



Design for Sustainability and Project Management Literature – A Review

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transition. People's actual everyday behaviour with regard to resource- and energy-use often deviates from their attitudes concerning environmental and climate protection as well as energy consumption (attitude-behaviour-gap). Above that, potential for saving energy by means of technological innovations might remain unutilised or may even be reversed through the same mechanism.

In this presentation we will focus on the relevance, analyses, and first results of metaphors in the context of the „German Energiewende“. Which metaphors are used? Why do certain actors use typical metaphors? What is the implication for the whole process?

K4 Paper Session: Energy Transitions (Room K7)

Chair: Kamilla Karhunmaa

Political ecology as perspective in analyses of crises in sustainable transition: on-shore wind power in a front runner country. *Michael Soegaard Joergensen, Kristian Borch, Sophie Nyborg, Laura Tolnov Clausen*

This paper investigates the societal implications of Sustainable Energy Action Plans (SEAP) at the local community level on the environmental, social and economic dimensions of sustainability. SEAP is based on the Covenant of Mayors that is the mainstream European movement involving local and regional authorities, voluntarily committing to increasing energy efficiency and use of renewable energy sources on their territories. By their commitment, Covenant signatories aim to meet and exceed the European Union 20% CO2 reduction objective by 2020. However, the local governments have trouble in managing this crucial goal because they have to combine it with the improvement of quality of life, wellbeing and local economic development. Moreover, the complexity of political strategies are increased by specific budget requirements, considering in particular the presence of different budget constraints at the local level (e.g. internal stability agreement) and the reduction of the budget available due to the economic crisis. For this reason there is a need to develop tools able to assess the effects of environmental and energy policies on the socioeconomic system and to assist policymakers in identifying the most effective choices.

Dynamics of scientific knowledge production and technology diffusion: Insights from the emergence of wind energy. *Cristina Sousa, Nuno Bento, Margarida Fontes*

Addressing climate change requires the widespread dissemination of new low carbon technologies. This paper aims at understanding the role of science-based learning (through R&D) and experience-based learning (through technology demonstration and deployment) in the emergence of new energy technologies, in different contextual settings. It addresses the case of wind energy, tracing scientific knowledge production (measured through scientific publication) and assessing how it articulates with technology diffusion (measured as growth of unit scale of turbines and total installed capacity) over time. The analysis looks at similarities and differences in the evolving patterns in initial (Denmark) and follower (Portugal) markets. Results reveal different patterns between countries: publication

grows following the increase in capacity installation in the pioneer, whereas they co-evolve in the case of the follower. The findings provide valuable insights for the definition of science and technology policies aiming to accelerate energy innovation and its spatial diffusion.

The societal implications of Sustainable Energy Action Plans (SEAP).

Giovanni Bernardo

The aim of this project is to frame the potential impact of SEAP at the local community level. We apply a System Dynamics model in the case of Cascina Municipality as one of the decision making tool in energy planning policies with specific considerations on CO2 emission reductions and local development. To build and calibrate this model, we used a two steps approach involving participatory planning and data analysis. The modeling approach permits to decompose a complex social or behavioral system into its constituent components and then integrate them into a holistic model - i.e labor market and a simplified representation of the local economy, transport system, housing. Thus, we present different scenarios showing the potential implication of local energy policies in term of transportation, environmental and economic indicators.

Ground-source heat in Finland: success by stealth. *Ville Lauttamäki*

Heat pumps that produce space heating by utilising energy stored in the earth's crust have gradually become more common in Finland. Currently in new detached houses the share of buildings using ground source heat (or shallow geothermal heat) is roughly 50% (Motiva 2014). Along with detached houses the interest for using ground source heat pumps (GSHPs) is also growing in larger buildings such as apartment buildings, offices and industrial facilities. This form of energy is considered renewable and is available practically everywhere in Finland.

Main purpose of this paper is to trace factors contributing to the development of the use of GSHP systems in Finland from times of the energy crises in the 1970's until the present day. Particular interest is devoted to two time periods: turn of the 1970's and 1980's and the first decade of the 21st century. First period covers the initial introduction of GSHPs to Finnish market and the boom-and-bust cycle that followed the energy crisis. Second studied period covers a new boom in GSHP installations. Paper will, in a concise form, present the most important factors and transformation processes that contributed to development of ground-source heat systems.

K5 Paper Session: Geography of Transitions (Room K4)

Chair: Peter Agoston

Aligning innovation policy with the spatial nature of socioeconomic benefits: An analysis of the tidal kite technology innovation system from a Swedish policy perspective.

Johnn Andersson, Hans Hellsmark, Björn Sandén

Since public support to the development and diffusion of renewable energy technology is usually motivated by the possibility of creating global environmental benefits