How to Integrate Social Science into Energy Scenario Modelling?

Integrated Approaches by IEK-STE

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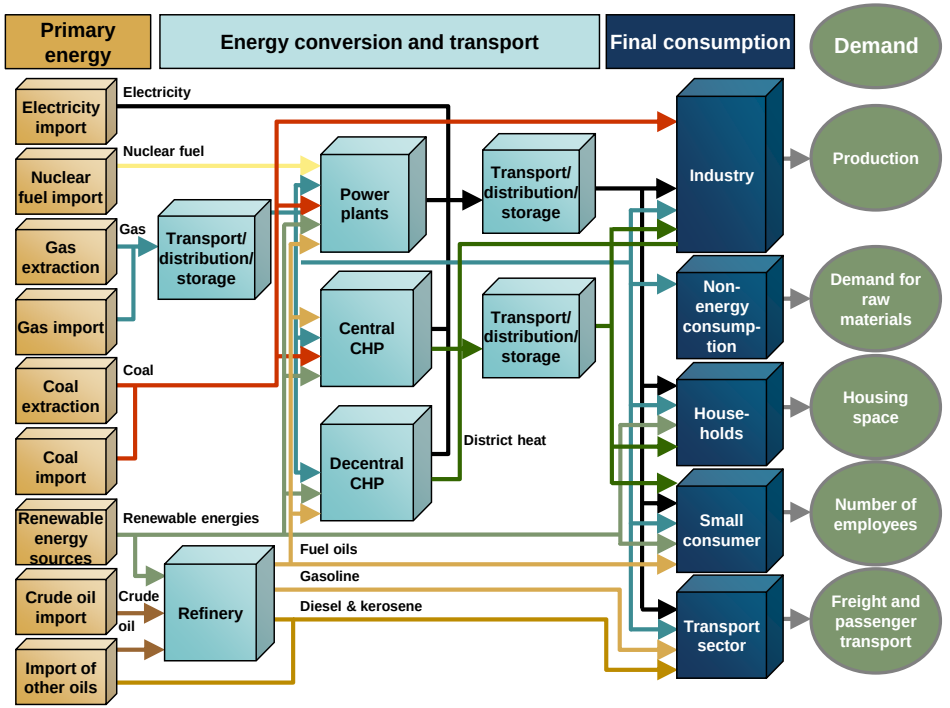
Aim of Energy Scenario Modelling

- Describes a possible future development (or a future state) of the energy system
- It is not a prognosis
- Tool in order to develop energy strategies and policies to change towards a sustainable energy system
- Results in policy implications and recommendations

Traditional Energy Scenario Modelling

- Mathematical model
- Description of essential system properties:
  - Technology efficiency
  - Installation and operating costs
  - Responding CO_2 emissions



Characteristics of Transformation Processes towards a low Carbon Society

- Nonlinear open-ended change process
- Goes beyond changes in the medium term
- Depends on basic innovations
- Radical innovations that affect large parts of the economy and of society
- Includes social, cultural and political processes of change
- Consequence of interlinked dynamics occurring at different time scales

Based on Leggewie and Messner (2012)

Scenario development within IEK-STE

Phase-out of Coal-Fired Power Plants in Germany **Approach**

1. Step: Scenario Framework Setting
2. Step: Data collection and modelling
    - Annual representative survey of the German public
    - Mathematical Models: Input-Output Analysis and IKARUS
3. Step: Analyze different time scales to phase-out of coal
4. Step: Integration of findings

Heinrichs, H. U., et al. (forthcoming).

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Phase-out of Coal-Fired Power Plants in Germany
Integration of acceptance

- Improved Context Scenarios:
  - A business as usual scenario: in 2050 still 12.5 GW
  - An early phase-out scenario: phase-out in 2038
  - A fast phase-out scenario: phase-out in 2020

- Findings:
  - **Survey findings:** 50% in favour of a coal phase-out by 2020 and 91.2% for a phase-out by 2050
  - **Technical Model:** Fast phase-out scenario exceeds realistic limits of extension rate of gas-fired power plants: The capacity of plant manufacturers as well as the time needed to build a power plant would not permit such an expansion rate in Germany in the next few years.

Heinrichs, H. U., et al. (forthcoming).


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Current Research

Goal: Improvement of context scenarios

Workshop in March 2016 with 28 experts in the field of energy:

- Identification of ‘Storylines’
- Identification of ‘Main Drivers’

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Findings March Workshop

Storylines:

- Trailblazer Germany
- Resilient World
- Sufficient World
- Efficient World
- EU / Global Integration

Main Drivers:

- Raw materials
  (declining in all storylines)
- Climate Change
  (increasing in all storylines)
- Interconnectedness
- Governance
- Economic System
- Social System
- Population growth

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Further Steps

Two Draft Scenarios

1. *Energy policy only on EU level*
2. *Nation state centred energy policy*

Next Steps:

- Modelling
- Derivation of policy recommendations together with experts

Obstacles and Chances of Integrated Energy Scenario Modelling

Integration of social science knowledge by applying participatory methods

- Depended on participating stakeholders, experts
  → Bias?!
- Conversion of qualitative data into numeric input data for model?

- Greater transparency
- Very precise scenario framework development
- Reality check
- Broader range of possible pathways

Literature

Heinrichs, H. U., et al. (forthcoming). "Integrated assessment of a phase-out of coal-fired power plants in Germany."

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Thank you!

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