Dr Antje Klitkou, leader of the TOP-NEST project, discusses the work that is going into Nordic sustainable transport and energy

Nordic pathways

TOP-NEST is a research project, funded by Nordic Energy Research, with participants from Norway, Sweden, Demark and Finland. The project looks closely at how these countries have approached the challenges of the transition from fossil fuels to renewable energy in the past, and then suggests viable future pathways. While this might not sound particularly revolutionary (after all, many countries have been attempting this for years), the project does not study energy in isolation, but links the challenges of moving to clean energy specifically to road transport.

Several energy technology platforms (biofuels, hydrogen and electricity) are closely examined in order to try and determine potential dependencies and long-term perspectives. The project thus applies a range of methods and theoretical perspectives to help make sense of an otherwise chaotic mesh of interdependencies. The approach is to look backwards at what has been done in order to identify strengths and weaknesses, before looking forward at potential ways of achieving key goals. In this way, past experiences can provide insights about prior successes and failures, and feed into the on-going learning process.

Paths from the past

The project examines both energy and transport policy from around 2000 to the present day in the four countries mentioned above. In order to link this analysis closely to the selected technologies, it is organised in three parts, each covering a different energy technology platform: liquid or gaseous biofuels; hydrogen; and electricity. In the first year, TOP-NEST focused on biofuels. Policy aims were considered and compared and the various initiatives were reviewed.

So far, the analysis suggests that the historical roots of each country have influenced existing policy to a very great degree. All four countries have set targets for increased use of biofuels, and all have allocated funding for research activities involving both academic institutions and industrial partners, and most have examples of pilot projects involving fleets of public vehicles, or small scale regional projects to develop and refine techniques for making biofuels from forest waste, farm waste or food waste.

However, there are important national differences in the selection of feedstock, technology and scale. Different instruments have been prioritised, such as emphasis on public purchasing to stimulate technological development or initiatives to stimulate business. The on-going analysis also suggests that the existing industrial structure of the countries has influenced their policy decisions and that other overarching policies unrelated to energy are influencing the directions taken.

Case studies combining value chain and technological innovation system analysis have been carried out and preliminary analysis suggests that a variety of different types of firms are involved in producing biofuels: established energy companies and chemical companies such as Neste, Statoil, Dong Energy and Borregaard, as well as many newly established companies which are spin-offs from research.

Some of the firms are concentrating on developing technology to sell to others, while some are concentrating on the production of biofuels for commercial use. The raw materials being used to produce biofuels are sustainable and include forest waste, straw, food waste and municipal waste. All the cases investigated had received some public funding in terms of research grants or the funding of pilot or demonstration plants. The technologies being developed have not become standardised; some are specific to the raw materials being used and some technologies have already undergone several rounds of development in order to improve efficiency and streamline production.

Paths to the future

In the next phase of the research project, value-chain analysis will be combined with 'future wheel scenario' methods, to explore potential energy and road transport futures. The analysis asks what Nordic societies will look like in 2050. Population structure and growth, economic development, community structure, values and attitudes and, of course, future transport systems will be considered.

The analysis will then look at prospective technology platforms and what knowledge, funding, materials, service providers, political environment etc. are necessary in order for them to develop further. These prospective value chains will then be developed and discussed with stakeholders. By including the value-chain analysis, the project aims to reveal key relationships which can influence success or failure of new technologies, such as the impact of platinum prices on hydrogen vehicle technology, or public attitudes to personal vehicle ownership.

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