

# Mapping Decarbonisation Risks and Opportunities for Regional Manufacturing across the EU

*Insights from the LOCALISED project*



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**Policy Brief**

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## Key Messages:

- The EU manufacturing sector faces a dual challenge: achieving decarbonisation targets while staying competitive in global markets.
- We introduce a Transition-Risk Index (TRI) to assess the regional distribution of decarbonisation risks and opportunities for the EU manufacturing.
- TRI reveals marked heterogeneity across EU NUTS-2 regions: highest risks cluster in western Germany and northern Spain, while Scandinavian regions show low risk.
- Industrial regions in the northern/western EU, although experiencing higher emissions, tend to be less vulnerable to decarbonisation due to better access to high-skilled labor and financial capital markets.
- Less-industrialised southern/eastern EU regions, on the other hand, suffer from structural inequalities in resource allocation.
- Industrial policymakers and business leaders should consider regional disparities when formulating effective decarbonisation strategies.



## LOCALISED project overview

The Horizon 2020 Project LOCALISED disaggregated national decarbonisation plans, consistent with Europe's net-zero target, to NUTS3 (regional) and LAU (local) levels across the EU (Patil et al., 2024). It provides regional authorities, citizens, and businesses with various climate action measures. The [Net-Zero Business Consultant](#) and the [Sustainable Business Model Canvas](#) are the two main tools developed by LOCALISED to assess the vulnerability and the risk of transition to local businesses and to assist business organisations with identifying the essential elements of their business models to perform a successful transition. An important part of LOCALISED is adapting to stakeholder needs. The project engages with the specific requirements of local actors through continuous exchanges with local industries and business stakeholders. In parallel, it collects regional examples and best practices which enable regional industries to improve their resilience and move towards their decarbonisation objectives.

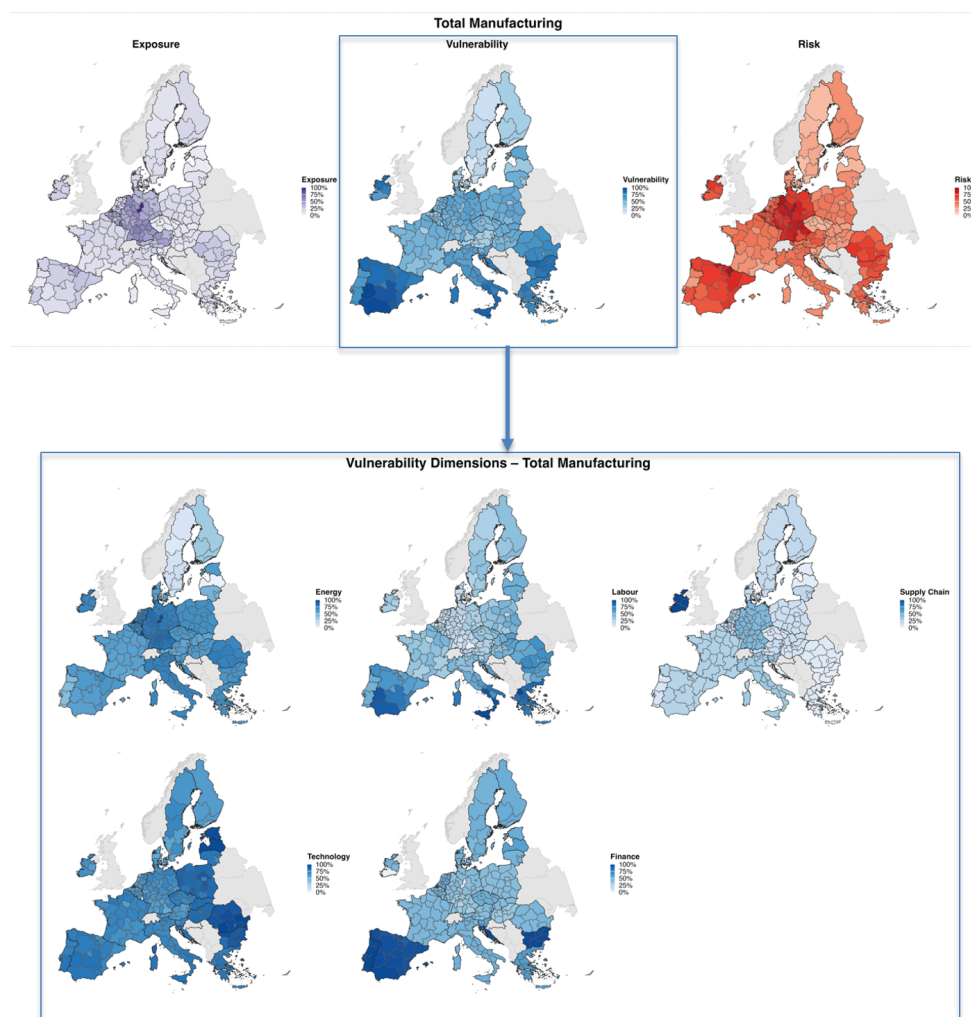
## Background

Achieving EU climate neutrality requires deep decarbonisation across society and industry. The EU has tightened policy via the **European Green Deal**, **European Climate Law**, and **Fit-for-55**, strengthening the European Union Emissions Trading System (EU ETS), introducing the Carbon Border Adjustment Mechanism (CBAM), and setting stricter efficiency and product-carbon standards-policies that elevate costs for carbon-intensive production and create **transition risks** for regional manufacturing. The manufacturing sector, while strategic, **accounts for ~21% of EU greenhouse gas (GHG) emissions**; in 2022 it emitted **~745 Mt CO<sub>2</sub>-eq**, second only to electricity and heat<sup>1</sup>.

Therefore, decarbonisation efforts have a potentially transformative impact on this sector and may undermine the EU competitiveness. On the other hand, differences in socioeconomic, technical, and financial structures make the transition costs and benefits vary across regions and subsectors. "Hard-to-abate" sectors (e.g., steel, cement, and chemicals manufacturing) in industrialised regions face greater constraints on their high emissions while less industrialised regions often struggle with systemic inefficiencies and inequalities. Such regional and sectoral heterogeneities pose a challenging task for EU policymakers and business leaders to develop a coherent decarbonisation agenda for the manufacturing sector.

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1. <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20231221-3>



**Figure 1:** Regional transition risk distribution as a function of exposure and composite vulnerability (top). Composite vulnerability dimensions include energy, labour, supply chain, technology, and finance (bottom). [Source: Coppola & Shayegh, 2024]

## Possible solutions

LOCALISED proposes a **systemic framework to assess decarbonisation risk (as a function of exposure and vulnerability) at NUTS-2 across manufacturing and its subsectors**, enabling decision-makers to **identify risk hotspots and tailor effective decarbonisation measures**. *Figure 1* provides a visual representation of the results for the EU's regional manufacturing. Transition risk is distributed heterogeneously reflecting diversity in both exposure and vulnerability.

In this framework, exposure refers to regional GHG emissions for each subsector while vulnerability is a composite index of Energy, Labour, Supply-chain, Technology, Finance indicators (Patil et al., 2024). For each indicator, several dimensions are considered whose values are normalised, direction-aligned (higher = greater difficulty), aggregated with equal weights within and across the indicators, then combined with exposure using a geometric mean to reduce the impact of outliers: extremely high scores in one component cannot fully offset low scores in the other.

Highest exposure for the total average manufacturing sector is observed in industrialised areas in western Germany while vulnerability is generally higher in southern/eastern Europe with structural insufficiencies in human and capital resources. **Combining both factors of exposure and vulnerability yields a heterogeneous distribution of risk across the EU regions** with manufacturing activities in some areas in western Germany and parts of Spain (Catalonia, Valencian Community) exhibit high risk to decarbonisation while low-risk regions are mainly in the Scandinavian countries where high renewables share, skilled labour, and finance creates more opportunities for the green transition.

Regions with higher risks exhibit different underlying patterns of exposure and vulnerability. As a result, the recommendations on how to improve their risk to decarbonization depends on whether they are exposed to high GHG emissions (e.g., west Germany) or they lack resilience along some of the areas pertaining to “Vulnerability dimensions” in Figure 1. Areas with higher exposure are heavily industrialized and therefore, the decarbonization solutions for these regions are often related to adopting alternative manufacturing processes with lower emission intensity. On the other hand, regions with higher vulnerabilities are less-industrialized with lower GHG emissions but higher rates of socioeconomic deficiencies such as lack of skilled labor and adequate financial resources for decarbonization.

Regional industrial actors and policymakers are able to access and analyze such heterogeneities through an interactive tool, Net-Zero Business Consultant, that can be accessed online at <https://nzbc.cmcc.it/>.

## Recommendations

- › Industrialised regions in northwestern Germany are the most exposed to GHG emissions. Decarbonisation efforts in these regions should **focus on prioritising emissions reduction measures through developing green manufacturing processes** and **shifting input energy-mix**.
- › In the EU regions where vulnerability dominates (many parts of southern/eastern Europe), **focus should be on the energy pillar** (lowering fossil dependency while increasing renewables capacity), **technology readiness** (R&D/innovation adoption), and **financial resources** (capital formation, investment climate).
- › Regardless of regional differences, there is an urgent need for an **unified approach to address deep vulnerabilities of the EU manufacturing sector**, especially in terms of technology readiness and competitiveness.
- › Better data with higher geographical and sectoral resolutions are still needed to provide a more comprehensive diagnosis of vulnerabilities that regional manufacturing businesses are facing. We **encourage EUROSTAT to create new indicators related to supply chain resilience/dependencies, and institutional/policy support for clean manufacturing at NUTS 2 level**.

## Resources

- Coppola, G.; Shayegh, S. (2024), Report on vulnerability of EU economic sectors and businesses at NUTS-2 level ([LOCALISED Deliverable 7.1](#)).
- Shruthi Patil, Noah Pflugradt, Jann M. Weinand, Detlef Stolten, Jürgen Kropp, A systematic review of spatial disaggregation methods for climate action planning, Energy and AI, 2024, 100386, ISSN 2666-5468, <https://doi.org/10.1016/j.egyai.2024.100386>

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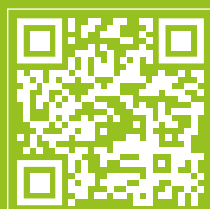
## LOCALISED partners:



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### Further information on LOCALISED:

**Website:** [www.localised-project.eu](http://www.localised-project.eu)

**Bluesky:** [@localisedeu.bsky.social](https://bsky.app/profile/localisedeu.bsky.social)

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