Transdisciplinary Research(funding) for climate

Shauna Stack, Magdalena Wicher, Richard Woolley

1.1. Introduction

Compared to its predecessors, the current and third generation of innovation policies can be differentiated by its focus on directing research towards addressing societal and environmental challenges in ways that change, or rather transform, underlying socio-technical systems (Schot & Steinmueller, 2018). In the past years, Transformative Innovation Policies (TIPs) have emerged as a key concept and model for policy experimentation following the characteristics of third-generation innovation policy[1]. Amongst other mechanisms of addressing complex socio-economic challenges, TIPs involve multi-stakeholder consultation and reflection about the desirable or undesirable directions in which research and innovation steer society. In other words, TIPs seek collaborative, reflexive, and experimental co-creation in the transformative processes of research and innovation to maximize outcomes for societal benefit.

More recently, the literature on TIPs has started to address the complex issue of evaluating TIPs (Molas-Gallart et al., 2021; Palavicino et al., 2023). In such a research context where experimental processes and multiple iterations with multistakeholder groups are desirable, Molas-Gallart et al. (2021) argue for the use of a formative approach to evaluation inspired by Luederitz et al. (2017). This entails that evaluators actively co-create the evaluation process with the relevant stakeholders and keep the process open to learning and reflexivity along the way.

With a formative evaluation approach, the implementation of a research program and its evaluation should go hand in hand. For the evaluation, administration and performance of research, TIPs provide a landscape for experimentation with research processes at multiple levels dealing with complex topics. For these reasons, this case study takes a research context where the characteristics of TIPs are present, and which targets the complex challenge of climate change. Within this context, this case study follows a formative evaluation of a 2019 call “Enabling Societal Transformation in the Face of Climate Change” (SOLSTICE) which was opened by a trans-national research effort called the Joint Programming Initiative on “Connecting Climate Knowledge for Europe”, otherwise referred to as JPI Climate (Council of the European Union, 2011).

The aim of the case study is to evaluate how characteristically TIPs-oriented aspects of transformative research were conceptualized and implemented through the JPI’s funding program. The study begins with background information on how the case came to be as well as the methodological approach taken. It then outlines the conceptual development of the SOLSTICE call focusing on the aspects that were most relevant to the transformative, TIPs-oriented aims of the call. This part of the case study follows the sequence of events from theoretical beginnings of the call, to coordinating with the trans-national funding bodies to arranging the evaluation and proposal selection. A major milestone for the evaluation team was the development of a first analysis of the SOLSTICE call, which was handed over to JPI before the mid-way evaluation of the projects. The study then concludes with the results of the midway evaluation which provides some indication of project level impact. However, because this study concludes before the projects are completed as well as because of resource constraints, this study focuses primarily on the policy and program level. The study then concludes with lessons

[1] For a systematic review of TIPs literature see Haddad et al. (2022).

regarding the pathway towards benefits associated with the SOSLTICE case, namely what the case teaches us about transdisciplinary and public engagement, funding transformative research and attempting to direct funding and researcher practices in transformative ways.

1.2. Background and methodology

Following the formative evaluation approach proposed by Molas-Gallart et al. (2021) the authors sought concerted engagement with the program as the call and its funded projects unfolded, rather than acting as external evaluators. The aim was to engage in the evaluation process in a way that would allow the outcomes of the program, including the evaluation itself, to be more transformative. The authors of this case study approached JPI to suggest a mutual exchange. As members of the SuperMoRRI project, the authors wanted to study the development of the call from concept to project results which entailed access to materials, time, and willingness to co-create from JPI. In exchange, SuperMoRRI would provide the formative evaluation which was mutually beneficial because the SOLSTICE Call Secretariat had no third-party funding for an external evaluation of the call and projects (this was the responsibility of the national funding bodies on the project level).

The formative evaluation included two formal workshops between JPI and SuperMoRRI partners, the first in December 2021 and the second in May of 2022. More informally, many exchanges occurred over the course of the collaboration, resulting in primary data in the form of minutes of meetings, participation in critical stages of the call such as the Kick-Off meeting and Mid-way evaluation, formal written analysis, and input regarding qualitative questions for the project mid-way evaluation and reporting templates and questionaries. In exchange for these inputs, the authors were given access to interviews with Lead Principal Investigators (LPIs) for the selected SOLSTICE projects, as well as interviews with policy makers who were instrumental in the realization of the call. At the time of writing in March 2023, the projects still have some months until the end of 2023 to finalize their projects, with some applying for extensions. However, within the frame of this case study, the formative evaluation concluded with the midway evaluation of the projects on November 16th, 2022.

In addition to the primary data produced by the formative evaluation, access was given to a variety of secondary data sources produced or commissioned by the JPI for their internal review processes. The authors were given access to research proposals, the evaluation grid used to assess the proposals, confidential documents such as minutes of preparatory meetings from the call design process. The evaluation team benefited from interview material with the funders, conducted and transcribed by a master's student who was working for the JPI at the time. The findings of this interview material were summarized and published in the public policy brief, "Ex post analysis of the SOLSTICE Call" (Göd et al., 2022). These materials were analysed in a qualitative manner, through mapping, coding, and systematic use of a Theory of Change model (Vogel, 2012).

A preliminary version of the ToC (Figure 5) was prepared and presented during a first workshop in December 2021 which included the Call Secretariate and the formative evaluation team.

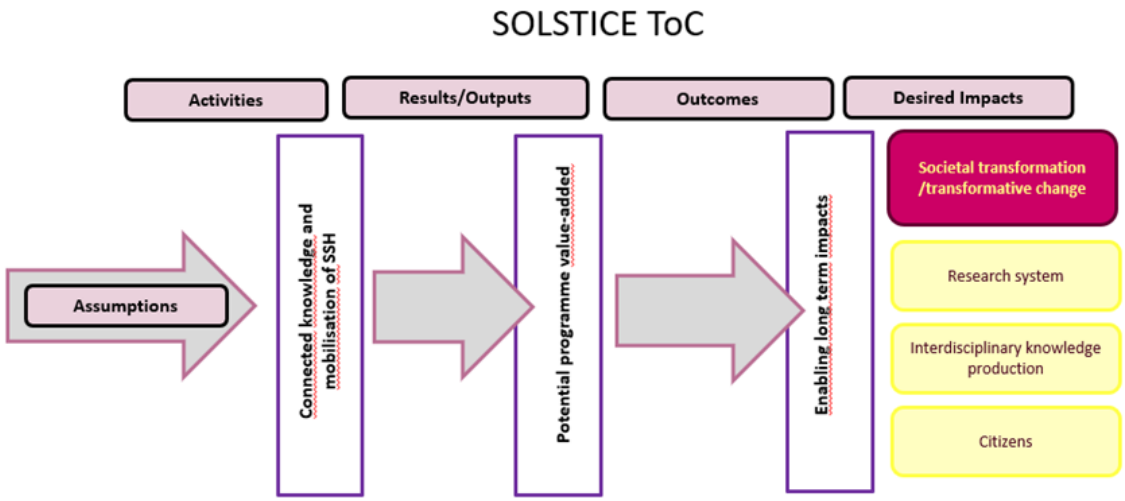

Figure 1: ToC of the transformative design of the SOLSTICE program

(Source: Own Contribution)

The ToC was intended as a framework to be further development and elaborated on together with the JPI. The diagram shows the core elements of the program from the theoretical assumptions of the call to activities of the call, outputs of the projects and outcomes defined as outputs which produce a systemic effect. The aim of the ToC diagram was to reflect these elements back onto the transformative aims to ensure alignment course correction.

During the first workshop, the main objective was to discuss the proposed ToC and agree upon how to think and evaluate transformative change. Evaluation of TIPs is still an emerging field of study, and there is debate about how to evaluate funding programs based on transformation.

Some of the questions raised were, *Is transformation one element of systemic change? What is the transformative part of the change? Is SOLSTICE about supporting pre-conditions for transformative change?* In addition to the lack of easily operable metrics as in other fields of evaluation, one workshop participant noted:

> *"The further you get away from a project, the less control you have over the projects and the more society starts to intervene. Tracking outcomes and impacts gets more difficult, also predicting where they are going and what they are doing. As you move away from projects it will become much more complicated to scale up and direct the outputs."*

Given the nascent scholarship, and the ambiguity surrounding what transformative aspects are, one participant argued that the interpretation of the call by SOLSTICE applicants is one way to develop a bottom-up ToC on the call level. The interpretations and research designs are themselves ToC's of the transformative aspects of the call. This approach to a collective understanding of a ToC can be somewhat validated by the observation that the projects interpreted the call guidelines in a similar way.

1.3. SOLSTICE Call: Design and Development

7.3.1 *Theoretical Background of SOLSTICE*

The conceptual development underpinning the SOLSTICE funding program was grounded in work done in 2018 by a JPI Action Group, "Enabling Societal Transformations in the Face of Climate Change". As stated on the website[2], their objective is to "promote the Social Sciences and Humanities as key disciplines in the sustainable societal transformation in the context of climate change". In 2019, the Action Group published a White Paper titled, "Operationalizing knowledge on and for societal transformations in the face of climate change" (West & Worliczek, 2019). This paper was a key driver of SOLSTICE becoming a funding program by serving as a theoretical starting point and set of recommendations for the eventual design. While the paper does not include an explicit ToC, it contained all necessary elements including a series of assumptions and a chain of anticipated results linking the characteristics of SOLSTICE to transformative outcomes for addressing climate change.

The primary recommendations of the paper were as follows. First, to stimulate Social Sciences and Humanities (SSH) perspectives and leadership on the topic of climate change and through this, increase the likelihood of trans and interdisciplinary research practices. The call to action for the SSH community is stated as the "critical need to move beyond a focus on describing climate change challenges, towards devising effective societal solutions and actions…" (West & Worliczek, 2019, pg. 2). To meet these needs, the White Paper outlines specific thematic areas which are "particularly well-suited to be led by SSH researchers but that can attract wide interdisciplinary and transdisciplinary engagement". This suggests that epistemically, the SSH community has the appropriate frameworks for asking transformative research questions. Furthermore, the quote suggests that these questions are also inviting to other discipline.

The assumption is that interdisciplinary and transdisciplinary will further research from knowledge production to catalysing change,

> *"...[transdisciplinarity] provides an opportunity for learning and reflexivity that can stimulate new methods and new paradigms for solving climate change issues, not just problematizing them".*

Relating this notion to the ToC, research is positioned as a mechanism of action such that funded research should not just describe or problematize climate change but help solve the climate challenge. In other words, this is the desired impact of SOLSTICE.

7.3.2 Selecting transformative topics

To identify specific SSH topics, the JPI Action Group conducted stakeholder consultations, a scoping process of previous JPI Climate calls, collected recommendations, reviewed the issues and agenda framework of Horizon 2020[3], and referred to the JPI Climate Strategic Research and Innovation Agenda (JPI Climate, 2016). The result was a comprehensive outline of the current SSH relevant research topics and knowledge gaps which were synthesized into five thematic prioritizations and two cross-cutting issues across these themes (cf. Table 5).

[2] https://jpi-climate.eu/programme/solstice/

[3] https://wayback.archive-it.org/12090/20220124080607/https://ec.europa.eu/programmes/horizon2020/what-horizon-2020

Table 1: Topics and Cross-Cutting issues identified in SOLCISTE White paper.

SOLCISTE relevant research topics and knowledge gaps	SOLCISTE cross-cutting issues
• Governance • Visions and scenarios • Social justice and participation • Sense making and cultural meaning • Transformative finance	• Politics of knowledge co-production • Responsible Research & Innovation (RRI)

(Source: West & Worliczek, 2019)

While there is no explicit definition of transformation in the White Paper, these research topics were chosen because on the one hand they are SSH relevant topics, and the White Paper included the following assumption:

> *"SSH researchers perform a dual role in these knowledge and solution production processes. On the one hand, inclusion of SSH perspectives can help to bridge gaps between science, policy and practices and make research results more relevant and applicable. SSH researchers also provide critical perspectives and insights on power and other dynamics that are bound up in knowledge production processes and that influence the application of new knowledge and the distribution of societal benefits derived from it" (Driessen et al., 2013).*

On the other hand, these topics were thought to include mechanisms that would steer the research towards transformative outcomes. For example, conducting research on visions and scenarios of climate change might lead to imagining and designing desirable visions and scenarios for transformative change.

In terms of relevance, SSH have epistemic expertise and disciplinary ownership over current knowledge gaps (knowledge-based needs). In terms of applicability, SSH can steer production of "effective societal solutions and actions" based on SSH's ability to organize research more inclusively and justly with non-academic stakeholders due to their perspective on power dynamics. Taken as part of a ToC, both the knowledge and the application of the knowledge are given equal weight in terms of their contribution to transformation. This would mean that within the funding program and the research projects themselves, the researchers require support mechanisms for both practices. However, it is important to remember the White Paper was the first and conceptually ambitious phase of the eventual call. The process of further designing, developing, setting up and launching the call involved external factors and practical challenges which played a significant role in how the SOLSTICE unfolded.

7.3.3 Development into a call for funding

Following the White Paper, a workshop was organized to initiate a first draft of the call and the formative evaluation team was granted access to the minutes. This workshop was the beginning of a negotiation process amongst multiple actors and institutions about how the "pure" ideas presented in the White Paper could be translated into a funding program. Widely accepted was opening the application to all JPI countries and disciplines and by doing so, aim for interdisciplinarity on the one hand and alignment of different national funding strategies on the other.

The deviations from the White Paper to the workshop discussion included transdisciplinarity shifting from being described as critical for "help[ing] overcome disciplinary silos and science-society divides"

to “highly encouraged where appropriate”. Additionally, the five thematic prioritizations were reconfigured and narrowed into three (cf. Table 6).

Table 2: Topics and Cross-Cutting issues manifested in SOLCISTE Call

SOLCISTE relevant research topics and knowledge gaps – White Paper	SOLCISTE relevant research topics and knowledge gaps – Call for Applications
• Governance • Visions and scenarios • Social justice and participation • Sense making and cultural meaning • Transformative finance	• Social justice and participation • Sense making and cultural meaning • Transformative finance

(Source: Own compilation)

In trying to align the topics and themes with the national priorities of the participating JPI countries, it was a challenge to identify shared needs while also avoiding competition with existing national funding. This presented the challenge of balancing desirable themes with potential overlaps with the pre-existing research policies of the national member states. Adding to this challenge was the aim of filling different gaps across different national policies, however these gaps were not so obvious considering the lack of common framework.

However, across almost all countries was a shared interest in promoting the SSH perspective and new combinations of disciplines including SSH as an innovative approach to climate research. This was seen as innovative because arts and humanities are often underrepresented disciplines in these fields. Although this was not explicitly linked to arts and humanities or SSH leadership, it was noted that funders in each member state want to move from knowledge to actionable research that has policy impact.

Another goal was to provide unusual combinations of disciplines an opportunity to collaborate which would otherwise not exist. To do this, the call needed to attract a wide range of disciplines. A mechanism for encouraging interdisciplinarity to compliment the thematic topics was devised in the form of three “lenses”. Proposal writers were to choose at least one of the following:

1) “Qualitative upscaling” meaning to look at concrete examples on a micro level and their transferability to a wider context,
2) “Normative framing” meaning to question the norms in the respective theme, and
3) “Structural approach” meaning to address the chosen topic through a systemic approach.

While the thematic topics are meant to attract SSH leadership to the calls, these lenses are intended to be more interdisciplinarity as well as more geared towards specific types of outcomes. The lenses provide added value through the SOLSTICE program by directing research toward solution-oriented knowledge outcomes and actions; examples that can be scaled, norms that can be questioned, and structures that can be made visible.

After circulation amongst the working group and national funders for their consultation, the first draft of the call was developed until Spring of 2019. Following iterative rounds of feedback and adjustments, the call was presented to the JPI Climate Governing Board and launched on October 28th, 2019, through various means including the JPI website, newsletters, word of mouth, exchange amongst colleagues and research administration offices.

1.4. Opening the Call

7.4.1 Guidelines for Applicants

The "Guidelines for Applicants"[4] document included formalities such as eligibility and funding criteria, a list of participating countries and their funding bodies, reporting requirements, the thematic topics, and a more condensed conceptual background as compared with the White Paper. Although the deviations from the White Paper were significant, there was a shared premise that, *"To enable transformational change, novel interdisciplinary collaborations across social sciences and humanities and potentially beyond are required"* (pg. 5).

Regarding transdisciplinarity, the guidelines were loosened compared to the White Paper and were "highly encouraged where appropriate". However, indirectly related to transdisciplinarity is the guideline that "impact should not be limited to scientific publications but should have the potential to trigger change in behaviour and attitudes at any level of society" (pg. 7). Thus, transdisciplinarity was promoted through encouragement to trigger change and produce actionable knowledge, as well as through the previously mentioned "three lenses" which applicants were asked to address in their proposal.

7.4.2 Proposal Evaluation

In terms of evaluation, the outline proposals were not formally reviewed by evaluators but were checked by the Call Secretariat for quality and first eligibility criteria. Based on the outlines, the Call Secretariat identified the appropriate experts to be evaluators of the 72 full proposals[5].

To reach consensus with participating funding bodies, the designers of the call had to compromise rather significantly regarding the funding criteria and the direction of the budget. Interviews with the designers of the call indicated that they initially wanted a stronger focus on societal impact criteria, but this had to be softened to fit the more restricted schedule of various national funding schemes. However, the evaluation was steered towards societal impact in the follow way. First, criteria of scientific quality and impact were double weighted compared to the other two criteria of proposals being in/out of scope and quality and efficiency of implementation. Secondly, impact was described explicitly as both scientific and societal. For example, a societal dimension of impact is highlighted as, "Strategy for disseminating and discussing the results of the project with a range of societal actors, including decision-makers, and ways to diffuse results "(pg. 10). Evaluation mechanisms such as this can be directly related back to the overarching ToC as the criteria directly supports projects which help achieve the desired impact of the overarching program.

However, some challenges to societal impact included national funding bodies with varying windows of eligibility for non-academic stakeholders to participate in the proposals. The result was that the call had to appeal to the least common denominator of eligibility, which in effect did not make it possible to fund the kinds of stakeholders who were sketched in the ToC as eventual end users of project outputs. The conditions of possible engagement for these stakeholders in the call determine the difference between traditional dissemination activities and transformative activities such as those

[4] https://jpi-climate.eu/wp-content/uploads/2022/11/solstice-guidelines-for-applicants.pdf

[5] In total, ten countries chose to participate and contribute to funding the call (Austria, Belgium, Czech Republic, Finland, France, Ireland, Italy, Latvia, Norway, and the United Kingdom) with a total budget of 6.9 million. A total of 96 outline proposals were submitted and 72 of those were invited to submit a full proposal, with 7 projects being selected for funding and starting in Spring 2020.

described in the guidelines as, “co-creating by-products”, “cooperation with NGOs or citizen initiatives, “involvement of non-scientific stakeholders early in the research project”.

1.5. Project kick-off

In the end, seven projects were selected to be funded for the SOLSTICE program. The projects according to their ToC are listed in Table 7 below:

Table 3: Summary of the main outputs, outcomes and impacts of the projects as described by the formative evaluation team.

Name of the project	Key outputs	Key outcomes/impacts	ToC
202CM	Open-source toolbox on climate change communication strategies	Overcoming barriers and indifference through communication that empowers citizens	Increase interaction between text- and image-cantered approaches with behavioural-, social- and individual-centred to improve strategic communication and reduce apathy towards climate change.
CCC-CATAPULT	Knowledge on students and teachers sense making of climate change	Youth action platform (YAP); integration with policy initiatives	Involve children in research on a transformed climate focused education to enable climate action
CLEAN Cultures	Toolkit for decarbonisation transition initiatives	Research as change process; best practices for transformative learning process	By initiating learning processes about local, contextualized decarbonation processes, they will be more inclusive and redistributive
Just-Scapes	Findings about justice and landscape actions	Knowledge and awareness; Media and resources shared on website available to public	Understanding the social dimensions of rural transformations will help remove justice barriers
ROLES	Toolkit on digitalisation of energy systems	Integrated in event EU Sustainable Energy Week 2023; 1:1 meetings with decision makers	Enhancing citizen agency and understanding their needs in energy digitalization will steer the process to generate social benefits
SOLARIS	Identification and analysis of inequalities	Availability of resources; Blog; Handbook; practitioner’s guide; web documentary	Anticipating the distributional impacts of deliberative participation processes when forming policies will help ensure that these participatory innovations are socially just
JUST-decarb	Articles for researchers and policymakers on adverse impacts of decarbonisation	Policy briefs; events; online website and media	Identifying the vulnerable actors of decarbonisation will inform policies to include them in opportunities created by transition.

The kick-off meeting was held in April 2021 and in attendance were all projects and their consortia, the SOLSTICE advisory board, members of JPI’s Transdisciplinary Advisory Board (TAB), members of JPI Climate Action Groups, the SOLSTICE Call Secretariate and the formative evaluation team. During this kick-off meeting, the formative evaluation team was tasked with hosting an impact session to get the projects to already think about their ToC and the mechanisms within their project to achieve their

intended impact. The impact session was structured into eight breakout rooms, seven for the individual projects to discuss impact and one room dedicated to people involved in administration, funding, and the development of SOLSTICE.

Along with the impact session, the evaluation team provided feedback to a questionnaire for projects to complete prior to the kick-off meeting. The questionnaire included 13 questions total, and two questions were prepared by the evaluation team. These questions focused on helping the research projects reflect on their own project level ToC and how their research processes would connect to the desired outcomes of the call level ToC. During the impact session, the evaluation team was introduced to the projects and the responses to the two questions were presented in a word cloud featured in Figure 2 and Figure 3 below.

Figure 2 Word Cloud results to Q8: Which kind of societal impact do you expect from your project? Please name three most prominent aspects that come to your mind.

Figure 3 Word Cloud results to Q9: How would you define the societal transformation your project is aiming for? Please name the three most prominent aspects that come to your mind.

Although key outputs of the projects vary considerably (see Table 7), the qualitative data gathered during the Impact Session offered insight into how transformation through research was imagined from the project perspective. Figure 6 demonstrates an actor focused approach to impact, through "consciousness", "policy", "agency", and social", entailing a high emphasis on decision making and reflection. As for Figure 7, ideas about transformation resulted in "transformation" being the most salient word for respondents which suggests a slight uncertainty around ways of describing such associations.

During the session, there were suggestions such as to "look out for and value the „smaller' impacts", and "developing intercultural connections", and one suggestion to take a more network approach and "improve impact by engaging with other JPI Climate projects".

1.6. Program level evaluation

After the first workshop, the formative evaluation team prepared a second workshop with the Call Secretariate for May 2022. The workshop was focused around presenting the results of the program-level evaluation to the Call Secretariate and relating these findings to the main questions around transformation and impact from the first workshop. Overall, the aim was to develop key insights for how future calls could improve transformative potential.

The timeline below demonstrates the various activities which accumulated before the evaluation document was presented to the Call Secretariate in the second workshop May 2022. Not all timeline events correspond with primary or secondary data used in the evaluation but are key events relating to the SOLSTICE process.

- 2018, White paper
- 2019, Call development
- October 2019, the call involved a 1.5 stage process
- January 9th, 2020, outline proposals due
- February 3rd, 2020, full proposals due on
- May 2020, projects were notified of successful proposals
- November 2020, pitch meeting between SuperMoRRI and JPI about the evaluation concept
- early 2021, formative evaluation was established
- January 2021, projects start
- April 2021, impact session at the kick-off meeting
- December 2021, formative evaluation first workshop
- May 2022, formative evaluation second workshop and presentation of Program Evaluation document
- November 16th, 2022, midway evaluation of the projects
- 2023/2024, projects end

In what follows, the insights from the program evaluation, reactions from the Call Secretariate and the results from discussions in the second workshop are summarized. On the highest level of call design, the evaluation found that there could be more explicit clarification and operationalization of inter and transdisciplinarity in the call text that would support projects in "pushing beyond" knowledge boundaries. In the seven project consortia, interdisciplinarity is mainly represented in different combinations of social sciences, e.g., linguistics, anthropology, philosophy, environmental management, human geography. In some cases, there was the inclusion of engineering and technical sciences such as civil, environmental and water engineering, however these were less represented overall.

As already mentioned, there was a shift between the White Paper and the call text as the former framed stakeholder engagement as essential to generate creative and alternative pathways to impact and the latter only encouraged stakeholder engagement "where appropriate". Interviews provided some insight that this was in part due to the different national funding schemes participating in the call and their respective eligibility criteria to be a beneficiary of research funding. The result was that applicants were guided more towards scientific innovativeness and methodological experimentation across SSH disciplines in the pursuit of knowledge. However, this created conditions that were not as ambitiously transformative as described in the White Paper.

During discussions about these findings from the evaluation team, a JPI representative stated during the Second workshop that, "the topics and lenses[6] should push the projects into certain directions" and thus the process of responding to these elements of the call would provoke interdisciplinarity. While this might have been the intended mechanism of the lenses, their implementation in the projects was not reinforced or made binding in any way. Furthermore, as was established in the design of the call, the lenses were meant to act as a mechanism for attracting interdisciplinarity and new innovative combinations of research perspectives. Without the reinforcement of their importance, the lenses were of lesser importance compared to traditional pressures within research contexts such as scientific excellence in the form of publications. This was noted as an important lesson for future calls, particularly as a potential program level mechanism to generate synthesis and identify synergies between projects by looking at how their respective use of the lenses could interact with each other.

1.7. Midway project evaluation

The evaluation team prepared three questions for LPIs to respond to in writing, along with their other reporting requirements. These questions were intended to provoke reflection on similar aspects that were addressed during the impact session of the Kick-Off, namely inter and transdisciplinarity, societal impact and societal uptake of project outputs, and the transformative potential of project activities. The questions were as follows:

1. *Please briefly describe how SSH is contributing to social change in the context of your project. How does this compare to what you expected prior to the project?*
2. *How would you assess progress made so far towards the eventual take up and use of your projects' outcomes?*
3. *How is the research process involving non-academic stakeholders changing or improving your plans to address the societal impact of climate change?*

In the responses to these questions, there was evidence that some LPIs could clearly link their project activities to a transformative impact. In these cases, the projects had no hesitation taking on board the idea that involving stakeholders could lead to direct impacts with transformative potential. For example, one LPI explained:

> *"We have engaged heavily with diverse local stakeholders, from everyday users of energy systems (smart electric meters, forms of transport, solar panels and energy flexibility devices like batteries) to experts within sectors like transport, electricity generation, distribution and consumption, primarily at the local and urban but also in some cases at the national level. These exchanges, which have taken multiple forms (semi-structured interviews, focus group discussions, public and closed-doors seminars, webinars, hands-on workshops), have themselves been a highly effective form of exchange of information and co-produced*

[6] As a reminder, these were (1) operational upscaling (2) deliberating norms and (3) a systemic approach.

perspectives. Thus, (the project) has been closely engaged in the case studies, to the extent that one direct impact of the project was a family-focused electric bicycle subsidy scheme from Bergen being transferred to Stavanger, a direct impact through policy mobility."

For this LPI, involving stakeholders was a clear means of "leverage points" in their research as the overall topic they were investigating required the obvious need to shift energy infrastructure but also to shift societal practices.

In other instances, other LPIs challenged the idea projects can meaningfully achieve transformative impact on a broader scale than the research project:

"Yet we are mindful of being one research project, and proactively seek meaningful collaborations, which help to amplify our reach and effectiveness at informing action through our insights. Our results also show that despite the urgency of challenges, there are few immediate solutions commensurate to the scale of the problems that can be implemented for adequate societal impact within a project timescale (such as three years), so part of our hope is in situating relevant knowledge with key actors in the contexts where this can be actionable and help steer the course towards a better future."

While this LPI did not have a clear path, there was a vision for how the project could find actors who would benefit from its outcomes. In such cases, mechanisms to support the SOLSTICE ToC such as the three lenses would be useful in supporting projects to think about how their projects could support or relate to each other. Such mechanisms could be useful for the projects in understanding what resources are available within the SOLSTICE program, and what knowledge or lessons have been learned from other projects.

While these were the kinds of responses reported in the written mid-way evaluation, the discussions during the meeting included some critical reflection on the idea of reporting impact. Some projects shared concerns that reporting impact at the midway stage was rather meaningless because impact had not occurred yet. Despite these comments, during the Q&A sessions the LPIs frequently shared informal, impact generating moments that occurred outside what they considered to be a strict impact pathway. Based on observations from the discussions during the midway meeting, it became clear that there is a standard practice for project reporting during such meetings, and smaller "moments of impact" (term coined by the evaluation team following the meeting) which are often more anecdotal, are not part of this practice. It is to be expected that researchers under a review process would not be comfortable straying from the standard practice, however these anecdotal, narrative meanderings about what occurs during a project are quite relevant to understanding the kinds of mechanisms attributable to transformation in the original and conceptually ambitious White Paper.

1.8. Conclusion

As a prototype for how TIPs can be translated into an actual funding program, SOLSTICE shows the journey from conceptualizing transformative research through multiple organizations, levels of governance, approval (both epistemically and administratively), and interpretative processes. The overall objective to fund, design, implement and practice research differently – in a way that is more transformative than „traditional' research funding – entails complex negotiations and compromises. Additionally, this case investigated a further dimension of this process by experimenting with how evaluation can contribute towards transformation.

To conclude, let's begin with the conceptual origins of SOSLTICE and how these were translated into a transformative funding program. The ambitions underlying the White Paper are clear and even though a strong definition of transformation is absent, the expectations for the necessary variables – SSH leadership in producing actionable solutions in partnership with other disciplines and stakeholders – are quite clear. With this clarity, the White Paper hopes to stretch standard practice of research programs into something transformative. However, as the White Paper is only a starting point and stretches a bit beyond what can be practically agreed upon in a multi-national funding scheme. While there are still transformative elements in the call design, the conceptual stretch starts to slowly look more like its original form.

The case demonstrates that there is some distance between the original ambitious of a TIP and its practical implementation. This is to be expected with any new practice model, particularly when it relates to changing systems and multiple actor groups and their interactions within them. This manifested itself in the necessary changes and compromises that the White Paper had to go through to become a funding program that multiple different national funding bodies could agree upon. This task itself is an experimental approach to integration within the European Research Area. In terms of research practices, project level LPIs are willing and interested in cooperating in such research projects, however the mechanisms that reinforce the program ToC, such as the trans- and interdisciplinary lenses within the SOLSTICE call, should be further developed as true resources for projects to fall back on. At the current stage, the lenses were more used as a proposal writing and development concept. This signals the start of experimentation but requires much more coordination and resources on the level of the Call Secretariate – resources which are currently under provided for transformative ambitions. For example, program level training might have helped boost confidence amongst projects when considering alternative ways to discuss or report on their impact. As the transformative aims of the program require more translation of knowledge into societal impact, networking building amongst non-scientific stakeholders and solution-oriented knowledge, the different researchers might have benefited from more opportunities to exchange with each other about these practices. Left to their own projects, it was easier for projects to fall back on more traditional forms of impact in the form of scientific article and conference presentations. These pursuits are still valuable for a TIPs, however communities are less likely to benefit from such outputs and therefore these scientific activities should not occur at the expense of stakeholder-oriented activities.

Related to the uptake of project outputs within communities is the initial aim of inter and transdisciplinarity. Although the development of the call presented some challenges when administering a climate change funding call to SSH disciplines, the projects were successfully able to attain a range of unique combinations. While the technical sciences were less represented compared to SSH overall, SOLSTICE was able to provide a unique opportunity for disciplines to work together. However, SSH led interdisciplinarity did not translate directly to an increased likelihood of transdisciplinarity and public engagement in the research process. This aspect was opaquer since it was not an explicit eligibility criterion and it also depended on the project context and reporting practices of the LPI. While some LPIs saw their activities as impact oriented and "reportable", others were doubtful about promising impact orientation at early to mid-stages of the project. This means that reporting on topics such as an impact and transformation is not standard practice, and it varies significantly by the LPI and their perception and willingness to embrace the concepts.

The case demonstrates that there is much ambiguity around transformation, what it looks like, how research should play a role in it and most importantly, what kind of funding structures and criteria it requires to take place. The experience from the side of the evaluation reinforces the idea that any

corresponding evaluation must be equally open to not just accounting for transformation, but experimenting, correcting, and learning about transformation as a specific research aim and strategy that falls outside the normal practices of standard research funding. This case therefore supports the argument of Molars- Gallart et al. (2021) that formative evaluation is the most suitable method for evaluating TIPs.

In terms of responsibility, SOLSTICE shows us how the string of multiple actors, at varying levels, are responsible to each other and must share in their commitment to experimentation. Experimentation requires a different kind of responsibility based on trust and openness, particularly when the direction these actors are pursuing is one that is as conceptually ambiguous as transformation. The case shows how each actors have their own rules and impediments, the visionaries of the White Papers, those who turn it into a call, those who administer the call, those who evaluate the call (we read little from them in the paper), those who interpret the call and turn it into a proposal and those who turn the proposal into research and their understanding of transformation.

References

Council of the European Union. (2011). Launching of five joint programming initiatives for research. 3133rd COMPETITIVENESS (Internal Market, Industry, Research and Space) Council meeting Brussels, 6 December 2011. Retrieved: https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/intm/126583.pdf

Göd, A., Worliczek, E., Haindl, M., Malnaca, M. (2022). Ex post analysis of the SOLSTICE Call. Deliverable 3.12. Strengthening International Cooperation on climatE change (SINCERE) Project.

Haddad, C. R., Nakić, V., Bergek, A., & Hellsmark, H. (2022). Transformative innovation policy: A systematic review. *Environmental Innovation and Societal Transitions*, 43, 14-40.

JPI Climate (2016). Strategic Research and Innovation Agenda. Joint Programming Initiative Connecting Climate Knowledge for Europe, Brussels, Belgium.

Luederitz, C., Schäpke, N., Wiek, A., Lang, D. J., Bergmann, M., Bos, J. J., ... & Westley, F. R. (2017). Learning through evaluation–A tentative evaluative scheme for sustainability transition experiments. *Journal of Cleaner Production*, *169*, 61-76.

Molas-Gallart, J., Boni, A., Giachi, S., & Schot, J. (2021). A formative approach to the evaluation of Transformative Innovation Policies. *Research Evaluation*, *30*(4), 431-442.

Palavicino, C. A., Matti, C., & Brodnik, C. (2023). Co-creation for Transformative Innovation Policy: an implementation case for projects structured as portfolio of knowledge services, Evidence & Policy, 19(2), 323-339. Retrieved Jun 19, 2023, from https://doi.org/10.1332/174426421X16711051078462

Schot, J., & Steinmueller, W. E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research policy*, *47*(9), 1554-1567.

SOLSTICE Guidelines for Applicants. 2019. CALL FOR PROPOSALS 2019 by the JPI CLIMATE. retrieved at https://jpi-climate.eu/wp-content/uploads/2022/11/solstice-guidelines-for-applicants.pdf

Vogel, Isabel (2012). Review of the use of 'Theory of Change' in international development Review Report. (Retrieved: http://www.theoryofchange.org/pdf/DFID_ToC_Review_VogelV7.pdf, 23.04.2020)

West, J., & Worliczek, E. (2019). White Paper: Operationalising knowledge on and for societal transformations in the face of climate change. Retrieved: https://jpi-climate.eu/wp-content/uploads/2022/09/White-Paper_FINAL_Feb_2019.pdf