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Towards a Transformative innovation policy research agenda

Workshop, February 2019 Report and Follow up plans

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Figure 1. Johan Schot facilitating a session at the workshop. [Pic courtesy: Tweet by @TIPConsortium]

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Executive Summary

The need to align the capacities of societies to innovate with grand challenges they face is increasingly recognised in various levels of research and policymaking. Transformative Innovation Policy (TIP) proposes an approach to address these grand challenges through STI, combining insights from sustainability transitions literature and innovation studies. As a concept, TIP is envisioned to be able to provide enough granularity to understand systems transitions, and at the same time, operationalizability to be used by advocates and policy makers.

Central to this concept is the notion of "transformation" which encompasses different scales, spaces and actor groups. It refers to ongoing, systemic transformations, irrespective of whether it is goal-driven and purposefully induced. The governance of transformation processes should be a way of organizing diversity of actors, practices and pathways. The state, in its different forms, can play an important role in steering, guiding and facilitating transformations, managing directionality and the interests of different stakeholders. There is no single answer of what kind state is required to enable transformations, as it will depend on local political cultures and the role of STI in each context.

In fact, top-down steering or 'strong State' should not be considered the immediate and only solution. Governance can also be fragmented, what is important is how is collective action organized. A more bottom-up approach to governance can accommodate better ongoing experiments and multiple stakeholders contributing to transformation. Transnational governance can also play an important role; however, conflict of interests and geo-political tensions can also undermine and delegitimize transnational and national efforts.

Transformation encompasses areas that go beyond STI policy, but innovation policy can play a central role in providing an imaginary for the future, and in managing deep uncertainties that will emerge through the transformation processes, for example, through the establishment of missions. Transformations in the Global South are about poverty and inequality, as much as they are about climate change and sustainability. Here also, STI agencies often are restricted to play an important role in the policy landscape and might be underfunded. This presents specific challenges, that a TIP approach might be able to mitigate.

In order to be transform systems and societies, STI agencies need to rethink their role as directionality and governance of innovation processes. The specific tools, be it programs, policies or initiatives, should take advantage of the existing repertoire combined with novel approaches to support experimentation, but also think beyond the experiments and scale up. Evaluation in this respect plays an essential role, but should be understood as a formative process of learning and network building rather than solely about accountability. Nevertheless, gathering evidence of systems transformation is essential to support long-terms efforts of TIP initiatives and for sustaining coalitions. Transformative Innovation Policy holds promises in addressing the grand challenges through experimentation, evaluation and new role of State, policy actors and STI agencies, however it requires continued transdisciplinary collaboration to impact sustainable futures.

At a glance

A two-day workshop titled “Internetwork Dialogue on Transformative Innovation Policy for STI community” was organised between 26-27th February 2019, funded by EU-SPRI Forum and hosted by Utrecht University, The Netherlands. Around 30 scholars participated this workshop representing research networks like the EU-SPRI Forum, Globelics, TIPC and STRN. This report summarises the discussion and paves the way forward towards a joint research agenda on TIP.

Introduction

In February 2019, academic scholars and policymakers involved in research and practice on science, technology and innovation (STI) policy came together to explore intersections of their perspectives around the emerging 'Transformative Innovation Policy (TIP)' theme. The rationale for this event is that, across different academic communities, there are debates emerging about how STI policy can respond to contemporary social, economic, and environmental challenges. Furthermore, the strategy and urgency with which the systemic problems must be confronted defy conventional approaches in STI motivated by primarily economic arguments around competitiveness and economic growth, or scientific endeavour. The effort to convene and facilitate an ‘internetwork dialogue’ between scholars of four research networks seek to capture the emerging discourses of transformative innovation policy in its various forms, scoping the questions and controversies that arise in its wake. It also aims at fostering the necessary forms of collaboration, joint work and research programmes that may address those questions and establish new directions of research and practice, together with potential funders. To this end, the workshop organised in Utrecht in February 2019 offered one of the first opportunities to explore the synergies and tensions between different perspectives on TIP by different research and policy communities.

Before reporting on the results of the February workshop, it is important to make a brief account of the theoretical underpinnings of this debate and a yearlong process of collaboration and continued dialogue that lead to the workshop.

Background

The need to align the capacities of societies to innovate with grand challenges they face is increasingly recognised in various levels of research and policymaking. The sustainable development goals, for example, imply the mobilisation of innovation policies in a range of areas: several SDGs allude to the need for system innovations, and better distributing the dividends from economic activity. The misalignment between stated goals and existing innovation policy led many scholars to propose rekindling the innovation policy under an emerging paradigm, which has been labelled Transformative Innovation

Policy or Innovation Policy for Transformative Change (Schot and Steinmueller, 2016; Steward, 2008; Weber and Rohracher, 2012)[1].

To face urgent societal challenges, the rationales, instruments, indicators and governance mechanisms that underpin the STI systems have to change, embracing a transformative turn. This emerging framing resonates with the insights and proposals from different STI communities. For example, the sustainability transitions field has for long argued that persistent challenges require new understandings of the dynamics of systems change (Grin et al., 2010; Smith et al., 2010).[2] Innovation studies scholar have also explored practices and rationales for policy making that could contribute to more participative, experimental and reflexive modes of governing STI systems (e.g. Borrás, 2011; Leach et al., 2012; Voß and Kemp, 2005; Kuhlman and Rip, 2014; Edler and Boon, 2018) [3]. The role of STI in reproducing and potentially transforming patterns of inclusion and exclusion has also been studied in depth (e.g. Kraemer-Mbula and Wunsch-Vincent, 2016, Kaplinsky, 2011).[4] Others have called for reconsidering the role of the State in providing directionality to innovation (e.g. Perez, 2013).[5] Nevertheless, it remains a challenge to mobilise the insights of these diverse communities, and devise new strategies, instruments

[1] **Schot, J., & Steinmueller, E.** (2016). Framing innovation policy for transformative change: Innovation policy 3.0. SPRU Science Policy Research Unit, University of Sussex: Brighton, UK. **Steward, F.** (2012). Transformative innovation policy to meet the challenge of climate change: sociotechnical networks aligned with consumption and end-use as new transition arenas for a low-carbon society or green economy. Technology Analysis & Strategic Management, 24(4), 331-343. **Weber, K. M., & Rohracher, H.** (2012). Legitimizing research, technology and innovation policies for transformative change: Combining insights from innovation systems and multi-level perspective in a comprehensive 'failures' framework. Research Policy, 41(6), 1037-1047.

[2] **Grin, J., Rotmans, J., & Schot, J**. (2010). Transitions to sustainable development: new directions in the study of long term transformative change. Routledge. **Smith, A., Voß, J. P., & Grin, J.** (2010). Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges. Research policy, 39(4), 435-448.

[3] **Borrás, S**. (2011). Policy learning and organizational capacities in innovation policies. Science and Public Policy, 38(9), 725-734**; Leach, M., Rockström, J., Raskin, P., Scoones, I. C., Stirling, A. C., Smith, A., ... & Folke, C**. (2012). Transforming innovation for sustainability. Ecology and Society, 17(2), 11; **Voss, J. P., & Kemp, R**. (2005, June). Reflexive Governance for Sustainable Development–Incorporating feedback in social problem solving. In paper for ESEE conference, Lisbon; **Kuhlmann, S., & Rip, A.** (2014). The challenge of addressing Grand Challenges. A think piece on how innovation can be driven towards the "Grand Challenges" as defined under the European Union Framework Programme Horizon, 2020; **Edler, J., & Boon, W. P.** (2018). 'The next generation of innovation policy: Directionality and the role of demand-oriented instruments'—Introduction to the special section. Science and Public Policy, 45(4), 433-434;

[4] **Kraemer-Mbula, E., & Wunsch-Vincent, S**. (Eds.). (2016). The informal economy in developing nations. Cambridge University Press; **Kaplinsky, R**. (2011). Innovation for pro-poor growth: from redistribution with growth to redistribution through growth.

[5] **Perez, C.** (2013). Unleashing a golden age after the financial collapse: Drawing lessons from history. Environmental Innovation and Societal Transitions, 6, 9-23.

and capacity building efforts to shape STI systems that can enable societal transformations and a fair allocation of their benefits. An internetwork dialogue on TIP is dedicated to address this challenge.

The path so far

The first phase of the internetwork dialogue involved sessions in the conferences of each of the participating networks, as well as a conference track in the Eu-SPRI conference (Paris, May 2018). Each of the sessions brought together participants from the other networks, asking them to identify pressing questions and shared insights that could help substantiate a joint research agenda. The notes collected in each of those sessions were organised as a set of questions and controversies (See figure 2). The second phase starts with the two-day workshop in Utrecht in February 2019, that resulted in an in-depth dialogue about a potential transformative agenda for innovation policy produced in collaboration between the STI community, policy practitioners, funders and innovation agencies.

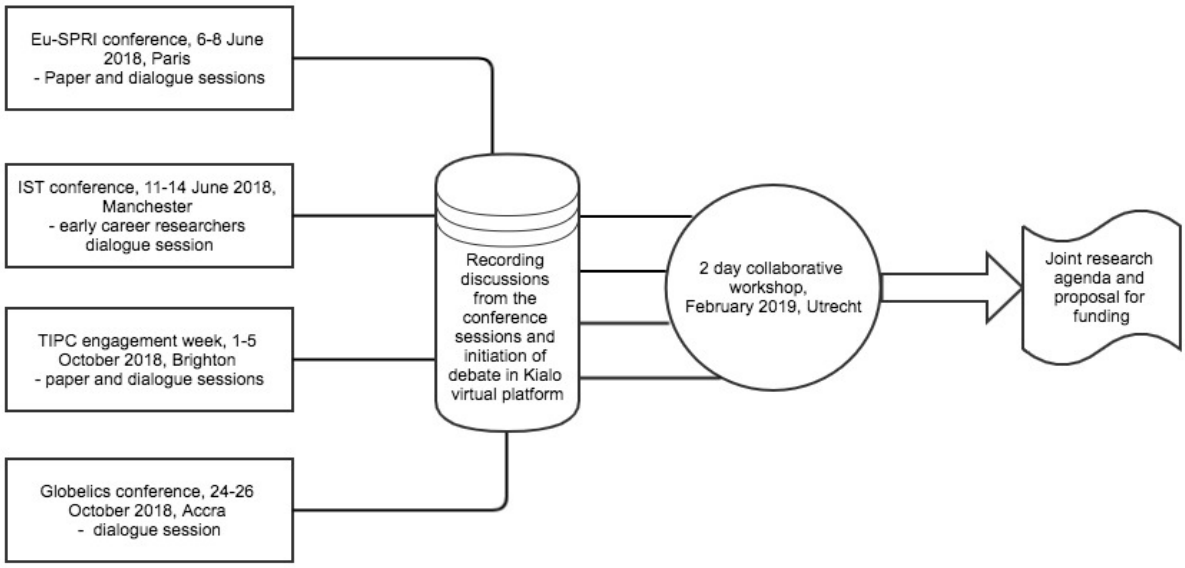

Figure 2. Path of internetwork collaboration until the workshop, Feb'2019.

Structure of the workshop

The two-day workshop began with brief invited introductions by 4 spokespersons from each of the four organizations, stating their position and understanding of the rationales of TIP and expected outcome of the workshop.

Matias Weber spoke on behalf of the EU-SPRI community, highlighting that transformative innovation policy is already emerging in that community as there is more focus on system innovation and

there is an ongoing normative shift in STI policy. He clarified that transformations can be driven by both societal challenges (unclear problems) and by disruptive innovation (unclear solutions). This lack of clarity results from uncertainties, complexity of interactions between demand and supply side actors, conflicting interests and differences in capabilities.

Lea Fuenfschilling, representing STRN community emphasized that research and policy communities need to keep each other up to date on not just understanding, but also enacting transition processes. She suggested that instead of policy advice, it is important to engage in policy dialogues, gain trust and understand interests, struggles and concerns which would in turn help academics to sharpen capacities to engage in TIP. She also mentioned that teaching transitions at early stage is important for shaping the future.

Erika Kraemer-Mbula, speaking as a member of the Globelics community, started off saying that at the heart of the challenge is addressing climate change while at the same time creating new systems of production and consumption that lift millions out of poverty. it is important to create innovation systems that are relevant for inclusive and sustainable development in resource-constrained contexts. In her view, the emerging challenges are to connect innovation policy with other type of policies; recognise the role of globalisation and to try out new forms of governance; to understand new relationships and impacts of emerging technologies and to facilitate interactive and collective learning processes within and across businesses and communities.

Finally, Johan Schot spoke on behalf of TIPC as a platform of innovation agencies and research councils, co-ordinated by SPRU and Utrecht University. The aim is to develop the narrative of TIPC within countries, build demonstrations, change evaluation techniques and to build capacities to bridge various innovative efforts and to transform existing systems of innovation. He argued that STI has been a separate silo in different governments which needs better integration with sectoral or system specific policies and infrastructure. STI policy also needs to be better tailored to address societal challenges of inclusivity, poverty, justice. He stressed on the aspect of directionality: TIP is not just about steering, but also about innovation processes recognising that they represent particular directionalities. In the end, this is a new development model which requires more work than extending existing innovation frameworks. What needs to be transformed and how - are the key questions we need to focus on.

The session set the scene of the workshop by posing more questions than answers, yet showcasing the heterogeneity of understanding of transformation, identifying common grounds as well as tensions regarding the conceptualisation and rationales represented in the room.

In the discussion that followed these brief pitches, it was suggested that sectoral approach could be useful way of understanding systems of innovations. This was contested with the response that focussing on sectors of production and separating out consumption is problematic and might be barrier for transformation. It is suggested that the understanding about sectors from supply side is part of what needs to be transformed. The premise is that transformations are ongoing and requires more attention

in understanding the processes (demonstrated with the example of the emergence of online platforms). It is further suggested that knowledge from research on specific systems like agriculture, communication needs to be mobilised for effective STI policy. Concerns were also raised about researcher's positionality as de facto incumbents in policy processes, therefore appreciating the role of different actors is a challenge in itself for TIP. Finally, questions are raised on who TIP is for and how STI fits different national and regional policy contexts. These initial questions reverberated in the discussions that followed.

In the three sessions that followed on the first day, three topics were discussed. In each session, there were 3 invited brief provocations, followed by group discussions in four smaller groups and finally a reporting and plenary discussion. The three topics/themes are as follows:

1. How to conceptualise transformative innovation policy (TIP)? How to put it in context of emerging approaches of framing new STI policies?
2. What is the role of innovation for STI policy in Global North and Global South?
3. How to design, implement and evaluate (do) transformative innovation policy initiatives in various contexts?

On the second day, groups were formed around each of these topics and discussion continued, based on questions compiled in the reader and using Padlet[6]. The following sections report on the insights gathered on each of the three themes across the two days, drawing from the contributions of all participants to the workshop. A list of participants can be found in Annex 1.

[6] An online platform called Padlet is piloted during group work on the second day of the workshop. Even though it wasn't used by many participants during the workshop, the platform provides a vibrant open access space for furthering the interaction online. https://padlet.com/tipconsortium/researchagenda

Insights on each of the three themes

This section provides an overview of the main aspects of the discussion around the three topics stated earlier.

Theme 1. How to conceptualise transformative innovation policy? How to put it in context of emerging approaches of framing new STI policies?

The first element of a conceptualization of TIP is to be clear why do we need a concept and what do we want from it. A conceptualization for TIP should be able to respond to two communities: for analysts and researchers; the concept should provide understanding of the phenomenon of system transition, its dynamics, drivers, and the role of policy. For practitioners, such as policy makers and policy entrepreneurs, the concept should serve as a basic cognitive frame to communicate about missions, to derive intervention logics. This means that a concept would have different levels of granularity and operationalizability.

This concept will be based on conceptual contributions from different academic communities, for which it is important to be clear about a shared understanding of its building blocks, and the different understandings of some basic conceptual elements: socio-technical systems vs production/consumption systems vs. sectors, institutional approaches vs actor-oriented approaches. It is important to find a balance between diversity and complementarity, and be clear and transparent about how basic concepts, such as socio-technical systems add value to the main research endeavour to understand system transitions and the role of policy.

TIP differentiates from previous understandings of STI policy in the sense that is highly normative in terms of defining and selecting problems societies want to tackle with policy, rather than a horizontal, socio-politico-technical framework. It is also more "instrumental", in the sense that it stresses concepts of coordination and new institutional designs, for the new matrix form of governing, reflexive and inclusive governance. It requires to conceptualize the actor landscape much more inclusively and institutional spaces more systematically. In the background of developing a strong conceptualization for TIP, there should be a constant reflection about the role of the STI and other epistemic communities in the process of system transformation as such.

There are some specific elements central to TIP that need to be clarified in the search for a common understanding.

1.1 Transformations

Transformation is a nuanced concept. It may refer to ongoing processes which have not been initiated intentionally (unfolding transformations) or to refer to normative efforts to induce transformations (induced transformations) along particular normative directions (e.g. attempts to

establish ‘car free cities’, 100% renewable futures and so forth). We can think of transformation along established lines of distinction:

a) Unit/Level of analysis
b) Moon vs ghetto (as in Nelson’s famous article)
c) Societal vs disruptive
d) Temporal unfolding

Transformation will require processes of change at many different levels of aggregation spanning from the individual to the world system. Consumers, workers, managers, engineers will have to learn to operate on the basis of new routines and competences. Given that innovation processes draw upon both science and experience-based knowledge ‘STI-policy’ points to a narrow conceptualization of the field. More adequate is ‘transformational innovation policy’.

There appears to be a bias in understanding origins of (regime) transformation at the level of niches in Multilevel Perspective where incumbents are generally absent. The centrality of niches, even when it is recognised that transformative processes often involve niches being assimilated or imitated by incumbents to inflect the direction of the regime’s evolution should be questioned and further research on the role of transformation involving incumbent actor agency is needed.

It is also observed that incumbents are an inescapable feature in many developing economy contexts because of the weakness of new firm formation and concentrations of talent in incumbent organisations. This suggests the need for ideas and research about working with incumbents to achieve transformational outcomes. In many cases, transformative directions are beyond the control of incumbent actors and they share an interest in developing more environmentally and sustainable practices.

1.2 Governance

The state has several important roles to play in the process of transformation. Re-organising markets in face of major technological or societally driven transformations requires a guiding force to enable and accelerate this re-organisation and reconfiguration process in order to help overcome path-dependencies and reduce uncertainty for the private, public and third sector agents. The state can take on more or less active roles in this process, from a proactive change agent to an enabler and facilitator of change. This balance depends on the political culture and the ability of actors and stakeholders to self-organise.

With transformative change affecting actors along the entire value chain, from innovation to production to consumption, processes would be easier if the actors concerned are involved in the shaping of policies early on. The role of the state is in organizing the policy-preparing and policy-shaping process in such a way that actors can develop coherent strategies of change. Governance is then the process of organizing this collective change process. Again, it depends on political culture whether bottom-up or top-down approaches prevail in any specific setting.

Not only are many actors affected by transformative change, but they can be positively or negatively affected (depending on their respective goals and objectives). Handling tensions, conflicts and the formation of coalitions can therefore be an important role for the state: how to deal with the losers of transformations?

Transformative change is about normative issues as well. The state, through organizing appropriate governance processes, is the agent responsible for addressing matters of directionality of change in line with the constitutional (in our contexts mainly democratic) principles of statehood.

A point of long discussion was understanding what type of state is needed for TIP, whether there is a specific type of state or if this should be tailored to different contexts. Some parameters were mentioned that could help define a "strong" state:[7]

- To be able to regulate
- Capability to generate shared vision
- Allocating Budget
- Citizen's representation
- Tolerance to the 'other'
- Scoring high in Democracy index
- Developmental State

It is argued that the state should be more explicit and vocal why it is favouring some experiments over others, why it would not follow up on a certain experiment -for the purpose of accountability. Moreover, the state should not initiate experimentation, but should facilitate, connect, assist, enable experimentation. Whether the role of state is strong or weak is also context specific, accounting for corruption and developmental challenges.

Governance can be fragmented - e.g. network of cities; what is important is collective action and transnational forms of governance. Some degree of coordination is desirable between regional and local governments. Specially in the case of cities, that can be benefit from (horizontal) circulation of knowledge and resources. However, coordination within a local or national context may not always be a desirable thing in context of change. In these contexts, we need to stress on experimentation and emerging coordination through working together in the ground. We need place-based experimentation since something like climate change require coordination at global and trans-local level AND a lot of local level experimentation. However, the issue is that cities are not seen as important level at which innovation happens (focus on national, regional levels). It is also the place where power imbalances exist and multinationals define the pathway for energy implementation in countries like Kenya or India.

[7] Strong in the sense of being able to steer processes of transformation, not to be read as an authoritarian state.

The centrality national states differ across countries with larger states often having both opportunities and challenges stemming from regional and local innovation processes. Diversity creates opportunities for experimentation and shared learning and for a plurality of initiatives. Diversity can also be accompanied by exclusion or marginalisation which reduces these opportunities. International tensions persist despite the global nature of many social problems. These tensions are productive when they serve as a spur to accomplishment, e.g. the aspiration of the Paris Accords. They also have the potential to diminish the value of scientific and technological commons which has been constructed through international cooperation and exchange (including the flow of people). The construction of transnational agreements and cooperation has played important roles in enlarging knowledge and in directing attention to salient issues. Further research on the influences that foster transnationality as well as impede or destroy it is needed.

It is recognised that very concrete coordination could take place in niches, which is important for Holistic innovation policy which looks at actor constellations - new interaction and relationships within and between communities, building new roles - emerging avenues through collaboration and networking. It is also useful to understand the importance of actor's actions in several critical junctures of different policy stage, allowing for interaction with feedback loops.

STI policy also has a high-technology bias that tends to exclude or ignore low and middle technology opportunities for improving social welfare and meeting needs. It is important to pay attention to innovation processes that are not research-led is needed. This requires openness to grassroots and other forms of bottom up innovation that are not research led.

1.3 The place for innovation policy

Transformation is far larger than what can be purely circumscribed to STI policy. Therefore, it is important to distinguish what is the place for innovation policy in relation to other policies, what specific roles or functions does it fulfil? Innovation policy is about creating and supporting novelty, while other policies have sectoral focus to regulate and operate systems like energy or mobility. It is also mentioned that Innovation policies are often centred around knowledge and process orientation.

It is recognised that role of science technology and innovation is crucial for TIP as it provides an imaginary for a future that is built on emancipation and solidarity. Digital technology provide this scope, as long as these technologies are mobilised to challenge the direction of current development. It is possible to find several examples of these transformations in the Netherlands, Sweden, South Africa, China, and here innovation agencies could play a crucial role in setting imaginaries and enabling change. The question is whether we can start envisaging different types of models within innovation agencies, for example enhanced STI led model additional roles for more demand articulation, more motivated (mission specific) agencies led innovation policy and engagement with initiatives at the city level such as urban labs.

When working with STI agencies in TIP, it is important to consider that implementation of innovation policy occurs through institutions that are themselves highly resistance to change. The room for manoeuvre is highly constrained, since civil servants are embedded in the long running political cultural institutions which lead to erosion of capabilities. Therefore, a central question is how to improve these capabilities by understanding human agencies and initiatives within agencies with greater reflexivity instead of "cockpitism".[8] In addition, STI policy has a supply side bias while transformation of socio-technical systems involves fundamental change in both supply and demand. Greater attention should be placed on the influence shaping demand and its evolution.

1.4 The language of TIP: Mission-led policies, grand challenges and/or transformations

It was widely recognised the mission led policies have become a common currency in policy narratives. This reflects a renascent confidence that government can make a difference to social outcomes which is broadly consistent with transformative innovation policy perspectives.

However, mission-led policies may also centralise processes of choice and 'close down' processes of exploration, experimentation, and learning prematurely. While it is granted that addressing many social needs is a matter of urgency, the absence of clear blueprints for a more socially and environmentally sustainable future suggests caution and avoiding rush to judgement about the direction and means for proceeding. It also seems likely that the leadership role of the state provides a convenient target for efforts to capture the methods and objectives of the mission by particular interest groups which are less inclusive and more invested in the current system. Finally, mission-led policies may leave out or leave behind parts of society perceived to be of secondary importance in mission success, a tendency which risks reproducing the separation between technocratic elites and the broader society.

This is part of the controversy concerning mission-led research. Even if mission-led constructs are becoming a more influential line of thought for policymaking, continued attention to other forms of governance – e.g. catalytic, challenge-led, or bottom-up should continue to receive research attention and comparison with mission-led policy outcomes.

[8] "cockpit-ism": the illusion that top-down steering by governments and intergovernmental organizations alone can address global problems, in **Hajer, M., Nilsson, M., Raworth, K., Bakker, P., Berkhout, F., De Boer, Y., ... & Kok, M**. (2015). Beyond cockpit-ism: Four insights to enhance the transformative potential of the sustainable development goals. Sustainability, 7(2), 1651-1660.

Theme 2. What is the role of innovation for STI policy in Global North and Global South?

2.1 Building relationships with actors in the context of uncertainty

A TIP and/or a mission-oriented approach is an essential tool for governments and policy makers to navigate STI policy in the context of a transformation. It is obvious that innovation is a process involving uncertainty. At an early stage of the innovation process there is technological uncertainty related to the fact that enterprises can't know in advance about the best technological solutions. There is market uncertainty all the way throughout the innovation process. Private enterprises have their own strategies to cope with technological and market uncertainty. However it is important to build connections between the different actors to navigate these uncertainties.

The theoretical core of the innovation system approach is about interactive learning. Since innovation is an uncertain process, actors will try to reduce uncertainty through building lasting relationships and that innovation thrives in 'organized markets' that combine market characteristics with elements of hierarchy. These organized markets play a key role in reducing uncertainty. For the single unit lasting relationships to suppliers reduce technological uncertainty and lasting relationships to users reduce market uncertainty.

The strength of the organized markets becomes their major weakness when there is a shift in technological paradigm. The transformation will require a fundamental reshuffling of organized markets. Old user producer relationships need to be broken up and new ones need to be built in the process. One implication is that during the transformation process the degree of uncertainty will be drastically increased.

To leave it to the market to overcome the uncertainty and to reshuffle relationships would slow down both innovation and its contribution to transformation. One way to overcome this problem and compensate for the high degree of uncertainty during the transformation process is for governments to engage in 'mission-oriented' policy where the state engages in a combination of public policies and in promoting a common vision indicating the direction of change.

2.2 Is transformation feasible?

One interesting observation was that policy that looks promising in paper may not be transformative upon accomplishment. Additionally, it is often unclear what it would mean to accomplish, especially when different nations name and understand innovation in different ways. In some countries, innovation agencies are emerging champions of systems change and work with the meta-knowledge about transformations processes themselves, for example Vinnova and their "Norm critical innovation". [9]

[9] Nilsson, Å. W., & Jahnke, M. (2018). Tactics for Norm-Creative Innovation. She Ji: The Journal of Design, Economics, and Innovation, 4(4), 375-391.

We need to be reflexive about what type of transformation do we need – is it about addressing poverty, climate change, or growing inequality and violation of human rights - so the framing of being transformative could be borrowed from the latest definition of socio-technical experimentation - inclusive, challenge led, practise based, adaptive to uncertainty.

There are specific challenges in context of the Global South. On one side there is lack of funds, resources but on the other hand policy makers are not trusted in the community due to a history of corruption. Furthermore, societies often need legitimacy and support from the governments to do things organically and bottom up. This led to people working together, creating direct networks when the state cannot deliver or keep up policy coordination cost to a minimal.

Innovation policies can deliver on transformation when there is emerging coordination across experiments in trans-local levels; and transformation is feasible when the state plays the role of a convener, facilitator and enabler. Also when we are reflexive on what problems we are addressing through transformation - which could be radically different in Global North and Global South contexts.

We start from the assumption that wider transformation processes are already underway although at different paces and directionalities in different societies. As transformations are taken to be underway, the principal roles of STI policy may be to shape the directionality, accelerate, or enable transformation. We noted from the outset that social context is fundamental in the enactment of these roles.

In some contexts, innovation is fundamental to the society, broadly understood by many actors and implicated in a wide range of policies including policies not set by ministries or agencies with a specific innovation remit. In other contexts, such as Africa and Latin America, agencies in charge of innovation and STI policy are far less influential in policy making, limiting their capacity to determine policies that might influence innovation beyond the explicit scope of STI, such as environmental or educational policies. Moreover, in many cases there is a lack of coordination or orchestration between science, technology and innovation policies with each group having dominant actors that largely control policy agendas.

2.3 The role of STI agencies in transformations

STI agencies can be seen to have key roles in the following areas:

1. Identifying opportunities for transformative change by creating baseline or reference knowledge about societal capabilities needed for transformation and about futures and the possible pathways for reaching these futures.
2. Creating forums for identifying issues of directionality which are more inclusive and deliberative than conventional consultation process.
3. Managing the diversity of stakeholders with a view to preventing capture of agendas and narratives by single interest groups or actors and encouraging participation by those that might otherwise be overlooked (e.g. citizens, new entrant firms, or regional actors)

4. Commissioning experimentation to deepen knowledge of alternatives and their prospects which address not only the need for new knowledge but also the implications of that knowledge for transformative change (e.g. responsible research and innovation).
5. Extending evaluation beyond the summative or accountability standards to provide means for deep learning (learning about what needs to be learned and retaining knowledge from experimentation) and for indicators or metrics of transformation.
6. Assisting in the circulation of knowledge and with the processes of embedding, implementing, scaling and reproducing knowledge.

Collectively, these areas suggest an enhanced role of STI agencies in the governance of the rate and direction of science, technology and innovation.

Each of these areas challenge existing processes and ways of working in STI agencies to enlarge and enhance capabilities. Many of these areas also challenge the position of STI agencies by implying a wider scope of action in which other governmental ministries and agencies are also implicated. This suggests the need for research on orchestration, coordination and policy analysis which is sensitive to context and the social and political realities these contexts bring. The research foundations for tackling these challenges is underdeveloped. Although there is a considerable amount of research that is relevant, there is an urgent need to re-examine and synthesise existing knowledge for the new contexts of application.

Transformative innovation policy should not ignore science nor place all the bets on scientific breakthrough knowledge that is assumed to accomplish transformative social aims. Although some would contest whether 'blue sky' research is a valid concept given the social influences within the scientific community that guide trajectories and agendas, others would highlight the uncertainty and elements of surprise that accompany research, some of which produce entirely unexpected and 'off-agenda' outcomes. In turn, some of these outcomes prove to have useful practical application either sooner or later.

2.4 SGDs in the context of Transformative Innovation

The SDGs have many implications for STI policy and as part of the articulation and circulation of knowledge STI policy organisations have an important role for identifying where and how STI may contribute to meeting each of the SDGs.

However, it is also the case that the SDGs often involve a scope of action beyond the remit of STI agencies and requiring the co-participation and cooperation with other parts of government, the political process, and the social discourse more generally. The SDGs cannot be relegated to STI agencies nor can they be ignored by these agencies.

Theme 3. How to design, implement and evaluate (do) transformative innovation policy initiatives in various contexts?

This third theme focused on how to "do" Transformative Innovation Policy, and the kind of changes in methods, methodologies and practices are required for its implementation. This is a broad topic so it is necessary to start from some general assumptions. First, TIP has ambitious goals such as addressing societal challenges, related mainly with equity and sustainability challenges, through socio-technical system(s) transformation. It considers a variety of functional policy domains that transcend STI. It should be thought of as a complement rather than replacement of traditional innovation policy (R&D support and innovation system support).

When thinking of the implementation of TIP processes, it is necessary to specify a number of dimensions: who is doing transformative innovation, what, why, how, when, where, whose agenda, which innovations/sectors/developmental stage and at which level experiment/projects/whole systems; who to target – upstream actors (firms, universities) and downstream actors (civil society actors, cities, communities, users, trade unions, etc).

3.1 Design and Implementation

A starting point in the design and implementation of TIP is to define what kind of leadership is required. Such leadership should allow to set priorities, locate policies, and identify the role of different actors including different parts of the state, at different scales (national, local, city etc). Leadership, be it organized by the state or some other agent, should provide directionality but at the same time be flexible. This could be achieved by a central coordinating organ like council or innovation agency that may be set up with representation of interested stakeholders. For some countries in the global South state leadership is paramount to set and provide leadership of long terms goals.

Designing specific tools for TIP needs to address a specific set of challenges. It needs to find a balance between multiple objective, for example, between environmental sustainability and social equity. Often transformations in socio-technical systems can occur without improving existing conditions of equity, even worsening it. Therefore, directionality is important.

Some of these tools could be mission-oriented policies that take into account different contexts, supporting localized experiments and using these results to inform upscaling, replication and mainstreaming. This is one of the biggest challenges of TIP: to think beyond the experiments themselves, how to combine the outcomes of various experiments to generate relevant policies.

A third practical implication relates to horizon and funding of TIP projects. To conduct mission-oriented experimentation and evaluation of long-term projects organized to elicit impacts on societal challenges, learning, and adaptation is expensive. Funding and budget are critical issues in some countries, where STI has been diminishing in recent years. In that respect, TIP tools should be designed taking advantage of existing elements, generating a policy mix that combines old and new instruments.

Last, the engagement of a diverse range of actors is critical in a TIP approach. But in the context of a variety of experiments at different levels, how do we organize participation in different socio-technical system? Is it more important long-term sustained participation in local experiments, or national level participation in setting up priorities? And how do we engage with stakeholders? How to we coordinate them? For what outcome?

Involvement of different actors also provides support in the formation of coalitions, networks, alliances and/or innovation partnerships for mission-oriented initiatives. These transformative coalitions and partnerships should go beyond incumbent-focus to include new entrants like civil society, citizens, users etc. These coalitions will face the challenge of embracing with the dynamism of the transformative process (actors may change or broaden along the process). This comes with intermediation challenges and managing expectations and conflicts. Policy makers, provided the adequate tools, may play a brokering role.

3.2 Evaluation

TIP requires radical changes in evaluation, in the processes used to conduct evaluation and the kind of changes and, consequently, indicators, we aim to observe. Traditional approaches to evaluation assume a linear logic in defining measurable goals as the bases for assessing performance. By simplifying reality, conventional evaluation approaches have been identified as inadequate in capturing change in complex issues, which may involve uncertain and often unpredictable interactions between different people and events, or where interests diverge or conflict. Similarly, conventional approaches to evaluation are seen as a tool for accountability, which may deter the recognition of transformation and foster second-order learning (i.e. the introduction of reflexivity to evaluation practice).

We envisage several potential relevant areas of research and practice in the TIP evaluation domain: (i) developing dynamic evaluation tools to monitor and reflect on unfolding transformations; (ii) adopting a formative approach to evaluation, aimed at improving the design and implementation of an intervention and at supporting organisational capability building; and (iii) engaging in participatory processes through evaluation in order to generate open debate, confront conflicts of power and interest, as well as foster second-order learning.

In building these evaluation tools, some key elements should be considered:

- How to design evaluation to address inequalities/equity issues and enhance participation. Such approach should consider diverse interests and expectations and seek to be inclusive.
- To be able to evaluate short and midterm gains without losing focus of the ultimate goal, the transformation of the socio-technical system, and how to use those observed changes to refine TIP theory.
- The unit of evaluation: project, programme or policy and at local, national or supra-national level
- Evaluation will largely depend on the framing: thinking about challenges (open to alternatives/openness) and missions (prescribes), both aim at different purposes/outcomes.

- Evaluation should be considered a formative stage and as a learning process that measure outcomes; it should promote steering in terms of collective action and network formation. Strong networks and partnerships, based on mutual learning processes can support long term funding, guarantee uptake, etc. The generation of evidence is the catalyst for upscaling, which together with a broad base of engagement, can create the required legitimacy for TIP initiatives.
- All stakeholders participating of the evaluation should gain some capabilities on evaluation, as it will allow them to actively participate of it. This also includes a shift from competition and success, to learning and acceptance of failure as part of the cycle of policy intervention.

Measuring transformative innovation presents its own set of challenges. Normative approaches tend to think about indicators that measure growth and which are process oriented. These indicators tend to measure knowledge change. However, we need data at micro level as well as qualitative indicators that measure non-technical change. As with any complex system, there is a potential problem with causal attribution, since proving that transformation results from a specific policy intervention can be difficult.

Socio-technical systems have diverse dimensions that need to be transformed (technologies, industry, regulations, knowledge, routines), but some of these transformations will only be seen in the long term, therefore it is necessary to have proxies. These proxies can be specific understandings of changes (outcomes) in elements of a transformation, such as learning, expectations, networks, niches, regimes, etc.; but it is necessary to test their adequacy as proxy measures for transformation.

System change indicators such as SDGs require to be explicit about directionality. In this respect, and for the development of solid indicators, access to good qualitative and quantitative data is one of the biggest challenges. It will be necessary to explore the possibilities enabled by large-scale web data for this purpose.

3.3 Instruments

New instruments for TIP are required, and to create them first it is needed to define their scope (project, program, institution, etc.) and to approach them from a challenge perspective: define the challenge to be addressed, analyze existing opportunities, and define capabilities required to do so. Capabilities, specially, might be required at different scales and will need of the staging of learning platforms. Therefore, to approach these new instruments these should be presented as a process of learning, of undertaking collectively something new, with the purpose of attracting continuous learning at the individual and agency level.

Future-oriented methodologies such are foresight are crucial for developing a structured approach to transformation. This is a process issue, and as stressed earlier, it needs to think seriously about participation (who, what, and at what level). Furthermore, these methodologies should consider future orientation that is already embedded in the policy processes. This is only possible if there are institutional capabilities in place.

In developing a shared narrative and pathway towards transformation, this should make room for winners and losers. It should also address the need to take risks in the policy process, seeing it as a relational process rather than one about problems and solutions. These choices will create tensions that have to be actively taken into account.

Instruments for TIP should also seek to be able to inform and feedback the policy process. There are at least two aspects to the way we inform policy processes. The first one is about strengthening participatory policy processes that can enhance the take up of different types of knowledge. The second one is how to organize the evidence that has been gathered through initiatives and experiments. This will necessary imply to rethink power, decision making and how to address formalized processes, as who makes the decisions on the types of knowledge and evidences that informed TIP will shape its outcomes.

An option is to take a bottom-up approach to the generation of evidence and categorization of knowledge. In this way, participation and diversity is achieved from the beginning, and would enhance support for capabilities building.

Policy makers and practitioners' perspectives

On the second day, practitioners across the world were invited to present their work and perspectives on TIP. Christian Matti from Climate-KIC suggested that multi-level governance is highly complex, but the bulk of implementation is done at the local level. Questions posed by him were what can regions and cities do in transition processes and what do regions and cities want to do in these processes?

Göran Marklund represented Vinnova, Sweden, presenting that their organisation is trying to contribute to the Swedish capacity for SDGs. This is likely to be good for both socio-technical systems and economic competitiveness. As an innovation hub in EU, they prioritised SDGs and are taking mission-oriented approach to address each of the challenges. What they miss and want to improve are 'roadmaps,' and active learning which would enables a real understanding of obstacles and potential of transformations.

Imraan Patel, representing the Department of Science and Technology, South Africa, mentioned that for the South-African context, it is shared that three different sets of policy makers that we need to think about:

1. Those in the sector departments (e.g. energy agency, food etc): There has been a great acknowledgement of technological development. We need to recognise that that the world is changing at incredible rate. How do we transition and build partnerships in the face of state capture and rapid technological development?
2. Agencies abroad
3. Agencies in the country (national science foundation, innovation agency): How do we use our own instruments and policies to change existing systems.

Just transition is emerging in the country. Apex priorities are health and education systems. There is an emphasis on technological change. The question is also on how to design innovation policy in the context of demographic change.

Mike Acquith from the European Environmental Agency suggested that building a clearer articulation on understanding systemic challenges and the need for transitions is important. Since 2015 there has been more work into a more solutions-oriented innovations and shift in discourse towards more transitions research. Role of cities and role of finance are two cross-cutting themes and the organisation is looking to building strategic partnerships for building a knowledge system in support of systemic change.

Final plenary: remarks and next steps

It is acknowledged that the research priorities connect very well with the policy-maker's concerns. A research agenda will help create a new knowledge infrastructure. The workshop identified priorities, but an agenda needs to be participatory, prospective, experimental. It needs to focus on urgency and articulate the relationship between research and policy.

Policy makers reflect on their perspectives on TIP, suggesting there is no wall between policy makers and 'policy-shakers' and researchers. Vinnova has been using the theories quite well. That learning has come about also because of the urgency and the sense that SDGs are real and useful. In the Swedish context, missions' processes have similarities (observers, reflexivity, insider academics). It is suggested that learning is not going to happen by itself. Therefore, basic research, co-learning is crucial. Being able to communicate what is seen, to tell a story is additionally important. Building in the storytelling and the imagery into the processes is necessary.

The workshop provided an opportunity for a constructive dialogue, generating good ideas. We scanned many issues, but we need to set more specific priorities. One participant remarked pluralistic diverse approach of understanding innovation is nice, but what it avoids is changes in existing set up. One has inertia in traditional ways of doing things, there got to be a change in orientation in system which is resource constraint - this is a difficult choice. Focussing on institutions - changing some traditional patterns resource distribution, finding new levels of governance might be the best way to find the new spaces for transformation. Furthermore, countries vary in the extent to which this localism is possible/desirable. It is often a political issue how the choice between displacement and finding new space is dealt with.

Finally, it was suggested that we still need to recognise tensions alongside complementarities in the perspectives of the four networks. It is important to think clearly about what would be distinctive about the TIP research agenda, and how not to fall back into a lowest common denominator.

Some of the next steps discussed are: a) Follow up sessions in upcoming EU-SPRI, IST, Africalics and TIPC conferences; b) TIPC conference call bringing together relevant research projects, c) look for new modes of funding and organising the research agenda work. Further suggestions welcome.

Annex I List of Participants

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Annex II Background papers (submitted by participants prior to the workshop)

Background papers for Inter-network Dialogue Workshop Utrecht - 25-26 February 2019

Papers	Submitted by
Schot, J., & Steinmueller, W. E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. Research Policy, 47(9), 1554-1567. https://www.sciencedirect.com/science/article/pii/S0048733318301987	Johan Schot
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De Vicente Lopez, J., & Matti, C. (2016). Visual toolbox for system innovation. A resource book for practitioner to map, analyse and facilitate sustainability transitions. ISBN: 978-2-9601874-0-3 Brussels: Transitions Hub, EIT Climate-KIC. https://eitclimatekic-my.sharepoint.com/:b:/g/personal/cristian_matti_climate-kic_org/EZ5Ik3YhyPFBuzHYQBlAVbgBtDbGLBVHi1xhzfVfdJhRsQ?e=JodHmv	Cristian Matti

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Weber, M. K., & Truffer, B., (2017). Moving innovation systems research to the next level: towards an integrative agenda. Oxford Review of Economic Policy, 33(1), 101-121. https://academic.oup.com/oxrep/article/33/1/101/2972713	Matthias Weber
Ramstad, E., (2009). Expanding innovation system and policy: an organizational perspective. Policy Studies, 30(5), 533-553. https://www.tandfonline.com/doi/full/10.1080/01442870903208551?scroll=top&needAccess=true	Elise Ramstad
Ramstad, E., (2009). Developmental evaluation framework for innovation and learning networks: Integration of the structure, process and outcomes. Journal of Workplace Learning, 21(3), 181-197. https://www.emeraldinsight.com/doi/abs/10.1108/13665620910943924	Elise Ramstad
EEA, (2019), Sustainability transitions: policy and practice. Report to be published in September 2019	Bruno Turnheim and Mike Asquith
Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., ... & Fünfschilling, L. (2019). An agenda for sustainability transitions research: state of the art and future directions. Environmental Innovation and Societal Transitions. https://www.sciencedirect.com/science/article/pii/S2210422418303332	Bruno Turnheim