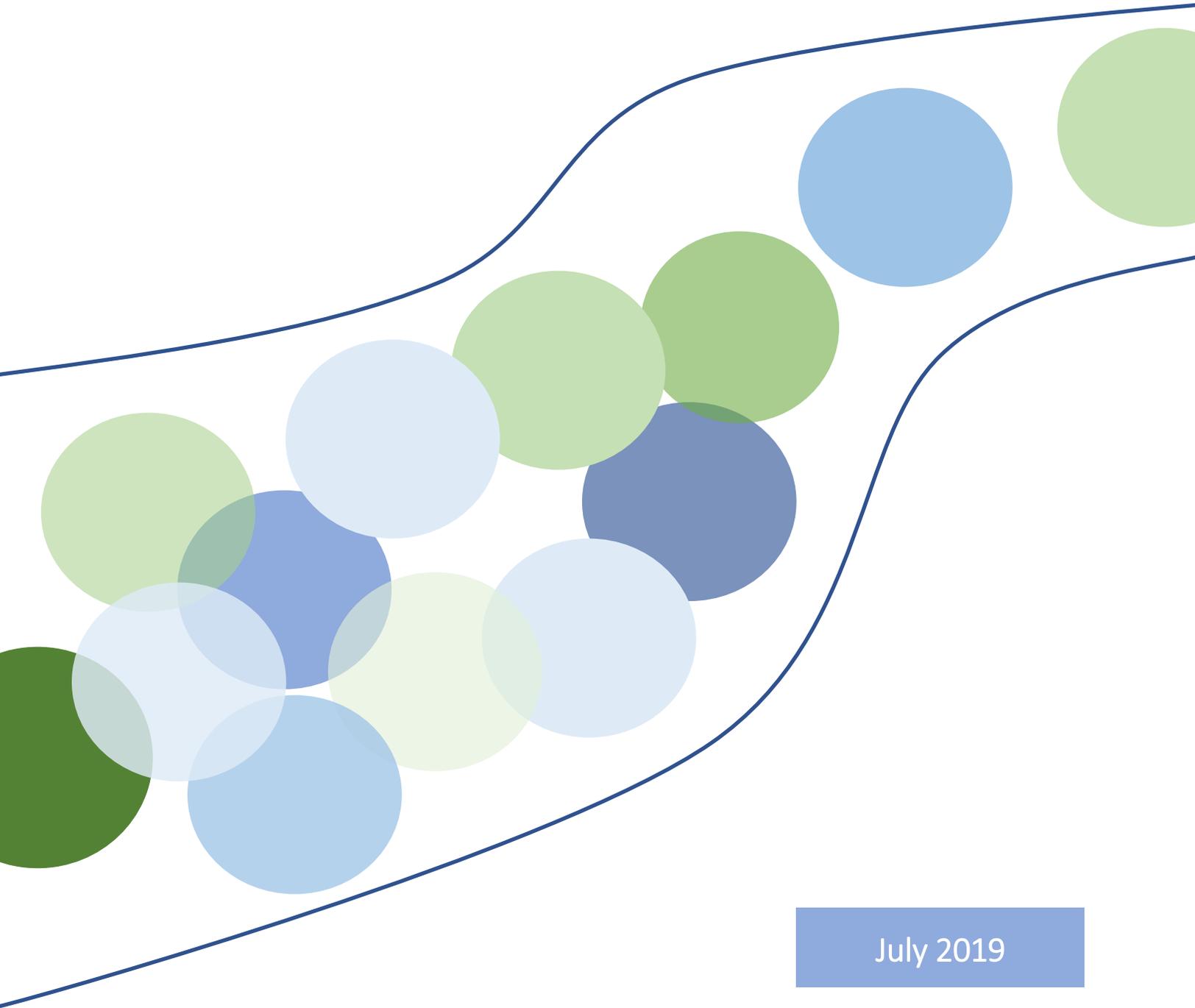




# Energy vulnerability and low carbon transitions in Europe

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*Policy Brief*



July 2019



## About this report

This policy brief constitutes part of Deliverable 4.3 (policy briefs) of the REEEM project, which analyses economic, social and environmental impacts of pathways towards a low-carbon EU energy system. This policy brief presents insights on the vulnerability concerns for households and industries of the European low carbon transition, but also the opportunities for address structural problems in the energy sector.

This report summarises key insights emerging from the detailed analyses reported in Deliverable 4.1b – *Energy vulnerability and low carbon transitions in Europe*.

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## REEEM partners



## About REEEM

REEEM aims to gain a clear and comprehensive understanding of the system-wide implications of energy strategies in support of transitions to a competitive low-carbon EU energy society. This project is developed to address four main objectives: (1) to develop an integrated assessment framework (2) to define pathways towards a low-carbon society and assess their potential implications (3) to bridge the science-policy gap through a clear communication using decision support tools and (4) to ensure transparency in the process.



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## Energy vulnerability concerns: why they matter

The low carbon transition envisioned for Europe is set to bring substantial benefits, from an increase in employment across specific sectors developing low carbon technology, to less reliance on fossil fuels and the associated price volatility, reduced levels of air pollution, and opportunities for lower energy costs through measures improving household insulation. However, it is inevitable that some households and industries more vulnerable to the changes that a rapid and large-scale transition brings could lose out, particularly if adequate mitigating measures are not put in place.

Recognising that the impacts of the large-scale structural shift towards a low carbon energy system will be distributed differently across sectors and different regions of the EU is important for three reasons; firstly, there is a moral imperative to ensure that the transition is fair and does not disproportionately impact those less able to make necessary change. Secondly, the transition will need broader stakeholder buy-in and engagement, which will be challenging to achieve if the low carbon transition is perceived as unfair. Finally, the transition provides a huge opportunity to address underlying structural problems across communities and industry, such as under-investment in retrofitting inefficient buildings and the need for efficiency improvements to industrial processes.

At the EU and member state level, the distributional impacts of climate and energy policy are not well recognised, nor are the data and tools for effective assessment. Impact assessments seldom undertake rigorous assessments that consider regional differences in household or industry sector impacts [1], with the process focused on economic efficiency.

## Energy vulnerability concepts in policy

The lack of recognition of this issue in part reflects the use of scenario analyses that consider aggregate spatial scales only and work with coarse sector resolution. Furthermore, economics framing focuses assessment on what is cost-effective and cost-optimal. In addition, distributional analyses require disaggregated data, whether that be spatial, sectoral, or by socio-economic groupings. However, these should not be reasons for maintaining the status quo.

This research is motivated by the absence of a recognition of distributional impacts but also an acknowledgement that scenario analyses that use a techno-economic framing are widespread and have considerable benefits. This reflects the REEEM approach that has techno-economic scenarios at its core around which it builds complimentary, linked analyses. We propose a complimentary approach to exploring the implications of different low carbon pathways for vulnerable regions, known as InVEST, or *Indicators of Vulnerability in Energy System Transitions*. This seeks to address the question of how we ensure that insights from modelled pathways used in strategy development take account of distributional impacts, and recognises vulnerable households and industries.

Crucially, key concepts that provide policy traction for energy vulnerability are recognised by the Commission, including just transitions and energy poverty, both of which were reflected in the recent Clean Planet for all strategy [2]. Just transitions relates to protection of workers in industries that may be more vulnerable to sustainable development policies. Driven by the trade union movement, the principles of just transitions are captured by guidelines provided by the ILO [3]. Energy poverty is a situation where households are unable to adequately meet their energy needs at an affordable cost. It is caused by a combination of inter-related factors including

low income, high energy prices, poorly insulated buildings, inefficient technologies and sometimes limited access to clean and affordable energy sources [4].

## Mapping energy vulnerability in the EU – the InVEST approach

The InVEST approach first maps out different sub-national regions across Europe that may be more vulnerable to impacts arising from the proposed low carbon energy transitions, based on a set of indicators. The indicator set captures energy vulnerable households, and industry sectors that are energy-intensive, both of which may struggle with increased costs, and sectors that are carbon-exposed, such as the coal sector. Based on the regional picture of vulnerability, the next step is then to consider how different pathways may impact such regions and communities in the future, if such vulnerabilities were to persist. We refer to regional vulnerability indicators as sensitivity metrics, and pathway impacts as exposure metrics, as per the vulnerability framing used in the climate impacts and adaptation field [5]. The basic concept is illustrated in Figure 1.

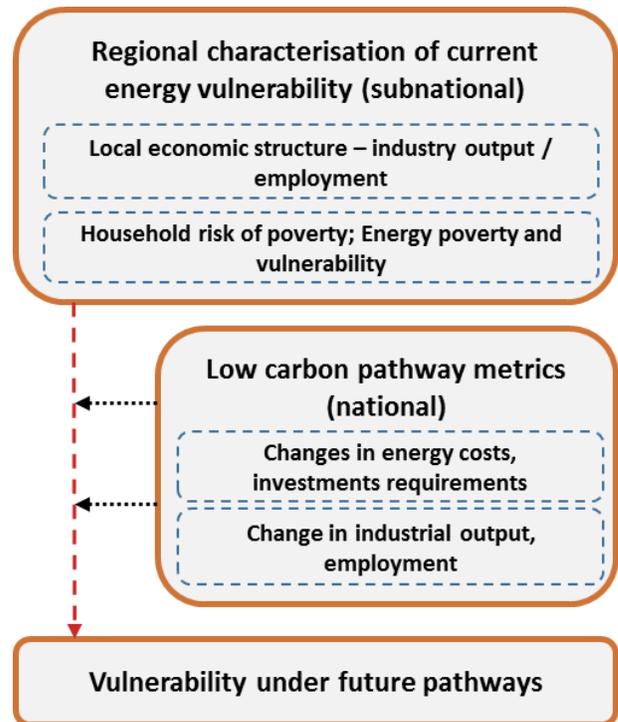


Figure 1. Concept of combining low carbon scenario metrics with proxy energy vulnerability datasets

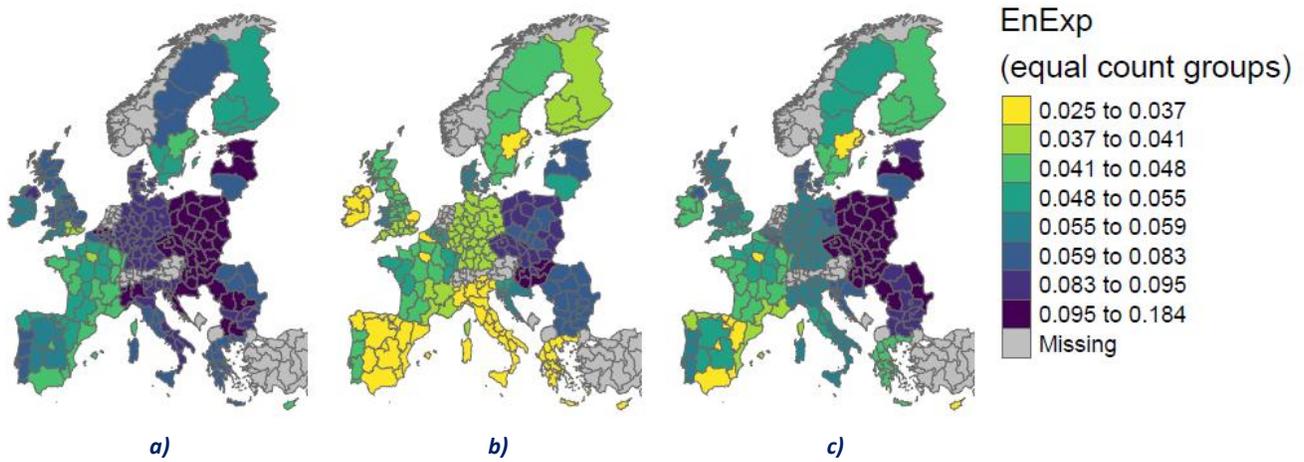
For households, sensitivity metrics (identifying vulnerable regions) include –

- Energy affordability, based on household budget surveys and other surveys focused on living conditions.
- Household income

For industry, metrics included –

- Employment in fossil fuel-based industries
- Employment in sectors defined as energy-intensive
- Long term unemployment

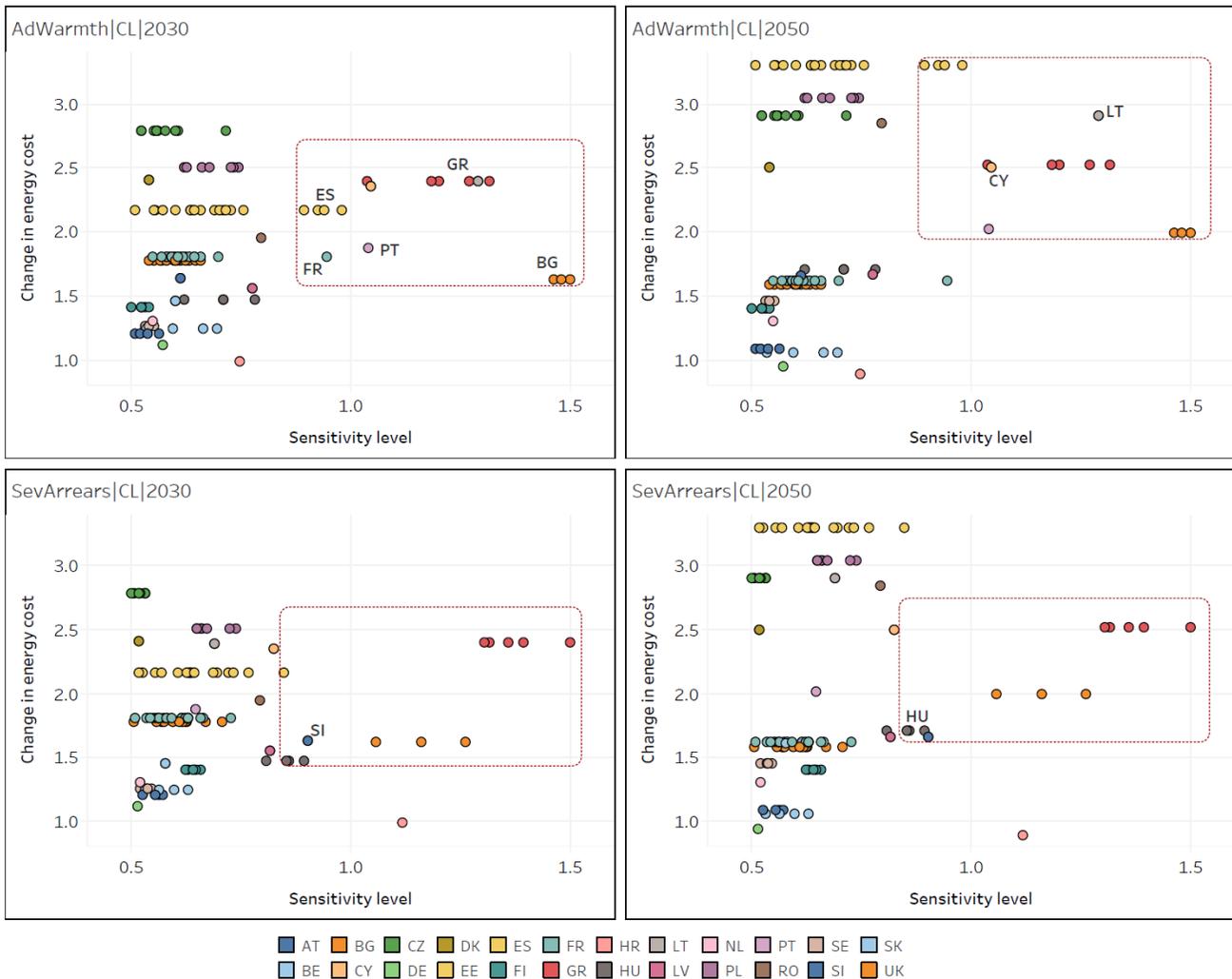
An example of one of the above sensitivity metrics – share of household expenditure on energy - is shown in Figure 2.



**Figure 2. Share of a) decile 1, b) decile 10 and c) average household expenditure on energy by NUTS1 region across member states.** Darker colours highlight higher relative expenditure on energy. Decile 1 represents the 10% of households with lowest income, while decile 10 represents 10% of those with the highest income. The legend reflects value binning on the basis of equal counts of NUTS regions. Data are for the year 2010. Household Budget Survey (HBS) data for Austria and the Netherlands were not available.

Once mapped, the implications of the REEEM low carbon scenarios across the different regions were considered. This was done by overlaying scenario metrics of relevance to regional vulnerability mapping. For example, coal production under the low carbon scenarios was compared to the employment levels in regions in different member states. For households, scenario metrics such as energy costs and investment levels across member states were compared to regions in those same member states identified as vulnerable.

Figure 3 provides an illustration of the approach, where changes in energy costs (vertical axis) in 2030 (left panel) and 2050 (right panel) are compared against two household sensitivity metrics (horizontal axis) – share of households unable to adequately heat their homes (upper panel 'AdWarmth') and share of household in arrears on bills (lower panel 'SevArrears'). Those regions in the red quadrant are those that are sensitive to increases in costs, as defined by these two metrics, and are in member states where energy costs are relatively higher.



**Figure 3. Change in energy cost level in 2030/50 (relative to 2015) under Coalitions for a low carbon path scenario versus current household sensitivity as measured by consensual indicators, AdWarmth and SevArrears.**

The sensitivity indicators are for the average household in a NUTS1 region i.e. not for a given decile group. Red boxes highlight those regions who are both sensitive and see high levels of cost. MS not represented include IE, MT, LU and IT.

## Key insights

A range of insights emerge from this analyses. For household, these include –

- Energy vulnerability in households is highest in regions of Eastern and Southern Europe, using both measures of affordability and lived experience. Factors giving rise to this include insufficiency of heating systems in colder periods of the year, while in Eastern

Europe factors may relate to a range of issues from poor building fabric to inefficient energy systems.

- There are considerable differences in household energy vulnerability between countries as well as within regions in a country. This reflects differences in income between regions, and within regions, as shown by the analysis of deciles. For example, in Greece, the highest decile (10) has an average share of households unable to keep

warm at 5%, while the lowest decile (1) has a share of 55%, a very large difference.

- The scenario metrics suggest that many of the energy vulnerable ‘sensitive’ regions in this research may also incur higher energy costs but also could see prospects of large investment, required to deliver the transition. This investment highlights the opportunity that the transition brings to resolving some of the underlying structural problems inherent in driving energy vulnerability (poor building stock, insufficient heating provision). Policy needs to manage the short-term risks of increasing cost, which could impact negatively on affordability, while incentivising and supporting the large-scale investment that is necessary.

Specifically on industry, we found the following insights -

- Particular regions have high concentrations of employment in vulnerable extractive sectors such as coal. Coal production and generation jobs are highly concentrated, based on regions with large extractive sites, notably Poland and Germany. The same is true for oil and gas extraction.
- All scenarios considered show rapid decline in both coal production and generation. Just transition planning is therefore vital for the affected regions. This means planning focused on new opportunities for workers, which need to be put in place over the next decade.
- There are specific regions of Europe with higher shares of employees in energy-intensive industries, which could be subject to higher energy cost pressures, and in some case, global competitive pressures. Regions include those located in Eastern Europe, BENELUX, and parts of Scandinavia, where

there is a focus on metals, non-metallic minerals, paper and pulp, and to a lesser extent, chemicals.

- The transition does see energy cost increases for these industries, but like in the residential sector, in large part the increase is driven by investments in low carbon technologies and cleaner fuels. If Europe is to compete in a low carbon world and retain its heavy industrial base, large investments will be required.
- Regions that have a higher dependency on energy-intensive industries do not necessarily experience higher costs under the scenarios. There is no obvious pattern between sensitivity and exposure for the scenarios used in this analysis. The main conclusion to draw from the analysis is that large investment will be needed across most regions to ensure a move to a low carbon system, allowing for the renewal and modernisation of different industry sectors.

## Policy recommendations

What is evident are the large regional differences across the European Union in potential vulnerability, both between and within member states – and that they will be impacted by low carbon transitions in different ways. This has important implications for energy and climate policy. And without this type of analysis, such differences are missed in the discussion of strategy and policy design. Whilst known to some extent, their lack of visibility is an issue. This is problematic, given that there is a widely held view that the transition will need to be equitable to garner support.

Furthermore, it is crucial to recognise that there are many other drivers of change, with a changing economy, evolution of consumer preferences and practice driven by technology, and the influence of automation, to name a few. This means that policy in the

domain of climate and energy also needs to recognise these other drivers, and work in a joined-up way with other policy functions. It may be that the climate and energy agenda can be used to align with ongoing transitional issues to help put support in place for communities and sectors.

Key recommendations include -

- Explore how the existing EU legislative process can further promote a recognition of distributional impacts. While energy poverty considerations are becoming increasingly integrated into EU policy, there is scope for further strengthening and integration into the policy process. The same is true of the preparedness for ensuring a just industrial transition that safeguards most industries and allows for a managed exit for others e.g. coal.
- Plan how new policies need to be designed to anticipate the needs of households and industrial sectors. The long-term climate policy goals and scenario exploration of these goals provide insights into some of the likely impacts. Therefore, policy makers know in advance of how such a transition may play out.
- Ensure joined up policy making. Given that issues of vulnerability cut across different areas of policy, it is important that energy and climate policy are joined up with what is happening on social and economic (or industrial) policy, particularly as it relates to specific regions.
- Explore best practice in addressing energy vulnerability across different countries. Following on from the previous point, an interesting idea would be to develop a Just Transitions Observatory for Europe in the same way as there is now one established for energy poverty, to bring together metrics, examples of best practice, and to link up policy makers and researchers.

- Undertake subnational analysis, which is critical for ensuring strategy and policy design account for regional variation. None of the above regional insights are possible without more spatially-disaggregated analysis. It would seem like a useful practice to build up the ESPON-funded Territorial Impact Assessment (TIA) approach, adopted strongly by the European Committee of the Regions – and think about how this can be mainstreamed into the Commission’s impact assessment process.

This research was very much an exploration of how to enrich scenario analyses by providing additional information to enable a discussion of distributional impacts, reflecting that different regions and the sectors in those regions might be differentially impacted. Other emerging approaches mean that there is potential for developing the research in this area. A number of research recommendations emerge from this REEEM study -

- Ensure that vulnerability assessment for transitions take account of the broader impacts. The approach proposed in this research did not cover transport, and for those sectors that were considered, a relatively narrow set of metrics was used.
- Explore how regional resilience and policy intervention can be integrated for a more nuanced picture of how communities and sectors can mitigate negative impacts / enhance positive effects. This reflects that this study did not focus on exploring resilience or adaptive capacity of different regions, which are important for better understanding sensitivity of the impacts of a low carbon transition.
- Use both qualitative expert judgement on potential impacts, as used in the TIA methodology, alongside quantified scenario metrics, used here, to gain benefits from both types of approaches.



- Feed into data collection activities and agencies the needs of this type of assessment, and explore other data that could be used here, drawing on the expertise of the ESPON programme in particular.

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