obligations of individuals**. During the interviews, several phrases have been used by university scientists to reflect their internal moral obligations,

[50] https://galapagosplasticfree.nl

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including personal calling (U1), desire to contribute to societal changes and transformation (U2), realizing impact (U3-U7, U10), and preparing the next generations to have future-ready skills to solve societal challenges (U1). Most of the university staff we interviewed linked their public engagement and transdisciplinary science-research activities with educations (U1-U5, U10). One of the notable examples is the community-engaged learning programme[51], aimed at utilizing research conducted by scientists for knowledge generations AND to pass this knowledge to the next generations (i.e. students and the younger public in general) (U1). A common practice to connect research and education is to combine them with existing transdisciplinary collaborative networks. Some practical examples are: inviting guest speakers from their research networks to give lectures to students and combining research projects with internships and thesis projects (U1-U5, U10).

The societal actors involved in public engagement activities shared similar visions, to be able to produce impact (S17-S19). A collective understanding of the impact mentioned by the societal stakeholders' interviewees is the change of behaviour and change of policy simultaneously (S18; S19). Both university actors and societal stakeholders mentioned 'networking value' as a form of incentive, which could help both university scientists and societal stakeholders in their current and future career development (U1-U6; U10; S17-S19). The sense of belonging in one community, and that each actor is there to support each other in the longer term, not only based on short-lived projects was one of the key desires of societal stakeholders to realize long-term impact (U1; U10; S17; S18). Another important individual incentive mentioned is the mutual learning aspect from and with university and societal stakeholders (S19). Although intrinsic moral obligations seem like a predominant driving force, there are also external incentives that influence researchers' level of motivations to initiate or be involved with public engagement and transdisciplinary-related science activities. External incentives include the possibility of promotions (U3, U5), funding supports (U3, U8, U10), and capacity building (such as training and practical administrative supports) (U3, U4, U8, U10). The establishment of unique career positions as highlighted in section 1, such as vice dean on impact, professors in oceanography and public engagement are to some extent an incentive by themselves.

Disincentives

The external incentives mentioned above are often also disincentives. Several disincentives mentioned by our interviewees are **lack of possibility of promotions/benefits for career, funding support, and capacity building**. The lack of possibility for promotions means that scientists cannot make a career out of public engagement and transdisciplinary science initiatives. This is very much related to the discussion on rewards and recognitions. Our interview findings show that currently, pursuing public engagement and transdisciplinary science is seen as a sidekick/hobby rather than an activity that directly benefits academics' future career (U5, U6). Furthermore, time limitation is mentioned as a consequence of the prioritisation of education and research (what university scientists are expected to primarily focus on) and the workload. Conducting fundamental research is still considered 'the norm' for the university (U9). The systemic pressures are still on for scientists

[51] https://www.uu.nl/en/education/community-engaged-learning

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to perform based on the conventional assessment standards (e.g., number of publications, H-index) (U1-U3; U5-U7). A lack of capacity building is also mentioned by several interviewees, in terms of lack of training to gain skills required to conduct public engagement or transdisciplinary science. This includes science communication skills, networking skills (not only to establish but also to maintain the network in the longer term), teamwork, management, and intercultural skills among others (U10; S18, S19). Disincentives also include a lack of practical support. Interesting to note is that the degree of all limitations/disincentives is often higher for early career researchers (U1-U5).

3.1.3.2 University level

Incentives

At UU, the existing structure and policies reflect the high motivation of the university to pursue open science and realise its impact on society (U6, U9). The structures and policies at the level of the university in itself provide incentives (see section 1). However, the driving force of these existing structures and policies is often the intrinsic leadership and entrepreneurship shown by a number of key actors, including people who are responsible at the administrative level (from the university to department or group levels), university professors, young researchers, teachers, students, and support staff (U6, U9). Take an example of the Science in Transition initiatives, the Open Science Community Utrecht[52], The Centre for Unusual Collaborations (CUCo)[53], and many more. These are the types of initiatives that drive further development of the Open Science Programme. The availability of supporting systemic policy is also crucial to the continuous motivation of the university to continue working on open science, public engagement/transdisciplinary science is. This includes, for example, the signing of the San Francisco Declaration on Research Assessment (DORA), aimed at assessing research and researchers by shifting the focus from bibliometric indicators (such as publications and citations) to a more holistic, qualitative approach. Equally important is the support from the system, especially the regional (EU) and national (NL) research and educational policies, funding mechanisms such as Horizon 2020 (now Horizon Europe), and Erasmus+. These funding sources have enabled and stimulated public engagement, inter-, and transdisciplinarity within and across European universities, including UU. More elaborations on the overview of policy and funding systems can be found under the systemic level section.

Disincentives

The development of the vision and mission of open science at UU is not without obstacles, especially thinking about operationalization and future directions (U6, U9). Visibility and impact of current policies and structures in place at the university level is a common challenge. Many initiatives have been taken by the university to promote open science, and therefore are expected to also improve public engagement and transdisciplinary science (see section 1 of this report). However, not all university actors are aware of and can benefit from the system. Interviewees mentioned that the

[52] https://openscience-utrecht.com/
[53] https://www.unusualcollaborations.com

diversity and complexity of the university, starting from the core university level to faculty, department, and group level could make effective operationalizations difficult (U6, U9). This is especially the case since each level at the university (faculty, department, programme group level) entails good science, the very definitions of open science, the position, and quality of transdisciplinary science and public engagement (U9, FGD). A challenge is how to move beyond window dressing, setting an ambitious, but at the same time feasible and collective goal to achieve in the short-, mid-, and long-term (U9)[54]. Another disincentive for the university is unhealthy competition. For example, in regards to the vision on international collaborations. Existing collaborations at the level of the university are arranged mainly through bilateral/trilateral, country to country, and university to university partnership (U9, see also section 1). For example, if one university partner has been selected from a particular country, then it would be difficult to invite other universities from the same country (U9), due to administrative and presumably, political reasons.

In general, UU is quite advanced in outlining its open science vision, including public engagement and rewards, and recognition (see section 1.3). However, our interviews revealed that the required next steps are to get necessary instruments in place and ensure effective implementation amidst the diversity and complexity of the university system (U2, U6, U9). This includes the importance of administrative support, training for the new, motivated actors to initiate/be involved in public engagement initiatives in their research and educational activities (U2, U6, U9).

3.1.3.3 Societal stakeholder level

Incentives

The interviewees who are societal stakeholders mentioned several incentives that motivated them to work with university partners in sustainability topics: **network, lifelong learning, financial support, and alignment of objectives**. Similar to what has been mentioned under the individual incentives, networking is a valuable incentive for societal stakeholders. The individual and collective networks are beneficial for societal stakeholders to establish and keep personal and professional connections in the longer term. Networking also creates visibility for societal stakeholders. In addition, the lifelong learning aspect is highly valued by societal stakeholders. Interviewees from the consultancy, for example, mentioned that working with scientists has helped them to learn from different perspectives, "get back to the class", refresh their knowledge, use scientific evidence, and learn not only together with the senior scientists, but also together with students involved in the collaboration. Through these experiences, they can reflect on the way they are doing their work (S17-S19).

[54] See also Boon et al. (2020). Open science & stakeholder engagement, why, how, and what could be improved? Accessed from https://www.uu.nl/sites/default/files/Open%20Science%20Stakeholder%20Engagement%20-%20exploratory%20study%20report.pdf

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Although not mentioned as a goal in itself, financial incentives also influence the motivation of societal stakeholders (S17, S18). One of the outcomes of an established network with university partners and other actors is collective project ideas and proposals, which can be utilised to acquire funding. According to the societal stakeholders we interviewed, the most important aspect to maintain cooperation and equal interest is that it contributes to organisational objectives. For example, for the consultancies, their goal is to deliver better services (S17, S18).

Disincentives

In terms of disincentives, some limitations mentioned by interviewees are **finding or selecting university partners and actors to work with, misalignment of objectives and timeframes, and complex university procedures and bureaucracy for collaborations.** The former refers to the dilemma experienced by societal stakeholders to find or select appropriate university partners to collaborate with. This is mostly the case when they have to find or select new partners (S17). Either university or societal partners will logically select partners they are familiar with, have a prior history of successful collaborations, and can be trusted to carry and implement collective objectives. This can be a tricky and political situation, especially when we discuss the issue of diversity and inclusiveness. Here, the issue of lack of capacity becomes relevant. To come up with successful collaborations, one would need access to good-quality resources. This is a challenge, especially among partners with marginalised positions (U10). Some societal stakeholders are not remunerated for spending their time for collaborations with university partners. This can reduce the sense of ownership and quality of the collaborative work (U6, U10). Furthermore, misalignment of objectives and timeframes is also acknowledged as a disincentive. The science funding system is currently not very supportive of longitudinal/long-term projects (U10), which forces the actors from the university or industry to have a piecemeal, short-term project-based type of mindset. While the societal stakeholders such as NGOs may have a longer-term mindset, for example, to change the behaviour of the community will take decades to be realised (S17, S18, U7, U10). Finally, complex university procedures/ bureaucracy for collaborations is also mentioned as an obstacle (S18). This relates to the legality of collaborations and project-related management issues (U6, S18).

3.1.3.4 Systemic level

The systemic level here can be divided into two levels: regional, and national level.

Incentives

At the regional level, sustainability and open science are a policy priority of the European Commission (EC). The communication of the new European Research Area (ERA) published in 2020 stated that EC has set ambitious goals and put instruments on sustainability. This includes climate neutrality, greenhouse gas emission, clean technology, and health[55]. Through its research and innovation strategy 2020-2024, EC supports open science and collaboration across academia, industry, public authorities, and citizen groups in research and innovation to address societal

[55] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A628%3AFIN

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challenges (E14). In developing their open science policy, EC has formed two expert groups. The first one is the expert group on open science policy platform to further develop and practically implement the policy. The second one is the expert group on indicators, with the task to propose indicators for researchers' engagement with open science and its impacts supporting and acknowledging open knowledge practices. Furthermore, there are 8 ambitions of the EU's open science policy[56]. The most relevant ambitions to public engagement and transdisciplinary science are the new generation metrics or research quality and impact, mutual learning exercise on open science, including altmetrics (metrics to measure the qualities and impact of research outcomes) and rewards (alternative rewards for researchers to engage in open science activities), future of scholarly communication through freely accessible peer-review and diversity of research output, education, and skills, and citizen science[57]. A concrete financial incentive provided by the EC is the Horizon Europe Programme. Horizon Europe, started in January 2021 is the successor programme of Horizon 2020 and promote open science and collaboration with diverse stakeholders through promoting the adoption of open science practices, from sharing research outputs as early and widely as possible, to citizen science, and developing new indicators for evaluation research and rewarding researchers.

At the national level, The Netherlands actively promotes open science and the involvement of the public in science. The Dutch National Research Council (NWO), for example, has been committed to taking the lead on open science through open access publishing requirements, transparent research data management, citizen science, and by taking part in the DORA declaration on new ways to assess research and researchers[58]. The latter two, citizen science and DORA declaration are highly relevant to public engagement and transdisciplinary science. NWO defined citizen science quite broadly as: Involving citizens in scientific research[59]. To promote citizen science, NWO opens up the possibility to include citizen science activities in the project budget for NWO proposals. The budget includes reimbursing expenses for volunteers, recruiting or training citizen scientists, or fund (digital) infrastructure required to enable citizen scientists to engage in research[60].

A breakthrough in the national policy and funding system is the establishment of the Dutch National Research Agenda (NWA) of NWO. The agenda was a product of collaborative input from citizens and

[56] The eight ambitions of the EU's open science policy are: Open data, European Open Science Cloud (EOSC) New generation metrics or research quality and impact, Mutual learning exercise on open science, including altmetrics (metrics to measure the qualities and impact of research outcomes) and rewards (alternative rewards for researchers to engage in open science activities), Future of scholarly communication through freely accessible peer-review and diversity of research output, Research integrity and reproducibility of scientific results, education, and skills and citizen science. Accessed from: https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/our-digital-future/open-science_en

[57] https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/our-digital-future/open-science_en

[58] https://www.nwo.nl/en/open-science

[59] https://www.nwo.nl/en/citizen-science

[60] Ibid.

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scientists to ensure that knowledge could be used for structural contributions to future society[61]. In total, 12,000 questions from citizens were grouped in clusters, representing urgent issues for research and innovation. Twenty-five routes were established based on these issues[62]. Several funding mechanisms are available for realizing the vision of NWA. One of the main fundings is the Research along Routes by Consortia (NWA-ORC). This science-encompassing funding round is aimed at making interdisciplinary research and innovation possible, so that scientific and societal breakthroughs come within reach. In total there is a 106.3 million euros budget available for the NWA-ORC 2022[63]. With regard to quality assurance, to ensure that impacts will be adequately considered, the NWA programme requires proposal applicants to submit an impact pathways plan approach (E12, E13, E14). In some of the funding programmes of NWO, there are also some good practices to ensure smooth collaborations and effective co-productions of knowledge between stakeholders. For example within the Applied and Engineering Science programme, Regular interim stakeholder platforms have been organised by NWO.

Disincentives

Our interviews with actors who are taking roles in either regional or national systems revealed that there are several disincentives at the systemic level: Limited collective interests and prioritization from the 'big players' and autonomy of universities. In terms of interests, many initiatives have been taken at the national level by relevant key agencies such as the Ministry of Education, Culture, and Science (OCW), Dutch Research Council (NWO), The Royal Netherlands Academy of Arts (KNAW), and Universiteiten van Nederland (UNL). However, the effectiveness of collaborations among these agencies can be improved by streamlining different visions into collective priority agenda (E12)[64].

Although there are many funding systems available to support public engagement and transdisciplinary science, the quality assurance, including formative evaluations to assess the quality of transdisciplinary research, can be improved. More experts in transdisciplinary science and standards are needed (E12; E15). In addition, the distinct autonomy of the universities is mentioned as both a challenge and an opportunity. Policies can be made at the regional and national levels, but in the end, strategies and their implementation would be up to individual universities (E12-E15). Like science, the policy direction and funding schemes for public engagement and transdisciplinary science are in transition. There are efforts to broaden science, but parallel steps should be taken from both policy and science sides to influence changes in funding systems (E13, E14).

[61] https://www.nwo.nl/en/researchprogrammes/dutch-research-agenda-nwa

[62] More information about the 25 routes can be accessed from https://2.wetenschapsagenda.nl/wp-content/uploads/2016/12/nwa_deel_eng_digitaal.pdf

[63] https://www.nwo.nl/en/researchprogrammes/dutch-research-agenda-nwa/research-along-routes-consortia-nwa-orc

[64] The issue of limited collective interests has been mentioned by the interviewees, however more research is needed to confirm this finding and substantiate the problem.

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3.2 Eötvös Loránd University Budapest (ELTE)

3.2.1 Existing university structure and policies relevant to public engagement and transdisciplinary science

Public engagement and transdisciplinary science are not centrally institutionalised at ELTE, however they are present in the scope and activities of several units on both central and faculty / department level. Central units closely linked to certain aspects of public engagement are the Rector's Cabinet Science Policy Office (SPO) and the Rector's Cabinet University Strategy Office (USO). The Science Policy Office (SPO) is responsible for institution-wide research & scientific strategies, is involved with the creation of the institution's OS strategy as well as mainstreaming OS. Also, this Office coordinates several initiatives to foster science communication, public engagement (citizen science, OS), e.g. in the form of an annual science communication competition for PhD students (since 2019), as well as Promising Researcher of ELTE - 'Opening Up Science' Special Award (since 2019), Researcher's Night, ELTEFeszt etc. (more details in point 2.1).

The University Strategy Office (USO) was established in 2020 (active from the end of 2020). It operates under the supervision of the Vice-rector for General Affairs, who is responsible for the development and coordination of university level policies, strategies and institutional development plans. One of USO's major foci is third mission: it aims to initiate, coordinate as well as monitor complex projects as well as inter- and multidisciplinary activities on a national and international level which require cooperation both across the University's faculties and beyond academia: with the public and business sectors. The USO identifies and valorises the third mission activities at ELTE and, in cooperation with ELTE's Directorate of Communications, Marketing and Recruitment, it is actively involved in the communication and dissemination of the results of ELTE's third mission contribution.

Public engagement and transdisciplinary science activities, projects are present at practically all faculties of ELTE, however, due to their educational and research profile, certain faculties and departments are more organically involved with PE than others. For example,

· the Faculty of Social Sciences offers among others a Public and Civil Studies MA programme[65] as well as Social Work BA and MA programmes[66] etc.,

· at the Faculty of Special Needs Education, there is, among others, an institute dedicated to social participation (Institute for Disability and Social Participation)[67]; and, overall, PE in relation to disability issues is a key commitment of the faculty as a whole[68]

[65] https://tatk.elte.hu/mesterszakok/civil
[66] https://tatk.elte.hu/szakok/alap/szocialismunka ; https://tatk.elte.hu/mesterszakok/szocialismunka
[67] https://barczi.elte.hu/en/content/institute-for-disability-and-social-participation.t.1314?m=284
[68] https://barczi.elte.hu/en/

· the Faculty of Education and Psychology includes the Institute of People-Environment Transaction conducting inter- and transdisciplinary research on human-environment interaction[69] and the Intercultural Psychology and Education Research Group with focus on the integration of minorities[70]; etc.

Besides the above mentioned, public engagement and transdisciplinary science activities and projects are distributed across other faculties basically at a department / research group level (e.g. Faculty of Law, Faculty of Humanities, Faculty of Sciences, Faculty of Informatics etc.).

The visibility of these activities and projects depends very much on the capacity and (ideally, active) approach of the participating researchers but in general, there is certainly need for mainstreaming and thus the enhancement of visibility both within the institution and beyond.

Since its launch in 2020, ELTE has participated in the National Laboratories Programme initiated by the Hungarian National Research, Development and Innovation Office (NRDIO) with the policy support of the Hungarian Ministry for Innovation of Technology. National Laboratories are dynamic, institutionalizing, collaboration-based arenas of discovery and experimental research that open up new, international dimensions and enable the social, economic and environmental utilisation of research results. Presently, the University is involved in four National Laboratories either as coordinator or partner, among which the National Laboratory for Social Innovation (TINLAB) coordinated by ELTE is especially worth mentioning with regard to PE, showcased below as institutional best practice.

ELTE's recently accepted Institutional Development Plan (IDP) 2021-2024[71] emphasizes a strong third mission approach in the full spectrum of educational, research and innovation activities of the University, with special emphasis on topics and activities related to environmental sustainability, inclusion and equal opportunities, digital transformation, emerging technologies, economic competitiveness, social responsibility, etc. The IDP 2021-2024 foresees the creation of a Third Mission Strategy which will support the university's commitment to further deepen its embeddedness in the local/regional/national ecosystem through diverse contribution to address pressing social and economic needs and challenges. Of course, this can only be carried out effectively in continuous dialogue and cooperation with societal stakeholders and industry partners. Therefore, the IDP 2021-2024 sets the agenda to approach external partners and create collaborations in the framework of educational programmes as well as R&D&I activities.

Beyond the general institutional approach and central initiatives - e.g. participation in National Laboratories, various advisory bodies & networks, recruitment, knowledge transfer, incubation, etc.), the setting of research agendas with the involvement of societal stakeholders is practically carried out mainly at a faculty/department/research group and even individual researchers' level. The IDP 2021-2024 emphasises the importance of making state-of-the-art scientific results

[69] https://ekti.ppk.elte.hu/intezet
[70] https://ppk.elte.hu/en/units/intercultural-psychology-and-education-research-group
[71] In Hungarian: https://www.elte.hu/dstore/document/7002/ELTE_IFT_2021-2024.pdf

accessible not only for the scientific community and business partners, but also visible and comprehensible for the general public. Therefore, significant institutional developments are envisioned among others in the field of mainstreaming Open Science (in accordance with that, an OS Strategy is currently being developed), science communication through various programmes and events as well as citizen science projects.

As mentioned earlier, besides a few central structures and initiatives related to public engagement and transdisciplinary science at ELTE, relevant activities, projects etc. are mostly distributed among the faculties or at a department/research group/individual researcher level, and typically not mainstreamed or interconnected within the institution. More than once, the lack of visibility of individual PE projects (and the need to improve on that) was mentioned by ELTE-affiliated interviewees during the 'flagship project' focus group discussions organised in the framework of the TORCH WP7 data collection. There may also be intra-institutional differences in the understanding of the actual definition of 'public engagement' (and related definitions, such as community engagement, civic participation, etc.), its levels, and the range of initiatives and activities it could actually involve. Therefore, the understanding and visibility of public engagement and transdisciplinary science would definitely require improvement at ELTE. Beside processes already in motion within the University in this regard, this claim is partially addressed in the above-mentioned IDP 2021-2024 (and the future Third Mission Strategy) and the role of the recently created USO in improving the visibility of third mission activities and initiatives in- and outside the institution is also worth mentioning.

3.2.2 Overview of good practices on transdisciplinary science and public engagement

3.2.2.1 University level initiatives Promising Researcher of ELTE - 'Opening Up Science' Special Award[72]

Related to the similar system of 'Promising Researcher of ELTE' Award launched in 2015, the University established the 'Opening Up Science' Special Award from 2020 onwards in order to acknowledge scientists who have significant achievements with regard to Open Science: open access publishing and establishing or editing open access journals, handling research data as open data, and the engagement, involvement of extra-academia individuals or communities (e.g. school classes) interested in scientific research in scientific work.

Application is open to lecturers and researchers below 40 years of age, who hold a PhD degree, are affiliated to research groups employed by ELTE or HAS research groups working at the University and have not yet won support either from the 'Momentum' (Lendület) Programme of the HAS nor at any of the ERC calls, and have yet not been awarded with the title 'Promising Researcher of ELTE'. Proposals have to include a 2 to 3 page summary of the open science and citizen science activity to be acknowledged, the relevant references and publications, furthermore the indication of any source demonstrating or certifying the open or citizen science activity.

[72] https://www.elte.hu/content/az-elte-igeretes-kutatoi.t.10709

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The submitted proposals are assessed and the award is granted by the ELTE Scientific Council; invited experts may also be consulted in the frame of the assessment process. The laureate receives a sum of gross 1 million HUF (financed by the ELTE Scientific Fund) and may choose to request this amount as a personal payment or for material expenses. Presently, there are only a couple of applications annually. Although the initiative can be considered quite new, certainly, efforts must be made to encourage more participation. Also, at the moment there is no follow-up of the laureates, however there are plans to revisit them every few years to follow their career.

Annual Science Communication competition for PhD students[73]

The competition is organised annually by the SPO since 2019, and has a double aim: on the one hand, it provides ELTE PhD students participating in the 'New National Excellence Programme' (ÚNKP) and the 'Cooperative Doctoral Programme' (KDP) a platform where they can develop their skills related to science communication and popular science; on the other hand it provides more visibility to the results of scientific research carried out in the frame of the above-mentioned programmes. Presently, the contest is only open for ÚNKP and KDP students, however there are plans to largely extend the circle of applicants by introducing diverse categories (MA/MSc students, PhD students regardless of ÚNKP/KDP background, lecturers/researchers etc.).

Students can apply in three categories (video, post/short article, meme). In principle, entries are assessed by the Vice-rector for Research in consultation with the Head of the SPO, a representative of the Directorate of Communication, Marketing and Recrutation. Other consultants may also be invited occasionally (e.g. the Vice-dean of one of the Faculties, the Head of the Library of the Faculty of Sciences, the Head of USO etc.).

Evaluation criteria include comprehensibility for the general public, potential to raise interest, quality of conveying information etc. Winners are announced according to category as well as target audience. Laureates receive an ELTE gift set (financed by ÚNKP); winning entries are made available at the ELTE website and also sent to the NRDIO (being the funding body for ÚNKP and KDP). In 2021, there were 50 entries. At the moment there is no follow-up of the winners, however there are plans to revisit them every few years to follow their career.

Major science communication events at ELTE: Researchers' Night and ELTEFeszt

Researchers' Night[74] is the largest event in Europe promoting science. In Hungary, ELTE is a major participant offering more than 200 programmes each year open to the general public. By launching flash mob-like activities and involving the audience in spectacular scientific experiments, the aim of the event is to create a better understanding of science among citizens as well as to orient young

[73] https://www.elte.hu/content/iii-tudomanykommunikacios-verseny.t.23226
[74] https://www.elte.hu/content/kutatok-ejszakaja-2021.e.13885

generations towards a career in science and innovation. In 2021, the 17th Researchers' Night involved several hundred programmes in various institutions in more than 50 Hungarian cities.

ELTEFeszt[75] is a festival organised by ELTE for high school students to orient them towards university education and a possible career in science, and to familiarize them in an interactive way with ELTE's facilities, educational offer and research activities. Prospective students can get to know the campuses, talk to staff and current students to discover what university life is like. Also, they can attend talks and presentations about the university, departments, courses, research, student organisations and more. Professors and teachers host workshops and taster sessions.

Besides the above, several science communication events and initiatives are present at faculty level, including the following:

- The Department of Ethology organizes an annual conference to inform the general public about their latest findings in different research areas regarding dogs and other animals living with humans. In 2021, the 8th Family Dog Project Conference included 22 presentations through which interested citizens and especially dog owners who took part in the research could learn about the results and proceedings of the projects they were involved in.[76]

- 'Energy University' is a cooperation between ENERGIAKLUB[77], and the Department of Environmental and Landscape Geography at ELTE with the aim of organizing a series of round tables where scientists and energy professionals from the industry and NGOs can present and discuss new scientific findings and also their practical aspects to the press and most importantly to the general public. Since its launch in early summer 2021, 3 events have been organised and more are to follow.[78]

- In 2021, the Rhetorics Research Group of the Faculty of Primary and Preschool Education announced a science communication competition in which PhD students can participate with short video presentations explaining their research to the general public. The winner is invited to give a lecture at a locally organised conference and to publish in the conference proceedings and also receives a cash prize.[79]

- The Elevator Speech Festival is also an interesting initiative at the Faculty of Science, where contestants are supposed to describe their field of interests in short (2 minutes long),

[75] https://www.elte.hu/eltefeszt
[76] https://etologia.elte.hu/hu/a-viii-kutyaetologia-konferencia-eloadasai-elerhetok-a-youtube-n/
[77] https://energiaklub.hu/en/about-us
[78] https://energiaklub.hu/rendezveny/elindul-az-energiaegyetem-az-energiaklub-es-az-elte-kozos-tudomanyos-beszelgetessorozata-4965?
[79] https://www.elte.hu/content/ti-vagytok-a-fold-szoja-tudomanykommunikacios-palyazat.t.24188

straightforward and entertaining presentations (also known as elevator speeches) with one illustrative tool of their choice.[80]

· In 2021, the Institute of Cartography and Geoinformatics at the Faculty of Informatics relaunched the annual celebration of GIS Day[81], an event that was periodically organised by the institute between 2001 and 2009. This event is organised at international level under the umbrella of the American Environmental Systems Research Institute (ESRI) every year in the second week of november. Its main aim is to popularize GIS (Geographic Information Systems, Geoinformatics) among the young generations. Last year the institute organised it together with the Károlyi Mihály Hungarian-Spanish Secondary School in Budapest and counted with the participation of more than 120 students.[82]

· At the faculty of Special Needs Education, several regular events are devoted to building and maintaining bridges and cooperations between researchers and members and various actors of the wide public; e.g., the annually held Disability Study Conferences[83], or the annual 'Dialogues on Autism' conferences of the HAS-ELTE 'Autism In Education' Research Group.[84]

· ELTE also regularly joins or even hosts external initiatives / programmes, e.g. 'The Capital of Sciences', hosted at the Faculty of Sciences in 2019;[85] Coimbra 3 minutes Thesis Competition.[86]

As a positive side-effect of the COVID-19 situation, the formerly local Poster Presentation Conference organized annually for BA, MA and PhD students by the School of English and American Studies became an online international science communication event.

National Laboratory for Social Innovation (TINLAB)[87]

Within the framework of the National Laboratory Programme coordinated by the NRDIO, on the initiative of ELTE (and under its leadership as consortium leader) the National Laboratory for Social Innovation (TINLAB) commenced its activity in late 2020. TINLAB includes two HEIs – the University of Miskolc and the University of Pannonia – as well as the Harph Foundation from the public sector as major partners; it mainly operates out of ELTE. As social innovation in itself can be considered an emerging concept in Hungary, the Laboratory can be considered a pioneering project is unique in the country. It is strongly PE-related, whereas it implements a strong cooperation with the actors from the quadruple helix from the very beginning of its existence.

[80] https://www.elte.hu/content/vi-liftbeszed-fesztival.e.13540
[81] www.gisday.com
[82] http://lazarus.elte.hu/hun/tantort/2021/2021-11-18-gis-day/thumb.html
[83] http://dsconfhun2021.elte.hu/index.php/en/home/
[84] https://maszk.elte.hu/index.php/en/about-us/
[85] https://www.elte.hu/content/tudomanyok-fovarosa.e.11824
[86] https://www.elte.hu/en/content/call-for-applications-3-minute-thesis-competition.t.1572
[87] https://www.elte.hu/innovacio/tinlab

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The main goal of the 1+4 years project is to create a definition and a support framework for social innovation at the national level, but at the same time to contribute to international social innovation networks - at least at the Central European level - in order to increase the absorption capacity of the Hungarian social innovation developments for example through the Horizon Europe framework programme. In the first year of its operation, TINLAB laid down the theoretical grounds of social innovations working together with members of the quadruple helix, relying heavily on them while planning and realizing several pilot projects (from the 2nd year onwards).

TINLAB has 8 thematic focus areas so called clusters listed below, with the following main activities:

· The social effects of digitalisation: development of child- and family-friendly applications, solutions to the FOMO (fear of missing out) phenomenon

· Culture, creative industry: developing innovative methodologies for disseminating cultural content and supporting cross-sectoral cooperation

· Local development, governance: development of local, rural innovative solutions to overcome different types of disadvantages (e.g., social farms)

· Environmental innovation, climate: multidisciplinary developments in support of climate awareness

· Social well-being: development of innovative models supporting the active participation of the elderly, social solutions supporting the spread of new technologies

· Aspects of the future of work, the economy of the future: new atypical forms of employment, innovative economic development solutions, home office models, new elements of the community economy

· Human systems: educational innovation, prevention methodologies, innovative social solutions, social solutions for smart cities

· Management of social innovation: Development of Social Innovation Readiness Level, accepted impact measurement methodologies

Within the framework of the Laboratory, several thematic R&D&I forums and professional R&D&I workshops – involving the actors of quadruple helix – were already established, the aim is to develop truly innovative solutions in response to social problems on the one hand, and gather and articulate social needs related to technological changes on the other. For example, good practices are being collected and analysed, a special international library of social innovation related literature is being assembled, and an accredited social innovation manager course has been elaborated and made available (100 people already obtained their degree in 2021). There are also plans to create further postgraduate courses in this field.

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In a later phase, the innovative models, products and services developed in the framework of TINLAB will be tested in real environments, settlements, regions and institutional systems with the involvement of the public sector. After setting up the Laboratory and the theoretical background of social innovation in the first year, the main task of the second year (2022) is to build international relations as well as to realize several smaller scale pilot projects. ELTE already has a diversified international network – this includes partnerships with 200 higher education institutions worldwide and many other partner institutions -, which enables effective cooperation and the promotion of innovative solutions. Having international co-operation on legal, security, educational, cultural heritage and disadvantaged opportunities areas is an advantage that TINLAB can count on. There are ongoing negotiations about becoming a member in the European Association for Social Innovation, the OECD Local Development Forum, and TINLAB aims at joining the new EIT CCSI KIC (the European Institute of Innovation and Technology's future Knowledge and Innovation Community dedicated to the Cultural & Creative Sectors and Industries) too. TINLAB experts also regularly participate in the SSAH (Social sciences, Humanities and Arts) working group of the Association of Technology Transfer Professionals Europe.

New R&D results, services, methodologies and process innovations will be the final products. These can be described as new developments and innovations rather than technologies, although the latter is also not excluded. In accordance with the Living Lab concept, primarily applied research and experimental development is carried out, in which members of the quadruple helix are involved. One of TINLAB's most remarkable result so far is the Social Innovation White Book, which is a comprehensive strategy of the field the Laboratory is devoted to take forward.

3.2.2.2 Faculty level initiatives

Complex integration of public engagement/transdisciplinary science in educational and research activities at the Faculty of Social Sciences

In accordance with its profile, the Faculty of Social Sciences at ELTE is by default actively involved in PUBLIC ENGAGEMENT/TRANSDISCIPLINARY SCIENCE. Throughout the years, complex and effective practices have been developed to integrate PUBLIC ENGAGEMENT/TRANSDISCIPLINARY SCIENCE with educational and research activities. The main pillars are:

- integration of PE in BA, MSc and PhD study programmes: theoretical as well as practical courses, field practice, service learning
- nurturing an extra-academia partner network (also through active outreach to alumni) which enables/supports both educational as well as research activities
- democratization of science through: a) outreach to marginalised groups in the framework of research projects, b) presentation of research results to wider audiences, c) individual PE involvement of researchers and lecturers e.g., as external experts

Some actual examples:

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A network of extra-academia partners including cca. 40-50 institutions covering the Hungarian public sector (ecclesiastical and civil organisations as well as local and national government organisations) is involved in Social Work BA and MA study programmes, providing opportunity for both field practice and research projects. Master lecturers liaise and coordinate educational collaborations with these partner organisations.

Social Work BA study programme includes 50 hours of volunteer work, as well as field practice in two courses (150 hours and 300 hours). Students can enrol in a specialised course on 'Nonprofit Management' as well as a course entitled 'Comparative Social Work', to this latter, international partners are invited to present case studies.

Social Work MA study programme includes – beside a 240-hour field practice – a 50 hour project practice course specially designed to foster innovative solutions to actual challenges in the public sector. In the frame of the course students develop and implement actual projects at chosen extra-academia partner institutions.

The MA study programme entitled 'Community and civil studies' addresses the characteristic needs and challenges of the civil society and the public sector and involves many field practitioners both among lecturers but also among students, which allows a clearly practice-oriented approach. Major foci of the study programme are management and project development, fundraising in the public sector as well as monitoring of national and international development projects.

One of the specializations of the Sociology BA study programmes is the 'World of NGOs' in the frame of which students are involved in the research of social innovations and also gain understanding of the mechanisms along which civil society and NGOs operate.

In general, students are encouraged to participate in Erasmus mobility especially for their 6. semester (dedicated to field practice), which offers important networking opportunities with international organizations (mainly NGOs) active in the social sector.

PE related topics are present among PhD students' research topics, a current example being 'Potentials of participatory research including teenagers on the relation of early parenthood and school dropout'.

The Faculty and its departments benefit greatly from an extensive network of alumni established at a great variety of ecclesiastical, civil and government etc. organizations throughout Hungary. Thanks to an effective outreach, Alumni are actively involved in both educational and research activities, most often acting as mediators for establishing collaborations between their alma mater and the organization they work at.

Every month, the Department for Social Work organizes a roundtable open to students and the general public entitled 'Department Thursdays', to which extra-academia partners and alumni are

also invited. Topics include actual research and innovation results as well as best practices in the public sector.[88]

Beyond their education- and research-related tasks, several colleagues of the faculty act as external experts in projects related to professional innovations such as parent skill/competence development; development of software applications in child protection; development of software applications for citizens with mental disorders; reducing risks for disadvantaged settlements etc.

Public Engagement through Service Learning - Social Responsibility Course at the ELTE Faculty of Law[89]

In 2019, the ELTE Faculty of Law, with the support of its top management, lecturers and Student Union has launched a specialised Social Responsibility Course for credits. The initiative aims at creating a service learning opportunity for the students in order to gain first-hand technical and social experience through volunteering and community service.

Within an organised and safe environment, guided by professionals as mentors, students can feel the benefits of helping those in need while contributing to the goals of various NGOs or the everyday life of their clientele (e.g. disabled or homeless people, sick children, rescued animals) with their knowledge and/or dedicated time. During these useful activities, participants develop soft skills like open-mindedness, acceptance, solution-centeredness, etc. that may well be exploited in the labour market supplementing their professional studies.

Each partner organization (by now more than 30) shall provide a dedicated contact person and has a liaising lecturer at the university. The course opens with a joint lecture were students learn about the goals, requirements and completion criteria of the course and where involved teachers as well as students who have already completed the course share their experiences. Students become familiar with the legal background of community service and meet the representatives of the host organizations.

Many organizations prepare the volunteers in advance for potentially stressful situations such as emotional shock or physical aggression. After this preparatory phase, students complete their service by an informal schedule on at least eight occasions 1,5 hours each. At the end, course assessment consists of written and verbal reporting. In the frame of the latter, participating students reflect on their impressions in mixed groups of ten, thus they learn from each other's experiences at different organizations. As students can enroll in the course in two semesters, they can either try themselves at another organization or deepen their bond with their original host. This works out well in practice and the course is very popular with the students.

[88] A recent event: https://www.tatk.elte.hu/content/az-ensz-fejlesztesi-programja.e.2255?fbclid=IwAR0loWyyU-ZWiBvNKZOVYIfUSeCI7gykklQN90hMTjZYmCFNzIM7kEYMBJA
[89] https://elteonline.hu/kozelet/2021/10/04/onkenteskedj-kreditert-kurzusajanlo/

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The main added value of the course is that participants can step out of their "envelope" or comfort zones and experience conditions which they would not have met normally. Participants learn a lot about themselves and evaluate better their own life's positives while feeling good to serve a noble cause. The experiences help to break down remaining prejudice, become more sensitive to social or environmental problems or even get inspired by real life stories. Besides, participation has also provided thesis material.

At the end of the semester, partner organizations receive feedback (based on the students' evaluations) and in turn, they have to fill in a questionnaire. The programme strengthens their visibility and awareness raising force. Moreover, some student volunteers stay with them also for a longer period. Good communications and dedicated, enthusiastic programme coordinators are the key to success (100-200 students per semester).

Due to the clear benefits of the programme for both students and staff, as well as its upscaling/extension potential, there are current efforts to make the course available for the students of other ELTE faculties, but the system could also be applied on a national level, although it should definitely be kept voluntary to preserve the honest motivation of those participating.

Supporting social integration of disadvantaged groups via culture and language

Social inclusion can be the solution to several pressing global problems such as poverty, segregation, racism, etc. ELTE is dedicated to the empowerment of socially and in other ways disadvantaged groups and across the faculties there are several current projects targeting this aim representing very different approaches, perspectives and methodologies. Language and culture can be extremely powerful tools of social inclusion and are central elements in two 'flagship' projects at the Faculty of Humanities, both of which showcase best practice(s) on public engagement/transdisciplinary science. The cultural component is very strongly present in the Roma Visual Lab programme[90], a community film club promoting sensitivity to social issues whereas language is a key element in the Languag-E-Chance project[91] focusing on sign language and bilingual situations in Roma communities.

In the interviews carried out in the framework of WP7 we have seen initiatives that emphasize the need for early integration, this way ending up empowering the members of disadvantaged communities. This can be translated very directly into the above-mentioned flagship projects by highlighting the cognitive and social advantages of as early exposure to minority languages and cultures as possible, both for the deaf and Roma communities. These two minority groups seem to have very little in common at first approximation, but their contexts do overlap when we consider the fact that they both use non-standardised languages in a highly disadvantaged social setting, which is something the social inclusion project explicitly focuses on.

[90] http://romakepmuhely.hu/en/home/
[91] http://edulingua.net/edupage/edu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017229.

It also became apparent based on the interviews that there is a very clear need for establishing detailed, at times completely new methodologies for social inclusion, methodologies that successfully combine integration and self-identity. The difference between research ON disadvantaged groups and research WITH members of those disadvantaged groups was often emphasised together with the observation that inclusive research always leads to more authentic results.

Some important components of this participatory form of research have been identified as follows:

·Information flow in both directions is crucial.

· There is an added value in members of the target communities ending up carrying out research themselves, which could and should be exploited;

· Academics should also be involved in the everyday life of the communities they research so that the actual needs of these communities are also identified;

· A balanced combination of bottom-up and top-down research is the most reliable form of research;

· There is pioneering work needed for adequate research methodologies.

Expected outcomes:

· One of the greatest advantages of participatory research is the message that it conveys for all of the participants: informants have the perception that what they know about their language/culture is actually valuable, which can lead to a change in their attitudes toward their own communities and identities. In turn, it can lead to a change in the way these communities are perceived by the public as well.

· The mere existence of participatory research makes the different focus groups more visible. Visibility can be understood in different, equally important ways: visibility as being noticed by the majority and visibility of the different (or even the same!) minority groups towards each other.

Participatory research is expected to have a strong empowering effect: as a result, more and more members of different disadvantaged groups end up in higher education (first as students then as researchers, where they are predictably even more painfully underrepresented) and other prestigious domains of society. It is mainly through learning that the greatest social impact can be achieved.

Public engagement/transdisciplinary science-related disciplinary/faculty specific 'Flagship projects/cooperations' at ELTE

Beside the institutional, overarching best practices listed above, there is a great number of Public engagement/transdisciplinary science- related disciplinary/faculty specific projects and

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cooperations at ELTE, some of which we would also like to highlight in this report. As mentioned in the Methodology section, the following projects were selected for focus group discussions by members of the ELTE WP7 expert group from a preliminary inventory of public engagement/transdisciplinary science related projects/cooperations based on relevance to the TORCH foci, 'lifespan' as well as scientific and societal impact. Also, we chose projects which complement each other in terms of the types of social stakeholders involved.

The major lessons learnt from the focus group discussions conducted with key participants (both academia and beyond) of the 'flagship projects/cooperations' were included in the (Dis)incentives section, where the projects will be referred to with their 'brief title' as below:

- *'Roma Visual Lab'*[92] - affiliated with the Institute of Communication and Media Studies at the Faculty of Humanities, the Roma Visual Lab is an innovative approach to studying Roma images as well as empowering Roma through culture in the frame of a university course. Since its foundation in 2011, the Lab functions as a community film club, based on student involvement and active participation. It has a wide public stakeholder cooperation network incl. a great variety of NGOs related to human rights, minorities, arts and education as well as cultural institutions and programme organizers, unions incl. the Hungarian Roma Parliament, the Hungarian Civil Liberties Union etc. but also has a considerable outreach to the general public through its presence at several cultural events. With the active involvement of progressive Roma intellectuals, Roma Visual Lab contributes greatly to the fight for equality of this ethnic minority. The Lab served as basis for the creation of the Minor Media/Cultural Research Centre, which, in collaboration with a variety of public stakeholders aims at strengthening and developing education relevant to a democratic media space on the BA, MA, and PhD levels.

- *'Energy'*[93] - Multidisciplinary/transdisciplinary education/research programme with 10+ years background, involving MSc and PhD students, conducted by the Geography and Planning Research Group at the Department of Environmental and Landscape Geography (Faculty of Sciences). Aimed at various topics related to climate change through energy management, energy efficiency, energy storage etc., producing practicable solutions for the public. Past and current research topics and initiatives: 'This way ahead' (100% energy scenario for the development of a renewable energy-based energy system); Bükk-area energy geography research (energy storage; development of small-town district heating systems; heat pump heating and demand-side control); EnergyUniversity (round table events open for the general public on topics related to energy science, in cooperation with ENERGIAKLUB.

- *'Star-bus Inclusion Intervention Programme'*[94] - The HAS-ELTE Autism In Education Research Group operates at the Bárczi Gusztáv Faculty of Special Needs Education; beyond the multidisciplinary research group's foci in exploratory research and innovative R+D projects, its

[92] http://romakepmuhely.hu
[93] https://ktf.elte.hu/index.php/en-energy-geography-and-planning-research-group/
[94] https://csiip.elte.hu/

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main interest is in establishing and developing further the evidence-based practices within the field of autism as this is a key way to improve the life qualities of people on the autism spectrum and their family members, and education as a primary target domain. Accordingly, the Star-bus Inclusion Intervention Programme developed by the Research Group in cooperation with the Hungarian Autism Society and implemented at public education institutions across Hungary, Star-bus provides an innovative tool for elementary school children and their teachers to support a better understanding and acceptance, thus integration of fellow students on the autism spectrum.

- *'Languag-E-Chance'*[95] - The actual person of a devoted researcher/lecturer affiliated with the Institute of Hungarian Linguistics and Finno-Ugric Studies (Faculty of Humanities) while being the head of the Research Centre for Multilingualism of the HAS Research Institute for Linguistics links ELTE with a series of innovative projects of the Research Centre. The projects, together spanning almost 10 years, are based on participatory research and the *,Nothing about us without us'* approach regarding certain marginalised groups (deaf people, Roma), and are aimed at developing methodologies, educational programmes and competences in the context of linguistics (language use and understanding, sign language, mother tongue vs. secondary language). Conducted in an intensive co-creation with public stakeholders including members of the affected groups, the projects provide these groups with strong support to their successful social, educational inclusion and empowerment.

- *'Family Dog Project'*[96] - Launched by researchers of the Department of Ethology (Faculty of Sciences) in 1994, the Family Dog Project is one of ELTE's internationally most renown research projects with a wide scientific and general audience outreach, latter due to a strong science communication focus. The project investigates the behavioural and cognitive aspects of the dog-human relationship. Beside publishing, findings and related topics are also presented in a comprehensible form to non-experts and dog lovers via free online seminars, video abstracts, social media entries etc.

- '*Psychoactive drug use in the segregates'*[97] - various interconnected research projects affiliated with researchers/lecturers at the Institute of Psychology (Faculty of Psychology) as well as the Institute of Social Studies (Faculty of Social Sciences), conducted in cooperation with the Hungarian Association on Addictions and several ecclesiastical and civil organisations, including participatory research with the involvement of marginalised groups living in urban and rural segregates.

Through the series of 'flagship project' focus group discussions organised in the framework of the TORCH WP7 research, we were able to gain important aspects on the different levels of incentives and disincentives towards public engagement/transdisciplinary science, based on the feedback of

[95] http://edulingua.net/edupage/
[96] https://familydogproject.elte.hu/
[97] http://www.esely.org/kiadvanyok/2020_1/csak-et-al-50-72.pdf

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interviewees - staff & students of ELTE as well as their extra-academic partners in public engagement/transdisciplinary science related projects.

As a 'closing exercise' of the 'flagship project' focus group discussions, interviewees were asked to come up with a keyword that expresses the core value/major strength of their Public engagement/transdisciplinary science-related collaborations. We decided to present some of these keywords in this report as we find them enlightening when thinking about the added value public engagement/transdisciplinary science:

CREDIBILITY/AUTHENTICITY - COMMITMENT - AWARENESS - PRESENCE - PARTNERSHIP - MUTUAL UNDERSTANDING - SHARED VALUES - EMPOWERMENT - RESILIENCE - REFLEXIVITY - EMPATHY - POLICY RELEVANCE - IDENTITY - UNITY IS STRENGTH

3.2.3 Incentives and disincentives

3.2.3.1 Individual level

Incentives

Undoubtedly the strongest individual incentive towards public engagement/transdisciplinary science is **personal interest / involvement** towards the research topic. This can manifest on different levels (e.g. dog owners participating in research related to human-dog coexistence see *'Family Dog Project'* but also teachers and parents of children on the autism spectrum see *'Star-bus Inclusion Intervention Programme'* or members of ethnic minorities see *'Roma Visual Lab'* etc.), but always involves a personal urge to learn about the research topic and results. Knowledge gained can also contribute to a change of attitude of the participating person, especially as public engagement allows a deeper understanding of a certain topic through the viewpoints of various involved stakeholders. Public engagement also fosters the introduction of practical aspects into theoretical research, as well as the testing and validation of scientific results in real life – several researcher interviewees mentioned that they cannot any more imagine doing research without these added values.

It came up in practically all of our focus group discussions that the **major driving force behind any public engagement/transdisciplinary science project is actually a devoted group of individuals**. As the interviewees of the *'Languag-E-Chance'* focus group discussions formulated it: "**a few obsessed researchers**". Actually, not only academics but extra-academic participants may also belong to this group; e.g. a mother with a child on the autism spectrum who became the advocate of the *'Star-bus Inclusion Intervention Programme'* after experiencing its benefits. Based on their shared personal and professional interest / involvement, these individuals nurture their cooperation from one project to the other, regardless of obstacles encountered. It is important to identify these individuals and as for the researchers affiliated with the University, it is essential for the institution to find the ideal ways to support them in best utilising their capacities and evade burn-out.

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Personal sense of social responsibility is a major drive behind public engagement, which offers a better understanding of real-world problems and a possibility to contribute to addressing these. Both students and staff involved in public engagement/transdisciplinary science mentioned **'moving out of the ivory tower'** as an individual motivation, that is, the urge to do science not only for its own sake but to utilise scientific research and results for the benefit of society. All our 'flagship projects' are relevant in this regard: *'Roma Visual Lab'* and *'Languag-E-Chance'* contribute to the empowerment of disadvantaged groups such as Roma and deaf/hard of hearing people; '*Star-bus*' offers an effective tool supporting the integration of school children on the autism spectrum; pressing challenges of environmental sustainability are addressed in the projects included in 'Energia'; findings of research projects included in 'Psychoactive drug use in the segregates' provide scientific basis for drug prevention intervention programmes.

Among extrinsic individual incentives the possibility of **acquiring practical skills & knowledge** useful in further research as well as the labour market but also **soft skills** was mentioned by several interviewees, both students and researchers (techniques of participatory research, experience in engaging public stakeholders, communication skills and many more). For instance, a PhD student involved in a transdisciplinary research project on renewable energy which was carried out with the involvement of the inhabitants of small rural settlements in a certain disadvantaged region (see *'Energy'*) was later hired for a project manager position at an NGO dealing with renewable energy directly because of his relevant experience & knowledge. Field practice is essential for students e.g. in social sciences, pedagogy and psychology, special needs education etc. to acquire experience useful in their later career (relevant: Best practice 2.2-2.3, but also '*Psychoactive drug use in segregates'*).

Experience gained in **translating scientific research to the language of the general public** and fostering the community's involvement in research can be especially rewarding not only towards a deeper understanding of science and better acceptance of scientific results but also in ensuring the professional and financial sustainability of public engagement/transdisciplinary science related projects. The *'Family Dog Project'* can be mentioned as a best practice in this regard which has a very strong science communication pillar (publications, events, social media etc.). As a result, since its launch in 1994 it was able to build a remarkable international scientific community and general audience, this latter ensuring a constant basis of subjects willing to participate in the research projects.

Public engagement/transdisciplinary science cooperations provide **a platform for networking far beyond academia**, as well the building of relationships with individuals/organisations of similar cultural, etc. background and interest (see e.g. *'Roma Visual Lab'*). It is very important that the sustainability of these cooperations as well as the initiation of new cooperations is very much based on these **professional as well as personal contacts and networks,** therefore it is important to support networking opportunities in the framework of PE projects: events, conferences, mobility etc. On several occasions participants appear in double roles (e.g. ELTE affiliated researchers involved in the '*Psychoactive drug use in segregates'* projects are members of the Hungarian

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Addictology Association; ELTE colleagues who developed the *'Star-bus Inclusion Intervention Programme'* are also affiliated with the Hungarian Autism Society etc.), which also allows for a larger scale mobilisation of professional networks and exploitation of synergies.

Disincentives

According to the opinion of the majority of our interviewees, **public engagement/transdisciplinary science activities, projects require considerable extra workload** (reachout to external partners, nurturing professional relationships, organization of fieldwork, research ethics issues, special administrative tasks etc.), therefore, in this respect, **general work overload and lack of time** reported by researchers can be considered a major barrier. On the one hand, the majority of colleagues are parallelly occupied with both teaching and research, while having many obligatory administrative tasks, too. On the other hand, despite recent positive developments in this regard, salaries at Hungarian universities can still be considered low, thus there are only very few researchers who can devote themselves solely for their academic activities.

Several researchers pointed out that at the moment, public engagement/transdisciplinary science activities are **not recognised in due measure** neither from a professional development/benchmarking point of view, nor financially, which may discourage many from investing time and effort in participating/initiating such projects. Public engagement/transdisciplinary science research/cooperation often result in social innovations, however, these tend to be not as much acknowledged as technical innovations as they are less 'tangible', their financial profitability less direct, implementation more difficult and their benefits may be exploited only over a longer time span. A major change of attitude on the systemic level is needed to tackle this challenge, to which initiatives such as TINLAB (in a Hungarian context) can greatly contribute.

In case of public engagement activities involving esp. disadvantaged, marginalised groups, staff and especially young researchers or students are exposed to an **extra mental load** not easy to handle, thus it may lead to rejection or even burnout. However, it is this experience – e.g., encountering the unfavourable conditions and prospects of fellow citizens – which also has an immense awareness raising power, and may greatly contribute to a positive change of attitude through the re-evaluation of one's own life and circumstances as well as values and becoming more empathic towards others.

Several public engagement relevant topics (e.g., ethnic or gender minorities, disadvantaged groups etc.) include **sensitive issues** from the society's point of view and dealing with them **may trigger conflicts** affecting those involved, thus individuals may be discouraged from participating in related activities/research.

Although during our interviews the **lack of experience/skills/knowledge** did not surface as a disincentive (naturally, as interviewees were chosen especially because of their experience/existing involvement with public engagement/transdisciplinary science), it may indeed be a general barrier

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for many who have not yet engaged in such activities. Improving the institutional visibility of PE initiatives and activities would certainly help to address this disincentive.

3.2.3.2 University level

Incentives

The **strengthening of the third mission approach** on a strategic level at ELTE is a long-term development process which is carried out in a mindful, gradual manner with the full commitment of the top management towards the social and economic engagement of the university. Beside several important institutional level milestones reached in the past few years (University Innovation Ecosystem Programme[98]) participation in the National Laboratories Programme[99] esp. TINLAB (see Section 3.2.2.1.). an important step in the process was the establishment of the Third Mission Strategy Office in 2020 that was formed into University Strategy Office with much-widened scope and personnel in 2021, as well as the fact that the IDP 2021-2024 was created with a very strong third mission emphasis.

Within the next few years, the above-mentioned process can significantly contribute to the mainstreaming of PE and the introduction of new initiatives related to public engagement/transdisciplinary science beside the already existing ones on institutional/faculty/departmental level.

Alumni are frequently involved in projects and initiatives across the institution and are especially important in terms of public engagement/transdisciplinary science as – for example in the field of Social Work (as showcased earlier) - they are the entry points to a network of governmental, municipal, ecclesiastical, NGO, etc. partner institutions across the country.

Inevitably, ELTE's **participation in CHARM-EU and especially TORCH** will provide a huge impetus to an internal transformation on the institutional level with public engagement/transdisciplinary science as well as open science being among the top priorities. In the frame of these initiatives ELTE gained a unique opportunity for self-assessment, as well as to overview and summarize public engagement/transdisciplinary science activities distributed among faculties/departments/research groups and to reach out to involved colleagues whose feedback provide highly valuable input for strategic planning.

Integrating public engagement into educational activities, the implementation of transdisciplinary education, the development of practice-based study and training programmes drawing from real life challenges is beneficial both for university students and staff as well as all stakeholders of the social-economical ecosystem. Embedding PE in curricula has a strong awareness-raising effect on future generations while involving students in public engagement/transdisciplinary science research as part of their training can also be a source of educational innovations.

[98] https://www.innoteka.hu/cikk/folyamatosan_epul_az_elte_innovacios_okoszisztemaja.2269.html
[99] https://nkfih.gov.hu/for-the-applicants/innovation-ecosystem/national-laboratories-programme

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Being among the most renowned HEIs in Hungary, ELTE has been traditionally associated by the general public with excellent education and research. Thus, **the ELTE 'brand'** may not only be an incentive in the development of professional partnerships but can also be considered as an asset during the implementation of research activities as it builds a basic trust in communities engaged through public engagement/transdisciplinary science research projects. As reported by interviewees involved in participatory field research (e.g. *'Psychoactive drug use in segregates'* but also *'Energy'*), communities were easier to engage when knowing that researchers came from ELTE.

The **diverse and numerous international relations** of ELTE, its participation in several university as well as professional networks provides staff and students with unique possibilities for networking and mobility. As for extra-academia partnerships, a major development currently in progress is the implementation of a CRM system (in the framework of the University Innovation Ecosystem Programme mentioned above) which will integrate data on extra-academia partners and past and present cooperation on both central and faculty/department level and will foster a more effective utilization of ELTE's accumulated social capital.

Beside institutional initiatives and funds (e.g., Scientific Fund) to support research, the University provides staff and students with the **possibility to apply to external funding schemes with ELTE as their basis** (e.g. government funded scholarship programmes such as the New National Excellence Programme and the Cooperative Doctoral Programme; international programmes e.g. Erasmus+). These funding schemes provide financial support to students and researchers/lecturers and can greatly contribute to the implementation of – among others, public engagement/transdisciplinary science-related – projects, cooperations.

Infrastructure provided by the university is an important institutional incentive for the projects/cooperations as university venues and equipment can be utilised for research activities. Also, the university public communication channels e.g. website, social media, newsletter etc. provide a platform for the dissemination of results and reachout to professional and public audiences. University venues are often used for workshops, conferences and trainings providing a platform for networking between researchers and extra-academia stakeholders as well as the general public. Often valuable professional connections are built at these events which can serve as basis for future collaboration e.g., 'Department Thursdays' at the Department of Social Work or the annual Disability Study Conference and 'Dialogues on Autism' conference at the Faculty of Special Needs Education.

Several of the above-mentioned university level incentives are present in the case of the *'Family Dog Project':* experiments with the dogs and their owners, which are regularly carried out on green spaces at the campus of the Faculty of Sciences. Beside its own public channels, the project regularly disseminates its results via the ELTE website and social media. University venues are used to host the annual 'Family Dog Project Conference' which not only contributes to the dissemination of findings but also in recruiting new participants from among the general public. Several students participating in the research study won scholarships and successful entries in university calls provided financial background for event organisation.

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Disincentives

Core financial resources of universities are **limited** and often have to face financial restrictions. Therefore, they are able to finance research activities only to a limited extent. As a result, research projects and other initiatives very much rely on external funding opportunities where researchers are faced with aggressive competition; also, applying for calls, administrative tasks related to project development and especially project management are very time consuming and bring along a considerable extra workload at the expense of researchers' professional work. Only a limited number of staff is employed on a permanent basis while many researchers have temporary contracts linked to externally funded projects which is a considerable source of insecurity and fluctuation, endangering the continuity of research. The institution is aware of these disincentives and strives for the strengthening of its fundraising activities as well as capacity building for the administrative support of project management in order to relieve research/educational staff. Nevertheless, sufficient financial support will always be an issue.

The size and the complexity of ELTE with its 9 faculties and one individual institute, 33.000 students and over 4000 staff, while being a crucial incentive in numerous, very diverse aspects, can also be considered the source of a major disincentive: the complexity and thus **slowness of administrative and decision making processes, obligatory administrative processes e.g. public procurement, bureaucracy**, institutional operating costs manifesting as financial burden on the budgets of externally funded projects. In order to adequately address this disincentive, the University makes efforts at implementing less bureaucratic, transparent and effective administrative processes, which lessen the administrative load on researchers as well as improve the institution's desirability as cooperation partner for extra-academia actors.

The variety of disciplines present at ELTE can be regarded as an incentive as it facilitates interdisciplinary approach as well as a wide outreach due to the diverse educational and research portfolio. However, this variety comes together with **considerable differences between the needs, concerns and possibilities of different disciplines** which is not easy to harmonize (see e.g. the challenge in creating an institutional policy on research ethics); the scientific and administrative independence of the faculties require delicate coordination. It is also difficult to follow up on the multitude of initiatives (e.g. in public engagement/transdisciplinary science) dispersed across the faculties. The key to the identification of areas where further support and initiatives would be useful is certainly regular communication with departments, research groups and individual researchers actively involved in public engagement.

Based on the feedback of interviewees there is great **demand for the improvement of the institutional incentive system with regard to public engagement/transdisciplinary science** (whilst keeping in mind the unique characteristics of different disciplines). Providing more visibility to public engagement/transdisciplinary science by integrating it into the lecturers/researchers' performance indicator system as well as improving the recognition of public engagement/transdisciplinary science activities/research in career progression will incentivise these activities and adequately express the University acknowledgement of the importance of extra-academia cooperation. The

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design of such a comprehensive, university level performance indicator system has recently begun at ELTE in active discussion with the faculties in order to address unique characteristics, and is planned to be finished and approved of by the end of 2022.

In parallel with the above, the **visibility of public engagement/transdisciplinary science activities/projects and their results need improvement/mainstreaming** both within the institution and beyond. The former can significantly contribute to a more effective exploitation of the synergies of faculty/department/research group level initiatives. As for the latter, interviewees noted, that a **very active involvement/engagement on behalf of the University** as an institution is necessary in **drawing the attention of policymakers, government bodies etc. to relevant research results** especially in topics related to the integration of disadvantaged groups, educational and social innovations, environmental sustainability and climate protection, that is, pressing societal challenges etc., as well as fostering wide professional discussion on scientific results and the possibilities of utilisation. It is utmost important to showcase that scientific work carried out at the University is meaningful and societal needs are of key importance.

3.2.3.3 Societal actors' level

Incentives

During TORCH WP7, we had a considerable number of interviewees representing a wide range of societal stakeholders such as:

· private individuals e.g. dog owner participating in *'Family Dog Project'* research

· colleagues of educational and/or cultural institutions e.g. school teacher participating in *'Star-bus Inclusion Intervention Programme'*, founders of Roma theatre groups cooperating with *'Roma Visual Lab'*

· representatives of associations and societies, other NGOs active in various fields, e.g. disadvantaged groups, energy etc. e.g. Hungarian Addictology Association, Hungarian Autism Society, EnergyClub

· representatives of ecclesiastical organisation e.g. Hungarian Maltese Charity Service

· representatives of government organisations e.g. NRDIO; the majors of small settlements in the Bükk-area involved with the projects included in *'Energy'*

It was interesting to see the **interconnectedness of roles:** researchers/lecturers being active members of associations and NGOs; students/researchers belonging to the disadvantaged group the research/cooperation was directed towards. In fact, this interconnectedness proves to be a major cohesive power in public engagement/transdisciplinary science cooperation.

From societal actors' point of view the **access to scientific knowledge and competences as well as research capacity** is among the strongest incentives. In several cases this access is formalised and

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societal stakeholders (e.g. government bodies and institutions, NGOs) become 'customers', as individual researchers or research groups are involved in projects on a contractual basis.

Through public engagement/transdisciplinary science related cooperation with universities, NGOs can **reach out to a wider audience**, which provides more uptake for their message and goals and more visibility for their activities. Also, they can contribute to the formation of next generations of responsible citizens, thus their awareness raising effect is multiplied. For example, in the framework of the Social Responsibility Course (see Section 3.2.2.2.) students encounter 30+ NGOs dealing with various topics and often become engaged on the long run (e.g. as volunteers).

Especially in the case of marginalised and/or disadvantaged groups, involvement in public engagement/transdisciplinary science activities have a **strong empowering effect.** During the cooperation process these groups learn about themselves, for example learn to appreciate their own values (e.g. unique cultural heritage – ref. *'Roma Visual Lab'* and *'Languag-E-Chance'*). Also, they experience that their knowledge and opinions are valuable. Through these, their identity is strengthened, their self-assessment improved until they become able to be advocates and disseminators of their own values and interests. Working as a researcher with such communities requires continuous self-reflection. The process can be described as a spiral: the researcher addresses the community with a question towards which it offers a certain answer; after evaluating this answer, the researcher provides feedback to the community which induces further self-reflection and a deeper understanding, and new questions arise which can afterwards feed again in to research, and so on.

In the *'Roma Visual Lab'* programme, for social stakeholders involved, the **possibility to meet individuals and organisations with similar cultural background a motivation** at the Lab's events is a major incentive. Participatory approach is a basic element of the Lab, whereas students as moderators as well as members of the audience can raise questions and issues within an open-minded and inclusive environment. Thus, not only a close scientific community, but the general public and members of involved communities – e.g., Roma youth – can express themselves competently and be part of the discourse on their own culture and representation.

In the case of the *'Languag-E-Chance'* project involving members of the deaf community has turned out to be beneficial in unexpected ways: while earlier informants were simply regarded as providers of data, once they had a clearer view of the research process they turned out to have an extremely useful double authentication role. Thus, Collaboration and co-creation is not only a **guarantee for the reliability of the data** but can highlight practical results from the perspective of the community, generating further research which would otherwise have gone largely unnoticed as well as **practical and usable results** are produced and looped back directly into the community. Thus, through public engagement/transdisciplinary science a broader societal impact can be ensured.

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Disincentives

Grasping societal actors' disincentives is quite hard as the context is very complex and disincentives depend on the type and background of stakeholder groups.

Many topics related to minorities or disadvantaged groups are **sensitive and may trigger conflicts**. Several members of these groups tend to avoid limelight to evade discrimination even at the expense of the possibility to receiving help, especially if the reason of their disadvantage is not as evident for the majority (e.g. autism spectrum – a considerable difficulty for the *'Star-bus Inclusion Intervention Programme'* was that several educational institutions rejected participation as they wouldn't want to expose how many of their students are affected, as this may lead to conflicts within the parents' community and also have shed a negative light on the institution.

Resistance on the part of target groups manifests among others in difficulties to reach out and involve the target groups: e.g. several events focusing on the integration of the Roma community end up without Roma participants in the initial stages. This can be identified as an authenticity-related problem, and **gaining the trust of the target communities can be time-consuming**, which researchers should be aware of and ready to handle. Very often a highly controversial situation emerges: those members of minority groups who are the easiest to reach very often find it hard to identify as members of the minority group under consideration (also related to the coming-out problem mentioned above).

An interesting remark from our interviewees was that a major barrier towards the involvement of societal stakeholders may be the fact that they are **not interested in scientific issues** in general, cannot see how they can benefit from a certain cooperation or how they could utilise the results in their everyday life and work. Here the mediator role of universities and researchers in 'explaining' the importance and benefits of the scientific approach is essential, as once the barrier is overcome and mutual discourse is established, direct benefits become clearly visible.

When a real relationship is established between societal stakeholders e.g. a Roma person, a minority or disadvantaged person and the researcher, the person / persons involved in the research become themselves researchers. In the 'flagship project' focus group discussion the expected, usual categories, such as the term empowerment, always appeared, but at the same time the opinions and experiences of the minority / disadvantaged people were always clarified and reworded by the researcher. However, it is important to let these involved societal stakeholders keep **their own voices, their own specific words**, so that the results of the research remain valid, not distorted.

3.2.3.4 Systemic level

Incentives

The **EU principle** directing scientific activity towards addressing global societal-environmental-economic challenges can be identified as a significant systemic incentive towards public engagement/transdisciplinary science. The active collaboration and co-creation among the

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quadruple helix stakeholders is a basic requirement, including the engagement/involvement of affected groups from all levels of society (citizens as 'end users'!). This principle is also enforced in the **actual EU funding system for R+D+I**, e.g., in the Horizon Europe Framework Programme, which fosters and financially supports the development of many research/education projects with public engagement/transdisciplinary science relevance. Environmental sustainability, climate protection and green transition as well as social inclusion are among global **'hot topics'**, therefore immense financial and administrative resources are already and will be available to relevant projects – many of them with a strong public engagement basis.

Another significant incentive towards public engagement/transdisciplinary science is the **systemic level mainstreaming of open science principles** and the integration of these among the basic requirements for research funding. This is not only present of course at global / EU level, but also in the Hungarian national context, where the government-operated major research funding body (NRDIO) is also committed to Open Science and e.g., has recently issued an Open Science Position Paper.[100]

NRDIO implements a double incentive system: on the one hand, Open Science principles are included among the **funding requirements** (e.g., open access handling of research data) both in case of large-scale funding programmes directed at universities and smaller scale calls for individual researchers. On the other hand, NRDIO aims at convincing both individual researchers and knowledge institutions of the importance of Open Science through awareness raising and sharing of information e.g., in the framework of workshops, info days etc. on important initiatives such as the National Laboratories, available research infrastructures, EU funding opportunities etc. (workshops, events) campaigns.

NRDIO also regularly issues **call directly relevant to public engagement/transdisciplinary science and Open science**: a recent example is the Science Patronage Call funded by the National Research, Development and Innovation Fund, a main objective of which is to support the development of open science in Hungary through providing financial support to researchers for – among others - the promotion of scientific results (dedicated sub-programme with 663 Mio HUF budget[101]). In 2021, ELTE was quite successful in this call, altogether 41 individual researchers as well as projects won funding. As a result of which several projects focusing on citizen science and science communication can be realised at the University.[102]

Government funding also significantly shaped the history of some of the 'flagship projects' involved in our TORCH WP7 research: e.g. '*Languag-E-Chance*' and the eponymous Languag-E-Chance Methodological Research Group was born from the individual level cooperations of committed individual researchers with the support of a TÁMOP project (Societal Renewal Operative Programme) including also the Hungarian Association of the Deaf and Hard of Hearing. The initial

[100] https://nkfih.gov.hu/openscience/position-paper-on-open
[101] https://nkfih.gov.hu/english/nrdi-fund/funded-projects-mec21
[102] https://www.elte.hu/content/elte-s-sikerek-a-tudomanyos-mecenatura-palyazaton.t.24723

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steps of the *'Psychoactive drug use in segregates'* research projects can be traced back to a governmental request towards professional deliverables towards the development of new methodological tools for drug prevention action programmes, which gained major scientific impetus through an OTKA project (National Scientific Research Programme).

Disincentives

Although there are many extra-academia funding opportunities available for projects with public engagement/transdisciplinary science relevance, there is **great competition** especially in the case of EU funding, where immense international networking is necessary to be included in winning consortia – researchers do not necessarily have the capacity or experience on how to negotiate.

In some fields/topics certain **divergence can be noticed between EU level and national level directives.** E.g. a change of attitude in education and especially towards the integration of children on the autism spectrum is clearly welcomed by the international professional scene however this same approach is not yet as strong in the national context *(*ref. *'Star-bus Inclusion Intervention Programme').*

Frequent structural changes e.g. the reorganization of background/support institutions as well as funding/maintaining institutions, sometimes the deficiencies of the background institution network can be the source of setbacks in public engagement/transdisciplinary science research/collaborations and the valorisation of their results. Bureaucracy in general and slowness of decision-making also appear on the systemic level as a disincentive.

COVID-19 has a dual impact on universities' public engagement: while the continuation/implementation of several projects, especially those involving field research (restricted mobility) or requiring official governmental permissions (slow-down in all administrative processes due to COVID restrictions) became rather difficult or even impossible, the pandemic has raised complex societal challenges to which scientific research can provide answers thus it ensures raison d'etre to new cooperations between academia and public stakeholders. At the same time, since science communication was forced to move online due to the pandemic, the partners show more readiness now to continue with their cooperations using online platforms, making the nurturing of international partnerships (or even creating new ones) possible and also more straightforward.

3.3 Trinity College Dublin (TCD)

3.3.1 Existing university structure and policies relevant to public engagement and transdisciplinary science

Trinity College is committed to academic excellence that benefits Ireland, the European Union and the international community. At the heart of the institutional guiding documents is the acknowledgement that engagement with society is interwoven into the fabric of college life:

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Trinity's Strategic Plan[103] points to academic excellence, transformative student experiences, impactful research, and engagement with society. The plan's title, 'Community and Connection', reflects the conviction that, in an increasingly interdependent world, we need to work together more intensely and in new ways to address the formidable challenges facing us. Core to the Mission are the following four themes:

Civic Action: Through our teaching, research and public engagement, we courageously advance the cause of a pluralistic, just and sustainable society;

- Organisation: We foster an effective and flexible organisation, which values all members of our community;
- Research: Pursued at the frontiers and intersections of disciplines, our research benefits our students, Ireland, and the world; and
- Education: We challenge our students to think independently, communicate effectively, act responsibly, and develop continuously, equipping them for lives of active citizenship.

Figure 6. CORE Mission at TCD

Trinity's Research Charter[104] presents the core principles that are central to our research philosophy and actions that will allow us to live those principles. It is the result of a highly consultative process:

Our Vision is to engage in research with the quality, intensity, depth, diversity, and openness that leads to fundamental breakthroughs, new understandings, key insights, and that can make translational and transformative advances – or, to build a world in which we want to live.

Our Mission is to create the research environment that supports our vision by pledging to seven principles:

[103] Trinity College Dublin, the University of Dublin, Strategic Plan 2020 – 2025: https://www.tcd.ie/strategy/
[104] Trinity College Dublin, the University of Dublin, Research Charter: https://www.tcd.ie/research/about/charter/

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· Cherish academic freedom, diversity of scholarship, and pursuit of truth

· Position research at the heart of Trinity

· Foster and grow research talent and leadership

· Harness our collective expertise for the greater good

· Broaden our local and global impact

· Engage profoundly with our publics

· Stand up for research

The Charter focusses on each of the principles, expanding their meaning, articulating their importance, and setting out high-level goals and actions. Under Principle 6, this includes the following recognition on public engagement: "Increasingly, it is about recognising that our different publics can be research collaborators – active participants and co-creators – in our research, and therefore it means acquiring the communication skills to work at this deeper level of two-way engagement."[105] The Charter also recognises that engagement is not just about dissemination but also about the two-way flow of ideas, with the potential to guide research through gaining insight into public concerns, and through offering new ways to collaborate. Trinity recognizes the need to be at the forefront of new forms of research collaborations with its publics and recognises this as an essential part of building and maintaining its reputation nationally and internationally"[106]. Measures to be taken include promoting existing research-related public engagement activities across Trinity in a much more comprehensive and effective manner by:

· Building on existing skillsets to radically rethink how we communicate research through various media to different audiences and execute large-scale public engagement programmes, such as Trinity-based citizen science initiatives or public defined research challenges.

· Working with our alumni, collaborator and employer networks to communicate the strength of Trinity's research.

· Expanding new and emerging practices with the public as a collaborator and leveraging the unique assets of Trinity in our engagements.

· Trinity's Living Research Excellence Strategy[107] emphasises meaningful relationships, rooted in authentic engagement. Specifically, Action 6.3 focuses on understanding how new forms of engaged research and research co-creation can drive discovery. More broadly, a series of actions

[105] Trinity College Dublin, the University of Dublin, Research Charter, p. 13.
[106] Ibid.
[107] Trinity College Dublin, the University of Dublin, Research Excellence Strategy: https://www.tcd.ie/strategy/documents/tcd-research-excellence-strategy.pdf

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in the strategy focus on how to "radically revise how we do research communications" in Trinity (Action 04). These note the growing interest in the co-creation of research with the wider public and the importance of "building expertise in reflexivity … so that we can become more skilled in two-way communications around research[108]."

· Trinity's Faculty of Health Sciences Research Metrics (2018 – present) provide additional research productivity points for Public and Patient Involvement in research. Evidence may include publications and proposals co-authored by public research stakeholders, including patients, members of the public, public or professional service providers, policy makers, civil and civic society organisations and other external partners.

· Civic and civil society engagement are also integral to the higher education policy landscape. Ireland's National Strategy for Higher Education to 2030[109] refers to civic and community engagement as one of the three core roles of higher education. The Higher Education Authority's System Performance Framework, 2018-2020, included civic and community engagement in two of its six key objectives:

Objective 2: Creating rich opportunities for national and international engagement which enhances the learning environment and delivers a strong bridge to enterprise and the wider community.

Objective 3: Excellent research, development and innovation that has relevance, growing engagement with external partners and impact for the economy and society and strengthens our standing to become an Innovation Leader in Europe.

The detailed metrics which form the basis of higher education institutional System Performance Compacts with the Higher Education Authority now specifically refer to engaged research activity.

The university coordinated a European Commission-funded project that addressed inter- and transdisciplinarity called Shaping Interdisciplinary Practices in Europe (SHAPE-ID)[110] , which was based in the Trinity Long Room Hub and had five objectives:

1. Review existing research to identify the factors that support successful integration of methodologies, techniques, personnel and administrative structures both among Arts, Humanities and Social Sciences (AHSS) disciplines and between AHSS and other scientific, primarily Science, Technology, Engineering, and Maths (STEM), disciplines.

[108] Trinity College Dublin, the University of Dublin, Research Excellence Strategy, p.26.
[109] National Strategy for Higher Education to 2030: https://hea.ie/assets/uploads/2017/06/National-Strategy-for-Higher-Education-2030.pdf
[110] SHAPE-ID: https://www.shapeid.eu

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2. Enable stakeholders to jointly explore best and poor practices and co-produce recommendations for improving AHSS integration, through a series of learning case workshops exploring participants' experiences, challenges and opportunities of AHSS integration.

3. Produce and validate a knowledge framework for successful AHSS integration based on the evidence gathering activities.

4. Deliver a toolkit with recommendations to guide stakeholders towards successful pathways to AHSS integration.

5. Build and maintain a stakeholder network to ensure knowledge transfer and dissemination of SHAPE-ID results

The SHAPE-ID toolkit[111] was launched on June 10th 2021 and by December had 8,000 users accessing its website. SHAPE-ID identified 25 factors influencing successful interdisciplinary research and the toolkit provides contextualised access to resources contributing to understanding inter- and transdisciplinary research in various contexts, including guided reading lists and reflective tools. It is influencing research policy through directly engaging with research performing organisations and national funders from 13 countries and the European Commission. SHAPE-ID is also collaborating with LERU to update their influential 2016 Interdisciplinarity in the 21st Century Research Intensive University report.

Additionally, Trinity is a founding member of CHARM-EU[112], the CHallenge-driven, Accessible, Research-based, Mobile European University, for the co-creation of a European University aligned with the European Values and the sustainable development goals (SDGs) and which includes a transdisciplinary focus.

At Trinity College, "Open Scholarship"[113] is defined as the practice of research, education and knowledge exchange in such a way that others can collaborate and contribute, where research publications, data, lab notes and other scholarly processes and works are properly and ethically managed and evaluated and, unless restricted for justifiable reasons, are freely available to all levels of society under terms that enable reuse, redistribution and reproduction of the work and its underlying data and methods. (Adapted from Foster's Open Science definition)[114].

Trinity became Ireland's first Higher Education Institutions to introduce an Open Access Policy[115] in 2010. Trinity's Open Access Policy states that all staff and research students must deposit their Accepted Manuscript into TARA, Trinity's institutional repository, immediately on acceptance for

[111] https://www.tcd.ie/trinitylongroomhub/media/news/articles/2021-06-10-SHAPE-ID-Toolkit.php
[112] CHARM-EU: https://www.charm-eu.eu/node/1
[113] Trinity's Open Scholarship: https://libguides.tcd.ie/open-scholarship
[114] Open Science Definition: https://www.fosteropenscience.eu/taxonomy/term/100
[115] http://www.tara.tcd.ie/handle/2262/80574

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publication[116]. TARA (Trinity's Access to Research Archive) contains more than 33,000 open access publications, freely available to the public and fully accessible and exposed for harvesting by search engines, and web-based bots and harvesters. A scholarly communication Library guide[117] directed to researchers is available and serves as a central point to promoting Open Scholarship.

In November 2018, the Dean of Research and the College Librarian & Archivist established an ad hoc Open Scholarship (OS) taskforce to explore emerging trends in OS within Ireland and internationally and to provide feedback to a growing number of consultations calls from relevant bodies. This led to a series of events in 2019, titled Unboxing Open Scholarship, to advance engagement and debate around what Open Scholarship means for the Trinity College Dublin community in preparation for the forthcoming report by Government[118]. In 2019, Minister of State for Training, Skills, Innovation, Research and Development, John Halligan T.D. launched the National Framework on the Transition to an Open Research Environment to guide Ireland's collective approach to Open Scholarship[119]. In February 2022[120], funding of €1.725 Million was designated to support the activities of the National Open Research Forum (NORF)[121] and ramp up Ireland's progress in implementing an open research ecosystem.

There are multiple positions within the university which are tied to public engagement and transdisciplinary science. These include leadership roles such as an Associate Dean of Civic Engagement and Social Innovation and a Vice President for Global Engagement, and communications and events staff, research impact officers, education and public education managers, among others distributed across the University. These roles are becoming increasingly relevant and sought after as engaged research and research impact gain relevance in the research and policy landscape. The most recent addition in this space is the team of three posts of Interdisciplinary Research (IDR) and Integration Funding Specialists. The IDR Funding Specialists are new roles, working across research support teams at Faculty level and within the central Research Development Office (RDO), and reporting to the Head of European Funding and the Head of the Research Development Office. They are supporting growth in IDR capacity and funding in TCD across Arts, Humanities and Social Science research, Health research, and Sustainability and Climate research.

Increasing visibility for public engagement has also come from two award opportunities, with accompanying case studies:

[116] Trinity Open Access Policy: https://libguides.tcd.ie/open-scholarship/policies
[117] https://libguides.tcd.ie/schol-comm/open-access
[118] Unboxing Open Scholarship Programme: https://libguides.tcd.ie/open-scholarship/relive
[119] National Framework for the Transition to an Open Research Environment: https://repository.dri.ie/catalog/0287dj04d
[120] Digital Repository of Ireland. Press Release – New Funding of €1.725 Million Positions Ireland to Lead in Open Research. https://dri.ie/press-release-new-funding-ireland-lead-open-research
[121] https://norf.ie/

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The Trinity Civic Engagement Award[122] annually recognises members of Trinity staff who have demonstrated outstanding achievements in engagement with wider society in their teaching and/or research; those who have played an active role in civic engagement in Trinity either through community-based research and/or community-based learning.

When the Living Research Excellence Strategy and Research Charter were launched in 2019, discussion soon began about how we could live the principles articulated in those documents. One of the suggestions that was brought to the Office of the Dean of Research was that a set of awards dedicated to research should be created. In 2020, the first awards[123] were made which included recognition of three researchers who were "engaging profoundly with our publics".

Additionally, Campus Engage[124], within the Irish Universities Association, was established by Irish higher education institutions to provide a national platform for the enhancement and co-ordination of civic and community engagement across the sector. It shares best practice and drives national and regional coordinated initiatives in the areas of community-based research and learning, student volunteering and the sharing of knowledge and resources with wider society. On June 16, 2014, leaders of all Irish Universities and Institutes of Technology from across Ireland came together in Dublin Castle to sign the *Campus Engage Charter for Civic and Community Engagement*[125] . The signing of the Charter indicated a willingness to enhance visibility and further the links between higher education and society, to demonstrate island-wide commitment to build on what has been achieved to date and place Ireland at the fore internationally in terms of promoting civic and community engagement in higher education. Subsequently, the institutions have worked collaboratively to deliver three important documents: *the Engaged Research Report: Society and Higher Education Working Together to Address Societal Challenges*[126] , the *Engaged Research Framework*[127] and *Planning for Impact Framework*[128] to advance civic and community engagement across the sector, which articulates and elaborates the ambitions of the Charter. The Charter is accompanied by a menu of indicators, which can be of use to institutions in gauging if and how they are meeting the ten basic principles contained in the Charter. Each institution engages with enterprise and society in different ways and the indicators are not meant to be prescriptive. Rather,

[122] Trinity Civic Engagement Award: https://www.tcd.ie/civicengagement/
[123] Trinity Research Excellence Awards 2020: https://www.tcd.ie/research/researchmatters/awards-2020.php
[124] Campus Engage, Irish Universities Association: https://www.campusengage.ie/
[125] Campus Engage, Charter for Civic and Community Engagement: http://www.thea.ie/contentfiles/Campus_Engage_Charter_June_Final.pdf
[126] Campus Engage, Irish Universities Association, Engaged Research Report: Society and Higher Education Working Together to Address Grand Societal Challenges: https://www.campusengage.ie/wp-content/uploads/2019/01/FINAL-JAN-16_ER-Report-2016-Jan-v2.pdf
[127] Campus Engage, Engaged Research Framework: https://www.campusengage.ie/wp-content/uploads/2018/12/Framework_for_Engaged_Research_May_18_Web.pdf
[128] Campus Engage, Planning for Impact Framework: https://www.campusengage.ie/wp-content/uploads/2018/12/Campus_Engage_Impact_Framework_May_2018_Web.pdf

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Campus Engage seeks to encourage diversity and pluralism in the complex and evolving world of civic and community engagement.

It is important to note that a significant amount of public engagement work across various disciplines takes place under analogous headings, including "civic action", "science communication", "civic engagement", "outreach", and "engaged research", among others. In 2021, Trinity had more than 400 researchers involved in generating 965 engaged works, per Trinity's Research Support System Civic Engagement Dashboard. The inclusion of the Campus Engage Engaged Research Framework linked to Trinity's Research Support System (RSS)[129] allows researchers to tag how their work aligns and whether it was created "with the community"; "for the community"; and whether the effort "involves TCD students" along with a description of alignment with the Framework, if desired. This has increased the visibility of engaged research activities and outputs.

In 2021, upon election of Trinity's 45th Provost, the Provost & President's Retrospective Review 2011-21 highlighted other public engagement activities and achievements during Dr Patrick Prendergast's tenure as Provost, 2011-21[130]. Chapter 16 features activities in education, research, innovation, global relations, philanthropy, capital development, sustainability, student experience, sports, and efforts to engage the public in research and learning opportunities.

Public engagement is an integral part of Trinity's mission and legacy. The campus is host to myriad public engagement events each year, including the annual Culture Night in September, Open House Dublin in October, and perhaps most notably, PROBE: Research Uncovered, an event held as part of European Researchers' Night each September. Prior to the COVID-19 pandemic, approximately 3,000 visitors attended PROBE each year. In 2020, the event was renamed START, and shifted to an online format due to public health restrictions. Trinity Week, a one-week public programme of lectures, symposia, and activities is also held each spring. One of Trinity's strategic targets[131] is to host public research events around the campus, including more than 1,000 in the 2020 to 2025 period in the Trinity Long Room Hub, Trinity's Arts and Humanities Institute.

Public engagement events also frequently take place on campus. For example, as part of the "Decade of Commemorations" (2012-2021), the university invited the public to participate in a series of topical talks, activities, exhibitions, and performances. Most recently, Trinity is a core partner in "Beyond 2022: Ireland's Virtual Record Treasury", a collaborative research project that will create an open-access virtual reconstruction of the Public Record Office of Ireland which was

[129] RSS is Trinity's Current Research Information System (CRIS)
[130] Trinity College Dublin, the University of Dublin, Provost & President's Retrospective Review, 2011 – 2021: https://www.tcd.ie/provost/review/
[131] Trinity College Dublin, the University of Dublin, Strategic Plan 2020 – 2025, p.33.

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destroyed in 1922. On an ongoing basis, the Library and its exhibitions are open to the public seven days a week and received 1.14 million visitors in 2019[132].

Science Gallery Dublin[133] was established in 2008 on the grounds of Trinity College Dublin as a cultural space targeting people in the 15-25 age range, with the goal of "ignit[ing] creativity and discovery where science and art collide" and is often highlighted as an example of best practice in Trinity College Dublin. The changing programme of exhibitions and events represented a novel and experimental form of public engagement: it was so successful that Science Gallery International was founded in 2012, with seven new Science Gallery locations opening around the world in the ensuing years. Despite this, in October 2021, Trinity College Dublin announced the indefinite closure of Science Gallery Dublin due to financial constraints, with its final exhibition, BIAS, concluding in January 2022. A February 2022 email from Professor Linda Doyle, Provost, to the College Community noted the closing of Science Gallery "affords us the time to address the problems and build a new, exciting and sustainable way forward."

In sum, as described above, the national and University policies and structures are increasingly emphasising public engagement, open scholarship and transdisciplinarity. From foundational documents such as the Strategic Plan and the Research Charter, to research projects (detailed below), Ireland and Trinity are deepening its engagement with fundamental issues within the R&I agenda. The promotion of public engagement is embedded into university-wide policies, job descriptions and scholarly culture, while transdisciplinary science is consolidated in some fields such as PPI and increasingly relevant in other areas, including the Arts and Humanities.

3.3.2 Overview of good practices on transdisciplinary science and public engagement

For this Report, we selected the 5 most commonly mentioned good practice examples based on expert interviews[134]. The table below provides an overview of the initiatives:

Table 1. Selected good practices in public engagement and transdisciplinary science, TCD

#	Good practice	Summary	Website
1	Science Gallery Dublin	Public engagement space with research	https://sciencegallery.org/
2	Trinity Access Programme (TAP)	Access to Third Level education programme	https://www.tcd.ie/trinityaccess/
3	ADAPT	Research Centre for AI-driven Digital Content Technology	https://www.adaptcentre.ie/research/
4	Trinity Long Room Hub	Arts and Humanities Research Institute	https://www.tcd.ie/trinitylongroomhub/
5	European Researchers' Night (START/PROBE)	Europe-wide public event	https://www.tcd.ie/research/start/

[132] Trinity College Dublin, the University of Dublin, Provost & President's Retrospective Review, 2011 – 2021: https://www.tcd.ie/provost/review/, p.114/115.
[133] Science Gallery: https://dublin.sciencegallery.com/
[134] Additional examples are listed in Annex 7.

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> *"In Trinity there's a lot of them. But I think that the one that always stands out for me is the Trinity Long Room Hub. I think they're really good at a public engagement. Their "Out of the Ashes" series was fantastic. But also think ADAPT does a really good work in that space as well with their citizen think-in. And I know that's more across Trinity and other institutions as well. But I think that's good, because they start conversations with a lot of different people. So those were the two that really stand out for me, even though I know that there's an awful lot of really good work going on."* (Interviewee 8)

Additional details follow:

Science Gallery Dublin:[135]

Science Gallery Dublin (SGD) is a public engagement space that offers an art-science programme of exhibitions and events that allow visitors to participate and facilitate social connections, and brings together scientists, researchers, students, artists, designers, inventors, creative thinkers, and entrepreneurs. Based on this pioneering model, the Global Science Gallery Network was formed. Since its opening, more than three million visitors to the non-profit gallery have experienced 50 unique exhibitions, ranging from design and violence to light and love, and from contagion and biomimicry to the futures of the human species and play.

SGD also led and participated in multiple research projects[136]. Recent highlights include coordinating a 10 partner and 11 third party organisations in 19 European countries in SySTEM 2020: Science Learning Outside the Classroom, that built an understanding of informal and non-formal science and STEAM (science, technology, engineering, art and maths) learning across Europe; and participation in SISCODE: Co-design for society in innovation and science, an EU-funded project aimed at stimulating the use of co-creation methodologies in policy design, and the use of bottom-up design driven methodologies to pollinate Responsible Research and Innovation (RRI) and Science Technology and Innovation (STI) Policies.

Within the 5 selected best practices, SGD was the one most often cited. Individual examples of best practises within Science Gallery included:

- An exhibit called "SITUATION ROOM" which used gamification to bring participants together to problem-solve apocalypse-type scenarios (Interviewee 14).[137]
- The European Research Project SiSCODE (Interviewee 9).[138]
- Mediator Programme (Interviewee 4).[139]

[135] Science Gallery Dublin: https://dublin.sciencegallery.com
[136] Research: https://dublin.sciencegallery.com/research
[137] https://dublin.sciencegallery.com/in-case-of-emergency-exhibit/situation-room
[138] Situation Room: https://siscodeproject.eu
[139] Science Gallery Dublin: https://dublin.sciencegallery.com/mediators

· Citizen think-in (Interviewee 2).[140]

· Multiple interviewees referenced other programmes:

BIAS Exhibition[141]

TECH SCÉAL Event[142]

The interviews that informed content that relates to the Science Gallery occurred at a time of great uncertainty. The Science Gallery closed end of February 2022 and reflections included should be contextualised in that regard. Trinity will be taking some time to reimagine its future.

Trinity Access Programme (TAP)[143]

TAP works in partnership across the education sector with students, teachers, families, communities and businesses to widen access to and participation in third-level education for under-represented groups. TAP is a central part of Trinity's strategy to encourage students under-represented in higher education, including young adults, mature students and ethnic minorities, to go to university. A suite of programmes including School and Community Outreach Links (SCOL), the Higher Education Access Route (HEAR), University Access Programmes and a range of post-entry progression student supports are available.

Since its inception in 1993 Trinity Access has had developed partnerships with 60 secondary schools nationwide, offering varying levels of support based on historical links and government funding144. As a not-for-profit organisation, Trinity Access is maintained via funding and support from a range of alumni and friends, including enterprise, who support Trinity Access by contributing their time, expertise and finances. Trinity Access engaged more than 10,500 primary and secondary students in its outreach programmes annually, and over 3,000 undergraduate students have entered Trinity through TAP entry routes[145].

> "*It's fundamental for a university to have different pathway that opens up opportunities and shows us new talents and amazing creativity that otherwise would not make it through conventional means*." (Interviewee 4)

[140] Science Gallery Dublin: https://dublin.sciencegallery.com/latest/citizens-think-in
[141] Science Gallery Dublin, Bias Exhibition: https://dublin.sciencegallery.com/bias
[142] Science Gallery Dublin, TECH SCÉAL Event: https://dublin.sciencegallery.com/latest/science-week-2020-at-science-gallery-dublin
[143] Trinity Access Programme: https://www.tcd.ie/trinityaccess
[144] Bray, A., Banks, J., Devitt, A., Tangney, B., Hannon, C., Ní Chorcora, E., Maguire Donohoe, J., Sullivan, K., Keane, L., Byrne, P., and Smith, R., 2021. Trinity Access - Project Overview. *Trinity College Dublin: Dublin, Ireland*.
[145] Trinity Access. Trinity Access Impact Report 2020-2021. *Trinity College Dublin: Dublin, Ireland*. https://viewer.ipaper.io/trinity-development-and-alumni/inspiring-generations/trinity-access/trinity-access-impact-report/?page=1

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ADAPT[146]

ADAPT is a Research Centre for AI-Driven Digital Content Technology, funded by Science Foundation Ireland, that brings leading academics, researchers and industry partners together to deliver excellent science, engage the public, develop novel solutions for business across all sectors and enhance Ireland's international reputation. Coordinated by Trinity College Dublin and co-hosted by Dublin City University, ADAPT's partner institutions include University College Dublin, Technological University Dublin, Maynooth University, Munster Technological University, Technological University of the Shannon: Midlands Midwest, and the National University of Ireland Galway.

ADAPT's Education and Public Engagement programme[147] has a three-pronged approach, inspiring the Irish public to LEARN[148] skills, explore and INTERACT[149] with emerging and future digital technologies, and PARTICIPATE[150] directly in ADAPT research areas.

ADAPT is also internationally renowned for its research expertise, comprised of a community of multidisciplinary academic experts, researchers, innovation specialists and business professionals. Highly competitive in international funding programmes, ADAPT has competitively won over 40 European Research Projects, and leading researchers and inventors were recently recognised at the recent Trinity Innovation Awards 2021[151]. In the past 6 years, ADAPT has collaborated with more than 30 industry partners on 54 projects and generated in excess of 60 Intellectual Property Licences. The Design & Innovation Lab, also known as the dLab, is a key part of the ADAPT Centre and frequently the primary contact point for Industry.

Trinity Long Room Hub[152]

The Trinity Long Room Hub Arts and Humanities Research Institute (TLRH) is dedicated to advancing Trinity College Dublin's rich tradition of research excellence in the Arts and Humanities, on an individual, collaborative and interdisciplinary basis. Its mission is to advance research excellence, drive collaborations and interdisciplinarity, and promote Trinity's Arts and Humanities research to the widest possible audiences, highlighting the nuanced and long-term perspectives these disciplines bring to understanding the complexity of human existence and major societal challenges.

Connecting diverse communities, the TLRH seeks to create a space where informed discussion can take place and perspectives can change. The Public Humanities Programme promotes critical

[146] ADAPT: https://www.adaptcentre.ie
[147] https://www.adaptcentre.ie/public-engagement/
[148] LEARN programme: https://www.adaptcentre.ie/public-engagement/learn/
[149] INTERACT programme: https://www.adaptcentre.ie/public-engagement/interact/
[150] PARTICIPATE programme: https://www.adaptcentre.ie/public-engagement/participate/
[151] ADAPT Researchers and Inventors Celebrated at TCD Innovation Awards: https://www.adaptcentre.ie/news-and-events/adapt-researchers-and-inventors-celebrated-at-tcd-innovation-awards/
[152] Trinity Long Room Hub: https://www.tcd.ie/trinitylongroomhub

thinking and increased understanding by connecting public audiences and scholars in dialogue and informed debate, particularly through formats such as its 'Behind the Headlines' series. Highlights since 2010 include 2000+ workshops, seminars, lectures, and panel discussions; online global reach of 1m+ through podcast, social media, and website; and 200,000+ audience attendance[153].

Fostering transdisciplinarity, the TLRH hosts artists in residence and public policy fellows and spearheads research approaches which position the human at the centre of measures to tackle complex societal challenges. Since 2010, the TLRH secured €10 million in external funding through philanthropy and competitive awards. Recent highlights include the Irish Research Council New Foundations CEPRAH project (Community Engagement Praxis for Research in the Arts and Humanities 2021), in partnership with Aontas (Ireland's National Adult Learning Organisation), which identifies pathways to enable researchers in the Arts and Humanities to engage with Ireland's civic and community sphere; HUMAN+ Fellowship Programme, a pioneering EU-funded MSCA programme to appoint 18 fellows working on human centric approaches to technology development involving joint supervision from the Arts and Humanities and Computer Sciences/Engineering with funded enterprise partnerships and secondments, in partnership with ADAPT; and the Schuler Democracy Forum 2021-24, committed to translating research into real-world practice and activity, which is working with media practitioners and civil society organisations, and hosting a pioneering media fellow programme to bring practitioners into the university research environment.

European Researchers' Night (PROBE/START)[154]

European Researchers' Night is an annual event funded by the Marie Sklodowska Curie Actions that aims to bring research and researchers closer to the public, promote excellent research projects, increase the interest of young people in science and research careers and showcase the impact of researchers' work on people's daily lives. The event mobilises the entire university community engaging the public with debates, live experiments, exclusive demonstrations, interactive workshops, and more. Trinity has coordinated European Researchers' Night events every year from 2013 to 2021 and will do so again in 2022 and 20230.

European Researchers' Night at Trinity was previously coordinated by an individual school, usually in collaboration with Science Gallery Dublin. After the conclusion of PROBE in 2019, the Office of the Dean of Research took over responsibility for coordinating European Researchers' Night events in Trinity and renamed the event START: Start Talking About Research Today. START promotes the idea that research is a living, fundamental part of our society that impacts on and involves everyone. Organising the event through the Office of the Dean of Research allows for a more coordinated, centralised approach and reduces the administrative burden on individual schools and PIs. Trinity's

[153] Trinity Long Room Hub. Celebrating 10 years. https://www.tcd.ie/trinitylongroomhub/assets/documents/10-year-anniversary-2020.pdf *Trinity College Dublin: Dublin, Ireland*.
[154] European Researchers' Night (PROBE/START): https://www.tcd.ie/research/start

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partners on the 2022/23 events include ADAPT and RCSI who will collaborate on public engagement events across multiple locations.

A central element of Trinity's European Researchers' Night events is a longstanding partnership with the British Council Ireland who provide communications training workshops for researchers who will then employ their skills in public engagement events. These workshops have been refined over the years and are currently being redesigned to include more advanced workshops for researchers to refresh and enhance their research communications skills.

3.3.3 Incentives and disincentives

3.3.3.1 Individual level

Incentives

Based on the interviews conducted, three main personal motivations or incentives to work in/with public engagement and transdisciplinary science were identified: personal experience, personal responsibility, and professional responsibility.

Personal experience, including having benefitted from initiatives such as the ones they work on today (e.g., Interview 3) or ones they mention (e.g., Interviewee 4), were mentioned by multiple interviewees – this was particularly true for the mention of TAP: several of the interviewees mentioned that they had come through the Trinity Access Programme themselves.

Personal responsibility was mentioned by most of our interviewees: personal responsibility to strive for social inclusion in research was mentioned by seven interviewees, while five mentioned their desire to effectively communicate and engage public audiences.

> *"In terms of society, really I am trying to be fed by what has been raised as a local concern by society rather than [...] coming along with something prepackaged or pre-determined for society, coming as a researcher in public engagement, so I want to hear from everyone else. Now, it does make it difficult because you have to choose that [...] right balance between open-ended choice and some boundaries that means you can lend your expertise."* (Interviewee 4)

Professional responsibility was mentioned by half of all interviewees (6 out of 12), since they felt they have a designated role concerned with public engagement. Such roles in Trinity, briefly mentioned in section 1 above, reflect University structures in place and include Communications Officers, Research Impact Officers, Education, Public Engagement & Communications Officers, Civic Engagement Officers, Research Assistants, leadership in public engagement programmes and projects. Such a high mention of professional responsibility may be due to the profile of interviewees in administrative-focused roles, which also constituted half our interviewee list.

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Disincentives

The most common disincentives involved personal circumstances. These were often categorised more as hurdles more than disincentives. The most frequently mentioned issues were caring responsibilities, recognition of public engagement work, Covid-related issues, and burn-out.

The most frequently mentioned personal disincentive to work with/in public engagement and transdisciplinary science was **Parenting responsibilities**, mentioned by four of our interviewees. A lot of public engagement work happens outside of normal working hours and this can present a challenge especially for those with no support network.

> *"There were an awful lot of people who were able to do it because it was outside of work hours, and it tends to happen late at night, which can disqualify a lot of people from participating. I think it's very particular to the individual. But in general, I would say yes, because often the things that you're expected to do as public engagement activities can take place outside of normal working hours, which is difficult for people if they have caring responsibilities outside of working hours to manage as well."* (Interviewee 8)

Not having public engagement work taken seriously or completely understood in interpersonal interactions was mentioned by 3 of our 12 interviewees.

> *"… my pursuit of and even research around this topic would be considered lesser."* (Interviewee 3)

Two interviewees mentioned **Covid-related challenges** such as people being tired of Zoom and technical limitations but also not fully comfortable coming back to live in-person events. Another two interviewees mentioned **'burnout' due to workload**.

Two additional insights worth mentioning from different interviewees are the **different pace of public engagement** when compared to traditional commitments, and that **being non-Irish** can be a barrier to acceptance as well as having added administrative hurdles.

3.3.3.2 University level

Incentives

Multiple University incentives were mentioned by interviewees, some of which are described in section 3.3.2 above.

The top two incentives mentioned were interlinked in the topic of recognition, mentioning **awards for public engagement** (4 interviewees), and TCD moving towards embracing EPE as an **important part of academia and recognised and rewarded** (3 interviewees).

The **Microsoft TEAMS channel for Education and Public Engagement staff** working across the university, which is a bottom-up organic channel in contrast with other central initiatives, was mentioned by 3 interviewees.

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The following most mentioned topics are related to policies and structures: **EPE being incorporated into academic staff advancement** (2 interviewees) and the **emergence of roles dedicated to outreach and public engagement** (2 interviewees).

> *"Academics have come to me and said can I work with [name of institution][155], I want to put it on my application for progression and promotion […] so it's seen as something that should happen."* (Interviewee 3)

Two interviewees mentioned incentives relating to Trinity's attribute as an old city centre-campus: Trinity has a **central location and a well-known name which makes access easier**.

Trinity's policies were also mentioned as incentives, with a highlight being the fact that the new **Strategic Plan has a communications and public engagement office** (1 interviewee), Trinity College's **efforts to move towards open access** (1 interviewee), and internal **Key Performance Indicators (KPIs) that have to be met** (1 interviewee).

Disincentives

As with incentives, interviewees were able to identify disincentives and provide recommendations and suggestions for improvements.

The major concern, expressed by most of our interviewees (7 out of 12) is the **lack of central hub for public engagement initiatives**. Even with the current bottom-up structures, there is a desire for "more intersections between projects and integration of learnings from other projects" (Interviewee 4), and more joined-up thinking was added as a potential benefit of such central structure, as there's currently "a lot of duplication, competitiveness for the same funds - it can be so counterproductive" (Interviewee 3). Indeed, the **lack of a unified message** was also identified as a disincentive (3 interviewees). The potential **closure of Science Gallery Dublin** was also addressed by many of the experts[156] (6 interviewees) – the most cited practice in EPE and transdisciplinarity.

> *"Not having Science Gallery in Trinity is like tearing out an a very important organ."* (Interviewee 4)

Interlinked issues around resources and capacity were the third most often cited group of disincentives: there are **not enough funding/resources available** and a perception that often public engagement is treated as an extra (5 interviewees). TCD technical infrastructure can be considered inadequate (2 interviewees), and administrative systems were also described as overly Byzantine: paying outside artists and informal learning specialists can be very difficult (1 interviewee).

[155] Omitted for anonymisation purposes.

[156] The interviews that informed content that relates to the Science Gallery occurred at a time of great uncertainty. The Science Gallery closed end of February 2022 and reflections included should be contextualised in that regard. Trinity will be taking some time to reimagine its future

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> *"The lower hanging fruit, we will achieve quite easily, but when it comes to, you know, real commitment, maybe it's not a request as well received."* (Interviewee 3)

Capacity is lacking on both academic and administrative sides of the University: often it is simply added on to another role without necessarily giving it more time/money, with a **lack of roles dedicated to outreach/engagement** (5 interviewees), in addition to **demanding administrative responsibilities on academic staff** that can take away from other aspects of their work, including public engagement (3 interviewees).

On research culture, some interviewees feel **public engagement is still considered something separate from research** (2 interviewees), that **researchers' lack of understanding about public engagement** and its importance (1 interviewee), and **researchers feeling protective** that their work is not "ready" for public audiences (1 interviewee).

The fact that **impact can be very hard to quantify** was pointed both as a systematic issue (below) and as a challenge at University level (2 interviewees).

3.3.3.4 Societal stakeholders

Incentives

Four main societal incentives were identified by our interviewees. The first is an increased perception of TCD as being **accessible and approachable, in terms of a societal mindset** (2 interviewees), even as a perception of Trinity as the epitome of an Ivory Tower is still regarded as a main disincentive. Trinity is increasingly diverse (Interviewee 11) and that has helped – indeed, **increased intersectionality, diversity and inclusion** was also mentioned as a societal incentive (1 interviewee), in addition to specific **accessibility for people with disabilities** (1 interviewee). The **increasing incorporation of co-creation** in Trinity was also mentioned (1 interviewee).

Disincentives

Societal disincentives were more widely mentioned. The most prevalent disincentive to public engagement and transdisciplinarity from a societal perspective was the **perception of TCD as the epitome of an 'Ivory Tower'** (5 interviewees), a **Dublin focus** to the detriment of the rest of the country (3 interviewees), and lack of appropriate facilities for those who have mobility issues, sight/hearing loss, who are not very well catered for (2 interviewees).

In terms of general societal trends in Ireland, **informal learning is sometimes dismissed by public audiences but also certainly by official bodies** (2 interviewees) and **combating misinformation** (1 interviewee) was also mentioned. **The lack of a science museum in Ireland** was also mentioned as a societal disincentive (2 interviewees), which may also be linked to wider societal trends.

One School-based interviewee called attention to the **public perception of you as a person based on your public-facing output** (1 interviewee) and the challenges of media interaction:

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"When it comes to public engagement in terms of the media or publicity, I find that me, and I would say this would be something of most, nearly all my colleagues, they have a bit of a conservative approach. I know that if I go on Pat Kenny, I will get an unbelievable stream of emails and tweets. […] A lot of it's negative and something that can be quite hurtful actually. So you're going to be very careful and you know you will get huge amount of phone calls. So you know that the minute you lean in to an interview, it will occupy two or three of your days coming up, and you basically have to just put other things to the side. […] I think a lot of people will pull back from engaging at the sort of the media level because they know that it will occupy a lot of their time. Unless they're publicizing a project or they're doing or paper they've written and they wanted to discuss with the public." (Interviewee 11)

3.3.3.5 Systemic level

Incentives

National, European and international incentives were mentioned as part of the systemic incentives. One interview highlighted how the Irish Government, the European Commission, and Science Foundation Ireland are all demonstrating an **attempt at a unified approach to highlighting public engagement in research** (1 interviewee).

On a national level, Science Foundation Ireland[157] was the most cited incentive among our interviewees: **Science Foundation Ireland requires that their researchers participate in EPE** (2 interviewees) and has **concrete KPIs that must be achieved** (1 interviewee). This may also result from the fact that 2 interviewees were affiliated to SFI-funded research centres. Irish **governmental consultations on public engagement becoming more common** was also referenced as a systemic incentive (2 interviewees).

The European level, however, gained more prominence, with 5 interviewees mentioning **European funding bodies wish to see public engagement with research**. Internationally the UN **Sustainable Development Goals are an incentive in themselves** (1 interviewee).

Disincentives

Impact being very hard to quantify, and funders often wanting that quantification, was identified as the most common disincentive (3 interviewees). The expected types of impact are also questioned since it's **difficult to have local impact when working on a European project** (1 interviewee).

Related to the issue of the time it takes for public engagement and transdisciplinarity, which was raised in response to other questions, **public funding rarely being sustained for long enough periods of time** was identified by one of our interviewees as a systemic disincentive. This seems to be a fundamental issue.

[157] https://www.sfi.ie/

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And finally, the motivation of funders was a major disincentive for one of our interviewees:

> *"It's the problem for me is always what's motivating these things, and, you know, funding bodies, and all those kinds of thing. And agencies are, and government, they're all going, you need to engage with public. And it's like, why do you want to do it as a funding agency, or a public body or government department? What is your actual motivation for doing this? And it's usually just to be seen to be doing it, they don't actually care what the engagement is. And that then gets filtered back into the universities as we have to do this, because they're telling us to, and not because we actually should. And so, I suppose it's the purity of motivation is the big problem for me."* (Interviewee 8)

3.4 University of Barcelona (UB)

3.4.1 Existing university structure and policies relevant to public engagement and transdisciplinary science

The University of Barcelona has different infrastructures focused on supporting transdisciplinary science and facilitating mutual learning and collaboration between research groups and citizens:

UB's Science and Technology Centres (CCIT-UB) are a set of facilities designed to provide coordinated and integral support for research activities in the fields of **chemistry or bioscience** at the University of Barcelona. Services are offered to the entire university community and to public institutions and private concerning technological transfer agreements with the University. The main objective is to promote a culture of innovation by transferring knowledge and technology. Also, it has a cross-disciplinary approach that allows them to develop new methodologies and technologies without disciplinary barriers and limitations[158].

Science Park of the University of Barcelona (PCB) is an international benchmark as a space to promote research, knowledge transfer, and innovation in the public and private sectors. It has over 100,000 m^2 available for companies and laboratories and houses almost 3000 professionals[159].

Through the Transfer Office, the **Bosch i Gimpera Foundation (FBG)** enables the impact of UB research on society through companies and institutions. They offer assistance and support to researchers, companies, and investors to promote the development of innovation projects through various forms of collaboration: technological cooperation, a license agreement or the creation of spinoffs.[160]

The **Scientific Culture and Innovation Unit (UCC+i)** of the UB promotes scientific dissemination actions following two axes: a) organization and coordination of their projects b) support and dissemination of the University's dissemination actions (through the website and social media).

[158] http://www.ccit.ub.edu/EN/home.html
[159] https://www.pcb.ub.edu/en/the-pcb/
[160] http://www.fbg.ub.edu/en/

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Specifically, this unit coordinates the program "**La UB divulga**" which covers scientific dissemination activities at the University of Barcelona and the aim is to promote the social interest in science and knowledge, increase the scientific culture of the citizens and scientific vocations of young people and children.[161] This unit became a club which anyone interested in science can join[162].

The portal collected 168 activities, and received 31,610 visits, with an average of 84.07 visits per day[163]. Among its main actions the **Science Festival** stands out, an annual event that brings research staff into contact with the public. In addition, **UB Scientific Coffees, UB Dissemination Meeting**, etc. Likewise, the unit carries out activities for primary and secondary schools such as '**Camins infinits**' (Infinite Paths) which offers lectures at schools so that researchers who are preparing their doctoral thesis can present their research to young students and answer their questions or the **Toc-toc,** which lets experienced researchers give lectures to social and cultural institutions that apply for it. There are other ones, such as **Crystallization at School Contest**, **Arque UB**, '**La caravana de la ciència**' (The caravan of science), **NeuroArt**, **Endless Paths**, etc. For citizens, there are different dissemination actions such as **Weather Explorers, Riunet, FloodUp,** etc.

The University of Barcelona has 14 **UB-specific research institutes** (ICCUB, IMUB, IQTUCUB, IREA, UBICS…) besides others in which the UB is a full member of their respective boards. The research institutes promote and undertake interdisciplinary and/or specialised research activities in various fields of science, technology, social sciences, humanities and arts. Also, all UB research institutes highly promote the transfer of research results to society[164].

Futurs UB (*UB Futures*[165] provides the dissemination among students and alumni, and **UB Premsa** (*UB Press*)[166] supports society's scientific learning, culture, and knowledge by bringing UB science and innovation to the community at large.

In addition, the University of Barcelona offers funding to cover the cost of publication fees to support the new **Open Access** publication model[167],[168],[169]. The system supports articles in non-subscription journals and therefore allows researchers to connect more easily and give visibility to their research, increasing cross-disciplinary research and open dissemination of knowledge. In the last years, a few policies have been implemented in the UB to encourage open access. Most of these policies require that research funding recipients deposit their results in a publicly accessible repository. The Vice-rectorate for Research Promotion opens a call for grants (120.000 euros) to publish in open access scientific journals such as *American Chemical Society (ACS), Cambridge*

[161] http://www.ub.edu/laubdivulga/projectes/ https://www.ub.edu/web/portal/ca/la-ub-divulga/
[162] http://www.ub.edu/laubdivulga/club
[163] http://www.ub.edu/laubdivulga/activitats
[164] https://www.ub.edu/web/ub/en/recerca_innovacio/recerca_a_la_UB/instituts/instituts.html
[165] https://www.ub.edu/futurs/
[166] https://portalfuturub.ub.edu/
[167] https://crai.ub.edu/en/crai-services/intellectual-property/open-access-ub
[168] https://crai.ub.edu/en/crai-services/intellectual-property/open-access-ub/policies
[169] https://crai.ub.edu/en/crai-services/open-access-ub/observatory

University Press, Elsevier, Springer and *Wiley.* UB members (students, teachers, researchers, etc.) can request funding.

Since the approval in 2011 of the UB's open-access policy, the number of open-access publications available has risen dramatically. Some general data on this can be followed on the OA Thermometer[170].

The **Office for Knowledge Transfer of the CRAI Unit (Resource Centre for Learning and Research)** offers university staff information and advisory service related to all aspects of the dissemination of scientific knowledge generated at the University, as well as on the use of materials created by others. It is especially focused on free dissemination options, as well as on information and promotion of open access initiatives[171].

Dr. Gemma Marfany is the **Rector's Delegate for Science Dissemination** and acts as a champion for public engagement and a senior leader who takes formal responsibility. This is a new position in the University governance, and it is an opportunity to promote scientific policies with public engagement at UB[172]. In addition, Dr. Marfany is one of the main drivers of a **university strategic plan** that aims to promote, encourage and organize citizen science initiatives, projects and activities. The implementation of the different measures of the plan is expected this year (2022), and involves: a) recognition of the administrative tasks performed by UCC+i staff; b) recognition of this type of research in PDA (Plan of Academic Dedication in UB); c) promotion of equal access to scientific information through fostering activities addressed to vulnerable and/or invisibilised groups (i.e. elder, patients, cultural groups, etc.); d) training of young PhD graduates in scientific dissemination. These items are intended to promote the visibility of open science, increase participatory and dissemination activities, and encourage researchers to consider bioethical aspects of science *(See section 3.4.3.2 on university incentives).*

Finally, the university can provide **financial support** for dissemination activities. The aim of this support is to promote activities that contribute to the dissemination of knowledge and stimulate citizen participation. However, financial aid is granted only to activities that do not require a large economic cost (e.g., setting up stages, installing lights, providing spaces, organizing activities, etc.) and prove that they generate impact.

Currently, the University of Barcelona has different services for the dissemination of research carried out by teachers and students. As a frame of reference, we reviewed websites and social networks.

University websites, such as the **UB website**, **Premsa UB** and **UB Internet,** are the main university communication tools, however, a preliminary diagnosis identifies deficiencies in the visibility of public engagement and transdisciplinary science in these websites. There is no information section

[170] https://crai.ub.edu/en/crai-services/open-access-ub/thermometer
[171] https://crai.ub.edu/en/about-crai/crai-units/research-unit
[172] https://www.elnacional.cat/ca/firmes/gemma-marfany

for transdisciplinary science and public engagement. Overall, the projects, research lines, and scientific services linked with co-creation and innovation with societal stakeholders are barely mentioned. Furthermore, there is little information regarding projects that are carried out jointly with different stakeholders (local, national, or international).[173]

Another institutional communication channel is "**La UB Divulga"**[174], in which public engagement and transdisciplinary science are more visible, including the set of scientific dissemination activities organised by the University of Barcelona. The portal collected 168 activities, and received 31,610 visits, with an average of 84.07 visits per day. However, the results of participatory activities are published occasionally.

In parallel, there is greater dissemination in **UB Divulga's social networks**. The profile has 5,165 followers on Twitter and 1,462 on Facebook. The Instagram account has 1,677 followers and the YouTube channel has 192 subscribers and 91 videos published, with a total of 17,773 views.

On **Instagram**[175], every 15 days a researcher talks about personal and professional aspects of the research, accompanied by photographs of the UB and the researcher's personal archive. This action seeks to bring the figure of the researchers closer to the public and to give maximum prominence to all those that make it possible for the UB's research system to continue to function. In other words, it is a strategy that seeks to explain the day-to-day and everyday life of research, so that citizens, especially young people, get closer to research.

On **Twitter**, each week deals with a specific event, every day a different content is offered. Mondays: a photo is featured under the hashtag #mésquemil ('more than a thousand'). Tuesdays: concept related to the event with the hashtag #voldir ('it means'); Wednesdays: person or organization relevant to the topic is introduced, #quiésqui ('who is who'); Thursdays: video is published with #miraub ('look UB'); Fridays: an activity or action is recommended with #apuntat ('join'). If there is a specific day during the week that marks the event, it is tagged with #avuiés ('today is')[176].

Across the university's various communication platforms, public engagement does not figure prominently and consistently in internal communications: its strategic importance or the resources and support assigned to sustain the activity are not highlighted. Moreover, it takes a long time to find this information on the platforms. A clear example is that "La UB Divulga" information is not easy to find when navigating in UB website.

[173] Some examples of dissemination of research and open science: https://www.ub.edu/web/ub/es/menu_eines/noticies/2021/07/021.html https://www.ub.edu/web/ub/es/menu_eines/noticies/2020/10/043.html https://www.ub.edu/web/ub/es/menu_eines/noticies/2014/10/047.html https://www.ub.edu/web/ub/es/menu_eines/noticies/2015/02/036.html

[174] http://www.ub.edu/laubdivulga/

[175] https://www.instagram.com/ubdivulga/?hl=es

[176] https://twitter.com/UBDivulga

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With regards to internal communications, there are limited number of a) learning activities or courses that promote the visibility of public engagement and, b) spaces to encourage staff and students, share effective practices related to open science, and celebrate success. Concerning external communications, the institution has not analysed yet the different public stakeholders and end-users of its research (in terms of expectations, attitudes and aspirations) which could be oriented to promote citizens' interest in UB research and increase the involvement in citizen science among them. Notwithstanding, as it can be seen in the following sections, most of this type of communication and dissemination engaging publics is done by individual researchers and research groups or individual research projects lead from the UB, for instance, when they present their project to their students or to potential stakeholders or address non-university publics. In conclusion, the visibility of co-creation, innovation and interdisciplinary methodologies is increasing at the institutional level, allowing the university body to become familiar with these practices. However, much time, effort and resources are needed to produce a real cultural change and make citizen science more visible in the university's internal and external communications.

UB research institutes promote and undertake interdisciplinary and/or specialized research activities in various fields of science, technology, social sciences, humanities and the arts. They also provide scientific and technical consultancy services in their areas of expertise. The University of Barcelona has 18 UB-specific research institutes and is a full member of the respective boards of a number of other research institutes.

All UB research institutes target highly competitive joint research, conduct innovative projects and promote the transfer of research results to society. Their mission is to:

· Promote interdisciplinarity and specialization.

· Coordinate the research developed by different research groups.

· Provide scientific and technical advice.

The 18 UB-specific research institutes are:

· Barcelona Economics Analysis Team (BEAT)[177].

· UB Archaeology Institute (IAUB)[178].

· Institute of Biomedicine of the University of Barcelona (IBUB)[179].

· Institute of Cosmos Sciences (ICCUB)[180].

[177] http://www.ub.edu/beat/

[178] https://www.ub.edu/web/ub/galeries/documents/sites/transparencia/organs_govern/consell_govern/Acords/consell_20201007/6.4_institut_dxarqueologia.pdf

[179] http://www.ub.edu/ibub/

[180] https://icc.ub.edu/

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· Institute of Mathematics (IMUB)[181].

· Institute of Nanoscience and Nanotechnology (IN2UB)[182].

· Institute of Neurosciences (UBNeuro)[183].

· Institute of Theoretical and Computational Chemistry (IQTCUB)[184].

· Water Research Institute (IdrA)[185].

· Biodiversity Research Institute (IRBio)[186].

· Medieval Cultures Research Institute (IRCVM)[187].

· Research Institute in Applied Economics (IREA)[188].

· Institute of Research in Education (IRE)[189].

· Research Institute of Nutrition and Food Safety (INSA)[190].

· GEOMODELS Research Institute[191].

· Transjus Research Institute (TransJus)[192].

· Ancient Near East Institute (IPOA)[193].

· Institute of Complex Systems (UBICS)[194].

The strength of these research institutes is an important asset for the whole UB in terms of fundraising for research, both in the national and the international arenas, and because they have become true hubs of knowledge for research at the UB. The economic value of the projects obtained by these institutes from 2014 to 2018 represented 68.7% of the total funding for research projects managed by UB researchers overall. UB institutes obtained 80.5% of this financing through competitive calls, while 25.7% was granted by international agencies. The interdisciplinary nature of the institutes at UB can be visualized in Figure 7[195].

[181] http://www.imub.ub.edu/inici/
[182] https://www.ub.edu/in2ub/
[183] http://www.neurociencies.ub.edu/
[184] https://www.iqtc.ub.edu/iqtc/about/
[185] http://www.ub.edu/aigua/en/
[186] http://www.ub.edu/irbio/home
[187] http://www.ircvm.ub.edu/
[188] https://www.ub.edu/irea/
[189] http://www.ub.edu/ire/en/the-research-center/
[190] http://insa.ub.edu/en
[191] http://www.ub.edu/geomodels/Home_en.html
[192] http://www.ub.edu/instituttransjus/index_ENG%20-%20Copia.html
[193] https://www.ub.edu/ipoa/en/
[194] http://ubics.ub.edu/index.php
[195] Updated information can be found at: www.ub.edu/portal/web/instituts/inici

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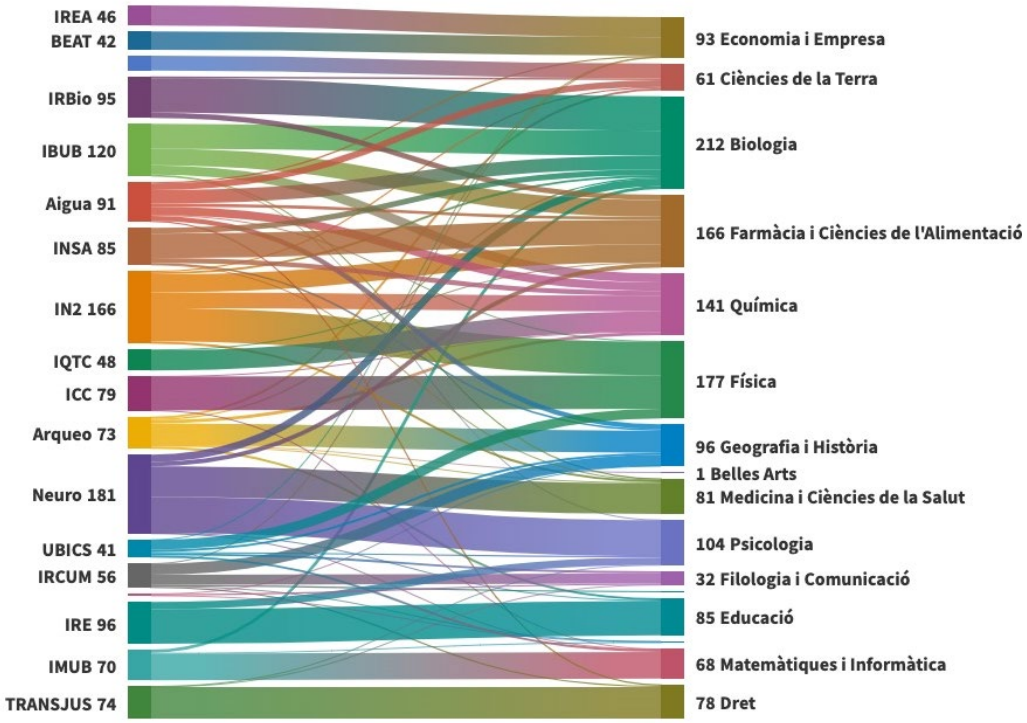

Figure 7. Institutes (left) and Faculties (right) correspondence at UB.

3.4.2 Overview of good practices on transdisciplinary science and public engagement

The best practices were selected through the panel of experts. The choices of our projects are based on four main criteria (1) projects that have demonstrated excellent results in improving public engagement and transdisciplinary science, (2) initiatives that form collaborations between different types of partners that have different expertise and resources, (3) proposals include Key Impact Pathways to achieve scientific, economic or social impacts and (4) diversity of projects, i.e., initiatives coming from different fields of science/discipline, which influenced the type of social stakeholders they are engaged with. They are the following projects: Surfing for Science (Faculty of Earth Sciences), xAire (Faculty of Physics), Allinteract (Faculty of Economy and Business), Prometheus (Faculty of Geography and History), and 11F "Girls in Science" (UCCi- Scientific Culture and Innovation Unit).

Surfing for Science

Surfing for science is a citizen science project with the objective to assess the level of microplastic pollution in shoreline waters. The citizens participate in the project by collecting scientific samples. They can contact any of the entities -on the Catalan coast- and sign up for sampling. The objective, on the one hand, is to know how much and what type of microplastics are present in coastline

waters to find solutions to reduce their impact. On the other hand, citizens' participation makes society more scientifically aware of the specific problem of plastic pollution[196].

xAire

xAire is an intergenerational citizen science project and was born from the Estació Ciutat (CCCB, ICUB, and Barcelona City Council). The aim is to determine the levels of nitrogen dioxide pollution around schools. The project counts on the participation of primary school students who install the diffusion tubes throughout Barcelona city with the help of their parents and teachers. 18 public primary schools from the 10 districts of the city participated in the action. Initial training sessions are organised for teachers and families. The young students presented a set of conclusions and recommendations in front of the Barcelona City Council and Barcelona Science Congress. The citizen science data provides a way to improve existing predictive models and to better understand the health impact of this pollutant.

ALLINTERACT[197] Widening and diversifying citizen engagement in science

ALLINTERACT is a European H2020 project developed by an interdisciplinary team. The aim is, on the one hand, to create new knowledge about how to transform potential citizen participation in science into actual engagement in scientific research on the fields of gender and education. On the other hand, to unveil new ways to engage societal actors, including young citizens and groups that have traditionally been excluded from science. Overall, the project is based on engaging a transformative and productive dialogue on gender studies and educational research with diverse citizens and societal actors involved in it[198]

Interreg POCTEFA Prometheus

Interreg POCTEFA Prometheus was born when UNESCO added the "Fire Festivities of Summer Solstice in the Pyrenees" in the Representative List of Intangible Cultural Heritage of Humanity. The project is led by the University of Lleida and UB is a relevant partner of the consortium. The goal is to enhance the common heritage of the three states (Andorra, Spain, and France) through cross-border innovation in universities and research centres. Specifically, the aim is to transfer the knowledge generated in the process of university research around the Fire Festivities, through training and informative products, intended for public institutions (municipal and regional), associations, and businesses in the cultural sector of the cross-border territory[199].

11F "Girls in Science"

11F "Girls in Science" is a citizen science project which was born in the UB to celebrate the International Day of Girls and Women in Science (11th of February) from the need to combat the

[196] https://www.asensiocom.com/surfingforscience/es/
[197] https://allinteract.eu
[198] https://allinteract.eu/
[199] https://www.prometheuspoctefa.eu/es/inicio/

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invisibility of women scientists and to try to promote scientific vocations among young girls. The aim is to break stereotypes and prejudices and encourage the participation of girls in the world of scientific and technological research. The project directly involves Barcelona's schools and UB women scientists: five women researchers from different disciplines and at various stages in their scientific careers share their stories with primary and secondary school students (i.e. what science means to them and the dreams they had when they were children) to convey the idea that gender should not condition, in any way, anyone's job opportunities.

3.4.3 Incentives and disincentives

3.4.3.1 Individual level

Incentives

Based on our qualitative fieldwork, we identified four main incentives that can change behaviour at the individual level.

The first incentive is related to emotional aspects. Researchers expressed the importance of the **passion for science**, especially when it is combined with ability and persistence. For them, love and affection for what they do, lifelong learning, and improvement of democratic systems is what encourages them to research and innovate. In addition, they highlighted the acquisition of several personal benefits: the **development of new knowledge** and **research skills**, as well as a deep and attractive **comprehension of socio-local issues**. A researcher on the xAire project argued that being a scientist is a vocation and the co-creation processes provide personal benefits:

> "*Many of us do research because we are passionate about it (...) it's not just a job, we really rely on science (…). But not only that, this type of research has also taught me many things that helps me understand problems that people live with daily, and how to investigate them*." (xAire researcher)

It is also remarkable that many researchers consider **societal engagement as a part of scientific activity**. Thus, the common ground is the belief that, in a truly democratic society, decisions regarding scientific issues should also be the subject of active opinion and debate by citizens. They believe that this allows them to conduct research with a high level of **veracity** and **robustness** while **respecting ethical elements**. Although most of the interviewees considered that citizen participation is part of scientific work, they pointed out that not all university researchers think the same way. This element is related to the importance of developing a participatory culture among university professors and scientists.

> "*Many things I was taught by my university professors are contrary to the scientific evidence (...) I realised it later in my career. But there also are professors who do lectures and research that overcome these hoaxes and transmit them to their students and to the scientific community*." (Allinteract researcher)

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The second type of incentive relates to the **social impact of research**. Although researchers are motivated by passion and a sense of curiosity and the drive to explore how the world works, they also see science as a way to make the world a better place. This issue was highlighted as highly relevant by many of the interviewees. They argued that the understanding of the social impact of research is related to the belief that the production of science and technology has a significant impact on different social dimensions: economic, political, community, specialised institutional domain (education, health, laws, welfare, and social security, among others), culture and values. Let us look at some examples:

> "*I have always been interested in feminism, so when the project was proposed to me, I decided to participate because I like the topic and also the project helps empower young women*." (Stakeholder 11F)

> "*I was encouraged by the idea of being able to contribute from the university to develop projects that have a social benefit in the local territories*." (Prometheus researcher)

> "*I am paid through the public budget, so I believe that citizens have the right to know all the results of my research (...) transparency is necessary in research. Moreover, democracy is not only for everyone to be able to participate a little. It is important to improve science and citizens' lives.*" (Allinteract researcher)

The **previous research experiences** are the third type of incentive. There is a relationship between experience and preference for certain research, i.e., the previous experience was found to play a key role in the researchers' choice. For this reason, researchers argued that accumulating a strong background in several research fields related to public engagement provides an incentive at the individual level:

> "*This project, from the beginning, motivated me a lot because I come from a background where public engagement is studied (...) I had studied it in my undergraduate and master's degree... also, I am actively involved in associations (...) so I had the tools to work on the project.*" (Prometheus researcher)

> "*I like science communication and I had worked on it, so I had the skills*." (11F researcher)

Disincentives

From our analysis, we identified three disincentives. These are a) lack of recognition of the science of public engagement in the PDA (Academic Dedication Plan) and CV (curriculum vitae); b) overwork and lack of time; and c) lack of knowledge about ways to interact with citizens.

The first barrier, "**the lack of recognition of this type of research in PDA and CV",** is important if we consider a university's model in which access and promotion in the university's professional career

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are carried out through systems of recognition of merits (bureaucratic nature). For instance, at the UB, the PDA includes all activities carried out by professors: teaching and research activity, innovation and knowledge transfer activity, social responsibility considerations and management activity. Academics often have a heavy teaching load, yet public engagement research while involves time and dedication is not considered significant in the PDA.

> "*These types of projects are well received in terms of image, but then, on a personal level, they do not generate many benefits (...) they do not free you from teaching tasks*." (Prometheus researcher)

Although researchers have emphasised the value and benefits of citizen participation in research, they still consider this kind of research as an **overload of work.** Many of them have a teaching, research and administrative responsibilities, so they have a **lack of time**. Thus, they stress that it is crucial to develop incentives that foster a participatory culture, in which co-creation and innovation methodologies will not be considered as a new labor burden.

In addition, many **early-career researchers**, the sheer size of the scientific endeavor, consider that the increasing pressure to win grants and publish results, can be discouraging to choose an initiative, methods, or tools to support public engagement. Thus, for many postdocs and Ph.D. students who are eager to climb the academic ladder, this kind of research is often overlooked. This can put young researchers and Ph.D. students in a difficult position, as one Prometheus researcher stated:

> "*The non-recognition of this type of research can make it easier for young people to not want to get involved (...) it doesn't pay off for their career*." (Prometheus researcher)

Another gap expressed by the researchers is the **lack of knowledge about ways of interaction** between various stakeholders to build more fluid, broad and responsive relationships. They emphasised two challenges: how to develop trust between scientists and the public and, ways to express that citizen science is an effective tool for life improvement and change.

The first concern is about the accommodations that they must make into **dialogue** related to "what to say" and also "how to say it". In addition, how can they ensure that citizens understand how the data can be used i.e., how can they explain the project so that it is compelling enough for people to take time out of their busy lives and participate in the research:

> "*Many scientists don't usually explain their work because they don't know how to do it. They are very used to talking to a very specialised audience (...) so they need tools to know how to do it. For example, I spend a lot of time in the lab, so I need to improve my communication skills*." (Surfing for science researcher)

> "*Sometimes it is difficult to make citizens understand why a project is necessary (...) even the "protagonists of the party", in the south of France, did not understand why such a project was necessary*." (Prometheus researcher)

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Moreover, citizens often want **immediate results**. The researchers pointed out the need for the development of practical tips for managing and setting expectations that allow all stakeholders to be on the same line. If the rules of interaction are not defined, they feel that they cannot expect stakeholders will be satisfied with the results. So, researchers need to know how to manage participants' expectations and be able to build trust with them:

> "*For people who are not involved in science, it is difficult to make them understand that they have to wait a long time before they know the results*." (Surfing for science stakeholder)

They are also unaware of the most effective means, **tools** and **methodologies** for communication about projects and results: through educational centres (high schools), events (public conferences, debates), social media (Instagram, Twitter, podcasts, etc.), traditional methods (newspapers and television), etc. Ultimately, the researchers argued that developing trust with citizens takes considerable time, so the time limits of the projects should not be short-term.

3.4.3.2 University level

Incentives

The researchers considered that the university institution is a strategic element to stimulate public engagement. The institution has the capacity and the opportunity to create access points for citizen participation. It can facilitate access to scientific and technical knowledge to the public and promote the collaboration of researchers with various external organizations.

> *"(...) the university is not only a place to create knowledge. I think we must overcome this vision. A university is a place where citizens can have access to carry out co-creation activities. Representatives of citizens and organizations can be included in the research (...) in addition, the institution is essential when it comes to transmitting knowledge to citizens through researchers*." (xAire researcher)

Furthermore, the university can be a good platform to respond to **interdisciplinary needs**, as well as to guarantee that there are no areas of research left behind. On the one hand, societal challenges are not subject to disciplinary considerations and research linked to those challenges need for the collaboration of different disciplines. The UB promotes transdisciplinarity through the coordination of Research Institutes and Centres. Nevertheless, there can be opportunities for other research groups, but they are not systematically designed and implemented. Some examples follow:

> "*UB allows you to establish relationships with other departments. These relationships facilitate the creation of future projects*" (Prometheus researcher)

> *"I met people from other faculties who struggled for the empowerment of women scientists (...) I had never met them before, and the project made me get to know them*." (11F stakeholder)

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In general, researchers highlighted the importance of **infrastructures that support and coordinate public engagement.** In this regard, the University of Barcelona is working through the following dimensions: **a)** the creation of decentralised support structures that have been formally assigned the coordination of participatory activities (e.g., UCC+i); **b)** an increase in the number and scope of outreach and citizen participation activities and festivals; **c)** the inclusion of a new position to strengthen science dissemination; **d)** the development of a participatory strategy to ensure cultural and operational changes. Let us discuss these points in more detail.

The **Unit for Scientific Culture and Innovation (UCC+i)** was emphasised due to its support for the university's research activity, by acting as a communication office for UB research projects, holding responsibilities for the maintenance of relations with non-UB institutions, and providing technical support in the development of one dimension of the 'UB scientific policy. However, this technical support is limited, as only two people form the staff of this Unit.

> "*It is true that they [UCC+i] have helped us a lot in administrative tasks and to focus some activity... but in the end there are only a few staff, and they can't be able to support everyone. It is a necessary help, but it is limited*." (Prometheus researcher)

The importance of helping university students to develop social interaction skills through community learning was also emphasised. There are certain university degrees (e.g., anthropology) in which students are socialised on how working together with the community can improve the impact, efficiency, and value of research. Furthermore, there is a plan to provide this type of training to PhD students through doctoral training capsules. As one researcher said, the role of the university in developing skills and capacities in researchers is essential:

> "*This project from the beginning motivated me a lot .... I come from a background in which citizen participation was studied in my bachelor's degree and master's degree*." (Prometheus researcher)

Another incentive identified is that the University of Barcelona offers funding to cover the cost of **Open Access** publication fees. Open access publishing allows researchers not only to disseminate their research results to the scientific community but also to disseminate to wider publics, to students and to society. The use of **UB social media** to disseminate knowledge, increase visibility and engage citizens is another strategy, yet it needs to be strengthened further at the UB.

Finally, the UB has taken a recent step forward to promote citizen engagement by appointing a **Rector's Delegate for Science Dissemination**. A researcher stressed the importance of having a person who formally defends the engagement values and makes visible the institution's commitment to open science. As a researcher points out, this may encourage others to become leaders who champion co-creation processes.

> "*I think that the creation of a formal figure, like Gemma, is an important step that the university has taken...because it gives the feeling that someone is defending*

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what we are doing and trying to improve working conditions (...) I think it is indirectly encouraging." (Surfing for Science researcher)

Accordingly, the Rector's Delegate is developing a **strategic plan** for science participation. The plan develops clear and measurable objectives for building open science and aims to remove some disincentives presented in the next section *(see 3.4.3.3)*. Following are the main lines of this strategy:

· **Institutional recognition of the tasks carried out by UCC+I:** to turn UCC+i into an administrative Unit with the objective of improving the staff working conditions and recognizing their good performance and positive results. The aim is to express appreciation, motivate staff and encourage a participatory culture. In addition, it is intended to create a record of all participatory activities carried out at the university and the strengthening of this Unit will contribute to this goal.

· **Recognition of the public engagement in science**: work is being done to include in the PDA (Plan for Academic Dedication) a section on "Dissemination and Knowledge Transfer" which can help to reverse the mismatch between institutional and individual commitment. Likewise, they are working on how to measure this activity, considering elements such as: having a FECYT (Spanish Foundation for Science and Technology) project on science dissemination, writing a book, carrying outreach activities, etc.

· **Training young doctoral students in science dissemination:** starting from a 10-hour course to become familiar with the importance of citizen science and develop skills in science dissemination. This situation will make young researchers or doctoral students not see the "culture of publication" as the only way to do science. In addition, they could carry out initiatives to encourage their future students to work with co-creation methodologies.

· **Targeting and including vulnerable people:** Existing public engagement and dissemination activities often target the citizens who already participate (i.e., same schools, same stakeholders). It is necessary to support the outreach to new publics, targeting especially vulnerable groups, such as people with less socioeconomic resources, people with disabilities, cultural minorities, patients, etc. It is envisioned that research includes citizens at different levels, and that people in vulnerable situations act as co-researchers.

Disincentives

The researchers have highlighted different university disincentives related to that there is a certain mismatch between individual and institutional commitment.

In the first place, there is **little acknowledgment** from the University of Barcelona of this type of project. There is a **gap in the dissemination of evidence of the societal impact** in terms of what the university is sharing on their website and social media platforms related to public engagement, transdisciplinary science, and innovation. Thus, they pointed out that the university should be an intermediary making visible evidence of societal impact.

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This situation means that the culture of participation and public engagement is not effectively promoted and valued in the university, and it is seen as an **"add-on to research" rather than part of the research activity.** Thus, researchers point out, there is a clear need to create awareness education on the purpose and value of participation "working together can improve the impact, efficiency and value of studies".

> "*The UB is evolving, but very slowly (...) research groups from different sciences are socialised into this idea of open science, but there are many more people (professors and others) who present multiple resistances to this change*." (Allinteract researcher)

The work of the UIC+i Unit is essential, as they support outreach activities and co-creation research. However, this unit only has **two staff members,** and its work at the administrative level is still not acknowledged. Thus, the Unit does not have a register of all the participation activities that researchers of their university are carrying out.

Second, researchers pointed out, there is an "**excess of bureaucracy"** that sometimes makes the realization of this type of projects and activities more difficult. This element correlates with the need for more staff to carry out the administrative tasks and management needed for successful achievement of public engagement activities, because, while the support offices exist, and they do a great job, they do not have the capacity to do everything.

Third, there is no **common space** for different academics to reflect, debate and learn about citizen science practices related to social issues and group participation. This is essential to develop skills while providing critical insight:

> "*I don't know what successful activities my colleagues from other faculties are carrying out. We need a space where we can share our experiences and learn from each other*." (xAire researcher)

It was noted that many researchers carry out outreach activities with schools and children. However, there is no analysis of the typology of schools involved. The University lacks information about the extent to which outreach activity is able to reach all sectors of society, including groups that have been neglected by science, such as cultural minorities or elder people. There is a **lack of visible data about public engagement activity, diversity of publics addressed** and the related societal impact. This challenge is a crucial component of ethics and good practice in research.

Finally, they noted that the University does **little dissemination of citizen science** activities and opportunities for participation, and it gives **little visibility to successful stories of public engagement and their impact results on society**.

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3.4.3.3 Societal Stakeholder level

Incentives

How communities understand their ties to science remains a critical question related to public engagement and the connection between the researchers and the community. At this level, there are different incentives for stakeholders to participate meaningfully in the design, collection, interpretation, and use of evidence.

First, to **receive information about projects' societal impact.** This process of information exchange between researchers and citizens increases the stakeholders' consideration that scientific knowledge is very useful in various aspects of their life and provides answers to society's challenges. Likewise, the dissemination of knowledge should include information about the ability of anyone to comprehend science and participate in projects. Such interactions encouraged citizens, especially people who have traditionally been neglected by science. A participant in a citizen science project, from a community centre, explained:

> "*Many people do not participate because they think science is difficult to understand. But I always say, we are not going to understand it as if we were scientists ourselves, but we are going to understand something (...) for example, I don't understand many words in scientific articles, but then I look for information about their meaning (...) it is important to participate because knowledge opens the mind and can be useful*. (Allinteract participant)

Second, the **scientific evidence must be good for a purpose**, rather than just good. Citizens get more interested when they can see the benefits of a given research for their own lives or the world in which they live. For example, in the case of Allinteract, citizens and organizations (e.g., schools) are using evidence from the project to challenge assumptions and false information related to education:

> "*The need to do things better is what motivates them [teachers and families]. For example, teachers are more satisfied with themselves if they know that what they are doing in schools is right (...) all citizens should know and be able to use the evidence about what works in education*." (Allinteract researcher)

Along these lines, to generate a science that goes beyond the ivory tower and the laboratory, it is important that the research responds to the **needs and expectations of citizens,** thus generating the empowerment and participation of the different actors:

> "*We have tried to get the public to express their real needs (...) from the university we may have the idea that it [project] is going to work out well at a social level, but the people may give other ideas (...) Opening to the real needs of the citizens is very essential*." (Prometheus researcher)

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Actually, diverse stakeholders from different projects argued that the cause must be compelling enough for them to participate. Furthermore, some added that when they have **previous experiences** related to the topic of the project, it is easier for them to identify the value, to realize it is compelling and they are then more willing to participate.:

> "*In the school of my children they had already worked on the issue of air pollution, so we were already aware of its importance*." (xAire stakeholder)

Third, they explained the importance that the activities were not merely informative ones but rather they **were participatory**, moving away from the idea that they are mere spectators of the events. It is crucial that citizens can **participate in many stages of the scientific process,** from data collection to dissemination of results. Therefore, public participation must take place both in the identification of the problem and the definition of the research objectives, as well as in the most practical part:

> "*One of the things that makes the project work so well is that we have involved citizens from the beginning. It is not a project that was conceived in the office and then we had to look for citizens to participate, we have involved them from the very beginning*." (Surfing for science researcher)

> "*The activity [sample collection] is so dynamic, you are doing something that you love, while you are helping science*." (Surfing for science stakeholder)

Furthermore, it is significant to take into consideration **micro-local realities**, such as linguistic or cultural realities. This is a strong incentive for organizations (NGOs, companies, etc.) to participate in research. As a researcher pointed out, the recognition of micro-local realities is an issue that favours present and future research because it creates a climate of trust and empathy in the work:

> "*When you are within the project, you realize that each society has certain different dynamics (...) these microlocal realities produce certain barriers when it comes to research (...) but throughout the work, we have been seeing how to solve it (...). For example, the meetings took into consideration these realities, and they were never monolingual... in the end, we all understood each other. I think this fact makes you have more confident with the various people with whom you work, this is a positive aspect. Linguistic and cultural rights generate empathy*." (Prometheus researcher)

Fourth, some stakeholders highlighted that one mechanism to increase citizen engagement is to choose to conduct the activities **outside working hours.** Some citizens are usually people who are working, studying or have some full-time activities that do not really allow them to have much free time to participate in this type of projects

Finally, one of the reasons that encourage some organizations to collaborate in research projects is the recognition by citizens and institutions of the social impact they produce. For instance, in the "Science Surfing" project, sports organizations that collaborate in the research have requested the

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City Council to recognize them as organizations that improve society, and not only as sports association. Such recognition encourages these organizations to collaborate in future research and motivates new ones:

> "*Many organizations are recognised for their sports tasks, but there are some of them that want to take a step further (...) last year, a sports association that participates in our research, was making a letter to the City Council to be recognised as an entity that is doing something good for society (...) also, these entities after the surfing project, have become more open to society and participate in more things*." (Surfing for science researcher)

Disincentives

There is a lack of appropriate research strategies for the **effective dissemination of projects and societal impact.** This trend demands that researchers must increase the dissemination of their projects and explore appropriate research strategies for effective dissemination. One citizen argued that it is necessary to develop a strategy to clarify how to inform citizens of the available opportunities for participation.

> "*Research results should be disseminated more. I find out about these things because I have a contact with people from a UB Research Centre (...) dissemination should be done in different places so that people know these exist*".

Some stakeholders argued that researchers should explore the use of a diverse range of communication channels to reach a variety of publics: web forums, social media, radio, television, videos, community theatre and storytelling, among many other. They highlighted that science dissemination does not reach out to the **various stakeholders in society**, especially vulnerable groups (elderly or unqualified people, migrants, refugees, etc.), which is a clear disincentive for them to participate. They emphasize that the skills, experiences, wisdom, and knowledge of vulnerable groups can be used for the benefit of all. Thus, it is pointed out that researchers should pay special attention to sharing information with vulnerable segments of the population. For example, one interviewee remarked that elderly people have become an increasing force to be considered in society - politically, economically, and socially - and they have free time to participate in science. However, they are not informed of the various opportunities to actively participate in the scientific process.

> "*These types of activities are usually aimed at young people or families, and we forget about the retired sector (...) and we don't know the channels to access this type of sector*."

This idea is linked to the lack of knowledge about the **communicative forms that involve and adapt to the different sectors of society.** They emphasised that to access the different profiles, it is necessary for researchers to study the characteristics of the different audiences so that the different

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communication processes and participation activities are adapted to the needs of each one and facilitate access to knowledge for everyone.

> "*There are times when I think about how I could reach out to more people, such as those without university degrees. How to make citizens feel that they are also part of science*."

Finally, **economic limitations** are some of the barriers for small organizations that want to participate in large-scale projects that require major funding. In these cases, members of an association or institutions with little economic power - such as city councils in small towns - cannot collaborate directly in the research, so they must turn to organizations with more purchasing power. However, although the economic factor excludes these institutions from direct participation, they can be indirectly involved.

> "*A project like ours cannot be directly associated with the citizens because they are not part of an association or institution that has the economic strength to participate (...) for instance, the small town councils could not participate either, because it was not economically viable, that is why we have turned to the General Council of Aran, the Government of Catalonia, etc. (...) this is an economic barrier that makes it difficult for them to be linked very directly, but they have been linked indirectly*." (Prometheus researcher)

3.4.3.4 Systemic level

Incentives

Most researchers highlighted that the **European Commission (EC)** promotes multi-actor and public engagement initiatives in research and innovation because it provides funding for projects that form collaborations between different types of partners that have different expertise and resources. The current Framework Programme of Research, Horizon Europe, considers as a basic requirement for the evaluation that project proposals include **Key Impact Pathways to achieve scientific, economic, and societal impacts**. In order to do that, project **proposals must include activities of co-creation and public engagement with different stake holders**. Furthermore, it is often a requirement that research consortia include diversity of expertise, research institutions and stake holders to guarantee the knowledge transfer to society and the social impact. Additionally, work programmes are oriented towards **societal challenges** (i.e. the Sustainable Development Goals) rather than disciplines, moving researchers to collaborate across disciplinary boundaries. These evaluation criteria incentivize researchers to embrace both transdisciplinary and public engagement in order to get funding.

> "*The most important incentive, which has arrived very recently, is social impact, and it came through the European Commission, which has made social impact a priority, and has forced researchers to seek not only scientific impact, but also the corresponding social improvements*". (Allinteract researcher)

Today, most funders such as **national research agencies and research foundations** follow the same criteria used by the European Commission, focusing on the SDGs and impacts, and therefore researchers are incorporating a new culture when designing projects and forming teams.

Another incentive is related to the evaluation of professors' and research centres' productivity. While some years ago the only indicators of scientific productivity were publications and the related metrics such as impact factor, today there are new criteria for evaluation. For instance, in Spain there is a new national **evaluation on Transference**,[200] which will take place every six years. Professors must now demonstrate that beyond publishing they have been involved in knowledge transfer activity. This is still very new, but growing in the near future.

Disincentives

The topic "public engagement" is not on the top of the agenda of prominent policymakers and research organizations in Spain. The fieldwork evidence that at national and regional levels there is no recognition of the importance of citizen science. So, the fact that there is a **lack of a public-engagement culture** is the first type of barrier.

Sometimes, there are **economic and political interests** behind research that can affect the dissemination and implementation of its results. On the one hand, political interests may come into dissonance with the results of research. For example, research results may be in conflict with and challenge existing legislation and may then not be perceived by politicians as a relevant advance in science to be shared. On the other hand, in terms of economic interests, research could show the ineffectiveness of certain projects that are already being implemented or products commercialised. This has an impact on organizations or companies whose economic stability is based on the implementation of these projects or products. An interviewee gave an example:

> "*Outside the universities, there are economic and political interests (...) when you show evidence that gender violence can happen in sporadic relationships, politicians see that this can be a challenge to their law or policy (...) in addition, there are companies that depend on carrying out programs for their living. For example, if their work is allegedly to fight gender violence based on speaking out against romantic love, and then there is evidence that no studies prove that romantic love causes violence, this implies a loss of income for them* " (Allinteract researcher)

The **tradition and culture** of the countries could also be an explanatory factor for citizen participation in research. In the European framework, there are countries with a catholic tradition and countries with a protestant tradition. This differentiating characteristic has an impact on the

[200] Evaluation on Transfer was carried out for the first time in 2018 by the Spanish National Agency for Scientific Evaluation (ANECA/CNEAI). Since then, the second evaluation exercise has not been called yet. See: http://www.aneca.es/Programas-de-evaluacion/Evaluacion-de-profesorado/CNEAI/Convocatoria-de-tramos-de-investigacion-de-la-CNEAI-2018

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participatory culture. Countries with a catholic tradition tend to have a more passive population, while protestant countries have more active citizenship in social issues.

> "*In the European case, countries with a catholic tradition, compared to protestant countries, have more difficulties to participate (...) this has a strong influence on teaching (dialogic or not) and consequently on the research... other countries have had it easier to develop an open science, compared to Spain*". (Allinteract researcher)

The type of project being funded has been highlighted as a disincentive at the system level. Researchers pointed out a **lack of equity when projects are funded:** large projects, whose initial investment is especially costly and is carried out by large institutions in urban areas, are mostly funded. As a result, there is little involvement of small intuitions that promote projects. This means that the territories with the greatest scope in open science are urban areas with many people.

> "*Many times, projects oriented to large institutions are financed but those projects that are carried out in small towns or small intuitions are forgotten. I think we need to identify the territories that have been less empowered by participatory research...there should be a bit of equity at all levels. For example, I think that very large institutions or city councils make the university go to them*." (Prometheus researcher)

> *"(...) projects should be carried out in the whole territory, not only in places with large populations, for example in the metropolitan area… Beyond the metropolitan area, participatory science should be developed*". (Surfing for Science researcher)

3.5 University of Montpellier (UM)

3.5.1 Existing university structure and policies relevant to public engagement and transdisciplinary science

At the UM, there are currently no vision documents or policies relevant to public engagement and transdisciplinary sciences. Public engagement and transdisciplinary sciences are not institutionalised and they are mostly based on personal initiative of researchers. However, UM has initiated a process to obtain the national label "Science with and for Society". The labelling by the Ministry of Higher Education and Research distinguishes strategic projects in public engagement of academic sites that are designed in partnership with relevant actors.

According to the Research and Doctoral Studies Department (DRED), transdisciplinarity has been conducted informally at the UM. The university is now starting to talk more about transdisciplinarity, however, they were some earlier initiatives. For instance, the Investment for Future Program (Programme d'Investissement d'Avenir - PIA) has allowed the University of Montpellier to lead some transdisciplinary research. UM has won a call-for- projects on Artificial Intelligence. It was a choice to respond to this call-for-project in order to have funding on a transdisciplinary field (IA). Moreover,

transdisciplinary is more visible and done through operating credits and doctoral contracts and is often carried out by research teams responding to specific calls-for-proposals. UM also funds equipment purchases that can be used by several disciplines, but does not look at whether the project is transdisciplinary in itself. In the future, there is a will to develop transdisciplinarity at UM, for instance by setting up a working group with some research centres to think about how to boost transdisciplinarity.

At the political level, the Vice-President in charge of the relation between science and society gathers and coordinates existing initiatives on scientific culture in partnership with national and local structures. They develop scientific culture' activities for students and UM administrative staff and civil society/communities. In addition, the Vice-President implements a policy aiming at harmonising the management of the research archives and of the research units. The Vice-President also further contributes to Scientific culture activities in the fields of teaching, training, research and historical patrimony. Finally, her objective is to promote digital uses for training in the field of scientific culture dissemination.

At administrative level, the Scientific Culture and Historical Heritage Department is divided into four offices: the Scientific Culture Office, the Office for historical patrimony's preservation, the historical patrimony's office and the office of historical, scientific and administrative archives. The Scientific Culture Office[201] implements the "Science and Society" policy and activities at the UM, coordinates the "Fête de la Science" and the "Science Bars" activities, develops a strategy for internal transverse action with the scientific community of the University to develop partnerships with the civil society. Eventually, the offices also train students to disseminate science. In addition, each Research Laboratory also conduct scientific culture dissemination activities**.** For example, the Montpellier Research Institute in infectiology[202] has developed a research training programme for middle-school and high-school students. The students realize a research project with a researcher.

The University of Montpellier is involved in a local consortium gathering sixteen institutions, among whose research laboratories, research centres, schools, MUSE (Montpellier University of Excellence)[203]. The objective of the consortium is to create a thematic research-intensive university working on three multidisciplinary strategic themes: Agriculture, environment and health. Those three thematics answer to the challenges "Protect, Feed and Care". MUSE federates a scientific, institutional and economic community to address those three major and interdependent challenges, aligned with the United Nations 2030 Agenda on Sustainable Development Goals and the Paris Agreement on Climate Change. In addition, the MUSE consortium aims at creating strong and long-lasting ties between the institutions and the local research and innovation ecosystem and

[201] https://cs.umontpellier.fr/
[202] https://www.irim.cnrs.fr/index.php/grand-public/manifestations-grand-public
[203] Montpellier Université d'Excellence, https://muse.edu.umontpellier.fr/en/muse-i-site/

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to develop partnerships with public and private actors and the civil society. MUSE has also initiated calls-for-proposal and fund transdisciplinary science.

3.5.2 Overview of good practices on transdisciplinary science and public engagement

Table 4. Overview of good practices at University of Montpellier

#	Good practices	Education/Research / Both	Website
1	MUSE Montpellier Université d'Excellence	Research	https://muse.edu.umontpellier.fr/en/muse-i-site/international/makit-home/ https://muse.edu.umontpellier.fr/en/muse-i-site/international/makit-home/19366-2/
2	Academic training	Education	https://ingenieurs-ecologues.com/parcours-ge/parcours-biodivcom/ https://biologie-ecologie.com/master-bee/mediacces/
3	Department of Scientific Culture of the University of Montpellier	Education	https://cs.umontpellier.fr/
4	GENOPOLYS	Education	https://www.genopolys.fr/
5	HUT (HUman aT home) project	Research	https://www.hut-occitanie.eu/en/home/
6	SEASONAL OBSERVATORY	Research	https://obs-saisons.fr/
7	ARTIVISTES	Both	http://artivistes.neowordpress.fr/
8	CoSciences	Education	https://cosciences.net

MUSE' initiatives on transdisciplinarity

The University of Montpellier carries the project MUSE «Montpellier Université d'Excellence», which mobilizes the forces of 16 institutions towards a common ambition: to bring to Montpellier a thematic university of intensive research, internationally recognised for its impact in the fields related to agriculture, environment and health, which is likely to become for all members of the consortium an academic partner to which they will be strongly linked and which they will be able to avail themselves of. Several initiatives within MUSE are:

MAK'IT: Montpellier Advanced Knowledge Institute on Transitions[204]

[204] https://muse.edu.umontpellier.fr/en/muse-i-site/international/makit-home/

MAKE'IT is an Institute for Advanced Studies of MUSE. MAK'IT was to create a place where international researchers and the scientific community of Montpellier can meet and work together on issues that make the transition to sustainable development. The objectives of MAK'IT is to stimulate communities' involvement and contribution in the realization of SDG in the fields of agriculture, food, environment and health, to renew areas and forms of scientific knowledge's mobilization. MAKE'IT feed the debates in national and international bodies where the transitions are thought and carried out, playing the role of interface science-society and science-politics.

MAK'IT is hosting the **UNESCO Chair** "Complexity - Edgar Morin". Since 2018, Edgard Morin is accompanying the MUSE initiative and MAK'IT in their reflexion on actual societal challenges, sustainable development and the interest of a transdisciplinary approach by the controversies as the driver of actual transitions.

CAT: Constructive Advanced Thinking[205]

CAT is a call for applications to encourage the creation of interdisciplinary teams of promising young researchers with new ideas to address emerging societal issues. Although the program places particular emphasis on projects with concrete societal applications, it does not exclude those in basic research, nor does it exclude any thematic field. CAT also promotes collaborations between researchers and actors outside the research world who wish to support or engage in innovative scientific initiatives (industries, policy makers, NGOs, etc.). This call was instilled within the framework of the European Network of Institutes for Advanced Studies (NETIAS) and also includes institutes that do not participate directly. This collaboration between 12 different institutes, from different countries, gives access to selected groups to a wide variety of high-level scientists and researchers in order to beyond the current frontiers of knowledge and develop the most innovative proposals possible on how to address complex societal issues

Scientific dissemination

Implementation of a training on scientific dissemination of 35 hours over 3 months for all INRAE (National Research Institute for Agriculture, Food and the Environment) staff (researchers, administrative staff, technicians etc.).

Academic training

At the UM Faculty of Sciences, there is a **pre-professionalization course for future school teachers:** "Sciences in the first degree and scientific mediation". One of the objectives of the training is to train students to a high scientific level in biology, mathematics and physics-chemistry and develop their skills in scientific dissemination.

[205] https://muse.edu.umontpellier.fr/en/muse-i-site/international/makit-home/19366-2/

In addition, there is also the bachelor degree **"Science in Primary Education and Science Mediation"** at the UM Faculty of Education.

There are two master's degrees at the university to train students in mediation and communication in science and ecology (ACCES and BIODIVCOM master)[206,207]

Department of Scientific Culture of the University of Montpellier

The Department of Scientific Culture of the University of Montpellier coordinates the dialogue between science and society through multiple events, on the campus network of the university and outside the walls, for an audience of citizens, students, high school and school students. To do this, the team collaborates with numerous partners: research organizations, CCSTI (Centres for scientific, technical and industrial culture), associations, cultural centres, public and private institutions. Some examples of their initiatives are:

Science Bars Co-produced by UM and COMUE LR (Community of universities and establishments of Languedoc-Rousillon). The Science Bars are an area to initiate debates involving the public and science-society meetings. Debates on several thematics. Ex: May 2021, Covid-19 vaccination campaign, new technics for modifying genomes in agribusiness. There is a replay on Youtube Channel and Facebook Page.

"Fête de la science" is coordinated by the department of Scientific Culture of the University of Montpellier. This is a national event of the Ministry of Higher Education, Research and Innovation.

Travelling and scalable thematic exhibitions

- **UM's Thursdays** are conferences to introduce and illustrate research lead at the UM.
- **Sud de Sciences** is a scientific Movies Festival: watch movies on relevant scientific news produced by research institutes implemented in Montpellier and surroundings.
- **Trainings to scientific mediation** for students, associations, professionals, PhD students.
- **Liternature** is a participative experience: implemented a participative inventory of plants and insects biodiversity represented in the literature and discovering of naturalist science, evolution, classification. Liternature create explorers camps inside libraries and public spaces to let discover the biodiversity, gather the funding in a numeric tree of life, create animations and exhibitions.
- **Atôme Hotel:** At the UM, the Scientific Culture Office has co-developed **"Atôme Hotel"**, a scientific culture webdocumentary dedicated to the world of atoms[208] : Taken in the form of an original transmedia device, Atome Hôtel dusts off, revisits and makes interactive Dimitri

[206] https://ingenieurs-ecologues.com/parcours-ge/parcours-biodivcom/
[207] https://biologie-ecologie.com/master-bee/mediacces/

[208] https://cs.umontpellier.fr/project/atome-hotel-un-webdocumentaire-atomique/

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Mendeleïev's famous periodic table of elements. Initiated during the International Year of Chemistry in 2011, Atome Hôtel stages nature on an atomic scale with a periodic table to discover the fascinating human stories (social, historical, political, scientific) that are hidden behind this mnemonic puzzle! In 2018, a new season was launched thanks to the European Regional Development Fund and regional financing. It is expressed through a tour in 20 establishments (middle and high schools) throughout the Occitanie Region, with scientific mediators, researchers and doctoral students. The periodic table is approached in its historical context, with various methods of mediation (animations, serious game, conferences). Various mediation methods were used during the tour: animations linking atoms, everyday objects and the interaction between atoms and light, conferences and debates on the profession of researcher and scientific mediator, an exhibition linking literary works to atom and a serious game about the discoveries of atoms.

Génopolys[209]

Génopolys is a UAR (Unité d'Appui à la Recherche- Research Support Unit): 3 trusteeships, CNRS, INSERM, UM (partly financed). Specialised in science-society dialogue in the field of bio-health. Bringing science to the citizen through various ways: trains doctoral students in scientific mediation (in connection with doctoral colleges), innovative pedagogy for master's students (learning through games), scientific workshops to schoolchildren and for teachers, educational sheets on critical thinking. This programme is open to broader audience, but the main target is schoolchildren aged between 9-12 years old.

HUT (HUman aT home) project[210]

Human aT Home" project is a scientific experiment started three years ago involving thirteen research laboratories, seven enterprises (Deliled, Enedis, Ikea, Nexity, Oceasoft, Sens Digital and Synox), institutional actors such as Montpellier Metropolis and citizens (students for now, latter will be open to other citizens), around the creation of a "connected apartment" where two students live. The project is a success, and is demonstrating how innovation can emerge through cooperation between academia, businesses, institutional and societal actors. The experiment will be extended to a whole student's residence building with 125 people living in connected studios. Involving citizens allows to understand end-users needs and expectations. A consortium agreement is framing the project and the enterprises are part of the executive committee. Each stakeholder is sharing human, technical and financial resources. Bilateral conventions can also be implemented for a specific need, for instance an agreement was established with the firm "Orange" for a loan and use of a connected mirror. This type of collaboration allows researchers to have access to funding and products. For enterprises, it is an opportunity to test the efficiency of their products. For citizens, it is the opportunity to participate to scientific research, and to reflect on their needs and

[209] https://www.genopolys.fr
[210] https://www.hut-occitanie.eu/en/home/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017229.

expectations. The HUT project is now alive at UM and a success story of transdisicplinarity and citizen science.

Seasonal Observatory[211]

The Observatory of the Seasons (ODS) is a program that allows citizens of all ages to contribute to scientific research on climate change. This is a participatory science program. The main objectives of the Seasons Observatory are to: 1. Raise public awareness of the impact of climate change on the environment and communicate research in this area, 2. Create a vast network of amateur observers supervised by the researchers to feed the scientific work and 3. Provide public authorities with a tool to monitor the effects of climate change on the territory.

ARTIVISTES[212]

Artivistes is a hybrid science-society association co-funded by a UM researcher. Artivistes-atelier is a citizen's laboratory for ecological and solidarity-based transitions. Its specificity is to articulate both environmental and participative expertise, notably through art and culture. Artivistes develops territorial projects that bring together researchers, experts, artists, associations, citizens, companies, elected officials, technicians and citizens in order to accompany and improve environmental action. The project of the citizens' laboratory is based on the observation that there is a constant lack of citizen involvement in the implementation of concrete and effective actions on the major issues of our society: climate, biodiversity, food, health, water, etc.

The Artivistes-atelier association develops:

· Studies aimed at supporting and developing expertise that meets the needs of local authorities.

· Innovative mechanisms for mobilising and consulting citizens.

· Research and development analyses thanks to its solid network of researchers from different backgrounds and the close partnership with the GDR PARCS and RECIPES (research group in participatory action research and citizen sciences).

· Training courses for environmental professionals, elected representatives, technicians, companies, etc.

· Educational projects inside and outside the school.

211 https://obs-saisons.fr/
212 http://artivistes.neowordpress.fr/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017229.

CoSciences[213]

Founded in 2014, CoSciences is an associative science journalism and mediation agency. For this agency, the fundamental challenge is to make scientific, technical and innovative knowledge accessible to as many people as possible. CoSciences produces audiovisual productions, organizes and runs conferences, and designs and publishes board games, all of which are adapted to different audiences. As part of an ecosystem of actors involved in knowledge transmission, our structure develops numerous projects in partnership (University of Montpellier, Lyon, CNRS, Science Animation). In the space of a few years, CoSciences has become a recognised structure in scientific mediation.

3.5.3 Incentives and disincentives

3.5.3.1 Individual level

Incentives

Researchers who are involved in scientific culture dissemination have a high desire to reach out to society, to communicate research results and scientific research methodology, to involve society in co-creation of research. Researchers strongly believe that they have an important societal role to play and that this is one of their **duty to disseminate science and to engage citizens** in a process of co-creation of science (I2, I3).

In addition, having interaction with public allow researchers to gathering information and questions from the public on their research. This dialogue helps researchers to have an external perspective on their researcher, it provides a fresh and distanced view of the research subject, which is always beneficial (S2).

According to researchers involved in citizens sciences, citizens sciences is a specific approach and vision of science, that is slow-science. Researchers note the importance of involving the relevant audiences as early as possible in the research process, and to collect data as closely as possible to the subject (I6). Questions that come from society are a very good source of inspiration for developing transdisciplinary research. Citizens' questions require transdisciplinary approaches to answer them. Some questions or societal challenges must be addressed by different disciplines (example of ecology, environment), thus transdisicplinary science is essential (I2). Researchers note the importance of involving social and human sciences in all research (I2, I3). Researchers are also driven by curiosity, a will to understand other disciplines research methods and have an appetence for crossing different views (I5).

Transdisciplinarity are projects that arise from discussions and meetings between researchers from different disciplines. Researchers underline the importance of dialogue, of sharing ideas and perspective and debate about them. Thus, there is a need to create meeting opportunities between

[213] https://cosciences.net

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different researchers from different disciplines, because without meeting there is no interdisciplinarity and transdisciplinarity *"interdisciplinarity and transdisciplinarity are born around the coffee machine"*(I5). Also there is a need to create interaction places and meeting opportunities with other external actors s to give birth to transdisciplinarity researches (I5).

Transdisciplinary science is a slow science, it takes time to interact with stakeholders and to establish sustainable relationships of trust to gather relevant information (I7). To create interdisciplinarity and transdisciplinarity project, researchers advice to avoid notions and concepts that refer too much to a discipline, and rather talk about the object. For example, they must not to talk about "housing", but about "flat", that is a more general term not linked to any discipline (I5).

During the workshop, researchers have underlined the importance on training citizens about scientific uncertainty as a best practice when conducting transdisciplinarity, to avoid disappointment. Researchers must inform the citizens about the scientific approach and the type of information and answers that scientists are able to provide.

To conduct public engagement, a best practice is the co-construction of a scientific protocol with involved stakeholders, and the adaptation of the protocol to the field, appropriation of the protocol by citizens through a training approach, by training participants on the project. The objective is increasing the competence of the citizen who participates in the data collection.

In addition, it is important to co-construct the dissemination strategy of the scientific results and to document the data collection process in public engagement, citizens science and transdisciplinary science to allow monitoring. Another best practice in public engagement and transdisciplinary science is the monitoring and evaluation of the best practice with an adaptive management (there is the need to qualify/characterise the status of the evaluation).

Disincentives

To conduct public engagement requires a lot of time and energy. It's a long-term process. Researchers already have a lot of duty and not a lot of time to conduct research with public engagement. Public engagement requires a high engagement of researchers (I6).

In addition to the **lack of time and resources**, researchers do not feel supported by their institution and there is **no retribution in term of positive evaluation or career advancement**. So, researchers may not want to take off their time if there are no retributions, which can have a bad impact on the researcher and create a bad reputation to the researcher (I6). Also, public engagement can require media exposure, and some researchers may not feel comfortable with media exposure, peer exposure and review. When there is media exposure, researchers' words can be distorted by journalists (S1, S2). Some researchers may fear of being perceived as "bad researchers", because have time for scientific dissemination or for citizens science (S1, S2). For researchers, it is important to have an institutional posture before having a political or activist posture (I5).

Citizens science is a long-term process, time-consuming that requires a high engagement for researchers. Conducting citizens science make the project 15 times longer than a « normal » research project. In addition, citizens science **r**equires a lot of administrative management, which let less time to the researcher to focus on the quality of the research.

Finally, researcher do not feel supported at all by the university, regarding financial resources needed to lead citizen sciences and administration management.

Researchers note a language issue that is a discincentive for transdisciplinary projects. Indeed, it is sometimes difficult to understand each other across disciplines, because they use different terms. In addition, there is not necessarily a shared culture between researchers. The researchers themselves do not manage to understand each other, so this raises questions about how to interact and understand each other with other actors. Researchers can't talk to each other and share data to have a comprehensible basis. There is also the question of the way in which researchers and disciplines see other disciplines: there can be a contempt of certain disciplines over other.

Furthermore, when being involved in interdisciplinarity and transdisciplinarity, one must not consider the practitioners of the other discipline as service providers. Technical staff is needed so that researchers can concentrate on their research. Support to prevent researchers from becoming monopolised on technical and logistic issues. Researchers get upset if they are seen as technicians only.

3.5.3.2 University level

Incentives

In related to interdisciplinary approach, tt the level of the MUSE ecosystem, we have a best practice of the CNRS (National Scientific Research Centre): The **Mission for Interdisciplinarity (MITI)**[214] provides support to researchers in setting up projects and provides financial support. MITI funds and supports interdisciplinary and inter-institute research programs. These calls for proposals essentially target emerging, exploratory and interdisciplinary themes that require new collaborations between disciplines that are not used working together. Some topics are addressed in partnership with other research organizations. Multi- or trans-disciplinary approaches carried out by CNRS institutes aim at exploring new topics or developing common strategies for major scientific challenges. MITI supports and coordinates these transverse initiatives.

The Ministry of Higher Education, Research and Innovation has entrusted MITI with the management of priority research programs for all French research institutions, on topics such as Sport or Make Our Planet Great Again. This is fundamental assistance because these are not projects that can be carried out alone. The CNRS has a real culture of interdisciplinarity, and researchers are

[214] https://miti.cnrs.fr/

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encouraged with financial and administrative support. However, the University of Montpellier has not institutionalised systems as efficient as the CNRS.

In terms of transdisciplinary science, several incentives include training and award. Regarding training, an example is the training programme in ethical rules of deontology. The UM doctoral college provides training for all doctoral students, whatever their discipline, and uses researchers from the institution to provide this training. College does not provide disciplinary training. It is not very visible but it is a real action as it allows bringing together PhD students from several disciplines. Meeting place between different disciplines. The University of Montpellier is a winner of the call for projects "Structuring training through research in initiatives of excellence" (SFRI). The aim of this call is to offer certain universities the possibility of strengthening the impact and international attractiveness of their training through research in the scientific fields in which they are developing their activities. The aim is to structure training through research in a global manner and at the level of the site, by promoting master's and doctoral training around high-level research laboratories. The *InterDisciplinary In Lab (*IDIL) project has a strong international dimension and aims to build original Master's courses, entirely in English, which radically transform training through research by immersing students in research units from the first year of the Master's programme, and **by encouraging the development of interdisciplinary and transdisciplianarity collaboration and cooperation.**

Disincentive

According to societal stakeholders, the University of Montpellier does not have the right means of communication for science dissemination. There is a lack of reactivity from the University in term of science dissemination on social medias for instance, because for each post, it is compulsory to have management and executive bodies approval. This approval requires time. Thus, the time of social networks is not the time of the university. Immediate reaction does not exist regarding scientific news (S1, S2). In addition, citizens sciences are not institutionalised at the University of Montpellier. Researchers do not feel supported by the University to conduct citizens science projects (I6).

At the UM, the training programs remain mostly monodisciplinary (U1, U3). When students start their studies in first year of bachelor, there are few interdisciplinary bachelors' programs available. This is where action is already needed: students should be able to follow interdisciplinary programs/degrees. We need to rethink the training models, there is a high demand for more interdisciplinary programs from the students. We can note more diversification and interdisciplinarity at master level, but it could also be improved. However, interdisciplinary programs are complicated to implement, it's almost tailor-made. In bachelor's degree, there are a lot of students, so implementing more interdisciplinary programs require significant resources and management.

At Montpellier, the geographical constraint restricts the places and possibilities of meeting between researchers and external stakeholders. Indeed, UM's site is very fragmented (Triolet, City Centre,

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Richter), which does not make it easy for different disciplines to meet. For example, the Faculty of Law is monodisciplinary (I5).

Moreover, laboratories have little support from the university. Going towards transdisciplinarity is not easy for researchers. It is a prerequisite to start with stimulating interdisciplinary science. Research is becoming so specialised that it is difficult to direct them to incorporate more interdisciplinary and transdisciplinary approach (I5).

3.5.3.3 Societal stakeholder level

Incentives

The Occitanie region funds and encourages scientific mediation projects, notably through calls for projects. It is quite recent but it is maintained. **At the local political level, there is a will to develop scientific mediation**.

The scientific mediation associations have seen a huge difference with the merger of the regions (Law n° 2015-29 of 16 January 2015 on the delimitation of regions). The Languedoc Roussillon and the Midi-Pyrénées region have merged into the Occitanie Region back then. The former Languedoc Roussillon region had no policy, no strategies, no interlocutors on scientific culture. The former Midi-Pyrénées region had a scientific culture strategy in place with calls for projects. This strategy and policy have then benefited the entire new Occitanie region. For instance, there was an **obligation in the calls-for-proposal to work between actors of the different ex-regions** (e.g.: scientific culture action must be at least on 4 departments and involve 3 structures).

The new Regional Plan for Higher Education, Research and Innovation (SRESI) is being co-constructed. There are currently **participative workshops organised with the participation of civil society actors** in order to co-construct the new scheme. Small working groups of up to 10 people, where everyone can express themselves and contribute their ideas. Working groups on the issues, others on the solutions. Afterwards, it remains to be seen whether what has been said will be taken into account in the final plan.

Regional and local associations of scientific dissemination note that the **public is in demand of more scientific mediation events** (S1, S2). In addition, during scientific mediation events, the associations note a qualitative level in the exchanges with the audience that are very good, there is a real participation of the public and a real interest for scientific questions. Those are high incentives to keep going with more scientific culture mediation activities. To develop more interaction with citizens, actors of the scientific dissemination should set up spontaneous and intuitive contacts, use means that reach people who are not necessarily interested in science. These means (for instance, art) serve to attract them (I2), then does it serve to keep them? We don't know (U4).

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Disincentives

Societal actors' disincentives have been collected through two interviews (S1 and S2). There are not enough opportunities available to meet between different actors in order to co-construct research and to conduct transdisciplinary science.

The question of budget is also predominant to raise, as it has been identified that the scientific culture has very little budget at national and regional level. On the field, the associations working on the dissemination of scientific culture only have the means to set up actions, but not to do any communication around their actions and event to attract more public and raise awareness about their actions. However, communication is essential to attract people to scientific culture events. For these associations, it is very difficult to access medias in order to disseminate scientific culture events, to make people aware of the scientific culture programme and to gather more people to attend these events.

In addition, there is few staff trained in scientific dissemination in universities, research centres and other organisms, there is a cruel lack of staff for all these actions. Research organisations do not want to create positions for these kinds of missions of public engagement.

Other disincentives could also be the dilemma between existing interest and lack of commitment of the societal stakeholders, e.g., people do not have a lot of time available to be interested in science, to attend scientific mediation culture events or to participate to citizen science and transdisciplinary science. Also, civic engagement is not necessarily long term and permanent. At the level of the public, people no longer have the energy to take an interest in scientific culture. Work takes up a lot of space in people's lives; after a long day at work, people don't feel like asking themselves scientific questions. Living conditions are getting tougher. That's why associations have rather old people, because retired people have more time to dedicated to scientific questioning.

3.5.3.4 Systemic level

Incentives

Systemic incentives have been collected through N1 and N2 interviews and by consulting national policy documents and laws.

In France, public engagement is addressed as "Science and society". The Ministry of Higher Education and Research (MESRI) oversees the "Science and Society" dialogue and the animation of the networks. The MESRI, through its "Science and Society" strategy, aims at connecting scientists and citizens, coordinates the "National Science Day", applies trusteeship on science museums and have a seat in their board of directors. In addition, the MESRI launches calls for projects for associations on "Science and Society" matters to encourage public engagement in science. Finally, the MESRI oversees the politico-strategic aspect of "Science and Society", implements and designs the strategy of science-society issues in relation with the regions and the European Union, facilitates working groups with regional bodies, regional academic delegated for research and innovation

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(DRARI), Vice-Presidents of universities and designs the science and society component of the Programming Law for Research.

At national level, public policies consider the relationship between Science and Society as a dialogue involving participatory discussions and common interest in both directions. The objective is to allow citizens to be involved in the society project they wish build and to be involved in research programming and in research projects. The scientific expertise, build with citizens, should influence public policy: this is the triangle Researchers-Citizens-Policy makers. In addition, the question of trust in science and trust in the institution is very important at national level, as the question of increasing the level of scientific culture of the citizens, notably in crisis situation, such as COVID-19 worldwide pandemic.

In addition, at the national level, a university network of Vice-Presidents for scientific culture has been set up to facilitate dialogue between universities, capitalization of experiences and exchange of best practices.

Disincentives

The lack of visibility of systemic incentives. There are organisations at all levels (for instance NRA, Region Occitanie) that set up incentives to develop public engagement in research, but these systems are not very visible. They must reach out to people, companies, communities and researchers. All these actors must be willing to see these schemes and take them up.

Public engagement and transdisciplinarity are not valued in researchers' career. In France, we can note a lack of institutionalisation of public engagement, citizen science and transdisciplinary science. This lack of institutionalisation is translated by a high demand of the research evaluation committees and agencies for the efficiency of research. Efficiency implies monodisciplinary research and leaves aside transdisciplinary research. For researchers, being involved on transdisciplinary research projects is more of a hindrance because the time spent on those projects doesn't help the career as they have less time to be spend on a monodisciplinary file, that would be more taken into account for their evaluation. To get promoted in researchers' careers, there is no need for transdisciplinarity. Indeed, research evaluation criteria do not take into account public engagement and trandisciplinary research for evaluation and promotion. For now, one of the main criteria for research evaluation is the number of publications, and publication in renowned scientific journals. The complexity is not sufficiently valued within research and institutions in France.

Difficulties to measure and evaluate public engagement and transdisciplinary science. Researchers' efforts based on pedagogy are more difficult to count/assess/evaluate. When a researcher publishes, we don't have a tool for monitoring transdisciplinarity. Journals are disciplinary. The question raised is on how to evaluate a transdisciplinary publication? It is difficult to measure and evaluate transdisciplinary research as we do not have a set of indicators. Also, there are difference between disciplines in evaluation methods. Evaluation systems do not allow complex evaluation in France. Another disincentive is the question of the consideration that each discipline

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has for the other. The disciplines do not know each other well enough, this misknowledge does not support transdisciplinary science.

Research and trainings are too monodisplinary, not enough focused on transdisciplinarity. Strong disciplines and monodisciplinary are needed because it is where concepts and theories are made, they are the guardians of the temple. But in addition to monodisciplinarity, we also need to develop more trandisciplinary science. It starts from training, yet, currently the trainings/degrees/courses for students are too normative and monodisciplinary.

Lack of opportunities for actors to meet to boost transdisciplinary science. Our research has underlines that there is a lack of opportunities for exchange, meeting and discussion (colloquia, conferences, or even physical premises) between researchers, but also with external actors (citizens, associations, enterprises, public institutions etc).

Also, in transdisciplinary research, we note that technicians and engineers are often not taken into account, as they do not have enough capacity (time) to devote to transdisciplinary research activities. As a result, their expertise is less taken into account, for instance they can give a technical vision on research topics that complements the scientific vision. Researchers have more freedom and flexibility in their working time to conduct transdisciplinary research.

Other disincentives. There is funding such as that from the NRA (National Research Agency), but researchers still have to take the risk of submitting applications. Publications from those research projects will have less impact, and researchers pay for this in terms of their careers (e.g. they are not research directors) (I3).

Also, the majority of calls-for-projects at all level (national, regional and/or local, university) do not put the focus on public engagement and transdisciplinarity. There is not enough funding to support public engagement in research and transdisciplinary science at all levels.

Public engagement in research and dissemination of science is relying on individual preference and times. They do not receive any retribution for their action in public engagement. Scientific dissemination activities only received a few funding. In addition, there are also disincentives that are more implicit cultural reasons. For instance, in France there is a « scientific nobility » vision in one generation of researchers (N2). The science is seen as noble, not for everyone, intellectual investment is reserved for an elite. This vision is fading with new generations.

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4. SYNTHESIS

Public engagement and transdisciplinary science are located at the heart of the open science debate. Open science contributes to offering citizens the means to appropriate the results of science with greater transparency and to contribute through participatory science approaches (Science with and for society). The open science movement started at many European universities, has facilitated a collaborative research process and new ways to disseminate results to contribute to sustainability transformations. The involvement of the five participating universities in the CHARM-EU alliance and TORCH Horizon 2020 project shows that there is a commitment from European universities to further advance this movement and promote responsible science to further democratisation of science.

In terms of structure, many universities have, to some extent, incorporated public engagement and transdisciplinary science as part of the wider agenda for opening up science. However, not all universities have a centralised or dedicated university policies and structures in place concerning open science, public engagement, and transdisciplinary science. The findings show that good practices on public engagement and transdisciplinary science (both research and education) are abundant. The existing initiatives, however, are fragmented and rely heavily on bottom-up, individual/team leaderships in initiating public engagement and transdisciplinary science activity.

There is a wide range of good practices on public engagement and transdisciplinary science within the five participating European universities, starting from research, education, and their interplays. These good practices are also diverse in terms of scales, from individual to systemic level type of initiatives. They cover small to large scales of initiatives conducted at the level of the university, faculty, inter-faculties, department, programme group, team, and individual, initiatives combining multi- and transdisciplinary perspectives. The core focus/objectives in each initiative also differ, i.e., science dissemination, science communication, co-creation, citizen science, stakeholder engagement, recognition and rewards, including new scientific evaluation models (MERIT/TRIPLE[215] system at UU, Plan for academic education to be adopted by UB), funding mechanisms at the regional, national, and local level to promote public engagement and transdisciplinary science and many more. These good practices also involved diverse societal stakeholders, from public/citizens to the community organisation, governmental institution, private sectors/industries and consortium consisting of a mix of stakeholders.

We have studied 31 of these good practices closely and investigated the incentives and disincentives experienced in each level (individual, university, societal stakeholders, and systemic level). The results show that incentives and disincentives for conducting public engagement and transdisciplinary science as reported by different universities are quite similar. The most prominent incentives at the individual level are peer support and internal motivation, while disincentives are mostly related to lack of capacity and rewards and recognition for scientists to pursue their careers through public engagement and transdisciplinary science. Regarding the university level, the

[215] https://www.uu.nl/en/news/from-merit-to-triple

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existing structure and policies such as university strategic visions on open science and ambition to leverage the role of the university to address societal problems in place are served as an incentive. Several notable practices are embeddedness of the rewards and recognition system at the UU and awards system for championing open science and public engagement organised at ELTE, TCD and UM. In addition, existing infrastructure and pioneer institutions who are leading the work on open science, inter-, and transdisciplinary science helped to promote more public engagement. Disincentives at the university level ranged from lack of resources (UM, TCD, ELTE) to physical space/infrastructure that can allow collaboration (UB, TCD, UM), and also visibility, operationalization, and mainstreaming of the open science programme to facilitate public engagement and transdisciplinary science (UU, ELTE). Finally, a lack of attention to vulnerable and marginalised groups was also mentioned as disincentive for public engagement and transdisciplinary science at the university level (UB).

In terms of societal stakeholders, the major incentives are the availability of networks, opportunities for lifelong learning and access to scientific information and financial support. Meanwhile, disincentives for societal stakeholder to be engaged in public engagement and transdisciplinary science-related activities are the excessive bureaucracy of the university, lack of interest from the university partners to deal with topics related to inclusiveness (engaging vulnerable/marginalised/disability group for the sake of avoiding potential conflict), lack of interest of societal stakeholder to be engaged in scientific discussion, and lack of long-term vision of collaboration due to funding limitation. Finally, in terms of incentives at the systemic level, it is clear that the existing funding mechanisms are the most attractive incentives. At the regional level, university partners mentioned Horizon Europe as a decisive funding mechanism. At the national level, several funding mechanisms are existing to disseminate science and promote open science (for example provided by NWO Netherlands and NRDIO in Hungary). Meanwhile, at the local level, universities have set their own funding mechanisms to further promote new initiatives on open science, public engagement and transdisciplinary science (e.g., Seed money project of UU, open access funding at UB, MUSE transdisciplinary research funding at UM). Several disincentives at the systemic level were reported, including the lack of quality assurance, especially related to the evaluation of "good" public engagement/transdisciplinary science, competition across initiatives, the divergence of EU and national policies, lack of national policies, which shows lack of political interests on this topic, and lack of institutionalisation. The COVID-19 crisis was also mentioned as an important hindrance at the systemic level. It blocks the access of communication among stakeholders and science and reduces the effectiveness of public engagement and transdisciplinary science-related work.

These findings show that a lot has been done in terms of promoting public engagement and transdisciplinary science as part of the open science movement in many universities. In the D7.2 report, we will present more in-depth reflections on what does the finding means in terms of progress to achieving the true vision of open science, the future role of European Universities therein and recommendations to strengthen public engagement and transdisciplinary science in addressing sustainability issues and societal challenges.

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ANNEX 1: GENERAL INTERVIEW STRUCTURE

Interview structure

1. **Introduction** – ask the interviewee to tell something about their background.

2. **Best practices** – ask for an introduction of the best practices they are involved with

3. **Incentives and disincentives** – ask what (de)motivates the interviewee to conduct transdisciplinary science and public engagement through the respective best practices. Structure your question based on the 4 types of (dis)incentives:

3a. Individual (dis)incentives (e.g. intrinsic (personal) and extrinsic (professional, including inter-personal aspect) incentives that can change behaviour at the individual level, including incentives related to increasing skills, commitment, leadership, professional development (visibility and networking issues) and support from peers, and coaching by supervisors)

3b. University (dis)incentives (e.g. certain structures that could enable/support public engagement (e.g. dedicated public engagement department/mechanisms, reward and assessment systems, and hiring systems)

3c. Societal actors' (dis)incentives (e.g. the (dis)incentives from the viewpoint of the societal stakeholders, such as awareness-raising, visibility, networking, additional resources (e.g. finances, human capital) for their projects)

3d. Systemic (dis)incentives (e.g. (dis)incentives related to the governmental policies, requirements by funding agencies, publishing policies/practices and assessment committees that are directly affecting the universities and researchers and engagement of societal stakeholders)

4. **Contextualization of (dis)incentives** –Ask the interviewees for their view on the contextual conditions of different types of (dis)incentives based on geographical, socio-cultural, accessibility, originated from different domains or disciplines, types of stakeholders and level of engagement.

5. **University approach and policies** – Ask the interviewee to walk the interviewer through the university's approach and policies on Public Engagement and transdisciplinary science (if applicable)

6. **Overarching lessons learned/recommendations** – Based on everything that has been discussed, what are some overarching lessons/recommendations for future transdisciplinary science and public engagement? For example, how these types of (dis)incentives could support or limit open science and democratisation of science?

7. **Close off** – Ask the interviewee anything to be mentioned that has not been discussed before and any suggestions for follow up interviews

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ANNEX 2: INTERVIEWEES AND IN-TEXT CODE (UU)

#	Affiliation/Institutions	Insights	In-text code
1	Community-engaged learning/UU	PE & TD Education	U1
2	Pathways to sustainability/UU	PE & TD Research and Education	U2
3	Physical geography/UU	Citizen science	U3
4	International development/UU	Global research and education	U4
5	IMAU/UU	Citizen science, science communication (research and education)	U5
6	Public engagement pillar UU/Centre for society and culture UU	Science communication (research and education), public engagement structure within UU	U6
7	Energy and resources/UU	Transdisciplinary collaborations with industry and policymakers	U7
8	Environmental biology/UU	Interdisciplinary and transdisciplinary education	U8
9	University corporate offices/UU	Policy – entrepreneurship and regional partnership within UU	U9
10	Human geography/UU	Transdisciplinary research and education in collaboration with partners from the global south	U10
11	Rathenau Institute	PE&TD science systems in NL	E11
12	NWO (National science funding The Netherlands)	Science funding system in NL	E12
13	NWA (Dutch Research Agenda) under NWO	Science funding system in NL	E13
14	EU Commission	EU research and innovation agenda	E14
15	KNAW (Royal Netherlands Academy of Arts and Sciences)	PE&TD science systems in NL	E15
16	International Science Council	Global science agenda	E16
17	Royal Haskoning NL	Societal stakeholder's view	S17
18	Galapagos Conservation Trust	Societal stakeholder's view	S18
19	Ministry of Infrastructure and Water	Societal stakeholder's view	S19

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ANNEX 3: LIST OF INTERVIEW QUESTIONS (UU)

- Could you please share your background and your work in public engagement/transdisciplinary education and research?
- Could you please share your key insights on your main projects/activities related to public engagement and transdisciplinary science?
- What motivates you on a personal level to be involved in public engagement and transdisciplinary science?
- What demotivates you?
- Do you think that the current university system has provided appropriate incentives on If yes, what, if no what is missing?
- Who are the societal stakeholders engaged in your initiative?
- What motivates/demotivates them to be engaged (short and the longer term)?
- Is there something to change from the systemic level (EU/NL level on science/education system) to motivate more engagement in public engagement and transdisciplinary science?
- What are your recommendation to improve the incentives system on public engagement and transdisciplinary science, reflecting on your experience? (please mention different levels: the individual, university, systemic, and societal stakeholder level)
- What comes to your mind when you hear the term of democratisation of science? Do we need it? Should that be our goal for public engagement and transdisciplinary science?

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ANNEX 4: MAPPING OF RELEVANT KEYWORDS RELATED TO PUBLIC ENGAGEMENT AND TRANSDISCIPLINARY SCIENCE IN THE UU AND FACULTY STRATEGIC PLANS 2021-2025[216] (UU)

Faculty	Vision for sustainability	Endorse open science	Public engagement/societal engagement/community engagement	Societal impact (societal challenges, problems; partnerships, service-based society)	Multidisciplinary	Interdisciplinarity	Transdisciplinary	Education (life long learning; entrepreneurial education; education for professional; community-engaged learning)	International, intercultural focus, diversity, and inclusion	Team science	Recognition and rewards (e.g. TRIPLE/MERIT)
UU	x	x	x	x	x	x	x (not specific)	x	x	x	x
SC	x	x	x	x	x	x	x	x	x	x	x
VM	x	x	-	x	x	-	-	x	x	-	-
HUM	x	x	x	x	x	-	-	x	x	x	x
UCE	x	x	x	x	x	x		x	x	-	x
MED	x	x	x (patient participation)	x	x	-	-	x	x	-	x
GEO	x	x	x	x	x	x	-	x	x	-	0 (not specific)
LEG	x	x	x	x	x	x	-	x	x	x	x
SBS	x	x	x	x	x	x	-	x	x	x	0 (not specific)

[216] https://www.uu.nl/en/organisation/strategic-plan-2025/the-strategic-plan

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ANNEX 5: LIST OF INTERVIEWEES (TCD)

Profile	# of interviewees
Male	04
Female	08
Academic/Research role	06
Administrative role	06
Central office-based	01
Institute/School-based	10
Central & Institute/School	01

Affiliation of Interviewees
Centre for Future Networks and Communications (CONNECT)
Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN)
Office of the Dean of Research
School of Botany
School of Education
School of Nursing & Midwifery
Science Gallery Dublin (SGD)
Trinity Long Room Hub Arts & Humanities Research Institute (TLRH)
Trinity Research and Innovation (TR&I)
Trinity Walton Club

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ANNEX 6: ADAPTED INTERVIEW GUIDE (TCD)

- Could you tell me what your role is?
- Could you identify an example of what you believe is best practice in public engagement or transdisciplinary learning, science communication, citizen science in Trinity?
- What motivates or demotivates you when it comes to public engagement and transdisciplinary science?
- What do you feel are the intrinsic (personal) and extrinsic (professional) incentives and disincentives that affect your public engagement work? How personal circumstances might affect people's either willingness or ability to engage?
- Do you think that the current university system has provided appropriate incentives? If yes, what, if no what is missing?
- What do you feel are systemic incentives and disincentives that affect your public engagement work, like government policies requirements by funding agencies and even publishing practices?
- What are your views on Trinity's approach and policies towards public engagement and transdisciplinary entity in general?
- What are your overarching lessons or recommendations for strengthening the future of public engagement work at Trinity?

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ANNEX 7: ADDITIONAL EXAMPLES OF GOOD PRACTICES IN PUBLIC ENGAGEMENT AND TRANSDISCIPLINARY SCIENCE (TCD)

Several additional examples were mentioned by some interviewees:

- Public Patient Involvement (PPI) Ignite Office at Trinity College[217] which broadens the group of health researchers who involve patients and members of the public in research and improves the quality of PPI approaches.
- The Trinity Centre for Ageing and Intellectual Disability and IDS-TILDA which advances engagement opportunities for people with an intellectual disability, their carers, family members and service providers.[218]
- Empowering people with dementia in research projects at the Global Brain Health Institute.[219]
- The All-Ireland Pollinator Plan[220]
- "Out of the Ashes" event series at the Trinity Long Room Hub[221]
- Docklands Partnerships[222]
- Mapping Found Poetry[223]

[217] PPI Ignite Office at Trinity College: https://www.tcd.ie/tcaid/ignite/index.php
[218] Trinity Centre for Ageing and Intellectual Disability: https://www.tcd.ie/tcaid
[219] Global Brain Health Institute: https://www.gbhi.org
[220] All-Ireland Pollinator Plan: https://pollinators.ie
[221] Trinity Long Room Hub: https://www.tcd.ie/trinitylongroomhub/whats-on/details/2018/out-of-the-ashes.php
[222] Docklands Partnerships: https://www.tcd.ie/innovation-district
[223] Mapping Found Poetry: https://zenodo.org/record/4266614#.YeU5WljP0UE

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ANNEX 8: LIST OF INTERVIEWEES (UB)

UNIT/PROJECT
Rector's Delegate for Science Dissemination Full Professor of Genetics at the University of Barcelona.
11F project researcher. Technician of the Scientific Culture and Innovation Unit within the Communication Area of the University of Barcelona.
11F project volunteer. Main researcher of the Surfing for Science project. Associate Professor of Marine Geosciences (Department of Earth and Ocean Dynamics) at the University of Barcelona.
11F project volunteer. PhD candidate in Neurobiology and Cell Biology at the University of Barcelona. She represented the UB at the Doctoral Thesis contest in 2021.
Main Researcher of xAire project. Full Professor of Physics at the University of Barcelona.
She coordinated the xAire project from the side of the Barcelona City Council. She directed the CITY STATION at the Centro de Cultura Contemporánea of Barcelona.
Mother of two students, one of whom participated with her in the xAire project three years ago.
Main Researcher of Prometheus. Full Professor of Social Anthropology at the University of Barcelona.
Project manager for Prometheus. He has coordinated different actions of the project, mainly educational and civic participation, in the festivities of the Occitan, Andorran, Aragonese and Catalan communities.
Predoctoral researcher involved in Prometheus who is part of the Heritage Anthropology Research Group (GRAP) at UB.
Main Researcher of Allinteract. Full Professor of Sociology at the University of Barcelona.
Allinteract postdoctoral researcher. María Zambrano Postdoctoral Researcher, Autonomous University of Barcelona
Member of a women's association in a community centre who participated in the gatherings of the Allinteract project.
Responsible for Surfrider Spain. Surfrider Spain is an organization of surfers that is actively involved in the Surfing for Science project, coordinating volunteers when they are collecting samples from the sea.
She is co-director of Plancton Diving, an organization that participates in the Surfing for Science project.

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ANNEX 9: LIST OF INTERVIEWEES AND IN-TEXT CODE (UM)

Table of acronyms

CEFE: Centre for Functional and Evolutionary Ecology
CNRS: Centre National de la Recherche Scientifique (National Centre for Scientific Research)
INRAE: National Research Institute for Agriculture, Food and the Environment
IRD: Research and Development Institute
MARBEC: Marine Biodiversity Exploitation and Conservation
UM: University of Montpellier
UMR: Unité Mixte de Recherche (Joint Research Unit)

#	Affiliation/Institutions	Insights	In-text code
1	Research Director, CNRS UMR CEFE	Open database, National Observatory and the Citizen Science program "Observatoire Des Saisons".	I1
2	Associate researcher, UM IRDEF	Participatory Action Research and Citizen Sciences.	I2
3	Senior researcher, INRAE UMR G-EAU	Innovative participatory methods to support multi-level management and governance of water and territories, between communities, policy makers and experts.	I3
4	Research fellow, CNRS UMR MARBEC	Collaborative research projects in partnership with local companies	I4
5	Lecturer UM, UMR Dynamique du droit	Transdisciplinarity	I5
6	Research fellow, CNRS UMR CEFE and UMR MARBEC	Citizens sciences	I6
7	Research fellow, IRD, UMR MARBEC	Citizens sciences	I7
8	Doctoral Studies and Research Department at UM	Research	U1
9	Mediterranean Centre for Environment and Biodiversity Laboratory of Excellence, CeMEB LabEx		U2
10	MAK'IT	Transdisciplinary researches on sustainability	U3
11	Vice-President in charge of "Science and Society"	Public engagement	U4
12	UAR Genopolys	Dialogue "science and society"	S1
13	Kimiyo	Scientific Culture Dissemination	S2
14	Ministry of Higher Education and Research	Science and society	N1
15	National Research Agency	Science funding, science and society	N2

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ANNEX 10: LIST OF INTERVIEW QUESTIONS (UM)

- Background/Presentation: Could you please explain your role in public engagement and transdisciplinary science?
- What are the best practices you've experienced in public engagement and trandisciplinary science (systemic, societal, university and individual level according to the interviewee's affiliation)
- What are the incentives to encourage researchers/associations/universities to conduct public engagement and transdisicplinarity?
- What are the existing barriers/discincentives that slow down/prevent/hinder the development of public engagement and transdisciplinarity?
- Which contextual conditions can explain the existence of those barriers/discincentives?
- Do you have any recommendations to improve public engagement and trandisciplinary science (systemic, societal, university and individual level according to the interviewee's affiliation)
- Anything to be mentionned that has not been discussed before?
- For you, what is "democratisation of science"?