TOWARDS ACTOR-BASED NEO-CARBON SCENARIOS

Tiina Koljonen, Lassi Similä & Juha Forsström, VTT

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Actor analysis – actions in the end of the FP 1

- Discussions with WP3 to utilize the techno-economic business case findings
- Agent-based modeling studied as a potential quantitative approach (Juha Forsström)
- Reporting of the whole FP 1 work (Neo-Carbon Working paper 2/2016, draft available in extranet)

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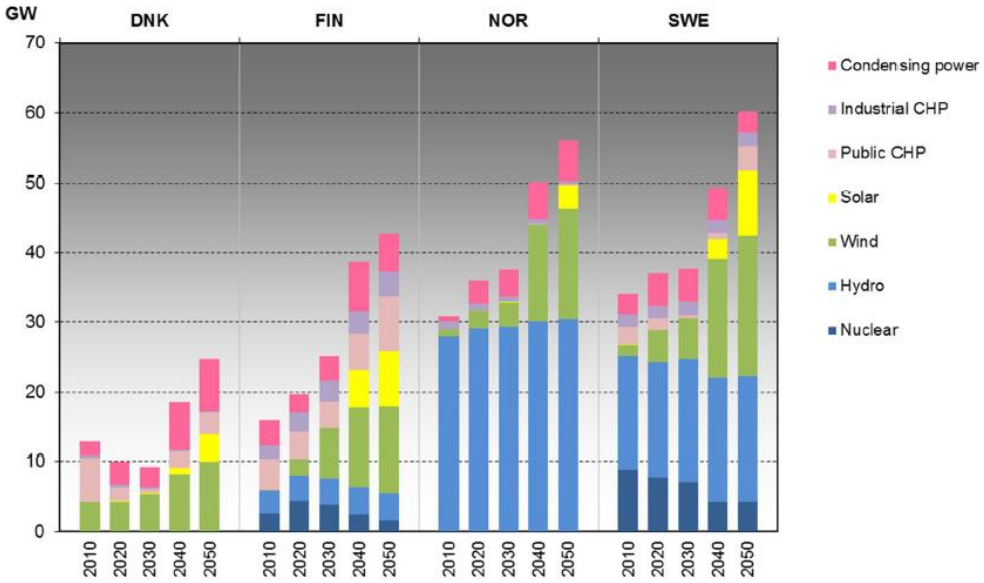
Viewpoint: turning the focus in question “who?”

What can change?



Who could change?

Authorities
- EU, global org.
- National
- Local administration

Consumers
- ”DIY”
- Freelancers
- Engineers

Research
- A
- B

Organisations, NGOS
- A
- B

Businesses
- Small-scale
- Startups
- Large, giant companies

Utilities
- A
- B

Media
- A
- B

1. Physical objects:
- Input from WP2, WP3

2. Societal structures
- Actor analysis, WP1

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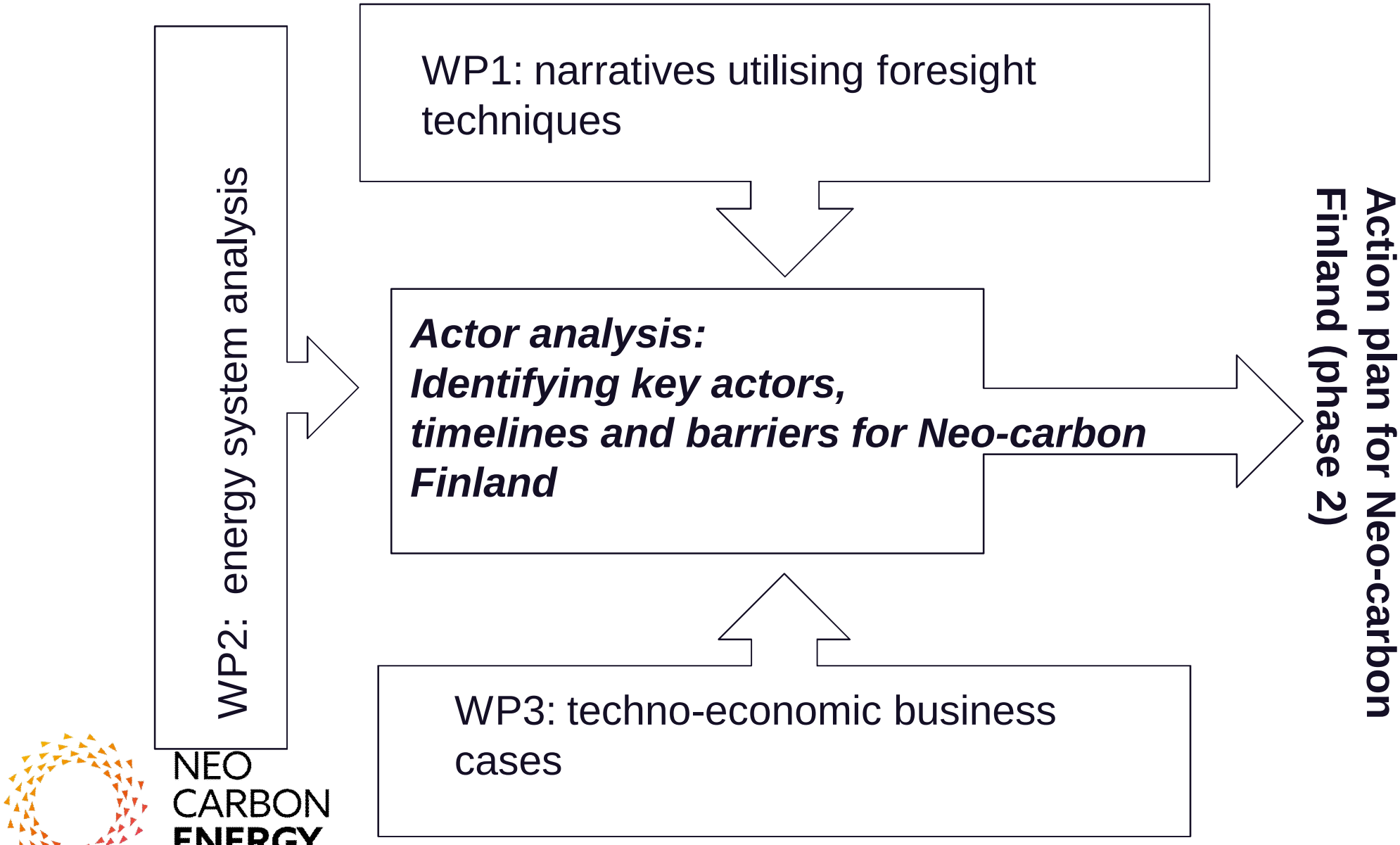
NeoCarbon actor framework



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NCE actor analysis: specialities

- A large part of the system/technologies not yet commercially exist to large scale
- In the future, there may be actors & roles significantly different that those of today's.

➢ "Textbook methods" - often based on interviews, surveys or workshops where key actors participate - cannot be applied as such

- NCE: a large variety of scenarios and other results available produced with different methods

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What is the end result of the efforts?

- **What needs to be done and when and by whom?**
- **Systematic methodologies for actor analysis and their application Neo-Carbon project to enhance and make the project results more utilizable**.

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Key actor archetypes identified in discussions with WP3

- Big, established companies actively keeping the same market in an environment of holistic system change (e.g. moving away from fossil fuels).
- Startups, ”better product” as a driver. Young, agile companies. Example: renewable wind and solar fields and associated P2G tech.
- Industrial passive adapters – the primary product being elsewhere.
- Do-It-Yourself. For example, small-scale inventors with a passion on technology, demonstrations, and new gadgets. Single-house owners in central role; the role of slow adapters/ forerunners.

- The collaboration with WP3 is planned to continue in FP2

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Towards quantification: agent-based modeling

- Agent: autonomous decision-making entity
- Limited knowledge about the future
- The agent can make a short-term plan based on its knowledge about the past and expectations about the future
- How to use the approach for the NCE scenarios?

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Tieju Ma,
Yoshiteru Nakamoric, Energy 34 (2009)

Agent-based modeling approaches (ABM): examples of characteristics captured in quantitative modeling

- **Individual agents**
  - Heterogeneity of individual
  - Decision rules
- **Social interaction**
  - Levels of social influence
  - (Social) network issues
- Suitable examples of applications in innovation diffusion

- In the two respects above, ABM tackles the identified shortcomings of aggregate top-down approaches (Bass (1969), Rogers (1962)).

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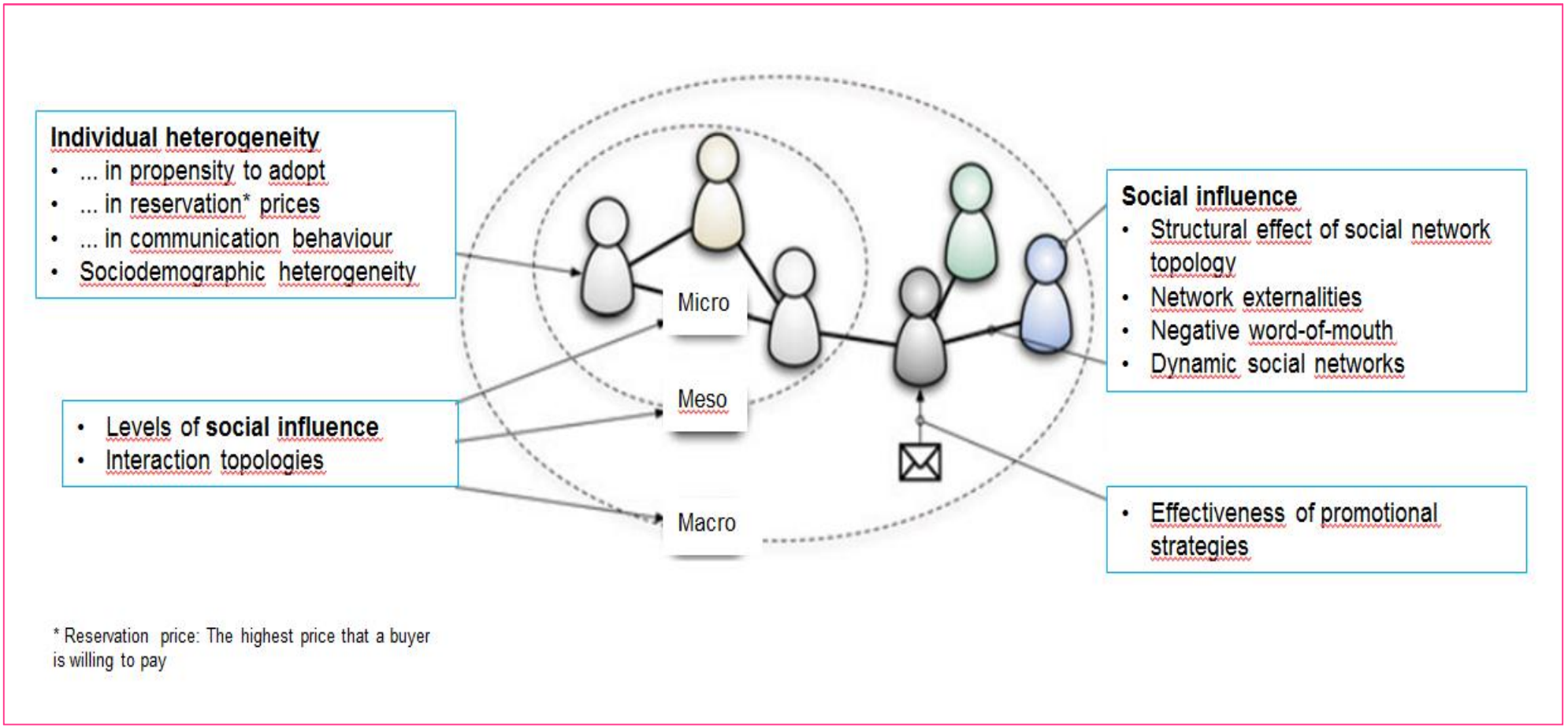
Key elements of an agent-based innovation diffusion model



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Source: modified by the author from Kiesling et al. (2012).

Case study of PV penetration

- Agent-based method applied in a case of penetration of small-scale PV panels in districts with a high number of stakeholders and decision-makers
- A topic closely linked to the scope of the Neo-Carbon project
- Goal: a household-level agent-based model
  - Able to generate empirically observed temporal and spatial patterns of the adoption of residential solar at the city scale (an area in USA until 2013)
- Modelling of the economic, attitudinal, and social network attributes.
- Theory of Planned Behavior (TPB) (Ajzen 1991) as a key building block.
  - Simple payback as a financial metric. Financial resources and physical features of the house affect on individual agents' investment decision
  - Social network: majority of their connections are geographic and economic neighbours
  - The attitude module: attitude (sia) and uncertainty about the attitude (U)

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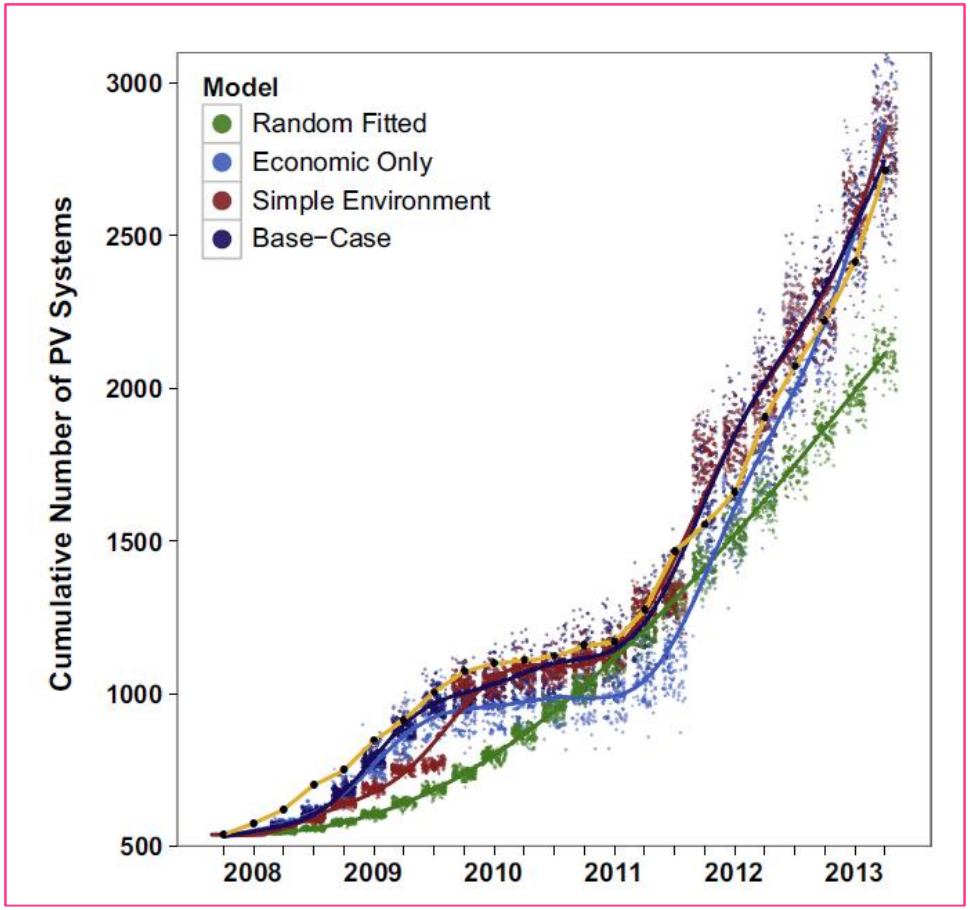
Results



- Home value, the tree cover, and insolation are good predictors of the solar installation decision.
- A simple economic model is likely adequate *if the goal is to predict adoption levels over time*.

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(Rai & Robinson 2015)

Conclusions on agent-based models based on example

- Computationally heavy and greedy
- Can be defined with easy-to-understand concepts
- Decision-making logic of the agents can at best be constructed so that they resemble those of everyday life
- NCE implications: case with a high number of stakeholders and decision-makers such as modelling of penetration of small-scale PV panels in districts
- The characteristic is strongly present in the Green DIY engineers scenario.

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Next steps

- *Social network approach*, and *Governance model approach and/or policy and change approach* applied in NCE context
- How?
  - WP3 interaction: deepening the understanding of actors through findings of techno-economic business cases
  - WP2 results: timelines, potential of technologies
- Roadmap, action plan
- Agent-based modeling efforts (?)

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