10 themes for eco-innovation policy

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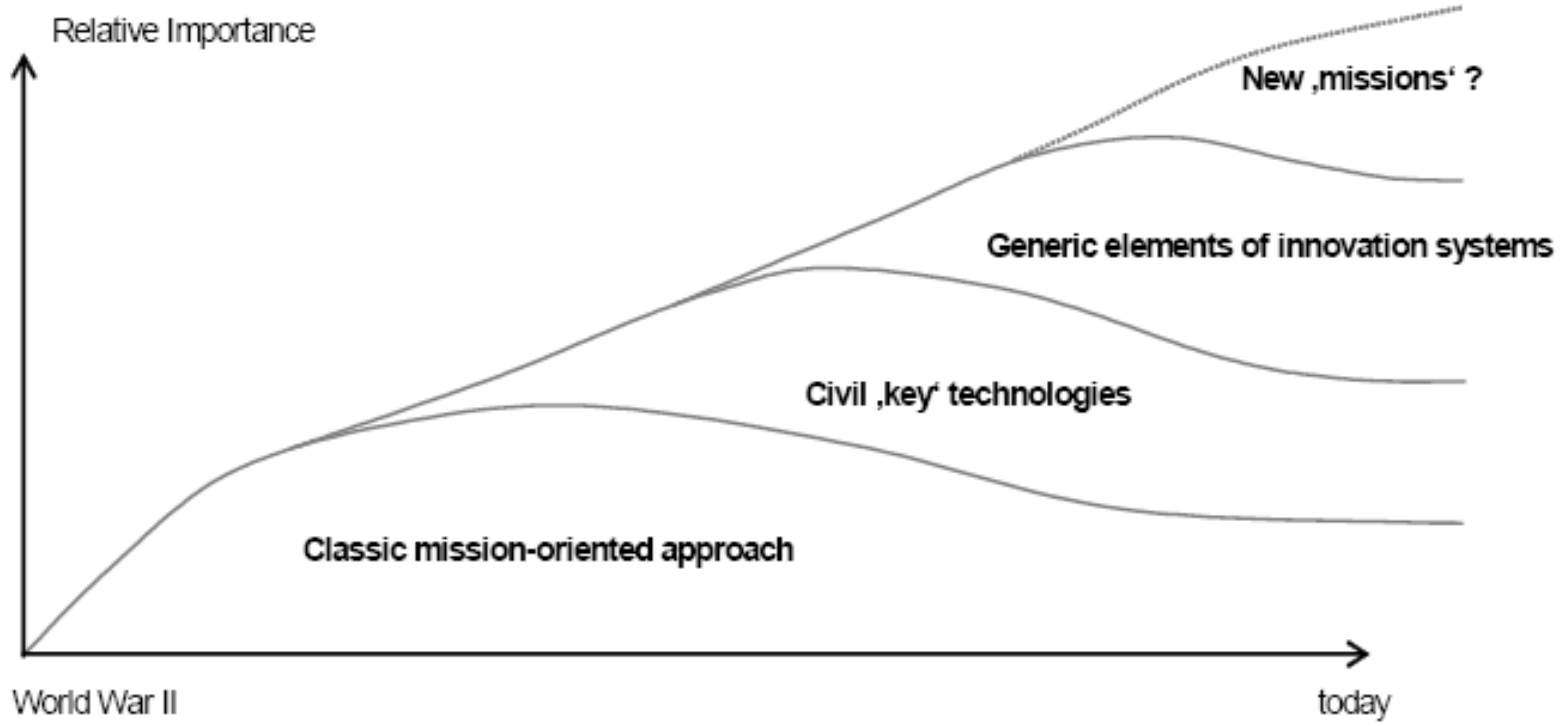
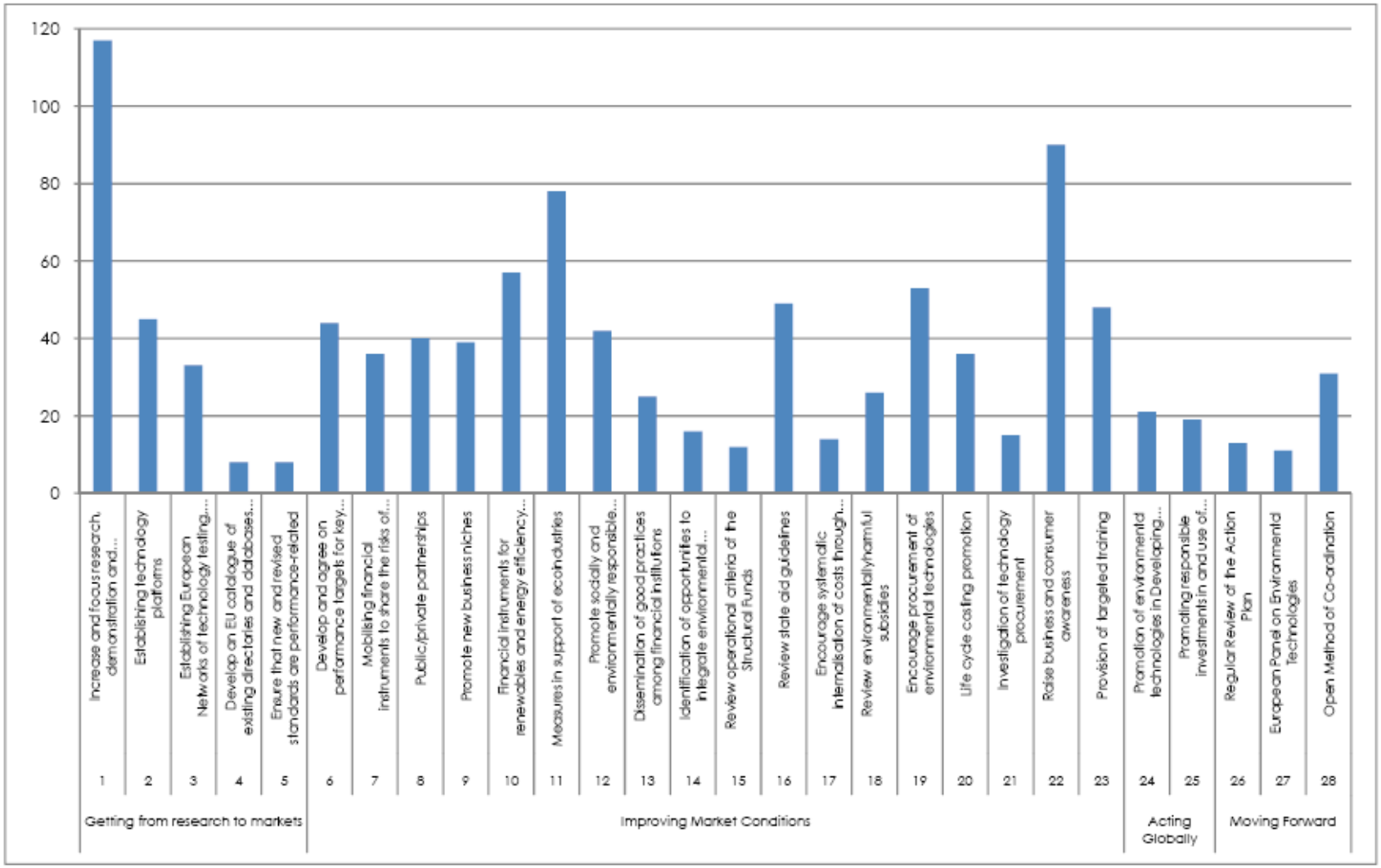
PRO INNO EUROPE
INNO GRIPS

Changing focus of innovation policy



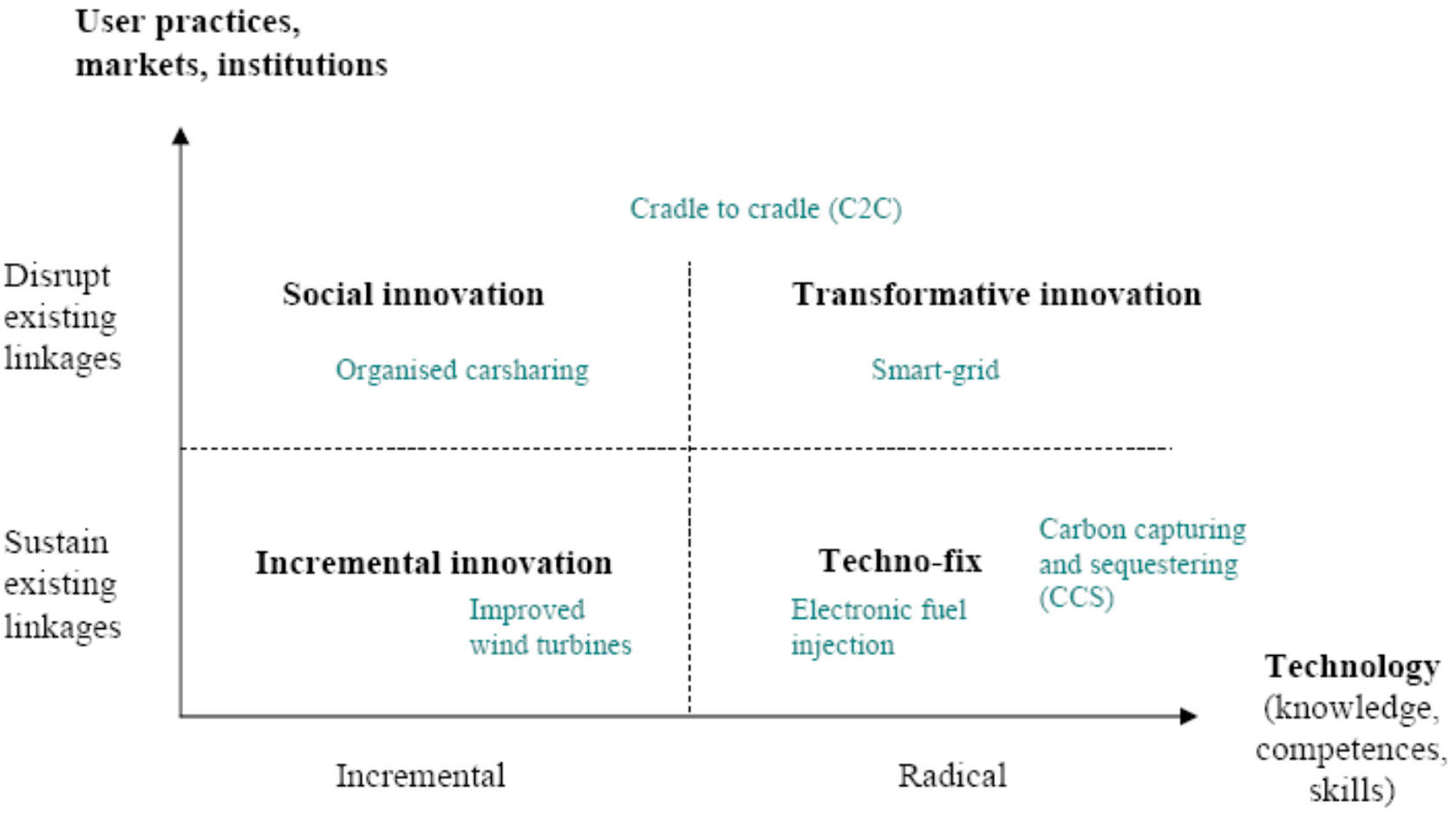
Source : Gassler et al., 2008, p. 206).

Overview of eco-innovation measures in EU Member States



Source: Kletzan-Slamanig et al (2009, p. 49)

Types of innovation



Regime-preserving vs. regime-shifting

- The concept of regime-preserving and regime-shifting innovations is of value because it can be used **to identify innovations that could face greater resistance**. The conditions for a *policy-driven* regime shifting innovation must therefore be carefully prepared.
- **But a regime-preserving innovation may become a regime-altering innovation**. An example is **road pricing**.
  - As an organisational and a technological innovation it alleviates the most important problem for car drivers (congestion).
  - However, road pricing can also encourage people to shift to other modes of transport and therefore contribute to a regime shift.

Theme 1: Policies should be based on identified barriers

(instead of on theoretical assumptions)

- The barriers may be **national** or **technology-specific**
- **Policy may be a source of barriers** (regulations creating market entry barriers, failures to internalise external costs, ..).
- In general, the **barriers for radical innovation are far greater** than those for incremental innovation

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
Price gap for environmental innovations at the beginning of the learning curve	Unfamiliarity and social resistance to certain innovations
	Actors not being able to coordinate joint action

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

Theme 2: Preventing windfall profits

- **Policy support may not be needed**
- **Grandfathering of carbon rights** (to steel and cement industries)

	No impact of the WBSO on projects taking place	*The WBSO is the deciding factor for projects taking place*
> 200 employees	72%	4%
50-199 employees	38%	6%
10-49 employees	35%	19%
< 10 employees	22%	23%

Source: PWC (2002), Figure 2-5 p. 40.

Theme 3: Specific versus general support

- Why specific support is needed:
  1. **Specific technologies suffer from specific barriers** that no general support scheme can successfully address.
  2. This is **especially true for radical innovations** because of uncertainty, long-term payoff (because of long development time) and problems of appropriating the benefits amongst contributing actors.

- 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"

Theme 4: Balance of policy measures

- "While R&D policy can help facilitate the creation of new environmentally friendly technologies, it provides little incentive to adopt these technologies" (Newell, 2010, p. 263).
- Adoption calls for demand-side measures but **the incentives for innovation from market pull policies may be too weak** or favour particular types of technologies.
- Innovation policy should **work in tandem** with environmental policy (Newell, 2010, p. 263).

Theme 5: Targeted spending in areas where innovation is needed

- The ETP 2010 study estimates the *annual* gap for low-carbon RD&D as **between USD 40 and 90 USD billion**, of which they say that half should come from public sources (IEA, 2010, p. 480). NB: Current levels of *annual* public spending for low-carbon RD&D are estimated at 10 billion USD.
- The Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) estimates that an additional $200 billion in global investment and financial flows will be required annually by 2030 just to return GHG emissions to current levels (UNFCCC, 2007)

European Strategic Energy Technology Plan

(SET-Plan)

European industrial initiative	**Public and private investment that is needed according to NET-Spar in the 2010- 2020 period**
The European wind initiative	6 billion €
The solar Europe initiative	16 billion €
The European electricity grid initiative	2 billion €
The sustainable bio-energy Europe initiative	9 billion €
The European CO2 capture, transport and storage initiative	13 billion €
The sustainable nuclear fission initiative	7 billion €
Fuel cells and hydrogen	5 billion € (for 2013-2020 period)
The smart cities initiative for energy efficiency	11 billion €
The European energy research initiative	5 billion €
Breakthrough science	1 billion €
	75 billion €[7]

Acting now or later?

- There is a discussion that we should wait for cheaper low-carbon options, using the next 10 years to bring down the costs through research.
- **Arguments against any further delays** in significantly reducing GHG emissions:
    1. **Learning curves depend on capacity and deployment** – low and zero carbon energy technologies need to be introduced now in order to gain experience that will reduce costs,
    2. **Policy proceeds in steps, with early steps preparing for later steps**
    3. **A delay of 10 years will result in a far greater step change in investment during the following decade**, placing even greater strain on the ability of supply chains to deliver

Theme 6: 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."

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)

Theme 7: Strategic Intelligence

(and avoiding regulatory capture)

- To deal with societal challenges, strategic intelligence is needed about what can be done.
- 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**.
  - "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)
- There is a need for assessing sustainability benefits of green (system) innovations, to **critically assess sustainability claims** of different actors.

Theme 8: Portfolios

- It is advisable that government support be given to a broad portfolio of options, to **widen the search process**.
- By relying on adaptive portfolio's **two possible mistakes may be prevented**
  - The **promotion of short-term options** which comes from the use of *technology-blind* generic support policies such as carbon taxes or cap and trade systems (which despite being "technology-blind" are not technology neutral at all because they favour low-hanging fruit and regime-preserving change (Jacobsson et al., 2009), and
  - **Picking losers** (technologies and system configurations which are suboptimal) through *technology-specific* policies.

Theme 9: Policy learning

- Experience with innovation policy making in European Member States shows that policies are usually a follow-up on existing policies. **Official research-based evaluations play a limited role in innovation policy**, as policy instruments are seldom evaluated for their effectiveness and efficiency (Wintjes and Nauwelaers, 2008).
- There is a need for lessons learned by executive agencies and evaluators about effective governance to be disseminated internationally (Kaiser and Prange, 2005; Borrás, 2009).
- Since the effects of policies depend on the characteristics of the policies and the context in which they are applied (Kemp and Pontoglio, 2010; OECD, 2011), **contextual features and design features should be incorporated in the evaluation of eco-innovation policies.** Evaluations should also consider **policy interaction effects** (Kivimaa, 2008; Ringeling, 2005).

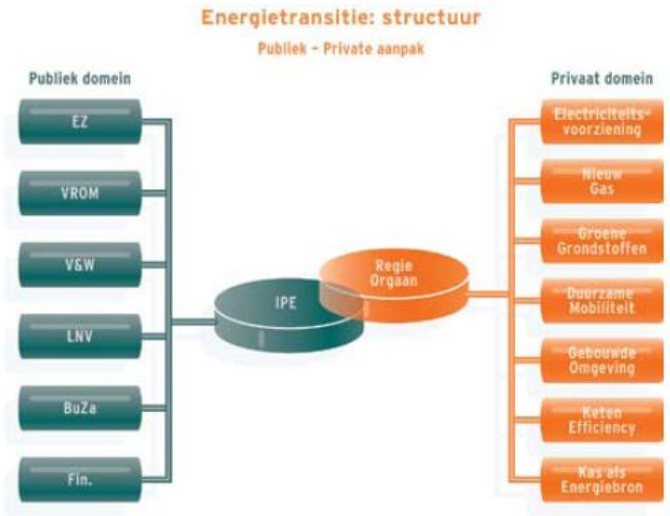
Theme 10: policy coordination and public-private interactions

- Policy coordination is a difficult issue for which there are no simple solutions (Braun, 2008).
- In the case of eco-innovation, there is a strong need for **horizontal policy coordination**, i.e. to align environmental policy with innovation policy, and a need for vertical policy coordination (across layers of government), each of which comes with problems (Schrama and Sedlacek, 2003).

The Dutch transition approach for sustainable energy

- The energy innovation agenda formulated in 2008 is oriented towards the 7 themes of the energy transition. For each theme, the government has formulated specific activities.

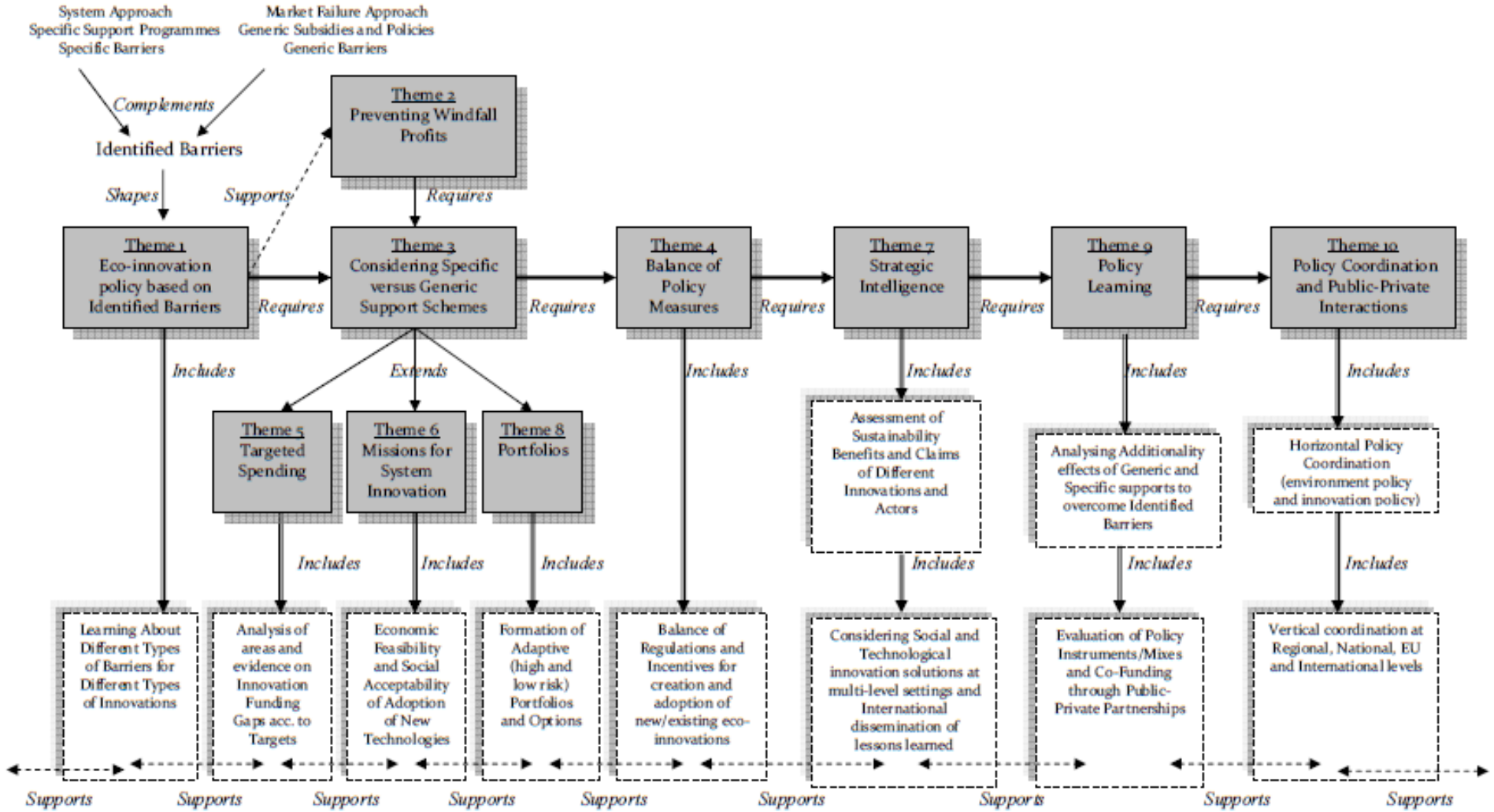
Creatieve Energie
EnergieTransitie



- 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

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

The links between the 10 themes for eco-innovation policy



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

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**
- Unpopular but necessary policies must be **introduced in strategic, step-wise manner** – to gain experience, build acceptance and sharpen them.

Points of intervention for a climate change transition policy

- **"Non-energy" issues** such as recycling, resource efficiency, ..
- **Radical innovation,** exploiting fit-stretch patterns
- Dynamic games between governments, companies
- **Branching points** such as
  - a global emission trading systems in which countries such as China and India participate besides the EU, US and Japan as well as most other OECD countries;
  - electrification of transport with extra electricity demand met by low-carbon electricity
  - an integrated EU system for electricity with solar power from North Africa.

Thank you!