Green Transition and Regional Disparities: Opportunities and Challenges

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1. Introduction

The global discussion on Green Transition (GT) presents both theoretical and practical challenges. Identifying sustainable practices and pathways, and how to revert non-sustainable societies are key goals. One of these challenges is regarding the GT and the labour market: how is it possible to define or classify a green industry and a green occupation, or, a polluting industry and a polluting occupation? Also, how such definitions and classifications could guide governments and policymakers to a fair and balanced GT?

Regarding the definitions of green and polluting occupations, there is no uniformity in the literature concerning the specific areas in which these green positions can be created, or transformed from polluting to green. For instance, governmental institutions and international organizations can vary in their definitions regarding which industry/occupation is considered green or polluting. The International Labour Organization (ILO) defines green jobs as work in agricultural, manufacturing, research and development, administrative, and service activities that contribute substantially to preserving or restoring environmental quality (ILO 2012a, 2012b). Regarding industries, the United Nations Industrial Development Organization (UNIDO) mentions green industries as those that are resource-efficient, low-carbon, and incorporate cleaner production policies into national development plans. They focus on reducing resource intensity and carbon emissions, using renewable energy, implementing energy-efficient processes, and fostering green innovation through research and development (UNIDO 2010). Other sources are broad in their definition, mainly associating the industry with the occupations within it, as stated by the Organisation for Economic Co-operation and Development (OECD), highlighting that there is no internationally or nationally recognized definition for "green industries" or "green jobs" (OECD 2023).

While green occupations and industries are expected to promote the use of renewable energy and reduce greenhouse gas emissions (GHG), polluting or brown occupations/industries are those that involve highly polluting activities, such as mining, manufacturing, and agriculture (Dierdorff et al. 2009; Vandeplas et al. 2022). In the literature, there is also not a strict concept for these industries/occupations, which are mainly correlated to GHG emissions and environmental degradation at some level (Dierdorff et al. 2009; Dierdorff et al. 2011; OECD 2023). With the GT and climate policies, polluting jobs/industries would be most negatively affected, with the possibility to go through a decrease in demand for labor in the future, with some sectors like coal and mining facing challenges on maintaining the employment level (OECD 2023). The greening of these sectors will bring significant structural changes, and here is where one of the biggest challenges relies on, once these industries and occupations will require different policies for adapting and being included in the GT (Vandeplas et al. 2022; OECD 2023).

In this context of GT, there is also the the European Green Deal (EGD), which is a comprehensive initiative focusing on three main areas: achieving net zero emissions by 2050, promoting economic growth that is not dependent on resource exploration, and ensuring that no person or region is left behind (Vandeplas et al. 2022; OECD 2023). The initiative is particularly important for industries and occupations that have a significant impact (e.g., GHG emissions) on the environment, as it aims to transition these sectors/industries and occupations towards more sustainable practices. To achieve these goals, the EGD relies on two transitions: decarbonizing and digitalizing Europe's economy. Although the EGD reports are clear on their goals, is important to highlight that this transition is not a straightforward change, and several studies have pointed out flaws and challenges when trying to apply effectively the EGD and GT (Consoli et al. 2016; Vandeplas et al. 2022; Rodríguez-Pose and Bartalucci 2023).

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The present study will bring two main points regarding the GT and EGD at the regional level: green jobs distribution, sectoral GHG emissions and sectoral employment share. The goal is to discuss the challenges of precisely defining and quantifying green jobs, while also considering sector and regional analysis. The study-case chosen for this discussion is Sweden, considering the year of 2021. The reason to choose this specific country and year is due to data availability and high granularity of employment data, allowing a more detailed mapping of occupation classification and GHG emissions.

1.1. Green Jobs Classification Challenges

To successfully apply a GT, the labour market has been one of the main topics considered in the recent discussion. It is essential to accurately identify the sectors and occupations that require adjustment or changes to a sustainable agenda in order to effectively allocate resources and develop relevant policies. Therefore, one of the main practical challenges is to properly and accurately classify and quantify green jobs, as well as industries. Currently, the most applied classification of green jobs in the literature is the one provided from the Occupational Information Network (O*NET), a US-based occupation-specific reference elaborated in 2010 (O*NET 2010; UNIDO 2010; Vona et al. 2017; OECD 2023; Apostel and Barslund 2024). This reference was elaborated in the context of US labour market, and is organized in categories, tasks and skills related to each occupation. Using this classification, the challenge starts when trying to link O*NET-specific code/definition to particular jobs and tasks in the European labor market. This procedure requires a crosswalk between the occupation codes, usually done using the International Standard Classification of Occupations (ISCO). This step in the methodology involves making assumptions and grouping occupation codes that do not necessarily correspond to each other in reality. As a result, these assumptions influence green job estimations and need careful consideration (Apostel and Barslund 2024).

The use of crosswalks applied to occupations is a step present in most of the bottom-up methodologies for classifying and measuring green jobs. In this sense, methods such as top-down and bottom-up approaches, have specific advantages and challenges in defining the scope of green employment (Apostel and Barslund 2024). Top-down methods categorize entire sectors as green by using a set of criteria or expert judgment, which simplifies the process but may overestimate green jobs by including non-green roles within broadly defined sectors. Usually in this method, the greenhouse gases (GHG) emissions are considered in the analysis, where the application of GHG emissions data are used to classify occupations and industries as green. This approach is particularly effective in identifying sectors with high pollution levels, highlighting where significant economic transformations are necessary if they are aiming for a GT. However, this sectoral GHG emissions approach can sometimes misclassify sectors as green if it ignores emissions that occurs later in the supply chain (Apostel and Barslund 2024). Despite this limitation, using GHG emissions data provides a crucial dimension to green job classification by focusing on the environmental impact that the occupation is connected with.

Differently, bottom-up approaches identify specific green occupations, companies, or establishments using several data sources (e.g., the list of green jobs from O*NET, patents and business descriptions). This method provides a more precise and detailed framework of green employment but can be resource-intensive and may not always be possible to have access to detailed occupation data, leading to use crosswalks methods that can wrongly classify occupations as green. This important discussion of top-down and bottom-up approaches here highlighted are well detailed by studies such as those by Apostel and Barslund (2024), bringing a series of previous works that benefits from combining both approaches. By integrating these methods is possible to develop a comprehensive and nuanced understanding of green employment, which is vital for guiding effective labor market policies and supporting the green transition.

To classify and quantify green jobs in the study-case chosen, the present work adapted the methodology proposed by Vona et al. (2017), which is one of the most referenced works on the topic of occupational classification regarding its level of "green" or "polluting" (Dierdorff et al. 2009; Dierdorff et al. 2011; Consoli et al. 2016; Vandeplas et al. 2022; OECD 2023). The goal is to analyze the green jobs distribution at the regional level in 2021 in Sweden. This study can modestly improve our understanding of the potential opportunities in GT, industries, and employment.

1.2. Regional Disparities and Greening EU

Besides the efforts to a homogeneous GT at EU level, the socio-economic, demographic and environmental differences within the European countries are present and influences on how the transition to a sustainable agenda will unfold. Studies indicate the importance of carefully considering how to address the impact of the green transition on certain regions in EU (Filipović, Lior, and Radovanović 2022; Balakrishnan et al. 2022). Examples are the regions with a low gross domestic product (GDP) per capita but with high growth that have traditionally depended on carbon-inefficient sectors for production and employment. These areas will require strong policies to ensure that the transition can easily go to a greener and more sustainable path (Filipović, Lior, and Radovanović 2022; Balakrishnan et al. 2022).

Once recognized that the GT will also have negative effects, different policies and programms were created focusing on the non-sustainable sectors regarding natural resources or energy consumption/production, such as the Just Transition Mechanism (JTM). The JTM was created as a tool to support regions and sectors that are most affected by the GT due to their heavy reliance on fossil fuels or carbon-intensive processes. This tool aims to support the labour sector from shifiting/creating new needed skills and occupations, to promoting new economic sectors (Filipović, Lior, and Radovanović 2022). Therefore, the reliance of several regions and countries on carbon and GHG-related sectors is connected to socio-economic disparities among EU regions, and this disparity is also one of the focus of, for example, the European Cohesion Policy (ECP). The ECP has long supported environmental goals, and continues to be crucial in executing the EGD by offering financial assistance and leading to regional development towards sustainability (Cedefop 2021).

Thus, in the context of GT and EGD, the connection of fossil fuels or carbon-intensive processes with industries and consequently, the labour market, is considered in studies regarding the identification and classification of green occupations and industries, mostly depending on the approach chosen (top-down or bottom-up) - as mentioned in Section 1.1. For this reason, regional disparities can be also analyzed under the perspective of GHG emissions, together with industries distribution and its employment share. In this work, for the case-study chosen, the overall regional GHG emissions will be analyzed together with industries GHG emissions and employment distribution. The aim of combining GHG emissions with green jobs distribution in this work is to instigate the discussion of the possibility of identifying regions to receive urgent attention and efforts regarding the GT and the EGD.

2. Material and Methods

In this work, it was considered the eight Swedish regions at the NUST-2 level: Mellersta Norrland, Övre Norrland, Stockholm, Östra Mellansverige, Norra Mellansverige, Västsverige, Småland med öarna, Sydsverige. This territorial level of analysis is compatible with the EUROSTAT database and also allows for the use and matching of EUROSTAT data with the Statistics Sweden database (SCB), which is the Swedish government agency for demographic, social, and economic data, among other areas. The municipality level was used for the counting of green jobs once the occupation data used was obtained at the municipal level. This data was then grouped to the regional level, and for Sweden, there is a total of 290 municipalities. The GHG emissions data also at the municipal level was obtained from the Swedish Meteorological and Hydrological Institute (SMHI), from the Nationella emissionsdatabasen in the year 2021. The same procedure of grouping the data to the regional level was applied to the emissions dataset.

2.1 Data Collection and Preprocessing

Employment and Industry Data

The employment data used to classify and quantify green jobs were obtained from the official government agency, the SCB, and EUROSTAT database. The data on occupation were obtained considering the municipal level and the Standard för Svensk Yrkesklassificering (SSYK) code, which has its equivalents to the International Standard Classification of Occupations (ISCO).

In order to apply the Vona et al. (2017) method of green classification to employment data, the first processing step involved standardizing green occupational codes from the Occupational Information Network (O*NET) to the Standard Occupational Classification (SOC). The standardization was done by identifying O*NET green codes and their corresponding SOCs, and adjusting the 8-digit SOC codes to 6-digit. Once the codes were standardized, they were linked to their corresponding SSYK-ISCO codes obtained from the SCB. This correlation was made at a 4-digit level to ensure consistency between the classifications. The resulting list of green codes contained 83 and 87 occupations, respectively. Minor differences between the original green occupational codes table from O*NET and the final green occupational codes table for Sweden occurred mainly due to the correspondence between the codes from O*NET, SOC, and ISCO. This methodology was used in the State of Nordic Region Report 2024 (NORDREGIO 2024), and the same data and procedures were applied for quantifying the green jobs in this work. Minor changes in the procedures of cleaning and data standardization were performed. It is important to highlight that in the mentioned report, a harmonization step was implemented in the classification and quantification of green jobs to ensure consistency with the reference study considered, which is the most recent OECD publication regarding green jobs distribution among several countries (OECD 2023). This step aggregated the green occupations at NUTS2 level, and in sequence a adjustment factor was calculated. The adjustment factor was then used to calculate the percentage of green jobs in each municipality, and the numbers for green employees in each area were adjusted accordingly (NORDREGIO 2024). The final numbers of green jobs per municipality were grouped at the regional level to match EUROSTAT regional division (NUTS2), allowing a coherent comparison with the sectoral data.

The EUROSTAT data on employment by sector was obtained through the table "Employment by sex, age, economic activity, and NUTS 2 regions (NACE Rev. 2)" - table referenced as lfst-r-lfe2en2. A additional harmonization step was also applied to this dataset to match the total employment in 2021 in Sweden, considered in the green jobs calculations. Is worth notice that the sectoral employment share in the regions Västsverige and Småland med öarna, and Östra Mellansverige and Sydsverige where merged and in sequence the percentage share for each sector were calculated accordingly. The EUROSTAT sectoral classification follows the NACE (Nomenclature statistique des Activités économiques dans la Communauté Européenne), which in this considered dataset are divided into 10 classes, respectivley:

Code	Title	Encompassing Sectors
A	Agriculture, forestry and fishing	Agriculture, forestry and fishing
B-E	Industry (except construction)	Mining (B), manufacturing (C), electricity, gas, steam and air conditioning supply (D), water supply, sewerage, waste management, and remediation activities (E)
F	Construction	Construction
G-I	Wholesale and retail trade, transport, accommodation and food service activities	Wholesale and retail trade (G), transport and storage (H), accommodation and food service activities (I)
J	Information and communication	Information and communication
K	Financial and insurance activities	Financial and insurance activities
L	Real estate activities	Real estate activities
M-N	Professional, scientific and technical activities; administrative and support service activities	Professional, scientific and technical activities (M), administrative and support service activities (N)
O-Q	Public administration, defence, education, human health and social work activities	Public administration and defence, compulsory social security (O), education (P), human health and social work activities (Q)
R-U	Arts, entertainment and recreation; other service activities; activities of households and extra-territorial organizations and bodies	Arts, entertainment and recreation (R), other service activities (S), activities of households as employers and undifferentiated goods- and services-producing activities of households for own use (T), activities of extraterritorial organizations and bodies (U)

Table 1: *NACE (Nomenclature statistique des Activités économiques dans la Communauté Européenne) sectors considered in the "Employment by sex, age, economic activity, and NUTS 2 regions (NACE Rev. 2)" table (ref. lfst-r-lfe2en2).*

Spatial and Emissions Data

The emissions per sector data were obtained through the Swedish Meteorological and Hydrological Institute (SMHI), available in the database Nationella Emissionsdatabasen. The data selected is expressed in CO2eq, the common unit to measure impact on global warming. To further comparison of sectoral GHG emissions with employment share per sector, the emission dataset required standardization steps. Differently from the EUROSTAT data base, the SMHI source does not follow NACE classification. The database has several sectors, which are divided into main sectors (counting a total of 7) and subsectors (counting a total of 52), with detailed emission data for each economic activity. For this reason, it was necessary to group SMHI sector classes to equivalent NACE sectors. This step considered the descriptions of NACE sectors in the official documentation and references (Eurostat, n.d.[b], n.d.[a]).

In sequence, the GHG emissions per sector were calculated, as well as the total regional GHG emissions. The sectors K and L (financial and insurance activities and real estate activities, respectivley) were not considered in the analysis due to the nonexistence of these classes in the SMHI emissions database. This also implied in not considering these sectors in the sectoral employment share analysis.

3. Results

For Sweden in 2021, the green employees accounted to approximately 26 percent of the total employment (Fig. 1.a). Regionally, a total of three regions stand out regarding higher share of green employment: Västsverige with 26 percent, Sydsverige with 25.3 percent and Stockholm region with 30 percent of its regional employment classified as green. The other regions remain within the range of 20 to 25 percent of green employment, being the Mellersta Norrland region with the lowest percentage of 23 percent. In the context of EU, the overall Swedish average of total green employment is 9 percentage points higher than the OECD average of 17.6 percent. This considerable increase in green jobs has been noticed in all Swedish regions since 2011 (OECD 2023). Although Sweden is among the countries that has approximately 80 percent of its population aged 20-64 employed (Cedefop 2021), regional disparities can be noticed mainly regarding the most "green" region (Stockholm) and the least "greener" one (Mellersta Norrland), with 7 percentage points difference.

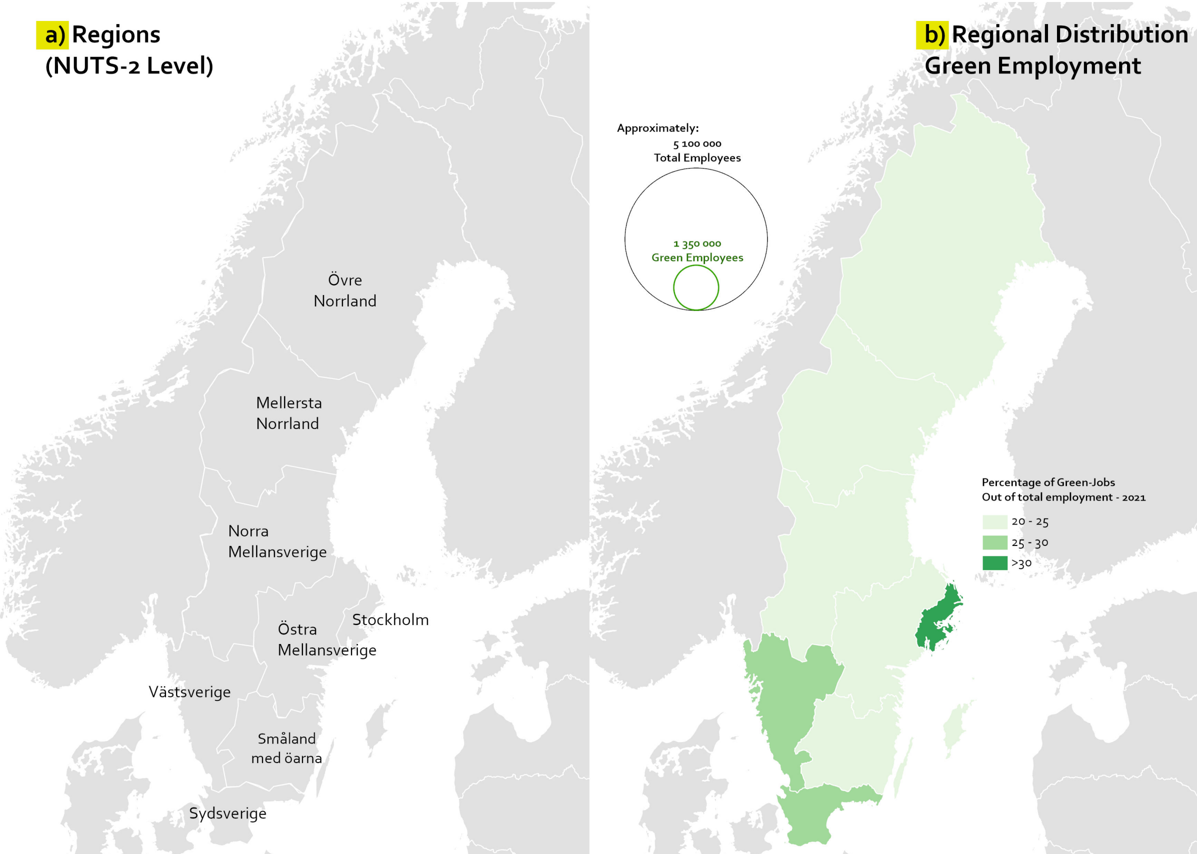

Figure 1: *(a) Swedish regions at NUTS-2 level; and (b) Regional Distribution of Green Employment ranging from 20 to >30 percent out of total employment in 2021.*

The regional differences in the employment sector is not only restricted to the green classification of occupations. Between the sectors, regions present varying shares of employment (Fig. 2). Major trends can be noticed, mainly that all regions have more than 30 percent of the occupations in the O-Q sector (Public administration, defense, education, human health and social work activities), and the G-I sector (Wholesale and retail trade, transport, accommodation and food service activities) is the second with the largest share of employment across all regions - ranging between 15 to 20 percent within the regional employment. Specific sectors can be present with higher share of employment in certain regions than in others, which is the case of sectors M-N, and J, which are mostly related to a wide range of occupations. Sector M-N, for example, include professional, scientific, technical, and administrative services, as well as legal, accounting, engineering, management consultancy, and research. Sector J covers activities related to publishing, media production, broadcasting, telecommunications, IT services, and data processing (Eurostat, n.d.[b], n.d.[a]). Stockholm region holds the highest employee share for both M-N and J sectors, with 6.2 and 20.4 percent of the regional employment allocated in these sectors, respectively.

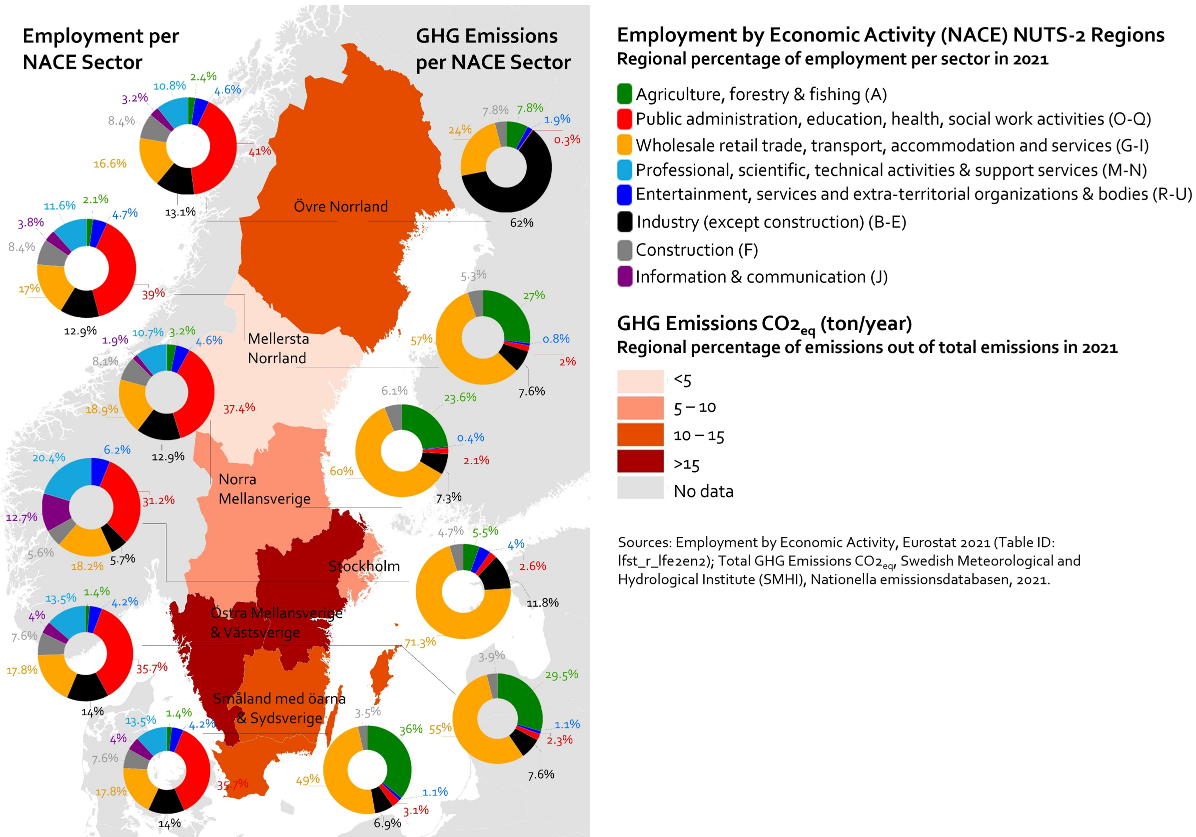

Figure 2: *Sector employment share distribution and GHG emissions in 2021. On the left side of the map, employment share per sector and regions is shown. On the right side of the map, GHG emissions per sector and regions are shown. The regions "Västsverige"-"Småland med öarna", and "Östra Mellansverige"-"Sydsverige" where merged and in sequence the percentage share of sectoral employment and GHG were calculated accordingly.*

Industry (B-E), Construction (F), Agriculture (A), and Entertainment/services (R-U) present varying shares across the regions but within similar percentage range. Examples of occupations associated with the mentioned sectors are: (B-E) includes occupations like miners, factory workers, and utility technicians; (F) involves builders, electricians, and plumbers; (A) includes farmers, foresters, and fishers; and (R-U) involves artists, individual care services, and employees of international organizations. Furthermore, Stockholm region is the only region that lack the counting for the employment among the agricultural sector.

Following the pattern of unevenness, the GHG emissions per region and sector demonstrates similarities and differences depending on the regions under comparison. Stands out the Övre Norrland region with the industry sector emissions share, representing 62 percent out of the total regional sectoral emissions. Considering only the regional contribution to the total yearly GHG emissions (regardless the sector in question), the region remains among the ones with highest contribution, with 14 percent, as is possible to see in the GHG Emissions CO2eq (ton/year) map (Fig. 2). The G-I sector maintain the the first place for the highest emissions contribution for all regions except Övre Norrland, and is Stockholm region that holds 71.3 percent of the sectoral emissions under G-I, the highest percentage. The Agriculture (A) sector is also responsible for high emissions across regions, with exception of Övre Norrland and Stockholm, and is the Småland med öarna and Sydsverige regions that holds the highest emissions in this sector, with a total of 36 percent. Östra Mellansverige and Västsverige regions also present high emissions percentages in the sectors G-I and A, with 55 and 29.5 percent, respectively.

For the year of 2021 in Sweden - considering the SMHI source related to economic sectors - the total GHG Emissions was approximatley 27 million tonnes of CO2eq. And as is possible to see in Figure 2, the overall regional contribution to the total yearly GHG emissions (ton/year) is unbalanced across the regions. Östra Mellansverige and Västsverige regions hold the highest contribution to the yearly emissions, with 18.2 and 23.8 percent (dark read class, Fig. 2). Övre Norrland, Småland med öarna and Sydsverige regions follows with 11.8, 11.7 and 14 percent, respectively. Mellersta Norrland, Norra Mellansverige and Stockholm are the regions with the lowest emissions contribution, with 3.8, 8 and 8.2 percent out of the total, respectively.

4. Discussion

Regional disparities and industrial composition has been discussed in the context of GT and EGD, mainly bringing the different industrial composition of the regions as one of the possible factors for uneven development and greening process (OECD 2023; Balakrishnan et al. 2022). At the EU level, regions with economies heavily dependent on carbon-intensive industries, such as agriculture, natural resource exploitation, and manufacturing are more likely to face economic instability during transitions towards greening the sectors and technologies (OECD 2023; Balakrishnan et al. 2022; European Commision 2024). In Sweden, significant changes in industrial development have been made in the last decades to reduce the dependency on carbon-intensive processes, mainly through energy efficiency improvements and fuel substitutions (Martínez and Silveira 2013; Toktarova et al. 2020; OECD 2023). As a result, Swedish industries have increased their production values while reducing both energy consumption and CO2 emission intensity. This success is mostly attributed to high energy prices, energy taxes, and substantial investments in clean technologies and energy-efficient practices (Martínez and Silveira 2013; Toktarova et al. 2020; OECD 2023).

Therefore, the industrial composition can bring insights about the greening process of Sweden and, consequently, the creation or transition of occupations towards the GT. Regions with industries aligned with environmental goals, such as research and development or green technology, tend to have higher number of green jobs, and this is mostly linked with the sector M-N (Professional, scientific and technical activities (...) see Table 1). In contrast, regions with a heavier reliance on traditional industries like industrial, manufacturing or agriculture have fewer green-task jobs (e.g., sectors A, B-E, F, and G-I). Urban areas are also the ones with higher chances to develop a wide range of green opportunities, once that the labour market diversity and high-skilled professional are concentrated in these areas (OECD 2023; Apostel and Barslund 2024). As an example, in Sweden, municipalities within the Stockholm region, such as Sundbyberg, Upplands-Bro, Stockholm, Nykvarn and Solna present a high share of green jobs. But also some more industrial municipalities, like Burlöv in Skåne, Gnosjö in Småland and Ludvika in Dalarna are together with the urban municipalities regarding the share of green jobs, having more than 30 percent of its municipal employment classified as green (NORDREGIO 2024). The analyzed data (Fig. 1.a) shows that Stockholm, Västsverige and Sydsverige regions holds between 25 to more than 30 percent of its regional employment as green, at the same time that the share of employment in sector M-N in these regions are higher than in the other regions (Fig. 2).

The data shows diverse regional economies in Sweden, with regions like Stockholm having more evenly distributed the employment across the sectors, and a overall employment concentration among the regions in the O-Q sector. In general, this suggests a patterns towards a public and professional services, diversified, and service-oriented economy, with each region having its specific higher employment concentration in other sectors. These differences at the sectoral level indicates different economic strategies and the level of diversification. This also affects the GHG emissions distribution and, although the effort towards decreasing dependency on carbon-intensive processes, the results shown in (Fig. 2) highlights punctual differences among the Swedish regions, mainly regarding GHG emissions both at the regional and sectoral levels.

The results pointing out to Övre Norrland region as the one with the highest emission in the industrial (B-E) sector is not surprising. The north of Sweden is know by its traditional industry on natural resources exploitation (e.g. mining, hydro power, and forestry), which has access to raw materials such as iron, copper and rare earth metals (Dubois and Carson 2016; Kneifel 2022). Several industries were developed in the region, and the iron ore fields of Kiruna are located at the center of a railroad line connecting the Baltic steel mill center of Luleå with the ice-free Atlantic export harbor of Narvik, Norway (Illgoutz 2017). Despite such context, the percentage of green employment in the region is not the lowest (25 percent), and the expectation is to increase. The region has been in focus to undergo through a GT process, and since 2010, wind power became a fast-growing industry in Sweden, promoted as one solution to reach climate goals and ensure more sustainability (Kneifel 2022). A variety of industries are currently investing in Norrbotten and Västerbotten regions, which are the northernmost regions in northern Sweden. A new industrialisation phase is considered, where 100,000 people are needed to work in almost 200 different professions in the public and private sectors (Nordic Co-Operation, n.d.).

Regardless the Swedish northern new expansion of sustainable industries, southern regions remain with the traditional agricultural production and development. Östra Mellansverige and Västsverige, and Övre Norrland, Småland med öarna and Sydsverige regions are the ones where the GHG emissions in this sector are the highest when compared to the same sector in the other regions. The largest agricultural areas and the highest productivity are found in the southernmost part of Sweden, where there is a focus on grain and pork production, as well as in the plains of the central area in the country (Lindqvist, Malmberg, and Sölvell 2008). Besides such share in the total annual and sectoral emissions, the sector A represents less than 2 percent of the employment, and the land ownership structure in Sweden mainly consists of small farms operated by individual families. Still, besides the traditional industrial development in the A sector, is possible to notice that in Västsverige and Sydsverige regions the green employment share is high, between 25 and 30 percent. It is worth to notice that these regions also hold important centers of scientific and technical development, represented by instutions and companies allocated in cities such as Göteborg, Malmö, Helsingborg, Lund, and others. This can be observed by the employment share in M-N sector.

To summarize, the distribution of employment across different sectors and regions indicates the diverse economic structures, varying from service-based to industrial economies of the regions. These structures can be influenced by strategic choices, local policies, and environmental factors. The regional disparities is a challenge at the EU and national level, as is possible to notice in the Swedish case-study here discussed. Therefore, achieving a fair GT and a successful EGD requires a complex understanding of regional historical, social, economic, environmental, and demographic contexts. This work exemplifies the importance of dedicated studies that provide comprehensive data, methods, and analyses on these topics. Adopting a broad approach that considers both sectoral and occupational levels offers a holistic view of regional and local strengths and weaknesses. Furthermore, evaluating environmental impacts, such as greenhouse gas emissions, is crucial for setting realistic goals like achieving net zero. Identifying the main contributing sectors to current emissions enables targeted strategies for effective and sustainable transition of both labour and industrial sectors.

5. Conclusions

In conclusion, the Green Transition (GT) and the European Green Deal (EGD) goals are intrinsically connected to address regional disparities within the EU. Achieving the objectives of decarbonizing and digitalizing Europe's economy requires acknowledging and mitigating the unique challenges faced by different regions, particularly those in industrial transition. Regions dependent on carbon-intensive processes requires fine-tuned policies and projects to achieve a successful transition. The complexity of quantifying green jobs and the lack of detailed employment data at the EU level also creates a barrier in addressing priorities, necessitating the development of robust database and methodologies to capture the full spectrum of employment patterns. Sweden's showcase exemplifies both the potential and the challenges in this path for a fair GT and successful EGD. Specific sectors are benefited regarding the GT, mainly those involving science and research. Other sectors must be inserted in the greening process carefully, once the structural changes must occur not only at the industrial-process level, but also concerning employees skills and education. As a country with a strong commitment to sustainability, Sweden highlights the critical need for comprehensive data, innovative policy approaches, and holistic view to drive successful transitions.

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