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University of Sussex
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Centre on Innovation and Energy Demand

Nordic Vehicle-to-Grid Systems from a Sociotechnical Perspective

Invited Presentation to the TRB Annual Meeting Workshop "Visions of grid-connected vehicles: What is the goal and how do we get there?," Washington, DC, January 8, 2017

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- Sociotechnical thinking
- Summary of Nordic V2G project

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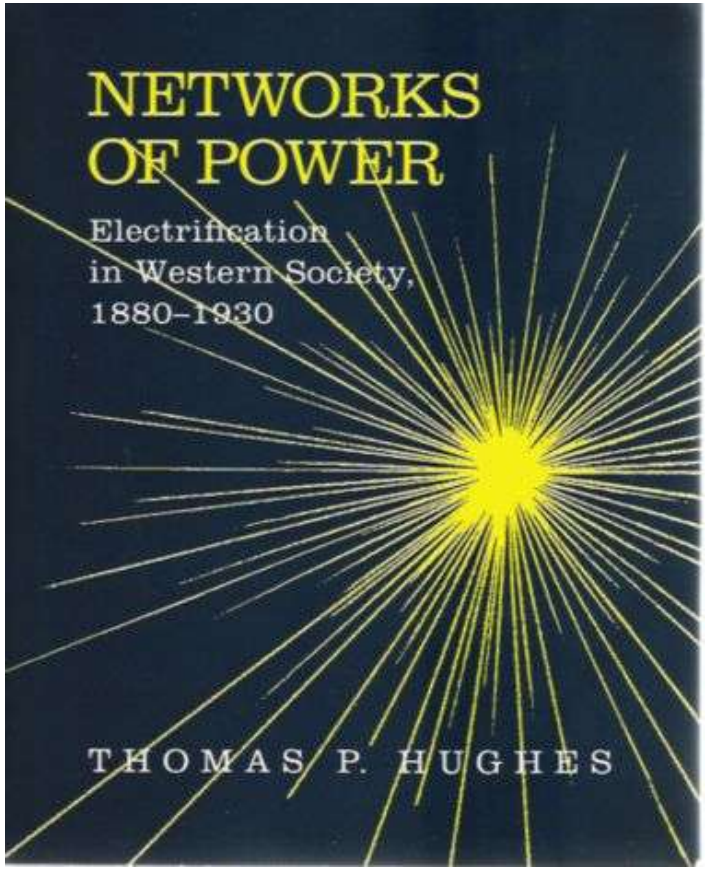
Sociotechnical systems thinking

- One of three key tools emerging from the historiography and sociology of technology
- Looks at social considerations, defining technological systems differently:
  - o System = seamless web of economic, educational, legal, administrative, and technical elements
  - o Momentum = mass, velocity, and direction



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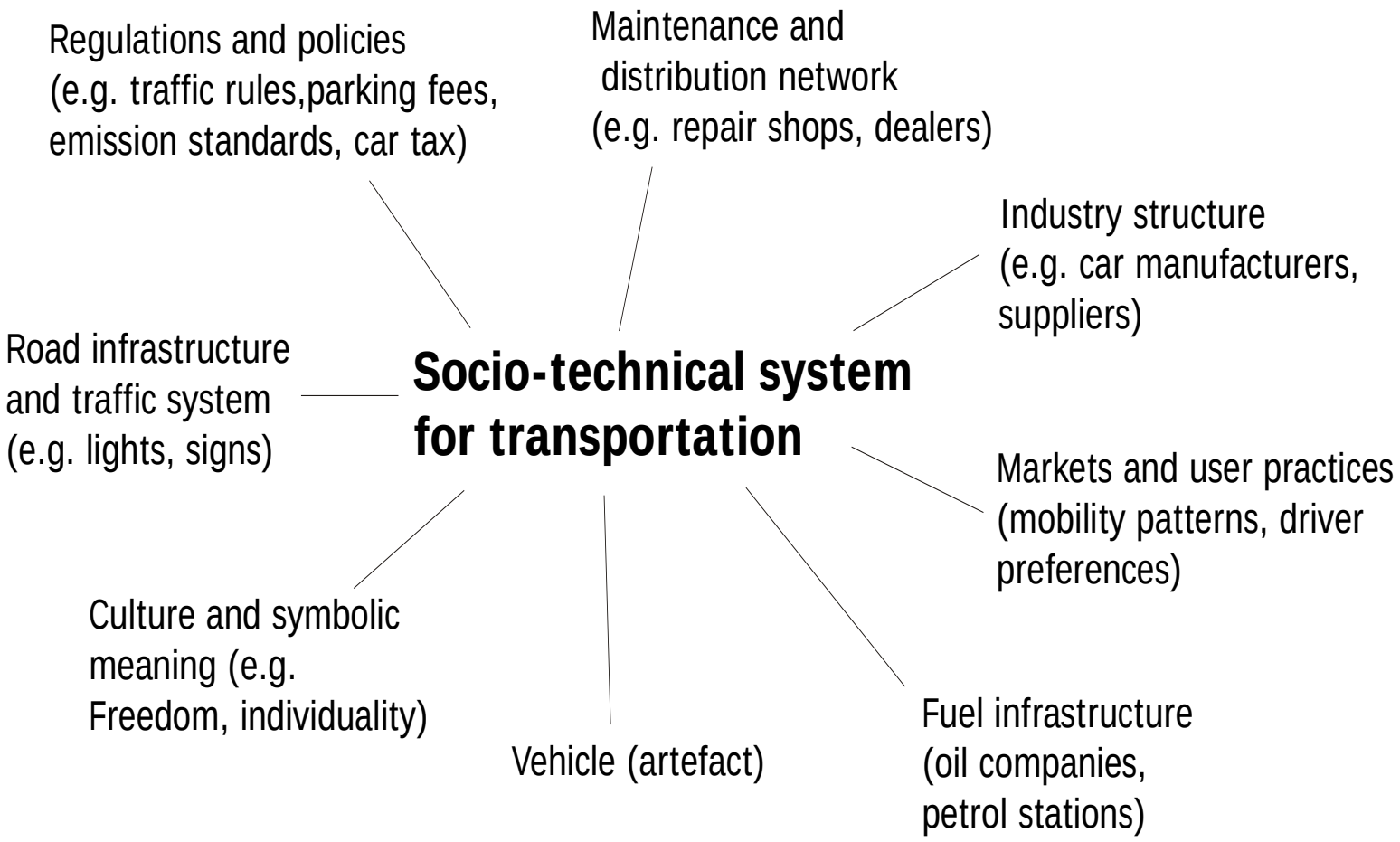
Sociotechnical systems thinking



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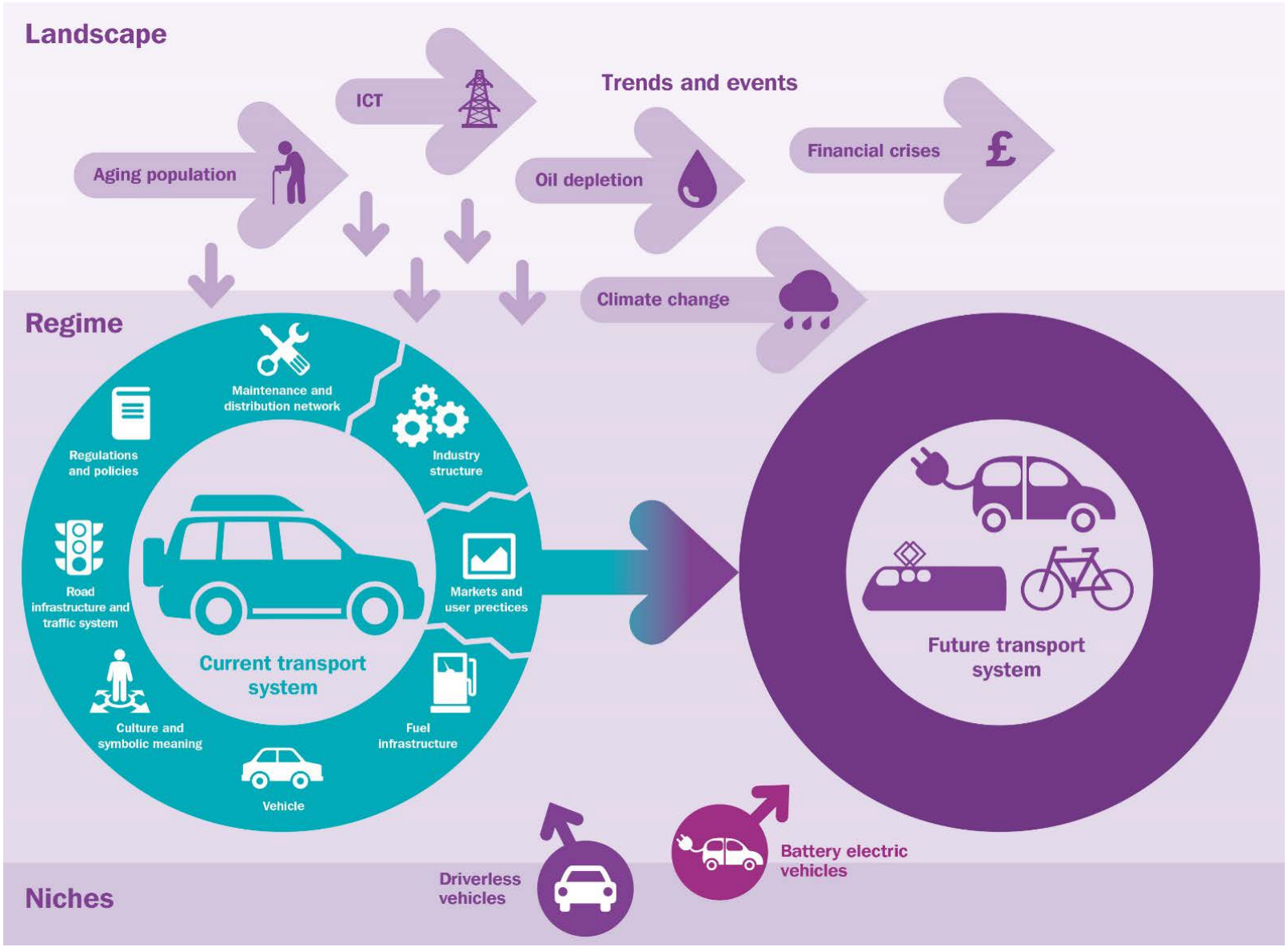
Sociotechnical systems thinking



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Implications (for research and policy)

- **Contingency:** technologies are the product of negotiation and compromise. Decisions are not inevitable; change the social conditions, change the technology (sometimes called "soft determinism.")
- **Social and political ordering:** energy technologies order the political and social world. Put another way, values get built "into" the system.
- **Invisibility**: people become enfolded into socio-technical networks.
- **Failure:** contests over technical feasibility can also be about social interests and values. Technologies can succeed technically, but fail socially
- **Classification**: barriers will fall into diverse dimensions cutting across technology, economics, politics, behavior, and aesthetics

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Summary of V2G Project


ICELAND
FINLAND
NORWAY
SWEDEN
DENMARK

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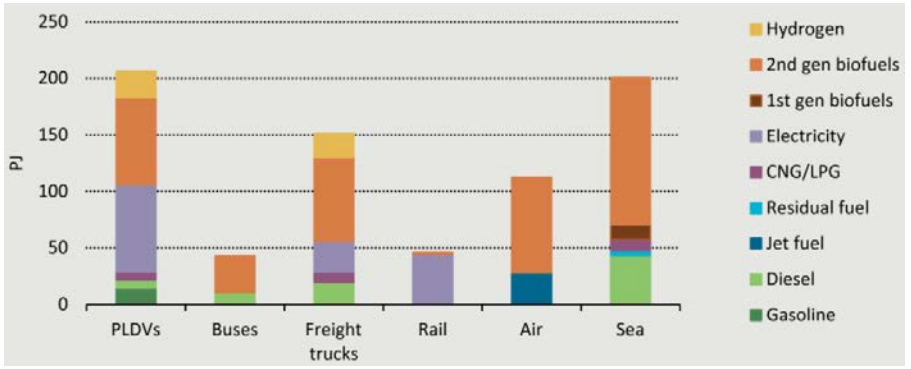
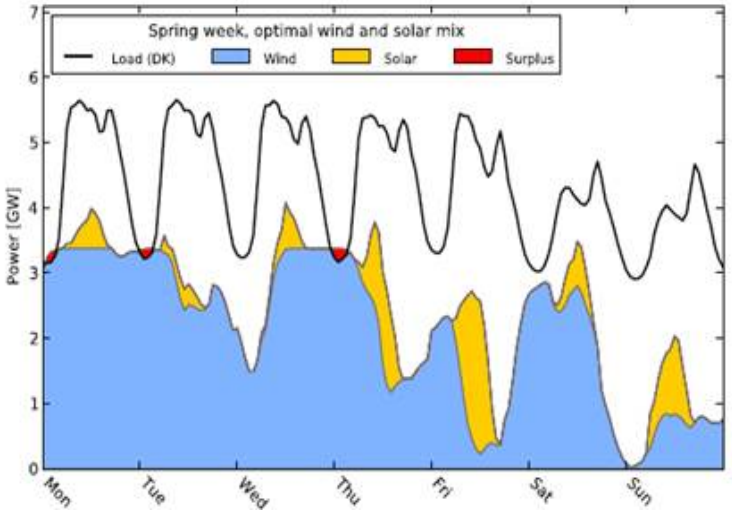
Background and context

Global premature deaths from vehicle exhaust $PM_{2.5}$

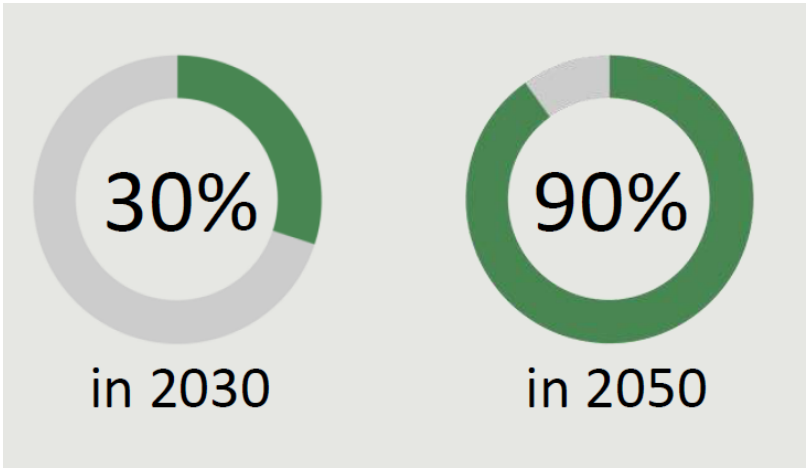
2050 Nordic energy use in transport



Wind and solar energy flows in DK



EV share of total Nordic (passenger) car sales



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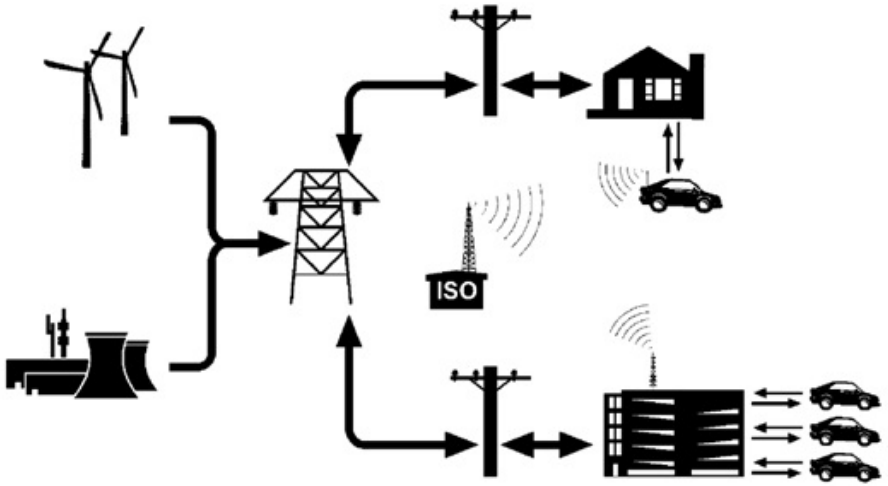
Nordic Vehicle-to-Grid (NV2G) Project

Question: What are the societal and business benefits, barriers, and policies for a vehicle-to-grid (V2G) transition in the Nordic region?

- *Most vehicles are not in use 90% of the time*
- *The equivalent capacity of automobile batteries surpasses that of the grid in all Nordic countries*
- *Electricity is much cheaper than liquid fuel per km driven*
- *Recharging at night wouldn't need significant new power plant infrastructure*

A V2G configuration means that personal Electric Vehicles (EVs) have the opportunity to become mobile, self-contained resources interconnected to homes and power grids



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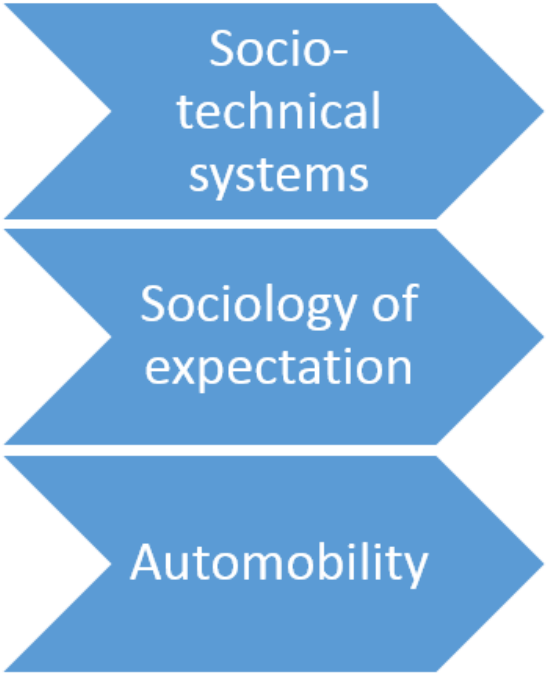
Working packages (WPs)

WP1: Assessing costs and benefits	WP2: Identifying barriers	WP3: Accelerating use with policies
• Cost-effectiveness analysis • Marginal abatement curves	• Field research • Surveys • Interviews • Focus groups	• Policy analysis and scenarios • Literature review • Interviews



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Contributions

- Electricity, transport, and homes are usually treated as separate research topics > e.g. “prosuming” or “e-mobility”
- Most research on V2G has been technical (Nikola Project) > this project investigates the social dimensions
- Preliminary inductive work on attitudes (survey) and ridesharing (focus groups, interviews) in DK > limited in scope, self-funded, non-comparative
- Preliminary findings need “tested” with DK results, mixed methods improves triangulation

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Very rough schedule

- Phase 1: Literature Review and Fundamentals (early 2016)
- Phase 2: Research Design (summer of 2016)
- Phase 3: Field Research (end of 2016 to mid-2017)
- Phase 4: Data processing and article drafting (end 2017 to early 2018)
- Phase 5: Books, Outreach and Closure (rest of 2018)

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Very rough schedule

- Phase 3: Field Research (end of 2016 to mid-2017)
  - A survey with choice experiments: http://tinyurl.com/NordicCarSurvey
  - Interviews with experts
  - Focus groups with users
  - Dealer shadowing/simulating
  - Field observation of charging etiquette

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Outputs so far

Session: 564, Current Issues in Alternative Transportation Fuels and Technologies
Session Location: Hall E / Convention Center
Session Time: Tuesday, Jan 10, 2017 10:15AM 12:00PM
Paper: 17-00760 - Selectivity, Conformity, and Fragmentation in Vehicle-to-Grid Electric Mobility: Navigating the Sociotechnical Acceptance of ISO 15118
Poster board Location Code: B139

Session: 563, Current Issues in Transportation Energy
Session Location: Hall E / Convention Center
Session Time: Tuesday, Jan 10, 2017 10:15AM 12:00PM
Paper: 17-00761 - Case Study of Electric Bicycles in Nanjing, China: Sustainable Transport Consumption Behavior and Sociotechnical Transitions
Poster board Location Code: B138

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Outputs so far

Transportation Research Part A 78 (2015) 113–123

Contents lists available at ScienceDirect

Transportation Research Part A

journal homepage: www.elsevier.com/locate/tra

Of "white crows" and "cash savers:" A qualitative study of travel behavior and perceptions of ridesharing in Denmark

Jesper Riber Nielsen [a], Harald Hovmøller [a], Pascale-L. Blyth [b], Benjamin K. Sovacool [a,c,*]

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Outputs so far

Energy Policy 94 (2016) 377–386

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Why Did Better Place Fail?: Range anxiety, interpretive flexibility, and electric vehicle promotion in Denmark and Israel

Lance Noel [a,*], Benjamin K. Sovacool [a,b]

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[b] Professor of Energy Policy, Science Policy Research Unit (SPRU), School of Business, Management, and Economics, University of Sussex, United Kingdom

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Outputs so far

nature climate change

PERSPECTIVE

PUBLISHED ONLINE: 9 MAY 2016 | DOI: 10.1038/NCLIMATE3027

Towards a science of climate and energy choices

Paul C. Stern[1,2], Benjamin K. Sovacool[3,4*] and Thomas Dietz[5]

The linked problems of energy sustainability and climate change are among the most complex and daunting facing humanity at the start of the twenty-first century. This joint *Nature Energy* and *Nature Climate Change* Collection illustrates how understanding and addressing these problems will require an integrated science of coupled human and natural systems; including technological systems, but also extending well beyond the domain of engineering or even economics. It demonstrates the value of replacing the stylized assumptions about human behaviour that are common in policy analysis, with ones based on data-driven science. We draw from and engage articles in the Collection to identify key contributions to understanding non-technological factors connecting economic activity and greenhouse gas emissions, describe a multi-dimensional space of human action on climate and energy issues, and illustrate key themes, dimensions and contributions towards fundamental understanding and informed decision making.

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Outputs so far

Energy Policy xxx (2016) xxx-xxx

Contents lists available at ScienceDirect

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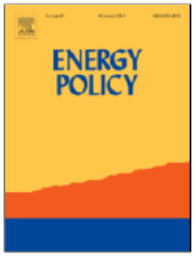

Contestation, contingency, and justice in the Nordic low-carbon energy transition

Benjamin K. Sovacool [a, b, *]