



Public policy and energy transitions

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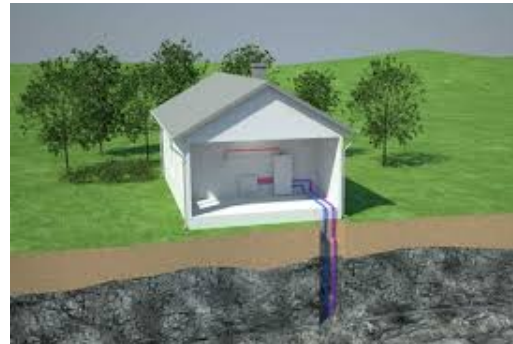
Contents of the lecture

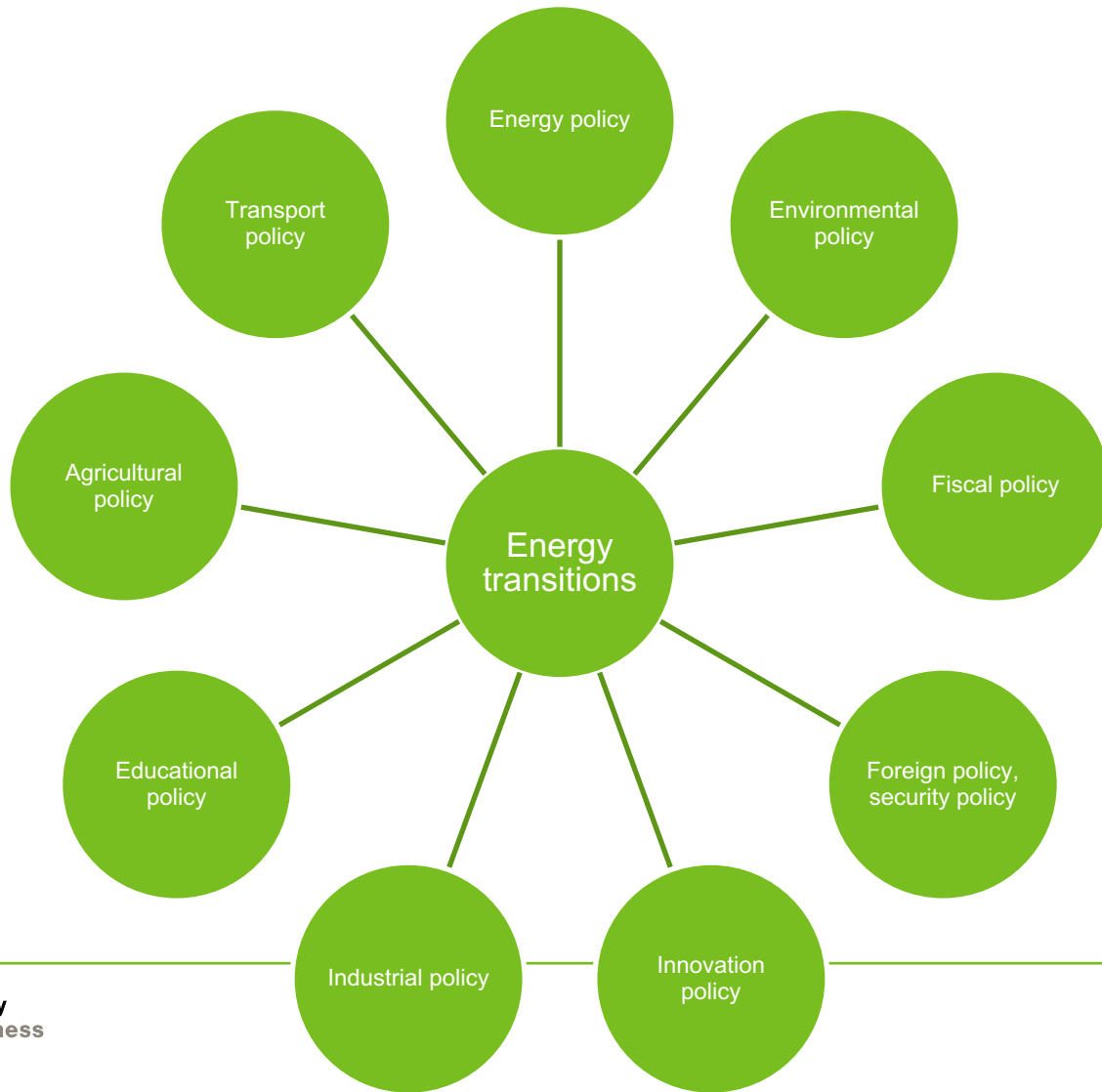
- Climate KIC, MLP video
- Public policy
- Energy policy and its development in Finland
- Policy mixes for energy transitions

Introduction

- ***Transitions imply not only the development of disruptive innovations but also of policies aiming for wider change in socio-technical systems***
(Kivimaa and Kern, 2016)
- **Government interventions, i.e. public policy, have an important role in energy transitions**
 - *They can facilitate transitions by setting goals, targets and specific policy instruments to support change*
- **Public policy can also hinder transitions**
 - *E.g. prevent diffusion of new innovations, subsidise fossil fuel industry, or otherwise support incumbent system*
 - *Also policy conflicts may undermine the influence of a transition-oriented policy (e.g. fossil fuel subsidy vs. renewable energy subsidy)*

What do you think as relevant policies for energy transitions?





Public policy

Public policies with differing levels of importance and influence

- **Overarching policy strategies**
 - *E.g. White Papers, Government Programmes*
- **Sectoral strategies**
 - *E.g. EU 2030 Climate and Energy Framework, national energy strategies*
- **Framework laws**
 - *E.g. the energy market act*
- **Specific regulations**
 - *Acts, directives, on emissions trading, building energy efficiency, etc.*
- **Specific policy instruments**
 - *Regulatory requirements (e.g. on emissions), taxation, subsidies, R&D support, voluntary agreements, information and labelling*

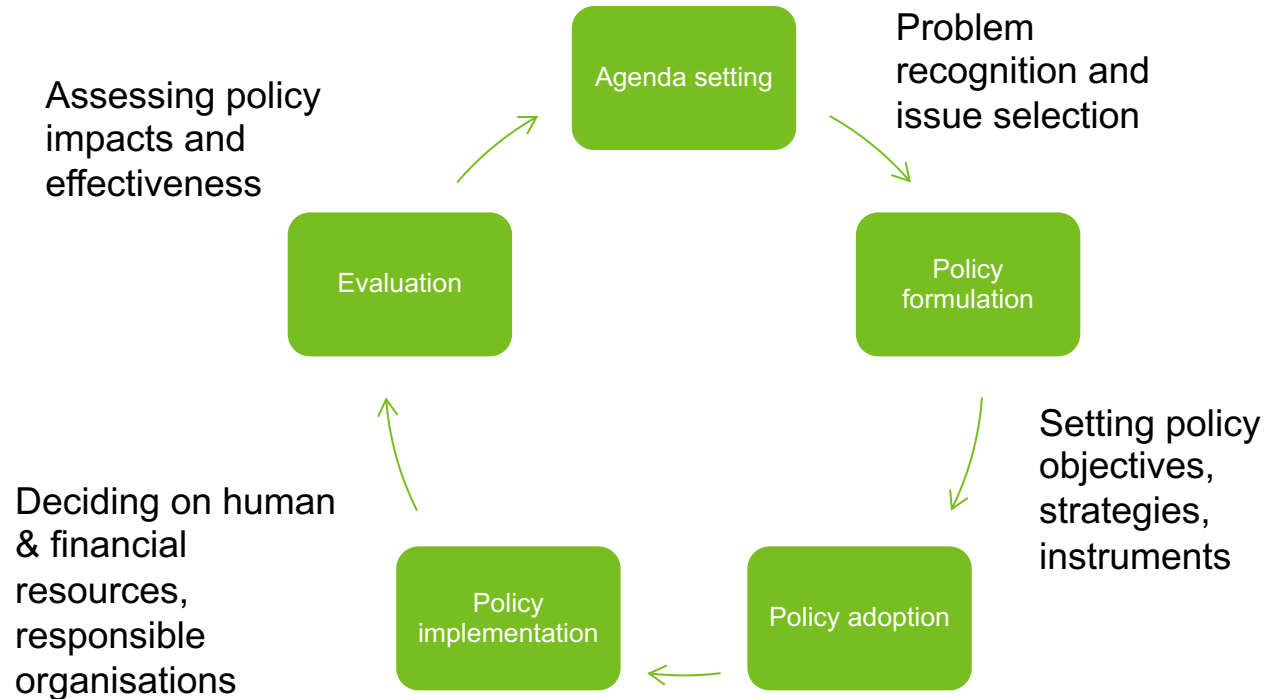
Policy strategies

- **Propose/outline a policy instrument package for a sector**
 - *In practice instruments sometimes pre-exist or are introduced outside a strategy*
- **Contain promises of policymakers to stakeholders**
 - *Influencing what stakeholders expect from future policy development, and e.g. what investments or other choices they make*
- **Frame technological options**
 - *“policy strategies can describe the favoured or ‘optimal’ technological solutions or system components that may or may not be supported through targeted mixes of policy instruments”*
 - *Supported by specific policy goals (but the justifications may change)*

Policy instruments

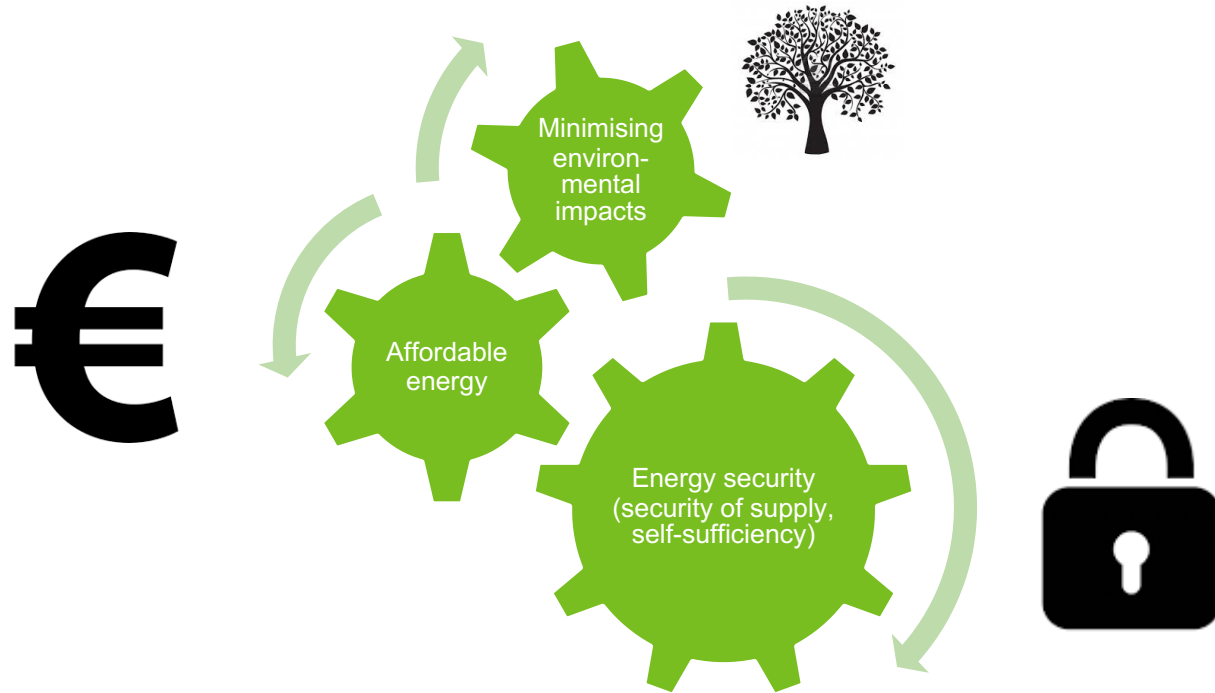
- **Core instruments in energy policy:**
 - *R&D and investment support*
 - *Taxation (inc. exemptions and rebates)*
 - *Information provision*
- **But a large range of instruments exist**
 - *over 30 national instruments on building energy efficiency (FI, UK)*
 - *E.g. energy performance requirements in building regulations, energy audit programmes, energy improvement subsidies, low-interest loans for renovation, energy certificates, voluntary energy efficiency agreements with industry/cities, energy advice systems, R&D programmes, planning requirements*

Policy cycle – policy can also influence before its implementation



Energy policy

Core goals of energy policy



International policy and governance

- **Paris Climate Agreement**

- *All countries set their own ambition levels in the form of non-legally binding 'nationally determined contributions'*
- *Emphasises informal governance approaches and experimentation*
- *Energy is at the heart of Paris agreement – energy efficiency and renewable energy important (UN Deputy Secretary General Amina Mohammed)*

- **The Organisation for Economic Co-operation and Development**

- *Mission to promote policies that will improve the economic and social well-being of people around the world*
- *International Energy Agency (IEA) is an autonomous intergovernmental organization established in the framework of the Organisation for Economic Co-operation and Development in 1974 in the wake of the 1973 oil crisis*
- *OECD/IEA reports are influential in many parts of the world*

EU Energy Policy

- **Three main goals**
 - *Security of supply, competitiveness and sustainability*
- **EU Energy Strategy**
 - *(1) Fully integrated energy market, (2) improving energy efficiency, (3) decarbonising the economy, and (4) supporting research, innovation and competitiveness*
- **Energy security strategy**
 - Increasing energy efficiency and reaching 2030 energy & climate goals
 - Increasing energy production in EU & diversifying supplier countries & routes
 - Completing the internal energy market & build missing infra
 - Speaking with one voice
 - Strengthening emergency mechanisms & protecting critical infra

EU Energy Policy

- **Clean Energy for All Europeans package:**
 - *(1) putting energy efficiency first,*
 - *(2) achieving global leadership in renewable energies, and*
 - *(3) providing a fair deal for consumers*
- **Energy Roadmap 2050**
 - *set out four main routes to a more sustainable, competitive and secure energy system in 2050: energy efficiency, renewable energy, nuclear energy, and carbon capture and storage*

EU Energy and Climate Targets

- **Targets for 2020:**

- *Reducing greenhouse gases by at least 20% compared to 1990 levels*
- *20% of energy from renewable sources*
- *20% energy efficiency improvement*

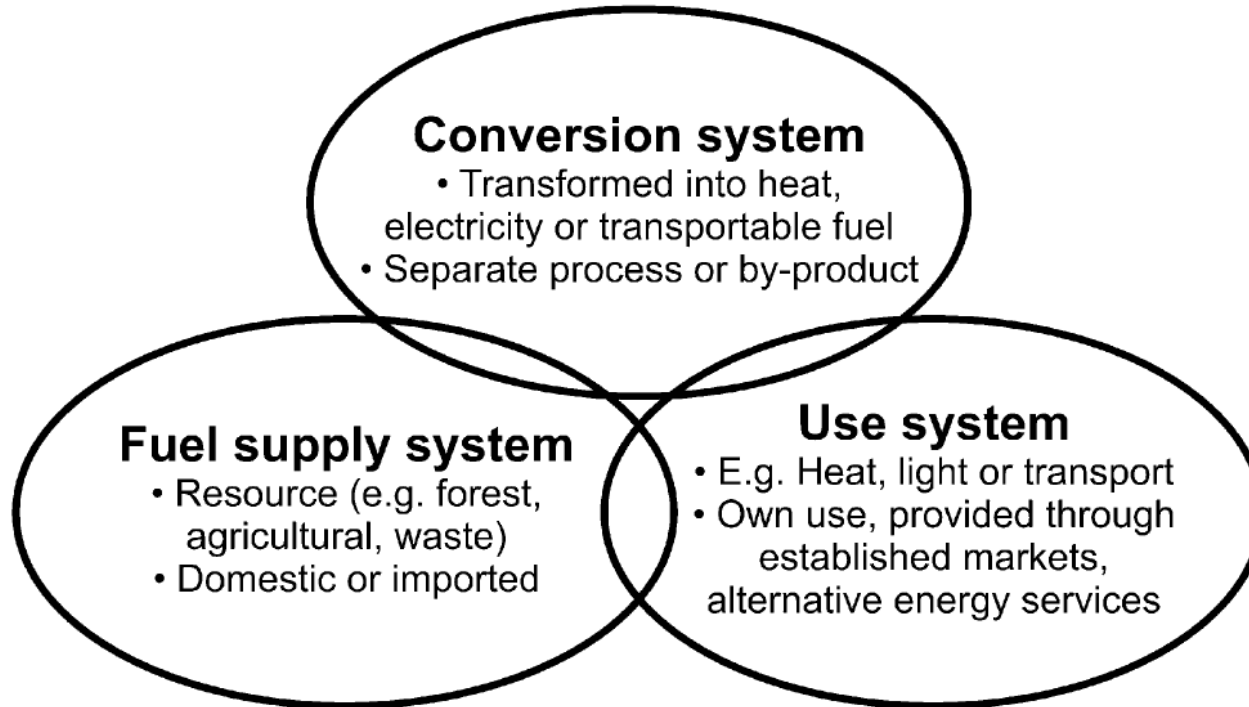
- **Targets for 2030:**

- *40% reduction in greenhouse gas emissions*
- *At least 27% EU energy from renewables*
- *Increase energy efficiency by 27-30%*
- *15% electricity interconnection (i.e. 15% of electricity generated in the EU can be transported to other EU countries)*

- **Target for 2050:**

- *An 80-95% cut in greenhouse gases compared with 1990 levels. The Energy Roadmap 2050 shows how we could do this.*

Energy policy can address different parts of the energy system



Finnish energy policy

- **Originated in 1972 by Pertti Paasio's II Government**
 - *But first national energy policy plan not published until 1979*
- **A series of energy policy strategies since**
 - *Energy Strategies 1992, 1997*
 - *Action Plan for Renewable Energy 1999*
 - *Climate and Energy Strategies 2001, 2005, 2008, 2013, 2016*
 - *Climate and Energy Roadmap 2050*
- **Cross-sectoral groups of ministers and civil servants**
 - *Coordinated by Ministry of Employment and Economy*
 - *Influenced significantly by Ministries of Finance; Environment; Transport and Communications*
 - *Powerful, stable and homogeneous energy elite in Finland (Ruostetsaari, 2010)*

Organisation of climate and energy policy

- **Ministry of Economic Affairs and Employment leading the coordination of cross-sectoral energy and climate strategies**
 - *Energy department: domestic energy policy, emissions trading sectors, renewable energy*
 - *Innovation department: R&D and innovation linked to energy*
- **Ministry of the Environment have tasks linked to long-term planning for climate**
 - *Emissions of non-emissions trading sectors, building energy efficiency*
- **Ministry of Transport and Communications**
 - *Energy use and emissions of transport (Mobility as a Service an important initiative)*
- **Ministry of Agriculture and Forestry**
 - *Emissions from agriculture, use of biomass sources for energy*



Key policies for energy and climate



**National Energy and
Climate Strategy 2030
(2016)**

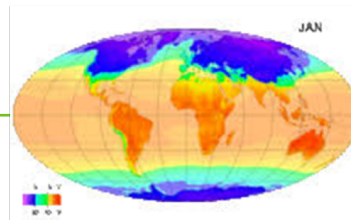
Goals for RES, self-sufficiency; goals for biofuels in transport, electric vehicles; coal phase out

**Energy and Climate
Roadmap 2050 (2014)**

Guide to carbon-neutral society, analysis of means to achieve 80-95% GHG reductions

Climate Change Act (2015)

Planning system for climate policy, monitoring, 80% reduction target by 2050
Focused on administrative procedures



From 'energy policy' to 'climate and energy policy'

- **In the late 1990s, reduction of CO2 emissions became a specific environmental goal in energy policy (in Finland and elsewhere)**
 - *Gradually increasing importance, gaining priority in the new millennium*
- **Significant influence of the European Union in bringing in the climate agenda**
 - *Finnish energy policy has focused a lot on implementing EU requirements unlike e.g. Germany or the UK that have more actively created their own policies*

Example: Finnish bioenergy policy (1)

	Support for domestic energy sources 1970-1991	Support for wood industry-based bioenergy 1992-1998	Diversified bioenergy in the context of climate change in the 2000s	Return to wood based strong bioenergy policy 2015 onwards (tentative)
Main energy policy goals	Security of supply Inexpensive supply Employment Regional concerns	Security of supply Competitive supply Self-sufficiency Environmental acceptability Regional concerns	Climate commitments Security of supply Reasonable supply Self-sufficiency	Climate commitments Security of supply Cost-efficiency
Sub-system emphasised	Resource supply	Resource supply Parts of conversion and use	Resource supply Conversion Use	Resource supply Conversion Use
Purposes of use	Non-commercial use within industrial plants, on farms, or in waste management	Industrial processes Heating (small plants and district heating) (Transport fuels)	Transport fuels Heating Electricity Industrial use	Transport fuels Heating Electricity Machinery

Example: Finnish bioenergy policy (2)

	1970-1991	1992-1998	in the 2000s	2015 onwards (tentative)
Conversion technology	CHP	CHP Black liquor combustion & gasification	CHP & co-firing Gasification & biorefineries Biogas Pellets Distributed generation	
Key actors	Forest industry Private forestry	Forest industry Rural population	Forest industry Farms and micro-businesses	Forest industry Private forestry Farms
Policy instruments	R&D support, subsidies, tax exemption for domestic fuels, education and advice	<u>New</u> : tax exemption for RE, agricultural & forest policies, lower tax for biobased transport fuels	<u>New</u> : Emission trading, regulation on waste management, innovation policy, feed-in tariff	

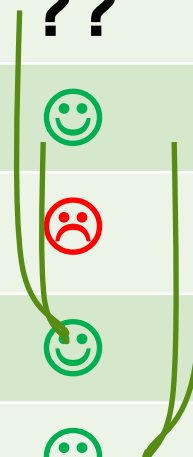
Linking strategies and instruments

- **Cross-ministry working groups**
- **Creation of broader programmes with stakeholder involvement, e.g. ERA17**
- **BUT**
 - New instruments introduced without changing policy goals – or vice versa
 - Some inconsistency in the mix of instruments used (strong sectoral division)

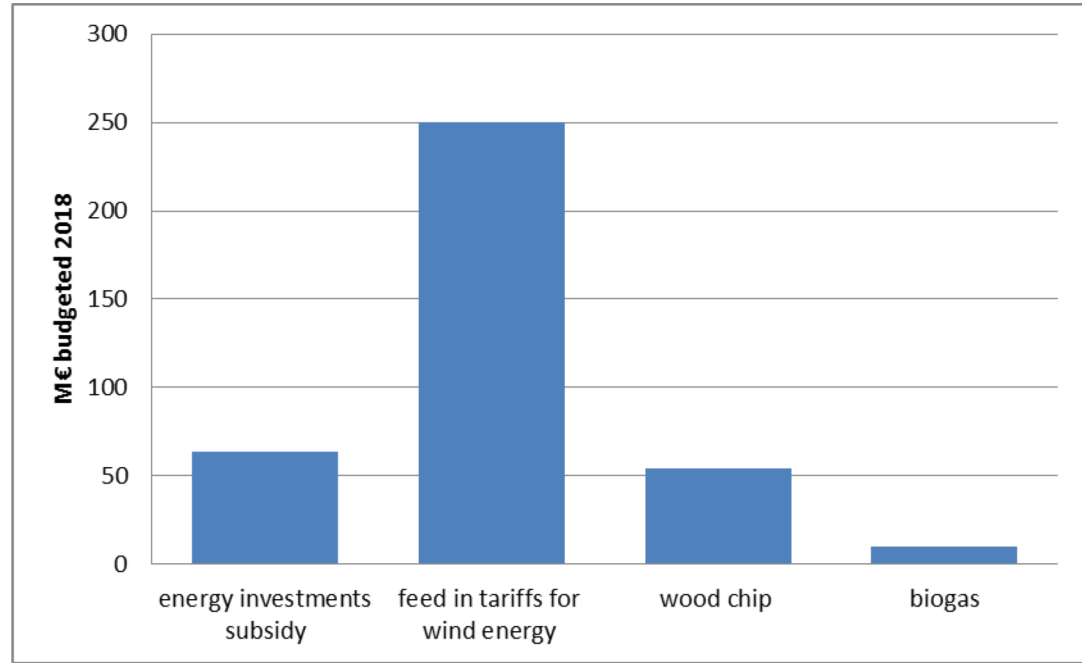
Elements of 'transition'

- **New 'energy actors' identified in policymaking, including farmers and micro-businesses (subsequently also prosumers)**
- **Explicit plans for phasing out coal**
- **Attention smart grids have potential if connected to renewable energy sources and energy efficiency**

Transition actions	Reduce dependency on imported energy	Secure affordable energy	Reduce net GHG emissions
Phase out coal	😊	😐	??
Reduce imports of fossil oil	😊	😐	??
Increase nuclear energy	😊	😞	😊
Increase bioenergy (incl. biofuels in transport and peat)	😊	😐😞	😞
Increase wind/solar/hydro	😊	😊😐😞	😊
Increase energy efficiency	😊	😊	😊
Smart (internationally) connected grids	😊(😞)	😊	😊
Demand side management	😊	😊	😊
Transport towards mobility as a service	😊	😊	😊



Direct support for transitions with some 370 M€/year



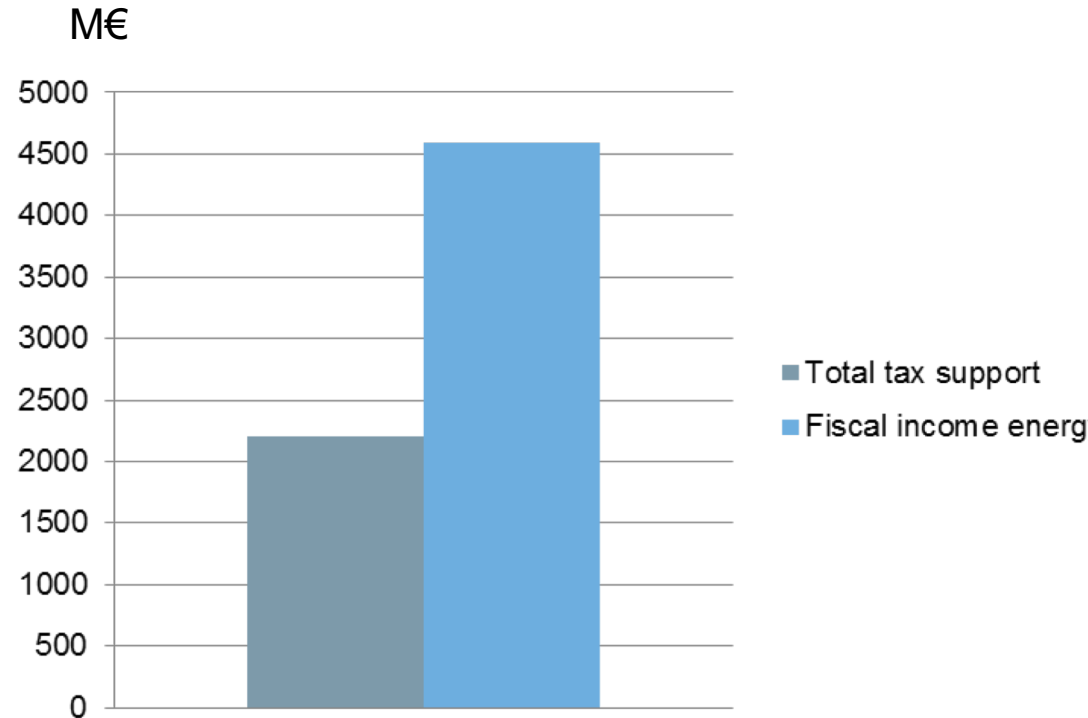
In addition significant R&D and deployment in
renewable energy - estimated at 0,1 % GDP –
approx 250 M€ [OECD 2014]

Hilden, 2018

On shooting oneself in the foot

'Anti-transition' actions

- Subsidies for (fossil) energy vs. fiscal income
- Support for energy intensive industries as direct repayment of energy taxes 200 M€.



Tensions in the policy discourse

Forest and other heavy industries

- Energy should be cheap and abundantly available
- No additional costs for meeting climate goals
- Strong financial support for any renewal of the industry
- Forests should be exploited fully, but raw material should be cheap, no additional costs due to carbon sinks

The green ideal

- Rapid switch to renewable energy sources
- Significant costs are justifiable
- Industrial renewal should happen, possibly with R&D support
- Payment for carbon sinks are OK, attention should also be paid to preservation of biodiversity and other ecosystem services

Question on energy policy

- **What do you think Finland could learn from other countries to improve its energy policy?**
- **What do you think other countries could learn from Finland?**

Policy mixes

What are policy mixes?

Combination of policy goals, instruments (and processes)

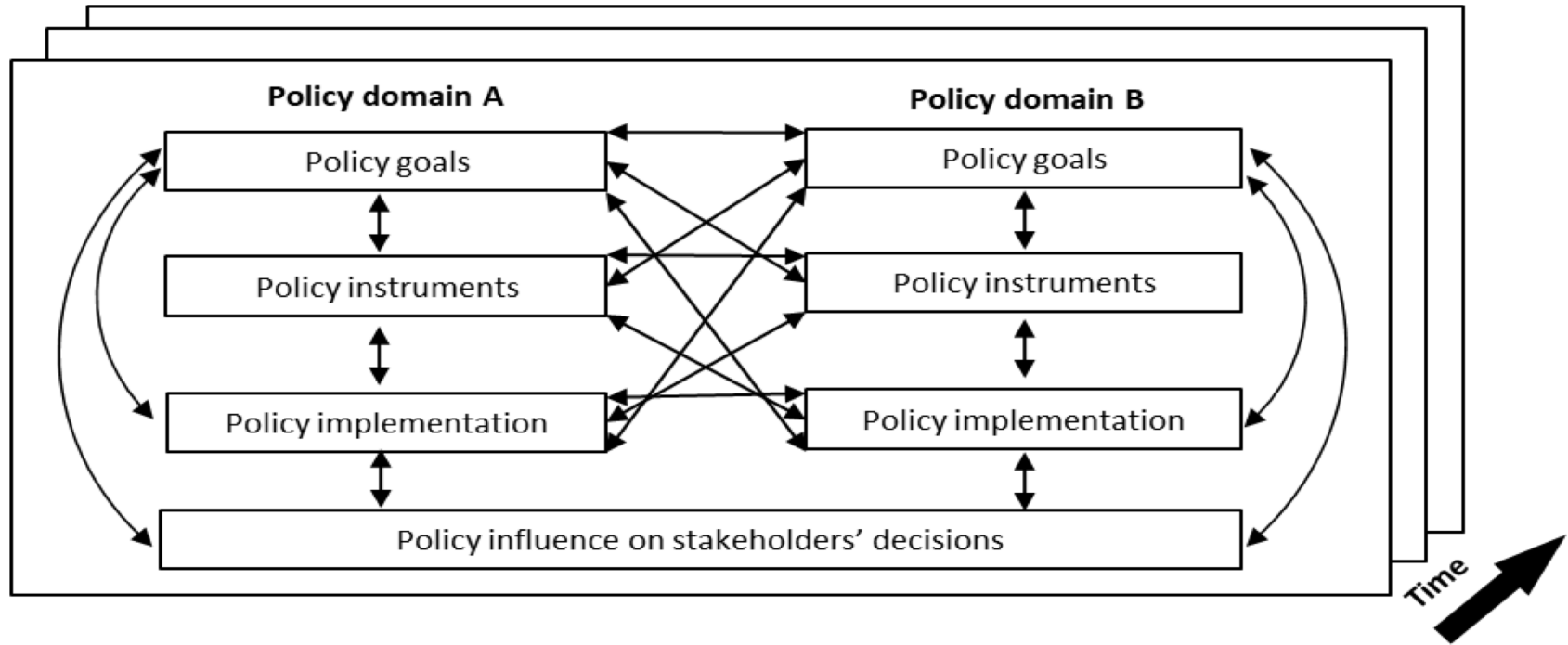
Portfolios of purposefully designed mixes in a given area (e.g. energy efficiency)

Mixes of "real world" policies influencing a given sector or a phenomenon

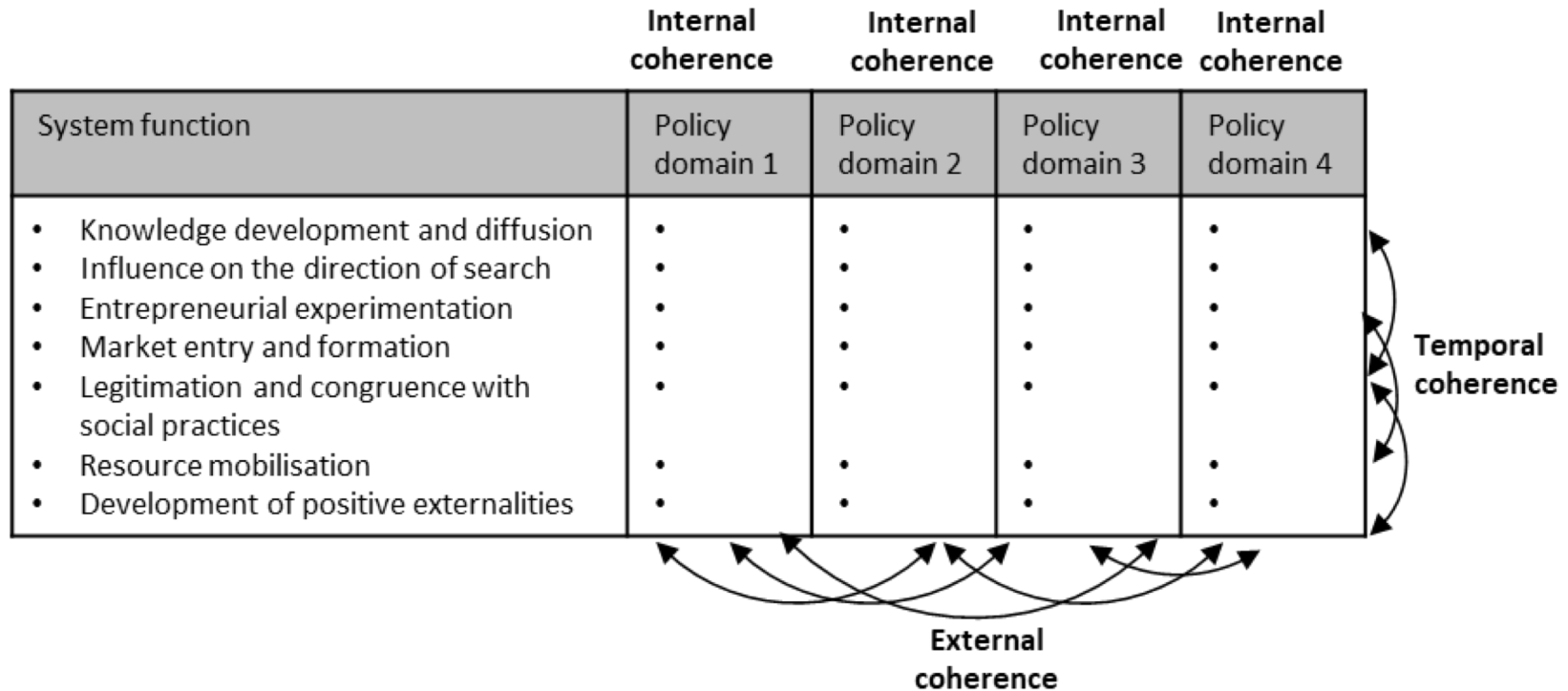
Policy mix coherence & consistency

- **Measurement of synergies and conflicts (e.g. Del Rio, 2010)**
- **“in the real world” policy instruments carry “quite different meanings from time to time, place to place and actor to actor” (Flanagan et al., 2011, p. 706).**
- **supportive policies in one sector can be made inefficient by unsupportive policies, instruments and practices in others (Huttunen et al. 2014)**
 - *But sometimes trigger innovation!*

Policy mixes across policy domains, e.g. A=energy, B=environment



The coherence of policies can be measured with TIS functions



Example of policy mixes for biogas

- **innovation bw several socio-technical regimes, inc. energy production, waste management, agriculture and transport**
 - *Biogas systems have sustainability benefits in the form of renewable energy, the reduction of emissions from landfills, and contribution to a more closed nutrient cycle.*
 - *BUT in 2012 only 0.1% of RES production in Finland*
- **investment decisions on new co-digestion plants are influenced by waste, agricultural, energy and transport policy**
 - *Positive influence: waste mgt legislation on organic waste treatment, agricultural policy on nutrient recycling, high attention on bioenergy (energy policy)*
 - *Negative influence: regulation on fertilisers (agri policy), feed in tariff not applicable (energy policy)*
 - *Uncertain: transport policy influence*

Creative destruction

A process where an innovative entrepreneur challenges existing firms and technologies that makes the existing technology old – forcing incumbent to withdraw from markets (Soete & ter Weel, 1999) or renew (Bergek et al., 2013)

Competence destroying (Tushman & Andersen, 1986) or disruptive (Christensen, 1997) innovation that reduces the value of existing skills (Abernathy and Clarke, 1985)

In a policy context, competence destroying policies can reduce the value of environmentally/socially harmful practices and technologies

Innovation policy mixes for “creative destruction”: key ideas

- Sustainable transformative change = systemic/architectural/modular innovations AND disrupting unsustainable systems (creative destruction)
- Innovation policy mixes should also contain disruptive policy measures (goals & instruments)

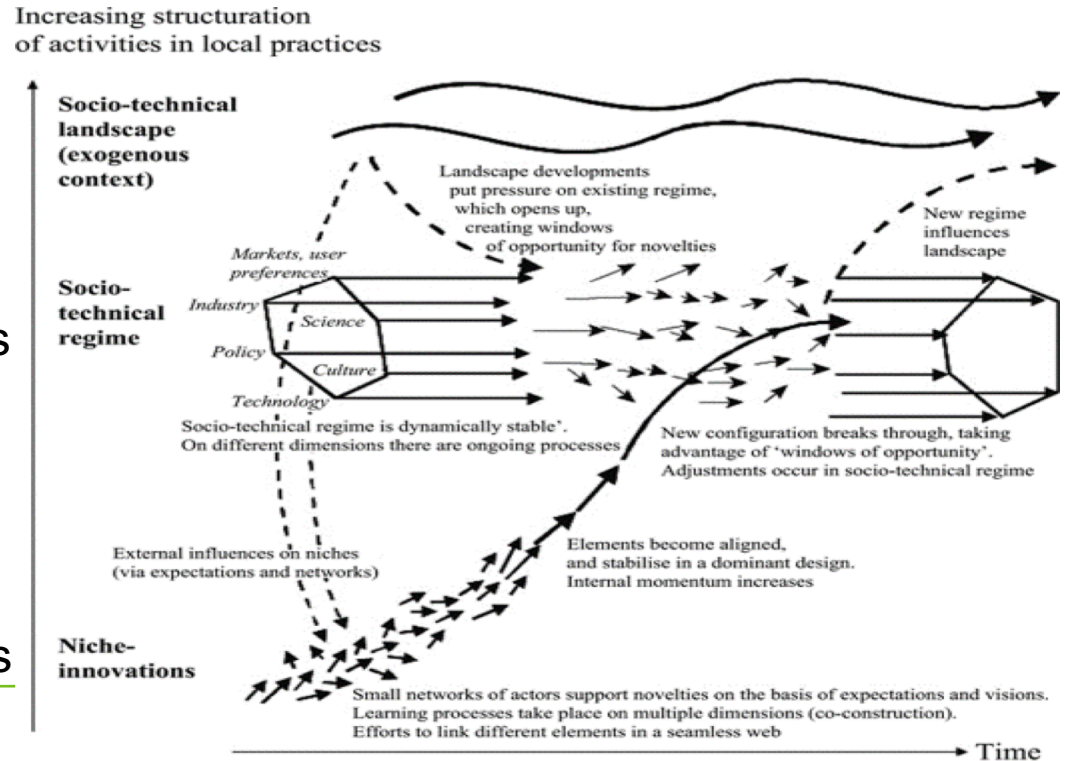


Policies from the perspective of creative destruction & transitions

POLICY MIXES

Destabilising / disruptive policies

Innovation stimulating policies



Source: Geels and Schot (2007, p. 401)

Building blocks

- Creative destruction and disruptive innovation
 - Process where innovation challenges existing firms and technologies, reducing the value of existing competences
 - Competence destroying policies could reduce the value of environmentally/socially harmful practices
- Multi-level perspective (MLP) and regime destabilisation
 - Process of destabilisation weakens core regime elements and enables upscaling of niche innovations
- Technological innovation systems (TIS)
 - Seven supporting functions for emergence of new technologies, and identification of system weaknesses
 - Motors of innovation, but little insight on how regimes destabilise

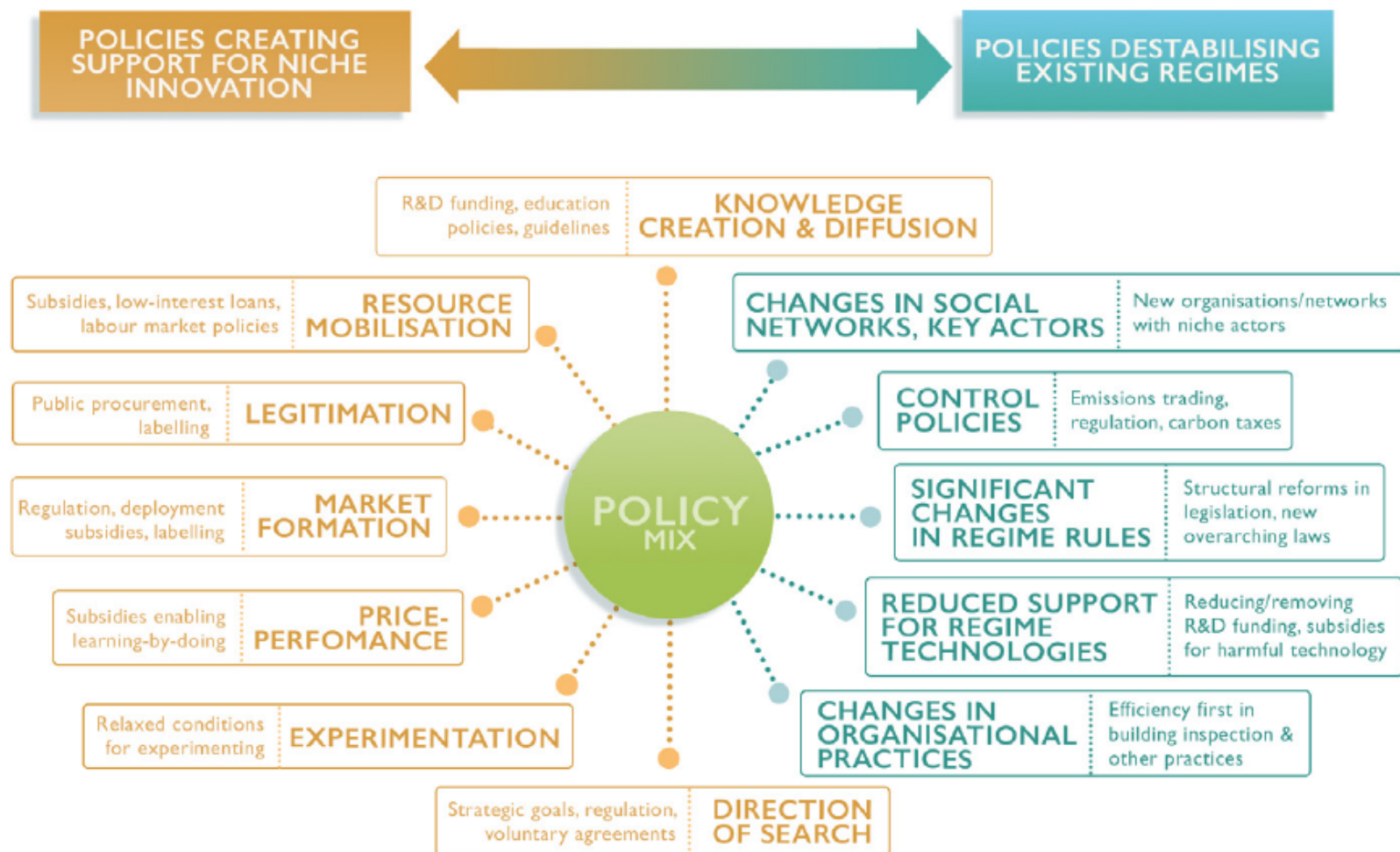
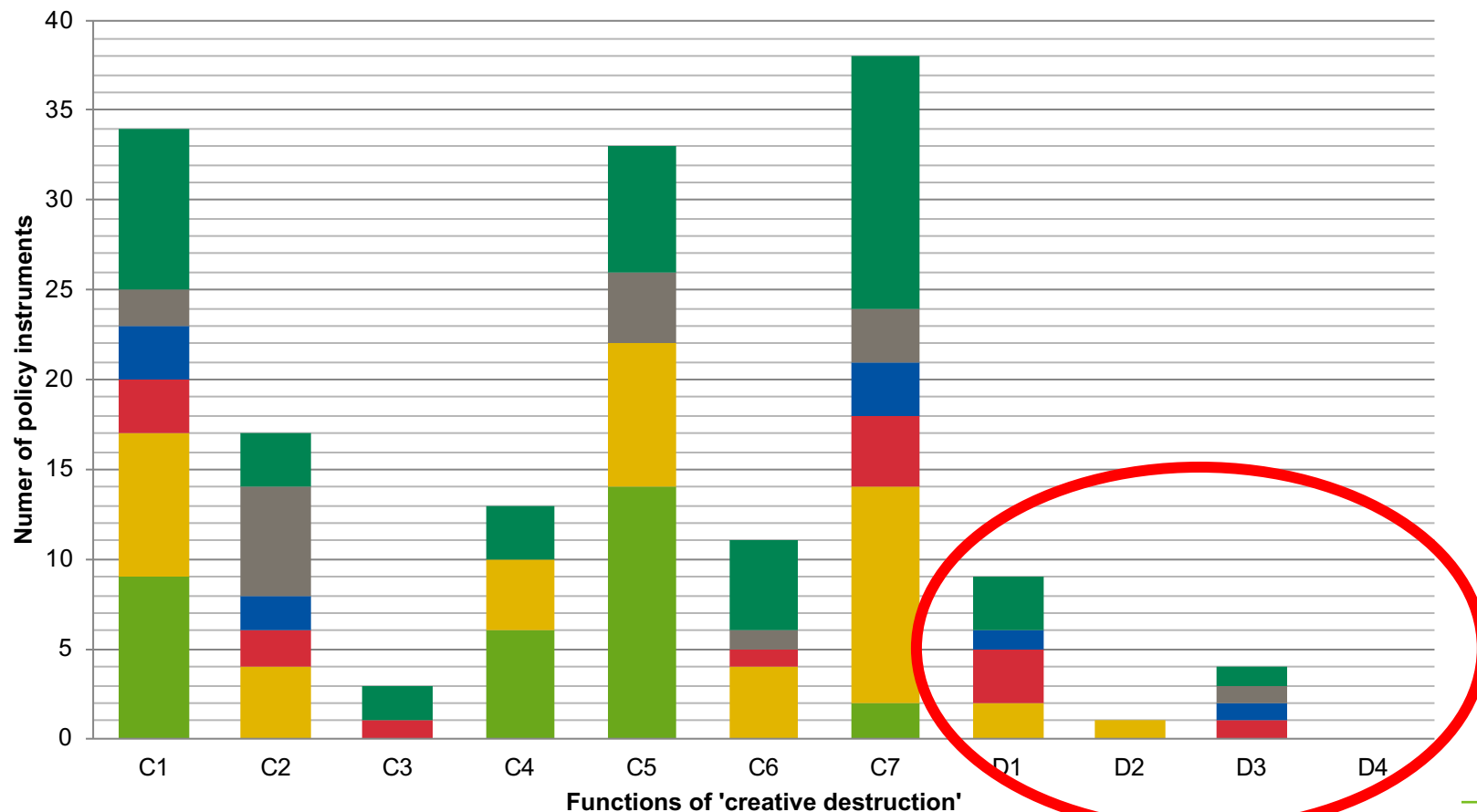


Figure 9. Policy mix for promoting low-energy transitions
 (based on Kivimaa & Kern, 2016 with an elaboration from Kivimaa et al., 2017)

Example: Policies for 'low energy' transitions in Finland and the UK

- **Finnish and UK policy instruments potentially influencing 'low energy' innovation, i.e. innovations for energy efficiency and energy demand reduction**
- **Policy mapping exercise**
 - *Four international policy measures databases (IEA, EEA, EC Erawatch, BEEP)*
 - *Divided in categories & coded in excel, one instrument can address several functions*
 - *Draft list of instruments sent for validation to national experts*
- **Focus on relative importance of creation vs. destruction; important gaps**

Policy mix for low energy innovation in Finland (n=64)



Innovation (generic)

Electricity

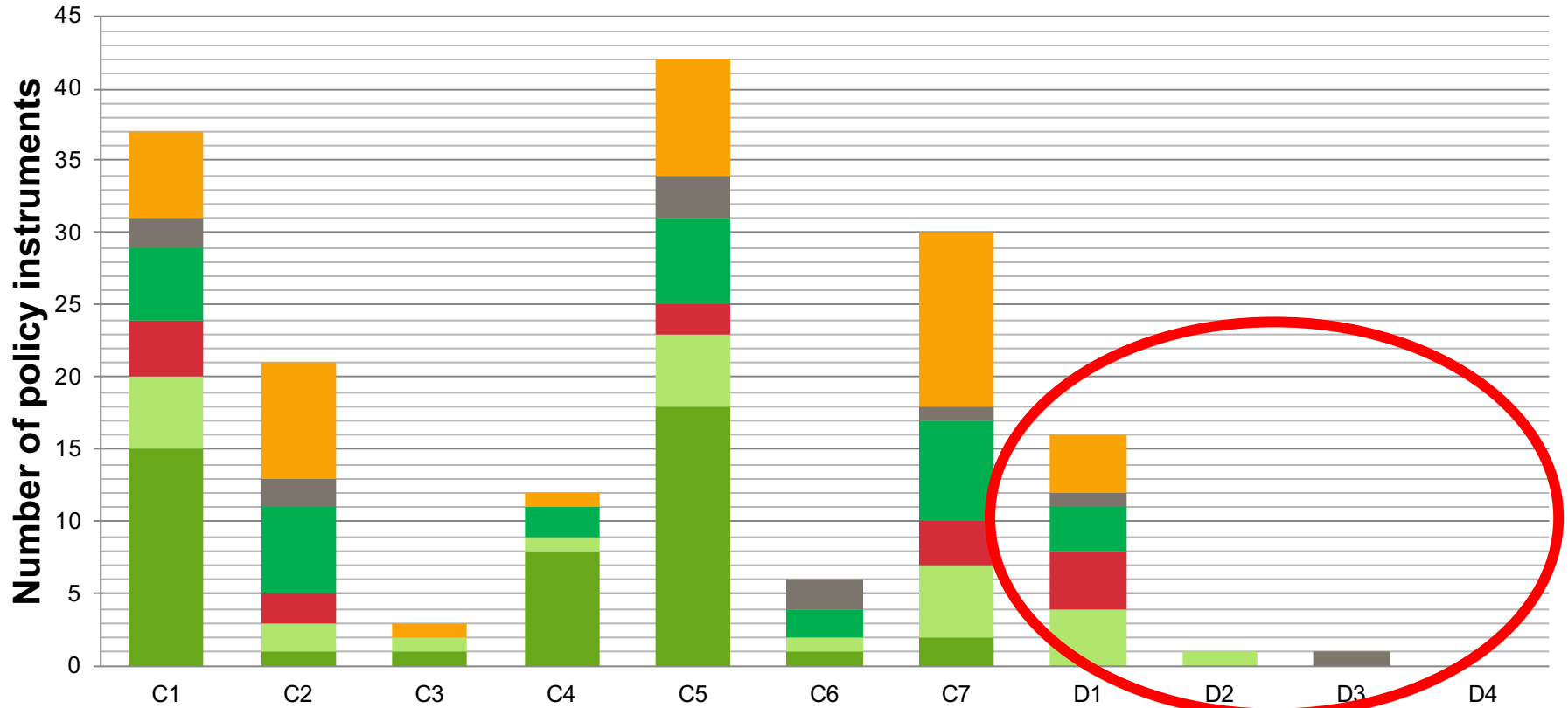
Climate and energy (cross-domains)

Heating of buildings

Heating and electricity

Mobility

Policy mix for low energy innovation in UK (N=72)



■ Innovation (generic)

■ Heating and electricity

■ Electricity

■ Climate and energy (cross-domains)

■ Heating of buildings

■ Mobility

Destabilising policies for low energy innovation in transport (2014)

Function	Finland	UK
Control policies	Emission performance standards for new cars, Amendment of Car Tax and Annual Vehicle Tax Regimes, Amendment of fuel taxation, Revision of the Land Use and Building Act	Emission performance standards for new vehicles, Company car tax reform, Fair fuel stabiliser, Government buying standards, Climate Change Act, Planning & Energy Act
Significant changes in regime rules	Revision of the Land Use and Building Act; Traffic Arc	Climate change act
Reduced support dominant regime technologies	Amendment of fuel taxation	None observed
Changes in social networks, replacement of key actors	"New energy policy" network?	Climate change committee?

Other examples of disruptive policies focused on reduction of support

- Removing of subsidies for coal mining operating costs (UK)
- Decisions to close down nuclear power (Germany, Sweden)
- Decision to limit the tax deductible share of commuting costs by private vehicles (Finland)
- Decisions (or consultations) on coal phase out (UK, Finland)

- But such political decisions can also be reserved before they result in destabilising influence



Coal phase out in the UK

- **Coal contributes 22% of electricity generation**
 - *Electricity produced in 8 coal power stations.*
- **Coal mining historically important**
 - *role reduced through market reforms and removal of mining subsidies*
- **Natural closing of power stations**
 - *due to age, inefficiency, and costly modifications to comply with air quality standards.*



Previous influence on recent rapid decline of coal use

- Low gas prices
- Expansion of renewables
 - Supported by Renewables Obligation, Feed in Tariffs
- One of the biggest driving forces has been the **UK's carbon price floor**, which tops up the tax paid on carbon emissions

”Phase out” consultation carried out during Nov 2016 – Feb 2017

- Coal Generation in Great Britain. The pathway to a low-carbon future: consultation document
- *“This consultation seeks stakeholder feedback on proposals to put into effect **an end to unabated coal generation by 2025.** It also tests proposals for a constraint on coal generation in the years ahead of that, in order to manage closures in an orderly way.”*
- Consultation does not propose a full phase out but phasing out unabated coal.



Proposal of the consultation

- **Option 1:** use the existing regime for new coal power stations onto existing plants from 2025 –
 - Demonstration of CCS technology on a proportion of the station's capacity
 - Undertake action to ensure remainder of the plant to be retrofitted with CCS in the future
 - Comply with the existing “mass based” Emissions Performance Standard
- **Option 2:** modify existing Emissions Performance Standard to apply a concentration-based limit on emissions per unit of generated electricity.
 - Benefits of co-firing with biomass

Gas as alternative to coal

- Greg Clark, the energy secretary: *“Taking unabated coal power out of our energy mix and replacing it with cleaner technology, such as **gas**, will significantly reduce emissions from the UK’s energy use.”* (Guardian 9.11.2016)
- Other options presented in the consultation: Biomass co-firing, utilization of CCS
- Energy demand reduction and renewable energy not explicitly considered



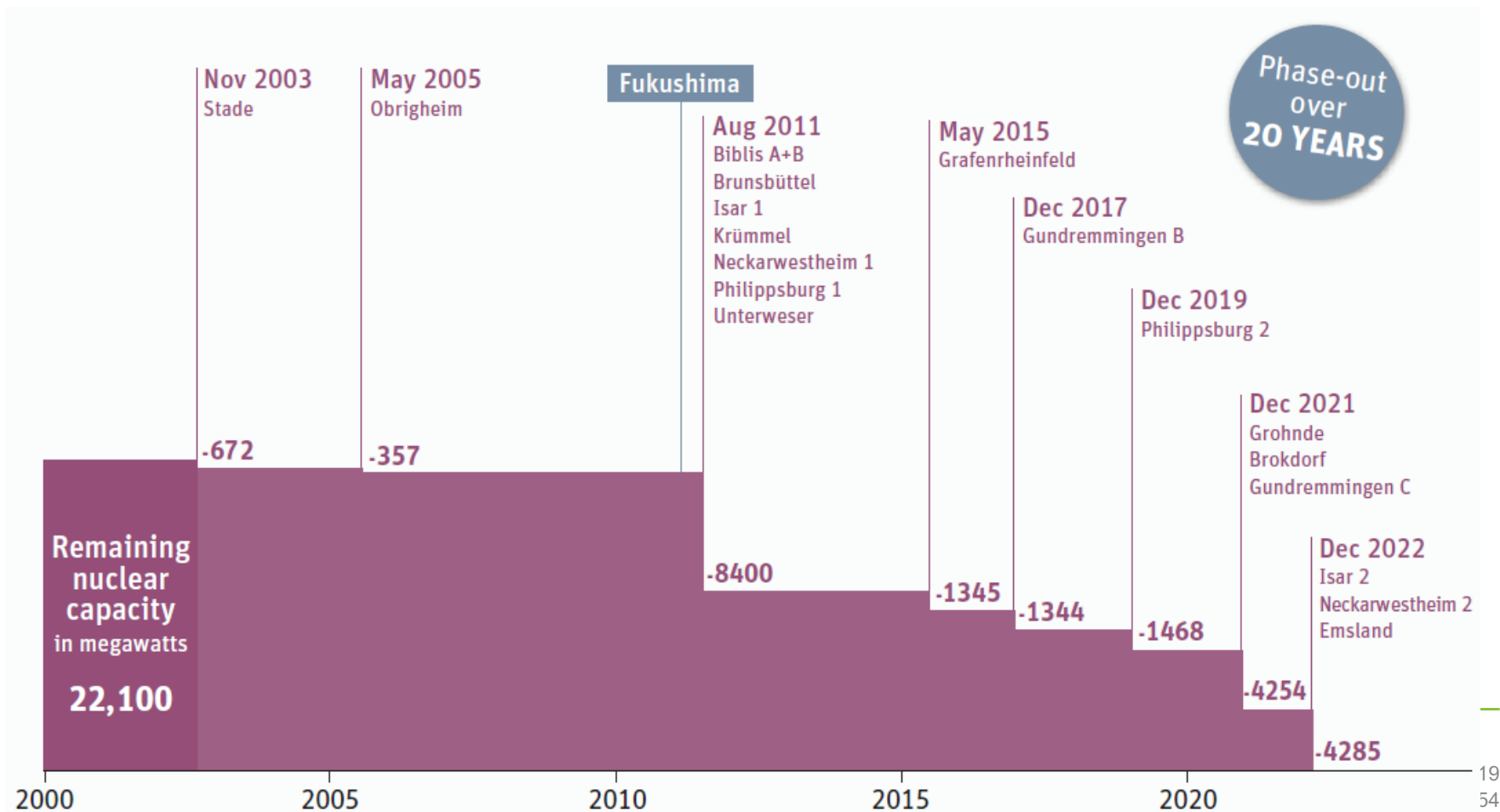
Lack of ambition

- Consultation confirms transition is happening anyway
- Most likely scenario estimate: coal power plants are shut down by 2022
 - But uncertainty – if price low without action can run until 2030.
 - Stakeholder calls for bringing the 2025 target forward

Lack of whole system perspective

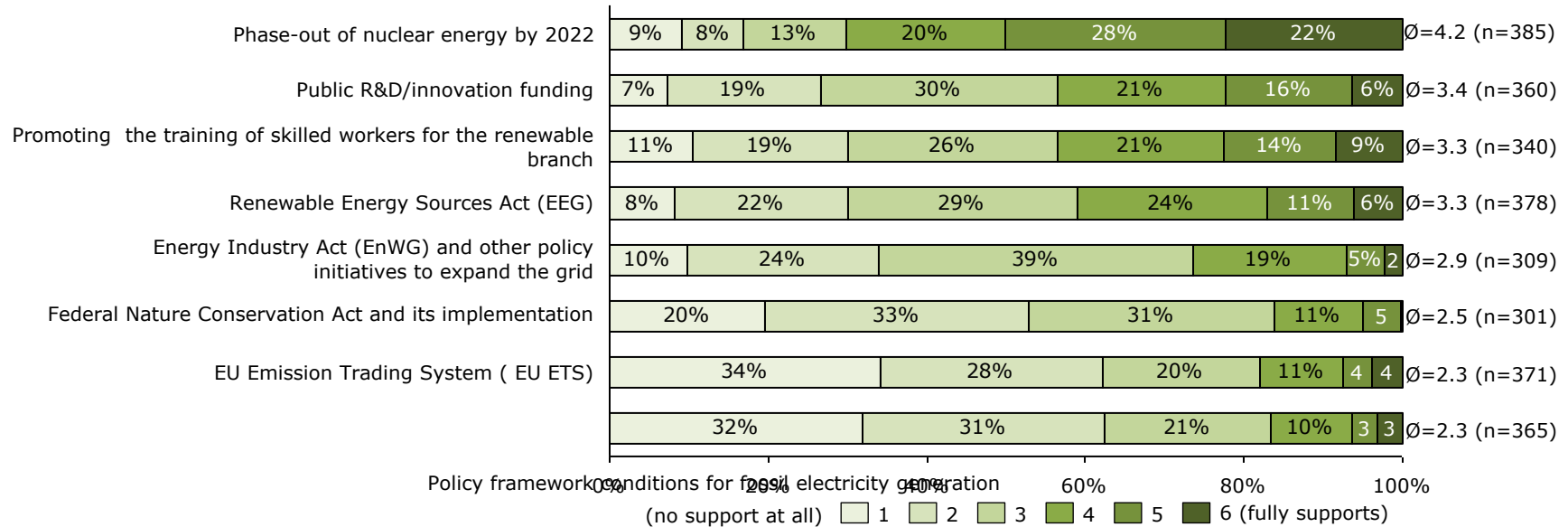
- A whole system perspective is missing in the proposition (SPRU consultation response, 2017), inc.
 - improving efficiency of appliances
 - improving thermal efficiency of buildings
 - demand shifting through renewed tariff structure
- Energy policy does not match with phase out plans
 - A dozen RES and energy efficiency policy instruments removed in July 2015
 - Yet, consultation states that “renewable energy would receive £730m in support”

German nuclear phase-out path (2000-2022)



Which instruments support RES most?

Support of the expansion of renewable electricity generation through:



- Nuclear phase-out supports the expansion of renewable energies the strongest
 - Public R&D/ innovation funding, training of skilled workers and the EEG are considered equally important instruments
- Rogge, 2017

Discussion on policy mixes & phase out

- **What kind of policies are most important for energy transition and why?**
 - *If you were an energy minister of Finland, what kind of policy mixes would you promote*
- **Can you think of ‘phase out policies’ that would influence energy consumption?**
 - *Example from city, national or international level*

Conclusions

- **Change in energy policy is needed as part of sustainable energy transitions**
 1. *Sustainability is officially one of core goals of energy policy in many places*
 2. *Complete policy overhaul is difficult as energy policy is intertwined with other policy domains and their goals*
 3. *Even when ‘sustainability transition’ policies exist, their effect may be reduced by other policies*
- **Policy mixes for transitions aim to highlight**
 1. *How a diverse mix of goals, instruments and processes are needed for transition*
 2. *That more explicit attention need to be paid to destabilising and phase out of non-sustainable energy production and consumption*