TRANSFORMATIVE INNOVATION POLICY CONSORTIUM
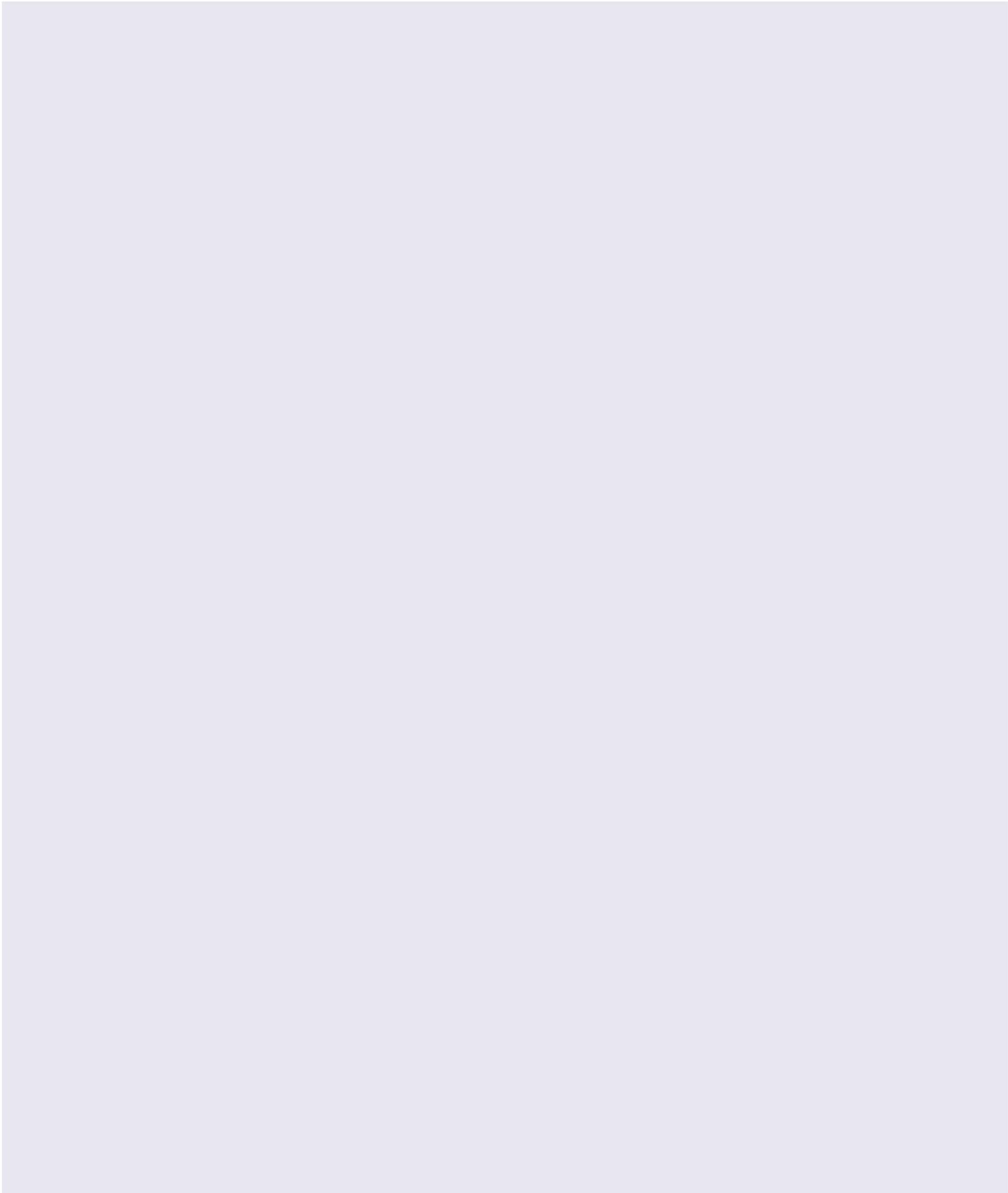
INNOVATION FOR TRANSFORMATION

CONTENTS

"The long-term vision of TIPC is to lead experimentation in Science, Technology and Innovation policy for transformation. Accompanied by rigorous comparative empirical research, we aim to build a constituency behind transformative policies through training, skills development, evaluation and public outreach. We are looking to generate new frameworks, standards and narratives which allow for positive upscaling. We would like to see widespread adoption of new transformative practices in the Global South and North. The vision is to explore novel ways of mutual policy learning and co-creation of knowledge between research and policy."

Professor Johan Schot,
Director, Science Policy Research Unit, University of Sussex
Professor of History of Technology and Sustainability Transitions

INTRODUCTION TO TIPC

The opening day of SPRU's 50th Anniversary Conference
in September 2016 saw the launch of the first stage of a new
seminal partnership, with the central aim of transforming innovation.

The Transformative Innovation Policy Consortium (TIPC) brings together global actors to examine and research respective innovation systems to explore the future of innovation policy – its foundation, formulation and governance.

Alongside SPRU, the founding countries of Colombia, Norway, South Africa, Sweden and Finland made an equal finiancial contribution and dedicated time of senior policymakers and other resources to collaborate on work within TIPC. A further cohort is anticipated for 2017/18.

The Consortium's key objective is to examine and expand on current innovation frames and approaches to assist in solving urgent social and economic issues. Partners commit to the Consortium to enable joint resource and working to progress new innovation theories and practices with key deliverables and outcomes seeking to address the central issues of our time: climate change, inequality, employment and future growth. This is a challenge for both the Global North and the Global South. TIPC aims to shape and deliver a new transformative innovation policy framework alongside other associated 'policy mixes' in a transdisciplinary way. The Consortium will interface between the worlds of research, business, government, media and civil society. During the process all participants are positioned as active co-researchers and co-policy designers.

The Transformative Innovation Policy Consortium and its vision for the next generation of thinking on innovation policy is beginning to form.

As with all fresh approaches, the answers are far from being definitive. Importantly though we are beginning to understand what is needed going forward. As expressed by Goran Marklund, Deputy Director General for External Matters at Sweden's Vinnova: 'We know the right questions now.'

Formulating the key areas of enquiry for TIP has been significant. Establishing the beginnings of the research agenda and the questions for analysis, experimentation, implementation and evaluation has been the primary impact of TIPC's pilot year. These will then translate into the aims of the proposed 5 year 'Transformative Exploration Lab' programme.

From the TIPC members' comparative studies conducted jointly by researchers and policymakers, the gaps in knowledge, and therefore the opportunities, around Transformative Innovation Policy have started to emerge.

TIPC POSITION PAPERS

Enacting Transformative Innovation
Policy: A Comparative Study

CHATAWAY, DANIELS, KANGER, RAMIREZ,
SCHOT, STEINMUELLER, (2017)

Framing Innovation Policy for
Transformative Change:
Innovation Policy 3.0

SCHOT, STEINMUELLER, (2016)

Available at
www.johanschot.com/publications

This joint development of research questions is the first step towards the coproduction of TIP knowledge between civil society, policymakers, international organisations and academics. This is the stand out opportunity for TIPC and its members.

The fresh thinking and narrative on innovation policy provided by the Frame 3 lens, is slowly starting to inform and influence next-generation approaches to policy construction across a number of other governments and international organisations. There is receptiveness to this alternative framing, demonstrated at the regional workshops held for interested participants across Africa and Latin America. In our transitioning world, TIPC's alternative viewpoint and the possibilities for national and international aims, such as the Sustainable Development Goals, have begun to gain traction and momentum. TIPC's exploratory year culminates in South Africa with members, and other interested participants, taking part in the 2017 inaugural TIPC conference – Prospects for Transformative Innovation Policy.

For more details visit
www.transformative-innovation-policy.net

MEMBERS

The first exploratory phase for TIPC includes five founding members.
We anticipate a further cohort for 2017/18 and beyond.
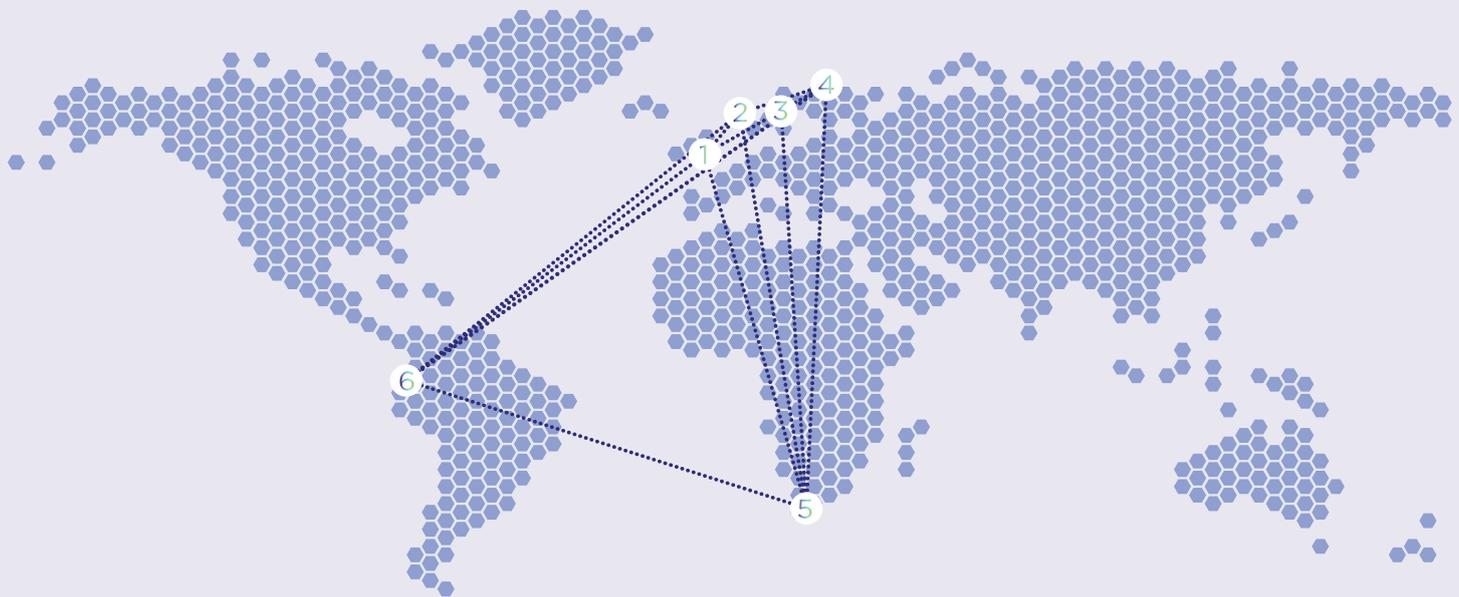
1

Science Policy Research Unit,
University of Sussex

3

Research Council of Norway

5

The South African National
Research Foundation

2

Swedish Governmental
Agency for Innovation Systems
– VINNOVA

4

Finnish Funding Agency
for Innovation
– Tekes

6

Colombian Administrative
Department of Science,
Technology & Innovation
– Colciencias

THE FORMATION & FOUNDING RESEARCH

A WORLD IN TRANSITION

SUSTAINABLE DEVELOPMENT GOALS

| 1 NO POVERTY | 2 ZERO HUNGER | 6 CLEAN WATER AND SANITATION | 10 REDUCED INEQUALITIES | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 14 LIFE BELOW WATER | 15 LIFE ON LAND | 17 PARTNERSHIPS FOR THE GOALS |

WHY IN SO MUCH FLUX?

A Diagnosis

We are in the Second Deep Transition since 1970s. First Deep Transition was the move toward Industrial Modernity. It lasted 150 years. Deep Transition is about transforming a range of socio-technical systems that form the material backbone of our civilisation. Current systems based on fossil fuels, mass production, mass consumption, resource and waste intensity and industrialization cannot address the Sustainable Developments Goals or ride the waves of the current megatrends. While the future is open, the world is moving in many directions simultaneously, radical innovation on systems level is necessary.

POLICY EXPERIMENTATION, TRANSFORMATIVE RESEARCH, AND COMPETENCE BUILDING

WHAT TO DO?

The Perscription

Innovation was 'Creative Destruction' now it has become more 'Destructive Creation'. Science, Technology and Innovation Policy needs a fresh model - Transformative Innovation Policy (3.0). Next generation approach to creating inclusive and sustainable sociotechnical systems. Current policies are too based on guiding principles such as stimulating R&D, building national systems of innovation and encouraging entrepreneurship. These are important but not sufficient. Urgent issue: develop and experiment with Transformative Innovation Policy.

CREATION OF GLOBAL CONSORTIUM

EXPRESSION OF INTEREST

TRANSFORMATIVE INNOVATION POLICY CONSORTIUM

PARTNERSHIP PILOT

Research Council of Norway

The South African National

Research Foundation Colombian Administrative Department of Science, Technology & Innovation – Colciencias

Science Policy Research Unit, University of Sussex

Swedish Governmental Agency for Innovation Systems – VINNOVA

Finnish Funding Agency for Innovation – Tekes
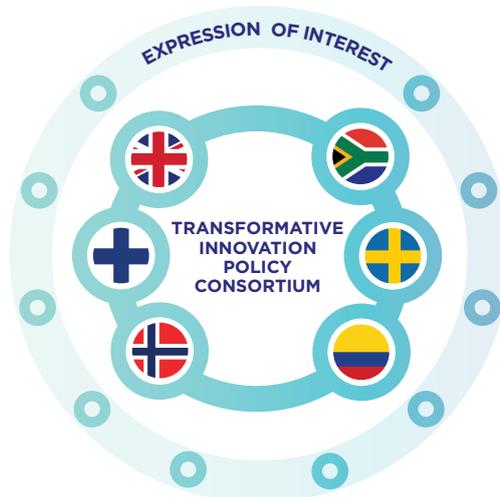
GLOBAL ISSUES, GLOBAL CONSORTIUM

Joint Pilot Program of research, learning, networking to articulate Transformative Innovation Policy agenda to define 5 Year experimental program with flagship projects, research network and program, training and shared learning activities.

THE THREE FRAMES OF INNOVATION

Re-thinking innovation policy is timely. Many research councils, governments and international organisations world-wide want innovation to address a number of societal or grand challenges. Another indicator is the growing impact of the notion of Responsible Research and Innovation (RRI). Yet how to design, implement and govern challenge-led innovation policies is far from clear. Many innovation policies are based on the 20th century supply-driven innovation model, which takes competition between nations and support for R&D as the main entry point for policy making without thinking more creatively about the broader suite of innovation policies that are available. Over the last decades two main innovation policy frames have been developed.

THE FIRST FRAME OF INNOVATION: R&D AND REGULATION

The first framing portrayed innovation policy as providing incentives for the market to produce socially and economically desired levels of science knowledge (R&D). This is mainly implemented by subsidies and measures to enhance the 'appropriability' of innovation (IPR). To identify which areas need support, foresight has been developed. With respect to negative externalities, various forms of technology assessment have been established and, to protect society if the impacts are becoming a problem, regulation is put in place. This framing identifies the most important element of innovation as the discovery process (invention) and gives rise to the linear model in which technology is the application of scientific knowledge. The linear model privileges discovery over application. In part because the rewards of application are assumed to be

carried out through an adequate functioning of the market system. Only in the case of market failure, is government action required.

THE SECOND FRAME OF INNOVATION: NATIONAL SYSTEMS OF INNOVATION & ENTREPRENEURSHIP

The second framing aims to make better use of knowledge production, supports commercialisation and bridges the gap between discovery and application. This framing takes as central various forms of learning including: those acquired by using, producing and interacting; linkages between various actors; absorptive capacity and capability formation of firms; and finally, entrepreneurship. The rationale for policy intervention is system failure – the inability to make the most out of what is available due to missing or malfunctioning links in the innovation system. Innovation policy focuses, for example, on technology transfer, building technology platforms and technology clusters to stimulate interaction and human capital formation. Further, in this model, foresight, technology assessment and regulation are add-ons to the core activity of promoting innovation (on the assumption that any innovation is desirable and good since innovation is the motor for producing economic growth and competiveness).

THE THIRD FRAME OF INNOVATION: TRANSFORMATIVE INNOVATION POLICY

A third frame for innovation policy is that of transformative change which takes as a starting point that negative impacts or externalities of innovation can overtake positive contributions. This frame focuses on mobilising the power of innovation to address a wide range of societal challenges including inequality, unemployment and climate change. It emphasises policies for directing socio-technical systems into socially desirable directions and embeds processes of change in society. Innovation Policy 3.0 explores issues around socio-technical system change to give a structural transformation in: governance arrangements between the state, the market, civil society and science; experimentation and societal learning; responsible research and innovation; and, finally, a more constructive role for foresight to shape innovation processes from the outset and on a continuing basis.

HOW DOES FRAME THREE DIFFER?

This flowchart below demonstrates the principal difference between Frames 1 and 2, and then that of Frame 3.

Frames 1 and 2 assume public welfare will be addressed through the stimulus of new knowledge and innovation which will be utilised by industry to achieve economic growth. Frame 3 explicitly and fundamentally addresses societal goals as a primary focus. By tackling societal challenges first and foremost, Frame 3 thinking supposes that, with attention on social and environmental welfare, there will be greater productivity and less inequality, therefore then, increased economic growth. It flows counter to that of Frame 1 and 2 assumptions.
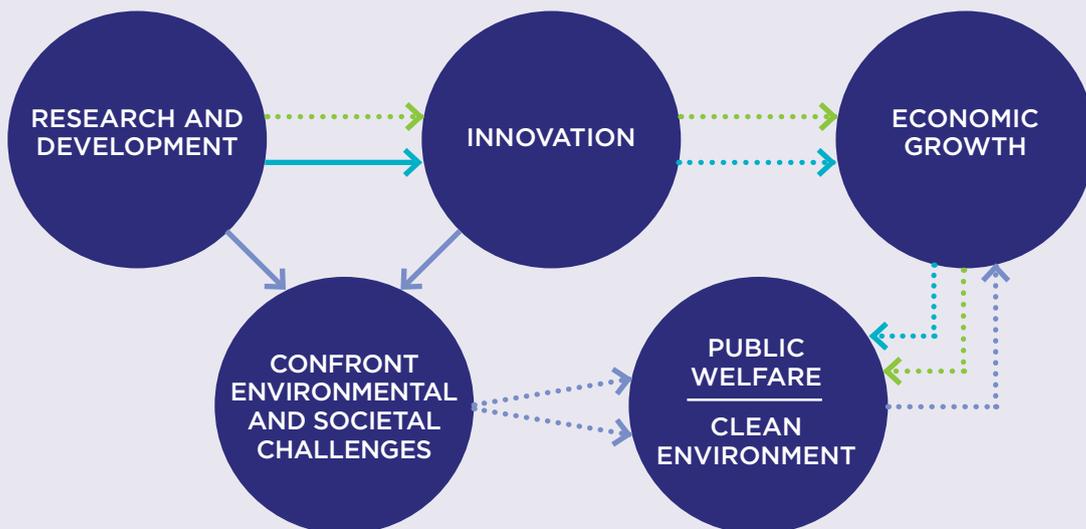
Frame 1 → **Frame 2** → **Frame 3**

Solid line = This shows the frame addresses explicitly this aspect
(e.g. the link between knowledge creation and utilization in frame 2).
Dotted line = This indicates that an aspect is assumed to follow automatically
(e.g the utilization of the results of basic scientific research by industries in frame 1).

TIPC AIMS AND IMPACT

The focus of impact for TIPC members is to develop on how to deliver transformative Science, Technology and Innovation policy: the experimentation; implementation; policy practice; evaluation; knowledge, skills, training and mutual learning.

IMPACT

- **Demonstrators** – Activities will be backed up with rigorous data-collection and evaluation so it is thorough, evidence based policy-making.

- **People** – Training, competence building, mentoring, coaching and co-creation.

- **Rejuvenated Standards** – New frameworks and narratives along with national and international data infrastructures.

AIMS

- Broaden the concept of innovation from what is traditionally called invention to innovation and embedding it in society to think far beyond support for R&D and the prioritisation of specific research avenues. It should support constant 'tinkering' and re-making of systems as well as the development of new services and organisational models to meet social as well as economic challenges. This involves a wide range of actors – from firms to knowledge institutions to users, NGOs and governments.

- Provide direction to innovation. This outcome is not about setting priorities, but about improving the process of opening up to a possibility of choices, and of the closing down of options. Innovation policy should allow a greater diversity of options without falling back to dichotomous, 'for' or 'against', arguments around specific options. It should specifically enable experimentation with options outside the narrow boundaries set by incumbents. It should be based on scientific advice from a broad range of perspectives, and should nurture opportunities for various stakeholders to challenge the dominant views. Innovation policy inescapably and necessarily involves conflict and political power struggles. Governance structures should be made compatible with these aims.

- TIPC does not assume that innovations and socio-technical system change will necessarily come from the Global North, and that other countries will have to play catch-up. On the contrary the assumption is that both the Global North and Global South are in a position to contribute, and that mutual learning will be beneficial. TIPC looks to develop social innovation, inclusive innovation, frugal innovation and pro-'poor' innovation.

WHAT IS TRANSFORMATIVE INNOVATION POLICY (TIP)?

In our Frame 3 approach, these six strands constitute steps towards achieving Transformative Innovation Policy. The case study for each member country's Transformative Innovation Learning History examined to what extent these elements were present and how they came into play. The policy review criteria includes:

1

DIRECTIONALITY:
Did the policy suppose non-neutrality or were a wide range of technological options considered and did it address which social and environmental issues they would provoke? Did the project and policy consider the non-neutrality of technology?

2

SOCIETAL GOAL:
Did the initiative focus on grand societal challenges such as those encompassed in the United Nations' Sustainable Development Goals?

3

SYSTEM-LEVEL IMPACT:
Does the initiative address change on the level of socio-technical systems? Does it have wide impact?

4

LEARNING AND REFLEXIVITY:
Does the project allow for 'second order' or 'deep' learning? Is the opportunity for this embedded within the policy and project?

5

CONFLICT VS CONSENSUS:
Were differences in opinion between stakeholders acknowledged and encouraged?

6

INCLUSIVENESS:
Have civil society actors and/or end-users been included?

1

From the outline, it follows that a **Transformative Innovation Policy (TIP) needs to engage with 'Directionality' – the first of the criterion**. The question here is whether in policy formulation and stakeholder engagement there is recognition that there are alternative pathways or trajectories by which technology can develop. The risk of not engaging with directionality is that existing trajectories may simply be replicated or extended.

2

The case study selection criterion of **'Societal Goal' represents the extent to which a policy initiative can be said to be directed at one or more specific social challenge**. Identifying the challenge or challenges is important to locate the case study for comparative purposes. It also provides a basis for exploring how different actors understand the nature of the challenge and the means for meeting it. These understandings are a basis for diverse viewpoints – and capturing this diversity is an important part of the case study research. It is a principal reason why we have adopted the methodology of Transformative Innovation Learning Histories (TILH).

3

The criterion of **'System Level Impact' is an indication of whether the innovation is aimed at a transformation of underlying routines**. Impact can be considered as the extent or scale of expected change. As noted in the above working definition, one indication of transformative is the extent of the disruption or break with past routines and practices. As always, there is a risk that novelty in language is a substitute for more fundamental change. By considering how routines and practices will be altered, the scale of system level impact can be judged in comparison with other efforts to enact change or reform.

4

The **degree of 'Learning and Reflexivity' is a further indication of the transformative nature of the policy initiative**. These are further indications of the ways in which routines and practices are altered by the innovation policy. Here, the focus is one of the accumulation of knowledge about the new routines and practices that emerge as new directions are explored. What is learned? Who learns? Do processes of learning involve questioning of existing routines, and understanding each other's assumptions and worldviews? Are these current and future learnings shared or exchanged with others? How are they preserved and applied over time?

5   **6**

The last two criteria – **'Conflict vs Consensus' and 'Inclusiveness' – relate to the social aspects and politics of the initiative** – addressing issues of democratisation, interests and inclusiveness. The issue of 'conflict' is about the recognition of interests. Some of these interests may support while others may oppose the transformative nature of policy (transformative in either sense). Conflict is expected although it is expressed in different societies in different ways. In some cases, it is made explicit, in others there is a search for common ground that allows widespread consent. There is no 'best way' for managing conflict, but considering how it is manifested and resolved is an important question for the case study research. The issue of inclusiveness recurs at several different levels in the policy cycle (the planning, implementation, and evaluation of policy). Inclusiveness refers both to the breadth of participation and empowerment and also its depth – the extent to which included actors are able to influence the processes of the policy cycle.

THE TIPC EXPLORATORY PHASE METHODOLOGY

Each member embarks on an exploratory phase to understand and analyse how the three framings of innovation interact and to examine Transformative Innovation Policy (TIP) elements within their national context while drawing from the experience of other participants. The next stage is to enter the five year TIP exploration lab.

Overview of policy activities from the perspective of the 3 frames of innovation. In country training (2 days) on the main ideas and co-develop five page study of your country's current STI policies. Build your country and SPRU team.

Review with the shared learnings from the cohort's case studies for further TIP analysis. Shortlisting and selection of the case study for each country's Transformative Innovation Learning History (TILH).

Conduct in-country TILH with workshops and evaluations. Analysis of case study, preparation of final report and discussions on next stage.

Further analysis, learning and coproduction of knowledge within the Consortium cohort.

If appropriate, design and implementation of 5 year TIP exploration 'lab' incorporating the 5 central strands of the TIPC central approach.

TIPC GLOSSARY OF TERMS

In TIPC, our overall aim is the co-creation of knowledge about TIP. Co- creation of knowledge by participants with different experience and prior understandings necessarily involves the construction of a shared vocabulary.

The meanings and contextualisation of this vocabulary will differ across participants. It is not productive either to dictate[1] this vocabulary or to pursue a 'grounded approach' that begins without pre-conceptualisations. Instead, we need to begin with a set of starting points for discussion about key terms and concepts and then discuss how these are understood, translated, and applied in thinking about and gathering evidence concerning member case studies. This glossary[2] offers a set of starting points shaped by a position on: academic pre-conceptions, the initial accounts of practice offered by partners and reflections on the case studies that have been offered by the partners. To simplify, the notes below make declarative statements rather than qualified and tentative statements such as 'some scholars or practitioners understand <vocabulary term> to mean <definition>. Since this glossary is a tool in the research process, we do not reference the terms here. In TIPC publications, we will provide more detailed references.

We focus here on terms which underlie the rationale for TIPC and those that have received some attention in TIPC discussions and analysis.

ACTORS

The proponents of and opponents to transformative change that respectively seek to accomplish or seek to block, divert, or slow transformative change for a variety of reasons including a perception or the reality that such change will disadvantage their current interests. Actors can be individuals, groups of individuals working within organisations and across organisational boundaries (so networks or coalitions) and organisations.

ACTOR-MAP

Overview of proponents and opponents as well as included and excluded actors and how they relate to each other and interact with each other. The actor-map would include attention to power-dynamics between actors (their dependencies, struggles, conflicts, divergent rationales and values)

[1] The word 'dictate' suggests that there is an authoritative definition of vocabulary or that, for the purposes of the consortium, we defer to some authority (e.g. for purposes of expediency). Since we regard transformative innovation policy itself to be innovative, there is no prior authoritative definition. Our collective desire to engage in co-production means that it is inappropriate to defer to either an external or internal authority.

[2] Version 1: Ed Steinmueller, Johan Schot, April 10 2017

CO-CREATION

A process in which participants attempt to reach a common understanding based upon reasoned discussion with attention to the opportunities and barriers for conveying this understanding to others. The aim is not consensus, but a better understanding of points of differences and overlap. Other words used sometimes are co-production, and co-construction. In our research process these words have a similar meaning

DEMOCRATISATION

In our project refers to participation. It is expected that achieving transformative change may require participation by many actors and drawing on their innovative potential. Participation also means that many actors have a voice and the least powerful are in the position to challenge the most powerful actors.

DIRECTIONALITY

Based upon one of the stylised facts of innovation research we can say that innovation is cumulative (building upon the past), innovation can be said to have a direction. Only certain solutions are looked for while others are typically ignored. This direction (sometimes called a trajectory or pathway) can be altered by transformative innovation that establishes a new direction and thus process of accumulation (also a new trajectory or pathway). A corollary is that a change in directionality involves the abandonment or destruction of an older direction (trajectory or pathway) (although it may involve the old pathway becoming much less prominent and influential). The process of change can follow a range of patterns. Two major ones: 1) substitution so competition between directions and in the end full or almost full replacement; 2) hybridisation (or reconfiguration) where several directions are combined, so elements of the old regime persist.

INCLUSIVENESS

Closely coupled with democratisation, this refers to the inclusion of all actors in decision making processes, but goes beyond that since it also refers to actors having the access and capabilities to participate. So it includes a consideration of the context in which actors interact.

Consideration of interests, democratisation, and inclusiveness is linked to the politics of innovation policy and therefore to issues of legitimacy (the extent to which innovation policies are seen as legitimate roles for state actors) and accountability (how the outcomes of policies are assessed).

INNOVATION

An idea, or process whose novelty distinguishes it from prior ideas and processes and is taken up and utilised (including processes of articulation, adaptation, or customisation) by people other than the originator(s). The idea of process can be a re-invention or re-use of older ideas and processes. Innovation is basically a process of renewal. Please note that for us innovation does not refer to a product or process technology, but of course includes the development of new artefacts (products). In the context of transformative innovation policy we are interested in innovation which builds up new socio-technical systems.

REFLEXIVITY

This notion refers on the one hand to the ability of actors to reflect on their own routines, and worldviews , the routines, position and worldviews of other actors, and the rationality. In some countries supply is intermittent rather than continuous and, of course, there are significant differences in the prices for use of electricity in different countries. The poor in a number of countries may have to pay in advance for access.

SECOND ORDER LEARNING

Or deep learning refers to a process in which routines are questioned. This includes a fundamental rethink of how problems are defined, and what solutions are considered appropriate. First order learning refers to a process in which routines are sharpened and become better defined. For example in a project on carbon calculations the actors can seek to optimize the calculations but also more fundamentally question the design and use of these calculations.

SOCIAL NEEDS

While *transition* is specifically related to social and environmental sustainability which is taken to be a social need, there are other social needs that may stand alongside or complement transition to sustainability. Examples include health, quality of life, and social justice (which are all included in a broad definition of sustainable development, and captured by the UN sustainable development goals.

SOCIO-TECHNICAL REGIME

In our project we look at sets of routines which are often aligned. This is what we call a socio-technical regime. We can make a distinction between heuristics (design rules, search rules); policy routines, user routines (preferences), cultural routines (expectations, perceptions, frames). These routines can be formal and informal. An example of formal ones are published standards; examples of informal ones are rule of thumbs or norms people follow.

SOCIO-TECHNICAL SYSTEMS

Norms, routines, and standards (regimes) become expressed in socio- technical systems. Such a system is a configuration of actors (their knowledge, skills), technologies (products, infrastructures), and institutions (regulations, cultural symbols, markets) for fulfilling a certain societal function (mobility; or inland mobility; urban mobility).

Example: The socio-technical system of grid distributed electricity includes the power plants, the electrical power cabling, the safe wiring of newly constructed buildings, and the existence of public or private arrangements for generating and distributing electrical power. Markets are: use of electricity in homes or businesses for purposes of illumination, heating, motors or powering electronic devices.

This is a large system with many different societal and technical features. It is over a century old and although it is not universal, about 85% of the human population participates in this system.2 In terms of relations between people, large numbers of people participate in this system as consumers using a myriad of electricity using technologies while a much smaller number of people are responsible for the generation and distribution of electrical power. One might imagine an alternative socio-technical system involving household generation of electrical power without connection to the grid. In this system there are very different relations between people (e.g. there are not separate groups of people engaged in the supply of electrical power). This alternative system would also create different relations between people and technology (e.g. it is likely that one would have to more carefully plan for how much electrical energy one uses and when it is used) and this alternative system is likely to be associated with different social, cultural or political models.
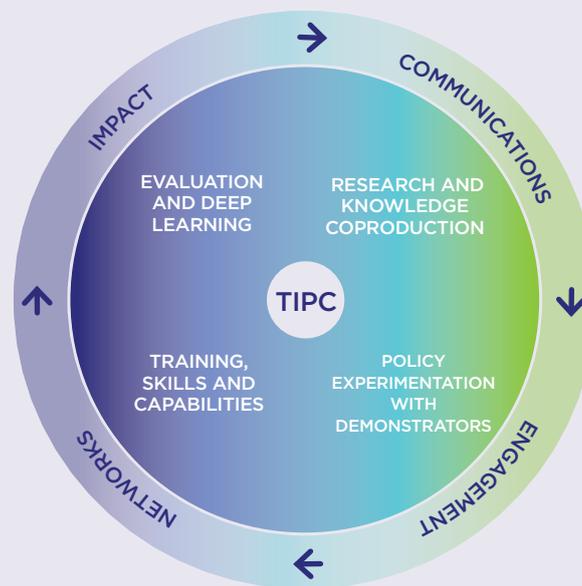
TRANSFORMATIVE

In our context, there are two important meanings for this adjective as applied to innovation: 1) a break or distinction from past practices or routines which opens new possibilities for further innovation across a broad front or over a wide variety of contexts (i.e. this definition is a qualitative statement of the potential or an achievement being large as compared to other innovations) and 2) further to 1), a process that establishes a new directionality.

TRANSITION

In its simplest form, the change from one socio-technical system to another (which thus also implies a change of regime, e.g. rules). The term is usually built on the premise that current socio-technical systems are not socially or environmentally sustainable and there is a social and/or economic need for a specific type of transition, one whose directionality is more compatible with social or environmental sustainability.

TIPC TRANSFORMATIVE LAB

Following the exploratory phase the aim is to set-up a five year programme to examine and embed innovation policy that is transformative to reach societal goals and aid sustainability transitions. The proposal is to establish a programme that comprise of four principal elements with communications, engagement and research network that encompasses and translates the findings and activities.

INNOVATION FOR TRANSFORMATION: POLICY ACTIVITIES

- Building transition arenas to support diversity and the opening up of alternatives with pathways to sustainability
- Technology forcing through regulation and/or procurement
- Building on social innovation, inclusive innovation, frugal innovation, pro-poor innovation
- Setting-up large scale societal experiments and scaling-up with use or creation of intermediaries, harnessing Strategic Niche Management

- Enhancing anticipation, adaptability, reflexivity capabilities
- Constructive Technology Assessment and Responsible Research & Innovation
- Bridging Science/Engineering and Social Sciences/Humanities in the education system
- New institutions for coordination between various policies with integration and policy mix of STI into other policies - energy, housing, agriculture, healthcare, transport, and city policies

TIMELINE

September 2016
TIPC Launch at SPRU
50th Anniversary

**September 2017 –
March 2018**
Second member cohort
enter their inception
phase

September 2017
Founding member
cohort complete the
first exploratory phase
culminating in inaugural
TIPC Conference

March 2018
Aim to launch a five year
TIPC Transformative Lab
programme

EXPLORE FURTHER

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FURTHER READING
Framing Innovation Policy for Transformative Change:
Innovation Policy 3.0
JOHAN SCHOT, W. EDWARD STEINMUELLER (2016)

Deep Transitions: Emergence, Acceleration,
Stabilization & Directionality
JOHAN SCHOT, LAUR KANGER (2016)

Enacting Transformative Innovation Policy:
A Comparative Study
CHATAWAY, DANIELS, KANGER, RAMIREZ, SCHOT, STEINMUELLER (2017)

All can be found at **www.johanschot.com/publications**