Key Takeaways for Plenary 3: Socio and economic impacts of the transition

Session overview

Moderator: Pao-Yu Oei (PO)

Welcome and introduction to the session

Presentation of results from registration-questionnaire, Diana Süsser (DS), IASS Potsdam

- **Tackling social drivers and constraints of the energy transition in energy modelling**, Diana Süsser (DS), IASS Potsdam
- **Socio-economic and competitiveness impacts of EU Green deal and climate neutrality**, Leonidas Paroussos (LP), E3Modelling
- **Regional impacts of electricity system transition in Central Europe until 2035**, Jan-Phlipp Sasse (JS), UNIGE
- **Addressing issues of inequality**, Johannes Emmerling (JE), CMCC

Plenary 3 was jointly hosted by the openENTRANCE, SENTINEL, NAVIGATE and CINTRAN H2020 projects that feature some of the leading European researchers in the field of energy systems and macro-economic modelling and assessment. The change of energy systems and technologies will have profound economic and social impacts in the EU member states, especially for regions that are carbon-intensive or that are rich in renewable energy sources. This includes distributional implications for GDP, industrial trade and competitiveness, structural changes (i.e. away from fossil fuel and energy-intensive industries towards renewable energy), changes in employment and labour skills, or in general financial requirements and welfare distribution. Reaching a political consensus for a joint European strategy for a European Green Deal is therefore conditional upon the idea of leaving no one behind. Understanding the challenges of a "just transition" is needed to examine how far incorporation into existing models is possible and needed. The aim of this session is to create a more politically relevant analysis of distributional impacts of various energy transition pathways to allow for higher societal and political acceptance (at the cost of in some cases slightly higher technological costs) while minimising the negative impacts on most vulnerable regions (i.e. coal regions), income classes, and trade-exposed industries.

PO: *The EU parliament just voted for a 60% GHG reduction target by 2030, so the session becomes increasingly important in the context of ambitious EU climate targets*

Presentation of results from the questionnaire, Diana Süsser, IASS Potsdam

DS briefly presented the results from the questionnaire on the important of socio-economic analysis in mitigation pathway. Forty replies are received, both from modelers and non-modelers.

Key takeaways

- Social and economic impacts are not sufficiently integrated in energy models, which should be expanded and improved to capture the socio-economic impacts of the transition.
- Distributional aspects, social costs and external costs are the economic aspects that should be prioritized to be included in energy system models.
- Social acceptance of technologies, social barriers, consumer behavior and energy poverty are the social aspects that should be integrated in energy system models.
- Increasing demand from stakeholders to integrate macro-economic and social impacts in energy system modelling, but questions remain on how to integrate them properly.

Tackling social drivers and constraints of the energy transition in energy modelling, Diana Süsser, IASS Potsdam, SENTINEL project

DS stressed the important of capturing social drivers and constraints in energy transition modelling, as social acceptability matters a lot for energy transition as demonstrated by the Not In My BackYard effect in Germany. Social narratives should be properly integrated in the scenario specification. She then introduced the QTDIAN 'toolbox' of socio-political-technological modelling tools that capture different drivers and constraints to better understand their influence on the renewable energy development and energy transition. By integrating these non-technical factors, models will be able to provide more realistic, relevant and sustainable decision-advice. Regional preferences and public opposition matter a lot in the renewable energy uptake and decarbonization transition (e.g. wind onshore preferences in Germany), so these are included in QTDIAN approach. The integration of social factors and distributional impacts in models is essential to provide more realistic and relevant advice, but further research is required to better integrate social drivers and constraints in models, while availability of good data is essential.

Socio-economic and competitiveness impacts of EU Green deal and climate neutrality, Leonidas Paroussos, E3Modelling

LP presented a recent analysis using the leading multi-sectoral Computable General Equilibrium model GEM-E3-FIT exploring the socio-economic and competitiveness impacts of the EU Green Deal goals of 55% GHG emission reduction in 2030 and climate neutrality by mid-century. The model-based analysis shows that decarbonization is a capital-intensive process (transition from OPEX to CAPEX) and requires new infrastructure, labour skills and coordination of market players. Ambitious and predictable policies are required to incentivize investment by reducing risk premiums over time. The EU Green Deal targets would lead to a more investment-intensive EU economy, which remains services-oriented but construction and clean energy technologies become increasingly important. Changes in employment depend on the sector position in the decarbonization context, which also involves a transition towards more skilled labour. The impacts on industrial competitiveness are dynamic depending on cost changes with largest impacts for metals and chemicals, while key countries for relocation of industrial activities are Russia, China and India

Regional impacts of electricity system transition in Central Europe until 2035, Jan-Phlipp Sasse, UNIGE

JS presented the regional impact of electricity system transition focusing on Central Europe and showed that social acceptability matters a lot for the transition (e.g. reduced investment in wind farms in Germany due to NIMBY effect). Therefore, they integrate social narratives into the specifications of techno-economic scenarios, aiming to meet three goals: cost-efficiency, GHG reduction and minimum distributional impacts. Their model-based analysis showed that the maximum equality would have high cost impacts and thus cost-efficiency in the entire system increases regional inequality. There is a trade-off between mitigation costs, equality and uptake of renewable electricity. Compared to 2018, the Central European electricity targets for 2035 increase system costs by 12–22%, increase regional equality of system costs by 18–43%, but increase renewable electricity generation by 97–140% across scenarios. The Regional impacts on system costs, employment, greenhouse gas and particulate matter emissions, and land use are mostly driven by changes in generation capacity from solar PV, wind, nuclear, coal, and gas. The aims of improving cost-efficiency, regional equality, and renewable electricity uptake have different implementation pathways and are difficult to be reached simultaneously.

Addressing issues of inequality, Johannes Emmerling, CMCC

The presentation of JE focused on three topics emerging from the NAVIGATE analysis, i.e. distributional impacts of climate change, social impacts of climate policies and shifts in the economy in terms of labour. The topic is highly relevant to the Just Transition concept, but high level of spatial data is needed. They developed an inequality module capturing 10 income deciles in Brazil and France and showed that there are large negative distributional impacts of climate policies for low-income deciles with the Gini index increasing in Brazil demonstrating higher inequality as a result of climate policies. There is a relationship between inequality and climate, with inequality being statistically lower in low-temperature climates. In addition, climate change has huge detrimental impacts on inequality globally and in South Africa. Finally they quantify the direct energy-related jobs based on country-level data, split by main technology and show that the implementation of ambitious Paris goals would increase direct energy jobs, especially in wind and solar PV.

<u>Questions to EMP-E 2020 speakers during Plenary 3 "Socio-economic impacts of the transition"</u>

1) Do we need to understand better social-economic impacts of climate policies to model it?

DS: A lot is done already, but further methodological and modelling improvements are required to improve our understanding of the socio-economic impacts of energy transition.

LP: It is preferable to start with a solid and robust economic theory, consistent with the reality in order to model it, e.g. neo-classical vs neo-Keynesian model paradigms. In addition, rigorous evaluations of models and their behavior is critical to understand potential problems.

2) How do you define inequality?

JS: In our study, the focus is on Spatial inequality, e.g. how the economic impacts are distributed at NUTS-3 regions. Employment impacts are quantified based on indicators from scientific literature. For this analysis, good disaggregated data are required, and it is preferable to use open-source data to the extent possible.

3) How important are aspects that cannot be quantified (e.g. social acceptance)? Can we include these issues into models?

DS: The social acceptance aspects are critical for the design of effective policies and should be included in energy system models. However, modellers should not try to include everything and should be selective on which aspects should be modelled depending on the specific questions. DS suggests to use the social science to reflect these dimensions in energy models. The Agent-Based Models have already incorporates social aspects and thus can be used for learning purposes by energy system modellers.

4) How lock-in effects are accounted?

LP: Generally, it has proved difficult to properly model structural and disruptive change, as energy-economy models use a lot of historical data and are difficult to change parameterization to account for disruptive changes. Energy-economy Models have to identify the drivers for disruptive change (e.g. low-carbon innovation, digitization), but these are difficult to quantitatively capture.

5) Do you expect that returns to capital increase in a decarbonisation context ?

LP: In the general equilibrium modelling framework, the reallocation of investment induced by decarbonization would pose a stress in the capital market (increasing the returns to capital) in the short term. However, in the longer term, these impacts will be smoothed, as the economy would transition towards its steady-state level.

6) How do you model job creation by technology?

JE: Their analysis focuses only on direct job requirements for the different stages of energy and power generation technologies (e.g. manufacturing, installation, operation and maintenance)

7) Should the models capture Wellbeing instead of GDP?

JE: It is important to look beyond conventional GDP measures and capture issues like well-being and inequality. However, these aspects are very difficult to be included in models, as they require good and reliable data and methodological advancements beyond the state-of-the-art.

8) What method did you use for the calculation of carbon leakage?

LP: All calculations are based on GEM-E3-FIT modelling results, comparing the changes in emissions in the EU and non-EU regions across scenarios. Our analysis identifies two key channels contributing to carbon leakage: the energy price channel (reduced global energy prices leading to increased fossil fuel consumption in non-abating countries) and industrial competitiveness through relocation of energy intensive manufacturing activities to countries without strict environmental regulation. The study focuses more on the industrial competitiveness channel.

9) What are the assumptions on technology costs learning?

JS: We used publicly available cost assumptions from peer-reviewed literature for key energy, transport and power generation technologies.

10) Are there available database on jobs per MW by technology?

JE: We used the IRENA studies for renewables, and performed data collections for other technologies in non-EU countries, as there are data for EU countries

Concluding Remarks/Identification of key issues in the survey

PO: granularity of data (and open data) is the key issue for modelers, while a variety of other issues are also important

Non-modelers: they expect additional analysis on the energy transition impacts on growth, lifestyle changes, social justice, circular economy, and decarbonisation co-benefits.