



# Socio-technical transitions - Transition and innovation studies as system studies

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- **Public policy in transitions / case of mobility-as-a-service in Finland**

# Need for systems to change!

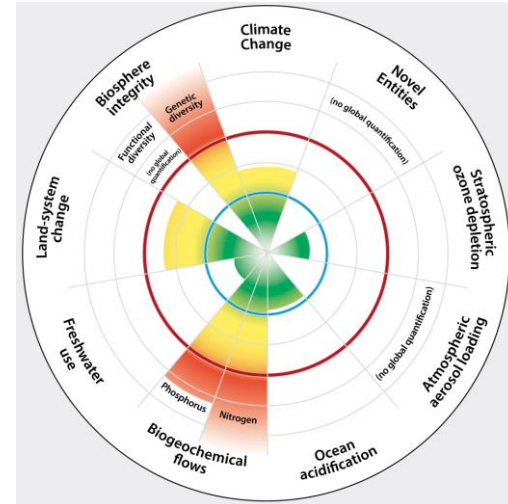


# Sustainability transitions involve addressing grand challenges

Sustainability transitions are highly complex and uncertain processes

Transitions are about *actors* doing things in new ways, changing their mind-sets, and the underlying rules

Changes in public policies and institutions are essential to catalyse and orient systemic changes in cooperation with businesses and civil society (EEA, 2019)



# Sustainability transitions research

- Originated in the late 1990s as an interdisciplinary social science research field, with an aim to tackle fundamental *environmental* sustainability challenges
- Tries to understand socio-technical system change through
  - (a) creation and diffusion of sustainability innovations (niches, technological innovation systems)
  - (b) path dependencies, lock-ins and the processes of destabilising socio-technical systems
  - (c) influence of broader landscape changes
- Incorporates normative goals to improve the state of affairs via research, approaches and "tools" generated – e.g. transition management

# Key concept: socio-technical system

- E.g. energy supply, water supply, transportation, food supply
- consists of (networks of) **actors** (individuals, firms, and other organisations, collective actors) and **institutions** (societal and technical norms, regulations, standards of good practice), as well as material **artefacts** and knowledge (technology)
- Different elements of the system interact providing services for the society



Source: CIED, 2015

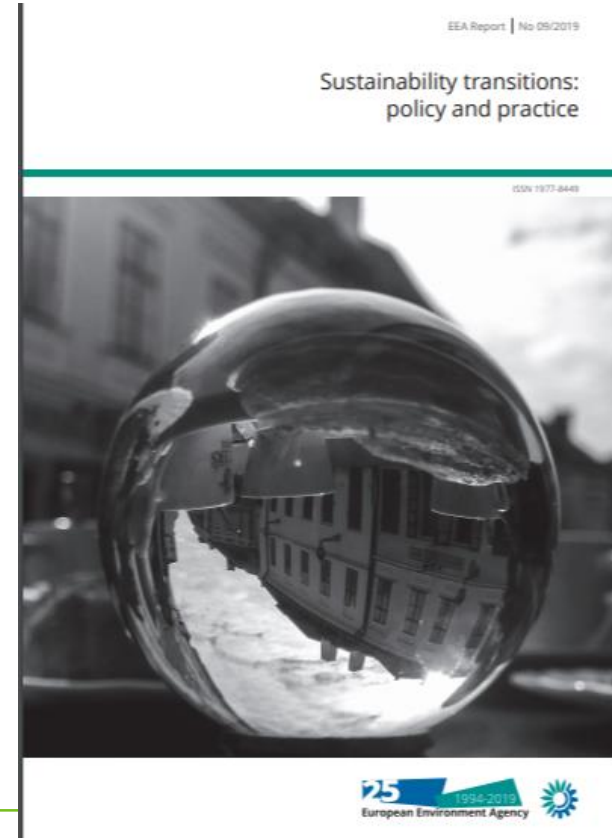
# Socio-technical transition

- **“set of processes that lead to a fundamental shift in socio-technical systems”**
  - Contains extensive changes along different dimensions: not just technological, but also organisational, institutional, political, economic, and socio-cultural
  - Include a large variety of actors
  - typically take a very long time (> 50 years).
  - During a transition, new products, services, business models, and organisations emerge
  - Technological and institutional structures undergo fundamental changes

Markard et al. 2012

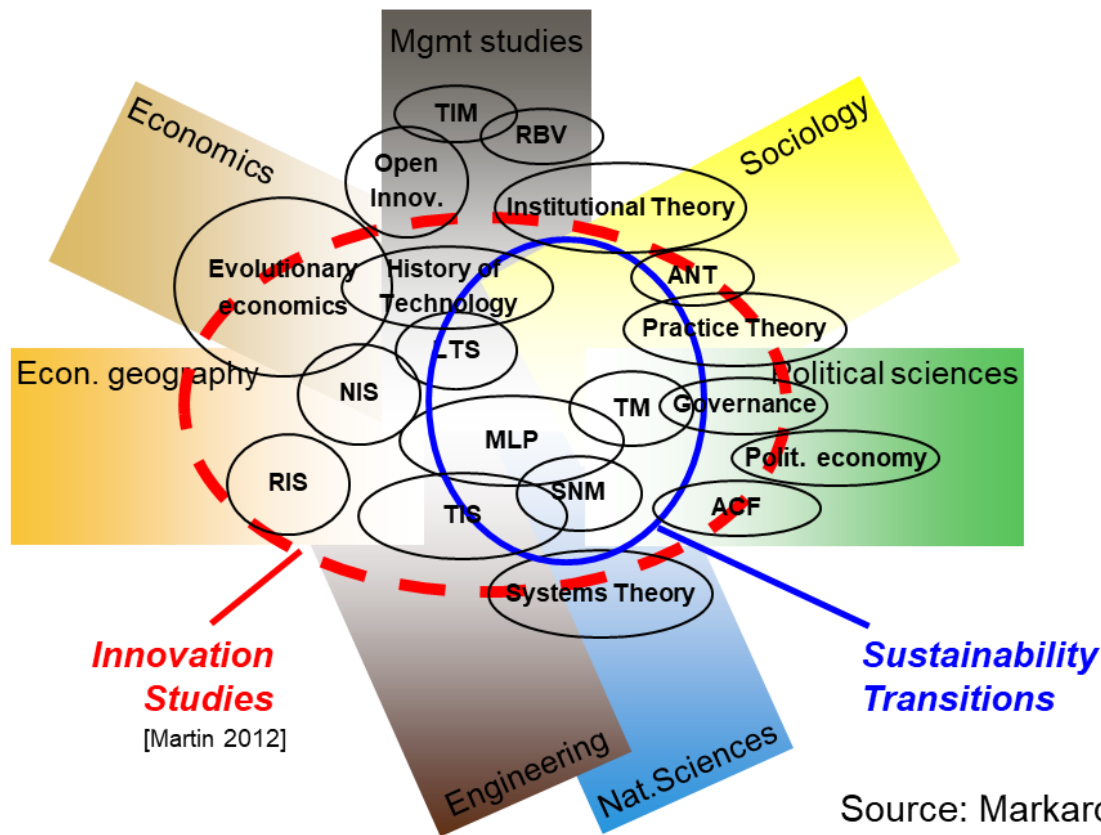
# Characteristics of transitions

- Multi-dimensional changes in socio-technical systems
- Multi-actor, multi-scalar processes
- Goal-oriented directionality (visions, pathways to sustainability)
- Disruptive (involving winners and losers)
- Open-ended and uncertain (learning and experimentation)
- Surprises, unintended consequences (evaluation, reflection)
- Urgency and acceleration (diffusion, phase out, exnovation)





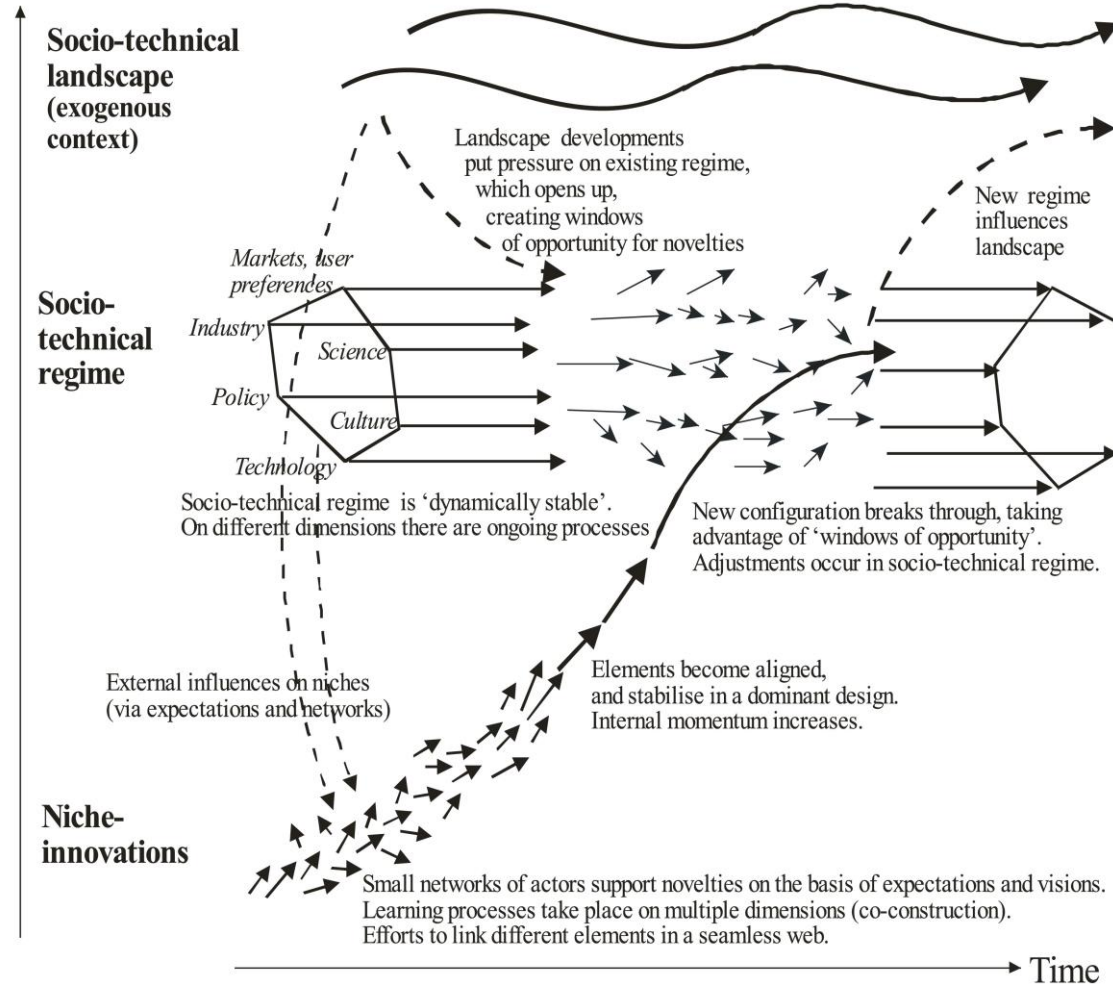
# Theory Landscape



Source: Markard, 2017

# Multi-level perspective (MLP)

Increasing structuration of activities in local practices



Geels & Schot 2007

# Core concepts of MLP

- **Socio-technical regime** = the deep structure of the socio-technical system involving alignment between technologies, infrastructure, institutions, practices, behavioural patterns, markets, industry structures, etc. (Geels 2002, 2004)
- **Niche** = protected space, i.e., a specific market or application domain, where radical/disruptive innovations can develop uninfluenced by the selection pressures of the dominating regime (Kemp et al., 1998).
- **Landscape** = long-term gradual developments, such as climate change and demographic trends, as well as rapid abrupt events including natural disasters and wars (and are described as landscape “shocks”) (Van Driel and Schot, 2005)

# Theoretical foundations of MLP / relevance for transitions

## Social construction of technology

- Social networks, visions & expectations, learning processes & alignment behind the development of niche innovations -> from variety to convergence
- Rules are initially fuzzy – circulation of knowledge & actors leads to more articulated rules and stable networks

## Evolutionary economics

- Long-term techno-economic patterns, e.g. transformation of core characteristics of firms, speciation (emergence of radical novelty), competition
- Technological discontinuities and disruptive innovation → struggles between niche innovations and regimes reproduced by incumbent actors
- Niches as protective spaces against mainstream selection environments (markets)

## Neo-institutional theory

- regimes as semi-coherent set of rules and institutions

Geels, 2020

# Many kinds of social actions in transitions

- Learning, network building, visioning to build niche innovations (strategic niche management)
  - Shielding, nurturing, empowering of niches
  - Translating and intermediating between niches and regime
  - Political struggles between niche and regime actors, combined with active resistance by regime incumbents
  - But also, strategic reorientations of incumbent firms towards niche-innovations
-

# Strategic niche management (SNM)

- SNM was developed to better understand technological change in connection with economic and social changes, aiming to facilitate the adoption of new technology to social contexts (Hoogma et al., 2002).
- Three core processes (Hoogma et al., 2002; Geels and Raven, 2006):
  - (1) Articulation of expectations and visions shared by many actors and demonstrated by multiple projects: strong visions can attract external support for the niche.
  - (2) Creation of networks enabling niche actors to interact, form partnerships and pool collective resources; and
  - (3) Learning in multiple dimensions, including aggregating best practice and lessons from projects and initiatives, and sharing knowledge towards local experiments.

# Destabilisation

- **Increasingly more explicit attention is paid to how existing (energy) systems destabilise**
  - E.g. decline of the UK coal industry (Turnheim and Geels, 2012)
  - Policies for destabilising unsustainable industries (Kivimaa and Kern, 2016)
  - Increasing use of the term ‘phase-out’
- **This involves**
  - “weakening reproduction of core regime elements” (Turnheim and Geels, 2012)
  - Opening up of windows of opportunity for niche innovations to diffuse

# Study of historical examples and the presently unfolding transitions

- From sail boats to steam ships
- From horse drawn carriages to motor vehicles
- From cess pools to sewer systems
  
- **BUT the present challenge is how to promote large-scale transitions supporting environmental sustainability (rapidly)**



# Intermediation in transitions

- Socio-technical transitions are about *actors* doing things in new ways, changing their mind-sets, and the underlying rules
- The core processes of transitions (articulation of expectations, networking, learning, changing regimes) *need support from intermediaries* that connect different actors, visions and actions
- Who are they, what do they do?

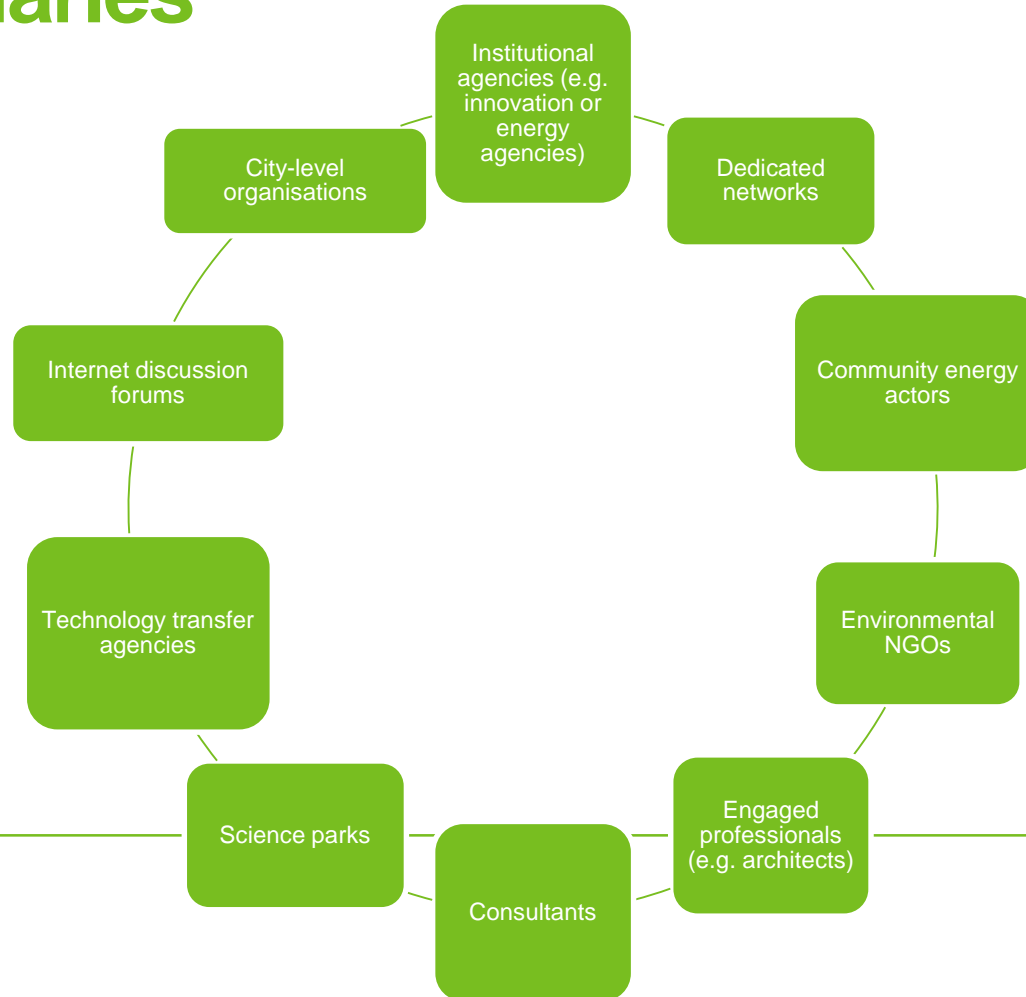
# Intermediary actors

Intermediaries link actors – new entrants and incumbents – and activities, skills and resources connected to these actors

to create momentum for change;  
create new collaborations around  
niche technologies, ideas and  
markets; and disrupt prevailing  
socio-technical configurations



# What transitions literature describes as intermediaries



# Example: SNM roles undertaken by Sitra for sustainable energy transition in Finland

SNM process	Activity
Articulation of expectations and visions	<ul style="list-style-type: none"><li>- Articulating important issues, e.g. energy saving in communities and building regulations</li><li>- Strategy development through participation in the revision of building regulations and ERA17 programme</li><li>- Accelerating the application of new technologies, e.g. piloting and funding new solar technologies</li></ul>
Creating social networks	<ul style="list-style-type: none"><li>- Brokering between public and private sectors</li><li>- Configuring and aligning interests between Sitra funded startups, city administrations and others</li></ul>
Learning in multiple dimensions	<ul style="list-style-type: none"><li>- Knowledge generation (background studies, pilots, competitions, visits, etc.)</li><li>- Piloting and experimenting (e.g. new city area)</li><li>- Investments in new innovative businesses</li><li>- Communication and dissemination of knowledge (guidebooks, manuals)</li><li>- Provision of advice and support (Peloton Campaign)</li><li>- Learning by doing and using (competitions, demonstrations)</li></ul>

# Emergence of dedicated intermediaries

## **Established to intermediate a transition process**

- E.g. coordinating local actions with sustainability, facilitate implementation of urban renovation

## **Established actors assuming intermediary roles for niche development or regime change**

- E.g. advancing energy efficient buildings, renewable energy, community energy, forest-sector innovation

## **Emerged in the process of transition**

- E.g. In response to large-scale institutional change or to failures in markets and innovation systems (to fill gaps)

## **Actors unaware they are intermediating**

- E.g. social landlords, building professionals, architects translating, for example, new regulations into practice

Drawing from Moss (2009)

27.10.2020

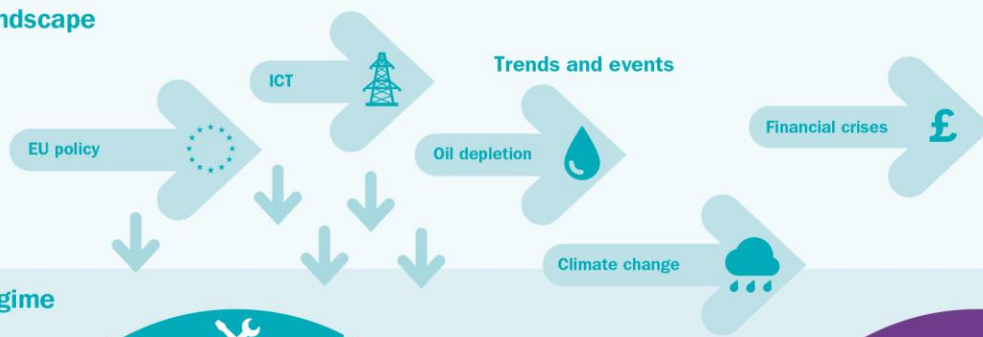
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# Case of UK low-energy housing

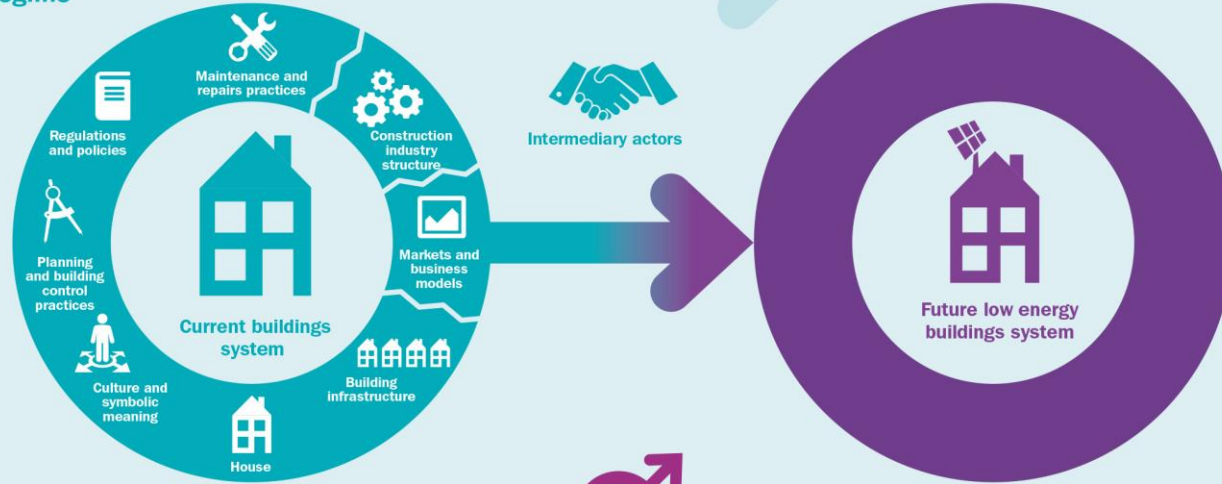
# Context

- Transitions to low energy buildings & related policy trace back to 1970s
- > 45 years later, residential building stock still a significant source of CO2 emissions
- Variety of niches around low energy, low carbon and ecologically sustainable buildings – but difficulties to become part of the regime
- A relatively ambitious policy mix from early 2000s was dismantled in 2015

## Landscape



## Regime



## Niches

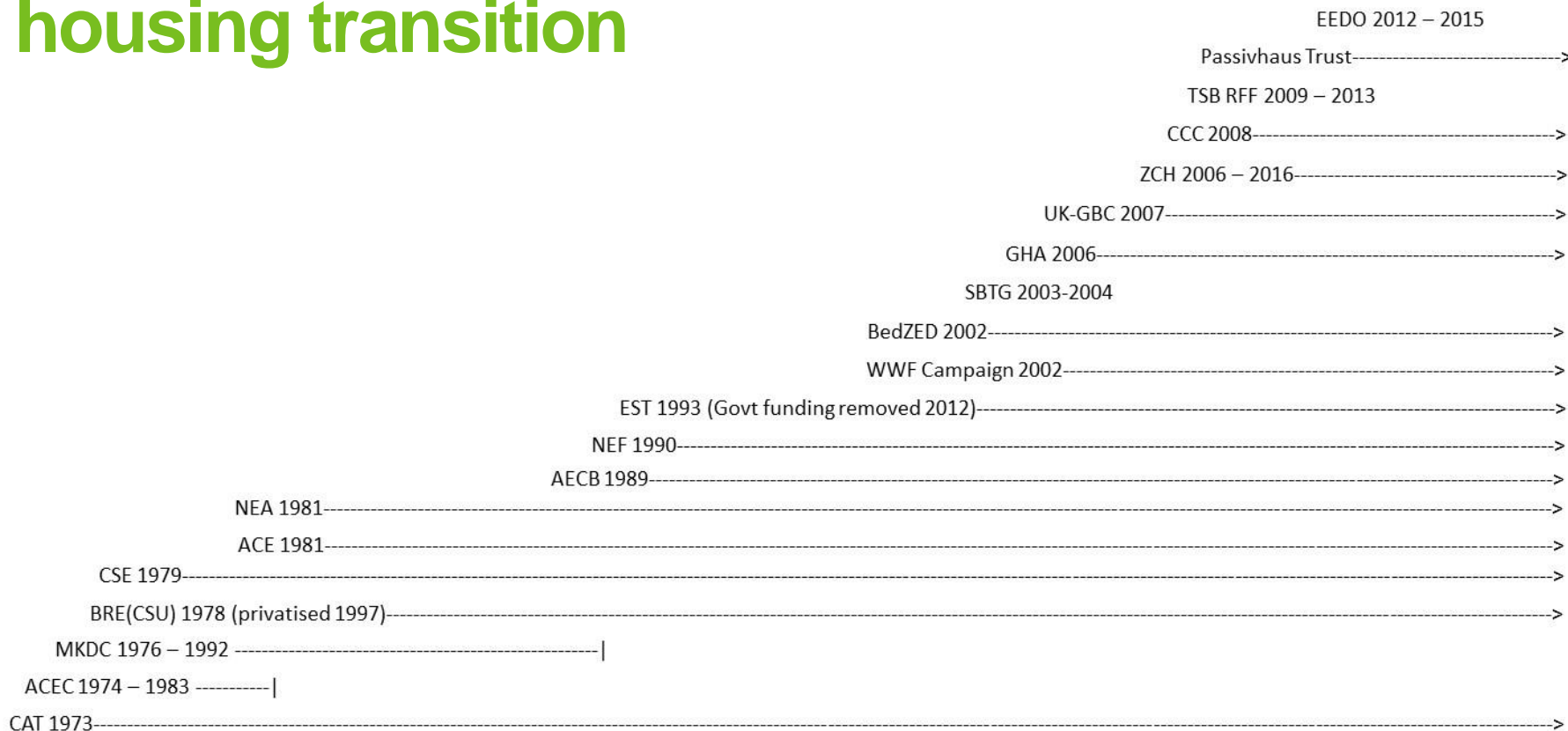


## Innovations

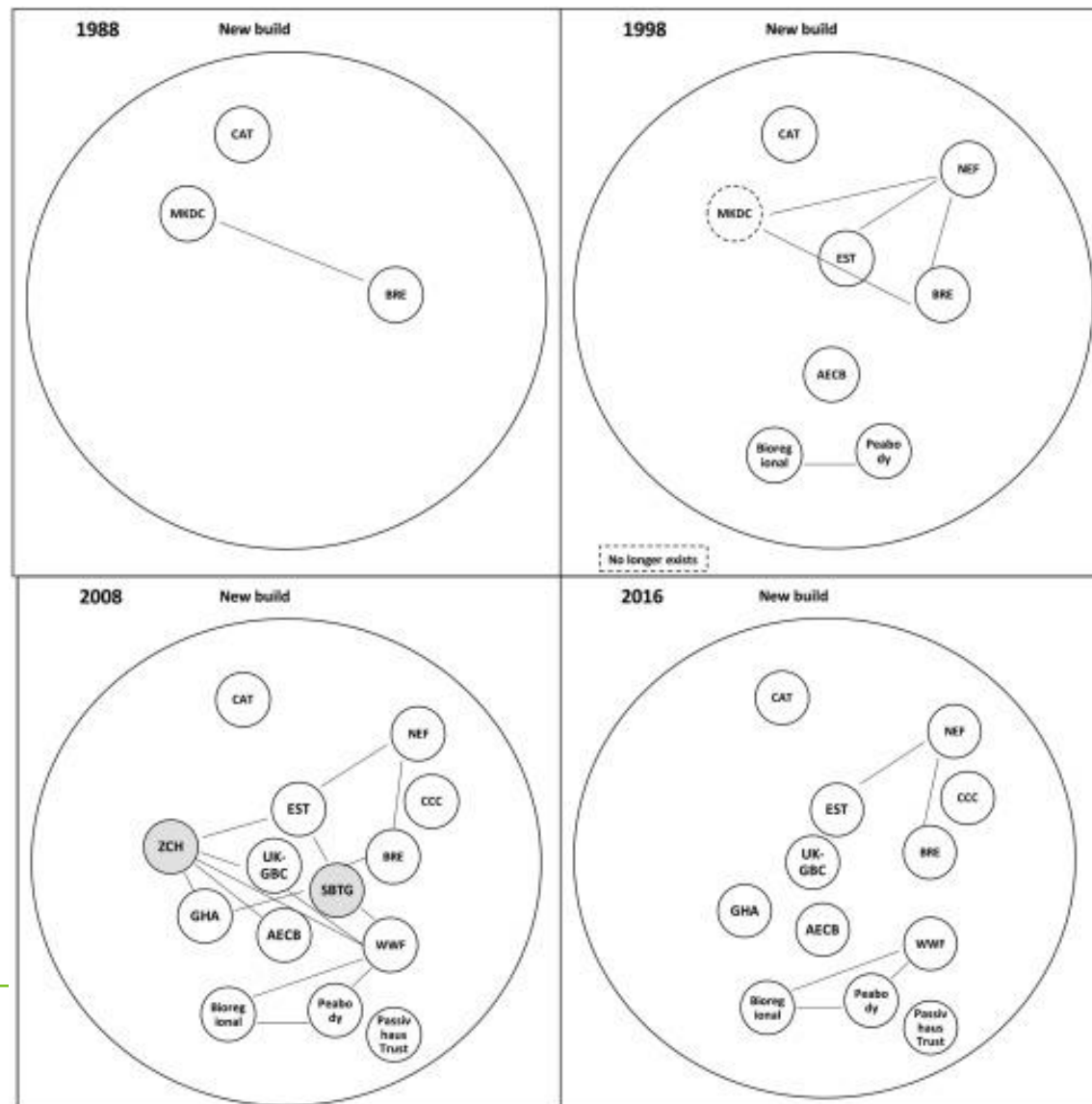
Radical reductions in energy demand require transitions to new socio-technical systems.



# Intermediaries advancing the UK low energy housing transition



Oil crises 1970-1978	Rational choice 1979-1982	Strong efficiency 1983-1986	Free market 1987-1990	Climate 1991-1998	Int. climate commitments 1999-2005	Zero carbon 2006-2008	Dismantling zero carbon 2009-2014	Policy U-turn 2015-2016
<b>PREDEVELOPMENT PHASE 1970-1998</b>					<b>TAKE-OFF PHASE 1999-2008</b>		<b>BACKTRACKING PHASE 2009-2016</b>	



# Types of intermediaries advancing the UK low energy housing transition

## Long-term private organisations (charities, social enterprises)

- Influencing the ***overall vision formation*** (of what is possible) and ***sharing experiences*** of early experimentation with implications on policy formation (Centre on Alternative Technology, Centre on Sustainable Energy in Bristol, Bioregional)

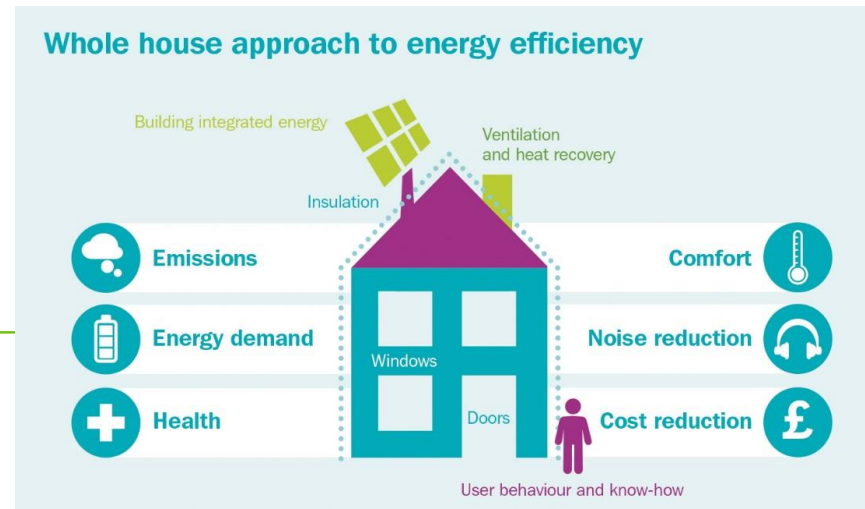
## Experimenting organisations and local events

- ***Motivating consumers*** to build and renovate more sustainable homes (Centre on Alternative Technology, Eco Open Houses events)
- ***Creating new networks*** for knowledge and information exchange (Eco Open Houses events)

# Types of intermediaries advancing the UK low energy housing transition

## Local and national (public-)private organisations

- **Aggregating learning and experiences** from innovative building and retrofit experiments (Eco Open Houses events, Energy Saving Trust)
- **Organise uncoordinated activities** to form a more coherent niche (Association for the Conservation of Energy, UK Green Building Council)
- **Emerge and lobby** at the absence of effective policy



# Core activities carried out by the intermediaries

1. Piloting & experimenting to demonstrate what is possible (*niche building*), influencing political vision building and gradual tightening of policy demands (*niche-regime interaction*)
2. Carrying out and coordinating assessments aggregating latest knowledge, in support of policy development (*niche-regime interaction*)
3. Influencing the development of standard setting and new legislation (*regime change*)
4. Implementing and translating policy to practice (*regime change*)
5. Creating and managing networks to lobby for new more transition-oriented policies or carry out activities on the ground (*niche building, regime change*)
6. Creating and managing public-private networks informing the government (*niche building, niche-regime interaction*)

# Issues and challenges

## Reduced space for intermediary action in UK low energy housing sector due to

- Financial issues: (a) reduced government funding on building energy efficiency; (b) reduced membership funding; (c) rent caps on the social housing sector → battles for survival within the ecology of intermediaries
- Political issues: Several key policies removed in 2015, disrupting the initial long-term approach and targets
- Organisation issues: Dozens of organisations set up over the years, which are partly overlapping – close down (Zero Carbon Hub) or merger (e.g. Association for Decentralised Energy)

# Public policy in transitions

- Initially rather little covered, mainly as one of the regime components without deeper analysis
  - But emergence of a rather substantial body of research on policy mixes (e.g. Rogge & Reichardt, 2016; Kern et al., 2019)
- Some of the focus areas
  - Analyses of mixes of policy instruments from the perspective of transitions
  - Analyses of development of policies vis-a-vis transitions over time
  - Creation of specific suggestions for more transition oriented policies and policy frameworks

# Key terms in context of transitions

**Public policy** – choices made by governments in the form of strategies, laws, taxation, public funding, and other means

**Policy mix** - an arrangement of policy goals, instruments and processes, developed incrementally over many years, influencing a given area, e.g. transport or more specifically electric vehicles

**Policy experimentation** - temporary and reflexive policy interventions that contribute to niche building and regime destabilisation via learning (and unlearning), articulation of expectations & visions, and networking (Kivimaa & Rogge, 2020)

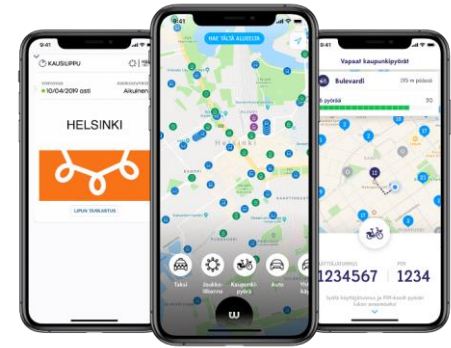
**Institutions** - “the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights).” (North, 1991)



# Case of mobility-as-a-service in Finland

# Mobility-as-a-service MaaS

- Not a single technology but a new way of thinking about how mobility is provided and used
  - From individual ownership of cars to personalised services and shared assets
- Different understandings of MaaS
  - *‘a wide range of transport services, from peer-to-peer services... to services that attempt to optimize the connection between personal cars and [public transport]’*
  - more narrow understandings as specific ‘packaged offerings’ with *‘intermodal planning, booking and payment functionalities, as well as multiple transport modes and mobility packages’*



Picture: [www.whimapp.com](http://www.whimapp.com)



Kivimaa & Rogge 2020

# Connection to MLP

- **Landscape**

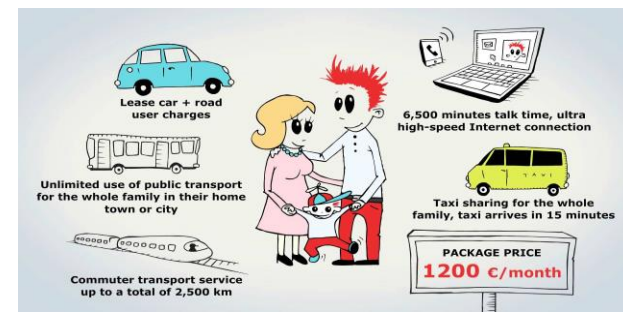
- Changing global developments e.g. climate change, digitalisation, urbanisation...

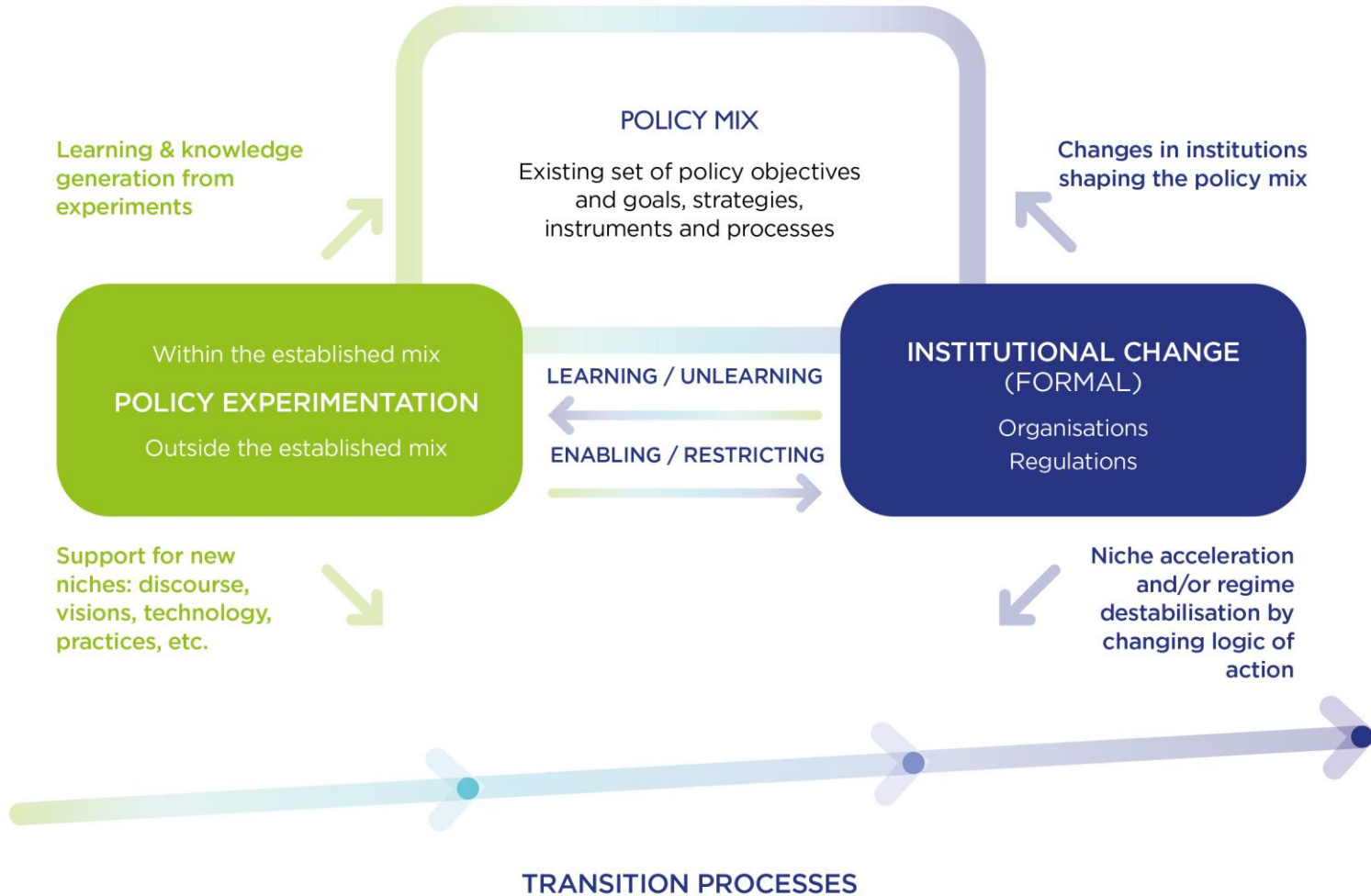
- **Context of connecting regimes**

- transport and communications policy since the 1990s
- history of Nokia in building the ICT sector
- lack of car manufacturing industry
- Strong role of municipalities and their public transport operators

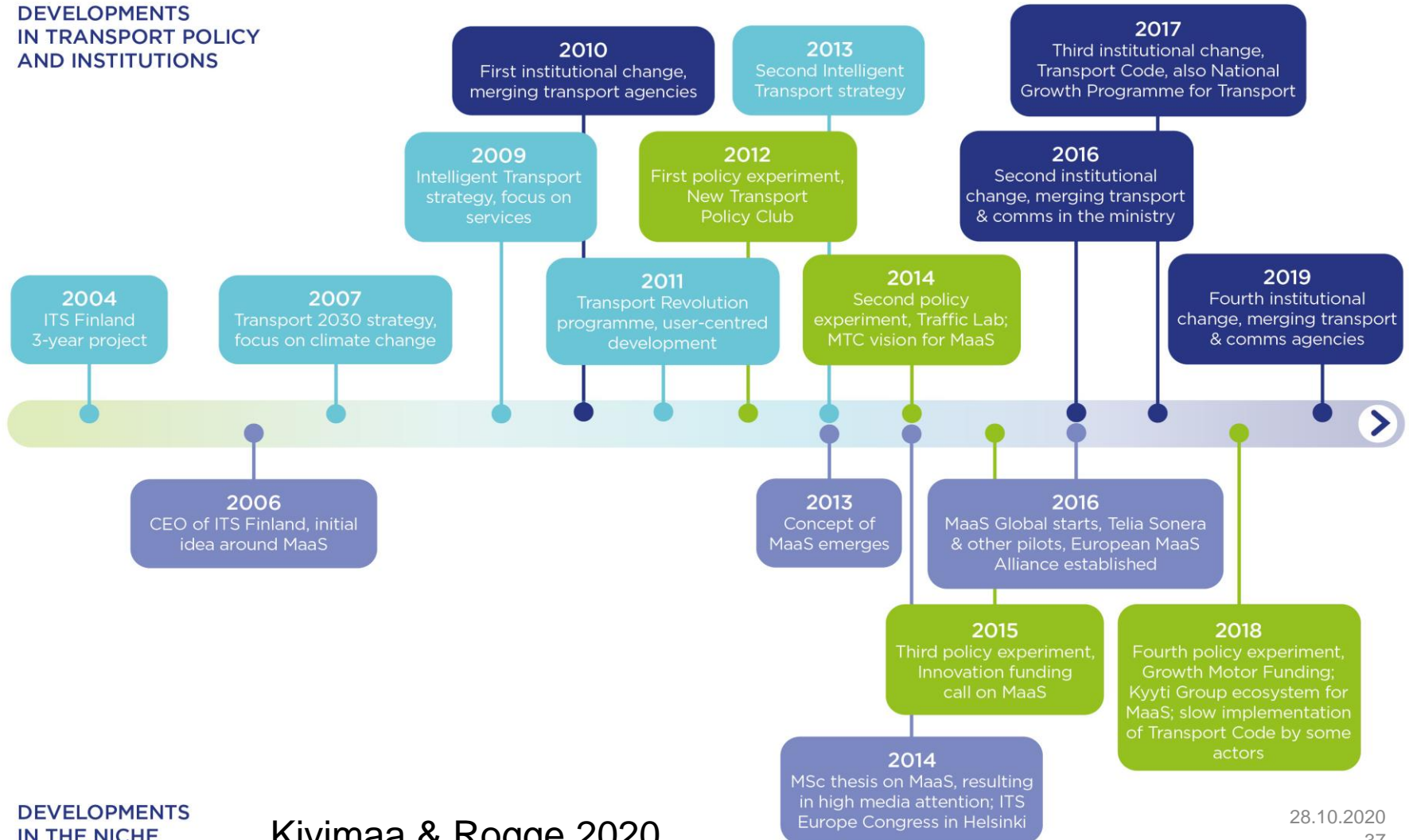
- **Niche building arising from an anticipation of intelligent transport systems**

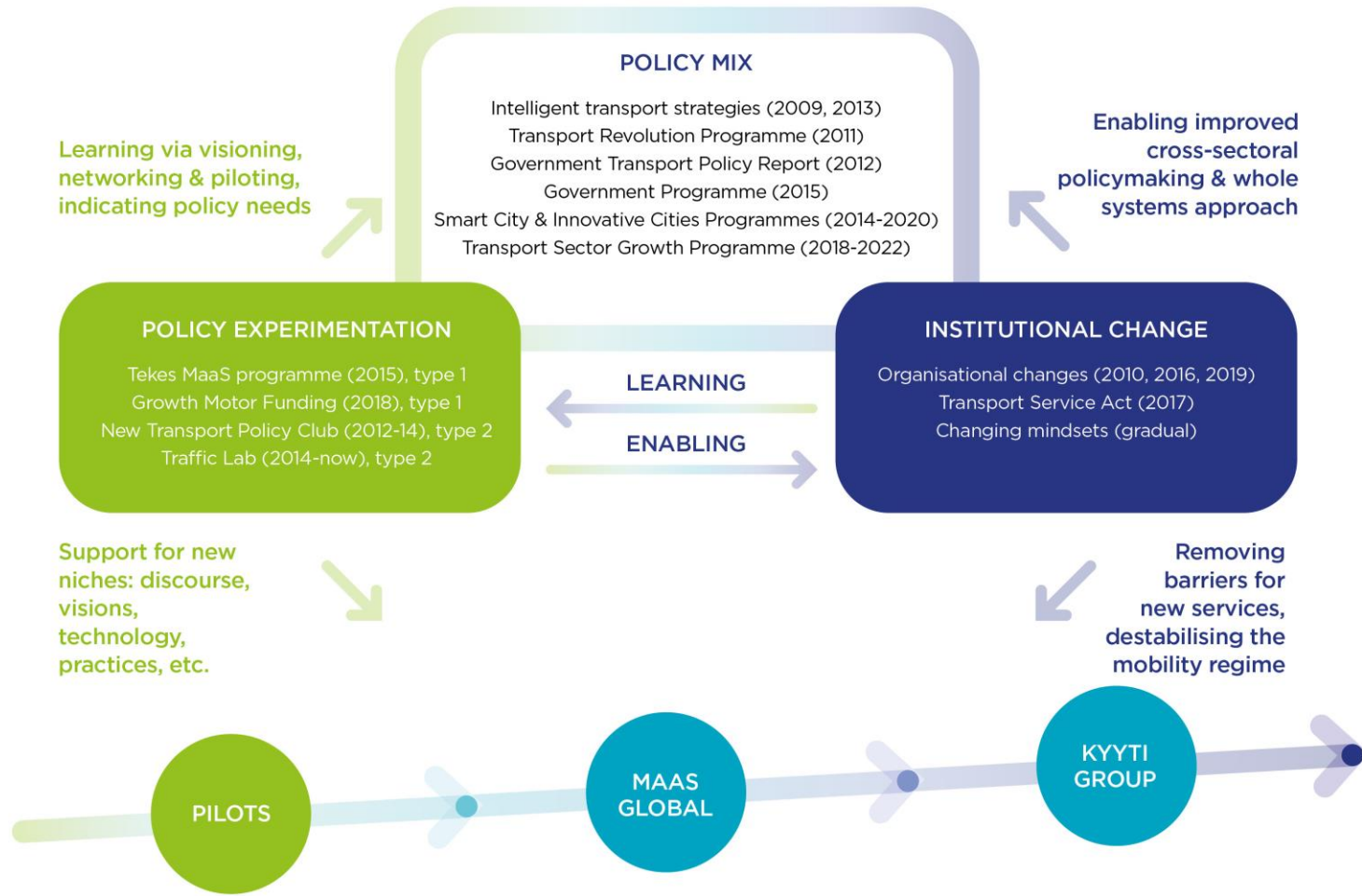
- Active search for new business models by public & private actors





## DEVELOPMENTS IN TRANSPORT POLICY AND INSTITUTIONS





MAAS AS PART OF THE SUSTAINABLE MOBILITY TRANSITION

Kivimaa & Rogge 2020

# Some insights

**Involvement of policymakers explains the rapid development of MaaS in Finland (compared to Sweden, or other sectors, e.g. building energy services)**

- Instrumental in vision formation (experimentation) and removing barriers for new market creation (major regulatory change)
- But also promoted via more traditional policy means (strategies, innovation programmes)

**This is complemented with many other drivers**

- Change-oriented, championing actors
- Collaboration between public and private actors (e.g. ITS Finland, Traffic Lab, Sitra and Tekes/Business Finland funding)

# Conclusions

- Sustainability transitions focus on multi-dimensional and complex changes in socio-technical systems (energy, food, mobility, etc).
- Multi-level perspective is one of the key analytical frameworks
- Increasing attention is paid to actors and agency
- Different types of actors play a role in intermediating sustainability transitions ('ecologies') – as essential contributors to transition processes but also issues of contestation, battle, neutrality
- Alongside incumbent and new businesses, public sector actors are influential in supporting/hindering transition processes



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# Thank you!

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