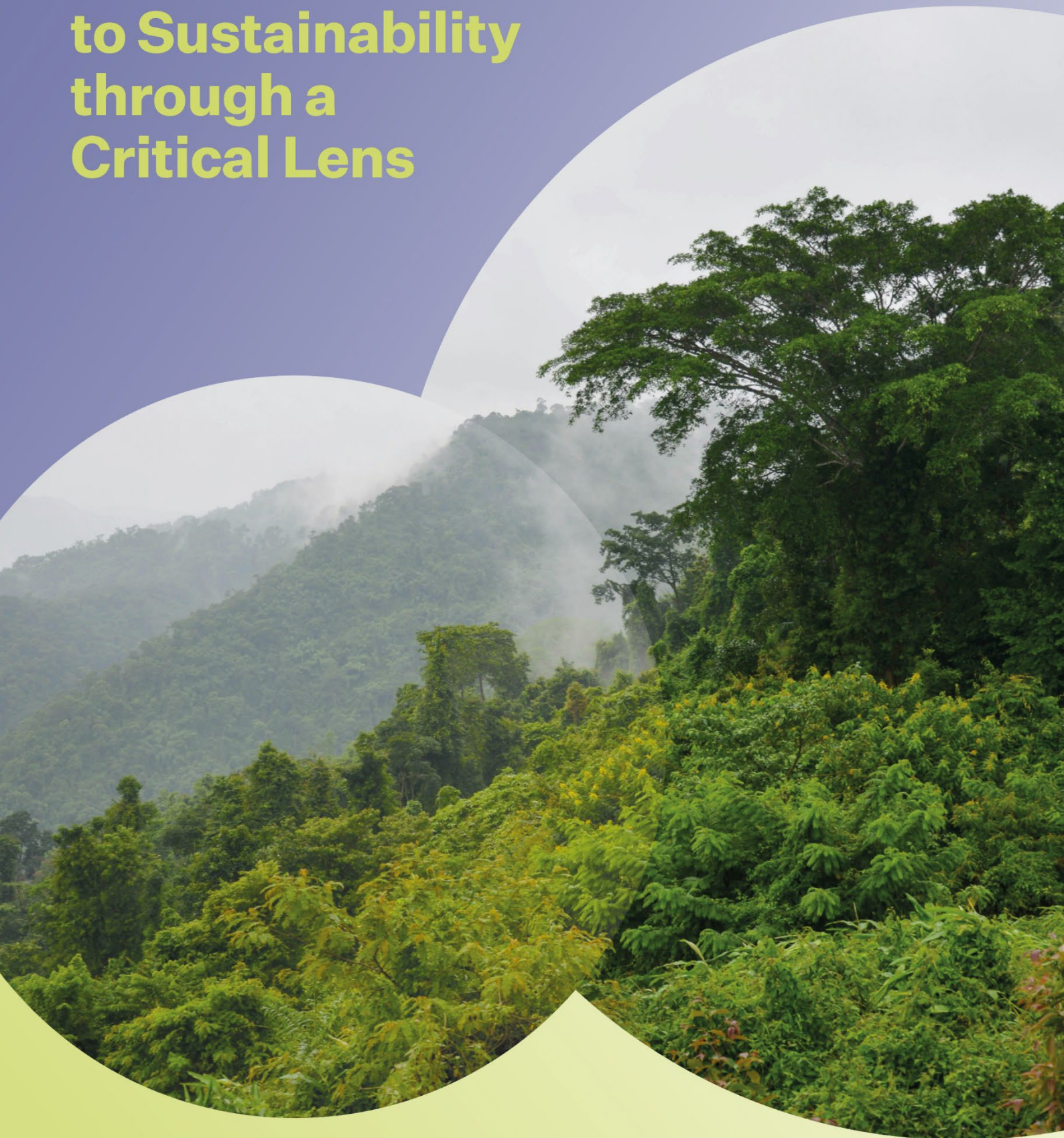


Social Transformations to Sustainability through a Critical Lens



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New Opportunities for Research Funding Agency Cooperation in Europe ([NORFACE](#)), launched in 2004, is a partnership of national research funding agencies in Europe dedicated to leading and developing opportunities for scientists in the area of social and behavioural sciences. NORFACE plays an important part in responding to the grand societal challenges by promoting research of the highest quality, sharing best practices among research funders and especially by making international collaboration between social scientists in Europe possible.

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[The Belmont Forum](#), established in 2009, is a global partnership of funding organizations, international science councils and regional consortia committed to the advancement of international, interdisciplinary and transdisciplinary science and knowledge for understanding, mitigating and adapting to global environmental change. Belmont Forum members and partner organizations work collaboratively to meet the Belmont Challenge by issuing international calls for proposals, committing to best practices for open data access, and providing transdisciplinary training.

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Social Transformations to Sustainability Through a Critical Lens

**Integrative insights from twelve research
projects funded under the Transformations to
Sustainability research programme
(2018–2022)**

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Prefatory note

From 2014 to 2019, the International Science Council (ISC) coordinated the Transformations to Sustainability research programme, in this report referred to as T2S1.

From 2017 to 2022, the Belmont Forum, the New Opportunities for Research Funding Agency Cooperation in Europe (NORFACE) network and ISC collectively funded and coordinated a second iteration of the Transformations to Sustainability programme, in this report referred to as T2S2.

The funders of the T2S2 programme decided in 2021 to undertake a study of learning derived from the programme. This study resulted in two reports:

- Moser, S. 2024b. *Social Transformations to Sustainability through a Critical Lens: Integrative insights from twelve research projects funded under the Transformations to Sustainability research programme*. Belmont Forum, International Science Council, NORFACE. This report focuses on insights into transformations to sustainability from an analysis of the outputs of the twelve projects funded under T2S2.
10.24948/2024.03
- Mukute, M., Colvin, J., Burt, J. 2024. *Programme Design for Transformations to Sustainability Research: A Comparative Analysis of the Design of Two Research Programmes on Transformations to Sustainability*. Belmont Forum, International Science Council, NORFACE. This report focuses on a comparative analysis of the design of T2S1 and T2S2.
10.24948/2024.02

The ISC also commissioned a synthesis study of the T2S1 programme, which resulted in the following report:

- Moser, S. 2024a. *Transformative Labour: The Hidden (and Not-So-Hidden) Work of Transformations to Sustainability. Integrative Insights from Three Transformative Knowledge Networks*. International Science Council. This report focuses on insights into transformations to sustainability yielded by the three projects funded under T2S1.
10.24948/2024.04

Together, this package of three reports presents some of the key insights and learning from nine years of research programming on transformations to sustainability.

The NORFACE network, Belmont Forum and the ISC would like to thank all project teams, project participants and interviewees who informed these reports.

Disclaimer

The information, opinions and recommendations presented in this report are those of authors of the report, and do not necessarily reflect the values or position of the ISC, the Belmont Forum or the NORFACE network.

Acknowledgements

The author wishes to wrap this synthesis of the second Transformations to Sustainability programme in an envelope of gratitude. I have nothing but deep appreciation and respect for what the twelve project teams – and their societal partners across the world – accomplished under the enormous and relentless pressures, constraints and demands that the COVID-19 pandemic unexpectedly served up. The research would have been challenging enough without that worldwide disruption. What ultimately was possible and accomplished in these projects reveals – in the first instance – human adaptability, creativity, dedication and stamina. Maybe even more importantly, it surfaces the importance of trust and care in the research process itself, if science wishes to contribute to transformative change under difficult circumstances. The research teams clearly echo this recognition throughout their work and outputs. It reflects a welcome level of consciousness and ethical conduct that should guide all social science (transformations) research.

In addition, I thank the members of the Emerald Network team for their research and insights, which provided additional input to this synthesis and the study's Advisory Group for their guidance and steering early in the process. Neither the Emerald Network nor the funders, Advisory Group or reviewers are responsible for the contents of this report.

Susanne Moser

List of acronyms

IP	Intellectual property
IPRs	Intellectual property rights
ISC	International Science Council
ISSC	International Social Science Council
NGO	Non-governmental organization
NORFACE	New Opportunities for Research Funding Agency Cooperation in Europe
NWO	Netherlands Organization for Scientific Research
SDGs	Sustainable Development Goals
Sida	Swedish International Development Cooperation Agency
TKN	Transformative Knowledge Network
T2S	Transformation to Sustainability programme (comprehensively)
T2S1	The first T2S programme, coordinated by the ISSC (later the ISC), with funding from Sida
T2S2	The second T2S programme, funded by the Belmont Forum, NORFACE and the ISC/Sida

Foreword: Breaking the mould with transdisciplinary research for sustainability

The Transformations to Sustainability (T2S) programme came to an end in December 2022 after nine exciting, challenging and rewarding years. The programme, launched in January 2014 by the International Social Science Council (ISSC, one of the predecessors of the International Science Council) with financing from the Swedish International Cooperation Agency (Sida), emerged out of a careful design process to create a research programme that would enable the social sciences to make their unique and much-needed contribution to sustainability science and action. As such the T2S programme was a milestone in the history of international science and is still one of the most significant manifestations of international, interdisciplinary collaboration between the natural and social sciences on sustainability.

Inspired by the ISSC initiative, the Belmont Forum and the NORFACE network of social science funders launched a second phase with the ISSC in 2017, benefitting from top-up funding from the European Commission that made for a hugely significant step up in scale and scope for social science research cooperation and leadership in the domain of sustainability.

These unique international funding opportunities attracted an overwhelming response from a global research community hungry for support for a new type of research for sustainability based on transdisciplinarity. The two phases of the programme made it possible to test innovative transdisciplinary and internationally comparative research approaches and offered opportunities for more equitable research participation and leadership from the Global South. The 15 international research projects funded under the two phases of the programme studied and participated in transformation processes in many dozens of sites all over the world, working with communities experiencing a wide range of socio-environmental problems. What the projects all had in common was the social framing of the problems and potential solutions, deep involvement of non-academic partners and the effort to understand and facilitate processes of social change

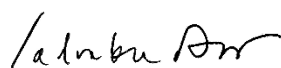
towards more sustainable and socially just situations. They shared the ethos of care for people and planet that characterizes transdisciplinary research. Collectively the 15 projects have produced several hundred academic and non-academic outputs, involved thousands of non-academic participants in their research and had significant impacts on the course of communities' lives and on research directions and practice.

The three concluding reports on the T2S programme released **in 2023** are rich in insights and learning which validate and extend the body of knowledge on social transformations and transdisciplinary approaches. The T2S programme has confirmed that integrated, transdisciplinary knowledge is an indispensable part of local and global efforts to achieve social and environmental sustainability, but also that science systems are still not conducive to mould-breaking, transformative research. The experience of the T2S programme adds weight to the evidence that science itself needs to transform, in its funding and incentive structures, evaluation cultures, training approaches and interfaces with practice, policy, society and the private sector, to achieve its potential to mitigate the urgent, existential risks to humanity we are facing. We hope that the example of the T2S programme will inspire other funders to mobilize resources for the kind of research that can help accelerate the achievement of the Sustainable Development Goals and long-term sustainable and just development.



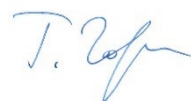
Nicole Arbour

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International Science
Council



Tomasz Zaleśkiewicz

Chair, NORFACE Network

Executive summary

Climate change, biodiversity loss, resource depletion and other global environmental challenges have reached unprecedented levels worldwide. Conventional knowledge, capacity building and policy approaches to tackle these challenges have proven inadequate to stem the existential level of environmental degradation and social injustices. Thus, achieving sustainable (safe and just) societies and ways of life will depend on rapid and fundamental change in the ways people interact with each other and with the natural environment. The Belmont Forum, NORFACE and ISC research programme on Transformations to Sustainability (T2S) was created to contribute to this change. Towards that end, the research programme synthesized in this report had two major objectives:

1. To develop understanding of and promote research on transformations to sustainability which are of significant social, economic and policy concern throughout the world and of great relevance to both academics and stakeholders.
2. To build capacity, overcome fragmentation and have a lasting impact on both society and the research landscape by cultivating durable research collaboration across multiple borders and disciplinary boundaries, and with practitioners and societal partners. This includes facilitating the development of new research collaborations with parts of the world which are not often involved in large-scale international research efforts, notably low- and lower-middle income countries.

This report focuses on the first of these goals, synthesizing the insights gained and the advances made in understanding of social transformations to sustainability by the funded research projects; no small task as the programme's twelve diverse and unique projects produced – despite its implementation under the constraints of the COVID-19 pandemic – a prolific amount of research. Collectively, they helped advance the understanding of social transformations processes in important ways. These insights are synthesized around the three main research topics (governance, economy and wellbeing) and the two cross-cutting themes (research innovations and improved understanding of transformations) as summarized below.

Research innovations

- **COVID-19-driven adjustments, innovations and ‘care-full’ research.** While COVID-19 temporarily brought the world to a halt, it did not defeat the T2S programme. Each project was forced in one way or another to adjust their research protocols due to lock-down periods, travel restrictions, the need for social distancing and the distractions researchers and their research participants experienced from the multitude of additional demands. Ultimately, this had the lasting impact of mainstreaming technologies and research methods adapted to conducting research with human subjects in face-to-face and virtual ways. While these types of adjustments are not unique to the T2S2 programme, it highlights that the pandemic, despite its disruptiveness, was also a time of unplanned, surprising innovation and creativity, an important – and maybe hopeful – observation about research amid global crises.
- **Innovative methods.** A few projects contributed methodological innovations beyond adaptation to the pandemic. This included mostly combining existing methodologies in new ways, e.g., working towards truly emancipatory relationships in citizen science; integrating value analysis, political ecology and adaptation pathways into the Delphi method, and doing so with asynchronous virtual engagement of experts and non-experts; or in integrating art and creativity into their social science methods.
- **The emergence of critical transdisciplinarity.** A highly interesting research innovation emerged from the integration of the projects’ critical social stance with transdisciplinarity approaches. The resulting ‘critical transdisciplinarity’ involves participating in or contributing to system-critical interventions that challenge the fundamental power hierarchies and social orders, a risky approach that is almost anathema to being effective in policy-making systems. Rather than ‘merely’ trying to make science more useful to decision-making (without questioning policy goals), critical transdisciplinary social science challenges the taken-for-granted assumptions, values and power structures underpinning existing policy and practice and interrogates the complex linkages between social, political, economic and environmental change and injustices in existing policy and practice.

In sum, the research teams were generative and creative in their projects – both intentionally and by necessity when the COVID-19 pandemic required significant adjustments. The methodological adaptations and innovations leave a permanent impact in the extant research community. The wedding of robust yet critical social science with transdisciplinary co-design and co-production of knowledge, however, points to a more significant shift in social scientists' allyship with marginalized groups in society, and perhaps even a slow, but progressive transformation in science, in which political engagement and rigorous knowledge production are no longer in conflict.

Advances in the conceptual understanding of transformation processes

- **Definitional advances.** The T2S2 projects all started from the basic understanding of transformations as a profound and permanent shift in the fundamental ways in which systems function. Based on mostly place-based, bottom-up research, the projects added significant nuance to this definition. Transformations, they found, are rather uncontrolled, emergent, non-teleological, non-linear, risky, relational phenomena, resulting from co-evolutionary, complex forces interacting in context-specific ways and ultimately leading to new paradigms, new and more just social relations and altered human–environment relationships, new behaviours and production processes. However, these outcomes are rarely predictable or assured.
- **The prevalence of precarity and uncertainty.** These definitional refinements point to the fact that transformations are much more than matters of technological innovations and economic transitions, and that it requires far more than policy interventions to steer systems in new directions. Uncertainty about any of these forces, their interactions and outcomes characterizes transformations. They are always multidimensional, multitemporal and rarely monodirectional or reducible to a single essential driver or element. Many projects were situated in frontier regions. These socially, culturally, environmentally and economically unstable situations provided not only deep insight into the distant global drivers of largely negative local transformations (towards unsustainability), but also offered important insights into the challenges to and conditions for transformations to sustainability. Such

situations of precarity offer both windows of opportunity for transformation, but also characterize the very nature of transformations where the old (if familiar) gives way to the unfamiliar new.

- **Power and politics of transformation.** Nearly all projects recognized the drivers, forces and processes of transformation as plural and power-laden, thus necessarily political and politicized. Some of these forces work in cooperative, mutually enabling manners, while others function in rather conflicting and mutually inhibitive ways. This plurality of forces and of their interactions causes the unpredictability of outcomes of transformation processes. Transformations were found to be sites of intense power struggles where incumbents and new entrants try to win dominance over ideas, values, belief systems, epistemologies, aspirations, meanings, cosmologies, material interests and conditions, social relations, governance approaches and institutions, technologies and resource flows. These inevitable struggles negate the possibility of a smooth, non-contentious process of change.
- **Complex transforming ‘ecologies’.** Maybe the most striking shared – and independently gained – insight across the T2S2 projects pertains to the complex, entangled nature of the situation and its constituents that need transformation. Nearly all projects focused on or discovered a bundled set of historically rooted and interdependent structures, conditions, processes, actors and imaginaries, which they named in different ways, yet which constituted the focal point of their exploration of transformations. They can be understood as complex ‘ecologies’ of factors that stabilize situations or systems but which can be transformed from one state into another, if internal and external forces align to enable such a profound change. Reckoning with these complex ecologies makes clear why it is often so difficult to ‘destabilize’ or ‘unmake’ incumbent situations and move them wholesale towards a transformed state. Not only do individual components of these ecologies transform at different paces; some help, some hinder, some push and pull, while others create a drag on the transformative momentum.

Governance and change strategies for transformations to sustainability

Together, the projects' contributions to a better understanding of 'what' is subject to transformations has significant implications for the 'how.' The idea of (or wish for) a neatly controlled steering or governing of transformations may well be out of reach. Still, transformations can be fostered and deliberately nudged through formal and informal change strategies deployed at different scales. The deeper the transformative shift aims to be, the more important are the informal strategies. However, before specific strategies can be offered, the projects pointed to important realities that must be confronted.

- **A critical view of governance and governments.** Prevailing thinking in science and decision-making circles conceives of governance as a necessary and supportive, enabling, guiding, incentivizing or steering mechanism for moving through transformations towards sustainability, equity and peace. The projects, however, questioned the simplistic (and often hegemonic) assumptions of a governable transformation process. Examining critically the role of governance as a force for progressive, transformative change, the projects found the following: (1) traditional governance structures are often implicated in unsustainability, so should not be expected to help make transformative shifts towards sustainability, at least not voluntarily and on their own; (2) traditional formal governance institutions are often weakened in sites of transformative change, where in their stead new, informal governance mechanisms emerge; and (3) to understand and make use of governance as a transformation-supportive force, one must take uncertainty, frontier dynamics, power struggles, politics and contestation seriously. Multipronged approaches are needed to grapple with complicated legacies to create conditions for more progressive change.
- **Transformative imaginaries and the illusion of control.** Several of the T2S2 projects took up the topic of imaginaries – collectively held visions of the future (either desirable or menacing), with underlying symbolic meanings, values, narratives, emotions and ideals that simultaneously open and constrain, and instrumentally shape, the realm of possible actions to create it. This understanding helps in recognizing the critical importance of imaginaries for shaping possible futures. Imaginaries – made conscious – render the past

questionable, the present malleable and the future tangible. This makes imaginaries sites of political contestation, whose outcomes can have decisive influence over the direction of societal evolution. Particularly, the imaginary of linear change perpetuates, at best, wishful thinking and the ‘modernist fallacy’ of governing transformations in some controlled way; at worst, such simplistic imaginaries stifle transformative impulses and leave change efforts superficial, partial or incapable of achieving progressive ends.

- **Change strategies within scales.** If the desire to govern, steer or control transformations processes is unmasked as hegemonic overreach or modernist fantasy, then how can deep change be affected? While future outcomes from transformation processes are unpredictable and emergent, parameters can be set, processes designed and desirable ingredients (e.g., values, worldviews, imaginaries and actors) can be put into the mix to be part of them. This is where agency and influence over transformations are located. The projects confirmed the importance of a set of actions and (often informal) strategies (first described in Moser, 2024a) that help nudge societal dynamics through a transformation process, including the following: visioning and lifting up alternative imaginaries; naming and reflecting on existing conditions; creating transformative spaces; fostering agency and empowerment; enacting steps to change conditions; and caring, tending and learning. Moving towards sustainability, equity and peace in this way takes deliberate and sustained effort. Such interventions act on different aspects and – even within any one spatial scale – on different time scales. Some of them change more quickly and easily than others, producing unpredictable interactions. Interventions from other (higher) levels can help transformative ‘seeds’ take hold and scale up and out.
- **Change strategies across scales.** Several projects offered specific suggestions for change strategies aimed at scaling transformative initiatives by extending cross-scale support, resources and reach. The ability to provide such cross-scalar support, of course, presumes that there are higher-level actors and institutions [e.g., government entities, businesses, regional institutions, funders, national or international non-governmental organization (NGOs) and boundary organizations] that are interested, willing and able to lend genuine support to transformative initiatives. A complementary set of activities to the within-scale

ones listed above have been found to be helpful, including the following: linking to broader visions of sustainability; learning from comparable situations; creating transformative alliances; building capacity and greater sense of empowerment; establishing supportive policy, funding and governance mechanisms; and establishing cross-scale alliances and learning mechanisms. Together, these categories of within- and across-scale activities constitute the transformative labour necessary to bring about deep change.

Economy and finance of transformations to sustainability

The T2S2 programme was interested in economic and financial visions and mechanisms that might advance transformations to sustainability. The projects critically examined not only the extent to which the existing, dominant economic system(s) is (are) implicated in the current state of unsustainability, but whether, and if so, what aspects of, economic systems could be leveraged to support transformations to sustainability.

- **Economic drivers of unsustainability.** Projects found that neither existing dominant economic actors nor, in most instances, the state are truly invested in an ecologically restorative, socially just version of sustainability. Instead, the interest of these actors in sustainability is rather shallow, often meaning little more than sustaining economic profits (with attendant political benefits) for elites and incumbent industries. By implication, state elites would need to extract themselves from the paradigmatic, ideological, political and financial benefits they derive from being enablers of extraction to become agents of social justice and environmental protection (i.e., transformation).
- **Helpful and unhelpful economic entanglements.** Just as sites of transformation tend to display weak formal governance systems in which new informal systems emerge, novel economic arrangements emerge through self-organization, even as old economic entanglements, such as trade markets, pricing schemes, debts and migrant remittances persist. This, again, points to the complexity of local-to-global systems that can both help or hinder transformation processes in any one site or sector.
- **Fiscal and related institutional levers in support of sustainability transitions.** Projects found that economic and fiscal levers can be pushed

through reforming and aligning policies across sectors, incentives and other legal mechanisms (e.g., intellectual property regimes, standards and procedural rules); however, to be truly transformative, this requires deliberate reckoning with the politics that shape them. For both researchers and societal actors, this surfaces the inevitable questions of normative stances and guiding values, as well as the pragmatic need and capacity to contain or undermine dominant forces.

Wellbeing, quality of life, identity and social and cultural values in relation to transformations to sustainability

- **Tolerance, resilience and the limits of wellbeing.** The projects did not explicitly define ‘wellbeing’ or ‘quality of life.’ Often, these two terms are used interchangeably and refer to a person’s experience of their lives or, more broadly, what is good for them, valuable to them, including a sense of their lives having purpose and meaning. Wellbeing can have physical, health, economic, social/relational, mental and emotional dimensions. Those projects that touched on this theme found that only when a limit in subjective wellbeing/quality of life vis-à-vis one’s willingness and ability to cope with challenges, precarity and uncertainty is reached do people become ready to entertain making deeper, even transformational shifts. For better or for worse, until such limits are reached, there appears to be a considerable capacity to tolerate variable and even diminishing conditions. Individuals weigh the known comforts/discomforts of their present lives against those unknown ones associated with profound change and a transformed life/lifeway.
- **Fluidity, resistance and adaptation in the face of transformation.** Identity and social and cultural values on the one hand and transformations to sustainability on the other are related in multidirectional and multidimensional ways. Projects related values and identity to people’s agency in explaining who or why some actors actively participate in or resist transformations to sustainability, and manage to navigate transformative changes, or – in turn – how the transformation processes impacted them in terms of their perspectives, identities and their abilities to shape their own (transformed) lives. For many

(perhaps most) people, the status quo is preferable to an uncertain future and the difficult change process to get there; and often significant suffering is necessary before the transformative journey is begun. Thus, as the deepest levers of change, identity and values often are less visible in transformation processes, yet they are at the heart of the plurality of visions of transformations and underlie the often difficult politics that mark them. Their influence on the direction and persistence of change is – ultimately – decisive.

1. Introduction

1.1 Context, background and purpose of this report

Climate change, biodiversity loss, resource depletion and other global environmental challenges have reached unprecedented levels worldwide. Conventional knowledge, capacity building and policy approaches to tackle these challenges have proven inadequate to stem the existential level of environmental degradation and social injustices. With seven out of eight Earth system boundaries now crossed (Rockström et al., 2023), the slow progress on relieving these pressures has led to ever more urgent calls, in both research and policy, to go beyond the study and incentivization of incremental change. Instead, many now agree on the urgent need for transformative change: achieving sustainable (safe and just) societies and ways of life will depend on rapid and fundamental change in the ways people interact with each other and with the natural environment.

The Belmont Forum, the New Opportunities for Research Funding Agency Cooperation in Europe (NORFACE) and ISC research programme on Transformations to Sustainability was created to contribute to this change. It aimed at restructuring the domain of sustainability research by putting the social sciences, as well as the humanities, at the heart of interdisciplinary research on sustainability, marking a step change in scale and scope for research programming in this area. Given the urgent need for action, the programme's main motivation was to explore to what extent these transformations are influenced by social, political and cultural practices and whether and how they can be successfully directed, governed or accomplished, by whom, to what end and with what consequences for different groups in society.

Towards that end, the research programme had two major objectives:

1. To develop understanding of and promote research on transformations to sustainability that are of significant social, economic and policy concern throughout the world and of great relevance to both academics and stakeholders.
2. To build capacity, overcome fragmentation and have a lasting impact on both society and the research landscape by cultivating durable research collaboration

across multiple borders and disciplinary boundaries, and with practitioners and societal partners. This includes facilitating the development of new research collaborations with parts of the world that are not often involved in large-scale international research efforts, notably low- and lower-middle income countries.

This report focuses primarily on the first of these goals, synthesizing the insights gained and the advances made in understanding of social transformations to sustainability by the funded research projects. As a point of departure, ‘societal transformations’ were defined by the programme as ‘profound and enduring systemic changes that typically involve social, cultural, technological, political, economic and environmental processes’ (Belmont Forum et al., 2017). It recognized that ‘[s]ustainability research needs to be based on a far better understanding of how such societal transformation comes about and how – if at all – it can be initiated, fostered or steered towards ends that are at the same time ecologically sound, economically viable and socially just’ (ibid).

1.2 Background to the second Transformations to Sustainability programme

The focus in this report is the Transformations to Sustainability Programme; more specifically, the second such international research programme (hereafter abbreviated as ‘T2S2’), implemented from 2018 to 2022. It overlapped with an earlier T2S research programme (‘T2S1’) implemented from 2014 to 2019. The T2S1 began with an initial project co-design stage with 38 seed grants awarded to research consortia to develop full proposals over a six-month period. In the subsequent main stage three international projects of three years’ duration, called ‘Transformative Knowledge Networks’ (TKNs), were funded. The International Social Science Council [ISSC, which in 2018 became the International Science Council (ISC)] coordinated that first programme with funding coming almost exclusively from the Swedish International Development Cooperation Agency (Sida). Funding for the seed grants and projects amounted to €3.7m (i.e., not counting programme coordination costs). That programme’s outputs were synthesized by Moser (2024).

Recognizing its successes and the continued need to further understand social transformations processes, a multinational funding consortium implemented the follow-

up research programme (T2S2) from 2018 to 2022. That programme – implemented as a Belmont Forum Collaborative Research Action in cooperation with the NORFACE network, the European Commission and the ISC with additional support from Sida – funded twelve international projects of three years’ duration. It was coordinated by the Netherlands Organization for Scientific Research (NWO), while other partners in the consortium were responsible, on a voluntary basis, for various ‘work packages,’ e.g., managing the calls for proposals and evaluation processes. The ‘Knowledge exchange and communications’ work package that supported cross-project interaction and learning (including this synthesis), communication and dissemination activities was principally managed by the ISC with support from the NWO. Funding for the twelve projects amounted to €11.5m (i.e., not counting programme coordination costs).

Both T2S programmes were explicitly intended to enable the social sciences to make their unique and necessary contributions to sustainability research, practice and policy, on the premise that the social sciences are critical to producing usable knowledge for sustainability, but to date have been far less supported in this area of research compared to the physical and natural sciences. The motivation behind both research programmes was furthermore the growing recognition of the following: the limitations of nationally funded and nationally focused research and of disciplinary, institutional and sectoral silos; the dominance of researchers and research traditions from the Global North; and the critical importance of working with different sources and types of knowledge, actors and institutions to understand problems holistically and to imagine, develop and implement just and widely acceptable solutions (see key findings in the World Social Science Report 2013,¹ which lays out much of this motivation).

While both programmes focused broadly on societal transformations to sustainability, the two differed in various institutional, thematic, organizational and programmatic ways that are not further discussed here. The interested reader is directed to Mukute et al. (2023), who produced a detailed comparison of the two programmes, with implications and recommendations for programme design.

¹ <https://en.unesco.org/wssr2013>

1.3 The five thematic and cross-cutting research foci of the T2S2 programme

The T2S2 programme had five specific thematic and research concentrations, detailed in the Call for Proposals (Belmont Forum et al., 2017). Thematically, the programme called for proposals with the following foci:

- Governance and institutional dimensions of transformations to sustainability;
- Economy and finance of transformations to sustainability;
- Wellbeing, quality of life, identity and social and cultural values in relation to transformations to sustainability.

In addition, projects were encouraged to address two cross-cutting themes, pertaining to the conceptual understanding and theory of transformation as well as on the approach to research and generating knowledge on transformations:

- Conceptual aspects of processes of transformation;
- Methodological innovation.

Appendix A offers a list of exemplary research questions on each of these themes and cross-cutting topics that proposals were encouraged to address.

1.4 Approach and inputs to this synthesis

The primary inputs to this synthesis are the written outputs from the twelve research projects. At a minimum, each project's contribution to special issues in *Current Opinion on Environmental Sustainability* and in *Global Environmental Change* contributed to this synthesis. All projects, however, delivered many more papers, reports, books and blogs that fed into this synthesis.

The outputs were read with a particular eye towards the five themes of the T2S2 programme. In addition, as project outputs were analysed, common themes, touch points, divergences and connections emerged that went beyond any individual project's

findings (further discussed in Section 3.1). These guided the organization and development of the integrative insights detailed in Section 3.

As a cross-check to the author's perspective, this synthesis further draws on original research conducted by (and used with permission of) the Emerald Network (John Colvin, Mutizwa Mukute and Jane Burt) between 2021 and 2022 – with guidance and feedback from the Advisory Group, made up of representatives from the funding consortium and the T2S projects. The Emerald Network undertook primary research, which was reviewed and integrated, as relevant, into this synthesis (see Box 1 for an overview of that additional information). In most instances, this additional information did not add to or diverge from the core points made here.

Box 1: Emerald Network's research informing this synthesis

A flexible and multipronged approach was used to elicit input to this synthesis from the projects to accommodate busy schedules during project implementation and conclusion:

- Elicitation of project insights, using a set of co-designed interview questions
 - Some project teams used those questions to discuss and coalesce their collective insights and provided a written document to the Emerald Network research team;
 - Other project leads offered their responses to the questions in interviews with the EN research team, which were recorded and transcribed;
 - For yet other projects, the lead/Principal Investigator provided written responses to the questions.
- Review of the two most important peer-reviewed outputs of projects (as identified by the Principal Investigators)
- Review of grey literature outputs of the projects, including blogs, reports and videos.

Eleven out of twelve projects responded to EN's elicitation of inputs.

1.5 Overview of this synthesis

Following these context-setting and methodological remarks, the report is structured as follows: Section 2 provides an overview of the twelve research projects, including some observations regarding their relevance to Agenda 2030 and the Sustainable Development Goals (SDGs) and the global coverage of the programme. Section 3 then presents integrative learning from the twelve projects, with each sub-section focusing on one of the three topical and two cross-cutting themes of the programme. Section 4 offers a brief synthesis and key take-aways, followed by references and appendices, which provide additional detail.

2. The twelve research projects – an overview

This section offers a brief overview of the funded research projects. More detailed information about each project can be gleaned from the programme website,² including short video vignettes of some of the projects.

The T2S2 programme funded a diverse set of interdisciplinary and transdisciplinary research projects, each led by one or more social scientists. Each project focused on a unique sustainability or development challenge, although all touched on other, related sustainability concerns. Table 1 gives a one-sentence summary of each of the twelve projects (a more detailed overview is provided in Appendix B).

² www.t2sresearch.org

Table 1: T2S2 project overview

Project name	Brief project summary
AGENTS	The project contributes approaches and analytical tools to catalyse recognition of and actual contributions of existing, but often scattered successful examples of protecting and governing biodiversity and landscapes in the Brazilian Amazon.
CON-VIVA	The project conceptually refines and empirically tests the prospects for one proposal for large-predator biodiversity conservation in Finland, USA, Brazil and Tanzania: convivial conservation.
Gold Matters	The project explores whether a transformative approach towards sustainability can arise in artisanal and small-scale gold mining in three locations in South America, West Africa and East Africa.
GoST	The project uses socio-technical imaginaries as a conceptual tool to make sense of how collective imaginations of transformation have determined past and present conditions and shape potential future transformations in energy, agricultural and urban digital infrastructure systems in Germany, India, Kenya, the UK and the USA.
H2O-T2S	The project analyses transformation processes in urban fringe areas of Indian cities, in particular how access to water as a consumption good and a resource for livelihoods is changed during the urbanization process in peri-urban spaces.
IPACST	As transformations to sustainability rely on innovation in complex systems, the project examines the role of intellectual property (IP) and IP rights (IPR) in sustainability transitions.
MISTY	This project integrates comprehensive insights on domestic and international migration across Europe, North America, Asia and Africa into theories of transformation to sustainability, recognizing both the positive and negative impacts of the movement of people.
SecTenSusPeace	Focusing on new approaches to land tenure registration in Burundi and eastern DR Congo, the project contributes to a better understanding of the challenges of local land registration and the recognition of claims in conflict-affected settings.
T2GS	The project comparatively studies promising grass-roots initiatives in groundwater governance in places where pressures on the resource are particularly acute (India, Algeria, Morocco, USA, Chile, Peru and Tanzania).
TAPESTRY	The project focuses on three patches of transformation in India and Bangladesh where, in the face of significant uncertainty, hybrid actor alliances use innovative practices to reimagine sustainable development and inspire societal transformation from below.

TRUEPATH

**Waterproofing
Data**

The project uses an innovative pathways approach to explore the global–local institutional dynamics that generate the dominant socially and environmentally unsustainable cattle development pathway in Nicaragua.

Waterproofing Data investigates the governance of water-related risks in various sites in Brazil, with a focus on social and cultural aspects of data practices.

Figure 1 shows how the projects addressed and contributed to 14 of the 17 SDGs.



Figure 1: Sustainable Development Goals addressed by the T2S2 projects. (Source: The author, based on project information)

Sustainability concerns addressed by T2S2 projects

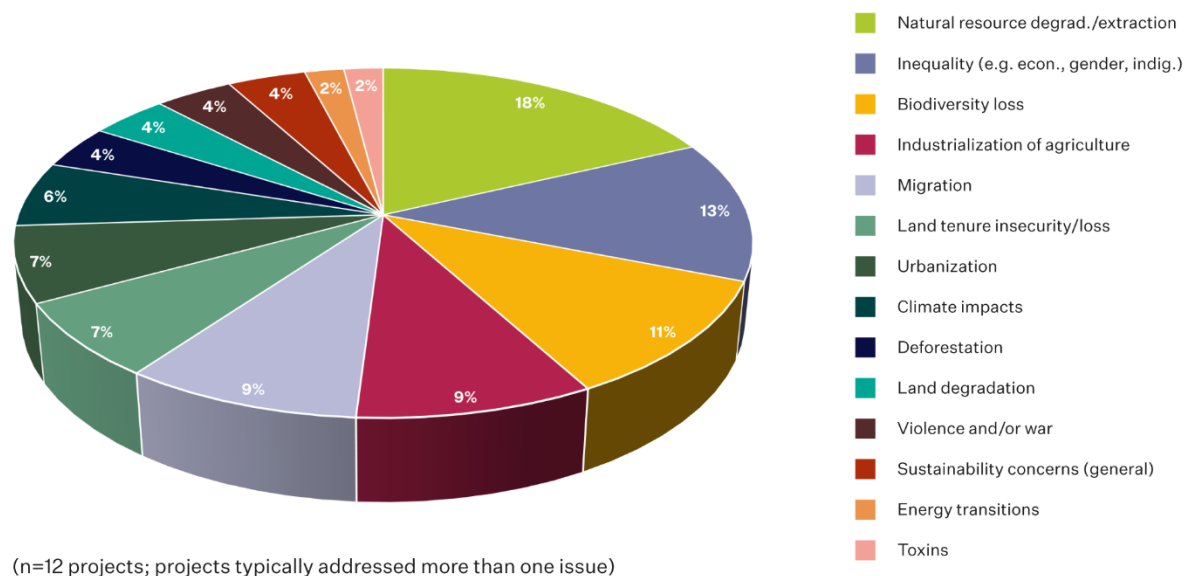


Figure 2: Sustainability concerns or states of unsustainability addressed by T2S2 projects.

(Source: The author, based on project information)

Importantly, most projects explored transformations from a situation of current unsustainability (Figure 2) towards greater future sustainability. Three projects (H2O-T2S, Gold Matters and CON-VIVA) focused primarily on better understanding the transformative forces that led to the current state of unsustainability, with lesser attention to, or fewer concrete insights into, how these forces would need to be re-oriented to produce more environmentally, economically and socially sustainable futures (Figure 3).

Transformations to sustainability

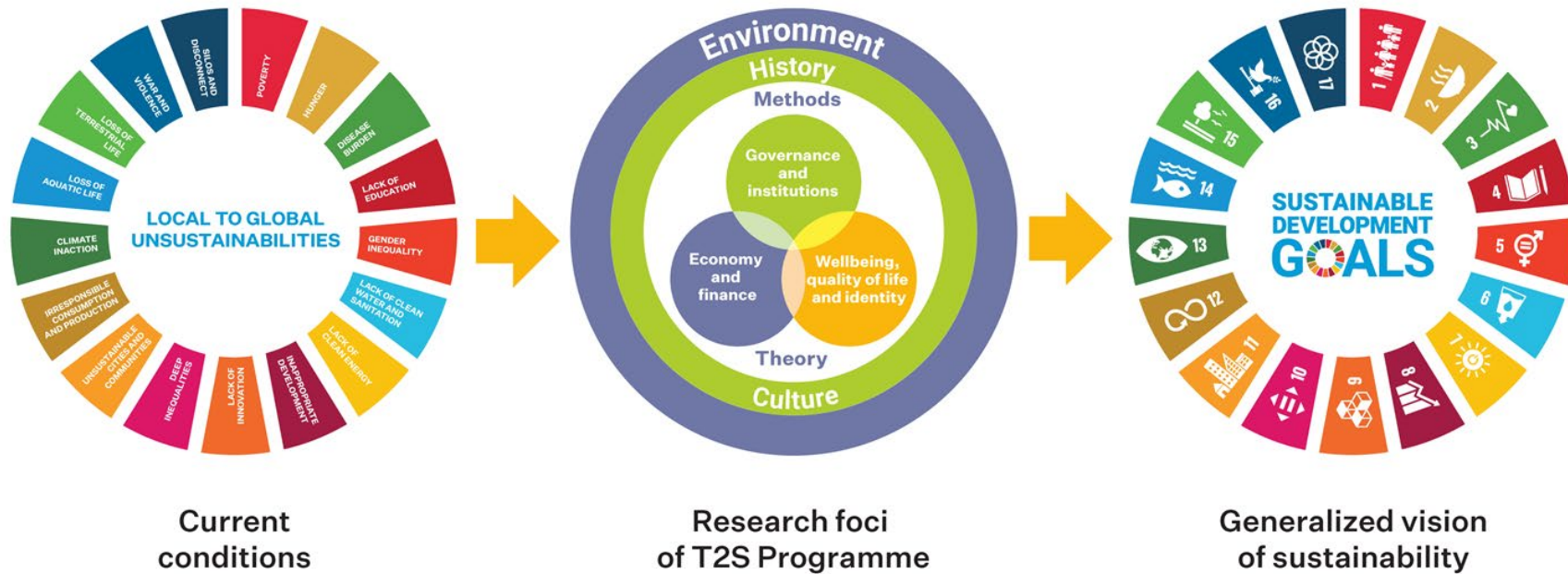


Figure 3: T2S2 projects examining societal transformations from unsustainability to sustainability through the programme’s three thematic and two cross-cutting lenses (Source: The author)

While the projects addressed at least one of the three themes and the two cross-cutting issues named in the Call for Proposals, they approached different aspects of the transformation challenge through different theoretical and/or conceptual lenses. Table 2 provides an overview of the research themes addressed and the emergent touchpoints among the projects. This, at once, makes it possible to coalesce the many case- and project-specific research findings around the five overarching themes, but also to have confidence in the robustness of these cross-project insights. This robustness is further strengthened by the fact that the research was carried out across a wide range of geographies, cultures and socio-economic settings. Figure 4 shows the locations of the project's research sites as well as the locations of the Principal Investigators' home institutions.

Table 2: Overview of T2S2 projects’ research themes

T2S2 CfP themes			T2S-funded projects	Sustainability concerns and research themes (with SDGs where applicable)																		
Governance (SDG 16 & 17)	Economy & finance (SDG 8, 9 & 17)	Wellbeing, values & identities (SDG 3)	Projects (in alphabetical order)	Sustainability (general)	Climate change & energy (SDG 7 & 13)	Biodiversity loss & conservation (SDG 15)	Natural resource degradation (SDG 15)	Freshwater (SDG 6)	Urban areas & urbanization (SDG 11)	Migration/mobility	Frontier dynamics	State-supported capitalist extraction	Land tenure (security) (SDG 16)	Precarity/uncertainty/violence (SDG 2, 8, 10)	Gender (SDG 5)	Imaginaries	Transformation as praxis	Emancipation/liberatory initiatives (SDG 4)	Complex transforming ecologies	Just & caring research approaches (SDG 17)	Politics & power issues in transformations	
x	(x)		AGENTS			(x)	X				x		x		(x)				X	(x)	x	
x	(x)	X	CON-VIVA			X	x			x	x	x							x		x	
x	x	(x)	Gold Matters				X	x		x	X	x	x	x	x	x			x	x	x	
x	x		GoST		x	(x)	x		x			x				X			x		X	
x	x	(x)	H2O-T2S			X		X	x	x	x		x	x	x				x		x	
X	X		IPACST	x	(x)														x			
x	x	X	MISTY	x					x	X				x					x		X	
x		x	SecTenSusPeace					x			x	x	X	X							X	
x	(x)	(x)	T2GS					X				x			X	x	x	x	x		x	
(x)	X	(x)	TAPESTRY		x		x	x	x	x				x		x	X	x	x	x	x	x
x	X	(x)	TRUEPATH				X				x	x				x	x		x		X	
x		x	Waterproofing Data		(x)			X	x					x					x	x	x	

Note: The table references the core programme themes that each project addressed (on the left), as well as the central sustainability concerns and emergent themes that were shared by at least two (independently developed) projects (on the right). Major themes are indicated by **X** (capital, bold); other important themes are indicated by x (small, normal font); finally, tangential themes within a particular project that relate to themes common to or significant in several other projects are noted as (x) (small, normal font, in brackets).

Social Transformations to Sustainability Through a Critical Lens



Figure 4: Map of T2S2 projects' research sites and location of researchers' home institution/affiliation (Source: The author, based on T2S programme information)

Table 3 summarizes this geographic information in a different form, revealing a somewhat uneven global coverage of the programme's research locales as well as researchers' home institutions.

Table 3: *Geographic representation in the T2S2 Research Programme*

World region	Researchers' institutions	Research sites	Notes
Africa	10	11	Most even distribution of researchers' institutions and cases studied across the African continent; only Tanzania had two projects doing case studies there.
Americas	9	12	Most researchers from the Americas are based in Central and South America, fewer from North America; the US and Brazil were case study sites for multiple projects.
Asia	6	4	Researchers from only three Asian countries participated in the programme, and both India and Bangladesh served as sites for two projects each.
Europe	29	10	European researchers dominated the programme by a large margin, even as far fewer European countries served as case study sites. Germany, the UK and Finland had two projects each doing work there.
Middle East	0	1	Only Syria served as a case study site; no researchers from that region were involved in the programme.
Other world regions	0	0	Vast regions of the world were not involved in the T2S programme, neither tapping their research expertise nor serving as case study sites (e.g., Russia, most of Eastern Europe, Australia, New Zealand, the entire Pacific region, China and East Central Asia).

Project leads in eleven projects were based in high-income countries;³ one project had two co-leads from India (a lower-middle-income country). In total, 75 percent (43 individuals) of all researchers listed as leads or co-leads on the twelve projects were from high-income countries. Of the remaining 25 percent, four came from upper-middle-income countries, eight from lower-middle-income countries and two from low-income countries.

These observations reflect the dominant international social science research funding situation, with the majority of funding commitments coming from the Global North. However, with broader funding coalitions, including Global South funders and different types of funders (e.g., development-focused public funders and private philanthropies), this traditional pattern can be successfully disrupted, as its predecessor programme illustrated (i.e., the ISSC/ISC-led, Sida-funded T2S1 programme, 2016–2019).

That said, the research projects examined a broad range of pressing sustainability concerns, most from a critical social science perspective, yielding mutually confirming insights across disciplines, theoretical lenses and world regions. These cross-cutting, integrative insights are detailed in the following section.

³ See up-to-date economic classification of countries provided by the World Bank at:

<https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

3. Key contributions: Advances in the study and understanding of societal transformations to sustainability

The T2S2 programme was implemented amidst the global COVID-19 pandemic. Far more than mere context, this disruptive and – for many around the world – devastating event unexpectedly and deeply shaped the research conducted in the programme. Not only did the empirical work originally proposed have to be radically adjusted; the disruption itself provided a lens on and insight into societal transformation processes. This synthesis thus begins with a discussion of several key innovations in the deployed research methodologies and the ways in which the research was conducted.

3.1 Research innovations

As detailed in Section 2, the T2S2 programme insisted on social science leadership. Also, as intended, five of the projects are multidisciplinary or interdisciplinary, while seven approached their respective topics collaboratively with societal partners in a transdisciplinary way. The latter was particularly encouraged in the Call for Proposals, and contributed to the capacity building goal of the T2S2 programme (see Mukute et al., 2023 for further discussion of this aspect). Here, three research innovations are highlighted, which stand out as significant programme achievements.

3.1.1 COVID-driven adjustments, innovations and ‘care-full’ research

While COVID-19 temporarily brought the world to a halt, it did not defeat the research programme. This bears mentioning, not just because it caused delays and required a few months of programme extension and institutional flexibility, but because it forced the researchers to rethink, be creative, adjust and – in some instances – reorient their proposed work. Even so, many of the projects relied on and were able to employ well-

established social science research methods (Figure 5), even though they traditionally required direct contact with research participants (e.g., ethnographic field work involving interviews and focus groups, participatory observation, workshops and mapping activities and transect walks). Others used historical analyses and secondary data analysis, and most used mixed-method approaches. As is quite common for social science research, few projects used experimental or modelling approaches, with some notable exceptions. A couple of projects conducted their research in conflict-affected regions of the world – a challenge above and beyond ‘normal’ social science field work, but also made more challenging in some ways by COVID-19.

Regardless of such methodological choices, each project was forced in one way or another to adjust their research protocols due to lock-down periods, travel restrictions, the need for social distancing and the distractions researchers and their research participants experienced from the multitude of additional demands (e.g., child and elder care, home schooling, the strain of constant online communication and virtual/on-screen engagement). Ultimately, this had the lasting impact of having now well-established technologies and modified research methods available to conduct human-subjects research in face-to-face and virtual ways. While virtual engagement might not be desirable in many instances, the pandemic showed its feasibility, and sometimes even its strengths, in reaching certain populations.

For several research teams the disruptions and stresses of the COVID-19 pandemic resulted first and foremost in an embodied recognition of the need for ‘care-full’ research approaches, i.e., research that does not add to further stress and exploitation, but foregrounds care and concern for the wellbeing of research participants and researchers themselves (e.g., Zwarteveen et al., 2021; Mehta et al., 2022; Calvillo et al., 2023, Albuquerque et al., forthcoming; Parthasarathy et al., forthcoming). While in and of itself not new (but called for by, especially, feminist scholars for some time), care for each other in the research process emerged as an important theme from multiple projects. This meant, for example, humanizing the research process by adding team care, personal check-ins even in professional contexts, shortening online engagements with team members and research participants, and helping research participants with their primary needs before asking for their input into the research projects.

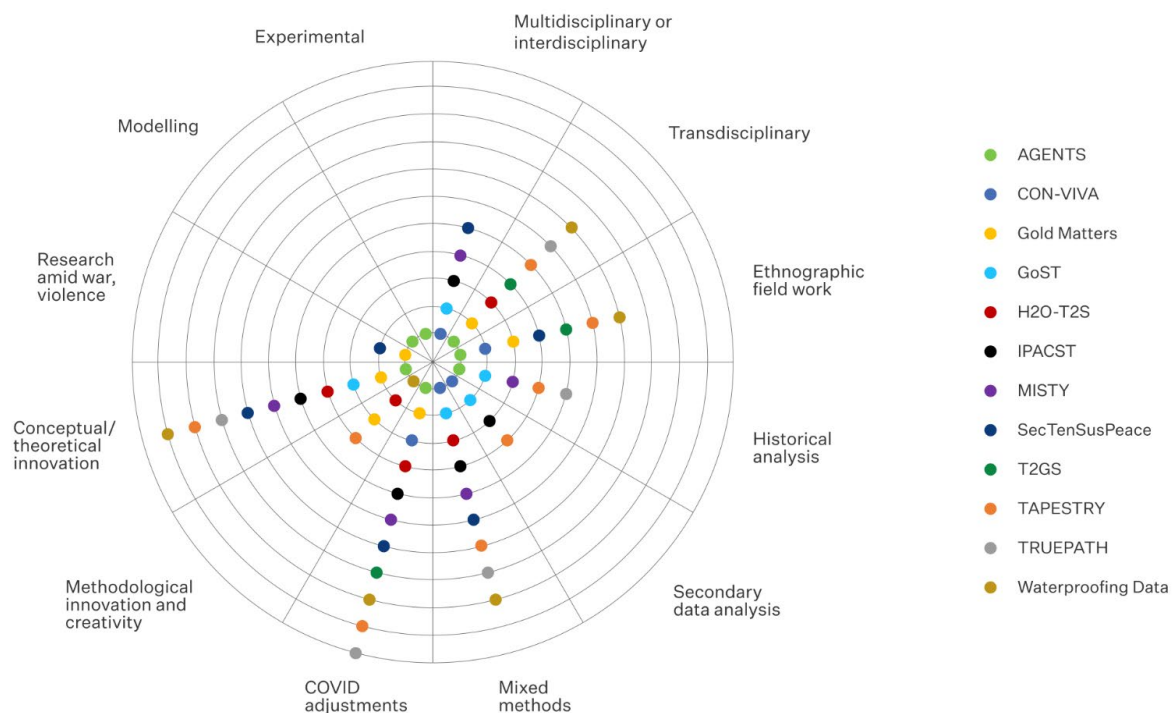


Figure 5: Overview of T2S2 projects' research approaches and methods (Source: The author, based on project information gleaned from projects' publications)

Some project teams had to delay or drop field work. Even when research projects could move forward, however, teams tangibly changed their approaches to the circumstances created by the pandemic. Commonly, engagements with research participants shifted from the intended in-person approach to increasingly available online platforms (from the simplest, e.g., WhatsApp interviews, to the more demanding, e.g., Zoom focus groups or Miro Board group interactions). Several researchers noted the benefits of having had well-established relationships of trust with research participants and partners, which made that shift relatively easy. For teams that did not have such pre-existing relationships, establishing new relationships with others was significantly more difficult, delayed or could not be accomplished – thus causing more significant shifts in the research projects.

While these types of adjustments are not unique to the T2S2 programme, it highlights that the pandemic, despite its hardship, was also a time of unplanned, surprising innovation and creativity, an important – and maybe hopeful – observation about research amid global crises.

3.1.2 Innovative methods

A few projects contributed methodological innovations beyond this general research and programme adaptability. The Waterproofing Data project, for example, worked towards truly emancipatory relationships in its citizen science work, acknowledging that engaging with the ‘other’ and ‘the world’ is ‘risky’ in that people – researchers and citizens – must make themselves vulnerable to being changed (Albuquerque and Almeida, 2020; Calvillo et al., 2023). The project also worked innovatively to make data visible in new ways, enabling novel ways of data interactions and sharing ‘data stories’ to enable engaged actors to see previously invisible, yet feasible alternatives, and in that way use data to inform, initiate and enable transformation pathways (Albuquerque et al., forthcoming).

The H2O-T2S project was also methodologically innovative in multiple ways: while the team had pre-pandemic plans to integrate value analysis, political ecology and adaptation pathways into the Delphi method, doing all this with asynchronous virtual engagement of experts and non-experts only emerged due to the pandemic (Luft et al., 2022; Gomes et al., 2023a, 2023b). Together, these modifications significantly opened up the method for other applications.

Several other projects were particularly creative in integrating art and creativity into their social science methods, including TAPESTRY, which used photovoice and arts-based methods in their engagement (Mehta et al., 2021; Parthasarathy et al., forthcoming), as well as Gold Matters, which produced lengthy documentary films of small-artisan gold miners – something only possible because of pre-existing, trusted relationships with their research participants. Also, Waterproofing Data used the arts and humanities in caring engagement of its research participants (Calvillo et al., 2023), developed a participatory mapping tool (Klonner et al., 2021) and developed a ‘data diary’ method to better understand actual data use practices (Tkacz et al., 2021).

3.1.3 The emergence of a critical transdisciplinarity

Possibly the most interesting research innovation is not one named by the projects themselves in these terms, but one recognized by them as needed. Nearly all projects adopted, as mentioned above, a 'critical social science' lens in their research (see Box 2 for a brief description of critical social science below; and Table 2 above).

That normative stance, in and of itself, is not novel in the social sciences nor in sustainability, global environmental change or development research. Several of the projects are exemplary of it (e.g., CON-VIVA, MISTY and GoST). Often in the past, however, such critical social science has remained somewhat aloof or at a distance from practical application and policy relevance; it also did not directly engage in a knowledge co-production process with those in positions of power or authority, even if they interviewed such individuals. Those T2S2 projects that adopted a transdisciplinary, engaged research approach deviated from this more conventional critical social science and in so doing helped further the shift towards a more concretely useful, but simultaneously critical and emancipatory science. The cross-project reading of outputs thus suggests the emergence of what might be called a 'critical transdisciplinarity.'

What does a critical transdisciplinarity imply, and how it is different from transdisciplinary work that does not necessarily challenge the deep structures of dominance implicated in the ordering of contemporary society? Traditionally transdisciplinary (co-designed and co-produced) knowledge production is aimed at being more responsive to practitioner needs than curiosity-driven science (Hirsch Hadorn et al., 2008; Brown et al., 2010; Brandt et al., 2013; Gross and Stauffacher, 2014; Klenk and Meehan, 2017; Belcher et al., 2019; Bergmann et al., 2021). Neutrally interpreted, this does not confine participants involved (including researchers) to particular political ends. Most scientists using transdisciplinary approaches are, in fact, motivated by having greater impact on policy- and decision-making, and thus become adept at navigating existing governance and political systems to achieve that kind of impact. While at times critical of existing policies or practices, system-critical interventions that challenge the fundamental power hierarchies and social orders are almost anathema to being effective in the policy-making systems in question, however.

Box 2: Critical social science – a brief definition

Critical social science combines the constructivist explanation of social reality with the emancipatory goal of trying to address social ills and injustices. It has a liberatory interest in knowledge; typically views phenomena in their historical context; often focuses on explaining social struggles and social relations of domination and oppression (which is reflected in prevailing social structures); and is normative in that it establishes, implies or assumes a vision of how things should be (Watts and Hodgson, 2019; Massarella et al., 2021) or at least how public debate should be opened up to include more voices and visions of the future (Lövbrand et al., 2015).

Critical social science (including critical data science) often examines existing situations through the dialectical relationship between structure and agency, recognizing that society is always in a state of change (sometimes even transformative change), and that there is always a plurality and instability of meaning. Contrary to revolutionary or (eco-)fascist thinking (which imposes change on others), critical approaches aim to be empowering to the oppressed (Wyly, 2009). They view people as responsible for their own lives and their own liberation, not with a blaming kind of assignment of responsibility, but with the ever-present assumption that they can emancipate themselves, given enough knowledge, conscientization, capacity building for greater agency and solidarity and support from allies.

Various branches of critical theory have informed the social sciences over the past few decades, including the anti-capitalist, anti-classist writings of the Frankfurt School; feminist, anti-racist and queer writings; and anti-colonial liberation theories. Each of these focuses on different oppressive forces and thus offers alternative routes to throwing off the confining shackles of the oppressed. What unites them, however, is their commitment to challenging taken-for-granted values, assumptions, power structures and approaches to social ordering imposed by those in positions of dominance, and then pluralizing and politicizing experiences and debates (ibid.). The T2S2-organized 2021–22 Special Issue in *Current Opinion in Environmental Sustainability* constitutes an important contribution to the critical social sciences (Fisher et al., 2022).

The CON-VIVA project (although a non-transdisciplinary project) drew on O'Brien et al. (2013) to articulate this challenge well when it noted that critical social science works as follows:

'to promote what is referred to as "axial" change. Axial change is defined as breaking through the status quo by questioning the entire system, in order to identify novel and radical approaches to change. It is contrasted with "circular" change, whereby new things are tried, but within the same hierarchies of knowledge and power' (Massarella et al., 2021, p. 82).

Rather than 'merely' trying to make science more useful to decision-making (without questioning policy goals), i.e., to provide input to inform effective decision-making during planning, implementation and management, a critical transdisciplinary social science would need to challenge the taken-for-granted assumptions, values and power structures underpinning existing policy and practice and interrogate the complex linkages between social, political, economic and environmental change and whatever is unjust about existing policy and practice. Analytically, it can help to politicize and pluralize debates and propose and support alternative approaches to transformative change, working either within existing structures to shift social power, empowering alternatives found at the margins of society or by breaking with dominant systems through participating in political struggle (adapted from Massarella et al., 2021, pp. 81–82).

However, building trust and workable relationships with those in positions of power – the very power that has led to negative environmental and/or social consequences for impacted areas or populations – only to then question the very hierarchies and ways of thinking that perpetuate such situations is tricky at best. It is a courageous and risky move to not just work together towards 'circular solutions' inside existing hierarchies and paradigms, but to maintain a system-critical stance *while* constructively engaging with societal partners to work together towards axial change.

Projects varied in their approaches of doing so, either by working primarily with those disadvantaged by the current/dominant system (e.g., TAPESTRY, T2GS, AGENTS and

Gold Matters) – a more commonly found research–practice allyship – or by (also) engaging representatives of those in positions of power (e.g., SecTenSusPeace, TRUEPATH and Waterproofing Data). This deep immersion in spheres of power and politics had nearly all projects recognize ‘the politics of transformations’ – not just as a theoretical or mere conceptual recognition, but as an experienced tension-filled space. Working to empower, and giving space to, those usually not heard or involved in such political and decision-making processes; finding politically resonant ways of reframing and visioning alternative futures; lifting up the experiences and voices of the marginalized; fostering actor coalitions; and producing evidence of feasible, alternative pathways were some of the arrows in the quiver of ‘transformative labour’ (Moser, 2024) used by the projects.

In conclusion, the research teams were generative and creative in their projects – both intentionally and by necessity – when the COVID-19 pandemic required significant adjustments. The methodological adaptations and innovations leave a permanent impact in the extant research community. The wedding of robust yet critical social science with transdisciplinary co-design and co-production of knowledge, however, points to a more significant shift in social scientists’ allyship with marginalized groups in society, maybe even a slow, but progressive transformation in science, in which political engagement and rigorous knowledge production no longer constitute opposites.

3.2 Conceptual understanding of processes of transformation

The second set of insights to coalesce from the twelve projects’ discoveries and achievements concerns advances they made around the conceptual understanding of the processes of transformation. First, this will focus on definitional advances; then, three repeatedly occurring threads will be highlighted: the role of precarity and uncertainty in transformations; the power and politics of transformation; and what stands out as the most important conceptual advance regarding the ‘what’ of transformation.

3.2.1 Definitional advances

In many spheres of science and practice, ‘transformation’ has become a buzzword that signifies little more than any other kind of change. However, to transformations scholars who carefully consider the depth and complexity of change, transformation has long come to mean a profound and permanent shift in the fundamental ways in which systems function (see the general definition provided in Section 1). The T2S2-funded projects all started from that basic understanding, but refined and put nuances into it.

Importantly, to contextualize these added nuances, most projects were place-based and took a bottom-up perspective on transformation processes, which – at once – provide a thick, detailed ‘inside-of-transformations’ perspective and – as the TAPESTRY project, particularly, noted – make it difficult at times to see the arc of transformation unfold or produce transformative outcomes. This is particularly true (as many other scholars and the TKNs in the T2S1 programme also found) for short research projects studying transformations that take much longer to complete.

What the T2S2 projects contributed to the definitional understanding of transformations is complexity and a sense of open-endedness that existing definitions disregard and maybe even avoid. Most projects defined transformation in the context of their projects, taking systems dynamics seriously, but mostly steered away from ‘systems language.’ Instead, they saw transformations as having the following characteristics:

- Rather uncontrolled, emergent processes, resulting from complex forces interacting in context-specific ways (Gold Matters);
- Non-linear, non-teleological fundamental change (T2GS);
- The result of co-evolutionary interactions of multiple complex, dynamic, evolving systems (social, institutional, cultural, political, economic, technological and ecological) (MISTY);
- Substantial, profound and fundamental change, requiring a paradigm shift in how humans relate to and manage the environment (CON-VIVA);
- A fundamental shift in human and environment interactions and feedbacks, typically with a longer-term orientation and gradual mainstreaming of new behaviours, cultures and practices (Waterproofing Data);

- Broad-based, pluralistic and relational processes;
- Risky processes, whose outcomes are not predictable or assured (SecTenSusPeace);
- The emergence of more environmentally and socially sustainable ‘alternative pathways’ that have the potential to challenge the hegemon of dominant pathways (TRUEPATH).

Nearly all projects recognized these drivers, forces and processes as plural and power-laden, thus necessarily political and politicized, whereby some work in cooperative, mutually enabling manners, while others function in rather conflicting and mutually inhibitive ways. This plurality of forces and of their interactions causes the unpredictability of outcomes of transformation processes.

Already, these definitional refinements indicate that transformations are much more than matters of technological innovations and economic transitions, and that it requires far more than policy interventions to steer systems in new directions. Uncertainty about any of these forces, their interactions and outcomes is thus a dominant feature of transformations. They are always multidimensional, multitemporal and rarely monodirectional or reducible to a single essential driver or element, as the GoST project made clear. Consequently, there is no simple way to drive, phase, contain or direct them. Each of these insights are elaborated in the following sections.

3.2.2 The prevalence of precarity and uncertainty

At least half of the T2S2 projects reported working in places that were (and are still) characterized by significant precarity and uncertainty (see Table 2 above). Most of them could be described as ‘frontier’ environments (AGENTS, Gold Matters, CON-VIVA, H2O-T2S, SecTenSusPeace and TRUEPATH), notable for the rapid transformative processes underway there (e.g., urbanization, deforestation, resource extraction and migration), for the economic insecurity for many people living and working there as well as – in several instances – for land tenure insecurity, violence and war.

These socially, culturally, environmentally and economically destabilized situations provided not only deep insight into the distant global drivers of largely negative local transformations (i.e., towards unsustainability), but also offered important insights into the challenges to and conditions for transformations to sustainability.

First and foremost, as particularly the TAPESTRY project pointed out, such situations of precarity and uncertainty offer windows of opportunity for transformations to sustainability (Mehta et al., 2021). As old systems are being destabilized and superseded, possibilities open up to create something new. These destabilizing times and situations do not necessarily suggest a turn to ‘the better’ (whatever that might mean to those involved – likely different things to incumbents versus innovators, and to dominant elites versus marginalized groups of society). They simply imply an opportunity for change that did not exist when systems and their supporting institutions were well established and stable, patterns of behaviour were habituated, traditional cultural ways were widely accepted and socio-environmental conditions tolerated. In this time of opportunity, institutional voids, gaps, confusions, overlaps and disconnects are commonplace. They enable and often produce transformative processes but also characterize the entire transformative arc more broadly. In short, one might think of transformations themselves as transitional spaces or ‘frontiers.’

As the Gold Matters project established, shocks and crises (including, for example, the COVID-19 pandemic) are common reasons behind this precarity, something many of the artisan gold miners they studied had grown accustomed to (Pijpers and Luning, 2021). Similarly, as TAPESTRY, AGENTS, CON-VIVA and H2O-T2S found, new institutions spring up; new entrepreneurial actors emerge while those not embracing the new situations fade into the background, their traditional livelihoods, resource uses and rights decline, or people migrate away (e.g., Luft et al., 2022; Fletcher et al., 2023; Gomes et al., 2023b). It is in those situations of upheaval, uncertainty and precarity that science–practice allyships with the marginalized and/or the progressive forces in society become crucial to help elevate the prospect of transformations to sustainability, to lift up unheard voices and generate alternative visions, to enable and empower those whose rights to a dignified life have been ignored. This, however, means engaging the power dynamics at play, and stepping into the politics of transformation.

3.2.3 Power and politics of transformation

While many have stated so before, it bears repeating what the T2S2 projects found again and again: transformations – whether to unsustainability or to sustainability – are never just matters of technological progress, simple (much less uncontroversial) legal or policy interventions or even of better alignment of market incentives. Rather, instances of transformation are sites of contestation among the plural drivers and forces that might push for one or another kind of change. Different values, belief systems, worldviews and interests are at stake – which is not surprising in and of itself. Only surprising is how long both scholars and policy-makers have insisted on, or wished for less contentious recipes for change.

This theme was emphasized by the vast majority of T2S2 projects, and several explored these political dynamics in detail. Almost all that did explore the historical roots of power hierarchies and politics. Most expanded this exploration beyond the local (or regional and national) political dynamics to illustrate how local and state elites often are the handmaidens to and/or enablers and beneficiaries of a global neoliberal capitalist extraction apparatus, silencing the needs, rights and aspirations of local and indigenous populations.

SecTenSusPeace, for example, explored in ethnographic detail the question of whether widely proposed land tenure registration systems could create greater land tenure security and thus be an instrument of peace-making in conflict-ridden regions. The team showed, however, that below the ‘official politics,’ there is an ‘everyday politics’ of institutional competition, elite manipulation and capture that can thwart such hopes as power holders use the uncertainties surrounding land tenure insecurity and institutional voids to create novel institutional arrangements for their own benefits. This, in turn, reproduces inequities, perpetuates longstanding injustices and thus offers no prospects for lasting peace (Leeuwen et al., 2023). TRUEPATH also explored power dynamics and politics in detail and showed how different forces (and associated belief systems and values) around agricultural land-uses cooperate and reinforce each other, while others conflict and work at cross-purposes, thus inhibiting transformative changes to sustainability (Romero et al., forthcoming). GoST explored in various case studies (e.g., industrial agriculture in Germany and nuclear energy in the UK) how widely visible as

well as clandestine elites, respectively, can decisively direct the trajectories of societal debates over agricultural and energy transitions (Johnstone and Stirling, 2020a, 2020b; Polzin, forthcoming). By contrast, TAPESTRY showed how local actor alliances can come together to successfully challenge dominant power structures (Parthasarathy et al., forthcoming). Likewise, the AGENTS project lifted up numerous examples of positive transformative initiatives in the Brazilian Amazon in which cross-scalar actor coalitions built capacity, provided mutual support and aligned with or gained support from higher-level policies and administrative and financial support to persist against dominant forces driving deforestation. Waterproofing Data similarly showed how conscientization, fostering literacy, capacity building, inclusivity and co-production of knowledge can succeed in changing decision-making dynamics.

More generally, then, the projects refined the understanding of transformations as frontiers where old meets new, and as sites of intense power struggles where incumbents and new entrants try to win dominance over ideas, epistemologies, aspirations, meanings, cosmologies, material conditions, social relations, governance approaches and institutions, technologies and resource flows. Each of these aspects is not isolated from the others. Rather, as the next section will show, they form deeply interrelated ‘ecologies’ that are at the core of *what* is being or must be transformed in order to move towards greater sustainability and equity.

3.2.4 Complex transforming ‘ecologies’

Maybe the most striking shared insight across the T2S2 projects – and independently gained – pertains to the complex, entangled aspects of what is subject to transformation. Projects focused on different scales, sectors, resource or land uses and units of analysis; they involved or studied different actors; and they explored transformations in different economic or development contexts. So, one might expect few commonalities across these widely varying situations. Yet, the cross-project analysis revealed a common thread that suggests something important for the understanding of transformations, and at once lays the foundation for the discussion of governance and attempts at steering transformations towards sustainability.

Nearly all projects focused on or discovered a bundled set of historically rooted and interdependent structures, conditions, processes, actors and imaginaries, which they named in different ways, yet which constituted the focal point of their exploration of transformations. In dynamic systems terms, one might conceive of them as ‘attractors’ – certain quasi-stable states resulting from the interplay of dynamic forces – that are recognizable to observers, and that organize system behaviour in decisive ways. As contextual conditions, drivers, needs and aspirations change, these incumbent constellations are no longer stable or adequate, and are pressed towards new complex states. Alternatively, one might frame them as complex ‘ecologies’ of factors that stabilize situations or systems but which can be transformed from one state into another, if internal and external forces align to enable such a profound change. Table 4 lists and defines these focal points of analysis for each of the relevant projects.

Table 4: Core concepts developed by T2S2 projects on complex transforming ecologies

Project*	Complex ecology	Description
CON-VIVA	Production– protection nexus	Denotes the site of interaction (often struggle) between those multiscale forces that wish to transform natural areas for agricultural and other ‘productive,’ profit-generating land uses and those that wish to protect those same areas for species diversity (specifically, as habitat for large predators) (Fletcher et al., 2023).
Gold Matters	(Gold) lifeways	Encompasses how gold and its extraction are embodied in lived experience, including viewing gold as a resource, a relational phenomenon that draws together matter, social organization, land and mineral rights, technology, capital and infrastructures, in processes of extraction across different spatial and temporal timescales (Fisher et al., forthcoming).
GoST	Imaginaries, infrastructure ecologies and multidimensional system disruptions	Imaginaries are defined as ‘collectively held, institutionally stabilized and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology’ – drawing on Jasanoff and Kim (2015) in Beck et al. (2021). The team explored their role in shifting complex socio-industrial ecologies (e.g., ‘infrastructure ecologies’)

Project*	Complex ecology	Description
H2O-T2S		(Johnstone and Stirling, 2020a) and showed the inadequacy of focusing narrowly on niches or sectors in transition theory (Johnstone and Stirling, 2020b).
	Waterscapes and hydro-social cycle	The core logic behind ‘waterscapes’ is that flows of available water follow the laws of physics in a landscape produced by the laws and institutions of society (Butsch et al., 2021). The hydro-social cycle sees a recursive relationship between water and society, both shaping each other and the practices that link water and society (Butsch et al., 2021; Luft et al., 2022).
T2GS	Overflow, bricolage and hydro-sociality	Overflow describes the always only partial adherence of actors to only one system, narrative, set of cultural values or rules. It attempts to capture the reality that actors constitute their reality by simultaneously participating in multiple ‘worlds’ (Dominguez-Guzmán et al., 2023). Bricolage (or tinkering) is used here in contrast to the command-and-control approach to groundwater management; it recognizes and supports instead a community-driven, caring approach to groundwater management, which emphasizes practice, relationality and justice and takes the mutually constitutive relationship between water and its users (hydro-sociality) seriously (Zwarteveen et al., 2021).
TAPESTRY	Patches of transformative praxis	Actor alliances and their transformative initiatives that challenge dominant trajectories of development and that reconfigure relations of power and knowledge are viewed as ‘patches,’ ‘seeds’ or ‘socio-ecological bright spots’ for improving environmental conditions and human wellbeing; they can serve as potential templates for reimagined human–nature relations under climate change uncertainty and as exemplars that inspire transformative change amidst largely unsustainable conditions (Mehta et al., 2021).
TRUEPATH	Territories and territorial pathways	Territories are understood as interactive, partially unintentionally governed complex systems in which the state is a particular political actor with multiple interests. ... a material-relational space apprehended and shaped by social groups with a proximity that fosters their ability to coordinate actions, share ideas and aspirations. ... defining

Project*	Complex ecology	Description
Waterproofing Data		its boundaries is itself a political process. Social structures, rules and norms, and ideas and culture interact in these spaces to create unique ‘currents’ of preferred livelihoods, ideas and visions of the future, around which actor coalitions build to work towards desired directions (territorial pathways) (Bastiaensen et al., 2021).
	Data practices (elaborated as data gardening, pollination and diaries)	Data practices are actions through which digital artefacts are generated, transmitted/circulated, changed and used in practice, considering different scales, actors and types of data and the interrelationships among them (Albuquerque and Almeida, 2020; Porto de Albuquerque et al., 2021; Tkacz et al., 2021; Horita et al., 2023; Albuquerque et al., forthcoming).

* Projects in alphabetical order.

AGENTS, IPACST, MISTY and SecTenSusPeace are not listed in this table because they did not explicitly conceptualize the *what* of transformation in terms of a ‘complex ecology’ of factors and forces. AGENTS, however, deduced and modelled the factors that characterized successful transformation initiatives, which could be understood in this ‘ecological’ way (Londres et al., 2023). IPACST explored various components of such ‘ecologies,’ such as intellectual property rights (IPR) and their role in the transition to a circular economy, in firm activity systems or in the well-established use of the (sustainable) business model canvas (Hernández-Chea et al., 2020a, 2020b; Eppinger et al., 2021). MISTY linked thinking about sustainability transformations to migration (the transformation–migration nexus), and in so doing, for example, expanded the understanding of ‘immobility traps’ but did not develop a construct comparable to those listed in Table 4. Finally, SecTenSusPeace explored the entangled institutional, political, economic and socio-cultural forces that prevent the emergence of land tenure security and peace, but did not name them in a way comparable to the complex transforming ecologies described by other projects (e.g., van Leeuwen et al., 2021).

Some observations from the cross-reading of Table 4 emerge: for example, some of these complex constellations convey both a physical space, site of struggle or grounding in concrete geographies (such as ‘patches,’ ‘territories,’ ‘waterscapes’ or

even ‘production–protection nexus’ and ‘lifeways’) and a more abstracted interaction of forces, actors, ideas and material flows that manifest in these places. While all of them imply these distant forces reaching and playing out in specific spaces (‘overflow’ and ‘imaginaries’), many of these concepts convey a sense of hands-on work or local practice (‘transformation as praxis,’ ‘bricolage/tinkering,’ ‘lifeways’ or ‘data practices’) to foster (as well as resist) deep change. All of them, in their extended definitions, point to the relational (‘ecological’) nature of these mutually reinforcing complexes of factors and forces. The projects in this way convey that transformation is not so much about ‘moving’ a system from one state to another. Rather, transformation is, or requires, a kind of ‘disentangling’ (more or less forcefully) of deeply interrelated components that constitute phenomena and lived experiences, as well as a caring/careful reconstituting or at least learning to live in and with newly forming ‘ecologies.’

While transition theory has long focused on ‘niches’ as spaces or constellations in which transformation occurs, the T2S2 projects considerably expanded this notion in at least four ways:

- Beyond technological or economic innovation contexts to a **wide variety of socio-environmental and socio-industrial applications;**
- Beyond the local/enterprise/business or even sectoral scale to a **multiscalar phenomenon shaped by local and global forces;**
- Beyond the simplistic linear (or cyclical, periodic) trajectory of transformation towards the more realistic, **multifactor and messy movements of simultaneous, but not necessarily synchronized and aligned transformational processes;**
- Beyond the somewhat mechanistic, controlled technocratic interventions in a clearly bounded system towards a more **humanistic read of people struggling to make a meaningful, just and ecologically-sustainable life.**

In summary, reckoning with these complex ecologies makes clear why it is often so difficult to ‘disturb,’ ‘disrupt,’ ‘destabilize’ or ‘unmake’ incumbent situations and move them wholesale towards a transformed state. Not only do individual components of these ecologies transform at different paces; some help, some hinder, some push and pull, while others create a drag on the transformative momentum. Together then, these

contributions to a better understanding of ‘what’ is subject to transformations has significant implications for the ‘how,’ which will be discussed in the next section.

3.3 Governance and change strategies for transformations to sustainability

All T2S2 projects, in one way or another, addressed the programme’s theme of governance and the question of how to foster or steer transformational change. As a point of departure, it serves to recall the power-laden, political nature of transformations to sustainability as discussed above, in which norms and values of societies, economies and cultures are at stake (Section 3.2.3), as well as the refined understanding of the complex ecologies that are to be transformed (Section 3.2.4). They hold two important implications for the question of governance and intentional advancing of transformations processes. First, the idea of (or wish for) a neatly controlled steering or governing of transformations to sustainability may well be out of reach. But this does not mean that transformation to sustainability is purely emergent and cannot be fostered or nudged at all. Rather – and this is the second implications – to the extent such deliberate nudging is possible, both formal and informal change strategies are typically necessary for tipping the preponderance of forces towards greater sustainability and equity. The deeper the transformative shift aims to be, the more important these informal strategies seem to be. This section will discuss these arguments in turn.

To begin looking at governance in more detail, it serves to synthesize how the projects thought of governance. Governance, in the broadest sense, is understood as the activity of governing a situation and the associated system of formal and informal institutions (i.e., the rules and norms developed to organize relationships, rights, responsibilities, interactions and transactions) for doing so (adapted from Chakraborty, 2021). The T2GS project conceived of governance even more comprehensively as overlapping spheres of knowledges, technologies and institutions (Zwarteveen et al., 2021). In several of the frontier-situated projects, where formal governance mechanisms were found to be weak or absent, the emphasis was particularly strongly on the informal governance mechanisms. For example, Gold Matters viewed governance as the emergent patterns of self-organization of actors to stabilize functioning of mining operations (Fisher et al., 2021). On the other end of the spectrum, IPACST – with its emphasis on IPR – was

almost exclusively focused on formal institutions (especially, legal instruments to support economic transitions) (Hernández-Chea et al., 2020b; Eppinger et al., 2021).

3.3.1 A critical view of governance and governments

The T2S2 programme's thematic emphasis on governance could be read in various ways, but the exemplary questions offered in the Call for Proposals (see Appendix A) suggest a predominantly 'benign' perspective on governance. This is to say, governance is presented as a necessary and supportive, enabling, guiding, incentivizing or steering mechanism for moving through transformations towards sustainability, equity and peace.

That point was raised most forcefully by the GoST project, which questioned the simplistic (and often hegemonic) assumptions of a governable transformation process (see also Section 3.3.2). Governance, the team argued, assumes a level of control that real-world cases of transformations do not really afford, given their complexity and dynamics. Thus, the project criticized such simplistic socio-technological imaginaries⁴ of transformations as not only not fitting reality (i.e., notions of linear unfolding of transformations to sustainability disregarding the more complex intertwining of social processes), but as being hijacked by hegemonic forces and ways of thinking that undermine and do not capture the possibility of more complex, more progressive forms of change that originate from and are perpetuated by actors and politics outside these simplistic conceptualizations and discourses (Arora and Stirling, 2023). Stirling et al. (forthcoming) thus argued for critically examining such imaginaries to transcend their otherwise restricting features.

SecTenSusPeace added similarly critical cautionary notes about the supposedly benign nature of governance, by bringing awareness to the discursive power of technical optimization and of technocratic interventions, as it tends to reduce policy-makers' engagement with questions of fairness in process and outcomes, and renders invisible the political choices these require. The project also made the important observation that the very attempt to want to engineer, steer, manage or control transformation is

⁴ See Section 3.3.2 for a discussion of imaginaries.

political, and hides the politics at the same time. The authors warned against underestimating the risk of elite capture and institutional competition accompanying the design and implementation of transformations; and against downplaying the level of risk involved and the possibility of unexpected outcomes of transformations (van Leeuwen et al., 2021).

Nearly all the ‘frontier’ projects showed through their historical, contextual analysis of their cases, how the state is often unhelpful or incapable of enacting sustainability policies, but sometimes also an active enabler of the extractive forces that produce the unsustainable conditions in evidence. They found that national policies, economic incentives, weak regulation and oversight and other governance mechanisms often serve to support the very economic activities that lead to exploitation, environmental degradation, conflict and injustice (i.e., unsustainability), rather than to socio-environmental improvements for its populations and environments. Thus, *undoing* existing governance mechanisms may be an important element of supporting transformative change. The CON-VIVA project, for example, called for a dismantling of the forces that produce human–wildlife conflicts by ceasing the problematic existing institutions, including forms of knowledge production, wildlife management practices, imaginaries and underlying power structures and assumptions about ‘right’ human–nonhuman relations, i.e., by unmaking the constraining incumbent structures (Fletcher et al., 2023).

To point out this complicity of governance in unsustainability may be unnecessary, but it reinforces the idea that transformations are deeply political, and that governments themselves are not just neutral or transformation-oriented arbiters of such political struggles, but themselves vested political actors that often hinder, rather than support transformations processes.

Beyond this fundamental questioning of the benign nature of ‘governance,’ many projects laid bare failures of governance (especially, of governments) to create, support and maintain the conditions for ecological sustainability, environmental safety, public health, justice, peace and secure livelihoods for all, or to rectify negative situations.

Some commonly found governance failures the following:

- Lack of oversight and enforcement;
- Lack of formalization of economic activities, practices and land/resource ownership conditions through clear and effective regulation;
- Top-down control that ignores the lived experience of people;
- Delays in decision-making;
- Siloed approaches to governance, resulting in redundancies, ineffective services, action incoherence, conflicts and stifled progress on sustainability and related matters;
- Jurisdictional complexity and governance vacuums, i.e., institutional voids, gaps and inadequacies of technocratic approaches to governance when adaptive leadership and governance is needed – *sensu* Heifetz et al. (2009).

Frontiers, in particular, were found to be places of institutional weakness, if not failures, where traditional institutions were unfit to manage the complexity and fluidity of rapid changes and emergent realities. The H2O-T2S project, for example, found peri-urban regions to be spaces where formal and informal institutions shape governance. There, traditional institutions were found to be inadequate or weakened and overpowered by the demographic, economic and land-use shifts underway. In this institutional fluidity and void, new informal institutions emerged (even if they were not yet powerful enough to be effective) (Butsch et al., 2021, p. 17). Gold Matters also found frontiers to be places of informality and self-organization, i.e., where alternative, informal institutions and governance mechanisms emerge in place of weak or absent formal state institutions (Fisher et al., 2021).

In summary, examining critically the role of governance as a force for progressive, transformative change, the projects made clear that (1) traditional governance structures are often implicated in *unsustainability*, so should not be expected to help make transformative shifts towards sustainability, at least not voluntarily and on their own; (2) traditional formal governance institutions are often weakened in sites of transformative change, where in their stead new, informal governance mechanisms emerge; and (3) to understand and make use of governance as a transformation-supportive force, one must take uncertainty, frontier dynamics, power struggles, politics

and contestation seriously, i.e., not sweep such contestation and institutional weakening/emergence under the rug as irritating distractions, but view them as sign and signature of transformative change and use a multipronged approach to grapple with these complicated legacies to create conditions for more progressive change. This, however, also requires grappling with divergences in visions of the future, and with the level of agency and control societal actors may have over transformations.

3.3.2 Transformative imaginaries and the illusion of control

Several of the T2S2 projects took up the topic of imaginaries (including Gold Matters, T2GS, TAPESTRY and TRUEPATH), and for one (GoST) it was the central research theme. Loosely defined (drawing on all relevant projects to be inclusive), ‘imaginaries’ are collectively held visions of the future (either wishful or frightening), with underlying symbolic meanings, values, narratives, emotions and ideals that simultaneously open and constrain, and instrumentally shape, the realm of possible actions to create it. As Bazzani (2023, p. 387) notes, ‘imaginaries can influence the course of action in three ways: by de-routinising it, by helping individuals cope with uncertain futures and by fostering projective agency capacity.’

This basic understanding helps in recognizing the critical importance of imaginaries for shaping possible futures. Imaginaries – made conscious – render the past questionable, the present malleable and the future tangible. Depending on whether future visions are desirable/utopian or frightening/dystopian, imaginaries can be empowering or paralysing to the actors that hold or confront them. As such they become instruments of (de)mobilizing agency. This basic understanding of imaginaries makes clear why they themselves are sites of intense political contestation over the direction of transformative change. The T2GS project, for example, explored the power of imaginaries in this regard – a particularly interesting case because groundwater is invisible, thus always subject to constructivist imagining. The project contrasted the technocratic, top-down imaginaries with the bottom-up, community-driven caring approaches to detecting, tending, sharing and restoring groundwater. By making these bottom-up imaginaries visible, the project argued, public discourses can change: alternatives to the status quo become imaginable to a broader set of actors and serve as seed for governance transformation as well as the forming of coalitions, capacity building and advocacy

necessary to achieve it (e.g., Cleaver et al., 2023; Kuper et al., 2023; Underhill et al., 2023).

Similarly, CON-VIVA stressed the importance of different imaginaries in shaping potential futures of human–wildlife relations: visions of exclusion of large predators from human-occupied spaces lead to one set of policies, economic activities, financial mechanisms, land-use arrangements and biodiversity outcomes, while visions of human–wildlife co-existence in shared geographies lead to another (Massarella et al., 2021, 2023). The H2O-T2S project also showed how people in peri-urban areas hold different imaginaries of the future, and how this has deep ramifications for the governing institutions, economic policies, forms of assistance and socio-economic and environmental outcomes one might expect to see or that are necessary (Chakraborty, 2021; Gomes et al., 2023a). Finally, the GoST project (with its specific definition of imaginaries, see Table 4) explored their role in specific cases [e.g., the German *Agrarwende* (agricultural transformation), the energy transition in the UK and Germany and urbanization and related digital infrastructures in Kenya], showing how imaginaries as sites of political contestation can have decisive influence over the direction of societal evolution (Johnstone and Stirling, 2020b; Cairns et al., 2022; Polzin, forthcoming).

More generally, however, the GoST project questioned commonly held socio-technical imaginaries of the transformation process itself. Typically, transformations are depicted as monotonic, unidirectional, progressively changing smooth curves from an unsustainable status *ex-ante* to a more sustainable state *ex-post*. Such simplistic imaginaries of the transformation process appear predictable, and thus controllable. Stirling et al. (forthcoming) emphasized how all such deterministic approaches to transformations to sustainability, seeking generalizable applicability and axiomatic understandings, reflect an underlying authoritarian imagination of change, and that this impulse must be critically questioned. The authors argued that under such assumptions, transformations are believed to be controllable and often steered by incumbent authorities or actors, scales or levels of governance with the (unspoken) goal of reproducing hierarchies of social order (including siloed sectors of societal activity and government policy-making). Such imaginaries retain a narrow focus on regimes and systems but leave contextual formations like capitalism, modernity, coloniality or patriarchy unattended to.

While real-life transformations do not comply with such simplistic linear depictions, and instead are far messier, the stylized linear imaginaries perpetuate, at best, wishful thinking and the ‘modernist fallacy’ of governing transformations in some controlled way (Mehta et al., 2019a; see also Stirling, 2019; Underhill et al., 2023; Stirling et al., forthcoming). At worst, they stifle transformative impulses and leave change efforts superficial, partial or all together ineffective vis-à-vis sustainability and equity goals, i.e., incapable of achieving progressive ends.

3.3.3 Change strategies within scales

If the desire to govern, steer or control transformations processes is unmasked as hegemonic overreach or modernist fantasy, then what remains for shaping or influencing deep change? The research projects navigated an interesting dialectical tension in answering this question. On the one hand, they insist on transformations as emergent, rather than controllable, deterministic processes; on the other hand, they maintain considerable space for intervention and agency. On deeper examination, this tension dissolves into a simultaneous truth: just as the fluidity of water from its constituent gaseous elements, oxygen and hydrogen, is an emergent property, water would never come into being if the two were not brought into contact with each other. In other words, what and who gets included and considered in the transformation process will serve – to use another metaphor – as ‘imaginal cells’ in the larva, i.e. as progenitors for what ultimately emerges from the metamorphosis of a butterfly. In the same way, what future outcomes exactly result from a transformation process is unpredictable and emergent. However, parameters can be set, processes designed and desirable ingredients (e.g., values, worldviews, imaginaries and actors) can be put into the mix to be part of them. This is where agency and influence over transformations are located.

The projects created, discovered, participated in, supported and recommended a number of strategies aimed at shaping transformations processes. They are categorically grouped here (following Moser, 2024) as follows:

- **Visioning and lifting up alternative imaginaries:** With the strong focus on future visions and alternative imaginaries, numerous projects helped with or argued for lifting up imaginaries of environmental sustainability, equity/justice

and peace that run counter to the dominant ones, to broaden public discourse and considerations of pathways to the future. TRUEPATH inquired into the preferred futures of different agricultural actor groups in Nicaragua; TAPESTRY engaged local communities in envisioning and shaping their local environment; T2GS listed up alternative visions of governing groundwater to counter ineffective top-down management approaches; and H2O-T2S engaged experts and non-experts in visioning adaptation pathways.

- **Naming and reflecting on existing conditions:** Documenting and naming unsafe, inequitable, unsustainable conditions, conducting research that ultimately validates local and indigenous knowledge and practices, and reflecting on the values and worldviews that led to the current state of discontent, was a common strategy to help initiate or change sustainability conversation. This baseline assessment also lends itself to inquiries into the values and goals that should guide future activities instead. Waterproofing Data created a citizen science project to map and reflect on local flooding risks to start such conversations with people not otherwise engaged in flood management. Gold Matters not only documented the precarity of small-scale artisanal gold miners, but once trust was established, respectfully inquired into their concerns about participating in a toxic, extractive and ultimately unsustainable lifeway.
- **Creating transformative spaces:** Several projects created – despite COVID-19 restrictions – spaces for dialogue and engagement, to give voice and visibility to people marginalized due to structural inequalities, to initiate dialogues and enable a reframing of dominant discourses. This opened space for them not just to air discontent, but to learn of non-dominant approaches to address sustainability challenges. TAPESTRY, T2GS and Waterproofing Data did just that to create generative and empowering ideas for addressing local problems, and pluralize management approaches and diversify data inputs, respectively; T2GS also aimed to use such spaces to decolonize modernist versions of governance and to pluralize approaches, and question paradigms and limited knowledge about groundwater management.
- **Fostering agency and empowerment:** Especially for actors marginalized and disregarded by dominant government and economic forces, education, empowerment and enabling people to take action to shape their own futures are critical elements of shaping transformations. Ultimately, it is the work of

engaging and changing power asymmetries. Both TAPESTRY and Waterproofing Data were rooted in Freirean liberation pedagogies and thus saw education and political conscientization as routes to empowerment; AGENTS noted the importance of grass-roots organizing and forming mutually enhancing alliances as critical ingredients in successful local initiatives, as well as that of deliberate alignment of actors (e.g., for the co-production of new ideas, new knowledge or action plans was a way of mobilizing people).

- **Enacting steps to change conditions:** Where actors feel empowered, taking concrete steps to change their conditions, transformation becomes more outwardly visible. Gold Matters documented, for example, how in the absence of functional formal governance, those at the frontier self-organize to manage the complex challenges of their situations; AGENTS saw actors diversify their partnerships or help groups by aligning financial means and technical assistance around positive imaginaries. Several other projects offered concrete action steps, even as they were not yet being implemented. For example, IPACST proposed various strategies (Eppinger et al., 2021, see their table 1) to address the known IP-related barriers to accelerating the transition to sustainability; MISTY suggested concrete ways to overcome the siloed nature of migration and sustainability policies (Zickgraf et al., forthcoming).
- **Caring, tending and learning:** Finally, most projects described significant investment in relationship building and tending, learning together (including from ‘failures’) and caring for the people and environments involved. TAPESTRY documented cases where local communities took the initiative to clean up and revive their local environment. AGENTS suggested that explicit mechanisms be built to assist learning and reflection, so that the new things being tried can be evaluated for their value and impact; T2GS made caring central to the groundwater governance approaches it found preferable to the more traditional top-down ‘command and control’ approaches. It advocated for recognizing, legitimizing and supporting place-based approaches of caring for and sharing of aquifers via solidarity and collective action, and learning from the wisdom, technologies and institutions that communities have devised or experimented with for a long time. T2GS saw in these caring approaches ‘inspiration for new groundwater imaginaries, cosmologies and moral-ecological rationalities’ (Zwarteveen et al., 2021, p. 91). Most of all, projects insisted on care in interacting

with people during the research process, especially under the often-encountered conditions of precarity and long histories of extractivism and exploitation.

These sets of activities that the projects and their societal partners engaged in make clear that moving towards sustainability, equity and peace – that is, away from the dominant pathways that produce unsustainable conditions – takes deliberate and sustained effort. Typically, incumbents do not voluntarily yield their privileges, powers, benefits and resources to make room for alternatives. Thus, much of the work that can and must be done to affect transformative shifts happens against the resistance of those in positions of power. Regarding the complex transforming ecologies and the multidimensional trajectories of change discussed in Section 3.2.4, it is possible to see how the transformative interventions listed above act on different aspects and – even within any one spatial scale – on different time scales. Some of them change more quickly and easily than others, producing unpredictable interactions of ‘imaginal cells’ – some of which align and reinforce each other, while others stall in unfavourable conditions. Interventions from other (higher) levels can help transformative ‘seeds’ take hold and scale up and out.

3.3.4 Change strategies across scales

Several projects offered specific suggestions for change strategies aimed at scaling transformative initiatives by extending cross-scale support, resources and reach. The ability to provide such cross-scalar support, of course, presumes that there are higher-level actors and institutions (e.g., government entities, businesses, regional institutions, funders, boundary organizations and national or international NGOs) that are interested, willing and able to lend genuine support to transformative initiatives.

Value-aligned NGOs and researchers (i.e., non-state actors) appear to play a particularly important role in this regard, as they can bring valuable perspectives, resources, tools and attitudes to such partnerships with local transformative initiatives. While this to some extent instrumentalizes researchers (particularly engaged researchers as those in the T2S2 projects) and advocates in the context of transformations to sustainability, it can also be taken as an empowering statement about the potential value of the work of these actors. Others with the capacity and

resources to cross scales, as discussed in Section 3.3.1, may be more suspect as potential partners. Clearly, to engage across scales with non-local partners is thus always risky, and it is useful to have trusted partners that can help critically examine and assess whether such a partnership is indeed helpful or a potential trap. As the AGENTS project found, staying anchored in considering local needs and remaining vigilant and committed to ongoing reflection and learning is necessary to avoid and resist co-optation and elite capture.

Assuming that helpful cross-scalar partnerships can be established, what strategies have projects found to be particularly useful in helping local initiatives take hold, expand, scale out and scale up? Using a complementary set of categories to those offered in the previous section, the following emerged from the research projects:

- **Linking to broader visions of sustainability:** Local visions of sustainability are, at best, microcosms of larger-scale visions for a thriving Earth community. In their particularity, however, they can become insular and not match up with other communities' visions, and in turn require coordination and adjudication with others to be realized. Alternatively, local communities might feel isolated and alone and may benefit greatly from knowing of others' inspiring visions. Such linking up, learning and mutual inspiration is critical for building advocacy coalitions and social movements. It is also important for linking local efforts together in somewhat coordinated ways and accounting for national and global trends. H2O-T2S, for example, spoke to the important need for regional governance structures to ensure that peri-urban development takes a sustainable trajectory, since powerful urban stakeholders can overpower less powerful rural stakeholders and governance structures in their attempts to maintain viable livelihoods.
- **Learning from comparable situations:** Relatedly, local groups can benefit greatly from the experiences of others in comparable situations but often lack the capacity and resources to learn about such efforts. Allies with insights into such relevant experiences from other locations, sectors or contexts can be exceedingly helpful in bringing useful lessons to the local scale (and vice versa). MISTY, for example, used the COVID-19 pandemic to learn from a few case studies about the differentiated needs in internal versus international migrants

during times of crises (e.g., how they experienced isolation, separation from family, the inability to access transportation or green spaces, the particular challenges around mental health and lack of access to government support like economic stimulus packages). Such insights can serve to inform broader public health, economic, environmental and immigration policies for other crises in the future.

- **Creating transformative alliances:** Recognizing the relational nature of transformation processes, one of the most critical strategies at any one and across scales, is to bring people with different capacities, perspectives, insights, knowledge and expertise together to expand horizons and change perspectives on what is possible. TAPESTRY found that forming diverse transformative alliances of partners with complementary skills and capacities was important for scaling out and up; in the same way, MISTY recommended that increasing the diversity among staff in government agencies, including international and internal migrants, is a comparable way to diversify perspectives in government entities so that the lived experiences of affected constituencies are better accounted for in higher-level policy and decision-making.
- **Building capacity and greater sense of empowerment:** The need for capacity building at higher levels of social organization and government is as important as it is at the community level. However, as a cross-scalar strategy, the emphasis here is on using the larger capacity and resources at higher levels to offer capacity building to local-level entities and groups. AGENTS, emphatically called for ‘capacity building to the point of independence,’ and also suggested higher-level or external groups could usefully provide access to conflict resolution. MISTY suggested empowering migrants to participate in local democracy and on advisory boards, encouraging migrants’ entrepreneurship, and diversifying participatory processes to link, practically, migration and sustainability policy-making.
- **Establishing supportive policy, funding and governance mechanisms:** Of course, policy, funding and revisions in governance to address observed governance weaknesses and failures are among the commonly called for strategies to help support, strengthen and expand local transformative initiatives. It bears repeating that this should be viewed and approached with vigilance and caution, given the frequently noted complicity of governments and

governance in unsustainability, and the dangers of elite capture of transformative initiatives amidst uncertainty, fluidity and confusion. That said, there are typically some allies at higher levels of governance who can mobilize resources in support of lower-level initiatives or who can forge strategic political coalitions to advance progressive policy initiatives. AGENTS offered a number of specific success factors where higher-level policy levers were engaged to help lower-level initiatives succeed, including long-lasting support to avoid ‘pilot project syndrome,’ rule enforcement, legal recognition, building infrastructure for market access of local initiatives, formal natural resource management agreements, commercial development schemes, community-based/driven management schemes and associated funding; both AGENTS and SecTenSusPeace argued for assistance with land tenure security, fraught as it is with politics and risks; MISTY advocated for addressing vertical disconnects in policy to better meet migrants’ needs (e.g., through working groups and other cross-departmental ways of collaborating, providing overarching guiding policy that forces everyone to consider both sustainability and migration issues at the same time, inclusionary policies, addressing environmental justice, and working towards integrative governance through multiple approaches); finally, GoST made the convincing case that technological disruptions/innovations are never enough to achieve transformative shifts, but instead require co-occurring market and policy/regulatory disruptions as well as actor alignment to make a breakthrough, each offering multiple levers or entry points to help nudge systems from incumbency to a novel state.

- **Establishing cross-scale alliances and learning mechanisms:** Finally, while the projects did not use the language of ‘care’ as a cross-scale strategy *per se*, the equivalent here is the frequently repeated call for allyship with the marginalized, tending to relationship across scale and aligning internal and external actors; using partnerships to maintain vigilance against elite co-optation/capturing processes for their own interests; and establishing explicit mechanisms for learning to accelerate transformative action and course correct as needed.

In summary, the change strategies compiled in Sections 3.3.3 and 3.3.4 were organized by the types of activities first identified in the synthesis of the T2S1 programme (Moser,

2024). Together, these categories of activities constitute the transformative labour necessary to bring about deep change. Figures 6a, 6b and 6c place them into a coherent framework, in which transformative labour *within* a given scale is related to equivalent forms of transformative labour *across* scales. It conveys the importance of complementarity of activities taken to advance transformative change ‘from below’ and ‘from above,’ while remaining vigilant towards and guarding against capture by incumbent elites. While recognizing the massive momentum of climate, environmental and demographic change as well as the relentless dominance of extractive interests, strategic deployment and expansion of these change strategies by a multiplicity of actors – rather than mere reliance on limited or counterproductive governance mechanisms – might help stem or at least slow the tide of destructive change.



Figure 6a: Types of transformative labour in dynamic relationships with each other, and how they can be scaled



Figure 6b: Assuming that helpful cross-scalar partnerships can be established, projects have found these corresponding higher-level strategies and activities to be particularly useful in helping local initiatives take hold, expand, scale out and scale up

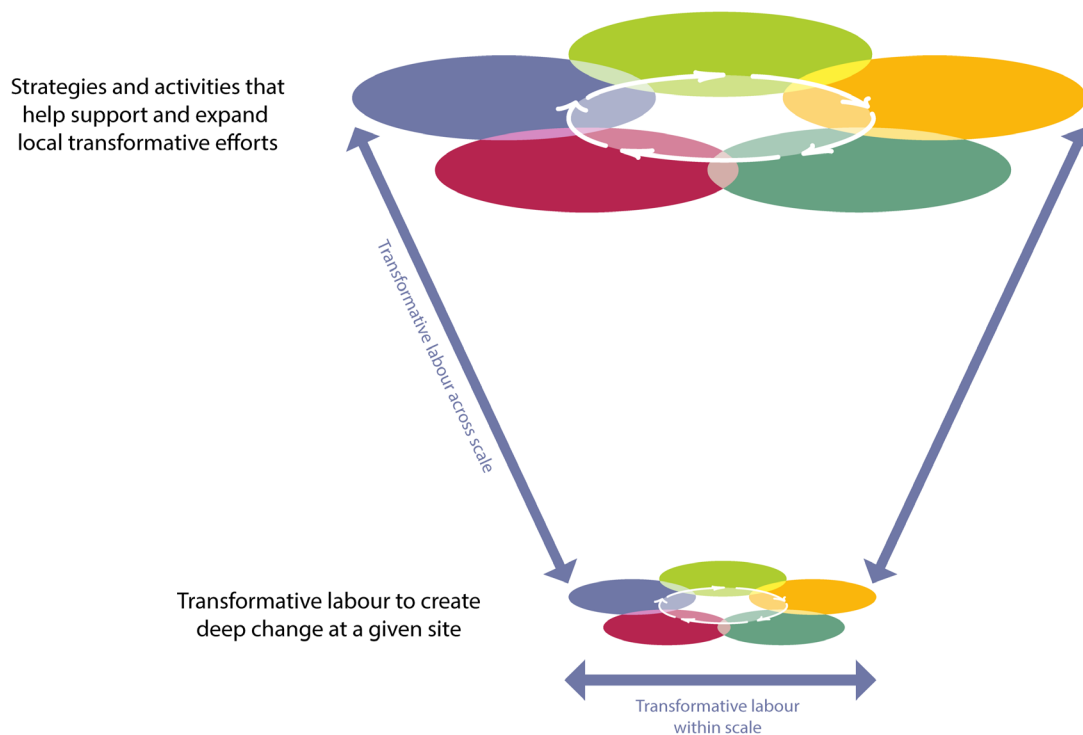


Figure 6c: The connection between transformative labour and strategies needed to bring about deep change within scale and across scale

3.4 Economy and finance of transformations to sustainability

Similarly to the theme of governance, the T2S2 programme was interested in economic and financial visions and mechanisms that might advance transformations to sustainability. The exemplary questions (listed in the Call for Proposals, see Appendix A) only indirectly acknowledge that the existing, dominant economic system(s) is (are) implicated in the current state of *unsustainability*. Instead, these questions, too, suggest an underlying assumption that the economy and its associated institutional apparatus could be – if sufficiently tweaked – a force for good. This section, again, explores this idea through a critical lens.

3.4.1 Economic drivers of unsustainability

As noted earlier, most projects touched on the economic drivers of the current state of affairs, the environmental and social contradictions in the dominant economic system and the enmeshment of the state with capitalist (or, more generally, extractive)

interests. Much of this is deeply engrained since at least colonial times and current economic activities often thrive on the legacies of colonial/imperial extractivism. Projects observed how these large-scale economic drivers often overwhelm small-scale efforts to develop alternatives unless they are somehow shielded from or supported in their evolution long past the point of being pilots. This clearly points back to the necessity of relevant state governance mechanisms that can serve these protective or shielding functions. Often, however, projects found precisely these state institutions (particularly in developing-country contexts) too weak to direct economic development in socially and environmentally positive directions.

For example, the H2O-T2S project examined in detail how economically and financially powerful actors take advantage of peri-urban spaces and direct transformations for their own benefit and profit, largely without regard for the rural occupants of the urbanizing places (Butsch and Heinkel, 2020). GoST found similar patterns of state–industry enmeshment in German industrial agriculture and in post-colonial urbanization in Kenya (Cairns et al., 2022; Polzin, forthcoming). In addition, that team’s research revealed deeply hidden, strategic-military interests pursued by the state (in this case, the UK) in maintaining the incumbent unsustainable technology of nuclear power, slowing down or even hindering economic, industrial and technological transformations towards renewables (Johnstone and Stirling, 2020a). In short, neither the existing dominant economic actors nor, in most instances, the state are truly invested in an ecologically restorative, socially just version of sustainability. Instead, the interest in sustainability is rather shallow, often meaning little more than sustaining economic profits (with attendant political benefits) for elites and incumbent industries. By implication, state elites would need to extract themselves from the paradigmatic, ideological, political and financial benefits they derive from being enablers of capitalist extraction to become an agent of social justice and environmental protection (i.e., transformation). While projects observed that initiatives develop alternative economic activities, they typically remain isolated islands of greater self-determination but often seek tie-in into the larger market economy, again rendering themselves vulnerable to these dominant forces. The next sections describe some of these entanglements and mechanisms to support economic alternatives to emerge and become more firmly established.

3.4.2 Helpful and unhelpful economic entanglements

The Gold Matters project described – in parallel to the self-organization of governance – a self-organization of finances in the artisanal, small-scale mining sector. Researchers in that project also spoke to the ever-important driver or constraint of indebtedness of small-scale miners and the vagaries of gold prices, both of which tie them in often vicious cycles to capitalist financial markets and mineral trade (Lanzano and Arnaldi di Balme, 2021). These observations, however, point to potential levers, such as local/regional banks, debt relief and cooperative approaches to funding mining, although they were not explored at this stage of the research.

The debt theme – and the implied need for upfront investment in many economic activities – was also addressed by the TRUEPATH project, which examined the role of green microfinance in transformations to sustainability (Huybrechs et al., 2019). The researchers argued basically, that while promising, green microfinancing only plays an assistive role in transformation if it is used with a systemic outlook and power-sensitive approach; as with all tools, its transformative potential depends on the values and worldviews that are brought to its use, both by lenders and borrowers.

GoST spoke to the entanglement of political and economic governance mechanisms. It emphasized how regulation is deeply linked with policy and politics; and thus can help or hinder innovations and technological or market disruptions (Johnstone et al., 2020). In other words, while one may wish to focus on economic or fiscal levers to assist transitions to greater sustainability, the complex ecologies that must be transformed demand attention to the other components of the systems at issue.

The MISTY project also explored economic entanglements in their research, focusing on the link between migration and sustainability – the ‘migration–sustainability paradox’ (Abu et al., forthcoming). At the heart of this paradox is the fact that migration is often a sign of multidimensional unsustainability in the places from which migrants originate, but that, under certain conditions, migration can also positively contribute to sustainability, both in the source and in the destination regions. The financial (and social) remittances of migrants back to their communities of origin constitute one of the mechanisms by which migrants contribute to sustainability to the regions of origin.

When the flip side of entanglements – isolation – prevails, migrants (especially international migrants) can experience severe negative socio-economic impacts of precarity in the places where they settle (Fábos et al., forthcoming). These observations, the authors suggested, point to a variety of targeted socio-economic policies that can help migrants be a positive force for sustainability, first and foremost to develop both (im)migration and sustainability policies in an integrated fashion (see also Section 3.3.4).

3.4.3 Fiscal and related institutional levers in support of sustainability transitions

Against the backdrop of dominant extractive market forces and complex entanglements, the question arises of what, if any, interventions can assist transformative efforts or increase the likelihood of their success. A few projects directly addressed the question of market or financial levers (often, again, linked with or articulated through legal agreements or regulatory mechanisms) that could be moved to advance transformations in the direction of greater sustainability. One, CON-VIVA, noted monetary schemes used to compensate people for livestock losses experienced when large predators take domesticated animals on which farmers, ranchers or ecotourism operators depend. These financial compensations are intended to increase rural populations' tolerance of wildlife but they do little, they argue, to question why such human–wildlife conflicts emerge in the first place (such as due to expansion of agriculture into wildlife habitat) nor do they question belief systems and values underlying human–wildlife interactions (Fletcher and Toncheva, 2021; Massarella et al., 2021; Fletcher et al., 2023). This approach might be seen as falling into the larger category of payments for ecosystem services – i.e., economizing benefits derived from nature either because they have intrinsic or instrumental value to humans.

The AGENTS project focused, as noted earlier, on initiatives that appeared to be successful in developing alternative, more environmentally sustainable and socially just economic activities, identifying the factors that helped them succeed. The research team found that long-term funding support, combined with capacity building, and establishment of the necessary infrastructure to assist local initiatives with market access were among the most important facilitative conditions (Brondizio et al., 2021;

Londres et al., 2023). This multidimensional approach might be seen as an example of finding a helpful balance between sheltering from and yet linking to (and maybe scaling) transformative initiatives in non-transformed, incumbent contexts.

Finally, IPACST, one of the few projects that addressed the economics and inner dynamics of competition within capitalist enterprises and industries most explicitly, offered a variety of strategies that aim at green innovation and nudging industries towards greater sustainability. To do so, the project focused on one particular lever – namely, IPRs – and associated financial/profit motives that hinder the spread of sustainable technologies. The team explored how IPRs can serve as the vehicle by which these profit motivations can be affected, such that businesses would consider investing in and sharing technological innovations with others to speed up their within- and cross-industry adoption (Hernández-Chea et al., 2020b, Vimalnath et al., 2020a, 2020b; Eppinger et al., 2021). Among their concrete suggestions are establishing IPR standards like widely available safety standards, developing non-discriminatory licences and non-voluntary licences for green technologies to broaden their uptake, creating incentives to share IPRs for sustainable technologies between incumbents and new entrants, establishing institutional mechanisms and standard licensing terms as well as supportive negotiations to facilitate cross-industry IP transfers and additional research, knowledge co-production and capacity building to support IP clarifications in circular economy schemes (Eppinger et al., 2021). The team also suggested innovative approaches to integrating IP concerns in sustainable business model canvases (Hernández-Chea et al., 2020b). All these ideas could become actionable in short order and assist in making industry, manufacturing and other businesses more sustainable. However, these within-system approaches do not question the large macro-economic drivers or paradigms underlying the dominant economic system.

In summary, the discussion in this section illustrates again the deep complexities of the systems that are being, or need to be, transformed to move towards greater sustainability, their multidimensional and multiscalar entanglements, and the inherent contradictions they reflect. This brings into focus the ever-present tension in transformations research between the intended or desired depth of transformation on the one hand and the limits of feasibility and impact that any one initiative (or research project) might face on the other. Scientists working in this space need to critically

examine their own ideological commitments and assumptions when they recommend (or co-design together with their societal partners) certain ways forward. It surfaces the inevitable questions of normative stances and guiding values, as well as the pragmatic need and capacity to contain or undermine dominant forces.

3.5 Wellbeing, quality of life, identity and social and cultural values in relation to transformations to sustainability

The final theme of the T2S2 programme was directly and centrally addressed by the fewest projects (compared to the governance and economy themes), but several projects addressed it as a minor or tangential theme, and all of them did so implicitly. This may be explained in part by the disciplinary backgrounds (e.g., there were no psychologists among the project leads or principal investigators) and the theoretical lenses projects brought to their topics, but also by the generally critical social science approach with its normative stance and foci. Moreover, the exemplary questions offered in the Call for Proposals (see Appendix A) were quite a diverse mix and sometimes vague. Still, there are valuable insights from the projects, which are synthesized in the following two subsections.

3.5.1 Tolerance, resilience and the limits of wellbeing

The projects did not explicitly define ‘wellbeing’ or ‘quality of life.’ Often, these two terms are used interchangeably and refer to a person’s experience of their lives or, more broadly, what is good for them, valuable to them, including a sense of their lives having purpose and meaning. Wellbeing can have physical, health, economic, social/relational, mental and emotional dimensions. These dimensions are often interrelated (e.g., all things being equal, physical wellbeing tends to increase emotional wellbeing; being healthy tends to increase mental wellbeing). Wellbeing can be experienced subjectively (e.g., pleasure, pain and desire satisfaction) or assessed on the basis of more objective conditions of the lifeworld and people’s behaviours (e.g., provision of basic needs or certain goods) (Breslow et al., 2016; Duan et al., 2016; Loveridge et al., 2020; Severns et al., 2020). In general, subjective, objective and relational dimensions are all considered important to the experience of wellbeing.

The Gold Matters project brought wellbeing centrally into its thinking about transformations, notably in the notion of ‘lifeways.’ Lifeways, as described previously (Table 4) was understood as more than livelihoods, but also as a set of aspirations for one’s life and a sense of autonomy and control in enacting them. It thus implies a sense of wellbeing. Embedded in lifeways are also certain social relations, relations to the land and resources, as well as a sense of self-efficacy in shaping one’s life as an artisanal gold miner (Fisher et al., 2021; Fisher et al., forthcoming). As discussed in Section 3.2.2, the project also noted the repeated experience of crises and resulting constant precarity and uncertainty experienced by these gold miners – something they were described as having got quite used to living with. On the one hand, such constancy of crisis might diminish those miners’ quality of life even as they derive some sense of pride from being able to make a decent life under such frontier conditions (Pijpers and Luning, 2021; Fisher et al., forthcoming). In fact, the project described them as making a ‘life in the ruins’ and displaying a kind of ‘jungle resilience’ (Fisher et al., forthcoming). Against this backdrop, the COVID-19 crisis seemed to add only marginally to the constancy of crisis they already lived with. On the other hand, the prospect of gold ore depletion began – at least for some – to create some emerging existential anxieties (ibid., p. 21) – a level of threat certain to diminish wellbeing.

The SecTenSusPeace, H2O-T2S and TAPESTRY projects also noted the constant state of insecurity, precariousness and uncertainty and people’s coping mechanisms. In some instances, this sense of insecurity was much increased by the actual experience of violence and war (van Leeuwen et al., 2021; Leeuwen et al., 2023). The rapid changes in peri-urban areas studied by H2O-T2S, for example, illustrated diverse strategies chosen to retain or build a sense of wellbeing, with some holding on to their traditional livelihoods and others using the newly emerging opportunities to shift livelihoods and entrepreneurship to other preferred ways of making a living (Butsch and Heinkel, 2020; Butsch et al., 2021; Gomes et al., 2023a, 2023b). TAPESTRY also studied the ways in which local communities dealt with different kinds of uncertainties, illustrating that they are anything but victims of changing circumstances (Mehta et al., 2019a, 2019b, 2021).

The Waterproofing Data project similarly recognized the cascades of vulnerability (Calvillo et al., 2023) and the intersectionalities of disasters and stresses on the most marginalized and poor in society (especially children and the elderly). One aspect of

their research project engaged students intergenerationally with the elderly, which led, as they noted, to improved wellbeing and empowerment for both because they felt they had a meaningful role in society (ibid.).

Finally, MISTY had a strong focus on wellbeing, with a particular focus on quality of life and wellbeing of migrants. The team related relative deprivation and subjective wellbeing scores to sustainability practices, finding that when migrants feel deprived and not well connected to others, their sustainability practices decline (Abu et al., forthcoming). They also noted that often migrants – when they first land in their new locations – are housed in informal settlements, which are characterized by inadequate infrastructure, crime, conflicts, difficult or unsafe housing conditions, low local mobility and limited job opportunities. Clearly, such conditions not only affect migrants' wellbeing but also their interest, care and commitment to sustainability practices (e.g., recycling, land care and resource conservation) (ibid.). Their still limited place attachment in their new homes also tends to be associated with fewer sustainability practices. Finally, migrants (both internal and international) tend to experience greater economic hardship upon arrival, as well as during crises (such as the pandemic), which magnifies their disconnects from 'home' and family, and makes it even more difficult to make new connections.

It appears from these observations, that only when a limit in subjective wellbeing/quality of life vis-à-vis one's willingness and ability to cope with challenges, precarity and uncertainty is reached do people become ready to entertain making deeper, even transformational shifts. For better or for worse, until such limits are reached, there appears to be a considerable capacity to tolerate variable and even diminishing conditions. In turn, one might suspect – although the projects did not explore this question specifically – that individuals weigh the known comforts/discomforts of their present lives against those unknown ones associated with profound change and a transformed life/lifeway. While two projects explicitly explored the role of conscientization and liberatory emancipation in building capacity for and mobilizing people for transformative action, and several noted the entrepreneurial spirit of people that allowed them to innovate, no project found any instances of where enhanced wellbeing became a *driver* of transformative change, even though an adequate quality of life can support sustainability behaviours.

3.5.2 Fluidity, resistance and adaptation in the face of transformation

Regarding the question of how identity and social and cultural values on the one hand and transformations to sustainability on the other are related, the answer appears to be, not surprisingly, ‘multidirectional’ and ‘multidimensional.’ Figure 7 simplistically suggests the aspects and directionalities to consider here.

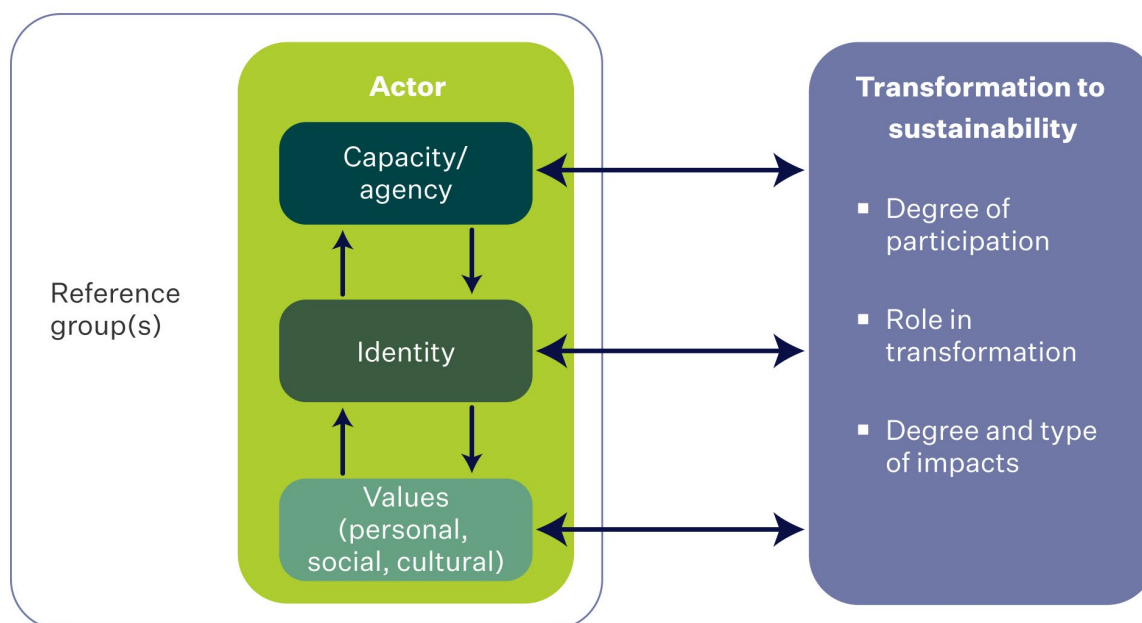


Figure 7: Relationship among identity, values, agency and transformations to sustainability
(Source: The author)

Figure 7 adds the aspect of agency to those of values and identity, as the projects related the latter to the former in their observations of who or why some actors actively participate in or resist transformations to sustainability, or manage to navigate transformative changes, and – in turn – how the transformations processes impacted them in terms of their perspectives, identities and their abilities to shape their own (transformed) lives.

CON-VIVA was one project that addressed the values and worldviews (regarding human–wildlife relationships) that shaped – together with livelihood exposure, capacity and degree of economic precarity – the level of acceptance people had of the risks of wildlife predation. The experience of human–wildlife interactions and losses also shaped the views and values these individuals held. As maybe the easiest lever to move,

policy-makers attempted to influence people's tolerance of large predators via financial compensation schemes in case of loss of farm animals. The approach allowed farmers and ranchers to maintain their livelihoods (and thus identities) and they were not asked to change their values (Fletcher et al., 2023; Massarella et al., 2023).

Gold Matters approached the relationship between transformations to sustainability and values and identities from the other end. The research team mentioned relational (and related livelihood and identity) changes as women took on bigger roles in gold mining as that sector changed (Lanzano and Arnaldi di Balme, 2021). Similarly, T2GS mentioned shifts in gender relations in connection to changes in groundwater management (Zwarteveen et al., 2021; Bhat et al., 2023; Cleaver et al., 2023; Dominguez-Guzmán et al., 2023; Underhill et al., 2023). Both projects thus highlighted how transformative changes (towards sustainability and unsustainability) affect identities and – simultaneously – relationships between actors and their reference groups. How this can at times be socially disruptive also came through in the rapid changes described in peri-urban spaces studied by the H2O-T2S project, where longstanding relationships in rural areas shifted as some gave up farming and shifted to more urban-oriented livelihoods while others retained their old identities (Butsch and Heinkel, 2020).

This point brings attention once again to transformations as sites of contestation and the observation, made by various projects, that not everyone is desirous of the impending transformative change. Many people's visions of the future are anchored around 'more of the same,' expressing a preference for the familiar, rather than for something different and new, even if it is healthier, more stable/secure and environmentally more beneficial. This came through in the Gold Matters, TRUEPATH, H2O-T2S and GoST projects. TRUEPATH, for example, explored four different visions of agriculture in Nicaragua, ranging from individualistic, profit-oriented forms of agriculture to collectivist/community-focused forms of co-existence and cooperative farming. In that case, some members of the community denied and ignored environmentally and socially negative impacts of farming practices while others worked to minimize them, and yet others created novel approaches that avoided or remedied such ills. These different views and related behaviours indirectly speak to the values that these different farmers held (Romero et al., forthcoming). A similar situation was found by H2O-T2S, where farmers expressed different preferences for different livelihoods in

the face of changing demographic, environmental, land use and socio-economic conditions. Many were found to be quite conservative in wishing to stick with ‘business as usual’; others, mostly younger ones, were choosing non-agriculture-based livelihoods and lifestyles, and generally were more enterprising and less tied to traditional lifeways and identities. This was also notable in their preferred climate adaptation strategies (Gomes et al., 2023b). TAPESTRY pointed to the importance of reflexivity as the practice or mechanism that links interior/personal transformations with exterior/systems transformations (Mehta et al., 2021).

Finally, the GoST project, particularly in the case study of German agriculture, looked not just at the identity and values of individual farmers, but at the relationship between national farming interest groups and national narratives and values related to Germany’s self-perception as a modern, technology-driven country. That self-image turned out to be a decisive factor in why a transformation of German agriculture to a more sustainable, organic model did not become the dominant reality (Polzin, forthcoming). Hints of a similarly strong influence of national imaginaries, coloured by a colonial past, also emerged from their case study in Kenya, which explored the influence of different visions of the African city (Cairns et al., 2022).

In summary, the theme of wellbeing, values and identities brings us back to the complex transforming ecologies that are at stake in transformative change processes. These complex ecologies constitute the deeper levers of change (e.g., Meadows, 1999; O’Brien and Sygna, 2013), and as such often remain less visible, yet they are at the heart of the plurality of visions of transformations and underlie the often difficult politics that mark them. In turn, their influence on the direction and persistence of change is – ultimately – decisive.

4. Synthesis and key take-aways

The Transformations to Sustainability programme with its twelve diverse and unique projects produced – despite its implementation under the strains of the COVID-19 pandemic – a prolific amount of research. Collectively, they helped advance the understanding of social transformations processes in important ways. The many methodological, theoretical and topical touch points among the projects suggest that they would have benefited greatly from additional in-person interactions – something that the pandemic and limited programme funding for cross-project exchange constrained. Virtual workshops at the early and mid-stages of the research, a range of online interactions to produce two special issues of journals and the appetite for cross-project interaction evident at the programme’s in-person final meeting hinted at that incompletely realized potential. The analysis of project outputs that resulted in this synthesis further illuminates the great benefits of exchange and joint tackling of questions and insights across projects.

Most T2S2 projects – much like the TKNs of its predecessor programme (T2S1) – brought a critical social science perspective to examining social transformations processes. This resulted in a deeper understanding of the multidimensional phenomena that are being transformed in the cross-hairs of power struggles and political contestation under persistent precarity and uncertainty (synthesized here as ‘complex transforming ecologies’). Bringing not just a multidisciplinary, multiscalar and historical lens to transformations, but producing practice-relevant understanding together with societal partners pointed to the further emergence of a ‘critical transdisciplinarity.’

That critical stance carried through on each of the core research themes of the programme. On that of governance and the institutional dimensions of transformations to sustainability, the projects deeply questioned the ‘modernist fantasy’ of being able to steer or even control emergent transformation processes. They recognized that particularly institutions of the state are frequently not only *not* helpful because of institutional weaknesses, but rather are active enablers of the extractive forces that produce the unsustainable conditions in the first place. This elevated the importance,

particularly, of informal governance mechanisms and change strategies, both within and across scales of social organization to help shield, support and scale up transformative initiatives.

Similarly critical were the projects' insights into the role of the economy and finance in transformations to sustainability. Most projects examined the economic drivers of unsustainability, the contradictions in the dominant economic system and the enmeshment of governments' interests with extractive activities. They detailed deep entanglements of local-to-global economic forces via monetary flows that frequently keep local efforts in vicious cycles of indebtedness and dependence, even as actors struggle to make a living. The projects repeatedly pointed to this ambiguity of economic and fiscal mechanisms, which can be used to benefit transformative initiatives – only if effective governance mechanisms shield and support them.

Finally, on the third programme theme of wellbeing, quality of life, identity and social and cultural values, projects found considerable capacity of human communities to tolerate precarious, variable and even diminishing conditions. Subjectively experienced wellbeing versus the ability to cope with challenges and uncertainty shape people's willingness to entertain making transformational changes, while their values, identities and sense of agency shape and are deeply affected by them. Once again, these multidimensional and multidirectional complexities explain why transformations to sustainability are sites of struggle and contestation at the frontier where the old meets the new.

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Appendices

Appendix A: Research questions on the five themes of the second Transformations to Sustainability programme (T2S2)

The following questions were provided as possible (although not limiting) research questions to be pursued in T2S2 in the Call for Proposals:

■ **Governance and institutional dimensions of transformations to sustainability**

Relevant exemplary questions under this theme included the following:

- What constitutes ‘governance’ of societal transformations across the globe?
- To what extent can societal transformations to sustainability be governed, and if so, how?
- Particularly, how can global commons (e.g., climate) be governed more effectively?
- What are the roles of state and non-state actors, partnerships and democracy?
- What are some new concepts and approaches to transnational governance?
- How do the temporal horizons of politics and economic processes (e.g., investment decisions) relate to sustainability and transformation processes?
- What political, institutional and legal factors stimulate or hinder different forms of transformation processes across countries?
- What changes in modes of governance would be required by different transformative processes and what are the implications for fit and interplay in multi-level or multiscalar governance?
- What can be learned from past and contemporary experiences of ‘successful’ or ‘unsuccessful’ attempts to govern transformations?
- What options exist for successful changes of path dependencies and the development of roadmaps for transformations?
- Can justice and participation of different groups be addressed in different governance arrangements, and if so, how?

■ **Economy and finance of transformations to sustainability**

Relevant exemplary questions under this theme included the following:

- Given the importance of the economy to sustainability, how can the tension between the persistent desire for growth be reconciled with the reality of environmental limits?
- What new forms of economic conditions/mechanisms/instruments/modes of production and consumption can create incentives for changes in behaviour, preferences and choices among private (consumers as well as entrepreneurs) and public actors?
- What are the roles of policy actors, industry, NGOs and private consumers in the struggle to determine the direction and speed of transformation processes across countries?
- What are the distributional impacts of different financial and economic arrangements across the globe and across and within countries?
- What alternative economic models, paradigms, narratives and practices are in place already or have been put forward from different regions and countries as well as by various scientists and stakeholders that might help achieve societal transformations, and what would they entail for today's economic practices and societies?

■ **Wellbeing, quality of life, identity and social and cultural values in relation to transformations to sustainability**

Relevant exemplary questions under this theme included the following:

- How do individuals, groups and organizations conceptualize sustainability, societal transformations and their potential impact on their lives and wellbeing?
- How do societal actors make sense of social transformations and which assumptions underlie social representations of transformations and sustainability?
- How are institutions, processes and behaviours related to sustainability linked to individual and group identity, norms and beliefs?
- How are they ascribed social and cultural value, and how can these relationships be transformed?
- How could the notion of 'sufficiency' be further developed?

- Can human emancipation and enhanced life quality be a driver of transformations, with environmental protection as an ancillary benefit, and if so, how?

In addition, projects were encouraged to address two cross-cutting themes, pertaining to the conceptual understanding and theory of transformation as well as the approach to research and generating knowledge on transformations:

■ **Conceptual aspects of processes of transformation**

Relevant exemplary questions under this cross-cutting theme included the following:

- Given experience with past transformations being largely the cumulative result of uncontrolled, incremental and emergent processes, can transformations to sustainability in fact be instigated and accelerated? If so, how?
- What features characterize truly transformative change?
- What are the processes through which societal transformations take place and how do these manifest themselves across time and space?
- What are the roles of agency and structure for deliberate, as opposed to emergent, change?
- What factors lead individuals, groups and organizations to resist transformations to sustainability?
- What is the role of so-called ‘tipping points’ in social systems facing rapid changes in behaviour, priorities and governance legitimacy?
- What are some examples of linear versus disruptive change and the consequences, or potential consequences, for societal transformations to sustainability worldwide?
- What does a critical examination of transformations suggest about what aspects of society need to change and which should remain unchanged or provide stability in the midst of swift and fundamental change?

■ **Methodological innovation**

Relevant exemplary questions under this final cross-cutting theme included the following:

- What are some innovative methods to engage stakeholders in the co-design, co-production and co-dissemination of research (transdisciplinary research), as well as to mitigate the risks that can be associated with this approach to research?
- What are the methodological opportunities and the challenges of the participatory turn, specifically in the involvement of stakeholders throughout the design of research projects?
- What insights from diverse social science traditions – e.g. Science and Technology Studies, Science and Communication Studies or Development Studies – can help?
- How does the politics of knowledge play out in co-construction?
- How and in what ways can the social sciences and humanities provide a critical contribution through research on inclusion/inclusive practices in transformations to sustainability?

Appendix B: Abstracts of the twelve T2S2 research projects

AGENTS: Amazonian Governance to Enable Transformations to Sustainability

The Amazon basin is a 'global keystone' region: locally, continentally and globally it hosts a wide array of environmental services, socio-cultural diversity and economic activities. Governing these multiple dimensions amid pressing social-environmental, and climate change is one of the most pressing challenges for sustainability. While government-driven solutions are commonly viewed as the route to sustainability, most sustainable forest management in the Amazon comes from individual and collective initiatives. The project contributes approaches and analytical tools to catalyse recognition of and actual contributions of existing, but often scattered 'pieces of solutions' to protect and govern biodiversity and landscapes. Organized in three Working Packages, the project includes stakeholder engagement, multitemporal analysis of land change at multiple units of analysis, predictive modelling of local conservation action, prognostic modelling of potential landscape connectivity scenarios and participatory scenario development representing the views of local stakeholders. The project develops innovative cross-cutting methodologies to assess, map and quantify the role of non-state actors, individual and collective actions to conservation, and uses these outcomes to engage with and inform local and regional decision-makers. The project responds to a decision of the Convention of Biological Diversity COP 13 requesting member countries to account for contributions of non-state actors in the conservation of biodiversity. Lessons from the Amazonian basin, therefore, will be relevant to many regions of the Global South as they share similar local, national and global contexts.

CON-VIVA: Towards Convivial Conservation: Governing Human–Wildlife Interactions in the Anthropocene

CON-VIVA is grounded in the premise that conservation is critical to transformations to sustainability but that its practices need to change radically. Conservation can be effective in protecting biodiversity in places, but *in toto* has failed to halt global biodiversity loss. Continued habitat fragmentation and reduced funding during times of austerity compound this problem. Many conservationists now acknowledge this, leading to vigorous ‘Anthropocene’ discussions on how to reconfigure human–wildlife relations, protected areas and the role of economic development in conservation. CON-VIVA’s key objective is to conceptually refine and empirically test the prospects for one proposal emerging from these debates: convivial conservation. This new model responds to the T2S themes by moving beyond protected areas and faith in markets to build landscape, governance and funding pathways that integrate conservation and poverty reduction, while enhancing prosperity. CON-VIVA investigates the prospects for convivial conservation by comparing cutting-edge conservation cases that address human–wildlife conflict involving apex predators in Finland, USA and DAC⁵-countries Brazil and Tanzania. Our hypothesis is that if ‘living with’ apex predators can be effectively combined with new forms of economic development, a transition to convivial conservation can be boosted significantly. By organizing the project around integrated academic–practitioner networks on local and global levels, we will better understand the conditions for this transition, while conceptualizing and popularizing a new model for conservation. This allows CON-VIVA to contribute to SDG15 and to inspire and enhance broader transformations to sustainability.

⁵ The DAC (Development Assistance Committee) maintains a list of countries which are eligible to receive official development assistance, sometimes called ‘DAC countries’.

Gold Matters: Sustainability Transformations in Artisanal and Small-scale Gold Mining: A Multi-Actor and Trans-Regional Perspective

The objective of the Gold Matters project is to consider whether a transformative approach towards sustainability can arise in artisanal and small-scale gold mining (ASGM). Supporting the livelihoods of millions of people in low- and lower-middle-income countries, ASGM has potential to contribute to sustainable development across the 17 SDGs. However, negative impacts generate critical barriers to sustainability. Anthropology is an entry point for an interdisciplinary approach to better conceptualize the dynamic, heterogeneous reality of ASGM and to identify potential for sustainable transformations in these shifting social settings. Capitalizing on existing ASGM partnerships, this forms the basis for a transcontinental and transnational project organized within seven Work Packages for integrated comparative sustainability tracking between South America, West Africa and East Africa. To add value to global research efforts, ‘Sustainability Conversations’ will enhance impact, co-producing knowledge with mining actors to understand sustainability from miners’ own perspectives. A strategic evidence-based summary ‘Visions and Vistas for Sustainable Futures in ASGM’ contributes to policy influence. Giving creative expression to people’s understandings of sustainable mining futures and building impact, is an exciting collaboration between African photographers from NUKU Studios, Ghana, and the Museum of Ethnography of Material Culture, The Netherlands. This incorporates the co-production of visual images with African and Brazilian gold miners, as the basis of an exhibition travelling ‘Moving Mine Matters’ between West and East Africa, Brazil and the Netherlands in 2020–2021.

GoST: Governance of Socio-technical Transformations

The GoST project focuses on transformation processes in three areas of crucial relevance to sustainable development, relating in particular to pressing imperatives in countries of the Global South: energy systems, agriculture and urban digital infrastructure. Each implicates intricate North–South linkages that must be better understood for global sustainability efforts. Adopting a systematic comparative approach, GoST uses socio-technical imaginaries as a conceptual tool to make sense of how collective imaginations of transformation have determined present conditions. Many challenges in the three focal areas are related to the prevailing imaginary, and solutions may require radically new imaginaries. Through analysis of two interlinked parameters of transformation (dimensionality and temporality) across five nations (Germany, India, Kenya, UK and USA), leading research centres in each examine, in cooperation with key stakeholders, the differences between imagined and experienced states in each focal instance of transformation in each country. By rethinking transformation through these lenses, GoST presents a methodologically innovative, integrative, empirically grounded approach that goes beyond usual characterizations of transformation as a linear process of development. Expected outcomes and impacts: GoST demonstrates feasible choices among alternative pathways for enacting socially progressive transformations towards sustainability, producing insights of immediate practical importance regarding how such transformations can best be governed in each selected area – by whom (Call Theme 1), to what ends, by what means (3), and with what welfare consequences for affected groups (2).

H2O-T2S: Water and Transformation to Sustainability in Urban Fringe Areas

The project analyses transformation processes in urban fringe areas of Indian cities. It aims at understanding how access to water as a consumption good and a resource for livelihoods is changed during the urbanization process in peri-urban spaces. The project is structured around four research objectives: (1) understanding institutional change of water governance, (2) analysing changing access to water with changing societal structures, (3) analysing livelihood changes during the urban transformation and the resulting changing water demands and (4) co-developing transformation pathways for sustainable water management in urban fringe areas. The project is designed as a multi-sited multi-method field study comparing the urban fringe areas of Kolkata, Pune and Hyderabad. Through its design, the research contributes understanding into the drivers of vulnerability and resilience of peri-urban communities, and helps to identify more sustainable future pathways. The project aims at initiating a stakeholder dialogue in the three research areas. Workshops include government agencies, local communities and key scientific experts that bring in further knowledge needed in addition to the knowledge generated by the project researchers. The project generates new insights on how urbanization processes take place in India. It identifies pathways towards the development of sustainable future cities as part of the stakeholder dialogue. It contributes to the knowledge on the sustainable use of water as an increasingly scarce resource.

IPACST: The Role of Intellectual Property to Accelerate Sustainability Transitions

Transformations to sustainability rely on innovation with complex diffusion and adoption processes. The role of intellectual property (IP) and IP rights (IPR) in sustainability transitions remains insufficiently understood. IPR can delay transitions by blocking new technologies, but if used effectively can encourage private investments, knowledge sharing and collaborative learning. The project transforms our understanding of how IP models accelerate sustainability transitions. It contributes through the integration of both fields through frameworks that conceptualize (i) which, (ii) how and (iii) under what conditions IP models accelerate sustainable transitions, in connection with sustainable business models. We build an interdisciplinary research community that furthers our understanding of dynamic sustainable development. An IP model and sustainable business model typology and conceptual frameworks will be developed based on case studies in clean energy and circular economy in low, middle and high income countries. With a Delphi study and simulations, the frameworks are tested for further contexts. To create impact in industries at different levels, tools are developed and promoted for selecting suitable IP and business models, best-practice cases and guidelines, and awareness and training kits for key stakeholders such as policy-makers, funding organizations, businesses and start-up incubators, education institutions and technology transfer offices.

MISTY: Migration, Transformation and Sustainability

This research integrates comprehensive insights on migration into theories of transformation to sustainability. There is unprecedented concern over involuntary migration globally affecting insecurity and human rights. However, both domestic and international migration have enormous transformative potential for individuals and societies. Transformation theories assume static populations and fail to recognize both positive and negative impacts of the movement of people. This gap limits explanations and intervention strategies for sustainability. The objective is therefore to use theory and rigorous empirical research to expand knowledge of transformations to sustainability by incorporating migration dynamics. These specifically include the following: the impact of aggregate flows of people on sustainability; the individual life-course dimensions of sustainability; and the governance of migration and sustainability. The research will develop a comprehensive migration–sustainability model, and develop insights on sustainability strategies at local, national and international scales. It will build global capacity of social science to explain and engage with migration dimensions of transformations to sustainability. The interdisciplinary social-science led consortium from Europe, North America, Asia and Africa builds on ongoing methodological innovation and deep collaboration. The research design involves modelling, observations and action research at global scales and in research sites representing the full range of so-called migration transitions. The outcome is co-designed to advance theory and salient and workable sustainability strategies reflecting real-world migration dynamics.

SecTenSusPeace: Securing, Sustainable Peace? The Challenges of Localizing Land Registration in Conflict-affected Countries

In conflict-affected settings, land tenure security of smallholders is seen as essential to prevent local land disputes and sustain peace, enable recovery of rural livelihoods and advance ecologically and socially sustainable agricultural production. To enhance tenure security – which is often severely compromised during conflict – interveners tend to turn to land registration and other forms of formally acknowledging claims to land. However, conventional state-led approaches relying on centrally-organized, individual titling often fail to deal with very complex local land struggles. Yet, the alternative of recognizing customary land governance is also problematic. Contrary to expectations, customary arrangements may also fail to find locally embedded, acceptable solutions. Hoping to overcome the shortcomings of both approaches, policy-makers and development practitioners are currently experimenting with ‘third way’ approaches that combine statutory and local arrangements. While land registration faces important challenges in stable settings, these become even more critical in conflict-affected settings. Not only is there less agreement on what norms prevail; approaches also tend to feed into local institutional competition, result in new exclusions and impinge on struggles around identity and belonging. Through local fieldwork in pilots on new approaches to registration in Burundi and eastern DR Congo, the project aims to contribute to a better understanding of the challenges of local land registration and the recognition of claims in conflict-affected settings. Through knowledge sharing with practitioners, it generates instruments that help interveners better map potential outcomes.

T2GS: Transformations to Groundwater Sustainability: Joint Learnings from Human–Groundwater Interactions

Billions of people around the world rely for their everyday existence on groundwater. Its invisibility, however, makes groundwater notoriously difficult to govern, also complicating efforts to avoid depletion or pollution. This project sets out to comparatively study promising grass-roots initiatives of people organizing around groundwater in places where pressures on the resource are particularly acute (India, Algeria, Morocco, USA, Chile, Peru and Tanzania). As these often defy or challenge conventional wisdom, the project's hypothesis is that these initiatives contain creative insights about ways of dealing with the intrinsic tensions that characterize groundwater governance: between individual and collective interests and between short-term gains and longer-term sustainability. Focusing on groundwater practices – of knowing, accessing and sharing – we combine qualitative ethnographic methods with hydrogeological and engineering insights to explore the knowledges, technologies and institutions that characterize these initiatives. Our aim is to enunciate and normatively assess their logic and functioning in view of tracing overlaps or patterns that allow them to serve as more generic models for transformations to groundwater sustainability. This effort is inspired by theorizations of water as simultaneously social and natural, builds on recent critical scholarship on institutions and has a particular sensitivity to how the distribution and use of groundwater is mediated by technologies. Our overall aim is to create global action–research collaborations to generate new inspirations for thinking about and dealing with interconnections and interdependencies between humans and groundwater.

**TAPESTRY: Pathways to Sustainability in Marginal Environments:
Responding to Climate Change Uncertainties in Marginal Environments
in South Asia**

The objective of TAPESTRY is to examine how transformation may arise from below in marginal environments with high levels of uncertainty. Climate change uncertainties, especially at the local level, constitute one of the main challenges to the sustainability of societies and ecosystems, calling for systemic transformative changes. While uncertainty can exacerbate anxieties about the future, it can also provide an opportunity to create transformation and deep structural change. TAPESTRY focuses on three patches of transformation in India and Bangladesh – vulnerable coastal areas of Mumbai, the Sundarbans and Kutch – where hybrid alliances and innovative practices are reimagining sustainable development and inspiring societal transformation. TAPESTRY is organized in a transnational and transdisciplinary consortium across the UK, India, Bangladesh, Norway and Japan. Its conceptual innovation lies in studying transformation as praxis, by putting bottom-up change and the agency of marginalized people at the centre and by analysing how co-produced transformations can be scaled up and out. The project is particularly relevant to Themes 1 and 3 of the call, i.e. governance, wellbeing, quality of life, identity and values in relation to transformations to sustainability. All these lie at the heart of the welfare and development challenges faced by India (a lower-middle-income country) and Bangladesh (low-income-country). The project's outcomes and impact will inform processes to improve the quality of life of marginalized people affected by climate change related uncertainties, build action and capacity among all partners while generating evidence of how bottom-up transformation can take place in marginal environments.

TRUEPATH: Transforming Unsustainable Pathways in Agricultural Frontiers: Fostering Bottom-up Actor Coalitions for Transforming Complex Rural Territorial Pathways

The project uses an innovative pathways approach to inquire into the global–local institutional dynamics that generate the dominant socially and environmentally unsustainable cattle development pathway, a major driver of deforestation in Latin America and contributing to climate change, destruction of critical biodiversity stocks and dispossession of indigenous people. Addressing the key concern of T2S, the deeper understanding of the socio-institutional dynamics characterizing processes at the agricultural frontier enables identifying in-roads for policies of institutional entrepreneurship. This contributes to a transformation of power-laden institutional processes in order to change today’s pathway in the direction of a more sustainable, equitable and climate-smart agriculture without a need to incorporate ever more land resources. The research consists of an action–research process in Nicaragua in cooperation with the microfinance organization Fondo de Desarrollo Local and the environmental NGO Centro Humboldt, focused on the potential of a Green Microfinance Plus (loans + technical assistance + payments for ecosystem services) connected to a citizen science approach to local climate data generation, processing and use as well as broader reflections in local deliberative fora. In terms of research methodology, a multidisciplinary mixed methods set-up is adopted, combining inputs from development sociology and economics with the Agrarian Systems approach, and making use of an original simulation game informed by local data. We develop scientific outputs and policy proposals that contribute to change towards sustainability in the Nicaraguan pathway and beyond, in particular for Green Microfinance.

Waterproofing Data: Engaging Stakeholders in Sustainable Flood Risk Management for Urban Resilience

Waterproofing Data investigates the governance of water-related risks, with a focus on social and cultural aspects of data practices. Typically, data flow up from local levels to scientific ‘centres of expertise,’ and then flood-related alerts and interventions flow back down through local governments and into communities. Rethinking how flood-related data are produced, and how they flow, can help build sustainable, flood resilient communities. To this end, this project develops three innovative methods around data practices, across different sites and scales: (1) making visible the existing flows of flood-related data through tracing data; (2) generating new types of data at the local level by engaging citizens through the creation of multimodal interfaces, which sense, collect and communicate flood data; and (3) integrating citizen-generated data with other data using geo-computational techniques. These methodological interventions will transform how flood-related data are produced and flow, creating new governance arrangements between citizens, governments and flood experts and, ultimately, increased community resilience related to floods in vulnerable communities of Sao Paulo and Acre, Brazil. The project is conducted by a highly skilled international team of researchers with multiple disciplinary backgrounds from Brazil, Germany and the UK, in close partnership with researchers, stakeholders and publics of a multisite case study on flood risk management in Brazil. Furthermore, the methods and results of this case study will be the basis for a transcultural dialogue with government organizations and local administration involved in flood risk management in Germany and the UK.

Source: Information drawn from project proposals and descriptions.