

An expert-based participatory evaluation of public policies for sustainability transitions

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1. Introduction

How can innovation policy mixes for sustainability transitions be appraised and compared between countries? This paper introduces a conceptual framework, a set of appraisal criteria and a participatory expert-based method for an evaluative reflection on country-level public policy frameworks for sustainability transitions. The Sustainability Transition and Innovation Reviews (STIR) framework combines a methodological approach inspired by the Bertelsmann Transformation Index (Bertelsmann Stiftung, 2016) with existing theoretical frameworks on sustainability transitions (Technological Innovation Systems (TIS), Multi-Level Perspective (MLP), Strategic Niche Management (SNM) etc.). In doing so, it seeks to provide an enhanced framework for comparative assessment of, and reflection on, the capacity of policy systems to deliver sustainability transitions.

The framework starts from the assumption that any attempt to provide a comparative assessment of country performance should be responsive and open to the divergent contexts and institutional capacities of the countries in question. It is thus situated firmly within aspirations for reflexivity in transition governance (Loorbach 2010; Kemp et al. 2007). Moreover, the uncertain and contested nature of many potential policies for sustainability transitions demand a framework that is reflexive and open to divergent perspectives, and that allows situated interpretation of relevant indicators. STIR is designed to provide a forum for a collective reflection of whether and to what extent public policies are fit to enable and drive sustainability transition.

STIR joins a growing family of analytical frameworks designed to assess and measure progress towards green economy and sustainability. These range from frameworks focused on measuring direct environmental pressures and impacts (e.g. the Driving Forces-Pressures-States-Impacts-Responses (DPSIR) models used by the EEA (OECD, 2003), or Yale's Environmental Performance Index), to those focused specifically on evaluating particular environmental policies. There are also a number of evaluation systems that attempt to combine outcomes, governance characteristics and policies, such as the EU Eco-Innovation Scoreboard or the Global Green Growth Institute's Global Green Economy Index.

The approach presented in this paper differs from these efforts in both the scope and the process of performing evaluation. Unlike most other scoreboard or index exercises, STIR is focused predominantly on public policy and governance. Our approach is based on both quantitative indicators and a qualitative expert appraisal on a country's performance. The choice of expert-based appraisal rests on the assumption that available quantitative data

require an informed interpretation and situated reflection to arrive at a useful appraisal of countries' performance.

There are three main purposes of the STIR approach:

- Policy evaluation and policy research – STIR is a systemic policy evaluation tool based on a mix of self-assessment and expert appraisal focused on individual countries.
- Public debate and policy learning – STIR is to contribute to a policy learning process providing a comprehensive policy appraisal framework for national debates and policy reflection on concrete steps to improve current policies.
- International collaboration – STIR aims to stimulate international debate and collaboration on the current and future role of public policy in enabling systemic changes in economies and societies towards sustainability.

The STIR process is currently being piloted. This paper provides an overview of the overall STIR process, and the conceptual framework used to inform the appraisal criteria.

2. Theoretical background

In order to construct a comprehensive framework to reflect on complex policy challenges, we draw on a number of approaches, including innovation systems (notably TIS), research and innovation “policy mix” and the sustainability transitions literature (MLP and SNM). We shortly discuss relevance of various approaches for the framework and its evaluation criteria.

2.1. Innovation systems and innovation studies

The STIR approach is rooted in a systemic and quasi-evolutionary view of socio-technical change. In particular, we draw on approaches that recognise the functions that emerging innovation systems must successfully perform if they are to progress, particularly the Technological Innovation Systems approach (Bergek et al. 2008; Hekkert et al. 2007). While the TIS framework is a useful tool for understanding the strengths and weaknesses of innovation dynamics at the level of a specific technology, it cannot be directly translated into application at the level of a national policy system. However, existing approaches for assessing innovation systems at the national scale (such as National System of Innovation research) have generally focused on the static structure, rather than the co-evolutionary dynamics of systems change. In our approach, we draw on elements of both the TIS and national innovation systems approaches, and in particular take inspiration from the clarity with which TIS scholars have sought to measure the performance of particular “functions” of innovation systems.

2.2. Sustainability transitions

Similarly, the multi-level perspective provides a broad heuristic framework for understanding the dynamics of technological transitions (Geels 2002, 2004). The MLP highlights the interrelatedness of dimensions of socio-technical stability and change, including such heterogeneous elements as culture, politics, technology, science, business practices and user habits. Many of the most policy-oriented conclusions from this literature have highlighted the potential for policy to support the establishment of ‘niches’ in which technological and social learning and development can take place (Kemp et al. 1998).

Other related areas of work include the co-evolutionary perspectives of Freeman and Louca (Freeman and Louca 2001) or of Foxon (Foxon 2011). All of these frameworks emphasise the inter-relatedness of various aspects of innovation, and the embeddedness of policy within, rather than outside of, socio-technical systems or 'regimes' (Smith and Stirling 2007).

More broadly, the sustainability transitions literature has roots in evolutionary economic approaches, as pioneered by Nelson and Winter (Nelson and Winter 1982). Such frameworks highlight not only the processes that result in 'dynamic stability' of systems; they also highlight the importance of the 'selection environment' in which novelties compete. Here, we also draw straightforwardly on traditional economic approaches, which highlight the roles of economy-wide environmental price signals and stringent environmental regulations in altering the market selection environment and thus stimulating environmentally-oriented innovation (Acemoglu et al. 2012; Popp 2010; Rennings 2000; Porter & van der Linde).

2.3. Policy design and policy mix

More broadly, we draw on classic policy evaluation typologies, which emphasise the importance of both measuring performance across a range of policy processes (from agenda setting and prioritisation through to impact assessment and implementation), and which provide criteria for policy evaluation (Arnold 2004). For example, the European Commission employs five key criteria: efficiency, effectiveness, coherence, relevance and EU added value.

The recent literature on the design of policy mixes for sustainability transitions has also suggested criteria to be employed in assessing policy mixes. Policy mixes are understood as 'complex arrangements of multiple goals and means which, in many cases, have developed incrementally over many years' (Kern and Howlett, 2009, p.395). There have been several recent contributions focused on the concept of policy mix in the context of sustainability transitions (Kivimaa and Kern, 2016; Rogge and Reichardt, 2016; Uyarra et al., 2016). Rogge and Reichardt (2016) point out that policy mix approached from the point of view of sustainability transitions requires a broader scope to encompass its complexity, policy processes and the role of long terms strategies and targets. The proposed policy mix for sustainability transitions concept comprises three building blocks and a number of analytical dimensions. Elements comprise policy strategy and policy instruments. Policy processes cover policy making and policy implementation, as well as style of policy processes. Characteristics include consistency of elements, coherence of processes, credibility, and comprehensiveness of policy mix. Dimensions include policy fields, governance levels, geography and time.

2.4. Governance and deliberative democracy

Aspiration of the STIR approach is that it addresses the broad governance framework that encompasses specific policies or policy mixes. In order to support the reorientation of policy towards meeting sustainability goals, the current governance underpinning political, regulatory and policy systems may require a radical redesign. The national systems, structures and processes, were not designed to cope with major global challenges such as climate change. The concern with global environmental problems, or even environmental conservation, have not traditionally been core priority of any state (Dryzek et al., 2013).

The focus on governance points to the importance of new forms of governance, including polycentric, networked and deliverable governance (ibid., p.141). Polycentric and networked governance relies on multi-actor and multi-level perspective of society, which allows for multiple initiatives to be pursued by various actors. Polycentric governance was forcefully advocated by Ostrom (2009) who emphasised the dimension of self-organisation and downplayed the need for the top-down central coordination. Other authors (Dryzek et al., 2013; Hajer, 2011), however, argued that in reality polycentrism requires a degree of central coordination and facilitation, notably given the often-conflicting objectives of various groups.

Deliberative governance is collaborative, inclusive and pragmatic, and features 'dialogues oriented to the production of mutually beneficial outcomes, persuasion rather than coercion, the pursuit of collective interests (such as global sustainability), reflection on what is desirable and defensible, and efforts to reach and understand those with different starting points' (Dryzek et al., 2013, p.144). Importantly, the process of deliberation should not avoid contestation and radical standpoints (see Braithwaite, 2007; Dryzek et al., 2013). The modes of governance designed with too strong a focus on collaboration and agreement may lead to relative moderate results close to the positions of established institutions and dominant actors (Dryzek et al., 2013, p. 143-134).

The latter observation is particularly relevant in the context of sustainability transitions calling for a radical overhaul of the current production and consumption patterns. It points to possible tensions in policy between, on the one hand, advancing radical and risky innovation and, on the other hand, seeking stakeholder alignment and ensuring wider legitimacy of policy choices made to respond to global challenges.

2.5. Political economy

Attempts to foster transitions to more sustainable systems have increasingly been viewed through a political economy lens (Kuzemcko et al. 2016). This literature has highlighted the importance of justice and equity perspectives (Sovacool et al. 2016). It has also highlighted how the creation and expression of interests shapes the direction of technological change (Avelino and Rotmans 2011), with powerful incumbents fighting to maintain markets and positions of power (Turnheim and Geels 2013), and emerging advocacy coalitions playing central roles in fostering policies for low-carbon innovation support (Jacobsson and Lauber 2006).

In this context, a framework to assess the capacity of national innovation systems to foster sustainability should encompass: the ability of environmental and social interests to achieve prominence in national policy debates; the extent to which more sustainable systems, which may be disruptive to established incumbents, can achieve legitimacy; and the degree to which policy is sensitive to the imperatives of equity and justice (as described in the SDGs).

3. Conceptual approach

3.1. Policy evaluation criteria for sustainability transitions

A core component of the STIR process is the application of appraisal criteria. The criteria draw on the above-introduced diverse perspectives on policy, innovation and sustainability transition. The appraisal framework is broad in scope and range from analysing agenda

centrality of sustainability transitions in the public debate to asking questions on effectiveness of policies in enabling and diffusing eco-innovations.

The exercise takes account of the main phases of policy cycle, including agenda setting, policy design, strategy and decision making, policy implementation, and policy monitoring and evaluation. The core assumption here is that the orientation towards sustainability should run throughout the policymaking process if it is to be effective.

The policy appraisal framework is structured around 12 criteria including:

- **Agenda centrality** - the relative position of issues related to innovation for sustainability in the policy debate and policy agenda. The criterion draws on the role of stakeholder dialogue and engagement in governance and deliberative democracy as well as the engagement of stakeholders in the agenda in transition management.
- **Policy relevance** - the assessment of the extent to which policy vision and objectives are consistent and adequate for sustainability challenges. This criterion draws on the field of policy evaluation. Systemic relevance assesses whether and to what extent policy objectives respond to sustainability challenges.
- **Directionality** - the extent to which policy mix is oriented towards sustainability. While relevance focuses on objectives and vision, directionality focuses on the entire policy mix and implementation of policies on the ground. It draws on both the economics literature and role of environmental prices and regulations. It is also influenced by 'guidance of search' concepts in TIS; also draws on the relevance of directed technological change for environment from the economics literature (Acemoglu et al 2012).
- **Environmental policy stringency** - the extent to which policy protects environment by installing and enforcing regulations that protect the environment from overexploitation. The criterion draws on traditional environmental economics focus on regulatory-driven innovation (Ashford et al. 1985; Porter & van der Linde 1995)
- **Alignment** - the extent to which public policy facilitates alignment of change agents for the vision of sustainability transition and transformative eco-innovation. The criterion draws on the MLP emphasis on alignment. It also resonates with the transition management literature in recognising the importance of 'guiding visions'.
- **Legitimation** - the extent to which policy choices on direction of transition pathways have democratic and social mandate. This criterion draws on governance and deliberative democracy literature as well as on the emphasis on legitimacy in TIS.
- **Demonstration** - the extent to which policy creates strategic arenas for experimentation and demonstration of transformative system innovation. This criterion resonates with the emphasis on lead market formation, entrepreneurial experimentation as well as the notion of niches in MLP.
- **Specialisation** - the extent to which policy encourages entrepreneurial and industrial specialisation in the areas taking into account their sustainability impact. This criterion echoes calls for prioritisation and 'smart specialisation' widely found in practical policy advice. Interestingly, the dimension of specialisation does not emerge in TIS or MLP literatures.

- **Policy Coherence** - the extent to which policy mix is consistent, coherent and comprehensive. This criterion is based on the policy design and policy mix literature indicating the role of policy coordination and coherence for delivering impactful public intervention.
- **Distributional impacts** - the extent to which policy redistributes costs and benefits of transition between societal groups and regions. Sustainability transition will create positive and negative impact for different businesses and societal groups. Recognition of varying destruction of impacts contributes to better policy design and implementation. This dimension is taken into account in political economy literature and in the practice of policy evaluation and strategic impact assessment.
- **Effectiveness** - the extent to which policy is effective in achieving transformative impact. This is a core evaluation criterion used in policy evaluation. In relation to sustainability transition it is assessed against sustainability goals which may or may not be reflected by formal policy objectives.
- **Policy evaluation and learning** - the extent to which policy is based on evidence and supported by learning environment. The role of evidence and learning in policy making is central for the evidence-based policy paradigm and is part of 'good governance' criteria.

3.2. The use of secondary data

The involvement of experts and stakeholders and the use of contextual analytic reports is intended to overcome a straightforward reliance on quantitative indicators, since the context matters. However, where comparative data exists, it can inform the reflection and help experts to benchmark various areas of national innovation performance.

Key indicators of relevance for innovation for sustainable development were collected, covering most aspects of the assessment criteria. This assembled database of indicators is made available to assessors. Examples of indicators include:

- Share and volume of public R&D directed towards environmental goals (Government Budgetary Appropriations and Outlays on R&D, by socio-economic objective)
- Patents for environmentally sound technologies (from OECD)
- Environmental Democracy Index
- OECD Environmental policy stringency index
- Global cleantech innovation index

4. Methodological approach

4.1. The scope and structure of the review

The full STIR is a comprehensive review of country's innovation system and public policy supporting innovation focused on the systemic evaluation of the policy. The review is based on three types of questions, including mapping questions (documenting policy practice), analytic questions (situated reflection on policy based on existing evidence) and policy appraisal questions (expert-based assessment of policy practice).

The structure of the review is as follows:

- Innovation challenges for sustainability transition: the most significant environmental sustainability challenges faced by a country that require innovation effort to be resolved;
- Innovation system and the transition: a concise evidence-based profile of research and innovation system of the country with a focus on analysing the elements of the system that enabling or impede eco-innovation relevant to addressing the sustainability challenges. The profile includes innovation specialisation and technology profile, key actors and collaboration patterns and determinants of transformative eco-innovation;
- Public policy and governance of eco-innovation: an analysis of the main stages and mechanisms of public policies supporting eco-innovation and sustainability transitions;
- Policy appraisal based on the twelve criteria;
- Key findings and policy messages.

4.2. Appraisal criteria and scoring process

The twelve criteria are annotated with stylised descriptions of appraisal ranges to provide conceptual reference points for debate and appraisals (see Figure 3 for an example and Annex I for the full set of annotated descriptions).

Similarly to the Bertelsmann Transformation Index, the scale used for the STIR appraisal ranges from 10 (best) to 1 (worst). There are four scoring levels (10-8, 7-5, 4 -2, 1). The scale allows to indicate trend reflecting the recent developments: ↗ indicated improvement over the last two years, ↘ suggests deterioration over the last two years, → indicates the situation has been stable.

Figure 1. An example of annotated appraisal criterion: Environmental policy stringency*

<p>Environmental policy stringency</p> <p><i>Public policy protects the environment and enhances eco-system services</i></p> <ul style="list-style-type: none">- 10 - 8: The country has a policy and regulatory framework ensuring the protection of nature and improvement of eco-system services. The framework is informed by scientific evidence, and takes a full account of the state of local and global ecosystems. The policy goes beyond obligations stemming from international agreements. While eco-innovation is at the core of the transition policy, all public support for innovation has to recognise the importance of the precautionary principle in order to avoid pursuing innovation pathways that present a considerable environmental and social risks.- 7 -5: The country has a policy and regulatory framework ensuring the protection of nature and eco-system services. The framework is informed by scientific evidence. The policy complies with obligations stemming from international agreements. Precautionary principle is used in taking policy decisions, however, economic benefits are often considered a priority, and seen as an opportunity to compensate for possible negative environmental impacts.- 4-2: The country runs environmental policy with formal objectives to ensure the protection of nature. The policy is largely reactionary and focuses on the acute environmental problems. There is limited use scientific evidence in designing the environmental policy. The policy formally complies with obligations stemming from international agreements, but their implementation is partial.- 1: The country runs a rudimentary environmental policy with formal objectives to protect the nature. The country, however, does not provide a legally binding framework for environmental protection and lacks the implementation capacity.- 0: N/A <p><i>Reference data</i></p> <ul style="list-style-type: none">- SGI network indicators – environmental policy (http://www.sgi-network.org/2016 and http://www.sgi-network.org/docs/2016/thematic/SGI2016_Environment.pdf)- OECD database on environmental policy (http://www2.oecd.org/econinst/queries);- LSE Grantham’s Global Climate Legislation Database (http://www.lse.ac.uk/GranthamInstitute/legislation/the-global-climate-legislation-database/)- EUROSTAT data on implementation of environmental legislation (EU)

4.3. Expert selection and the review process

Country review will be prepared by a lead author and reviewed by one or more experts. The following criteria are followed in selecting lead author and reviewers:

- Knowledge and expertise
 - Thematic knowledge (authors and reviewers)
 - Understanding of national research and innovation systems;
 - Understanding of eco-innovation and green growth trends;
 - Knowledge of innovation and environmental policies;
 - Methodological proficiency (country experts and reviewers)
 - Understanding of basic concepts related to innovation system, innovation process as well as sustainable development;

- Ability to use diverse sources of evidence to describe the current situation as well as to draw original and robust conclusions.
- Network and policy learning (authors)
 - Ability to identify and interview key players in the innovation system;
 - Preferably proven ability to engage in the public debate on the topics related to sustainability and innovation;
- Independence (country experts and reviewers)
 - Proven ability to formulate and express independent, evidence-based views and opinions on public policy and business activities;
 - Absence of conflict of interest, notably absence of formal links to government or dominant business actors;
- Availability and commitment (country experts and reviewers)
 - Proven ability to engage in professional assignments;
 - Commitment to contribute to international project;
- Proven ability to work in English (country experts and reviewers)
 - Proven ability to work (speak and write) in English;
 Preferably track record in publishing on innovation and/or sustainability (authors).

Following the author selection, the process follows the following steps:

- Lead authors are briefed and provided with supporting material by the Inno4SD coordinating team: the STIR toolkit includes annotated template, secondary data, glossary, examples of cover letters and (when at the later stages) examples of completed reviews.
- Lead authors analyse secondary data and existing evidence.
- Lead authors conduct interviews with selected experts and stakeholders in the country (including policy makers, academia, business, civil society and media).
Lead authors conduct stakeholder workshop with a collective reflection on the appraisal criteria. Stakeholders are invited to provide commentary and suggested scores on each appraisal criterion, reflecting on the specific context and developments in a country.
- Lead authors suggest overall scores against criteria based on all gathered evidence.
- The reviews and scores are subject to peer review by selected country experts. When scores suggested by the author and reviewers are significantly different, a meeting or teleconference is arranged to discuss and record the reasons for discrepancies and, if possible, to agree on the final scores.

5. Preliminary findings and outlook

The STIR process has developed a policy appraisal framework based on a synthesis of relevant literatures and established approaches to measuring green economy and eco-innovation.

The pilot country appraisals (South Africa, the UK and Turkey) will be completed by the end of October 2017. Initial reactions from policy stakeholders have been positive, with many expressing interest in the process and in particular in the balance that the process provides

between a simple scoreboard approach based on indicators, and a richer analytic-reflexive perspective. In our initial consultations, policy stakeholders have confirmed that this provides value both because it enables understanding of relative performance and activity in light of national contexts, and also because the process helps to initiate or reframe a strategic dialogue about innovation policy.

The pilot studies also suggest challenges in implementing the framework:

- Scale and framing – While the national scale, and broad framing of ‘sustainability’, is clearly relevant for a comparative policy appraisal process and for the SDGs, it creates difficulties for practical appraisal. In particular, the diversity of relevant policy areas (spanning industrial policy, business and innovation, science, environment, energy, transport) creates the potential for radically diverging appraisal ‘scores’ across different areas of sustainability. In the UK for example, there has been a clear focus on low-carbon, but a much less clear strategic emphasis on some other areas of sustainability concern. The framework allows for this, by emphasising that the appraisal is focused on those sustainability challenges that are most significant and relevant for the country in question. However, implementing the framework highlights the tension between conducting a high-level national comparative overview, and more detailed sector-, issue- or region-focused comparative work.
- Data limitations for less developed countries – High-income countries are often well served with measures of policy, governance and innovation performance, particularly long-established members of the OECD. For many countries, data is much less available, which hampers clear benchmarking of performance across national systems.
- Balanced stakeholder representation - Ensuring a balanced representation of stakeholders may be a challenge, especially in countries with diverse and competing visions for public policy. The latter may also lead to conflicting views which may result in polarising views on policy performance. STIR includes a strong emphasis on facilitation and skills needed to address the above issues, and it recognises the need to record and make explicit where significantly divergent perspectives exist.
- Stakeholder engagement – Ensuring a buy-in from government and business stakeholders may be challenging in countries with a long-standing tradition of innovation and sustainability research.
- Policy and governance are moving targets – Two of the pilot study countries, the UK and Turkey, are experiencing a particularly uncertain period in terms of governance context. As a result, the status of key elements of policy and governance are uncertain in both countries. This highlights the challenges of a policy appraisal process focused on current rather than past activities.

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