EUt+

European University of Technology

Deliverable D48

D4.2.1c Analysis research/challenges - D4.2.2c Challenge-based laboratories

Del. Rel. D4.8

WP 4

Description: Conduct an in-depth analysis of EUt+ partner's research alignment with grand societal challenges, then development report ; Creation of The Pan-European Sustainability laboratory (1st), Mobility laboratory (2nd) & Energy laboratory (3rd) Especially extension of the PhD in sustainable sciences

Comments: The current document is provided in its English version to be succint. Translations in other languages will be provided upon request.

Dissemination level: **PU**-Public

https://www.univ-tech.eu/phase-1-results

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Foreword to deliverable 4.2.1c and 4.2.2c

After Deliverable 47 which has described the scope and development strategy of the European Sustainability Science Lab (ESLab+)[1], this Deliverable 48 presents the needs analysis that will helpfully inform the co-construction of the institute. In this process towards becoming an European Research Institute, the ESLab+ has been acknowledged by EUt+ Research Committee as a research group (see purpose document describing the scope of ESLab+ as Annex 1). The main insights concern a need for clarification of the objective of ESLab+ and communicate about next events. The definitions of sustainability science, sustainability, and interdisciplinarity need to be discussed, at a theoretical level and with practical examples. Also, the link between sustainability science researchers and societal issues must also be discussed in order to understand the implications for the projects developed within ESLab+.

This deliverable is divided into two sections: (1) a study within the network of EUt+ researchers wishing to participate in the sustainability laboratory, and (2) a presentation of the first activities carried out within the framework of the sustainability laboratory. The first section corresponds to deliverable D4.2.1c, while the second corresponds to deliverable D4.2.2c. The two sections have been combined into a single document for ease of reading.

The first part of the deliverable (analytical research) focuses on a survey sent to researchers interested in the ESLab+, to understand their positioning in terms of sustainability, interdisciplinarity, and radicality. The second part of the deliverable (challenge-based laboratory) focuses on a science fiction workshop to understand the expectations of scientists from EUt+ scientists ESLab+. As mentioned in the deliverable description, a last section is dedicated to PhD students in sustainability science.

[1] https://esleut.pubpub.org/

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Introduction

Exceeding planetary boundaries has profoundly altered the balance of the Earth system. As a result, the habitable conditions of the planet are under threat, to the point where certain areas of the world are becoming inhabitable. The global and local consequences of these imbalances are such that scientists have proposed a new geological period to characterise the changes underway: the Anthropocene. This observation suggests that human societies must make efforts to move towards more sustainable lifestyles if we are to come back within planetary limits and learn to be resilient in the face of current and future changes.

This transition in socio-technical systems, although defined as necessary by scientists some forty years ago, is struggling to get off the ground. Indeed, the impact of societies on planetary limits continues to intensify, and the inequalities that structure societies have changed little. Socio-technical systems need to be redesigned to adapt to this new situation while reducing the pressure on ecosystems. To enable these changes, sustainability scientists have identified several leverage points, the most important of which is the ability to transcend paradigms.

Sustainability science requires deep interdisciplinary competencies and is practice-oriented. Sustainability science is about challenging research goals, research methods, and ultimately research practices. Researchers are questioning the extent to which the way in which they produce their knowledge affects their credibility and the way in which the knowledge produced is disseminated to society.

Therefore, the research produced within European Sustainability Science Lab (ESLab+) will come from different epistemological backgrounds, ensuring the rigour of the knowledge produced and the ability to tackle 'wicked problems'. For that, after identifying the scope and development strategy of the ESLab+ (D47), it appeared important know what assumptions are shared or not shared among researchers to pursue the co-construction process.

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1 Analysis research / challenges: survey within EUt+ on sustainability science

1.1 Motivation

We conducted a survey to determine the extent to which some aspects of sustainability science are shared or not within the future ESLab+ community.

1.2 Method

In order to create the European sustainability laboratory, it is important to know what assumptions are shared or not shared among researchers. Therefore, the following questions are posed:

- The link between research and values,
- The link between research and the SDGs,
- The link between research and the radicality of the selected projects,
- The link between themes and research practices.

In the literature, we found that existing laboratories can be categorized into **six types** (McCrory et al. 2020):

1. fix and control
2. design and optimize
3. make and relate
4. educate and engage
5. empower and govern
6. explore and shape (more details in Annex 4).

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We asked the participants which type they would like the European sustainability laboratory to fit into.

Other questions were more related to the ability of researchers to participate in the sustainability laboratory (barriers, reasons to participate). The survey consisted of a questionnaire with 12 questions (see List of Annexes

Annex 1: ESLab+ document describing the scope of the to-be ERI

(that has been acknowledged by the EUt+ Research Committee as a Research Group)

Annex 2: Application form for researchers to be affiliated to ESLab+

Annex 3: Questionnaire as part of the needs and expectations analysis

Annex 4: Expanded lab typology

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Annex 1

Purpose document describing the scope of ESLab+

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European Sustainability Science Laboratory (ESSLab+)

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Preambule

"*As a University of Technology, our mission is first and foremost to serve society*". This was one of the first statements of the European University of technology (EUt+). This desire to serve human societies is expressed in the context of exceeding planetary boundaries and can only be achieved by taking this phenomenon into account. The overstepping of planetary boundaries, mainly due to the pressure of societies on ecosystems, calls into question the habitability of planet Earth. In this context, the development of a research institute on sustainability issues within the EUt+ seems essential in order to participate in the sustainable transition of European societies. This will make it possible to study the "*pivotal role that technology plays in forging an inclusive and sustainable future*" (2020). This document describes the institute, its scope, and its development strategy.

Scope and perspective

Exceeding planetary boundaries has profoundly altered the balance of the Earth system (Steffen, Richardson, et al. 2015). As a result, the habitable conditions of the planet are under threat, to the point where certain areas of the world are becoming uninhabitable. The global and local consequences of these imbalances are such that scientists have proposed a new geological period to characterise the changes underway: the Anthropocene (Crutzen 2006). This observation suggests that human societies must make efforts to move towards more sustainable lifestyles if we are to come back within planetary limits and learn to be resilient in the face of current and future changes.

This transition in socio-technical systems, although defined as necessary by scientists some forty years ago, is struggling to get off the ground. Indeed, the impact of societies on planetary limits continues to intensify, and the inequalities that structure societies have changed little, as evidenced by the increase in greenhouse gas concentrations in the atmosphere, from 325 ppm in 1970 to 420 ppm in 2023, the decline in biodiversity, and the increasing rate of land artificialisation (Steffen, Broadgate, et al. 2015) – to name but a few. Socio-technical systems need to be redesigned to adapt to this new situation while reducing the pressure on ecosystems. To enable these changes, sustainability scientists have identified several leverage points, the most important of which is the ability to transcend paradigms (Abson et al. 2017). Sustainability science is understood here as an interdisciplinary endevour oriented towards practical action. This interdisciplinarity of scientists obliges researchers to be epistemologically agile and methodologically grounded in order to ensure the rigour of the knowledge produced (Haider et al. 2018). This is a real challenge for researchers, as interdisciplinary requires more time to build a common vocabulary among researchers and poses a risk to the disciplinary structure of science. Thus, it is clear that sustainability science challenges the status quo and target multi-level issues.

The development of sustainability science in Europe is a major challenge to enable European society to participate in the sustainable transformation of societies. As EUt+ aspires to be a key player in the

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future, it is imperative to address the complex issue of sustainability. Thus, the ESSLab+ lab is not about the design of new technologies to fix environmental issues, but about better understanding the paradigms behind current and new technologies, stepping back from regular production, and exploring new socio-technical paradigms. This document outlines the specificities of the European Sustainability Laboratory (ESSLab+).

ESSLab+ within EUt+

EUt+'s academic contribution to sustainability efforts will be made through a new European Research Institute called the European Sustainability Laboratory (ESSLab+). ESSLab+ will be a multinational, multi-campus, trans- and interdisciplinary research institute.

Firmly rooted within the mission and vision of EUt+, ESSLab+ is particularly aware that the answers to these challenges necessarily involve technology, but that they must be multi-faceted and address the complexity of socio-technical issues. Furthermore, ESSLab+ aims to develop a critical perspective on technology to enable paradigm shifts.

"This can only be achieved by empowering technologically responsible citizens, and researchers who fully comprehend the potential of technology as well as the risks of neglecting its purpose". (Statement from the European University of Technology proposal, submitted to the 2020 ERASMUS+ Call for proposals)

Name of the proposed ERI	European Sustainability Laboratory (ESSLab+)
Constituent Universities:	+ University of Technology of Troyes, + Darmstadt University of Applied Sciences, + Riga Technical University, + Technological University Dublin, + Technical University of Sofia, + Cyprus University of Technology, + Technical University of Cartagena, + Technical University of Cluj-Napoca.
Leader Member	Professor Dr. Nicole Saenger, University of Applied Sciences Darmstadt (h_da)

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Missions of the European Sustainability Laboratory (ESSLab+)

ESSLab+ is about better understanding the paradigms behind current and new technologies, stepping back from regular production and exploring new socio-technical paradigms to achieve sustainability of our societies. Thus, projects within the framework of ESSLab+ are concerned with the production of knowledge about the interactions between human societies and ecosystems.

The European Sustainability Laboratory has three missions:

1. RESEARCH. To generate knowledge on sustainability
2. TRANSFER. To reduce the time needed to transfer knowledge from researchers to non-researchers
3. REFLEXIVITY. To explore ways of doing research in a more sustainable way

RESEARCH. To generate knowledge on sustainability

ESSLab+ aims to promote research that contributes to understanding the evolution of our world, especially in the context of technological change. "*It is our essential human ability to express, think and understand the world through artefacts.*" (Mission statement, 2020). The first mission therefore focuses on generating scientific knowledge to better understand the role of technology in the sustainable transformation of our societies. As technology and people co-evolve, it is crucial to study technology in the context of sustainable lifestyles (assumption 1). Technology shapes people's understanding of problems, while at the same time people design technical systems. Sustainability transitions assume that technological production needs a paradigm shift to reduce pressure on the Earth System while ensuring the well-being of the majority of human societies, not only a minority. Sustainability issues are thus wicked problems, that need to be tackled with multi-level perspectives (assumption 2).

ESSLab+ aims to go beyond the application of the SDGs to bring an ambitious research plan embedded in a strong sustainability perspective, and to try to move away from an anthropocentric view (towards a more ecocentric view). This will allow ESSLab+ to have a critical perspective on the first moto of EUt+ "think human first", and to explore the (PhD) students' moto "*think human and all living beings first*" (Student MoU, 2019).

Sustainability science is not easy to practice, as it requires deep interdisciplinary competencies and is practice-oriented. Therefore, the research produced within ESSLab+ will come from different epistemological backgrounds that need to be explained (positivism, feminism, constructivism, interpretativism, …), while having a deep methodological groundness (Haider et al. 2018) (assumption 3). As stated by (Nagatsu et al. 2020), "*sustainability scientists have recently started discussing a range of methodological issues, including the transferability of case-based transdisciplinary knowledge (Adler et al. 2018), the taxonomy of experimentation (Caniglia et al. 2017), evidence synthesis (Livoreil et al. 2017), and the synthesis of scientific and non-scientific knowledge such as indigeneous knowledge*

(Tengö et al. 2017). *These all revolve around the question of how to produce knowledge that is both epistemically reliable and practically usable.*" This addresses several questions: How is knowledge produced? Who produces knowledge? For what purpose? Should we have a purpose? It is related to the notion of dissemination and knowledge transfer which are the second main mission of ESSLab+.

TRANSFER. To reduce the time needed to transfer knowledge from researchers to non-researchers

As EUt+'s main objective is to serve society, it is fully in line with the transdisciplinary approaches that are crucial to the practice of sustainability science. Indeed, "*transdisciplinarity for producing groundbreaking sociotechnical solutions has to serve (a) the public good and (b) calls for independence, academic freedom, institutionalization, and proper funding schemes.*" (Scholz 2020)

Given the urgency of the sustainable transformation, the knowledge generated by scientific projects needs to be disseminated more rapidly to society at large. Therefore, other knowledge transfer systems beyond the traditional science-industry interaction need to be put into practice to accelerate the sustainable transformation. In line with this statement, closer collaboration between stakeholders within the production process should be developed. This type of knowledge production is called transdisciplinary research. Furthermore, as EUt+ campuses are located in different areas (rural, urban, landlocked territories or capital cities), the transfer process will have need to be adapted to the different local situations.

Some academic platforms will need to be developed to support the knowledge produced on sustainability.

REFELEXIVITY. To explore the ways to practice research in a more sustainable way

Sustainability science is challenging research goals, research methods, and ultimately research practices (Clark and Dickson 2003; Jerneck et al. 2011; Kates 2011). Researchers are questioning the extent to which the way in which they produce their knowledge affects their credibility and the way in which the knowledge produced is disseminated to society.

These questions may seem trivial, but they have been the subject of a great deal of research, so much so that several researchers have come together at national and international level to address them. The first questions focused on the environmental impact of research, mainly in terms of carbon emissions, especially from transport. (Bossdorf, Parepa, and Fischer 2010; Cluzel et al. 2020). Others question the ability of researchers to conduct research in a doubly anxiety-provoking environment. First, the research environment has become anxiety-provoking (competition, publish or perish), leading to a higher representation of mental pathologies among PhD students than other highly qualified individuals in all countries (Berry et al. 2020; Levecque et al. 2017; Martínez-Nicolás and García-Girón 2021). Second, as the planet's living conditions are not assured there is a development of eco-anxiety among the younger generations and thus among students (Eriksson et al. 2022).

More broadly, we can ask: how to practice research in sustainable (environmental but also social) contexts? what does it mean to produce knowledge in the Anthropocene? What kind of knowledge does society need? Does the Anthropocene force us to rethink the role of the researcher in society?

Organisation of ESSLab+

The laboratory will be organised into a transversal group and thematic groups. The transversal group will tackle questions such as “What is sustainability science?”, “How to practice interdisciplinarity research?”. The thematic groups will be interdisciplinary groups dealing with specific topics. Figure 1 represents the organisation and the interaction between the transversal group and the thematic groups.

To give an example of thematic group, “computing” thematic group could tackle the issue of the design of computing systems outside of a cornucopian paradigm, which means having researchers from philosophy, HCI, ergonomics but also telecommunications disciplines. Wherever possible, practical actors (industry, grassroots communities) will be involved in order to ensure that the research is applied and action-oriented. Reducing the pressure on the planetary boundaries while maintaining a certain level of well-being for human and non-human societies should be the framework for the thematic groups.

Short term timeline

This section is dedicated to the short term timeline. The long-term timeline will be co-designed by the ESSLab+ members and therefore cannot be presented yet.

The mission of the European Sustainability Laboratory is to develop and conduct innovative research via EU Projects in combination with national funding. The next EU calls coming up are on Widening of the Horizon Europe, Erasmus plus and MSCA. To answer those calls, ESSLab+ will rely on the European Research Office (ERO) and the European Innovation and Technology Transfer Office (EITTO) which have been created and are working in the frame of EUt+. Indeed, the ERO and the EITTO support the researchers in EUt+ and the EUt+ European Research Institutes (ERIs) as European project offices.

SHORT TERM GOALS

Within the first year, the main objectives are to:

- To build a community on sustainability, which can share different visions on the topic and challenge the status quo.
- To provide input to young researchers willing to develop their research in the field of sustainability.

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- To support a community by empowering senior researchers on the topic of sustainability
- To understand the current European landscape on sustainability science (from an institutional point of view) and to be able to position ESSLab+within this landscape (McCrory et al., 2022).
- To start the development of an international project.

1st YEAR AGENDA (Figure 2)

In order to respond to the short-term objectives, a 1-year agenda has been set up, consisting of 3 steps:

1. **Co-designing the scope and perspective of ESSLab+:** this process will last for several months and will allow us to understand the different perspectives of the researchers participating in ESSLab+. This process will be participatory in the sense that every researcher wishing to express their views will be able to do so.
2. **Laying the first stones:** this moment will be dedicated to the launching of different actions (seminars, reading groups, weekly meetings) and better understand the position of ESSLab+ in the European academic landscape.
3. **Consolidation:** this phase is in the continuity with the previous one, through the organisation of different actions (seminars, reading groups, weekly meetings), so different formats of events to enable all researchers on sustainability to find *their* way to participate in ESSLab+.

Figure 15: Chronology of the different actions for the 1st year of the ESSLab+

Conflict Management

The institute will adhere to the EUt+ guidelines presently under development and in accordance with The European Code of Conduct for Research Integrity.

A code of conduct will be adopted in the first year following the start of ESSLab+ activities (approximately June 2024).

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Annex 2

Application form for researchers to be affiliated to ESLab+

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APPLICATION (PART 1/2) AS A MEMBER OF THE EUROPEAN RESEARCH GROUP ON

EUROPEAN SUSTAINABILITY SCIENCE LABORATORY (ESSLAB+)

This application serves as an application for individual membership in the research group as

☐ Core member

The membership encompasses voting rights in the general assembly and eligibility for election as a member of the research group council or the academic lead. Double core membership, i.e., further core membership in another Research group/ERI is not given. For the initial phase of the research group the core member may use their home affiliation together with the research group affiliation for publications.

☐ Associated member

Associated membership as a researcher conducting research linked to the research group's subject area. The membership does not entail voting rights or eligibility to receive funding by the research group.

☐ I am core member in another research group/ERI: _____
☐ I am a postgraduate student on master and doctoral level and wish to join as an early career stage researcher for the duration of my studies with an EUt+ partner university of the research group. In this the membership entails a consultative vote role.

Applicant

Degree	Name, First Name	EUt+ Partner University

If you are a postgraduate student

Start of your PhD	/ /
End date (approx.)	/ /
Thesis title	

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Personal Information

Department	
Postal Adress	
Email	
Webpage	
ORCID	
Other profile	

Keywords of your study fields (3 to 7)

Brief description of your research interests, the problems you address and how they relate to the main scientific interests of sustainability science.

Motivation for joining the research group

Research experiences

☐ My ORCID profile contains my academic CV
☐ My academic CV is attached
☐ My ORCID profile contains my publication list
☐ My publication list is attached

I certify the accuracy of the information provided here and confirm my wish to be admitted to the research group as a member. As a member I will exercise my rights and fulfill my duties to participate in the achievement of the objectives as well as the fulfilment of the tasks of the research group and to participate in its self-administration and governance.

Place, date Signature

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Annex).

The questionnaires were filled in by students, PhD students and researchers from the 8 first member universities of EUt+: 50 respondents in all. The answers were anonymised during the analysis process. All answers were kept. This type of survey could be carried out every year in order to follow the evolution of the assumptions made by the researchers of our community.

1.3 Results and interpretation

This section describes the insights gained from the survey, organized in 9 categories' sub-sections:

1. type of laboratory
2. definition of sustainability science
3. participation in ESL
4. value neutrality of sustainability science
5. SDGs
6. sustainable research practices
7. perspective in projects (radicality)
8. interdisciplinarity in projects
9. other comments

1.3.1 Type of laboratory

Figure 1 can be read as follows: 1 participant choose the lab "fix and control", 5 participants preferred the lab labeled "design and optimize", 3 picked "make and relate", 17 picked "educate and engage", 8 chose "Empower and engage", 12 "explore and shape" and 4 picked the box "Other".

The most selected types are the following three (title and description):

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- **Educate and engage** (17 answers): "*Educate and engage labs include real-world university approaches to teaching and learning sustainability. These educational environments, located at university campuses, focus on rethinking university-society relations by engaging students in experiential, action-oriented learning. Institutionally, they frequently counter conventional approaches to education for sustainable development that are teacher-centred, lecture-based and disconnected from real-world application.*" (McCrory, 2022).

- **Explore and shape** (12 answers): "*Explore and shape labs are process-based initiatives, whose focus lies in generating a collective and systemic understanding of sustainability in context. These labs begin by orienting around a complex and contested challenge, which may require alternative perspectives and new framings. Inherent in the challenge is a significant degree of uncertainty, and a systemic quality to be engaged with. Explore and shape labs develop processes to create this understanding at the level of system, to surface multiple perspectives, and to embrace complexity.*" (McCrory, 2022).

- **Empower and engage** (8 answers): "*Empower and govern labs are partnership-based labs, whose focus is to understand, intervene in, and respond to, multifaceted sustainability challenges often located at "the urban" level. Novel partnerships and organisations commonly emerge from Empower and govern labs to enable interactions that were previously challenging. Experimentation is therefore broader than technical, with little emphasis on the commercialisation of products, and services. Rather, labs catalyze relational or institutional forms of experimentation. The former includes organizational experimentation with neighbourhood healthcare provisions, whereas the latter includes land for new relations and ownership.*" (McCrory, 2022).

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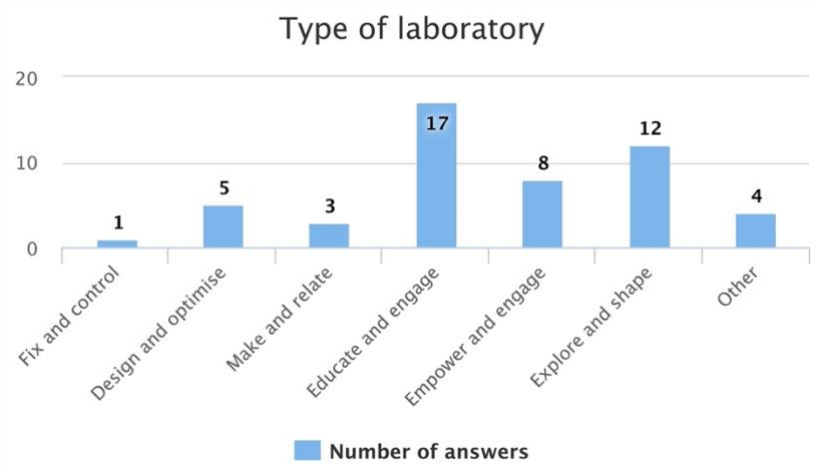

Figure 1: types of laboratories according to the typology of (McCrory, 2022)

A participant chooses “other” and writes the three types of laboratories above (*Educate and engage*, *Explore and shape*, *Empower and engage*). So, ‘+1’ can be added to each one of these types. Another participant wrote: “Deconstructing the role of university and its responsibility, encouraging systemic reflexivity and alternative paradigms”. This suggestion is close to *Educate and engage* and *Empower and engage*. A third participant wrote “Educate not only in university and explore new ways of understand of sustainability and their challenges” which is also close to the three main selected proposals. Finally, one participant added “Finding ways to degrowth”, which is a bit different from the other suggestions in the list. Nevertheless, the implications of such a focus for a lab are close to *Empower and engage* or *Explore and shape*.

Only 1 person has chosen *Fix and control*, which means that future participants of the laboratory do not want this approach which is reminded here: “*Fix and control labs are exemplars whose focus is on eco-efficiency in technical systems. These labs are controlled environments for technological testing, bound at street, district or city level. A sub-group of labs exists on university campuses, where students and staff are energy users. Underpinning*

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all Fix and control labs is an assumption that real-time information will increase awareness, thus reducing energy use, and increasing eco-efficiency and cost savings. Processes are driven by experts and focused on implementation."

Thus, eco-efficiency, cost savings, data collection to raise awareness and, more generally, a focus only on technical systems with a micro perspective is not a perspective chosen by the participants and should not be adopted by the laboratory. On the other hand, the three types most favoured by the participants in the study focus on collaboration between researchers and non-researchers (ecological transition initiatives, students, universities, various organisations), i.e. experiments in situ (outside laboratories). Another common aspect is the socio-technical approach to the issues studied, ranging from analysis of the study participants and understanding relationships to potentially more technical issues.

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1.3.2 Definition of sustainability science

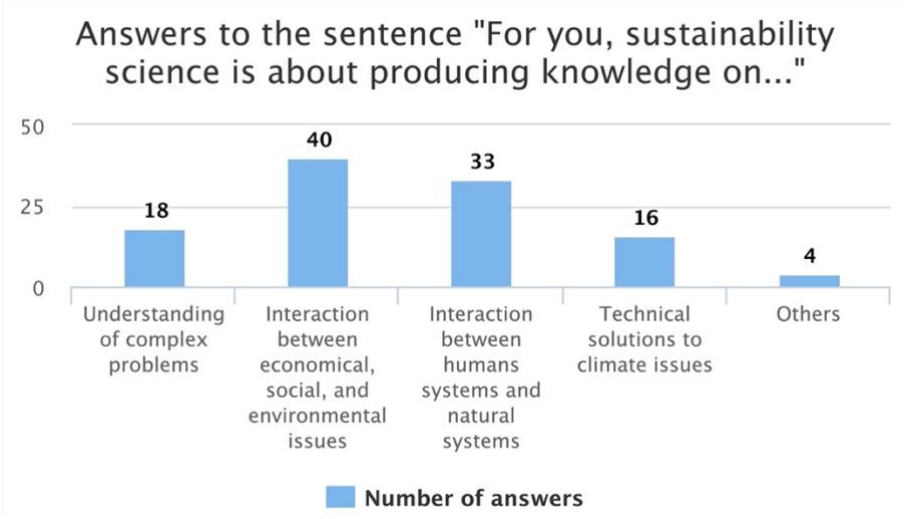

Figure 2: definition of sustainability science according to the participants of the survey

The responses to the questions were categorised into 4 different approaches to sustainability science, as shown in Figure 2:

- Answer A “Understanding of complex problems”: the notion of complexity is usually mentioned when describing the focus of sustainability science (Kates 2011; Spangenberg 2011).
- Answer B “Interaction between economic, social, and environmental issues”: this definition is the definition of *sustainability* and not *sustainability science*. This definition is directly related to the definition of sustainable development in the Brundtland report (World Commission on Environment and Development 1987), with the idea that economic, social and environmental aspects must be balanced in a project related to

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ecology. Choosing this answer allows us to understand whether researchers confuse sustainability with sustainability science.

- Answer C “Interaction between human systems and natural systems”: this definition has been taken directly from sustainability science scientists (Spangenberg 2011; Weinstein, Turner, and Ibáñez 2013)
- Answer D “Technical solutions to climate problems”: this definition shows a techno-centred perspective on sustainability issues and a narrow understanding of environmental issues (only climate and no focus on other elements such as biodiversity loss, land-use, etc).
- Answer E “Others”: Other possible definition from the person.

What is surprising is that answer D was chosen 16 times whereas in question 1, “Fix and control” type of laboratory or “Design and optimize” has been chosen in total only 6 times. And the vision of sustainability science of those 2 types of laboratories is very close (similar) to answer D. Nevertheless, what we can see in the answers is that the participants chose several answers and only 1 chose answer D as the only answer. Most of the checked answers also are also A, B or C (with a higher rate of B).

Of the four participants who ticked the box “Other”, only three added a comment:

- “Leading the paradigm shift / how to cooperate and govern”: a vision of sustainability science focused on governance and structural change.
- “Holistic approaches”: a vision of sustainability as a wicked problem, with a multi-level perspective on problems.
- “Finding ways for our survival within the given boundaries”: a vision of sustainability science linked to the notion of planetary boundaries (or absolute sustainability).

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The results for this question are consistent with the results for the type of laboratory. Sustainability science is seen as a field area of research that deals with complex, multidimensional issues.

1.3.3 Participation in ESLab+

By the 2 next questions, we wanted to better understand the hindrances and reasons for researchers to participate in ESLab+ (Figure 3, ESLab+ is also called "ESL" in the Figure).

As the labels are not fully readable on the graphs, here are the full labels (from left to right):

Answers of "**Hindrances faced by EUt+ researchers to participate in ESL**":

- Answer A "I don't understand how I can participate"
- Answer B "I am scared to speak English (non-native English speaker)"
- Answer C "The goal of the ESL is not clear enough"
- Answer D "I don't want to fly to the different campuses (for ecological or economical reasons)
- Answer E "I feel that my topics are not represented in the participants of the lab"
- Answer F "I am not aware about the different events"
- Answer G "Other"

Answers for the **reasons of participating in ESL**:

- Answer H "To have international experiences"

- Answer I “To build my network by meeting new people”
- Answer J “To get money through projects”
- Answer K “To have fun”
- Answer L “To strengthen my knowledge on sustainability”
- Answer M “To share my work abroad”
- Answer N “Other”

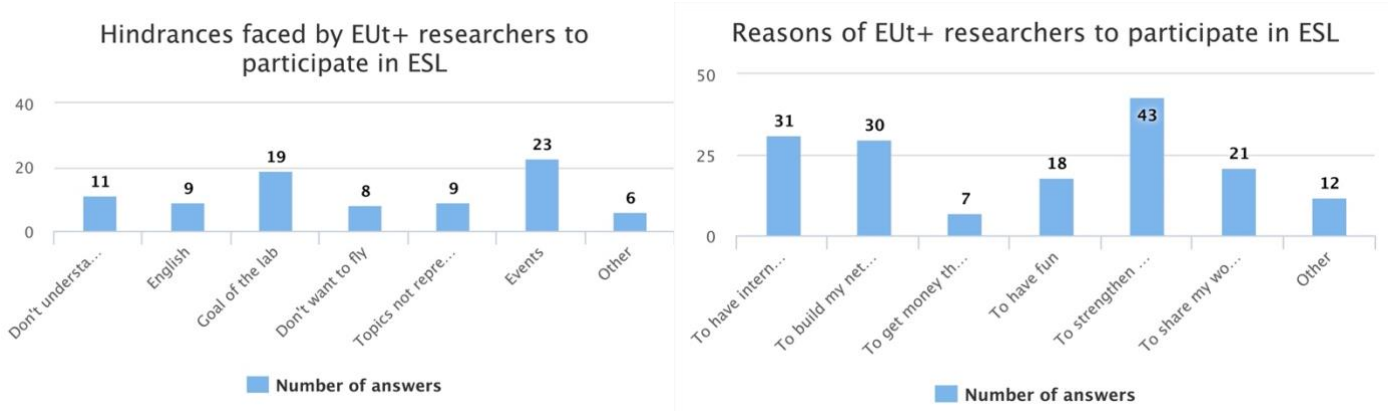

Figure 3: hindrances and reasons to participate in ESLab+

The main obstacles faced by future participants of the ESLab+ are the communication about the different events (answer F) and lack of clarity about the objective of the lab (answer C). These 2 answers are normal as the sustainability lab is just starting. The objective of the Lab has only recently been defined and needs to be widely communicated. In addition, a specific place to inform participants about the next events needs to be created soon.

ESLab+ is seen as an opportunity to gain an international experience (answer H), a good opportunity to build a network (answer I), but the main reason remains the willingness to

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"strengthen knowledge on sustainability" (answer M). There is a strong willingness among the participants to share scientific knowledge on sustainability science. This means that the events organized should enable participants to learn (e.g. with keynotes highlighting key messages) and to share their work (presentations, group work, poster sessions) in a pleasant atmosphere (answer K).

There were some interesting comments on the question of barriers:

- One comment from a participant was "the search costs are too high" (comment from a senior researcher). Therefore, we have to make sure that all senior researchers from EUt+ have the possibility to participate, regardless of financial issues.
- Another obstacle to participation came from a PhD student "I am not sure to be in EUt+ next year". The difficulty of not knowing if they will continue in EUt+ can be a barrier to participation for the youngest (lack of perspective).
- A barrier was "Personal sustainability": researchers have many demands and can be under pressure, with no time to devote to ESLab+.
- "Lack of structure": ESLab+ needs to have a clear structure to enable everyone to participate.

There were also some comments on the question of reasons:

- 3 comments were focused on the creative aspect of participating in international projects "Set new ideas and perspectives" and "create innovative projects", "Share the different approaches according to countries / contexts".
- 2 comments were focused on the added value for some partners: "Find opportunities for cross-border and interdisciplinary research cooperation, strengthening the university's presence abroad.", "Developing a sustainable curriculum for the architecture faculty".

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- 4 comments were focused on the added value for individuals: “Improve the subjects I’m teaching”, “Make a difference”, “To give a different perspective on the topic”, “To act at the european scale”.
- A final comment was more related to the community-building aspect of ESLab+: “To gather memories”.

1.3.4 Value neutrality of sustainability science

There are several hypotheses made in sustainability science. One of them is that this science assumes the fact that it is not value neutral. With this question, we wanted to know if this hypothesis was shared by the participants.

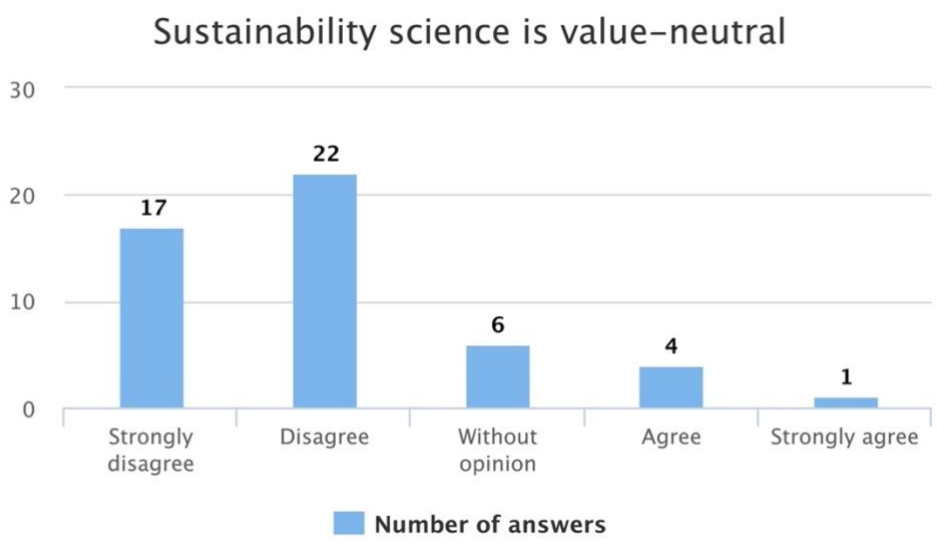

Figure 4: neutrality of sustainability science

Participants had to position themselves according to the following statement: “Sustainability science is value-neutral”. Figure 4 shows the results. We can see that 17 participants strongly disagree with this statement, 22 participants disagree, 6 do not have an opinion, 4 agree and

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1 strongly agree. In percentage terms, 78% disagree (strongly or not) with this statement, 12% did not have an opinion and 10% agree (strongly or not). So there is a large part of the community that shares this assumption.

In the comments we can see that 2 people added the same kind of comment: “There is no such thing like value-neutral applied science”, “There are no science that are value-neutral” (disagree side). Another participant added “it is strongly linked to interest (political, etc) so not really neutral from this point of view”. Finally, a participant who answered “without opinion” added the following comment: “In a philosophical way, I disagree (also in holistic thinking)”.

1.3.5 SDGs and sustainability science

Participants had to position themselves according to the following statement: “The SDGs are a relevant framework for developing knowledge about sustainability”. We can see that 1 participant strongly disagrees with this assertion, 5 participants disagree, 3 do not have an opinion, 30 agree and 10 strongly agree. The answers are shown on Figure 5.

It is interesting to note that all participants knew the SDGs.

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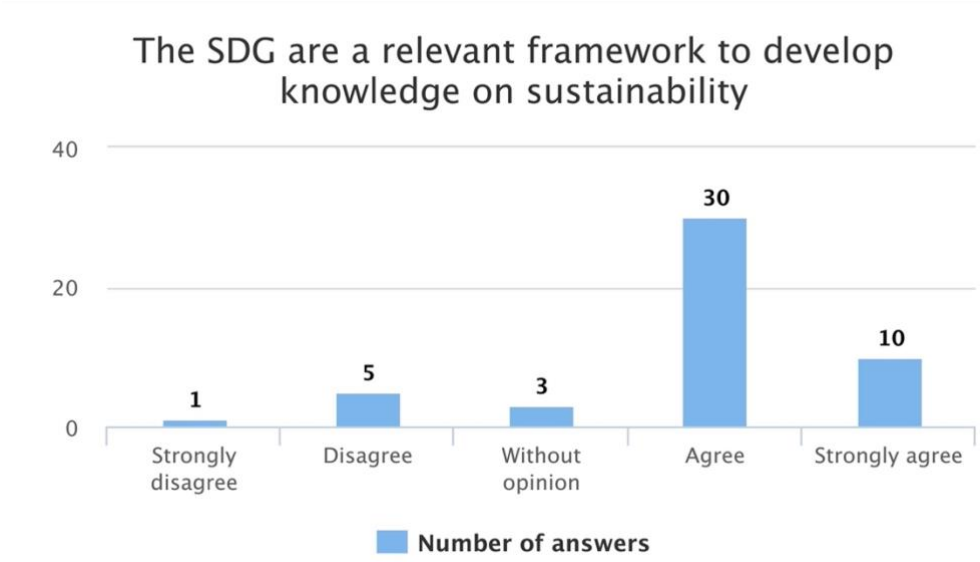

Figure 5: relation between SDG and sustainability science

The SDGs can be used in a literature review to structure work on sustainability in a particular area (for example, this has been done by (Hansson, Cerratto Pargman, and Pargman 2021)). Nevertheless, the comments of those who “disagree” and “strongly disagree” are interesting in the sense that they speak to the limitations of the SDGs as a grid for reading sustainability work. For example, one participant pointed out that work in philosophy could not be assigned to a specific SDG “conceptual works like philosophical studies may find hard to position in these very concrete goals”. This issue came to light when we tried to classify the abstracts of the researchers who participated in the first ESLab+ workshop. The researchers' work was classified thematically (mainly SDGs 12 and 9), with the exception of the philosophical work and the contributions based on conceptual distinctions based on conceptual distinctions that could not be assigned to a specific SDG.

The comments on this question are very different. One participant affirmed his/her love for the SDGs framework, “Absolutely love SDG”, while another participant stated that the

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framework does not matter: “There is no real importance of the methodological frame but the way we put things into practice”. Most of the comments (6 comments) focused on the fact that the SDGs are not sufficient to carry out sustainability science projects:

- “Could be a beginning but they are too « general » (and fixed by institutions led by a capitalist culture)”,
- “More awareness or practical rephrase than knowledge”,
- “They have the benefit of being consensual, but they are so broad that they could comprise merely all kind of science... (NB: conceptual works like philosophical studies may find hard to position in these very concrete goals)”
- “Might need further steps”,
- “but not enough yet”,
- “In a just and physical set of planetary boundaries”.

1.3.6 Sustainable research practices

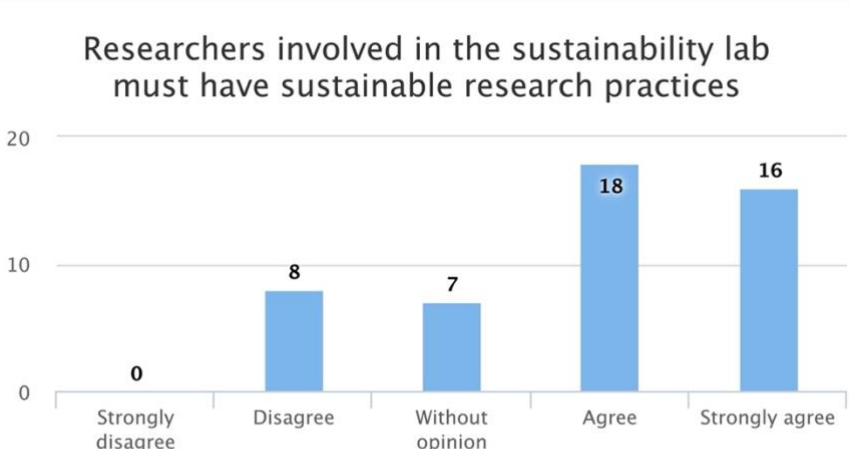

Figure 6: sustainable research practices among the community

Participants had to position themselves according to the following statement: “Researchers involved in the sustainability lab must have sustainable research practices”. We can see that no participant strongly disagrees with this statement, 8 participants disagree, 7 do not have an opinion, 18 agree and 16 strongly agree. 1 participant did not answer the question. This means that 70% of the researchers do agree that researchers involved in the sustainability lab must have sustainable research practices, 14% do not have an opinion on the question and 16% disagree with this statement. The results are shown in Figure 6.

One of the participants made the comment “Leading by example”, meaning that researchers in sustainability science should lead by example by showing other researchers how to reduce the environmental impact of research.

Some participants agreed with this sentence but also said that this constraint should not be imposed to others. For example, we can find the comment “I agree in a matter of principle, but in fact some practices (e.g., going to conferences, doing fieldwork…) are necessary even if not always sustainable” or the comment “It could be good but in real life it will be complicated. Nevertheless, it would be possible to have a guidelines or good practices.” Thus, researchers feel that it is really complicated, almost impossible, to follow sustainable research practices. This is in line with the state of the art, which shows that even in sustainability science, very few events follow sustainable guidelines for event organisation or travel advice (Neugebauer et al. 2020).

Two other comments were “It’s a benefit that should not work as an excluding factor”, “You can help people with that”. Thus, it tells us that there is a need to discuss this issue in order to define how ESLab+ could help researchers to align their practices with their willingness to have sustainable research practices.

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1.3.7 Perspective in projects

It was important to ask some questions about the radicality willing by researchers in the different projects carried in ESLab+. Therefore, 2 opposite questions were asked, one about the radical perspective and one about the non-radical perspective in the projects. The results are shown in Figure 7.

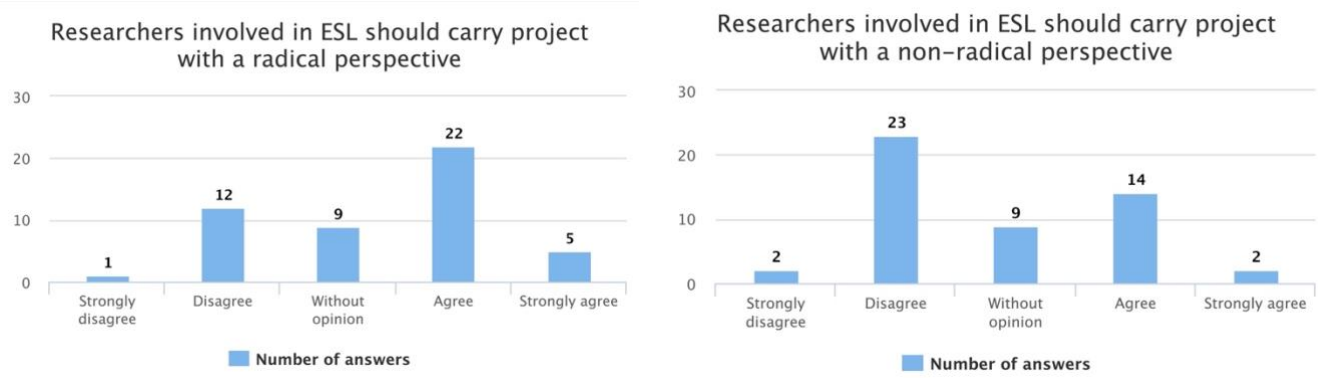

Figure 7: the notion of radicality

Participants had to position themselves according to the following statement: “Researchers involved in the sustainability lab should carry projects with a radical perspective of sustainability (compatible with degrowth)”. We can see that 1 participant strongly disagrees with this statement, 12 participants disagree, 9 do not have an opinion, 22 agree and 5 strongly agree. In terms of percentages, 27% disagree (strongly or not) with the fact that projects with a radical perspective are carried out, 18% do not have an opinion and 55% agree (strongly or not). Thus, more than half of the participants do want that ESLab+ to be a place where radical projects can be carried out.

In parallelly, participants had to position themselves according to the following statement: “Researchers involved in the sustainability lab should carry out projects with a non-radical perspective of sustainability (compatible with growth)”. We can see that 2 participants

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strongly disagree with this statement, 23 participants disagree, 9 do not have an opinion, 14 agree and 2 strongly agree. In terms of percentages, 50% of the participants do not want ESLab+ to be a place for non-radical projects, 18% do not have an opinion and 32% agree with carrying out non-radical projects.

So, there is a deep divergence within the community on this question on radicality.

In the comments, we can see that there is a fear that radicality will drive researchers away from their research position (comment from someone who disagrees with the fact that ESLab+ researchers should carry out projects with a radical perspective: “that would mean that scientists become activists”). Another comment is: “Progressive open approach that is more « accessible » would be more efficient in including researchers and disseminating realistic practices”. Or this comment “Yes but it have to be an inclusive approach with ALL the society (for instance all companies have to be included)”, “In order to be realistic and be understandable by companies who can accessibly change practices, and implementable by policy makers”. Thus, there is a fear of exclusion of non-radical projects (among participants who chose the answer “strongly disagree” or “disagree” with radical projects).

We could see that this question raised a number of internal issues for the participants: “[The non-radical projects] should be limited without being too much in a radical ecological position, otherwise we will be too far from the real world”.

On the other hand, pro-radical participants think that the research output in non-radical projects is very poor: “These proacts take the problem in earnest”, “I don’t think it’s interesting to have a lab that will only do business as usual”, “Greenwhasing or false-tale-belief based projects make no sense”, “This projects should be discuss in a perspective of a degrowth if are part of the ESL”, “Infinity growth is bad for the planet, and for the humans.”

We note that one participant stated that he/she “disagree” with the radical perspective of projects, but added in the comment field that “every project should be”, which contradicts the answer.

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This question raised another one according to one participant: “Who is able to have a clear opinion about a degrowth compatibility of projects? No so easy…” We can assume that this question was divisive because it means that some projects will have to be rejected. And who can reject a project within ESL? What would be the analysis grid?

Two final comments were “we need both aspects” and “I agree and disagree at the same time. I think the lab would be a good place for confrontations between the perspectives. But the radical perspective has to be there”. This raises some questions: how to create a safe space for discussions about radicality? How do you ensure that researchers discuss the topic without being crisped up?

1.3.8 Interdisciplinarity in projects

According to (Spangenberg 2011), sustainability science needs to be interdisciplinary or “at least ‘interdisciplinary-ready’”. We wanted to know if this characteristic of sustainability science, which is well described in the literature, is also shared by the ESLab+ community. The responses are shown in Figure 8.

Participants had to position themselves according to the following statement: “Sustainability science cannot be disciplinary, it can only be at least interdisciplinary”. We can see that 2 participants strongly disagree with this statement, 5 participants disagree, 4 do not have any opinion, 14 agree and 25 strongly agree. So 78% of participants agree that sustainability science is at least interdisciplinary, 8% do not have an opinion and 14% disagree.

There were some comments from the participants:

- From people who agree (strongly agree and agree): “For wicked problems this is required”, “complex problems”, “Disciplines need to understand this in a larger picture”, “it can only be at least pluridisciplinary”.

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- By people “without opinions”: “Can be disciplinary and interdisciplinary”
- No comment from people who disagree with this statement.

From the results we can say that researchers from the ESLab+ community largely agree with the fact that research projects need to be carried out in an interdisciplinary way. However, they do not agree with the statement that they know how to carry interdisciplinary projects. Therefore, we will have to accompany researchers who need help in this aspect.

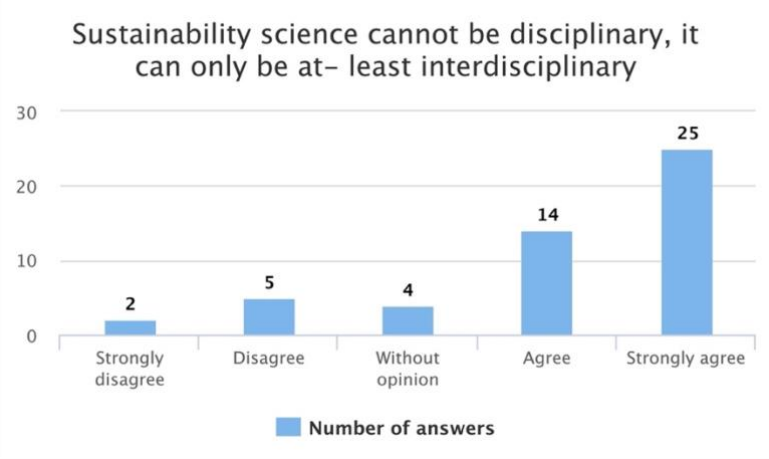

Figure 8: interdisciplinarity in sustainability science

1.3.9 Other comments

The concept of planetary boundaries (Steffen et al. 2015) was not included in the questionnaire. However, some participants added it in the comments section.

The concept of urgency appeared in some responses and is present in the discussion on defining sustainability challenges (van der Leeuw et al. 2012).

Finally, the concept of degrowth was added by one participant.

1.4 Discussion and next steps

To conclude, this survey has helped us to understand the range of researchers willing to participate in ESLab+. This survey could be repeated next year to see the evolution within the community. Other concepts could also be integrated, such as the model of planetary boundaries (Steffen et al. 2015), the concept of the Anthropocene (Crutzen 2006), and the methods of interdisciplinarity (Scholz 2020).

According to the response, the next steps for ESLab+ are:

- Consolidate or question already shared assumptions (value-driven research, SDG as a shared concept);
- Move from a theoretical understanding of interdisciplinarity to a practical approach;
- Starting to discuss the possibility to sharing radical and non-radical projects within ESLab+.

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2 Challenge-based laboratory

2.1 Projection in a research group on sustainability science

This section describes the launch of a participatory workshop activity within a EUt+ meeting, to better understand the researchers' expectations of the European Sustainability Laboratory.

2.1.1 Motivation

Our motivation was to enable PhD students to experience a workshop in an international sustainability science research group. The results will help us to understand what people think about this initiative and what they want in the long term. As it is difficult to gather scientists from 8 Universities in one place, a monthly EUt+ week in Troyes was used as an opportunity to organize such a workshop.

2.1.2 Method

The method chosen to gather scientists' view on ESLab+ was a science fiction prototyping workshop. This type of workshop is described in the scientific literature, in particular in (Burnam-Fink 2015). The process of pitching and critiquing was not carried out as described in the paper due to lack of time. Nevertheless, at the end of the 4 steps, a pitching and critiquing session (45 minute discussion) was held between all participants. This discussion allowed the participants to reflect on their story, and to critique the stories of others, photos of which are available in Figure 12.

The method used during the workshop is described in Figure 9, with 4 steps:

- **Definition of the world** of the group, also called "Define your European sustainability laboratory": per group, participants fill in a canva and define the characteristics of their laboratory.

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- The **science inflection point**: exploring the consequences of a failure in a technological, institutional, or political development. The chosen failure should affect the laboratory's ability to continue its activity.
- The **human reaction**: how people reacted to this failure and changed their practices or organisation.
- The final word '**what have we learned?**': through the story, what was important for the group? What values emerge from each group's story?

The workshop took place on the 11th of July 2023, from 1pm to 4pm (3 hours). There were six groups of 4 to 5 people each, i.e. about 30 participants from undergraduate students to senior researchers.

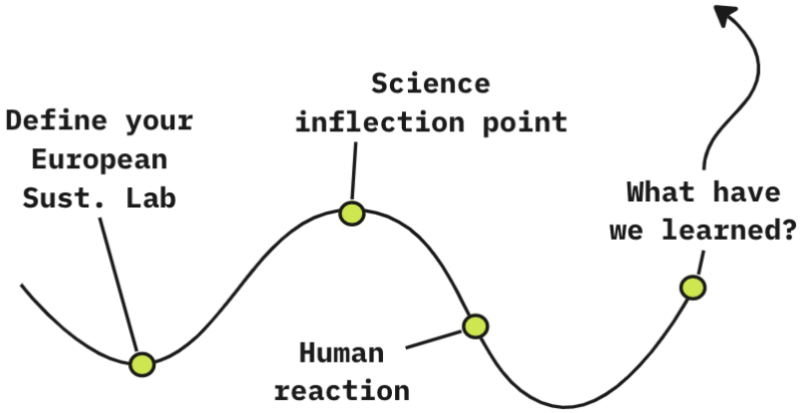

Figure 9: science-fiction prototyping method adapted from (Burnam-Fink, 2015)

The first step allowed participants to define “their” European sustainability laboratory. As this first step was a bit difficult, they had to fill in a canva with 3 main areas: research themes, research governance and research practice. This canva is described in Figure 10.

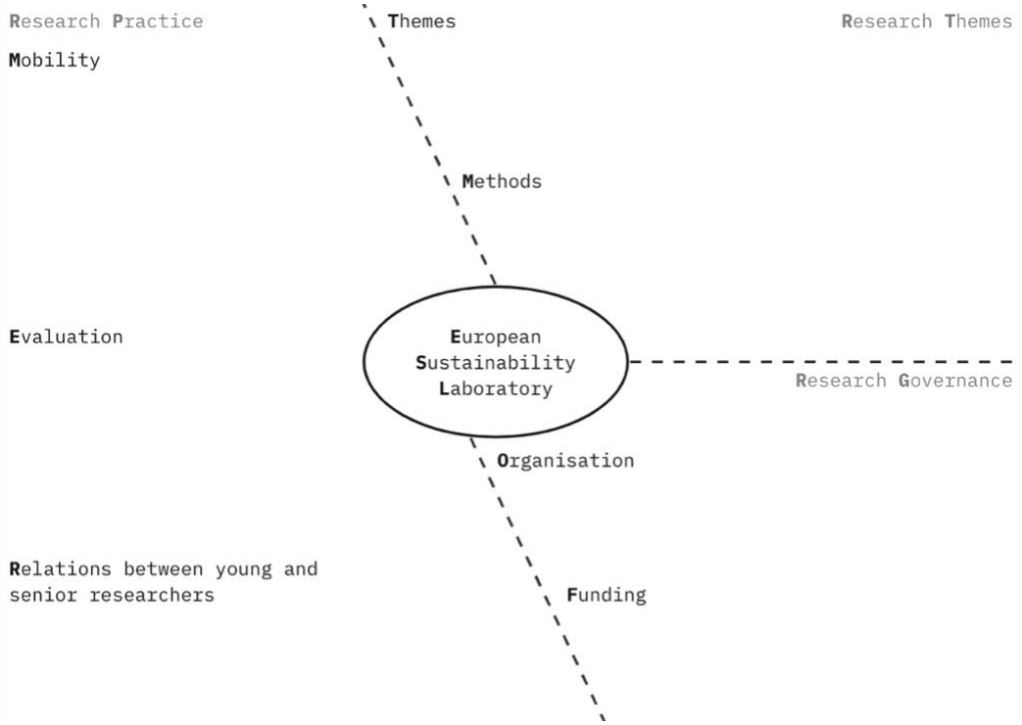

Figure 10: canva given to participants for the 1st step of the science-fiction workshop

The participants filled in the canva very easily. However, 2 groups asked some questions to make sure they understood the activity:

- Does the laboratory have to be structured like a real laboratory? To what extend can they create a fictional story?

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- Are the participants in the group part of this fictional story? Are they themselves actors in the laboratory or is it a story outside their own person?

The participants were active during the 4 steps of the workshop and had to decide on different things each time: the scope of their laboratory, the topic they were working on, the interdisciplinary approach, the choice of a science inflection, a human inflection. Only the last phase ('what have we learned?') was reflexive.

2.1.3 Data

Two types of data were collected:

- Written output: completed canva, notes, values, sentences describing the laboratory
- Recording of the discussion session (at the end of the workshop)

All the participants were not specialised in sustainability science but had an interest in these topics. In addition, all the participants had received training in ecological ethics.

Figure 11: photo of the discussion session (pitching) among all participants

The figure above is composed of 2 pictures showing how participants shared their story to others.

2.1.4 Results

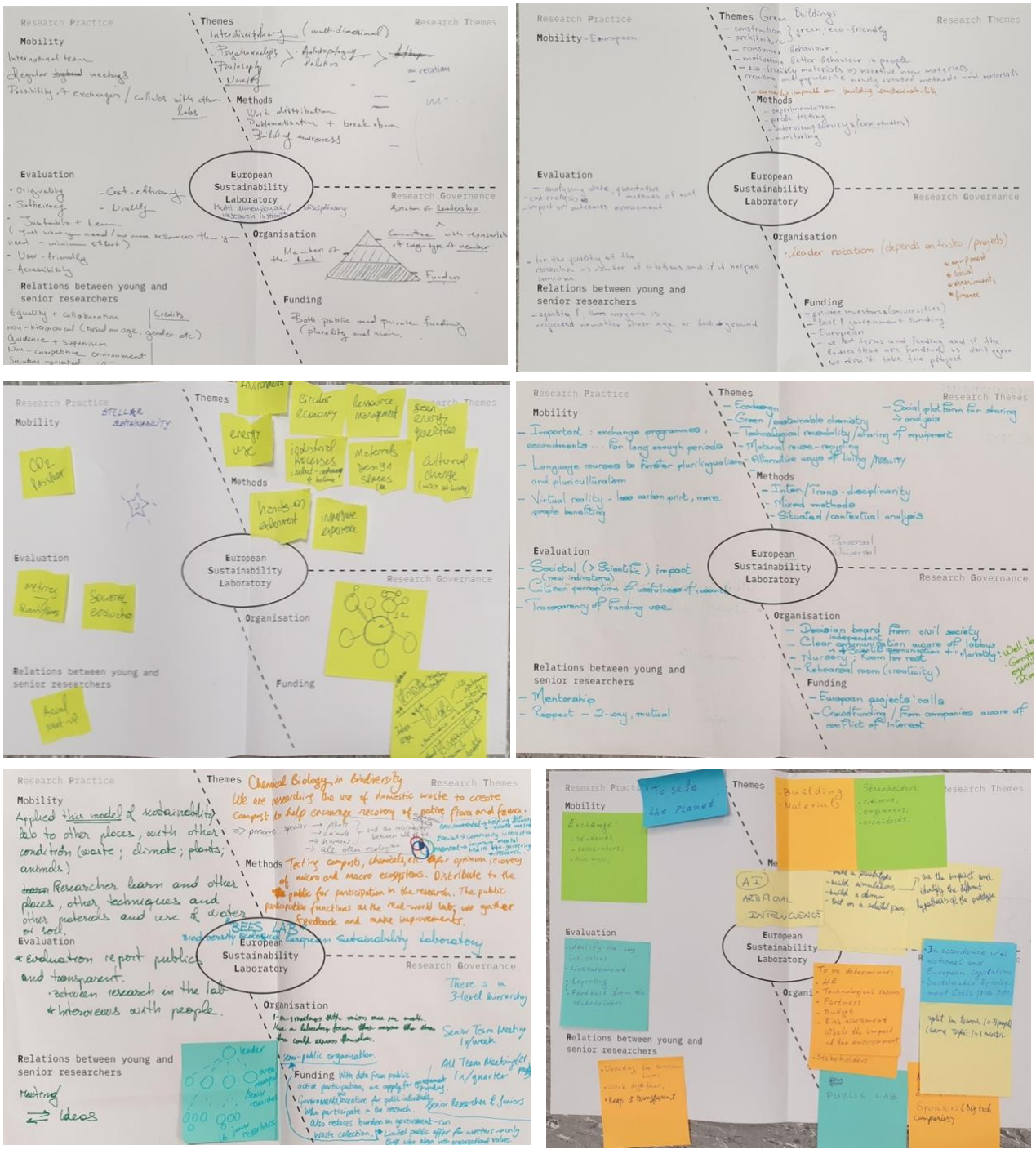

Figure 12: canva filled in by the 6 groups

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After analysis of the written output and the listening of the recording, the story of each group was sorted:

- Pick your world (description of the laboratory)
- Inflection point (dramatic situation happening)
- Impact on the lab (consequences of the inflection point on the lab)
- Humanistic inflection point (how humans reacted)
- What did we learn? (the main values that each story tells)

Figure 13 shows that all the steps that the participants had to follow during the workshop. Each line represents one group. Two groups did not clearly state what they had learned.

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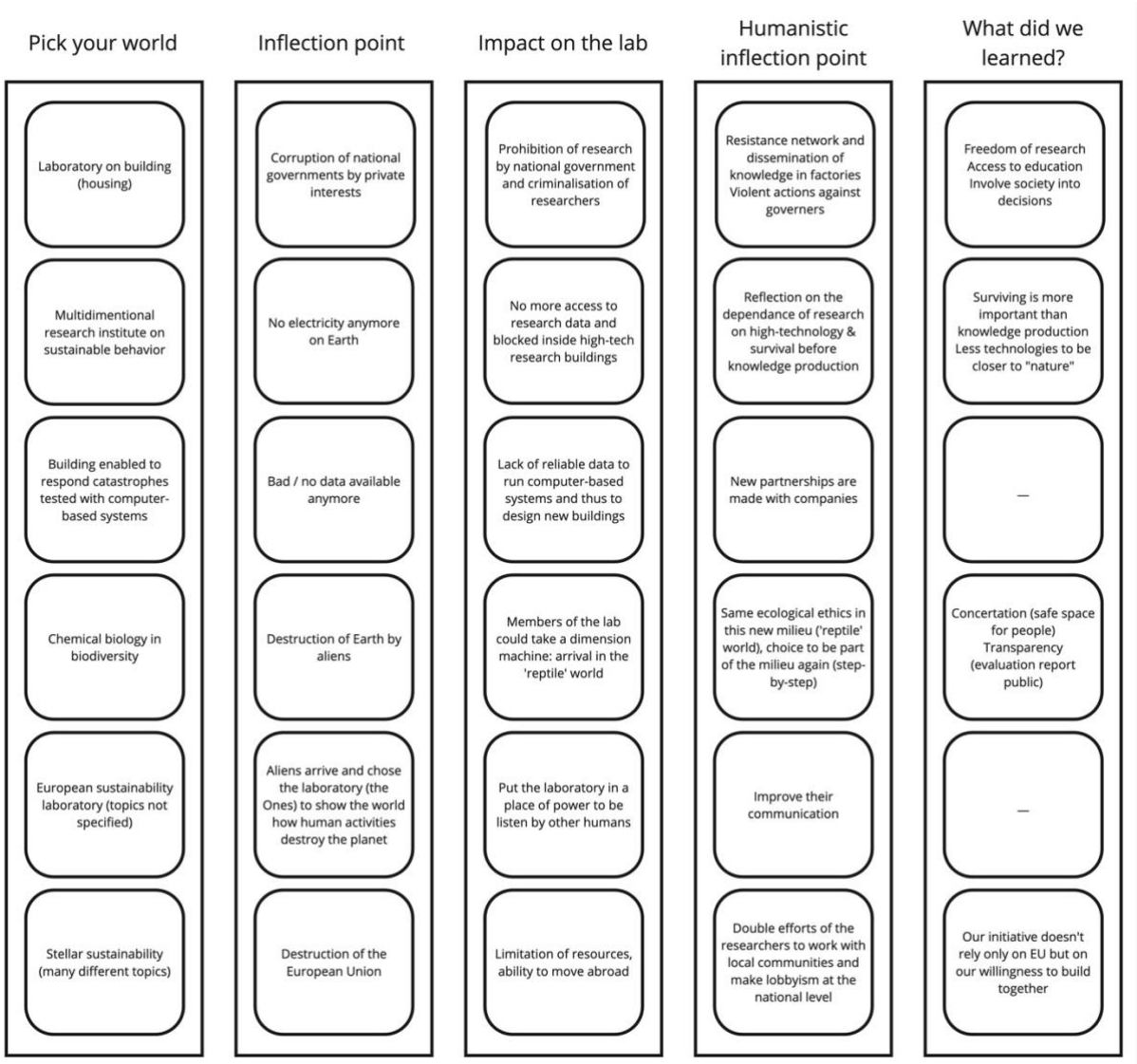

Figure 13: sum up of all the stories according to the steps of the workshop

2.1.5 Discussion and next steps

From our analysis we can draw the following conclusions:

- The researcher in sustainability science **challenges the status quo**. This is in line with the assertion of van der Leeuw et al., that defines sustainability challenges as "are beyond the capacities of our current institutions to address, are caused by path-dependent behaviors, and require substantial changes to systems with crippling inertia." (van der Leeuw et al. 2012) Two elements related to this challenge to the status quo were raised by participants:
  - Research is seen as a threat to the business-as-usual economic system (group 2). This type of observation is discussed in the literature but not by saying that the *researcher* is a threat but *research projects*.
  - Research is **embedded in society** and has an impact on it (group 2, group 4, group 5). This is in line with the discussions at the World Summit on Sustainable Development in Johannesburg in 2002 : "The concept [of sustainability science] articulates a new vision of harnessing science for a transition towards sustainability and is, thus, an attempt to strengthen the dialogue between science and society (Clark and Dickson 2003; Weaver and Jansen 2004; Jäger 2009)" (Jerneck et al. 2011).
- There is a **confusion between sustainable development as an act and the production of knowledge in sustainability science** (group 1, group 2). This confusion can lead to difficulties to building the ESLab+. Indeed, participants may confuse the fact of producing research in sustainability science with producing research on another topic and trying to relate it to sustainability issues.
- There is a tension between the freedom of researchers and the willingness to use sustainability as a framework for all knowledge production (group 2)

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- **The interdisciplinary** perspective of their work. Even if the interdisciplinary perspective is defined as important by all the participants, they have difficulties in defining a research question that brings this interdisciplinary perspective.

The definitions of sustainability science, sustainability, and interdisciplinarity need to be discussed, at a theoretical level and with practical examples. The link between sustainability science researchers and societal issues must also be discussed in order to understand the implications for the projects developed within ESLab+.

Practical suggestions were made by the participants. Here are some of the suggestions that could be used to build the ESLab+:

- Environmental impact:
  - Proposal of having a “CO2 Passport” for researchers’ mobility
- Evaluation criteria:
  - A societal evaluation of scientific production
- Governance:
  - Rotation in the leadership of the laboratory
  - Equality between the members of the laboratory (senior and young researchers)

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2.2 Extension on PhD in sustainability science: visit to Darmstadt

2.2.1 Concept and agenda

The theme of the seminar was *Exploring sustainability science*. The workshop took place the 9th and 10th of June 2022 in Darmstadt.

The program was the following:

9th June: (Great) activities of this day will be focused on PhD and sustainability

4 - 4.30 30 minutes	**Making your PhD in Germany: what does it look like?** What does it look like? What is the structure of French research? What are the main institutions? 15 minutes presentation and 15 minutes discussion
4.30 - 5 30 minutes	**Making your PhD in France: what does it look like?** What does it look like? What is the structure of French research? What are the main institutions? 15 minutes presentation and 15 minutes discussion
10 minutes	**Break (you can make some yoga exercise)**
5.10 - 5.55 45 minutes	**How to conduct a PhD in sustainable science? A proposal from h_da Doctoral School French-German** Presentation of the concept, the main principles, the operationalization, difficulties and how can it be applied to the EUt+ level

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	20 minutes presentation and 25 minutes discussion

From 6pm, beer time! Philipp and his team will drive us to the best places of Darmstadt!

10th June: activities of this day will be focused on research activities and exchanges on outputs

9 - 10 1 hour	**Visit of the lab on sustainable science and exchange on the different projects conducted** **Presentation of the lab on Risk Management and sustainable development (RASUM)** Main projects conducted and the fundamental theories in which it is anchored.
10 minutes	**Break (you can make some yoga exercise)**
10 - 10.40 40 minutes	**How to represent interactions between the anthroposphere and the ecosphere?** The impact on sustainable engineering
10.40 - 11.10 15 minutes to 30 minutes	**Low weight buildings** PhD student from Frauenhofer institute
11.10 - 11.40	**Impact of learning LCA on students** The PhD student will present the results she got from her qualitative analysis on the use of life assessment tools.

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30 minutes	
20 minutes	**Break**
12 - 1pm	**ine/sne project** How to make h_da sustainable?

Break / Lunch

2 - 3.30 1.30 hour	**Visit of the lab and presentation of PhD students experiments** We will see big wheels, water systems and other impressive research engines! PhD students from the environmental science center

2.2.2 Output

Participants came from Hochschule Darmstadt and the University of technology of Troyes. This exchange enabled the participants to understand that doctoral studies are different depending on the national context (in terms of national structures, length of the study programmes, type of relationship between PhD students and their supervisors). The visit to the environmental engineering laboratory was also an opportunity to better understand the types of experiments carried out in their laboratory. These experiments are controlled experiments, very different from the research practices of the French team, which are more focused on interviews and observations in the real-world (outside laboratories).

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Conclusion

The main insights from the comprehensive and co-design methods described in this Deliverable 48, is a need for clarification of the objective of ESLab+ and communication to make it known. It also emerged that the definitions of sustainability science, sustainability, and interdisciplinarity need to be discussed, at a theoretical level and with practical examples. Also, the link between sustainability science researchers and societal issues must be discussed in order to understand the implications for the projects developed within ESLab+.

Another important knowledge gained is about interdisciplinarity. From the results, it appears that researchers from the ESLab+ community largely agree with the fact that research projects need to be carried out in an interdisciplinary way. However, even if the interdisciplinary perspective is defined as important by all the participants, they have difficulties in defining a research question that brings this interdisciplinary perspective. Therefore, it will be necessary to accompany researchers who need help in this aspect.

Empirically informed by these insights, and the previous ones in D47, the next steps for ESLab+ are to:

- Consolidate or question already shared assumptions (value-driven research, SDG as a shared concept);
- Move from a theoretical understanding of interdisciplinarity to a practical approach;
- Starting to discuss the possibility to sharing radical and non-radical projects within ESLab+.

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List of Annexes

Annex 1: ESLab+ document describing the scope of the to-be ERI

(that has been acknowledged by the EUt+ Research Committee as a Research Group)

Annex 2: Application form for researchers to be affiliated to ESLab+

Annex 3: Questionnaire as part of the needs and expectations analysis

Annex 4: Expanded lab typology

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Annex 1

Purpose document describing the scope of ESLab+

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EUt+

European Sustainability Science Laboratory (ESSLab+)

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Preambule

"*As a University of Technology, our mission is first and foremost to serve society*". This was one of the first statements of the European University of technology (EUt+). This desire to serve human societies is expressed in the context of exceeding planetary boundaries and can only be achieved by taking this phenomenon into account. The overstepping of planetary boundaries, mainly due to the pressure of societies on ecosystems, calls into question the habitability of planet Earth. In this context, the development of a research institute on sustainability issues within the EUt+ seems essential in order to participate in the sustainable transition of European societies. This will make it possible to study the "*pivotal role that technology plays in forging an inclusive and sustainable future*" (2020). This document describes the institute, its scope, and its development strategy.

Scope and perspective

Exceeding planetary boundaries has profoundly altered the balance of the Earth system (Steffen, Richardson, et al. 2015). As a result, the habitable conditions of the planet are under threat, to the point where certain areas of the world are becoming uninhabitable. The global and local consequences of these imbalances are such that scientists have proposed a new geological period to characterise the changes underway: the Anthropocene (Crutzen 2006). This observation suggests that human societies must make efforts to move towards more sustainable lifestyles if we are to come back within planetary limits and learn to be resilient in the face of current and future changes.

This transition in socio-technical systems, although defined as necessary by scientists some forty years ago, is struggling to get off the ground. Indeed, the impact of societies on planetary limits continues to intensify, and the inequalities that structure societies have changed little, as evidenced by the increase in greenhouse gas concentrations in the atmosphere, from 325 ppm in 1970 to 420 ppm in 2023, the decline in biodiversity, and the increasing rate of land artificialisation (Steffen, Broadgate, et al. 2015) – to name but a few. Socio-technical systems need to be redesigned to adapt to this new situation while reducing the pressure on ecosystems. To enable these changes, sustainability scientists have identified several leverage points, the most important of which is the ability to transcend paradigms (Abson et al. 2017). Sustainability science is understood here as an interdisciplinary endevour oriented towards practical action. This interdisciplinarity of scientists obliges researchers to be epistemologically agile and methodologically grounded in order to ensure the rigour of the knowledge produced (Haider et al. 2018). This is a real challenge for researchers, as interdisciplinary requires more time to build a common vocabulary among researchers and poses a risk to the disciplinary structure of science. Thus, it is clear that sustainability science challenges the status quo and target multi-level issues.

The development of sustainability science in Europe is a major challenge to enable European society to participate in the sustainable transformation of societies. As EUt+ aspires to be a key player in the

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future, it is imperative to address the complex issue of sustainability. Thus, the ESSLab+ lab is not about the design of new technologies to fix environmental issues, but about better understanding the paradigms behind current and new technologies, stepping back from regular production, and exploring new socio-technical paradigms. This document outlines the specificities of the European Sustainability Laboratory (ESSLab+).

ESSLab+ within EUt+

EUt+'s academic contribution to sustainability efforts will be made through a new European Research Institute called the European Sustainability Laboratory (ESSLab+). ESSLab+ will be a multinational, multi-campus, trans- and interdisciplinary research institute.

Firmly rooted within the mission and vision of EUt+, ESSLab+ is particularly aware that the answers to these challenges necessarily involve technology, but that they must be multi-faceted and address the complexity of socio-technical issues. Furthermore, ESSLab+ aims to develop a critical perspective on technology to enable paradigm shifts.

"This can only be achieved by empowering technologically responsible citizens, and researchers who fully comprehend the potential of technology as well as the risks of neglecting its purpose". (Statement from the European University of Technology proposal, submitted to the 2020 ERASMUS+ Call for proposals)

Name of the proposed ERI	European Sustainability Laboratory (ESSLab+)
Constituent Universities:	+ University of Technology of Troyes, + Darmstadt University of Applied Sciences, + Riga Technical University, + Technological University Dublin, + Technical University of Sofia, + Cyprus University of Technology, + Technical University of Cartagena, + Technical University of Cluj-Napoca.
Leader Member	Professor Dr. Nicole Saenger, University of Applied Sciences Darmstadt (h_da)

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Missions of the European Sustainability Laboratory (ESSLab+)

ESSLab+ is about better understanding the paradigms behind current and new technologies, stepping back from regular production and exploring new socio-technical paradigms to achieve sustainability of our societies. Thus, projects within the framework of ESSLab+ are concerned with the production of knowledge about the interactions between human societies and ecosystems.

The European Sustainability Laboratory has three missions:

4. RESEARCH. To generate knowledge on sustainability
5. TRANSFER. To reduce the time needed to transfer knowledge from researchers to non-researchers
6. REFLEXIVITY. To explore ways of doing research in a more sustainable way

RESEARCH. To generate knowledge on sustainability

ESSLab+ aims to promote research that contributes to understanding the evolution of our world, especially in the context of technological change. "*It is our essential human ability to express, think and understand the world through artefacts.*" (Mission statement, 2020). The first mission therefore focuses on generating scientific knowledge to better understand the role of technology in the sustainable transformation of our societies. As technology and people co-evolve, it is crucial to study technology in the context of sustainable lifestyles (assumption 1). Technology shapes people's understanding of problems, while at the same time people design technical systems. Sustainability transitions assume that technological production needs a paradigm shift to reduce pressure on the Earth System while ensuring the well-being of the majority of human societies, not only a minority. Sustainability issues are thus wicked problems, that need to be tackled with multi-level perspectives (assumption 2).

ESSLab+ aims to go beyond the application of the SDGs to bring an ambitious research plan embedded in a strong sustainability perspective, and to try to move away from an anthropocentric view (towards a more ecocentric view). This will allow ESSLab+ to have a critical perspective on the first moto of EUt+ "think human first", and to explore the (PhD) students' moto "*think human and all living beings first*" (Student MoU, 2019).

Sustainability science is not easy to practice, as it requires deep interdisciplinary competencies and is practice-oriented. Therefore, the research produced within ESSLab+ will come from different epistemological backgrounds that need to be explained (positivism, feminism, constructivism, interpretativism, …), while having a deep methodological groundness (Haider et al. 2018) (assumption 3). As stated by (Nagatsu et al. 2020), "*sustainability scientists have recently started discussing a range of methodological issues, including the transferability of case-based transdisciplinary knowledge (Adler et al. 2018), the taxonomy of experimentation (Caniglia et al. 2017), evidence synthesis (Livoreil et al. 2017), and the synthesis of scientific and non-scientific knowledge such as indigeneous knowledge*

(Tengö et al. 2017). *These all revolve around the question of how to produce knowledge that is both epistemically reliable and practically usable.*" This addresses several questions: How is knowledge produced? Who produces knowledge? For what purpose? Should we have a purpose? It is related to the notion of dissemination and knowledge transfer which are the second main mission of ESSLab+.

TRANSFER. To reduce the time needed to transfer knowledge from researchers to non-researchers

As EUt+'s main objective is to serve society, it is fully in line with the transdisciplinary approaches that are crucial to the practice of sustainability science. Indeed, "*transdisciplinarity for producing groundbreaking sociotechnical solutions has to serve (a) the public good and (b) calls for independence, academic freedom, institutionalization, and proper funding schemes.*" (Scholz 2020)

Given the urgency of the sustainable transformation, the knowledge generated by scientific projects needs to be disseminated more rapidly to society at large. Therefore, other knowledge transfer systems beyond the traditional science-industry interaction need to be put into practice to accelerate the sustainable transformation. In line with this statement, closer collaboration between stakeholders within the production process should be developed. This type of knowledge production is called transdisciplinary research. Furthermore, as EUt+ campuses are located in different areas (rural, urban, landlocked territories or capital cities), the transfer process will have need to be adapted to the different local situations.

Some academic platforms will need to be developed to support the knowledge produced on sustainability.

REFELEXIVITY. To explore the ways to practice research in a more sustainable way

Sustainability science is challenging research goals, research methods, and ultimately research practices (Clark and Dickson 2003; Jerneck et al. 2011; Kates 2011). Researchers are questioning the extent to which the way in which they produce their knowledge affects their credibility and the way in which the knowledge produced is disseminated to society.

These questions may seem trivial, but they have been the subject of a great deal of research, so much so that several researchers have come together at national and international level to address them. The first questions focused on the environmental impact of research, mainly in terms of carbon emissions, especially from transport. (Bossdorf, Parepa, and Fischer 2010; Cluzel et al. 2020). Others question the ability of researchers to conduct research in a doubly anxiety-provoking environment. First, the research environment has become anxiety-provoking (competition, publish or perish), leading to a higher representation of mental pathologies among PhD students than other highly qualified individuals in all countries (Berry et al. 2020; Levecque et al. 2017; Martínez-Nicolás and García-Girón 2021). Second, as the planet's living conditions are not assured there is a development of eco-anxiety among the younger generations and thus among students (Eriksson et al. 2022).

More broadly, we can ask: how to practice research in sustainable (environmental but also social) contexts? what does it mean to produce knowledge in the Anthropocene? What kind of knowledge does society need? Does the Anthropocene force us to rethink the role of the researcher in society?

Organisation of ESSLab+

The laboratory will be organised into a transversal group and thematic groups. The transversal group will tackle questions such as “What is sustainability science?”, “How to practice interdisciplinarity research?”. The thematic groups will be interdisciplinary groups dealing with specific topics. Figure 1 represents the organisation and the interaction between the transversal group and the thematic groups.

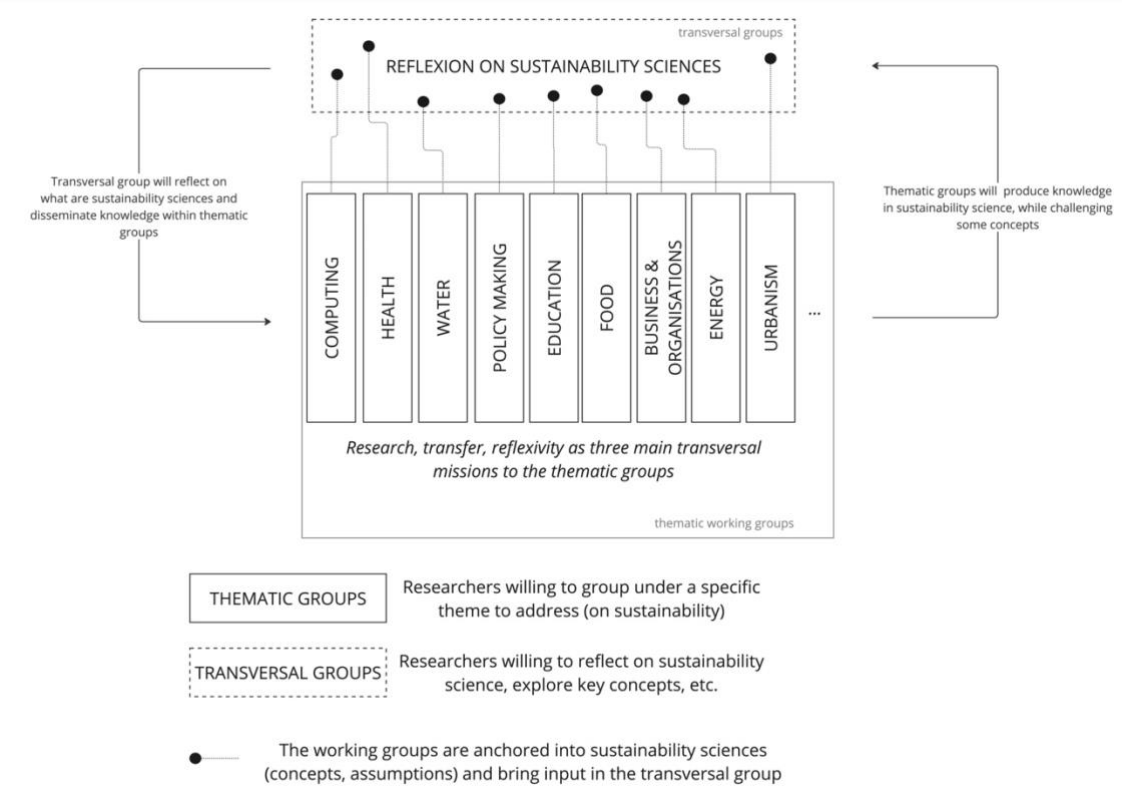

Figure 14: diagram representing the organisation of ESSLab+

To give an example of thematic group, “computing” thematic group could tackle the issue of the design of computing systems outside of a cornucopian paradigm, which means having researchers from philosophy, HCI, ergonomics but also telecommunications disciplines. Wherever possible, practical actors (industry, grassroots communities) will be involved in order to ensure that the research is applied and action-oriented. Reducing the pressure on the planetary boundaries while maintaining a

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certain level of well-being for human and non-human societies should be the framework for the thematic groups.

Short term timeline

This section is dedicated to the short term timeline. The long-term timeline will be co-designed by the ESSLab+ members and therefore cannot be presented yet.

The mission of the European Sustainability Laboratory is to develop and conduct innovative research via EU Projects in combination with national funding. The next EU calls coming up are on Widening of the Horizon Europe, Erasmus plus and MSCA. To answer those calls, ESSLab+ will rely on the European Research Office (ERO) and the European Innovation and Technology Transfer Office (EITTO) which have been created and are working in the frame of EUt+. Indeed, the ERO and the EITTO support the researchers in EUt+ and the EUt+ European Research Institutes (ERIs) as European project offices.

SHORT TERM GOALS

Within the first year, the main objectives are to:

- To build a community on sustainability, which can share different visions on the topic and challenge the status quo.
- To provide input to young researchers willing to develop their research in the field of sustainability.
- To support a community by empowering senior researchers on the topic of sustainability
- To understand the current European landscape on sustainability science (from an institutional point of view) and to be able to position ESSLab+within this landscape (McCrory et al., 2022).
- To start the development of an international project.

1st YEAR AGENDA (Figure 2)

In order to respond to the short-term objectives, a 1-year agenda has been set up, consisting of 3 steps:

4. **Co-designing the scope and perspective of ESSLab+:** this process will last for several months and will allow us to understand the different perspectives of the researchers participating in ESSLab+. This process will be participatory in the sense that every researcher wishing to express their views will be able to do so.
5. **Laying the first stones:** this moment will be dedicated to the launching of different actions (seminars, reading groups, weekly meetings) and better understand the position of ESSLab+ in the European academic landscape.
6. **Consolidation:** this phase is in the continuity with the previous one, through the organisation of different actions (seminars, reading groups, weekly meetings), so different formats of events to enable all researchers on sustainability to find *their* way to participate in ESSLab+.

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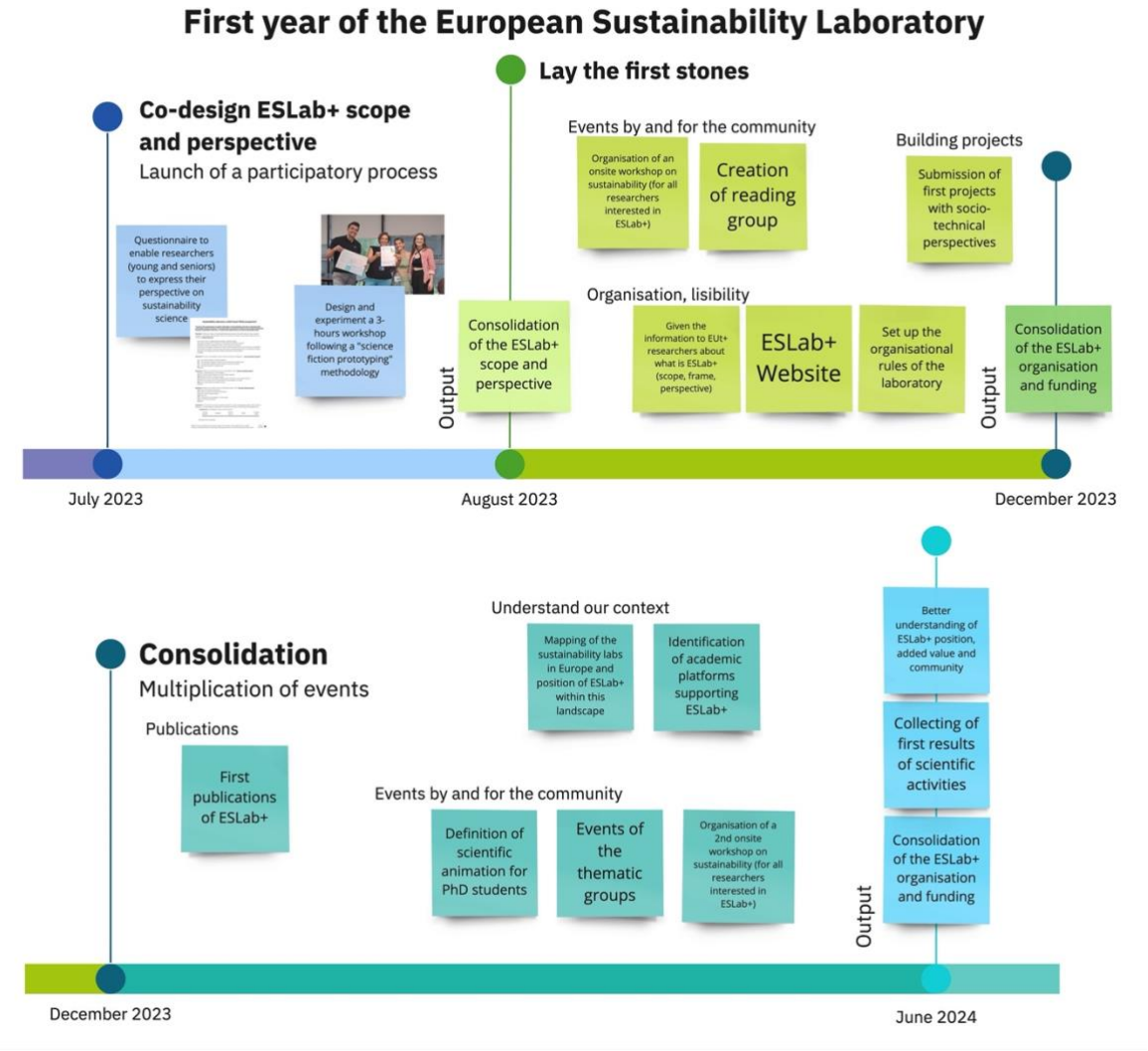

Figure 15: Chronology of the different actions for the 1st year of the ESSLab+

Conflict Management

The institute will adhere to the EUt+ guidelines presently under development and in accordance with The European Code of Conduct for Research Integrity.

A code of conduct will be adopted in the first year following the start of ESSLab+ activities (approximately June 2024).

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Annex 2

Application form for researchers to be affiliated to ESLab+

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APPLICATION (PART 1/2) AS A MEMBER OF THE EUROPEAN RESEARCH GROUP ON

EUROPEAN SUSTAINABILITY SCIENCE LABORATORY (ESSLAB+)

This application serves as an application for individual membership in the research group as

☐ Core member

The membership encompasses voting rights in the general assembly and eligibility for election as a member of the research group council or the academic lead. Double core membership, i.e., further core membership in another Research group/ERI is not given. For the initial phase of the research group the core member may use their home affiliation together with the research group affiliation for publications.

☐ Associated member

Associated membership as a researcher conducting research linked to the research group's subject area. The membership does not entail voting rights or eligibility to receive funding by the research group.

☐ I am core member in another research group/ERI: _____
☐ I am a postgraduate student on master and doctoral level and wish to join as an early career stage researcher for the duration of my studies with an EUt+ partner university of the research group. In this the membership entails a consultative vote role.

Applicant

Degree	Name, First Name	EUt+ Partner University

If you are a postgraduate student

Start of your PhD	/ /
End date (approx.)	/ /
Thesis title	

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Personal Information

Department	
Postal Adress	
Email	
Webpage	
ORCID	
Other profile	

Keywords of your study fields (3 to 7)

Brief description of your research interests, the problems you address and how they relate to the main scientific interests of sustainability science.

Motivation for joining the research group

Research experiences

☐ My ORCID profile contains my academic CV
☐ My academic CV is attached
☐ My ORCID profile contains my publication list
☐ My publication list is attached

I certify the accuracy of the information provided here and confirm my wish to be admitted to the research group as a member. As a member I will exercise my rights and fulfill my duties to participate in the achievement of the objectives as well as the fulfilment of the tasks of the research group and to participate in its self-administration and governance.

Place, date Signature

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Annex 3

Questionnaire proposed to members of EUt+ interested in ESLab+ as part of the needs and expectations analysis. 50 researchers answered the questionnaire.

Sustainability Laboratory: which frame? Which perspective?

The aim of this questionnaire is to gather information on the positioning of the ESL as desired by EUt+ sustainability science researchers. The questionnaire is anonymous and will be used to help developing the European Sustainability Laboratory. The data will be gathered by Lou Grimal (lou.grimal@h-da.de).

Question 1. There are 6 types of sustainability laboratories around the world, each can carry a specific ambition*. The 6 types are listed below. Which one should the European Sustainability Laboratory (ESL) embrace? (**choose only one**).

- ○ Fix and control: to deploy technical things / technical scaling
- ○ Design and optimise: to change user-consumption and speed to market
- ○ Make and relate: to develop activities in local areas (civic initiatives)
- ○ Educate and engage: to develop real-world university approaches to teach and learn sustainability
- ○ Empower and govern: find new ways of governing and organising around sustainability challenges
- ○ Explore and shape: generating a systemic understand of sustainability
- ○ Other:

Question 2. For you, sustainability science is about producing knowledge on... (**you can choose several**)

- ☐ ... the understanding of complex problems
- ☐ ... the interaction between economical, social and environmental issues
- ☐ ... the interaction between humans systems and natural systems
- ☐ ... technical solutions to climate issues
- ☐ Other:

Question 3. What are the hindrances for you to participate in ESL? (**you can choose several**)

- ☐ I don't understand how I can participate
- ☐ I am scared to speak English (non-native English speaker)
- ☐ The goal of the ESL is not clear enough
- ☐ I don't want to fly to the different campuses (for ecological or economical reasons)
- ☐ I feel that my topics are not represented in the participants of the lab
- ☐ I am not aware about the different events
- ☐ Other:

Question 4. What are the reasons why you would participate in ESL? (**you can choose several**)

- ☐ To have international experiences
- ☐ To built my network by meeting new people
- ☐ To get money through projects
- ☐ To have fun
- ☐ To strengthen my knowledge on sustainability
- ☐ To share my work abroad
- ☐ Other:

Question 5. In this section, you have to position yourself on a grid: strongly agree, agree, without opinion, disagree, or strongly disagree. All questions are asked in the frame of the European Sustainability Lab.

Question 5a. Sustainability science is value-neutral**.

Strongly disagree	Disagree	Without opinion	Agree	Strongly agree

Comments (not mandatory)

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Question 5b. The Sustainable Development Goals (SDG) are a relevant framework to develop knowledge on sustainability.

Strongly disagree | Disagree | Without opinion | Agree | Strongly agree

Comments (not mandatory)

Question 5c. Researchers involved in the sustainability lab must have sustainable research practices.

Strongly disagree | Disagree | Without opinion | Agree | Strongly agree

Comments (not mandatory)

Question 5d. Researchers involved in the sustainability lab should carry projects with a radical perspective of sustainability (compatible with degrowth).

Strongly disagree | Disagree | Without opinion | Agree | Strongly agree

Comments (not mandatory)

Question 5e. Researchers involved in the sustainability lab should carry projects with a non-radical perspective of sustainability (economic-growth compatible)

Strongly disagree | Disagree | Without opinion | Agree | Strongly agree

Comments (not mandatory)

Question 5f. Sustainability science cannot be disciplinary, it can only be at-least interdisciplinary.

Strongly disagree | Disagree | Without opinion | Agree | Strongly agree

Comments (not mandatory)

Question 6a. You are a...

- ☐ Young researcher (PhD students until 8 years after PhD)
- ☐ Senior researcher
- ☐ Other:

Question 6b.	What is/was your master about?	What is/was your PhD about?	What is/was your current research about?
Natural sciences	○	○	○
Social sciences	○	○	○
Applied sciences or professions	○	○	○
Mathematics or Statistics	○	○	○
Humanities	○	○	○
Interdisciplinary sciences	○	○	○

Finished!

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Annex 4

Expanded lab typology

Appendix A
Expanded lab typology

Dimensions / Lab types	Overall sustainability orientation	Focused sustainability object	Properties Constructed as	Ambitions	Foregrounding	Collaboration	Experimentation	Approach to innovation	Nature of process	Illustrative lab case
Fix and control	Technological innovation/ change	Eco-Efficient technical systems	Research/private testbeds at city/ district level	Technical roll-out	Technology in responding to sustainability	Instrumental, citizens as receivers	Controlled, technology-centred experiments	Market-oriented innovation, technology as an end	Implementation and evaluation	T-City Friedrichshafen (Lee et al., 2011; Menny et al., 2018)
	Technological innovation/ change	Eco-Efficient technical systems	Closed, research-driven experiments on uni campus	Technical scaling across buildings	Technology in responding to sustainability	Expert-driven	Controlled, technology-centred experiments	Market-oriented innovation, technology as an end	Implementation and evaluation	University Cape Town (McGibbon et al., 2014)
(Re-)Design and optimize	Consumption and user involvement in production	Sustainable lifestyles and behaviors	1) real-time controlled, or 2) real-world uncontrolled environment	Changing user-consumption and speed to market	Technology as an enabler	User-focused with hybrid research involvement	User-centred experimenting, prototyping and valuation	User-driven, with tech challenge at starting point	Design-thinking and ideation techniques	SustLabNRW (Baedeker et al., 2017)
Make and relate	Participation and cultural development	Practices and relations in local communities	Hubs, constructed and bound at the local level	Space in local setting	Communities, practices, and relations	Voluntary and driven by locals	Material and social learning-by-doing	Social innovation	Informal and self-organizing	Trial and Error (Hector, 2018)
Educate and engage	Education (for sustainable development)	University-society relations, students as change agents	Educational learning environment	Multi-stakeholder real-world education using transdisciplinary tools	New ways of educating	Student-stakeholder-society; researchers as teachers	Curriculum and learning	Curriculum innovation	Formal and sequenced, bound to curriculum	University of Wisconsin Lab (Lindstrom et al., 2015)
Empower and govern	Interconnected and multi-facetted (urban) challenges	Governance and urban regeneration	Urban, partnership-based, and inclusive	New ways of governing and organizing around community challenges	Partnerships and governance	Driven by communities/ researchers	Relational and institutional	Technology as means; innovation as participatory	Varying formality	Mooi Mooier Middelland (Puerari et al., 2018)
Explore and shape	Complex and contested (social-ecological) systems	Diverse–Systemic and collective interventions in local context	A shared exploration	Grasping complexity	Methods and process	A pre-condition, with researchers as process designers	Systemic, value and challenge-driven	Systemic - opening boundaries within which innovation may occur	Formal, rigorous, and sequenced	Xochimilco T-Lab (Charli-Joseph et al., 2018)

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