WHAT POLICY MAKERS CAN DO TO PROMOTE GREEN INNOVATION

How to make best use of possibilities for innovation, given constraints of capability, special interests and distributional consequences

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Inherent difficulties in innovation policy

- Innovation is surrounded by uncertainty, creating a problem for effective policies
- Contradicting requirements of innovation: support and selection
- Danger of regulatory capture by innovation actors (scientists, companies, …)
- A policy world full of policies (with different rationales) that interact with each other (competition policy, environmental policies, innovation policies, …)
- Ideologies that are not always helpful (government cannot pick winners, …
- …

Rationales for innovation support

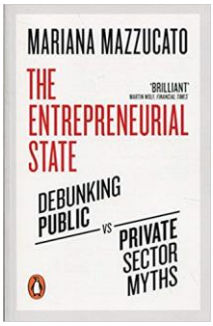
Market failure	System failure
Public good nature of knowledge gives rise to problems of appropriating the benefits from innovation (e.g., risk of imitation)	**Inadequacies in the technology / knowledge infrastructure**
Uncertainty and incomplete information about costs and benefits of innovation	**Old and rigid technological capabilities** causing transition failures to new knowledge bases
Market power	**Insufficient entrepreneurship**
Entry barriers	**Not enough risk capital and high capital costs**
Network externalities causing a lock-out	Regulations acting as barriers to innovation
	Actors not being able to coordinate joint action
Price gap for environmental innovations at the beginning of the learning curve	

Source: Kemp in article for S.A.P.I.E.N.S

Points of intervention for innovation policy

- The national system for innovation (education, **finance**, knowledge vouchers for SMEs, …)
- Sectoral systems for innovations
- Specific technological innovation systems (e.g., wind power, bioenergy, …)
- **Sustainability transitions through STIR and solution design**

- A study of Henderson and Newell (2010) into **the role of government support in 4 important sectors** (agriculture, chemicals, life sciences, information technology) found that "**In nearly every sector, federal policy has [...] been critically important in either stimulating or providing demand**, particularly in the industry's early stages. Policies have also ensured that fundamental research has been *simultaneously creative and useful* – a balancing act that is notoriously hard to pull off – and in shaping the "rules of the game" to encourage competition and entry by new innovative firms"
- Mariana Mazzucato about the Enterpreneurial State



New missions?

- Among innovation experts there is a discussion of whether persistent problems such as global warming warrant mission-oriented programmes.
- According to Keith Smith (2008, p. 2) the answer is yes: "*We now require new large-scale "mission-oriented" technology programs for low- or zero emissions energy carriers and technologies,* ***resting on public sector coordination and taking a system-wide perspective***."
- **But is the public sector capable of this?**

Characteristics of Old and New "Mission-Oriented" Projects

Old: Defence, Nuclear and Aerospace	*New: Environmental Technologies*
The mission is defined in terms of the number of technical achievements with little regard to their economic feasibility	The mission is defined in terms of economically feasible technical solutions to particular environmental problems.
• The goals and the direction of technological development are defined in advance by a small group of experts	• The direction of technical change is influenced by a wide range of actors including the government, private firms and consumer groups
• Centralised control within a government administration	• Decentralised control with a large number of involved agents
• Diffusion of results outside the core of participants is of minor importance or actively discouraged	• Diffusion of the results is a central goals and is actively encouraged
• Limited to a small group of firms that can participate owing to the emphasis on a small number of radical technologies	• An emphasis on the incrementalist development of both radical and incremental innovations in order to permit a large number of firms to participate
• Self-contained projects with little need for complementary policies and scant attention paid to coherence	• Complementary policies vital for success and close attention paid to coherence with other goals

Source: Soete and Arundel (1993, p. 51)

Innovation missions require Strategic Intelligence

(and mechanisms for avoiding regulatory capture)

- To deal with societal challenges, strategic intelligence is needed about opportunities, bottlenecks and working with special interests in a good way.
- Technology assessment, foresight, evaluation and bench marking are tools or sources of strategic intelligence (Smits and Kuhlmann, 2004).
- BUT: **Uncertainty and special interests are a complicating factor when it comes to policy choices**.
  - "Much lobbying work is undertaken by various organisations to influence the perceived desirability of a various technologies, including their potential. Ultimately, the objective is to shape expectations of policy makers. Moreover, **advocates of immature technologies frequently face entrenched incumbents who are in a better position to influence expectations** due to a superior access to funding, media and politicians. Policy makers have therefore to manoeuvre in a political minefield. Decision makers must, consequently, develop an independent position and critically assess attempts to shape the perceived desirability of various technologies" (Staffan Jacobsson)

Policy coordination and public-private interactions

- Policy coordination is a difficult issue for which there are no simple solutions (Braun, 2008).
- Embedded autonomy (Rodrik 2014) seems a useful principle
- The STIR framework as mechanisms for generating **strategic intelligence** which is considered by relevant people in a discussion format (*data does not speak for it self*!)

Dani Rodrik on green industrial policy

- The prime task for policy makers is *to learn where the constraints and opportunities lie and respond appropriately to these.*
- Regarding the *interaction with business*, he favours a model of "**embedded autonomy**" consisting of '*strategic collaboration and coordination between the private sector and the government with the aim of learning where the most significant bottlenecks are and how best to pursue the opportunities that this interaction reveals*' (2014, p. 485).

- **There are multiple institutional settings within which this kind of collaboration can occur**: *deliberation councils, supplier development forums, search networks, regional collaborative innovation centres, investment advisory councils, sectoral round-tables, private-public venture funds, and so on.* (Rodrik, 2014, p. 485).
- To prevent regulatory capture & inefficiencies, Rodrik advocates "**discipline**" in the use of policy support.
- For safeguarding the public interest and obtaining buy in, policy agencies should be publicly **accountable** as to their failures and successes. "Accountability not only keeps public agencies honest it also helps legitimize their action" (Rodrik, 2014, p. 488).

Guided evolution

as a model for new industry creation and sustainability transitions

Transition management *as*
guided evolution
by exploiting the ***adjacent possible*** *in*
a forward-looking, adaptive way

Key elements of TM

- **Forward-looking thinking** (visions of alternative systems and new business)
- **Learning and experimentation** by actors interested in alternative systems
- Adapting policies and portfolios that receive support
- Government as facilitator (not a director or just a funder)
- Institutional support for transition endeavours
- Putting pressures on non-sustainable regimes (easier to do in case of well-developed alternatives)

TM as used in the Netherlands

- At the heart of the energy transition project are the activities of 7 **transition platforms**.
- In these platforms individuals from the **private** and the **public** sector, **academia** and **civil society** come together to develop a common ambition for particular areas, develop pathways and suggest transition experiments.
- The 7 platforms are:
  - New gas
  - Green resources
  - Chain efficiency
  - Sustainable electricity supply
  - Sustainable mobility
  - Built environment
  - Energy-producing greenhouse

Creatieve Energie
EnergieTransitie

Platforms	Pathways
Chain Efficiency Goal: savings in the annual use of energy in production chains of: - 40 à 50 PJ by 2010 - 150 à 180 PJ by 2030 - 240 à 300 PJ by 2050	KE 1: Renewal of production systems KE 2: sustainable paper chains KE 3: sustainable agricultural chains
Green Resources Goal: to replace 30% of fossil fuels by green resources by 2030	GG 1: sustainable biomass production GG 2: biomass import chain GG3: Co-production of chemicals, transport fuels, electricity and heat GG4: production of SNG GG 5: Innovative use of biobased raw materials for non-food/non-energy applications and making existing chemical products and processes more sustainable
New Gas Goal: to become the most clean and innovative gas country in the world	NG 1: Energy saving in the built environment NG 2: Micro and mini CHP NG 3: clean natural gas NG 4: Green gas
Sustainable Mobility Goals: Factor 2 reduction in GHG emissions from new vehicles in 2015 Factor 3 reduction in GHG emissions for the entire automobile fleet 2035	DM 1: Hybrid and electric vehicles DM 2: Biofuels DM 3: Hydrogen vehicles DM 4: Intelligent transport systems

Platforms	Pathways
Sustainable Electricity Goal: A share of renewable energy of 40% by 2020 and a CO2-free energy supply by 2050	DE 1: Wind onshore DE 2: Wind offshore DE 3: solar PV DE 4: centralised infrastructure DE 5: decentralised infrastr.
Built Environment Goal: by 2030 a 30% reduction in the use of energy in the built environment, compared to 2005	GO 1: Existing buildings GO 2: Innovation GO 3: Regulations
Energy-producing Greenhouse Goals for 2020: • Climate-neutral (new) greenhouses • 48% reduction in CO_2 emissions • Producer of sustainable heat and energy • A significant reduction in fossil fuel use	KE 1: Solar heating KE 2: Use of earth heat KE 3: Biofuels KE 4: Efficient use of light KE 5: Cultivation strategies and energy-low crops KE 6: Renewable electricity production KE 7: Use of CO2

More than technology support

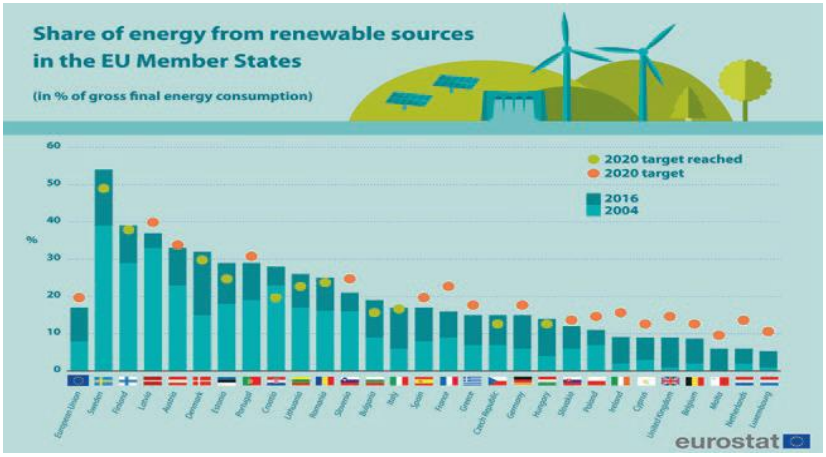
- The transition approach goes beyond technology support. It is **oriented at creation capabilities, networks and institutions for transitional change** through the creation of agendas, partnerships, new instruments, and vertical and policy coordination are part of it.
- The IPE (*Interdepartmental Project directorate Energy transition*) plays an important role in "taking initiatives", "connecting and strengthening initiatives", "evaluate existing policy and to act upon the policy advice from the Regieorgaan and transition platforms", to "stimulate interdepartmental coordination" and to "make the overall transition approach more coherent"

Vehicles for change

- The whole approach is set up as a *vehicle for sociotechnical change and policy change* in a coordinated manner through:
  - The (programming) **activities of transition platforms** and taskforces
  - A **frontrunners** desk for innovators (based at the executive agency)
  - Specially commissioned research into the development of transition paths and prospective innovations
  - The transitions knowledge center (KCT)
  - The competence center for transitions (CCT)
  - The use of transition experiments (UKR)
- There are also regular interactions between transition researchers, practitioners and government.

Topics for policy makers engaged in transition endeavours

Shares of energy from renewable sources in the EU



Source: Eurostat (2018) quoted in Turnheim et al. (2018)

Criticisms of transition management as used in the NL

- Incoherent goals and inconsistent policy instruments (*policy layering*) (Kern and Howlett, 2009)
- Too much technology-focussed
- Undemocratic: civil society not really involved in it (Hendriks, 2008)
- It is dominated by regime actors (corporatist)
- **Poor policy coordination** (Kern and Smith, 2008); no attempt to phase out (or seriously restrict) fossil-fuel based technologies
- In 2011, it was officially abandoned, replaced by a **backing winners** approach, oriented towards sectors in which the Netherlands was economically strong ("topsectors").

Policy as a trajectory of its own

- Optimal policies only exist in economic text books, agencies must find ways of using instruments, adjust them to new technologies and circumstance.
- Policy is about taking **steps in the right direction**
- **Policy learning** should be maximised.
- Analysing the interaction effects of different policies may help to remove **policy inconsistencies**
- Agencies and high-level group who oversees progress are important elements (for *protecting* the approach and *adapting* it)

Important questions for policy are

- What is it achieving?
- What is it not achieving more: why is progress low / disappointing?
- Is policy part of the problem of slow progress or are external developments responsible for this (or slower than expected technical progress)?
- What are no-regret policies and what policies make bets on the future?
- Are changes in policy governance needed?

Transition steering is emergent and erratic

- Depending on **political coalitions** and **economic circumstances**
- The **framing** of issues (public health, costs, new jobs, old jobs, energy security/dependencies, …)
- Growing/declining opposition to renewable policy and renewable projects
- Court rulings and other contingencies (system crises)
- Scientific reports (such as UK Oil & Gas Authority report on fracking, IPCC reports)
- International obligations and scrutiny

Three approaches to managed change

- Politically led change (Germany's nuclear phase out)
- From small wins to wider change (NL approach)
- Application of incentives and disincentives

Each with its own problems

- Any big change will create a big problem
- How to overcome opposition from incumbents, old ways of thinking of experts and people?
- How to grow winners?
- Support can not be maintained for ever and may become increasingly expensive to do

The approaches are NOT mutually exclusive

- Big political decisions can be made *when* alternatives are ready for implementation
- The closing power plants and mines can be done **in combination with** a targeted approach for regional diversification/transformation
- Fossil fuel use can be greened (through CCS and energy efficiency)
- Revenues from carbon taxes can be used to fund a green development strategy (can only be done if carbon use is economically viable)

Possible ways to sweeten the pain of industrial transitions

- Retraining and reskilling programmes (**Just Transition Fund**)
- Moving public organisations to a region and giving the region a university (done in Limburg, NL)
- **A Green New Deal** (championed by the Democratic party in US and Labour in UK)
- Maintaining the heritage and history of a region (done in the Ruhrgebiet)
- Repurposing the infrastructure (converting railway tracks into bicycle paths for tourists, turning factories into office buildings, co-worker spaces, buildings for arts events) through public investment (done in Germany)

The Ruhr transition as an example of managed change

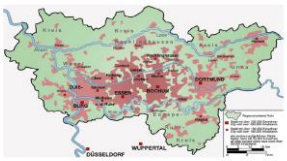
consisted of a three waves of change, which built on each other

1. The **greening of dirty industries** through pollution control and policies for nature conservation which helped to establish an eco-industry (1961-1990)

2. The ecological reconstruction, clean-up and urban **revitalization** of the Ruhr district (19892015)

3. The **sustainable energy transition** (2010 onwards)

Ruhr Area within the state of North Rhine Westphalia



Map of the Ruhr District

Source: Schepelmann, P. Kemp, R. and Schneidewind, U. (2016) **The eco-restructuring of the Ruhr district as an example of a managed transition**, in Hans Günter Brauch - Úrsula Oswald Spring - John Grin - Jürgen Scheffran (Eds.): *Handbook on Sustainability Transition and Sustainable Peace*, Springer, pp. 593-612