Socio-technical energy transitions and the role of (user) practices

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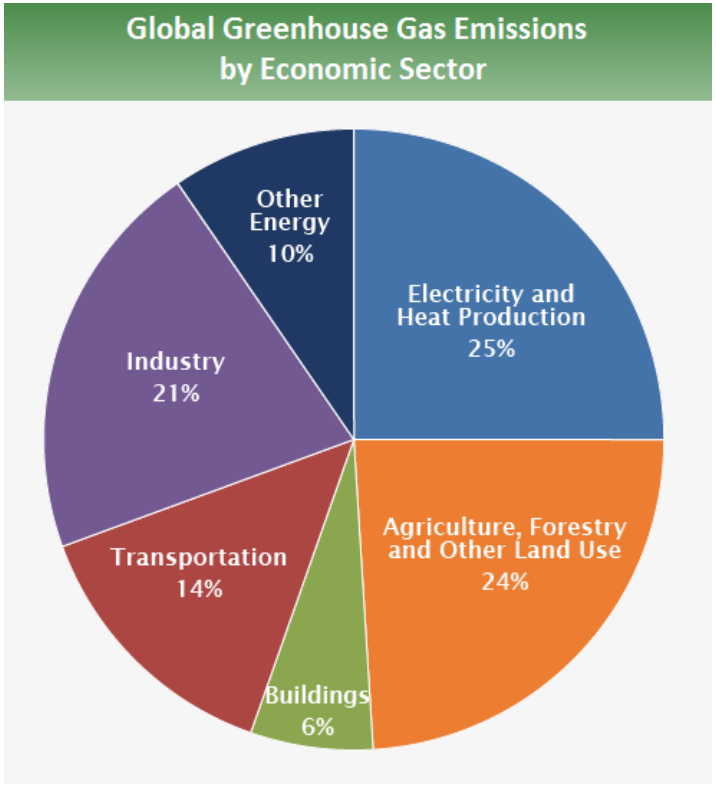
Long term target 60-80% of reduction by 2050

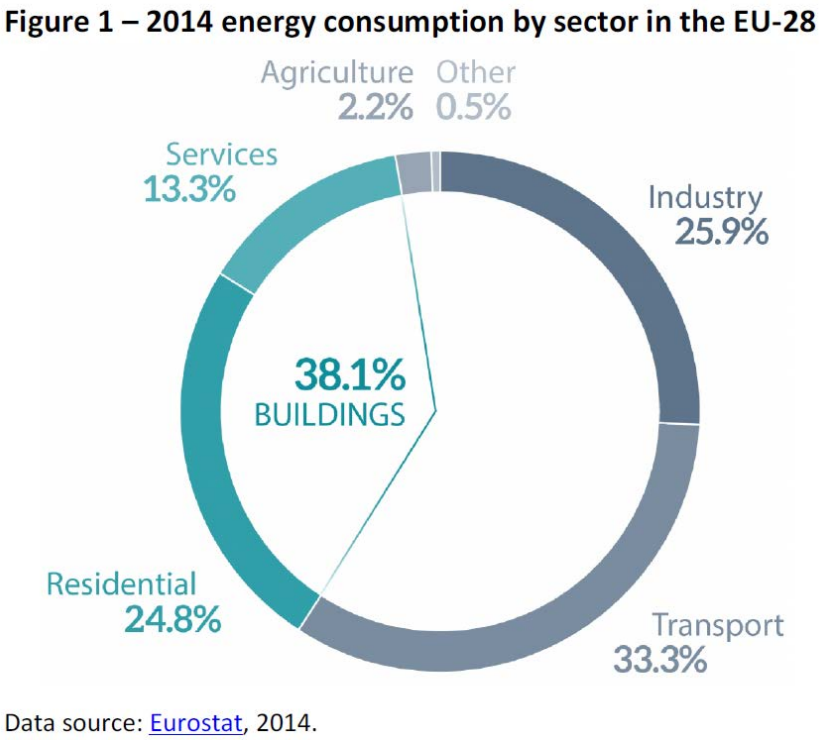
→ Challenging because it requires deep change in multiple sectors

GHG production, IPCC 2014, world



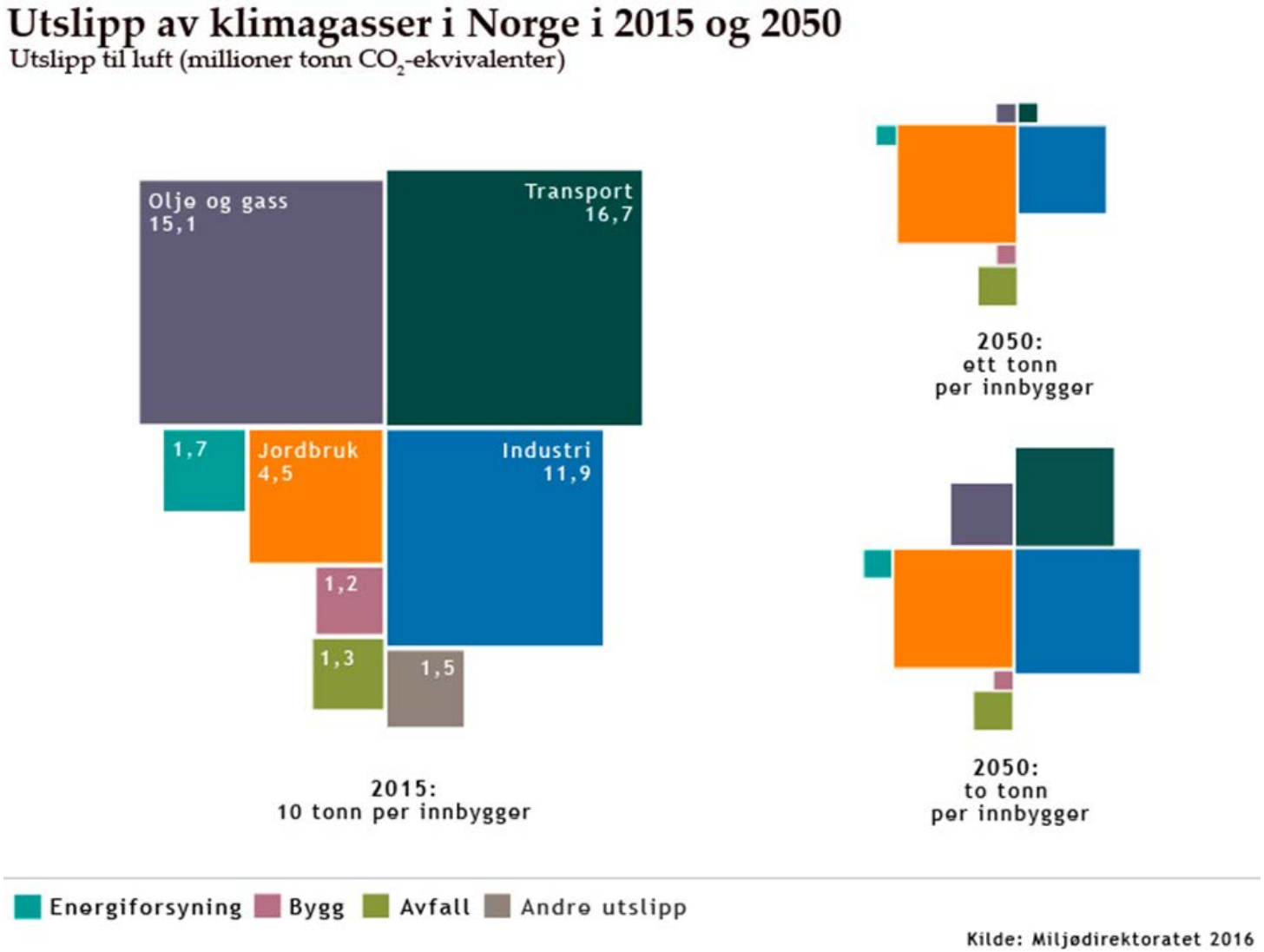
This problem framing leads to **technical solutions**

End-use perspective on European environmental problems

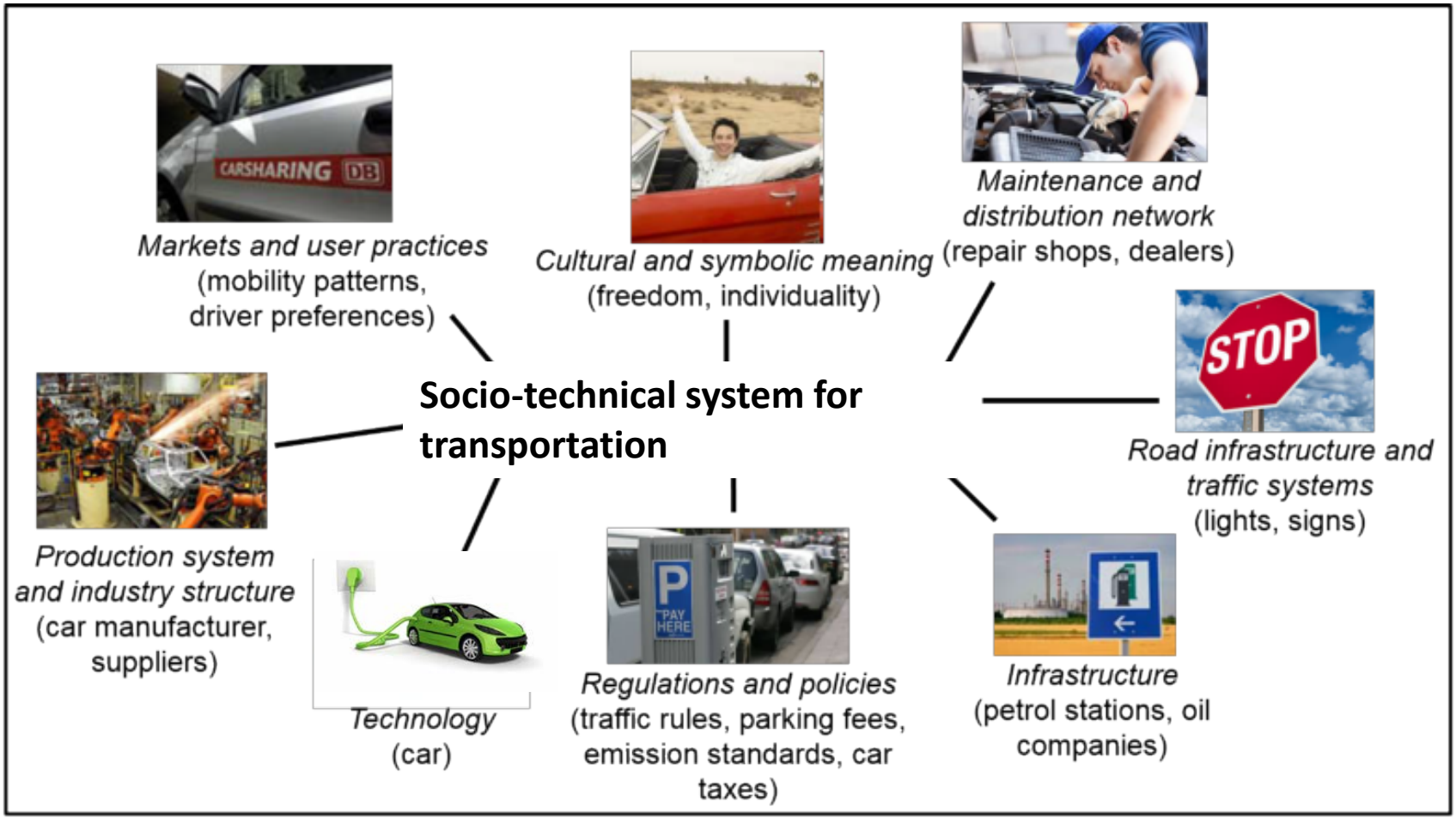


This framing leads to + **socio-technical system** change

Norway


Utslipp av klimagasser i Norge i 2015 og 2050
Utslipp til luft (millioner tonn CO_2-ekvivalenter)
Olje og gass
15,1
Transport
16,7
1,7
Jordbruk
4,5
Industri
11,9
1,2
1,3
1,5
2015:
10 tonn per innbygger
2050:
ett tonn
per innbygger
2050:
to tonn
per innbygger
Energiforsyning
Bygg
Avfall
Andre utslipp
Kilde: Miljødirektoratet 2016

Socio-technical system



http://www.cta-toolbox.nl/tools/#practical-considerations-and-implementation

Some changing user practises related to electrification of person transport:

Engaged in energy transition dialogues

Mobility practises scrutinized

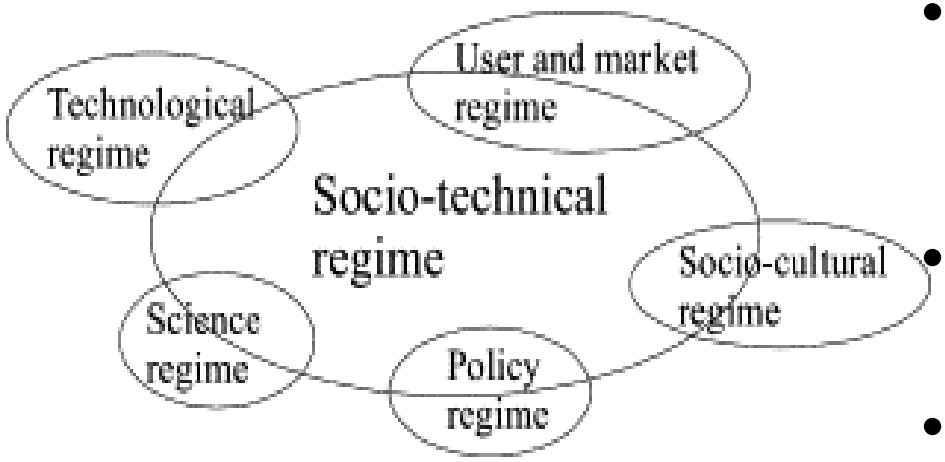
Energy consumption become visible

Create environmental awareness

Are we aiming for deep transition, deep de-carbonisation and ”transformative change”?

- Need transformation of the socio-technical regime into a new system provision of mobility services
- Need system innovation, not only technological innovation(mobility)
  - Requires cultural innovation: Need to change routines (embedded in infrastructure, technology, organization of society)
  - Need eroding existing regimes
- Johan Schot: “If you only have niche development, transformation will not happen!”

Meta-coordination through socio-technical regimes



- Co-ordination as the outcome of organizational and cognitive routines
- Semi-coherent «Rule set» or «grammar»
- Generates incremental innovation

"Technological regimes result in technological trajectories, because the community of engineers searches in the same direction"

Geels, 2004

Example: Studying future mobility pathways

- the role of user imaginaries in relation to electric cars - how these imaginaries influence the Norwegian transition strategies

  "how people imagine energy technologies and their futures is a critical social facet of energy transitions" (Sovacool and Brossmann, 2010; Sovacool and Ramana, 2014)

- move beyond a focus on the pure technical potential or cost-benefits, but focus on:

(1) the way stakeholders actively construct or imagine 'the public' or electric car users;

(2) how these constructions influence the way strategies and policies are formulated to promote the future of electric mobility in Norway.

Expectations, visions and user imaginaries have policy implications

Table 2
Schematic view of user imaginaries, characteristic use, main traits and accompanying governance strategies.

Users imaginaries	Characteristic area of use	User traits and priorities	Strategy
Early	Two car households EV as second car City use	Environmentalists Idealists Accept 'teething problems'	Unimportant
Current users	Two car households EV as second car	Range anxiety Car safety increasingly important	Strong and predictable Economic and regulatory incentives
	City use	Environment less important	Technology development
	Commuters		Infrastructure investments
Future users	More and more areas of use as car technology is developed	Economy important	Technological development
		Environment not important	Continued economic incentives
		Decreasing range anxiety	Incentives adjusted as technology gets more mature
'Self-propelled' mass market	EV used as any IC car	Diverse user groups No specific traits	No incentives needed

→ Transition pathways

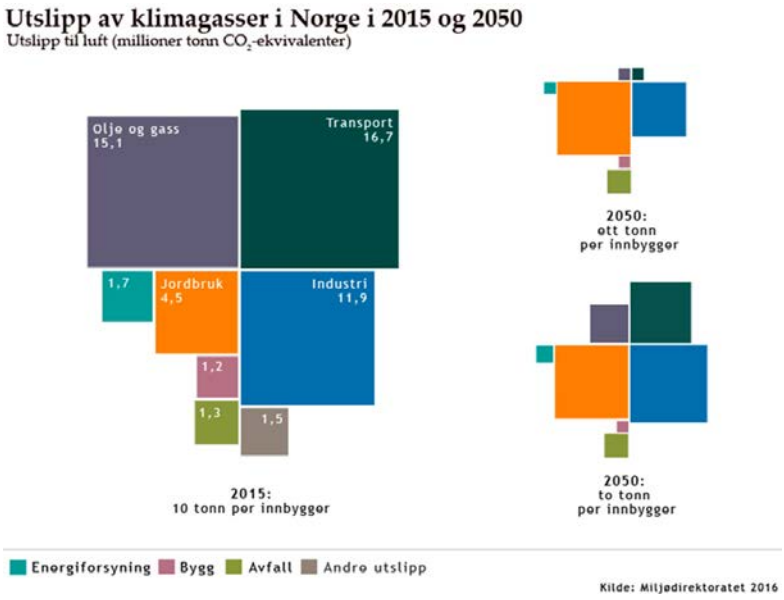
Norwegian policy: Technology substitution or transformation of the transport system?

- **individual car use** the dominant mode of transportation in the future
- deployment of technology relying on **techno-economic incentives** (overlooking possibilities to transform practices by other means).
- a pathway in which alternative fuel vehicles are simply another car in a sustained social context, like a **technical substitution process**'

The social aspects of incumbents in transition

- Large solar power installations many places
- Wind farm in West-norway
- Large funds for employees interested in environmental retrofits etc
- Electric trucks
- Electrolysis and hydrogen production
- Developping heavy duty hydrogen trucks
- WHY?

Why?



- Future expectations
  - Climate threat
  - Imagined future society
  - Hydrogen economy
  - Strict rules for procurement
  - Increased value of environmental action
  - Innovation
- Networks and trust enabling and supporting transformation
  - Owners with long-term perspective (50+ years)
  - Scientific collaborators (Sintef important)
  - Public support systems (e.g. Enova)
  - Trusting relatinship industry collaborators (e.g Scania)

Key research challenges from our perspective

- How to promote social acceptance (of climate change and related solutions) amongst incumbent actors
- How can we build societal and business support for incumbents and newcomers across sectors who have accepted the climate change challenge?
- What is needed to phase out existing systems?
- How can we stimulate socially and environmentally responsible research and innovation (RRI) processes across industry and academia?
- How to promote diverse modes of public participation and citizenship in transition processes?

Take home point

- Human/social factor = not only end user «accptance»
- «The social» is distributed accross the energy system, embedded in different regimes
- Deep de-carbonization requires cultural, practical and technological innovation amongst
  - End users
  - Policy makers/regulators
  - Researchers/Scientists/Technology developers
  - Incumbents
  - Start-ups

«Knowledge and engagement for sustainable energy transition»

Thank you for your attention!

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