



# ENTRANCES

ENergy TRANSitions from Coal and carbon: Effects on Societies

## D5.3. Multidimensional Taxonomy of challenges and coping strategies



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement n° 883947. The document represents the view of the author only and is his/her sole responsibility: it cannot be considered to reflect the views of the European Commission and/or the Innovation and Networks Executive Agency (INEA). The European Commission and the Agency do not accept responsibility for the use that may be made of the information it contains.

## Authors

Andrei Holman (Alexandru Ioan Cuza University of Iași, Romania)

## Contributors

Giovanni Caiati (K&I); Simona Popusoi (UAIC); Nachatter Singh, Ricardo Garcia Mira (UDC); Katja Heinisch, Christoph Schulz, Oliver Holtemöller, Walter Bartl, Reinhold Sackmann (IWH); Adrian Healey, Laura Norris (CU), Lidia Gawlik, Wojciech Kowalik, Aleksandra Komorowska, Wit Hubert (IGSMiE PAN), Christian Klöckner, Erica Löfström, Kenneth Vilhelmsen (NTNU); Manfred Spiesberger, Markus Otter (ZSI); Nadia Cerone, Elena Deluca (ENEA); Tristram Barrett, Marc Wolfram (IOER); Daniel Skobla, Richard Filcak (CSPS); Anja Rühlemann, Marika Kushan, and Marcela Norena (WECF).

We gratefully acknowledge the valuable contribution to the research we received from all the participants of the focus group, the in-depth interviews, and the online survey. All choices and interpretations in the current text, are, however, our own responsibility.

## Contact

Alexandru Ioan Cuza University of Iasi, Romania (UAIC)

Andrei Holman

Email: [andrei.holman@uaic.ro](mailto:andrei.holman@uaic.ro)

Website: [www.uaic.ro](http://www.uaic.ro)

This report is delivered in the framework of the European Commission H2020 funded project - ENergy TRANSitions from Coal and carbon: Effects on Societies - ENTRANCES, G.A. 883947.

Work Package 5: Comparative analysis

Lead Organisation: Alexandru Ioan Cuza University of Iași, Romania

### **ENTRANCES project**

Project coordinator: Ricardo García Mira (University of A Coruna, Spain)

Project email: [info@entrancesproject.eu](mailto:info@entrancesproject.eu)

Project website: <https://entrancesproject.eu/>

Publication date: 28.04.2023

## Table of Contents

<b>Index of Figures .....</b>	<b>3</b>
<b>Index of Tables.....</b>	<b>3</b>
<b>1 Introduction .....</b>	<b>5</b>
1.1 Overview.....	5
1.2 Components and organization of the taxonomy .....	6
<b>2 Transition trajectories .....</b>	<b>8</b>
<b>3 Challenges and coping strategies .....</b>	<b>17</b>
3.1 Recurring Territorial Dynamics.....	28
3.2 Territorial Drift Patterns.....	35
<b>Annexes</b>	
<b>Annex 1 - Quantitative analysis .....</b>	<b>38</b>
<b>Annex 2 - Qualitative analysis .....</b>	<b>142</b>
<b>Annex 3 - Inventory of of changes, challenges and coping strategies .....</b>	<b>190</b>

# Index of Figures

Figure 1. General and specific transition trajectories .....	11
Figure 2. Recurring territorial dynamics.....	34
Figure 3. Territorial Drift Patterns .....	36

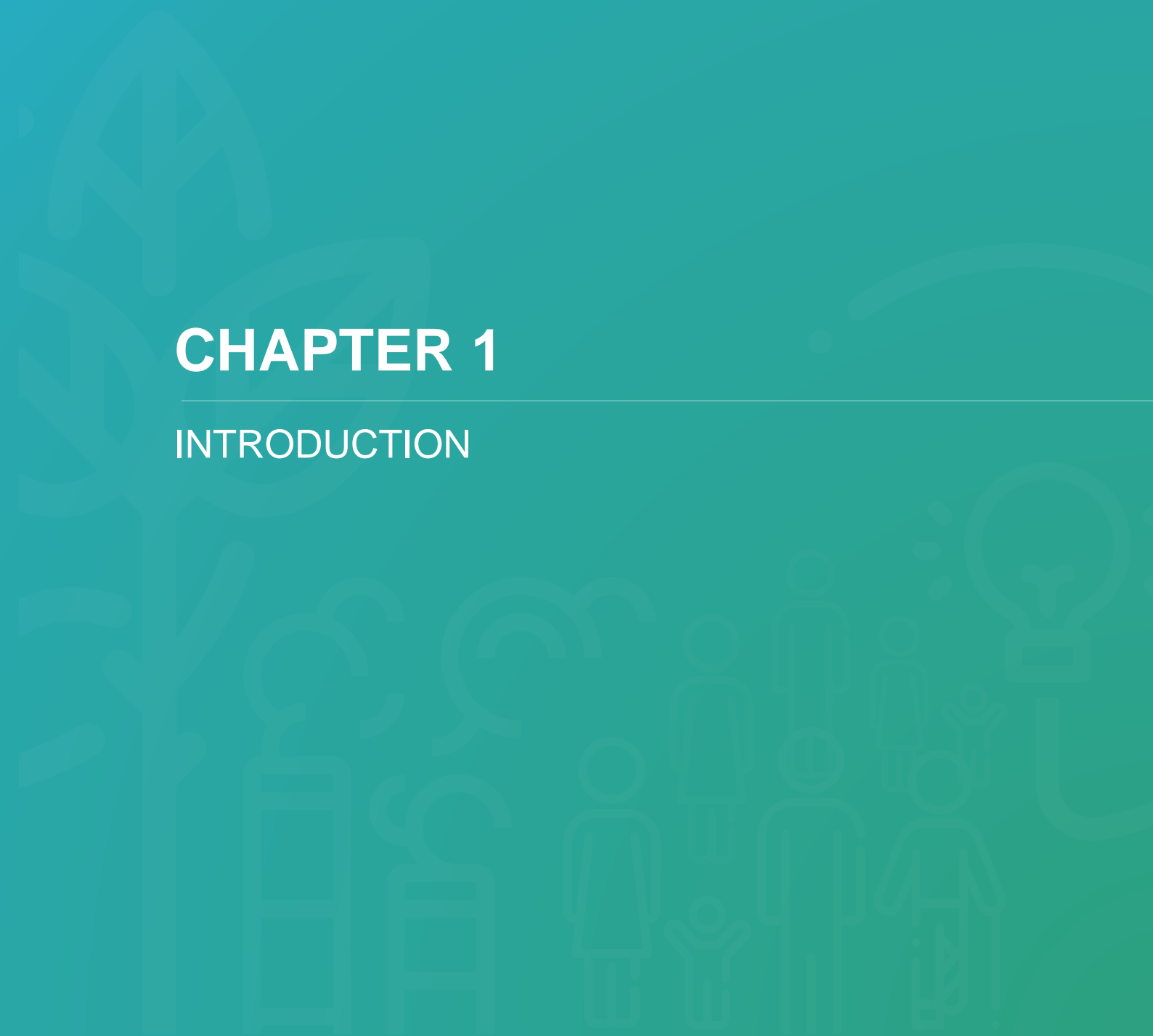
# Index of Tables

Table 1. Trajectories and related sub-trajectories.....	14
Table 2. Challenges and associated coping strategies.....	25

# CHAPTER 1

---

## INTRODUCTION



# 1 Introduction

## 1.1 Overview

This report has been drafted in the framework of the project —ENergy TRANSitions from Coal and carbon: Effects on Societies - ENTRANCES, which is a three-year project funded by the European Union's Horizon 2020 research and innovation programme. The project addresses the topic —Social Sciences and Humanities (SSH) aspects of the Clean-Energy Transition<sup>II</sup> and call: LCSC3-CC-1-2018-2019-2020. ENTRANCES is coordinated by the University of A Coruña and is conducted by a consortium of 14 European partners, including universities, research institutes, networks and umbrella organizations.

ENTRANCES' **overall goal** is developing a theoretically-based and empirically-grounded understanding of cross-cutting issues related to SSH aspects of the clean energy transition in European coal and carbon-intensive regions and formulating a set of recommendations able to tackle these issues. To achieve this goal, the project investigates the challenges facing carbon intensive regions in transition hinging on the idea that the transition to clean energy should not be considered only as a technological change or an industrial shift but also as a complex and multidimensional process that affects the daily life of local communities. In this regard, the project understands the impacts of the clean energy transition on coal and carbon-intensive regions, either in terms of the potential activation or strengthening of the **detritorialisation process**, i.e., the process of progressive weakening of ties between a community and its territory, and conversely as a window of opportunity for triggering their **reterritorialisation**.

The research conducted in ENTRANCES has been conceptually guided by a Multidimensional Analytic Framework (MAF) developed in WP1 and articulated in 6 components: (socio-economic, socio-technical, socio-ecological, socio-cultural, socio-political and socio-psychological). This theoretical framework was translated into an analytic framework and methodological set of research tools in WP2, which were then used in the empirical research on the case studies of coal (WP3) and carbon-intensive (WP4) regions. The coal and carbon-intensive regions investigated in ENTRANCES are: As Pontes (Spain), Brindisi (Italy), Central Germany (Germany), Jiu Valley (Romania), Katowice (Poland), Krakow (Poland), Lusatia (Germany), Port Talbot (United Kingdom), Rhineland (Germany), Stavanger (Norway), Sulcis (Italy), Upper Nitra (Slovakia), and Upper Styria (Austria). Overall, six methods of enquiry were used in the empirical research on these case studies: Desk research, Semi-structured interviews, Focus groups, Survey, Text-research, and Quantitative macroeconomic modelling.

All the data collected in WP3 and WP4 in the empirical research through these various methods was integrated, processed and analyzed in WP5 (Comparative analysis). The general purpose of WP5 is to carry out a comparative analysis that would identify and interpret commonalities and differences among the 13 coal and carbon-intensive regions, by combining different perspectives: a Multi-dimensional perspective (through the six dimensions of the analytical framework), a Comparative perspective (through the comparisons between case studies), and a Multi-level perspective (through the integration of data pertaining to different levels of analysis of the regions under scrutiny, specific to each of the research tools used in the five empirical studies). Specifically, WP5 aimed to:

- (1) collect the data gathered in each of the 13 case studies and to organize it in accordance with the analytical framework developed in WP1 and WP2, thus generating a cross-case unifying database;
- (2) apply distinct approaches of data analysis: quantitative (T5.2), qualitative (T5.3), gender-focused (T5.4), and developing an inventory of changes, challenges and coping strategies (T5.5);
- (3) identify from the data collected in the 13 case studies different regional transitional trajectories, territorialization dynamics and patterns, challenges and coping strategies, and to organize them in a taxonomy (T5.6).

This report describes the rationale, process and results of Task 5.6, aiming to develop a Multidimensional taxonomy of trajectories, territorialization dynamics and patterns, challenges encountered and acknowledged by the governances in the 13 coal and carbon intensive regions included in ENTRANCES, and corresponding coping strategies. The development of the Multidimensional taxonomy relies on the data emerging from WP3 and WP4 in the case studies of coal and carbon-intensive regions, collected using the research instruments developed in WP2 within the conceptual framework generated in WP1. Moreover, this process is based on the results of the previous tasks in WP5, aiming to structure the results of the parallel cross-cases analyses carried out in the previous tasks. Thus, it organizes in a common comprehensive framework information and categories extracted from the empirical data collected in the five empirical studies focused on the components of the Multidimensional conceptual framework of ENTRANCES (socio-economic, socio-technical & ecological, socio-cultural, socio-political and socio-psychological), as well as from the case study reports and state-of-the-art reports elaborated in the previous WPs of the project.

## 1.2 Components and organization of the taxonomy

The Multidimensional taxonomy was elaborated through the application of distinct classification approaches on the observations collected in the project, in line with the Multidimensional Analytic Framework of ENTRANCES. These approaches target recurring and differentiated features of the 13 regions, grouped in **three general complementary components** of the Multidimensional taxonomy:

- (1) different types of **transition trajectories** of the coal and carbon regions, including the relevant de/re-territorialization factors that have influenced the trajectory in each case;
- (2) different types of **challenges** met and acknowledged by the regions that illustrate each transition trajectory, and the **strategies** that they have implemented in the attempt to cope with these challenges.
- (3) different **dynamics** of the de/re-territorialization process ongoing in coal and carbon-intensive regions, and **territorial drift patterns** created by recurring configurations of these dynamics.

# CHAPTER 2

---

## TRANSITION TRAJECTORIES



## 2 Transition trajectories

The identification of the different transition trajectories relied on a process of hierarchical classification, which includes criteria of differentiation between the coal and carbon regions analyzed that are extracted from the outcomes of the Quantitative and the Qualitative stages of data analysis in WP5. Furthermore, this approach also identifies specific coal and carbon regions that illustrate the specific categories emerging from this classification. The taxonomic nomenclature that was developed to these aims specifically includes the following hierarchic taxonomic categories:

2.1. the **cluster** classification emerged from Task 5.2, i.e., the *quantitative analyses* on the empirical data collected in the five separate studies on the components of the ENTRANCES multidimensional conceptual and analytical framework. This analysis and its outputs are explained and detailed in Annex 1 (the report on the Quantitative analysis of the data).

The first stages of quantitative data analysis highlighted a set of variables that are meaningfully related to the key indicators of the adaptation to transition and of de/re-territorialization across regions. As detailed in Chapter 3 of Annex 1, these key indicators mainly pertain to the socio-economic adaptation of the region and to residents' intention to relocate. After standardizing and transforming all the relevant data collected in the different studies on each of the five components of the Multidimensional conceptual framework of ENTRANCES across the 13 regions, cluster analyses were used in order to classify the 13 regions on the basis of the communalities and differences among them on these key input variables.

The results of these analyses indicated a classification of the regions in 5 clusters or groups, represented in Figure 1. Moreover, there was a restricted set of variables that significantly contributed to this five-cluster solution, in the sense of differentiating in a substantive amount among these five clusters, namely: Exo-conflicts, Endo-conflicts, Place rootedness, Stress, Nostalgia, Economic hardship, Intention to relocate, Personal re-invention, Life satisfaction, GDP per Capita 2019, Population Change 2019/2000, Employment rate and Working across agency levels. Each cluster is characterized by specific positions on these key variables pertaining to the challenges encountered by the coal and carbon territories and the changes that they have undergone. We further classified these positions in five evaluative categories ranging from Very low to Very high, in order to facilitate the comprehension of the results. These evaluative categories reflect the comparison on that parameter between the regions included in that cluster and the entire set of 13 regions. For each cluster, there was a set of specific characteristics that emerged from the data, which reflected a (very) high or (very) low magnitude or intensity of those variables in the regions included in the cluster in comparison to the other coal and carbon regions. These specific characteristics pertaining to each cluster are also presented in Fig. 1.

Overall, this variability in terms of cluster membership represents the first dimension of classification of this first component of the taxonomy, reflecting different types of transition trajectories of the regions investigated, as well as of the significant de-territorialization factors and their impacts, as emerged from the perspective of the quantitative analyses on the empirical data.

2.2. the **common territorialization component** (Transition or Identity) shared by the regions in the respective cluster, as emerged from Task 5.2, i.e., the *qualitative analyses* in WP5. This analysis and its outputs are explained and detailed in Annex 2 (the report on the Qualitative analysis of the data).

This stage of data analysis assessed the coal and carbon regions according to two territorialization components, i.e., the *transition* component, i.e., how the local community is pursuing a purposive transformation, and the *identity* component, i.e., how the territory is being transformed in terms of identity by the combined actions of several ongoing changes that are exercising pressure on the territory. The assessment on each component reflected the previous qualitative evaluation of two out of the four territorialization elements that compose the quadripartite theoretical model of territory as a social assemblage, which includes the following territorialization elements:

**Symbols** express the singularity of a territory, the continuity between its past and its future and provide the member of the local community with life meaning and individual identity. Symbols play an important role in keeping the territory united. Albeit being a long-lasting element of the territory, symbols are not static, they can evolve over time or lose relevance and value.

The **Vision** reflects the shared interpretation of a territory and how it is expected to provide subsistence to its inhabitants. The vision also reflects the distinctive role of the territory in the broader context, including surrounding territories or higher-level regions where the territory is encased, thus the Ad-extra feature of the territory.

**Boundaries and transactions** reflect the essential feature of the territory of drafting boundaries with the outside. A territory exercises control over transactions with the outside, to some extent defend itself from undesired influences, actions or violation. The control over boundaries and transactions contributes to making the territory a safe space for its inhabitants.

**Governance** reflects rules, norms, practices and mechanisms devoted to managing internal strains & conflicts, as well as managing risks and opportunities as they arise and ensuring some form of participation of territorial actors in the decision-making process. Governance norms practices and mechanisms might be both formal and informal.

These four elements were assessed in each of the 13 regions and subsequently used in order to analyze the **transitional and identity processes** ongoing in the coal and carbon territories. Specifically, the vision and governance elements were combined for obtaining the *transition* component and two other elements - borders & transactions and symbols - for obtaining the *identity* component. The transition component refers to the process of territorial transition in which the coal and carbon territories have been engaged, defining transition as a purposive transformation of the territorial organization model. The territorial transition is not the same across different coal and carbon region, as there are different points of departure and different envisaged arrival points for the transition. Second, exposure to prolonged and profound stress means that coal and carbon territories are already experiencing a process of change in their identity, intended in two different perspectives, i.e., a) as a sense of similarity, ownership, and distinctiveness and b) as a continuity on which solidarity rests.

The assessments of the four territorialization elements were combined in the evaluation of the two territorialization components (Transition and Identity) in each region. The output of this process was

the inclusion of each of the 13 regions in a specific evaluative category (positive or negative) on each of these components. More specifically, regions with a shared interpretation of the territory in its transition pathway, and in which the territorial transition is an explicit process and is governed by specific plans, mechanisms and resources were evaluated positively on the Transition component. Alternatively, regions without a clear transition vision, or with multiple contrasting visions, and where territorial governance is fragmented, de-powered or dependent on external actors were evaluated negatively on the Transition component. On the Identity component, regions in which new boundaries or transactions are promoted directly by local actors and/or the territory retains significant negotiating power with new transactions, with new symbols that can counter past territorial stigma, at least for the local community, were evaluated positively on this component. Alternatively, regions where territorial boundaries are defined by external actors, while the territory is not able to defend or negotiate changes, where the transaction toward the territory resulted in a loss of territorial relations, and characterized by territorial stigma or erosion of past territorial symbols, with no new emerging symbols, were evaluated negatively on the Identity component. Chapters 3 and 4 of Annex 2 (the report on Task 5.3. Qualitative analysis) describes in full the content and application of this iterative classification process.

2.3. The **territorialization component** (Transition or Identity) that **differentiates** among the regions in the respective cluster, thus generating a second classification criterion of the transition trajectories among the coal and carbon regions.

Figure 1 represents the general and specific transition trajectories that emerged from the application of these complementary analyses. As described above, the first classification criterion pertains to the clusters of regions that were extracted from the quantitative analysis, and thus differentiates among five transition trajectories. This first level of classification also enumerates the specific characteristics of the regions included in the cluster, as they emerged from the quantitative analysis (i.e., as described above, the features reflecting a (very) high or (very) low magnitude or intensity of those variables in those regions in comparison to the other coal and carbon regions). Secondly, all the regions in each cluster were found to share a common evaluative type of territorialization components, i.e., positive or negative Transition or Identity, and this common component is specified as another key feature of the respective trajectory. Thirdly, in most of the cases, the other territorialization component differentiates between certain regions included in the first level of classification, thus generating a further ramification of specific transition trajectories.

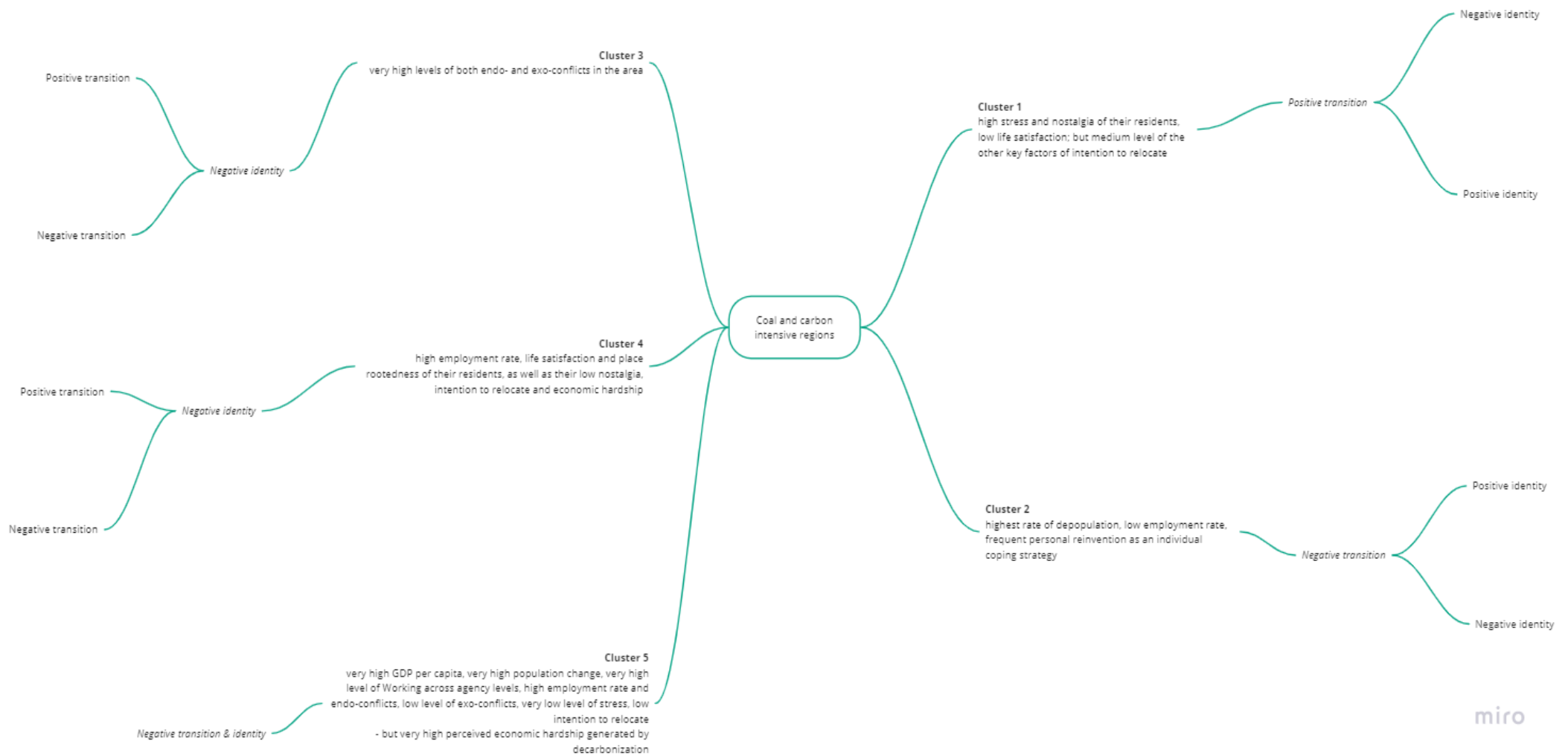


Figure 1. General and specific transition trajectories

These transition trajectories were identified inductively, from a bottom – up approach on the data collected in ENTRANCES in the 13 case studies. Nevertheless, they represent potential transition paths that are probably applicable to all the coal and carbon regions that undergo decarbonization and energy transition processes. Hereinafter we present the characteristics of each of the general and specific transition trajectories, while also mentioning the regions that emerged as being illustrative for each specific trajectory.

T1. The **first general transition trajectory** includes the following specificities of Cluster 1, as extracted from the quantitative analysis: *high stress and nostalgia of their residents, low life satisfaction*; but medium level of the other key factors of intention to relocate. The *positive* character of the *Transition* component, as emerged from the qualitative analysis, is another key general feature of this trajectory. This combination of features characterizing this general trajectory could be labeled as “*Positive regional transition coupled with psychological inadaptation*”. Furthermore, there are two specific trajectories that are generated from this general category, differentiated by the qualitative evaluation of the Identity component.

T1.a. There are two regions illustrative for the trajectory that includes *Negative identity* as another feature, together with those listed above, namely Katowice (Silesia) and Upper Nitra. In light of its overall set of specificities, i.e., high stress and nostalgia of their residents, low life satisfaction, positive Transition and negative Identity, this specific trajectory can be labeled as “*Transition misaligned with individual and collective identity*”.

T1.b. Two other regions (Krakow Metropolitan Area and Port Talbot, South Wales) are illustrative for the other specific trajectory emerged from the ramification, which were evaluated as *positive* on the *Identity* component. In light of its overall set of specificities, i.e., high stress and nostalgia of their residents, low life satisfaction, positive Transition and positive Identity, this specific trajectory can be labeled as “*Re-territorialization while struggling to personally adjust to the new development scenario*”.

T2. The **second general transition trajectory** is characterized by the specificities of Cluster 2: highest rate of depopulation, low employment rate, frequent personal reinvention as an individual coping strategy, together with negative Transition. This combination of features characterizing this general trajectory could be labeled as “*Negative regional transition*”. Furthermore, there are two specific trajectories that are then generated by the differentiation created by the second territorialization component (Identity).

T2.1. The first is characterized by a positive character of the Identity component, and the regions illustrating this trajectory are Sulcis and Brindisi. In light of its overall set of specificities, i.e., highest rate of depopulation, low employment rate, frequent personal reinvention as an individual coping strategy, negative Transition but positive Identity, this specific trajectory can be labeled as “*Unfulfilled re-territorialization*”.

T2.2. The second specific trajectory includes characterized by a negative character of the Identity component and is illustrated by the Jiu Valley coal region. In light of its overall set of specificities, i.e., highest rate of depopulation, low employment rate, frequent personal reinvention as an

individual coping strategy, negative Transition and negative Identity, this specific trajectory can be labeled as “*De-territorialization and socio-economic decline*”.

T3. The **third general transition trajectory** is characterized by the specificities of Cluster 3, namely very high levels of both endo- and exo-conflicts, together with negative Identity. This combination of features characterizing this general trajectory could be labeled as “*Heterogeneous and conflictual development*”. Furthermore, there are also two specific trajectories that are then generated by the differentiation created by the second territorialization component (Transition).

T3.1. The first specific trajectory is characterized by positive Transition, and is illustrated by Upper Styria among the coal and carbon regions analyzed. In light of its overall set of specificities, i.e., very high levels of both endo- and exo-conflicts, negative Identity but positive Transition, this specific trajectory can be labeled as “*Controversial but determined transition*”.

T3.2. Conversely, the specific trajectory characterized by negative Transition is illustrated by A Coruna. In light of its overall set of specificities, i.e., very high levels of both endo- and exo-conflicts, negative Identity and negative Transition, this specific trajectory can be labeled as “*De-territorialization and discord in envisaging and managing transition*”.

T4. The **fourth general transition trajectory** is characterized by the specificities of Cluster 4, namely high employment rate, life satisfaction and place rootedness of their residents, as well as their low nostalgia, intention to relocate and economic hardship, together with negative Identity. This combination of features characterizing this general trajectory could be labeled as “*Externally – controlled development*”. Furthermore, there are also two specific trajectories that are then generated by the differentiation created by the second territorialization component (Transition).

T4.1. The specific trajectory characterized by positive Transition is illustrated by the region of Rhineland. In light of its overall set of specificities, i.e., high employment rate, life satisfaction and place rootedness of their residents, as well as their low nostalgia, intention to relocate and economic hardship, negative Identity but positive Transition, this specific trajectory can be labeled as “*Effective but top-down driven transition*”.

T4.2. Conversely, the specific trajectory characterized by negative Transition is illustrated by Lusatia and Central Germany. In light of its overall set of specificities, i.e., high employment rate, life satisfaction and place rootedness of their residents, as well as their low nostalgia, intention to relocate and economic hardship, negative Identity and negative Transition, this specific trajectory can be labeled as “*Deferred and externally-dependent energy transition*”.

T5. The **fifth general transition trajectory** is characterized by the specificities of Cluster 5, namely very high GDP per capita, very high population change, very high level of Working across agency levels, high employment rate and endo-conflicts, low level of exo-conflicts, very low level of stress, low intention to relocate. At the same time, this cluster of features also includes a very high perceived economic hardship generated by decarbonization, together with negative Identity and Transition.

Stavanger is the only region illustrating this trajectory. In light of its overall set of specificities, this specific trajectory can be labeled as “*Delayed regional transition from a nationally profitable scenario*”.

To summarize, the trajectories and related sub-trajectories that were identified are presented in Table 1.

**Table 1. Trajectories and related sub-trajectories**

<b>General trajectories</b>	<b>Specific sub-trajectories</b>
<b>Positive regional transition coupled with psychological inadaptation</b>	Transition misaligned with individual and collective identity Re-territorialization while struggling to personally adjust to the new development scenario
<b>Negative regional transition</b>	Unfulfilled re-territorialization De-territorialization and socio-economic decline
<b>Heterogeneous and conflictual development</b>	Controversial but determined transition De-territorialization and discord in envisaging and managing transition
<b>Externally – controlled development</b>	Effective but top-down driven transition Deferred and externally-dependent energy transition
<b>Delayed regional transition from a nationally profitable scenario</b>	





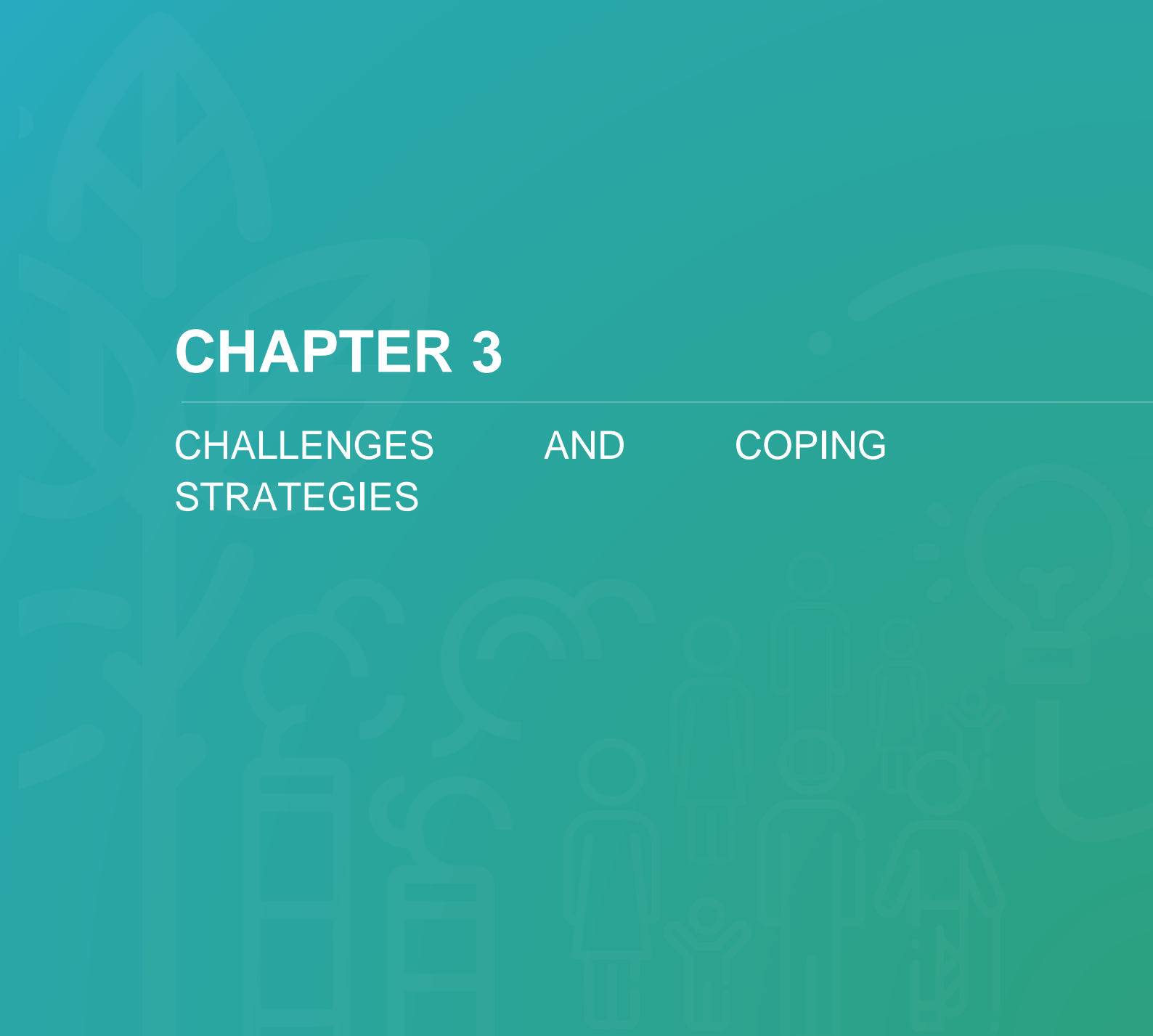
# CHAPTER 3

---

CHALLENGES  
STRATEGIES

AND

COPING



### 3 Challenges and coping strategies

The second component of the multidimensional taxonomy includes the different types of challenges met and acknowledged by the regions that illustrate each transition trajectory, and the strategies that they have implemented in the attempt to cope with these challenges. These elements were identified in Task 5.4 through the examination of the data collected in the empirical research in WP3 and WP4, of the case study and state-of-the-art reports elaborated in the previous WPs of the project, of the results of the cross-case gender analysis in WP5, and based on the inputs from the researchers working on each of the 13 case studies. All these inputs were submitted to a cross-case analysis in order to provide a descriptive inventory of the challenges identified and the strategies to cope with these challenges that have been implemented in the coal and carbon-intensive regions in transition, included in Annex 3 of the present report.

The important changes generated by the decarbonization process in these regions have been posing new challenges to local communities, acknowledged as such by the relevant policy makers. These **challenges** represent objectives that are considered to be important for the local community in order to tackle the negative impacts of a certain change generated by the decarbonization process, especially by the decarbonization policies that have been implemented and by the closure of large industrial units in the region. Moreover, these challenges have motivated policy makers, at least in some cases, to design and implement **coping strategies** in order to address these challenges. The inventory of challenges and coping strategies describes several challenges and associated coping strategies pertaining to several categories of changes, which are organized according to the multidimensional framework of the project (i.e., socio-economic, socio-technical & ecological, socio-cultural, socio-political, socio-psychological and gender – related). The inventory also includes an indication of the specific coal and carbon regions where each of the challenges has emerged (and has been acknowledged as such by the local, regional, and/or national governance), respectively of the regions where each of the coping strategies identified in the cross-cases analyses has been implemented. Consequently, each challenge was assigned to a restricted number of regions in the descriptive inventory. Furthermore, as not all the regions confronting a challenge have designed coping strategies aiming to address it, each coping strategy pertaining to that challenge was identified as implemented in a restricted number of regions.

Hereinafter we briefly present each of the challenges and their associated coping strategies that were identified (for full details on their content, please consult Annex 3).

#### **Challenge: Meet the needs of old population (health care, domestic services) and improve their quality of life.**

This challenge entails ensuring that older residents have access to the services and support they need to maintain their health, well-being, and independence, to quality healthcare, affordable housing, and transportation services that enable older residents to remain active and engaged in their communities. It is important to provide targeted support and resources to help older residents make the transition towards a low-carbon economy, such as financial assistance, training programs, and technical assistance. To address the challenge of meeting



the needs of an aging population in carbon-intensive regions, it is important to adopt a comprehensive approach that engages a range of stakeholders, including government, industry, and civil society.

**Coping strategies: Older people support by providing special urban living facilities**, in terms of comprehensive health services, energy-efficient housing (reducing energy consumption and lowering the cost of living for older people), affordable and accessible public transportation, opportunities for social interaction, such as community programs and group activities.

### **Challenge: Attracting and retaining young people**

Attracting and retaining young people in carbon-intensive regions in Europe is a challenging task, as these areas not offer the same level of job opportunities, quality of life, and cultural experiences as larger urban centers.

**Coping strategies: Provision of educational and training opportunities**, which can help young people develop the skills and knowledge needed to succeed in the workforce and contribute to their communities. This can help reduce the need for migration from carbon-intensive regions, promote economic growth, and support a more sustainable future. This general strategy can entail several specific directions, such as creating education and job opportunities, promoting entrepreneurship, developing local industries, and supporting sustainable development.

### **Challenge: Job creation**

Job creation in carbon-intensive regions in Europe can be a complex issue, as it involves balancing the need to address climate change and reduce carbon emissions with the need to support the economic well-being of these regions and their communities. One strategy to support job creation in these regions is to invest in renewable energy sources and technologies, such as wind and solar power, which can create new job opportunities in manufacturing, installation, and maintenance. Another strategy is to support the transition of carbon-intensive industries to lower-carbon technologies and processes. In addition, there are opportunities to support job creation in other sectors that are not directly related to energy production or heavy industry. For example, investing in sustainable agriculture, forestry, and tourism can create new job opportunities while also promoting environmental sustainability.

**Coping strategy: Easy access to business loans and support for self-employment**, which can help address the challenge of job creation and consequently reducing unemployment in carbon-intensive regions by fostering new businesses and thus creating job opportunities, promoting entrepreneurship, developing less carbon-intensive local industries, in areas such as renewable energy, sustainable agriculture, and eco-tourism, and stimulate economic growth.

**Coping strategy: Attracting external investments**, which can help revive the economy of carbon-intensive regions by attracting new businesses, developing new industries, upgrading infrastructure, and providing training and education opportunities. This can create new job opportunities and support economic growth, helping to build a more sustainable future.

### **Challenge: Re-industrialization and Diversifying local economy**

Diversifying local economies in carbon-intensive regions can be a complex and challenging process, requiring significant investment, coordination, and collaboration among stakeholders. It requires identifying and supporting new industries that can provide employment and economic growth while also being environmentally sustainable. It is important to involve a range of actors, including government, industry, academia, and civil society, to ensure that the diversification process is inclusive and equitable, and that it supports the needs and aspirations of local communities.

**Coping strategy: Incentives for renewable energy projects**, by providing funding and incentives for research and development of new technologies, promoting entrepreneurship and innovation, and investing in infrastructure such as renewable energy systems, energy storage, and smart grids. In addition, it may be useful to leverage existing strengths and resources in carbon-intensive regions to support the development of new industries. For example, regions with a strong mining or engineering sector may be well positioned to develop expertise in renewable energy technologies such as geothermal or wind energy.

**Coping strategy: Investment in the IT and service (tourism and catering) sectors.** Investment in the IT sector can include developing tech hubs, providing training and education opportunities in digital skills, and attracting tech companies to the region. IT jobs are often less carbon-intensive than traditional manufacturing or resource extraction jobs, making it a good option for economic diversification. Investing in the tourism sector can help revive the economy of carbon-intensive regions by promoting local attractions and cultural heritage. This strategy relies on developing infrastructure such as hotels, restaurants, and tourist facilities, and providing training and education opportunities for local residents to work in the tourism industry. Investing in the catering sector can also create new job opportunities in carbon-intensive regions, particularly in the form of restaurants and cafes. This can include developing local food production systems that can supply the catering industry with local, sustainable food products.

### **Challenge: Solve regional conflicts and strengthen collaboration**

Carbon-intensive regions are often characterized by complex social, economic, and political dynamics that can create tensions and obstacles to the transition towards a low-carbon economy. Regional conflicts can arise for various reasons, such as differences in values and priorities, conflicting interests, or historical grievances. These conflicts can make it difficult to build the consensus and cooperation necessary to develop and implement effective transition

plans. Strengthening collaboration among stakeholders in carbon-intensive regions is crucial for overcoming these challenges.

**Coping strategy: Involvement of regional governments and local stakeholders in policy making and implementation.** Regional governments are often closest to the communities and industries affected by the transition, and they can provide important insights into local perspectives, values, and priorities, and they can play an important role in facilitating dialogue and cooperation among stakeholders in carbon-intensive regions. They can help to identify shared goals and strategies for the transition, and to involve diverse groups of stakeholders in the policy-making process. In addition, regional governments can provide targeted support and resources for the development of low-carbon industries and infrastructure in their regions. This can include funding for research and development, support for training and education programs, and incentives for businesses to invest in low-carbon technologies and practices.

### **Challenge: Bridging the digital divide and human capital formation**

Bridging the digital divide and human capital formation are significant challenges for carbon-intensive regions in Europe, as these regions often face a range of social and economic barriers that can make it difficult to attract and retain highly skilled workers and to compete in an increasingly digital and knowledge-based economy. One of the main issues involved is the lack of access to high-speed internet and other digital infrastructure, which can make it difficult for businesses to operate and for individuals to access education and training opportunities. This can also exacerbate other social and economic challenges in these regions, such as a lack of job opportunities and limited access to health care and other essential services.

### **Coping strategy: Provision of broadband connection and digitalization**

To address this challenge, policymakers need to focus on investing in digital infrastructure, such as high-speed internet and other digital technologies, that can help to bridge the digital divide and create new opportunities for economic growth and human capital formation in these regions. This may involve partnering with private sector firms and other stakeholders to develop and deploy new technologies and services, as well as investing in training and education programs that can help local workers develop the skills needed to succeed in a digital economy. At the same time, it is important to recognize that human capital formation is also a key challenge in carbon-intensive regions, as many of these regions have historically been characterized by low levels of educational attainment and limited access to training and development opportunities. To address this challenge, policymakers need to focus on investing in education and training programs that can help to build a highly skilled and adaptable workforce in these regions, one that is equipped to succeed in a range of industries and to respond to changing economic and technological conditions.

### **Challenge: Preserve mining and industrial heritage**

Carbon-intensive regions in Europe have a rich history of mining and heavy industry, which has played a significant role in their economies and communities for decades or even

centuries. However, the transition to a low-carbon economy means that these regions must reduce their greenhouse gas emissions, which requires a shift away from fossil fuel-based industries such as coal mining and steel production. This transition can have significant economic and social impacts on these regions, including job losses and a decline in the local economy. Despite these challenges, there are opportunities for these regions to preserve their industrial heritage while also embracing a low-carbon future.

**Coping strategy: Investment in heritage preservation.** The transition to a low-carbon economy can pose a significant threat to this heritage, as many of the buildings, sites, and artefacts associated with the region's industrial past may be at risk of decay, neglect, or demolition. Investing in heritage preservation can help to safeguard this cultural heritage and ensure that it is passed down to future generations. This investment can take many forms, from restoring historic buildings and sites to creating museums, cultural centres, and other educational resources that celebrate the region's industrial heritage. By preserving the cultural heritage of carbon-intensive regions, we can also help to promote sustainable development and foster a sense of community pride and identity. Heritage preservation can be a catalyst for economic development and cultural tourism, creating new opportunities for businesses and creating jobs in the local economy.

### **Challenge: Valorizing local specificities**

Valorizing local specificities, or recognizing and leveraging the unique characteristics of a region, is a significant challenge for carbon-intensive regions, but also an opportunity to build a more sustainable, resilient, and prosperous future. By identifying and leveraging their unique strengths and resources, these regions can create a low-carbon economy that is tailored to their specific needs and priorities. These regions often have specific natural resources, cultural traditions, and economic structures that have been shaped by their history and geography. Transitioning to a low-carbon economy requires a fundamental shift in the way these regions produce and consume energy, which can have significant economic and social impacts. However, by valorizing their local specificities, these regions can identify new opportunities for economic development and create a more sustainable and resilient future. It is also essential to engage and empower local communities in the transition to a low-carbon economy.

**Coping strategy: Community-based cultural activities.** These activities involve local communities coming together to celebrate their shared cultural heritage and to develop new ways of promoting their unique characteristics. By involving local communities in cultural activities, they can contribute to the preservation of local traditions and help to foster a sense of community pride and identity. This can be especially important in carbon-intensive regions, where the transition to a low-carbon economy can pose significant challenges to the social fabric of the community.

### **Challenge: Control pollution and industrial waste**



Carbon-intensive regions in Europe typically have a high concentration of heavy industry, such as power generation, steel, cement, and chemicals production, which are significant emitters of carbon dioxide and other pollutants. The European Union has set strict environmental regulations to reduce emissions from these industries, such as the Industrial Emissions Directive, the Large Combustion Plant Directive, and the Waste Framework Directive. These regulations require industrial facilities to use the best available techniques to limit their emissions and to monitor and report their pollution levels. However, implementing these regulations can be challenging, especially in regions where heavy industry is a crucial source of employment and economic activity. The transition to more sustainable practices may require significant investments in new technology and infrastructure, which can be difficult for smaller, less financially stable companies. Additionally, carbon-intensive regions may face social and political resistance to these changes, as workers and communities may fear the loss of jobs and economic activity.

**Coping strategy: Force industries to cut emissions by increasing carbon prices and implement pollution control technologies.** Carbon pricing is a market-based mechanism that puts a price on carbon emissions, encouraging industries to reduce their emissions to avoid the costs of the carbon tax. This is incentivizing companies to switch to cleaner energy sources, invest in energy-efficient technologies, and reduce waste and pollution. In addition to carbon pricing, implementing pollution control technologies is also helping reduce emissions from industries. These technologies include improved processes, cleaner fuels, and better waste management. However, it is important to ensure that these measures are implemented in a way that is fair and effective, taking into account the needs and concerns of all stakeholders, including businesses, consumers, and communities.

**Coping strategy: Strict laws to punish polluting firms.** These can serve as a deterrent to companies that might otherwise prioritize profits over environmental responsibility. By imposing heavy fines, penalties, and other sanctions on polluting firms, governments can incentivize businesses to reduce their environmental impact and invest in cleaner technologies. To ensure that the extant regulations aiming to control pollution are effective, it is important for governments to have strong enforcement mechanisms in place. This can include regular inspections and audits of industrial facilities, as well as penalties and sanctions for noncompliance. Additionally, it is important for governments to work closely with businesses and industry groups to promote environmental responsibility and encourage the adoption of cleaner technologies.

### **Challenge: Rehabilitation of land**

Rehabilitation of land is a significant challenge for carbon-intensive regions as they often have a long history of heavy industrial activity, which can leave behind contaminated and degraded land that requires remediation. Remediating contaminated land can be a complex and expensive process that requires specialized knowledge and resources. In some cases, the contamination may be so severe that the land cannot be rehabilitated at all, which can limit future economic and development opportunities. Furthermore, the transition to more sustainable practices in these regions may require the repurposing of former industrial land for

other uses, such as renewable energy production or green spaces. However, this can also be a challenge, as there may be competing interests and conflicting land-use demands.

**Coping strategy: Conversion of mine pits to freshwater lakes or recreation parks.** These can help restore some of the natural features of the landscape and provide a new habitat for local wildlife. In addition to providing environmental benefits, the conversion of a mine pit to a recreational area can also provide social and economic benefits, as these sites can be used for a variety of recreational activities, which can provide opportunities for local communities to engage in outdoor activities and promote tourism in the area. However, it is important to ensure that the conversion of a mine pit to a recreational area is done in a responsible and sustainable manner.

### **Challenge: Ensure water quality and availability**

Industrial and agricultural activities can generate water pollution through the discharge of chemicals and pollutants into waterways. These contaminants can have serious health and environmental impacts, such as harmful algal blooms, fish kills, and drinking water contamination. Furthermore, carbon-intensive regions may also face challenges related to water availability, particularly in areas with low rainfall or high demand for water. Climate change is expected to exacerbate these challenges, with changing precipitation patterns and more frequent droughts. To address these challenges, the European Union has set strict regulations on water quality and the management of water resources. However, ensuring water quality and availability in carbon-intensive regions requires ongoing monitoring and management, as well as investments in water treatment infrastructure and sustainable water use practices, and collaboration between industry, agriculture, government, and local communities.

**Coping strategy: Installation of water treatment plants.** Water treatment plants can be designed to remove contaminants from water sources and make them safe for human consumption and other uses. However, it is important to note that water treatment plants can be expensive to install and maintain, and they may not always be the most sustainable or long-term solution to water problems in mining areas. In some cases, it may be more effective to focus on reducing the amounts of pollutants released into water sources in the first place, through measures such as improved mining practices and waste management.

### **Challenge: Combating infrastructural peripheralization**

Infrastructural peripheralization refers to the marginalization of regions that are geographically distant from urban centres or that lack adequate infrastructure to support economic development. In carbon-intensive regions, this can be a particular challenge, as heavy industry is often concentrated in specific geographic areas, which can lead to a concentration of economic activity in those areas, while other regions may be left behind. This can create economic and social disparities between regions, as well as environmental impacts related to transportation and infrastructure development. To address infrastructural peripheralization,



governments and policymakers need to prioritize investments in infrastructure, including transportation, energy, and telecommunications networks, in a coordinated approach that involves multiple stakeholders, including industry, local communities, and government. It also requires a long-term perspective that looks beyond short-term economic gains and considers the social and environmental impacts of infrastructure development.

**Coping strategy: Investments in infrastructure.** Investing in transportation infrastructure, such as roads, railways, and ports, can improve connectivity and make it easier for businesses to transport goods and people. Expanding energy infrastructure, such as building new power plants, transmission lines, and distribution networks, can help to improve the availability and reliability of energy resources. Promoting public-private partnerships can help to attract private investment in infrastructure projects, while also ensuring that projects are aligned with public policy goals.

### **Challenge: Prevent displacement of local population**

Preventing displacement of local populations in carbon-intensive regions can be a complex and challenging task, as it involves addressing a range of social, economic, and environmental issues. The transition to a low-carbon economy can have significant impacts on local populations, particularly those who are employed in carbon-intensive industries. These workers and their families may face the risk of displacement, job loss, and economic disruption.

**Coping strategy: Invest in renewable energy and low-carbon industries.** Transitioning to renewable energy and low-carbon industries can help to reduce the carbon footprint of the region while also creating new employment opportunities for local populations. This can help to reduce the economic reliance on carbon-intensive industries and reduce the risk of displacement.

**Coping strategy: Provide education and training.** Providing education and training programs can help local populations acquire the skills and knowledge they need to transition to new industries and job opportunities. This can help to reduce the risk of displacement by ensuring that local populations have the skills needed to participate in the new low-carbon economy.

**Coping strategy: Engage with local communities.** Engaging with local communities can help to build trust and understanding, and ensure that the needs and concerns of local populations are taken into account in decision-making processes. This can help to reduce the risk of displacement by ensuring that the transition to a low-carbon economy is done in a way that is equitable and inclusive.

### **Challenge: Increase participation of women in the transition process (policy making and implementation)**

Increasing the participation of women in the energy transition process is a big challenge. Women are underrepresented in the energy sector, both in terms of employment and

leadership positions. This gender gap is particularly pronounced in the fields of science, technology, engineering, and math (STEM), which are critical for driving the energy transition. One major barrier to women's participation in the energy transition is societal norms and gender biases that limit women's access to education and employment opportunities. Another challenge is the lack of role models and mentors for women in the energy sector, which can make it difficult for them to envision themselves as leaders in this field. Women also tend to have less access to networks and resources that can help them succeed in the energy industry.

**Coping strategy: Quota for women in policy making and jobs in renewable sector.** In terms of policy making, quotas for women can help to ensure that diverse perspectives and experiences are represented in decision-making processes, which can lead to more inclusive and effective policies. This can be particularly important in the context of climate change and the transition to a low-carbon economy, which will require a range of perspectives and expertise to address complex challenges. In the renewable sector, quotas for women can help to address gender disparities in employment and ensure that women have equal opportunities to participate in the transition to a low-carbon economy.

**Coping strategy: Involvement of women in the implementation of green energy projects.** Firstly, women can bring unique perspectives and experiences to the development and implementation of green energy projects, which can lead to more inclusive and effective solutions. Secondly, involving women in green energy projects can help to address gender disparities in employment and promote gender equality. This can help to build a more diverse and inclusive workforce, which is essential for creating sustainable and resilient communities. Finally, the involvement of women in green energy projects can help to promote women's empowerment and support the development of women's leadership skills. This can help to address broader issues of gender inequality and promote greater social and economic inclusion. Additionally, efforts should be made to promote women's participation in training and education programs related to green energy, as well as to provide mentorship and leadership development opportunities for women in the sector.

To summarize, the challenges and associated coping strategies that were identified are presented in Table 2.

**Table 2. Challenges and associated coping strategies**

Challenges	Coping strategies
<b>Meet the needs of old population (health care, domestic services) and improve their quality of life.</b>	Older people support by providing special urban living facilities
<b>Attracting and retaining young people</b>	Provision of educational and training opportunities
<b>Job creation</b>	Easy access to business loans and support for self-employment
	Attracting external investments
	Incentives for renewable energy projects

<b>Re-industrialization and Diversifying local economy</b>	Investment in the IT and service (tourism and catering) sectors
<b>Solve regional conflicts and strengthen collaboration</b>	Involvement of regional governments and local stakeholders in policy making and implementation
<b>Bridging the digital divide and human capital formation</b>	Provision of broadband connection and digitalization
<b>Preserve mining and industrial heritage</b>	Investment in heritage preservation
<b>Valorizing local specificities</b>	Community-based cultural activities
<b>Control pollution and industrial waste</b>	Force industries to cut emissions by increasing carbon prices and implement pollution control technologies Strict laws to punish polluting firms
<b>Rehabilitation of land</b>	Conversion of mine pits to freshwater lakes or recreation parks
<b>Ensure water quality and availability</b>	Installation of water treatment plants
<b>Combating infrastructural peripheralization</b>	Investments in infrastructure
<b>Prevent displacement of local population</b>	Invest in renewable energy and low-carbon industries Provide education and training Engage with local communities
<b>Increase participation of women in the transition process (policy making and implementation)</b>	Quota for women in policy making and jobs in renewable sector Involvement of women in the implementation of green energy projects

# CHAPTER 4

---

## DYNAMICS AND PATTERNS OF DE/RE- TERRITORIALISATION



## 4 Dynamics and patterns of de/re-territorialisation

The third component of the multidimensional taxonomy includes the different **dynamics** of the de/re-territorialisation process ongoing in coal and carbon-intensive regions, and the **territorial drift patterns** created by recurring configurations of these dynamics. These elements were identified in Task 5.3, through the qualitative analysis of the data collected in the empirical research, and of the state of the art and the case study reports of each of the regions included in the analysis.

### 1.3 Recurring Territorial Dynamics

The results of the qualitative comparative analysis of the 13 regions led to the identification of a set of recurring dynamics of the de/re-territorialization process ongoing in coal and carbon-intensive regions. We focused mostly on “critical dynamics”, meaning dynamics that constitute weaknesses or limits of the current territorialization processes. This critical approach allows us to single out aspects that might be relevant to orient policy and actions toward “territory making”. The dynamics have been identified by combining a deductive and an inductive approach. We used the lenses of the four elements of territorialization detailed above (vision, governance, boundaries & transactions, and symbols, composing the quadripartite theoretical model of territory as a social assemblage) to observe the dynamics of each case; then we singled out the recurring dynamics in an inductive fashion. The list of dynamics presented below, thus, does not exhaust all the possible dynamics ongoing in coal and carbon territories across Europe. However, given the internal diversity of the regions surveyed by ENTRANCES and their recurring feature, the list of dynamics presented here are certainly relevant for any policy oriented toward territory-making in European coal and carbon territories. The dynamics described above have been singled out across the 13 coal and carbon territories considered as case studies by ENTRANCES. It is worth mentioning that not all the dynamics apply to all the cases. Some dynamics are present in almost all cases, while some of them are present in only a few cases.

Hereinafter we present each of the territorial dynamics identified (for full details on their elaboration, please consult Annex 2, which also presents the set of coal and carbon regions that were singled out as relevant for each specific dynamic).

#### Dynamics related to the vision

**Old-time nostalgia.** A common dynamic that was identified in the research is an interpretation of the territory characterized by old-time nostalgia, in which the present territorial condition is persistently and negatively compared with a positively idealized past. Old-time nostalgia assumes different forms in coal and carbon-intensive regions, such as mining nostalgia, coal-fired nostalgia, and smokestack nostalgia. This dynamic was identified in several of the coal and carbon territories analyzed in ENTRANCES.

**Skepticism about the dominant vision(s).** The visions of territorial transition of coal and carbon territories are often developed or pushed by actors at the regional or national level. In some cases, there is widespread skepticism about the proposed visions for the territory. Such visions are often seen as too radical, or unrealistic. This dynamic is particularly strong in cases

where several failed or unfulfilled plans and visions were proposed over time, and when there is an exogenous-driven vision.

**Conflicting visions.** Some coal and carbon territories are characterized by conflicting visions on what direction the territory should take in its transition path. We refer here to cases where different visions are in overt conflict with each other, meaning that there are public disputes about the future of the territory. Many of the conflicting visions singled out in the research are related to the clean energy transition and the coal phase-out as opposed to the well-established path of reliance on coal and carbon-intensive industries as a pillar of the local economy.

**Ambivalent vision.** In some other cases, the conflicts are latent and not addressed. In these cases, different visions of the territory (e.g., a relaunch of carbon-intensive industries and the broader development of tourism) are considered compatible with each other, but, as a matter of fact, they enter into conflict with each other. When two or more visions are in a latent conflict, the territory lives a condition of deep ambivalence, which hinders the possibility to take action in one direction or the other.

**Exogenous-driven vision.** Often the transition vision for the coal and carbon territories across Europe is driven by the policy agenda at the European, national and regional levels. In most cases, such an agenda is linked to the target of climate neutrality and the national plan for coal phase-out. The research has shown that despite stakeholder consultations the transitional vision for the coal and carbon territories is often perceived as exogenous, i.e., imposed on the territory by external actors. This is also due to the lack of representativeness of the traditional and stakeholders of the population at large. It is worth noticing that this dynamic was also common in the cases where a Territorial Just Transition Plan should be developed as a prerequisite for the grant of Just Transition Funds. In some cases,

**Endogenous-driven vision.** In some coal and carbon territories, a new transitional vision emerges directly from within the territory. In the window of regions that the ENTRANCES project has studied, it seems that these endogenous visions are more likely to emerge in the later stage of transition – such as those of acceleration or stabilisation of change, in which the policy input is less at the centre and where there is more room to creative territory making promoted by local actors. The research also shows that the emergence of emerging vision is easier in the urban territories, in which the territory is identified with just one administrative unit, rather than in the coal and carbon territories which are composed of a sum of different towns or cities.

## Dynamics related to governance

**Fragmentation or division in local governance.** In some cases, coal and carbon territories are composed of several municipalities sharing a common territorial stake. The research has shown that in many cases such municipalities are unable to pursue common objectives or to cooperate for coping with common territorial challenges. The fragmentation of the governance across different municipalities – each of them pursuing its small-scale objectives – was found among the key dynamics hindering the development of common territorial governance.

Similarly, in other cases, when the territory is split into a major city and its surrounding, it was found that the governance is divided between the urban centre and its surrounding, as they pursue different and uncoordinated objectives. The efforts to overcome these divisions, such as through the establishment of governance at the level of the metropolitan area, were found to be challenging.

***Depowering of territorial institutions/regionalization.*** Many coal and carbon territories across Europe have been affected by an overall trend of depowering or even dismantlement of territorial institutions (e.g., local administrative units encompassing different municipalities, or small regional units), in favour of broader regional units, which increasingly incorporate powers and competencies once attributed to lower regional levels. Such depowering includes a wide range of aspects, such as budget cuts, and loss of competencies. This dynamic is bolstered by “reform populism”, which emphasizes the need to cut expenses considered inefficient and to some extent useless. This dynamic, which was found among several of the coal and carbon territories analysed by ENTRANCES, is also a key factor hindering the effectiveness of their territorial transition as territorial governance is increasingly distanced from the perspective of the territory.

***Dependence on national or private decision-making.*** Coal and carbon territories as bearers of national strategic assets have developed over decades and in some cases centuries a privileged relationship with national governments. If this relationship means special attention and access to national resources, it also means that key decisions on the territory are taken at the national level. After the privatisation of coal mining and carbon-intensive industries, that was introduced in the 90s across Europe, coal and carbon territories are increasingly dependent also on the strategic decisions of private international actors (such as steel or energy companies). The result of this dependence is a reduced capacity to orient and steer the territorial transition by the local actors.

***Discontinued territorial transition plans.*** The territorial transition plans of coal and carbon territory are in some cases discontinued, due to changes in political priorities (including change of ruling parties) or to changes in the socio-economic and socio-political landscape. Discontinued transition plans are among the key dynamics determining a breakdown or a stall of the territorial transition process in coal and carbon territories.

***Administrative and financial barriers to participation.*** In several coal and carbon territories, even when a robust governance structure is being developed, there are some administrative and financial barriers to participation. Many regional transition plans rely on bottom-up proposals and funding schemes, but these schemes require administrative and financial capacities that few actors possess. This tends to generate a barrier to participation to a broader set of actors, especially those active at the territorial or community level.

***Uncertainty in a volatile environment.*** The rapid ongoing change, including European target toward climate neutrality, national coal phase-out plans, and the volatility of the energy market connected with the Russian war in Ukraine, have even increased the uncertainty of the coal and carbon territories hindering the capacity to design and implement territorial transition plans.



**Bottom-up decision-making/participation.** Maybe due to all the dynamics presented above, only in a few cases, we have observed the emergence of bottom-up governance or genuine participatory processes in coal and carbon territories in transition. From what has been observed in the ENTRANCES project, this dynamic is more likely to occur in cases where the territorial transition is in a later stage when political input is weaker, and the overall context is more stabilised and less unstable.

### **Dynamics related to boundaries and transactions**

**Increasing urban-rural divide.** In some coal and carbon territories, there is an increasing urban-rural divide, where the main urban centre is attracting people and investments and diversifying its economy, while the surrounding towns – which are still dependent on coal mining and carbon-intensive industries – are lagging.

**Rejection of private or public investments.** The research has shown that Coal and carbon territories are the targets of several public and private financial investments. Some coal and carbon territories exercise control over such investments as they have shown the capacity to block or reject undesired investments when such investments are considered or perceived as disadvantageous transactions, harmful (e.g., for local landscape) or territorial encroachment. In the cases studied in ENTRANCES, such rejected investments include renewable energy plants, infrastructures (bridges, roads), accommodation structures and others.

**Unbalanced disinvestments from coal mining and carbon-intensive industries.** While Coal and carbon territories are targets of investments (see above), the research has shown they are also targets of huge disinvestments in coal mining and carbon-intensive sectors. This kind of disinvestment is a decades-long trend that appears across Europe that is now enhanced by climate policies. Such disinvestments are only partially compensated by public transfer and subsidies, and, only in a few cases, they have been compensated by equal investments in sectors able to support local employment and territorial development. We have interpreted this dynamic as a loss of control over territorial transactions.

**Loss of territorial facilities.** Another common dynamic found in some coal and carbon territories is the loss of territorial facilities, e.g., local libraries, kindergartens, small shops, schools, etc. This loss is connected with the de-funding of public institutions and local authorities, raising estate prices, and the concurrency of multinational or national companies building big commercial centres in the city outskirts.

**Weakening of transaction management via national actors.** Coal and carbon territories have often developed a privileged relationship with the national government, that allowed them to negotiate territorial transactions with national actors. This is reflected in the availability of funds, special rules (e.g., the establishment of special economic zones), compensation subsidies etc. However, the research has shown that the negotiation power of coal and carbon territories with the national state of many coal and carbon territories has declined over the last two decades. In many territories analysed by ENTRANCES, a low capacity to manage transactions was particularly visible in the energy transition plans, including the development of Territorial Just Transition Plans.



***Territorial override.*** Many coal and carbon territories are experiencing a progressive loss of control over their territorial transactions. Larger actors, such as supra-national organisations, national governments, and international enterprises are increasingly overriding the capacity of the territory to select and negotiate exchange with the outside.

***Youth out-migration.*** One of the more common dynamics in coal and carbon territories is youth out-migration. This outmigration was found to be due to several factors, not only linked to the economy or employment opportunities but also to lifestyle, education opportunities and territorial services offered by other territories, e.g., regional or national capitals. This dynamic was found to be relevant in most of the coal and carbon territories analysed in the research.

***In-migration.*** While most coal and carbon territories suffer from youth outmigration (see above), few others, mostly those that are large cities, are on the contrary experiencing a rapid population increase due to immigration. Large immigration and growing population in the city and its surroundings is a dynamic that challenges the tenure of the endurance of territorial boundaries.

***Defense of territorial boundaries.*** Some coal and carbon territories are actively defending the physical, social and economic boundaries of the territories. In the cases analysed by ENTRANCES such defense takes different forms, such as controlling the access to the territory of people (e.g., by limiting the access to a city with cars); providing some advantages only to those internal to the territories (e.g., the establishment of special economic zones, targeted benefits to those living in the territories); negotiating the distribution of compensation funds to all the inhabitants rather than only to some categories (e.g., also to professionals and SMEs operating in the area, rather than only to workers that lost their jobs).

## **Dynamics related to symbols**

***Territorial Stigma.*** A territorial stigma – i.e., a detrimental collective representation – is attached to many coal and carbon territories across Europe. Depending on the cases, coal and carbon territories are represented as unsafe and polluted, economically backward, irremediably disorganised, or morally dissolute, with all these representations present in some of the cases. In some cases, the territorial stigma was reinforced by a stigma on coal (or oil) which is increasingly perceived as a dirt and immoral product. Territorial stigma was found to be perpetrated depending on the case from the outside or from the inside, and in some cases from both the outside and the inside. Through territorial stigma, external actors distance and detach themselves from the territory. These cancerous representations also trigger acceptance of unfavorable situations and inaction within the territory. Territorial stigma was found across several of the coal and carbon territories analyzed in ENTRANCES.

***Active countering of territorial stigma.*** In some cases, coal and carbon territories are actively countering the stigma attached to them. The countering of the stigma might be focused both on changing the factual circumstances that were at the basis of territorial stigma (e.g., extreme pollution) and promoting a counter representation of the stigma. Active countering of territorial stigma was found only in some of the 13 coal and carbon territories analyzed by ENTRANCES.

**Persistence of Coal and Carbon territorial symbols.** Coal and carbon territorial symbols are present in several if not all the coal and carbon territories analysed. Coal and carbon territorial symbols might be physical places, buildings or structures, events in local history, local heroes, etc. Some coal and carbon territories still rely mainly on coal and carbon symbols with no other symbols in local memory or no new symbols emerging now.

**Re-interpretation of coal symbols.** In some coal and carbon territories, traditional coal symbols are reinterpreted following some transformations in the organization of socio-economic activities in the territory. In some cases, coal mining and carbon-intensive industries' structures have been re-used in other sectors such as culture, tourism, R&I, and others, allowing rejuvenation and a reinterpretation of the related territorial symbols.

**The emergence of new territorial symbols & myths.** In some cases, new territorial symbols and myths emerged in recent years. In the cases analyzed in ENTRACES, such symbols are often linked to attractive places or local events as mirrors of new economic activities in the tourism and culture sectors.

**Other traditional territorial symbols & myths.** Some coal and carbon territories rely also on other territorial symbols and myths such as symbols from the territory's ancient past, symbols linked to worker rights movements, or myths of special features or skills attributed to local people.

To summarize, the recurring territorial dynamics that were identified are presented in Figure 2.

Figure 2. Recurring territorial dynamics

**Dynamics related to the vision**

- Old-time nostalgia
- Skepticism about the dominant vision(s)
- Conflicting visions
- Ambivalent vision
- Exogenous-driven vision
- Endogenous-driven vision

**Dynamics related to governance**

- Fragmentation or division in local governance
- Depowering of territorial institutions/regionalization
- Dependence on national or private decision-making
- Discontinued territorial transition plans
- Administrative and financial barriers to participation
- Uncertainty in a volatile environment
- Bottom-up decision-making/participation

**Dynamics related to boundaries and transactions**

- Increasing urban-rural divide
- Rejection of private or public investments
- Unbalanced disinvestments from coal mining and carbon-intensive industries
- Loss of territorial facilities
- Weakening of transaction management via national actors
- Territorial override
- Youth out-migration
- In-migration
- Defense of territorial boundaries

**Dynamics related to symbols**

- Territorial Stigma
- Active countering of territorial stigma
- Persistence of Coal and Carbon territorial symbols
- Re-interpretation of coal symbols
- The emergence of new territorial symbols & myths
- Other traditional territorial symbols & myths

## 1.4 Territorial Drift Patterns

The dynamics presented above, combined with each other, produce very different situations. However, it is possible to identify some patterns created by recurring configurations of these dynamics. During the analysis, the main focus has been on critical situations, which we might call "potential territorial drifts." We refer here to detrimental transformation in the territory that might occur if no concrete actions are undertaken to counter, balance or guide the ongoing territorial trends. The territorial drift patterns have been identified inductively based on the cases analyzed by ENTRANCES. The list of paths identified, therefore, does not exhaust all the possible types of territorial drift patterns for coal and carbon territories but reflects only the patterns identified during the research.

Hereinafter we present each of the territorial drift patterns identified (for full details on their elaboration, please consult Annex 2).

**Peripheralization.** Some coal and carbon territories are experiencing or might experience a peripheralization path. In these cases, the coal and carbon territories are increasingly framed as functional to the interests of other "centres" (being geographical or economic centres), e.g., they are increasingly exploited as the workbench of other successful regions or international private actors. The territories that are facing this potential territorial drift pattern are losing their character of "centre", which attracts people and offers a territorial dimension of its own. This feature is often reflected in transport infrastructures, which connect the coal and carbon territory to regional and national centres but have weak internal connections. This is also reflected in a loss of territorial facilities in favor of big commercial sites in the outskirts. The research has shown that in the territories on a path of peripheralization critical choices for territorial development are taken by national, state or regional actors or even by the national or international private actors investing in the area.

**Absorption or incorporation.** For some of the cases, there is the risk that the distinctive features of the regions are lost and that their increasingly looser boundaries might dissolve into those of other territories. In the cases with these territorial drift patterns, similarly, with the peripheralization path, key decisions are taken by state or regional actors or by private investors, but differently from that path, there are low prospects for the preservation of the distinctive traits of the territory – i.e., coal mining and carbon-intensive industry.

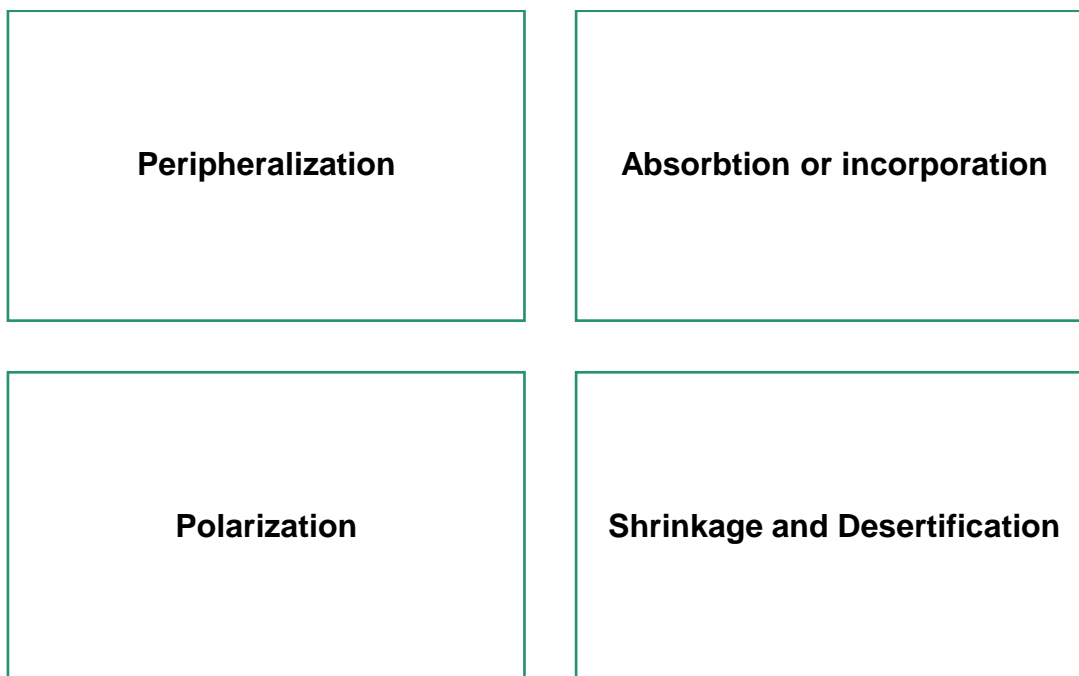
**Polarization.** In some cases, the coal and carbon territory is being polarized between urban and rural areas. While the urban centres have already differentiated their economy, the surrounding rural areas are still highly dependent on coal extraction and carbon-intensive activities, which, in turn, are increasingly becoming less profitable and sustainable. The coal and carbon territories once relying on the urban-rural interaction and common strategies and plans, are thus taking different directions, with an increasing appeal of urban centres, and an increased marginalization of the rural areas. While in some cases, the risk of peripheralization is being countered through the establishment of specific institutions – such as the Metropolitan Areas, it is still to be understood whether these strategies will work or not.

**Shrinkage and Desertification.** Finally, some coal and carbon territories might potentially be on a path of shrinkage and desertification. In these cases, no main actions have been undertaken to counter the losses determined by the interruption of coal mining or carbon-

intensive industries. Without viable alternatives or the capacity to attract investments, these territories risk severe depopulation or even abandonment.

To summarize, the recurring drift patterns that were identified are presented in Figure 3.

**Figure 3. Territorial Drift Patterns**





# ENTRANCES

ENergy TRANsitions from Coal and carbon: Effects on Societies

## Annex 1 - Quantitative analysis



ENTRANCES

ENergy TRANsitions from Coal and carbon: Effects on Societies

## Authors

Andrei Holman (Alexandru Ioan Cuza University of Iași, Romania)  
Simona Popușoi (Alexandru Ioan Cuza University of Iași, Romania)

**Contributor:** Ștefan Boncu (Alexandru Ioan Cuza University of Iași, Romania)

We gratefully acknowledge the valuable contribution to the research we received from all the participants of the focus group, the in-depth interviews, and the online survey. All choices and interpretations in the current text, are, however, our own responsibility.

## Contact

Alexandru Ioan Cuza University of Iasi, Romania (UAIC)  
Andrei Holman  
Email: [andrei.holman@uaic.ro](mailto:andrei.holman@uaic.ro)  
Website: [www.uaic.ro](http://www.uaic.ro)

This report is delivered in the framework of the European Commission H2020 funded project - ENergy TRANSitions from Coal and carbon: Effects on Societies - ENTRANCES, G.A. 883947.

Work Package 5: Comparative analysis  
Lead Organisation: Alexandru Ioan Cuza University of Iași, Romania

### **ENTRANCES project**

Project coordinator: Ricardo García Mira (University of A Coruna, Spain)  
Project email: [info@entrancesproject.eu](mailto:info@entrancesproject.eu)  
Project website: <https://entrancesproject.eu/>

## Index of Figures

Figure 1. Strain situations within each coal case study .....	10
Figure 2. Areas of change occurrences within each coal case study .....	11
Figure 3. Strain situations within each carbon case study .....	12
Figure 4. Areas of change occurrences within each carbon case study .....	13
Figure 5. Strain situations between each coal case study .....	14
Figure 6. Areas of change occurrences between each coal case study .....	15
Figure 7. Strain situations between each carbon case study .....	16
Figure 8. Areas of change occurrences between each carbon case study .....	17
Figure 9. Place attachment between the coal intensive regions .....	18
Figure 10. Resilience and optimism levels between the coal-intensive regions .....	19
Figure 11. Decarbonization impact levels between the coal-intensive regions .....	19
Figure 12. Coping strategies between the coal-intensive regions .....	20
Figure 13. Life satisfaction levels between the coal-intensive regions .....	20
Figure 14. Place attachment levels between the carbon-intensive case studies .....	21
Figure 15. Resilience and optimism between the carbon-intensive case studies .....	22
Figure 16. Decarbonization impacts levels between the carbon-intensive case studies .....	22
Figure 17. Coping strategies levels between the carbon-intensive case studies .....	23
Figure 18. Life satisfaction levels between the carbon-intensive case studies .....	23
Figure 19. The ratios of each coded socio-political factor within the coal-intensive case studies ..	26
Figure 20. The ratios of Exclusion: from access to benefits of decarbonization within the coal-intensive case studies .....	27
Figure 21. The ratios of uneven corporation within the coal-intensive case regions .....	28
Figure 22. The ratios of Polarisation: stigmatization vs idea of progress within the coal-intensive case regions .....	28
Figure 23. The ratios of Segregation: "de-facto" barriers to access decarbonization advantages within the coal-intensive case regions .....	29
Figure 24. The ratios of Centralization: higher regional dependence on the center within the coal-intensive case regions .....	30
Figure 25. The ratios of Countersignification: claim for a just transition within the coal intensive case regions .....	31
Figure 26. The ratios of Counterdelegation: negotiating clean coal technology within each coal-intensive regions .....	32
Figure 27. The ratios of Antisignification: rejecting and denial of decarbonization within the coal-intensive regions .....	33
Figure 28. The ratios of each coded socio-political factor within the carbon-intensive case studies .....	34
Figure 29. The ratios of Exclusion: from access to benefits of decarbonization within the carbon-intensive case studies .....	36
Figure 30. The ratios of uneven corporation within the carbon-intensive case regions .....	37
Figure 31. The ratios of Polarisation: stigmatization vs idea of progress within the carbon-intensive case regions .....	37
Figure 32. The ratios of Segregation: "de-facto" barriers to access decarbonization advantages within the carbon-intensive case regions .....	38



Figure 33. The ratios of Centralization: higher regional dependence on the center within the carbon-intensive case regions .....	39
Figure 34. The ratios of Countersignification: claim for a just transition within the carbon- intensive case regions .....	40
Figure 35. The ratios of Counterdelegation: negotiating clean coal technology within each carbon-intensive regions.....	41
Figure 36. The ratios of Antisignification: rejecting and denial of decarbonization within each carbon-intensive regions.....	42
Figure 37. The ratios of Exclusion: from access to benefits of decarbonization between the coal-intensive case studies.....	43
Figure 38. The ratios of uneven corporation between the coal-intensive case regions .....	44
Figure 39. The ratios of Polarisation: stigmatization vs idea of progress between the coal-intensive case regions .....	44
Figure 40. The ratios of Segregation: "de-facto" barriers to access decarbonization advantages between the coal-intensive case regions.....	45
Figure 41. The ratios of Centralization: higher regional dependence on the center between the coal-intensive case regions .....	46
Figure 42. The ratios of Countersignification: claim for a just transition between the coal intensive case regions .....	47
Figure 43. The ratios of Counterdelegation: negotiating clean coal technology between coal-intensive regions.....	47
Figure 44. The ratios of Antisignification: rejecting and denial of decarbonization between each coal-intensive regions.....	48
Figure 45. The ratios of Exclusion: from access to benefits of decarbonization between the carbon-intensive case studies.....	49
Figure 46. The ratios of uneven corporation between the carbon -intensive case regions.....	49
Figure 47. The ratios of Polarisation: stigmatization vs idea of progress between the carbon-intensive case regions .....	50
Figure 48. The ratios of Segregation: "de-facto" barriers to access decarbonization advantages between the carbon-intensive case regions .....	51
Figure 49. The ratios of Centralization: higher regional dependence on the center between the carbon-intensive case regions.....	51
Figure 50. The ratios of Countersignification: claim for a just transition between the carbon-intensive case regions .....	52
Figure 51. The ratios of Counterdelegation: negotiating clean coal technology between the carbon-intensive regions.....	52
Figure 52. The ratios of Antisignification: rejecting and denial of decarbonization between the carbon-intensive regions.....	53
Figure 53. GDP 2018 per Capita relative to EU28 between the coal-intensive case studies .....	54
Figure 54. Population in PAR in 2019 relative to 2000 between the coal-intensive case studies...	55
Figure 55. The comparison between the population changes of the coal-intensive region and that of the country .....	56
Figure 56. Population changes in the coal-intensive regions relative to population change in the country from 2000.....	57
Figure 57. GDP 2018 per Capita relative to EU28 between the carbon-intensive case studies .....	57

Figure 58. Population in PAR in 2019 relative to 2000 between the carbon-intensive case studies .....	58
Figure 59. The comparison between the population changes of the carbon-intensive region and that of the country .....	59
Figure 60. Population changes in the carbon-intensive regions relative to population change in the country from 2000.....	60
Figure 61. Inclusive and multiform governance between the coal-intensive case studies.....	61
Figure 62. Transformative leadership between the coal-intensive case studies .....	62
Figure 63. Empowered communities of practice between the coal-intensive case studies .....	62
Figure 64. System awareness between the coal-intensive case studies .....	63
Figure 65. Sustainability foresight between the coal-intensive case studies.....	64
Figure 66. Diverse community - based experimentation with disruptive solutions between the coal-intensive case studies.....	64
Figure 67. Innovation embedding and coupling between the coal-intensive case studies.....	65
Figure 68. Reflexivity and social learning between the coal-intensive case studies.....	65
Figure 69. Working across human agency and political-administrative levels between the coal-intensive regions.....	66
Figure 70. Inclusive and multiform governance between the carbon-intensive case studies .....	67
Figure 71. Transformative leadership between the carbon-intensive case studies .....	67
Figure 72. Empowered communities of practice between the carbon-intensive case studies .....	68
Figure 73. System awareness between the carbon-intensive case studies .....	68
Figure 74. Sustainability foresight between the carbon-intensive case studies.....	69
Figure 75. Diverse community - based experimentation with disruptive solutions between the carbon-intensive case studies.....	69
Figure 76. Innovation embedding and coupling between the carbon-intensive case studies. ....	70
Figure 77. Reflexivity and social learning between the carbon-intensive case studies .....	70
Figure 78. Working across human agency and political-administrative levels between the carbon-intensive regions.....	71
Figure 79. Causal paths between variables.....	92
Figure 80. Cluster description .....	102

## Index of Tables

Table 1. Cluster distribution and distance .....	99
Table 2. Distances between Final Cluster Centers.....	<b>Erro! Marcador não definido.</b>
Table 3. ANOVA .....	<b>Erro! Marcador não definido.</b>
Table 4. Cluster description .....	99

# CHAPTER 1

---

## INTRODUCTION

# 1 Introduction

The quantitative analysis in WP5 integrates and further develops the primary analysis conducted on each region during the previous two WPs. The main objectives of the activities in this task are to provide:

1. an assessment of the indicators pertaining to each of the six dimensions identified in WP1 at the overall level, which would offer an overview of the current state of affairs in what regards the socio-economic, socio-technical, socioecological, socio-cultural, socio-political and socio-psychological changes and challenges, as well as the gender – relevant dynamics of change in these regions. Moreover, these activities will identify the regions that are most affected in each of the social areas under scrutiny, as well as an overview of the variations of the magnitude of the deterritorialization process across regions. To this aim, the first stage of the data analyses in this task develops a descriptive and comparative analysis between regions on each of the variables collected in the research on all the five components of the ENTRANCES multidimensional conceptual and analytical framework.

2. the identification of the communalities or regularities in these changes across regions. To this aim, the second stage of the data analyses in this task examines the relationships between the variables measured in the five empirical studies in the 13 regions under scrutiny, which provides an empirical-based assessment of these communalities, and also highlights a pattern of association between certain key variables pertaining to various analytical dimensions, suggesting specific routes of influence between the factors, challenges and changes across the whole set of the 13 coal and carbon regions investigated. This would also provide essential knowledge in what regards the factors that significantly contribute to lowering or amplifying the magnitude of the deterritorialization process across regions.

3. the identification of the different types of transition trajectories of the regions investigated, as well as of the significant de-territorialization factors and their impacts, as emerged from the quantitative data collected. To this aim, the third stage of data analysis provides an assessment of the communalities and differences between the 13 regions on whole set of key variables measured in the research, in a transversal approach that statistically accommodates the five different components of the ENTRANCES multidimensional conceptual and analytical framework, and their various measurement instruments and indicators. The outcome of this approach is the development of a classification of these regions in several groups or clusters, each characterized by specific positions on the key variables pertaining to the challenges encountered by the coal and carbon territories and the changes that they have undergone. Therefore, each of these clusters represents and characterizes a specific transition and de/re- territorialization trajectory, together with the significant set of factors that fostered it.

The first two stages of this task were performed on the Cross-cases database (D5.1 of WP5), which integrates and organizes all the data collected independently in each of the 13 case studies in WP3 and WP4 into a unifying database. The third stage was performed on a new database, generated on the basis of the initial cross-cases database. As further explained in the third chapter of this report, this new database includes transformations of the key variables (as emerged in the

previous stage of data analysis) collected in the research on the five components, which rendered them suitable for a transversal and cross-component comparative statistical approach.

# CHAPTER 2

---

## Descriptive analysis

## 2 Descriptive analysis

### 1.5 Socio-cultural component

The descriptive analysis of the socio-cultural component was based on the data file obtained from the focus-groups in the coal and carbon-intensive case regions. The data file contains the number of occurrences of each factor of the socio-cultural component that arose from the focus-group activities in each case study, namely for: (1) *each type of strain* (endo-conflict, exo-conflict, impasse and contradictions, dependence and uncertainty) and (2) *areas of change* (financescape, technoscape, mediascape, ethnoscape, ideoscape, naturescape, or multiple areas united). Furthermore, two different types of descriptive analyses were performed.

Firstly, the ratios of (a) each type of strain situation from the total number of strain situations reported by each case study and (b) each type of area of change from the total number of changes were calculated. These ratios were used in other to describe the differential proportions of each element within each case study.

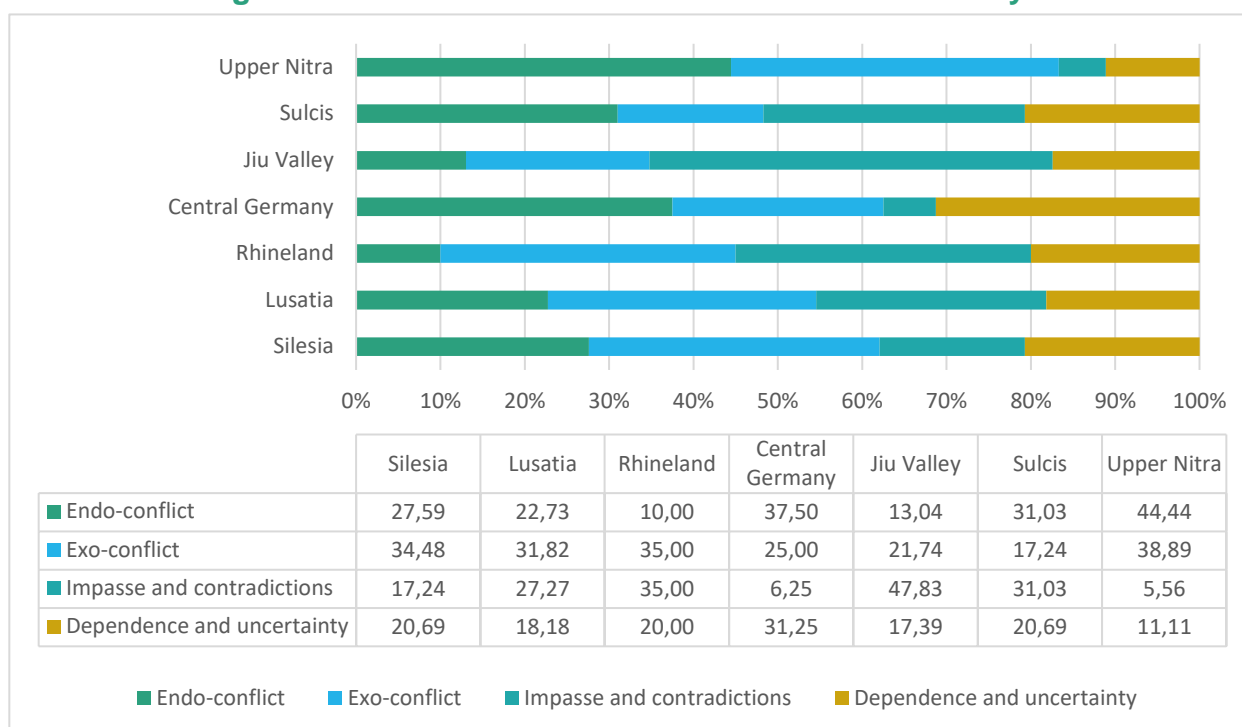
Secondly, the ratios of (a) each type of strain situation from the total number of strain situations reported by all case studies and (b) each type of area of change from the total number of occurrences reported by all case studies were calculated. These ratios were used to describe the different proportions of strain and areas of change between the case studies.

Finally, the results present the different ratios for each case study within and between its' category, namely, for the coal-intensive regions and, separately, for the carbon-intensive regions.

The number of occurrences of each strain situation was differently pondered inside each case study. In Silesia, the descriptive analysis suggested that the strain situation mostly reported in this area are exo-conflict type of situations (34.48% of the total strain situations reported by Silesia). The most reported strain situation in Lusatia is, also, the exo-conflict type (31.82% of the of the total strain situations reported by Lusatia). Rhineland's results suggested that endo and exo conflict are equally found in this region (35% of the total strain situations reported by Rhineland), whereas the most found type of strain situation in Central Germany is the endo-conflict type (37.50% of the total strain situations reported by Central Germany). Moreover, the most frequently described strain situation in Jiu Valley is the impasse and contradiction type (47.83% of the total strain situations reported by Jiu Valley), while endo-conflicts were most reported in Upper Nitra (44.44% of the total strain situations reported by Upper Nitra) (see Figure 1).



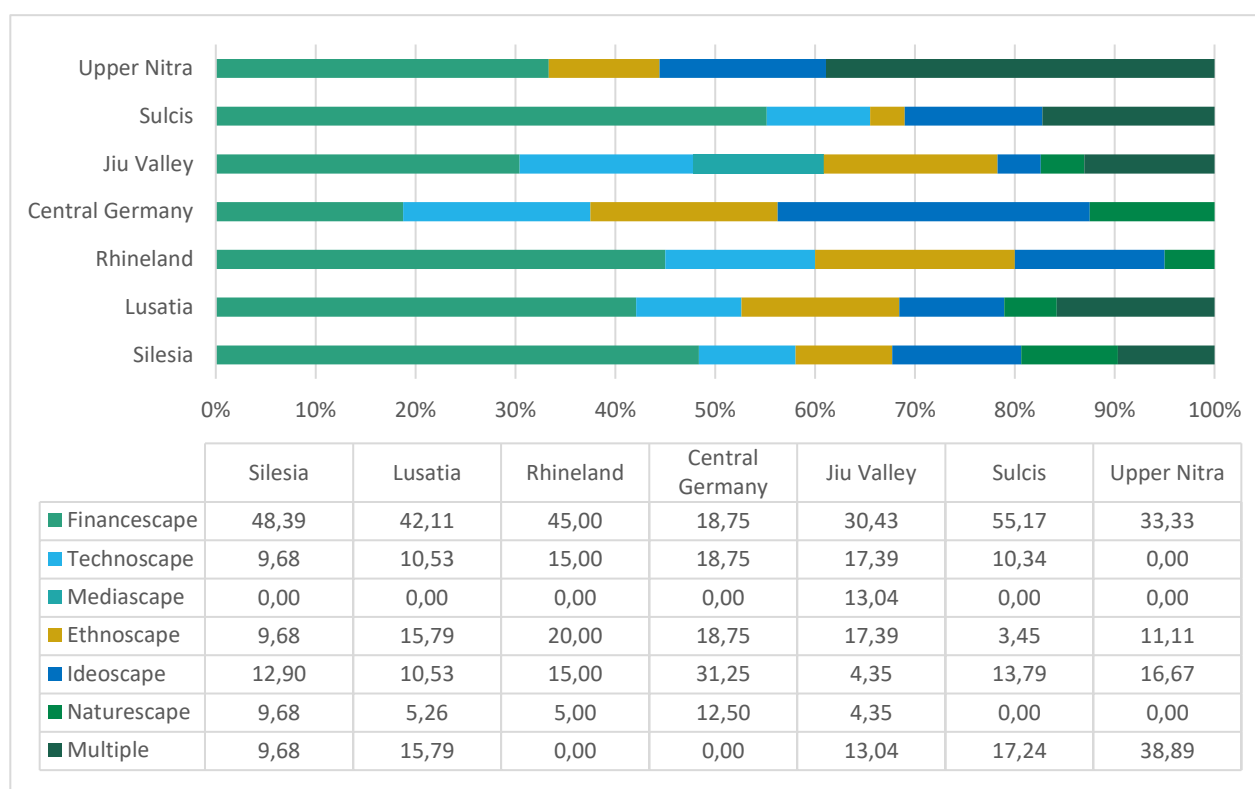
**Figure 4. Strain situations within each coal case study**



*Source: ENTRANCES focus group results and own compilation of data*

In terms of area of change, Silesia, Lusatia, Rhineland, Jiu Valley, and Sulcis's results indicated that the most frequently described situation is that concerning the financescape. The coal-intensive region of Central Germany's results indicated that ideoscape's area of change is most encountered, whereas Upper Nitra's focus-group indicated multiple areas of change (see Figure 2).

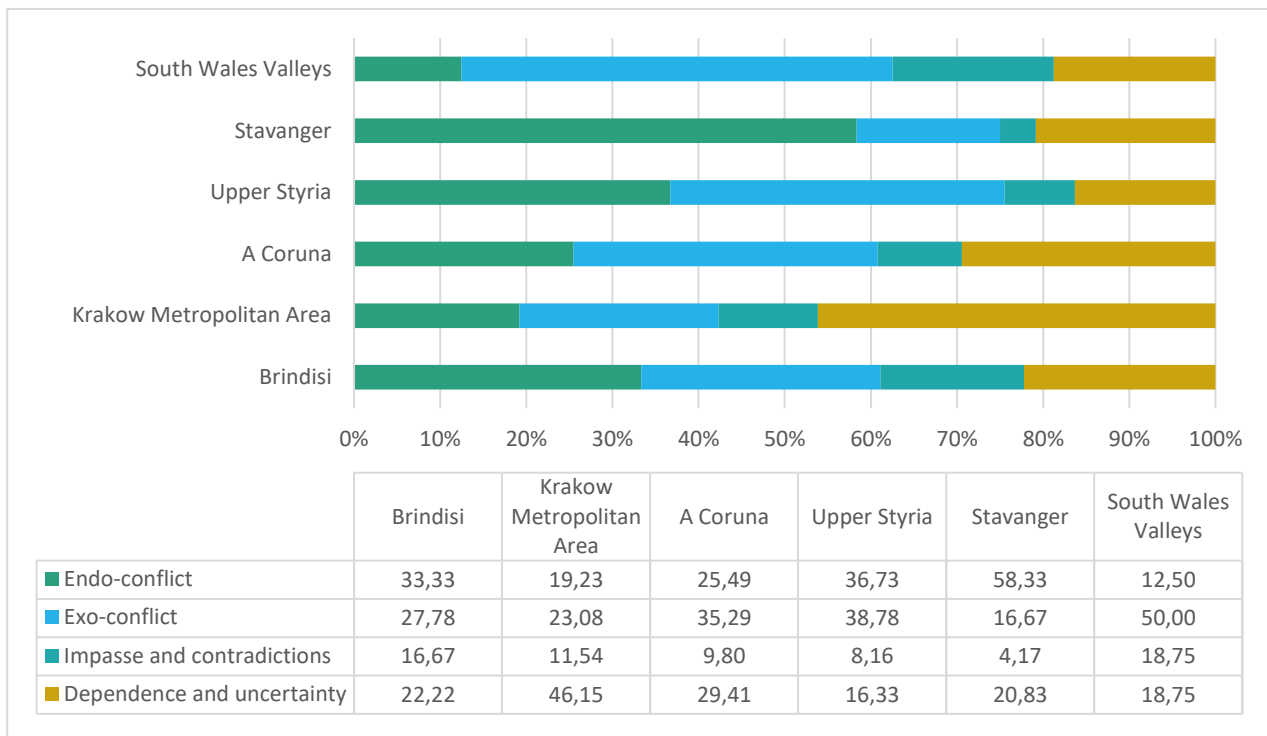
**Figure 5. Areas of change occurrences within each coal case study**



Source: ENTRANCES focus group results and own compilation of data

In the carbon-intensive case regions, Brindisi's results suggested that endo-conflicts are the most encountered strain situations, whereas Krakow Metropolitan area emphasized the dependence and uncertainty strain situations. A Coruna's case study results suggested exo-conflict as being the most usual type of strain situation (35.29% of the total strain situations reported by A Coruna) and Upper Styria equally reported endo and exo-conflicts as the focal strain situations encountered in this area (38.78%, 36.73% respectively of the total strain situations reported by Upper Styria). Further, Stavanger's case indicated endo-conflicts as the most usual strain situation encountered in this area (58.33% of the total strain situations reported by Stavanger), whereas South Wales Valley's results suggested that half of the strain situations encountered in this area were exo-conflicts (50% of the total strain situations reported by South Walles Valleys) (see Figure 3).

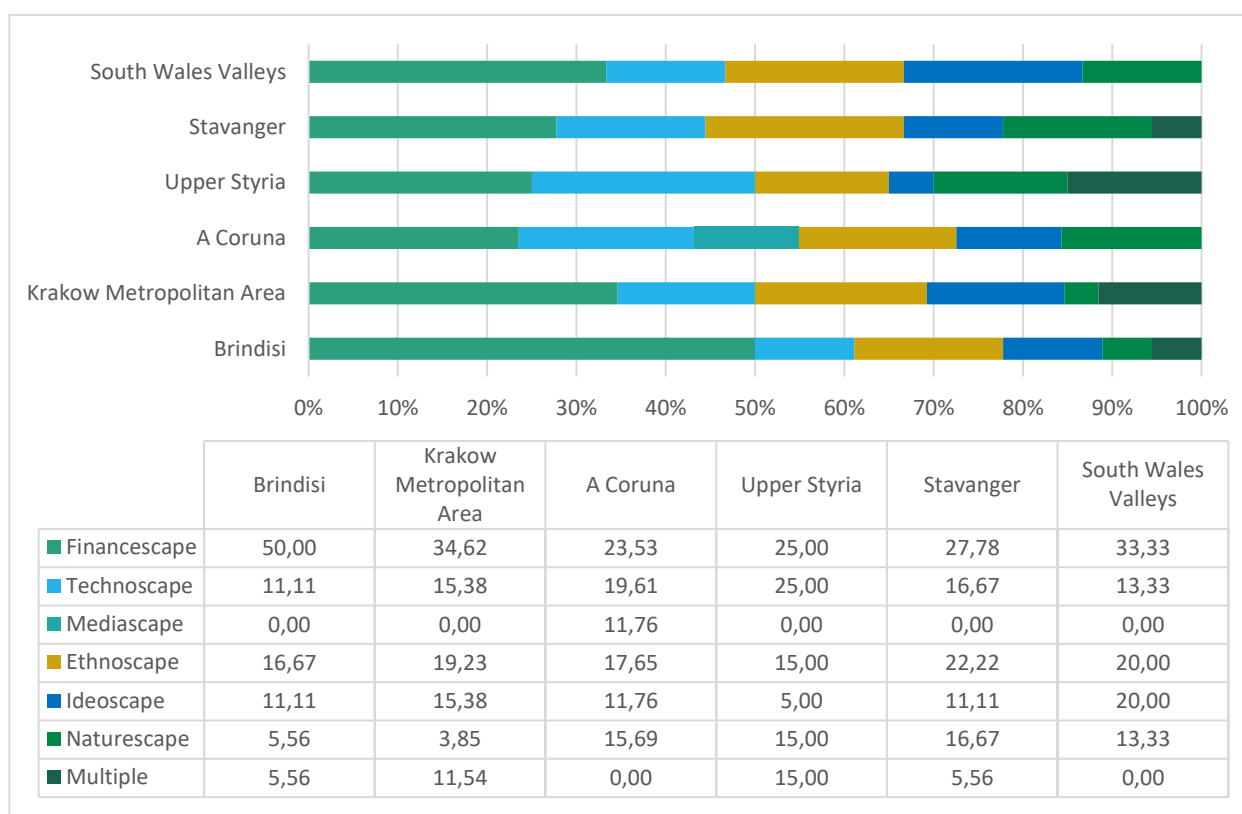
**Figure 6. Strain situations within each carbon case study**



*Source: ENTRANCES focus group results and own compilation of data*

Regarding the areas of change, carbon intensive regions can be described as following: Brindisi and Krakow Metropolitan area focused on financescape and ethnoscape, A Coruna emphasized the financescape and technoscape as the most encountered areas of change. Upper Styria equally reported financescape and technoscape as areas of change, whereas Stavanger and South Wales Valley's results indicated a focus on finance area of change (see Figure 4).

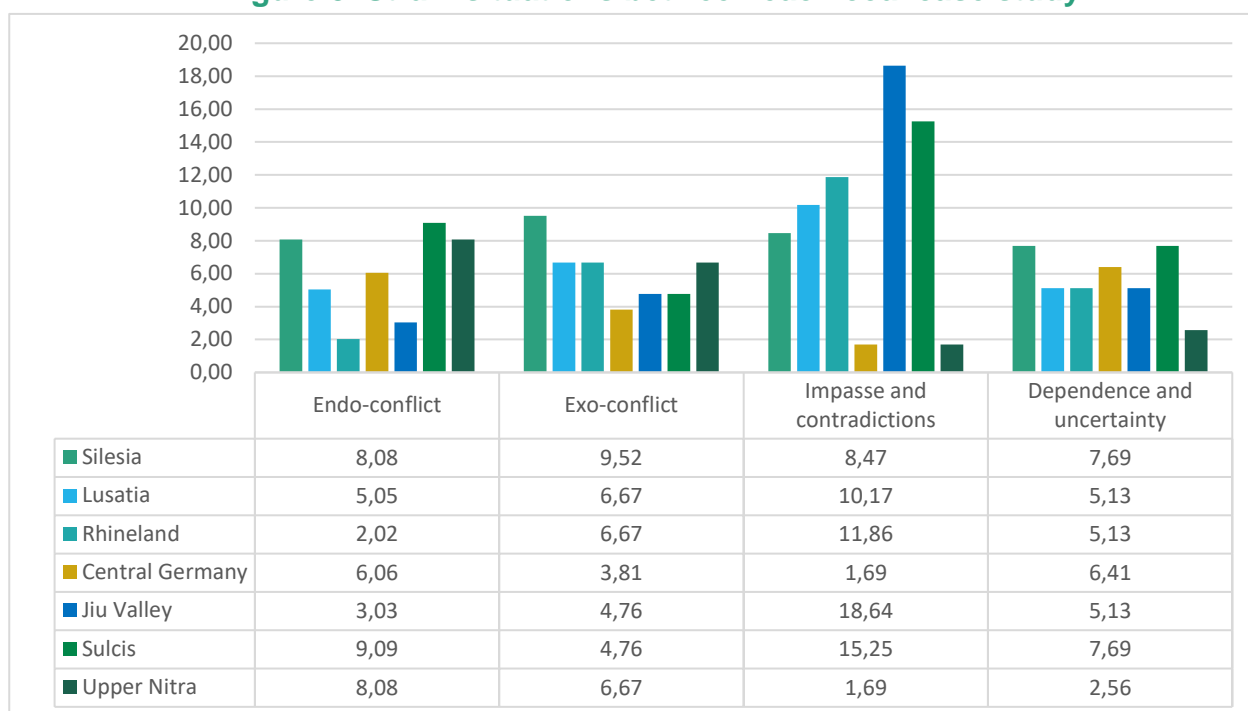
**Figure 7. Areas of change occurrences within each carbon case study**



Source: ENTRANCES focus group results and own compilation of data

The between coal-intensive cases descriptive analysis suggested that endo-conflicts were most encountered in Sulcis, followed by Silesia and Upper Nitra, whereas exo-conflicts were most encountered in Silesia, Lusatia, Rhineland, and Upper Nitra. Furthermore, impasses and contradictions were mostly supported by Jiu Valley and Sulcis, whereas the dependence and uncertainty types of strains situation are characterizing Silesia and Sulcis's case studies (see Figure 5).

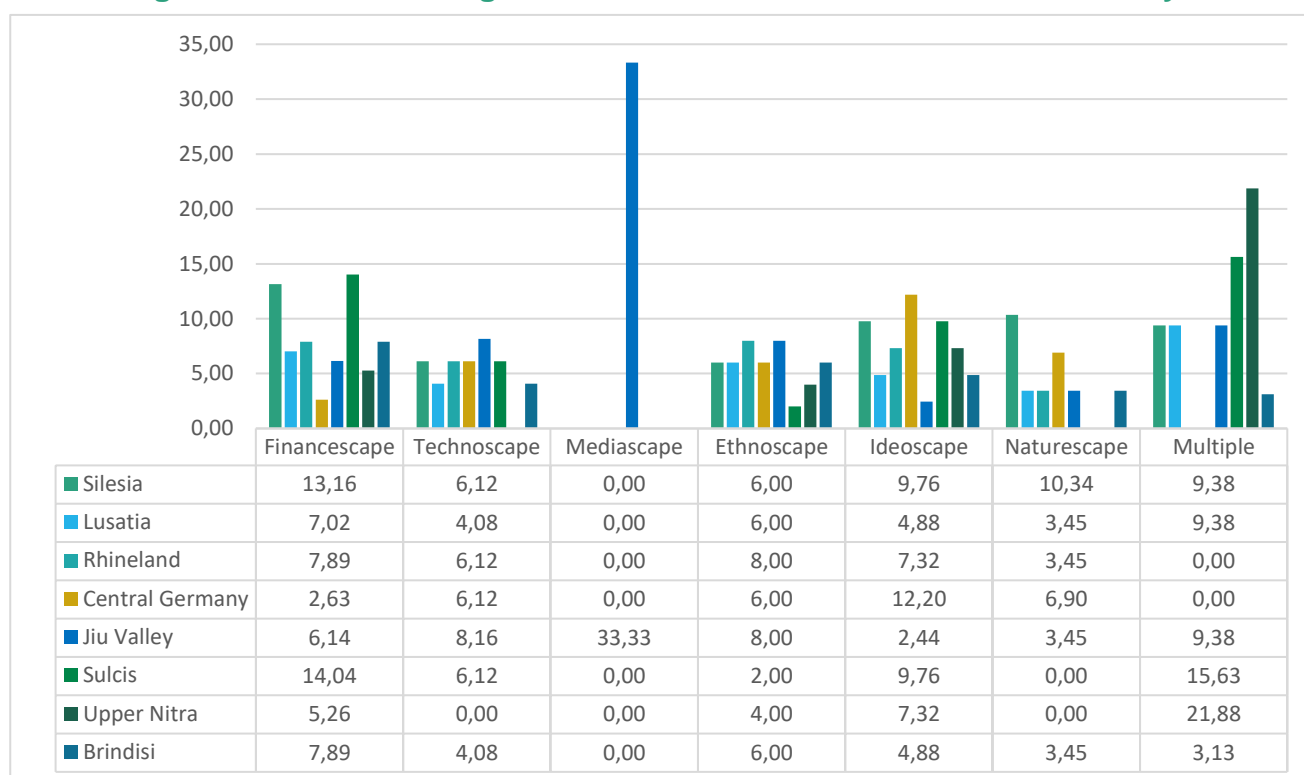
**Figure 8. Strain situations between each coal case study**



*Source: ENTRANCES focus group results and own compilation of data*

The analysis of the areas of change in the coal intensive regions suggested that the theme of finanscape was mostly supported by Silesia and Sulcis. The technoscape area of change was mostly encountered in Jiu Valley, Silesia, Rhineland, and Central Germany. Furthermore, the media scape area of change was only found in Jiu Valley, whereas ethnoscape was found almost equally distributed between the cases with an exception for Sulcis. The ideoscape area of change was strongly supported in Central Germany, whereas naturescape was a focal point mostly in Silesia. Lastly, Upper Nitra indicated the presence of multiple areas of change (see Figure 6).

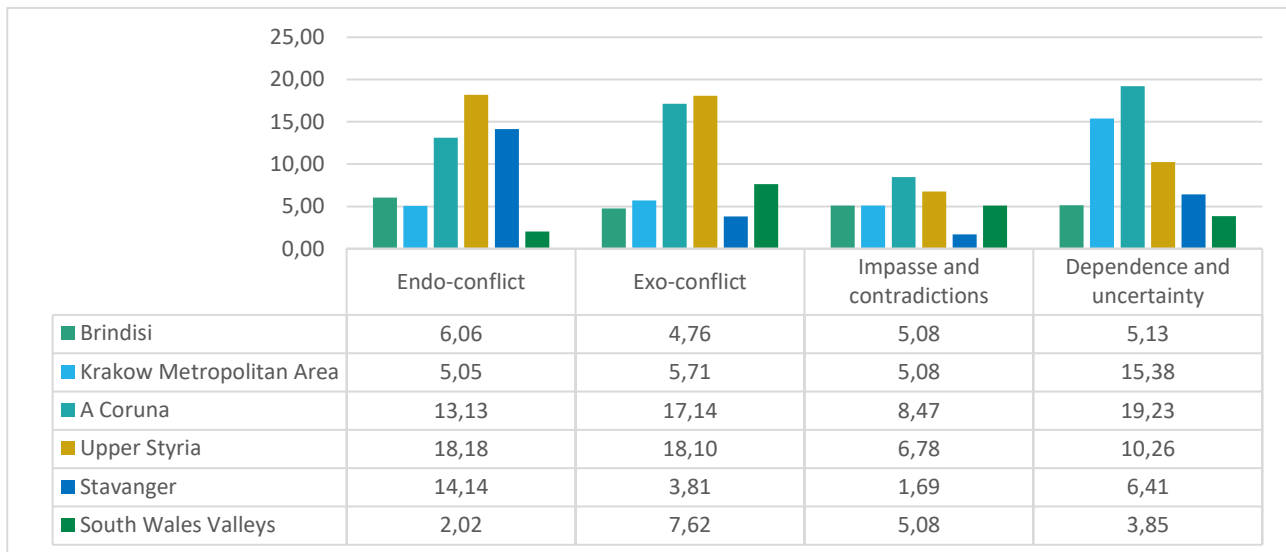
**Figure 9. Areas of change occurrences between each coal case study**



*Source: ENTRANCES focus group results and own compilation of data*

In the carbon-intensive regions, endo-conflicts were frequently encountered in Upper Styria, Stavanger, and A Coruna. Furthermore, Upper Styria and A Coruna's case study results also suggested a focus on exo-conflicts. The impasses and contradictions strain situations were almost equally distributed between the carbon-intensive regions, with an exception for Stavanger that indicates a lower frequency of this type of strain situation. Lastly, A Coruna, Krakow Metropolitan area and Upper Styria's results suggested that dependence and uncertainty is more frequently encountered in these specific areas of the carbon-intensive regions (see Figure 7).

**Figure 10. Strain situations between each carbon case study**

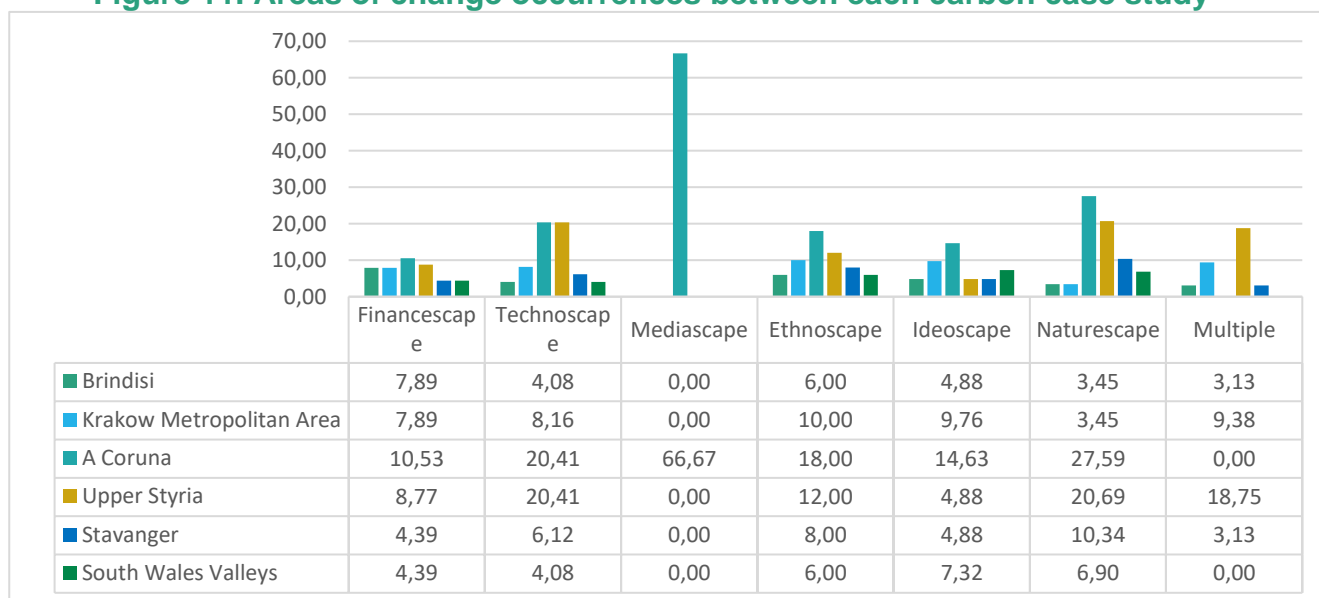


Source: ENTRANCES focus group results and own compilation of data

The financescape area of change was highly encountered in the A Coruna case, the technoscape was equally found in A Coruna and Upper Styria, whereas the mediascape was solely found in A Coruna. Moreover, the ethnoscape was mostly discussed in A Coruna, Upper Styria, and Krakow Metropolitan area; the ideoscape was mostly supported in A Coruna, and the naturescape theme was encountered in A Coruna and Upper Styria. Lastly, Upper Styria's results suggested that in this case there were multiple areas of change supported (see Figure 8).



**Figure 11. Areas of change occurrences between each carbon case study**



Source: ENTRANCES focus group results and own compilation of data

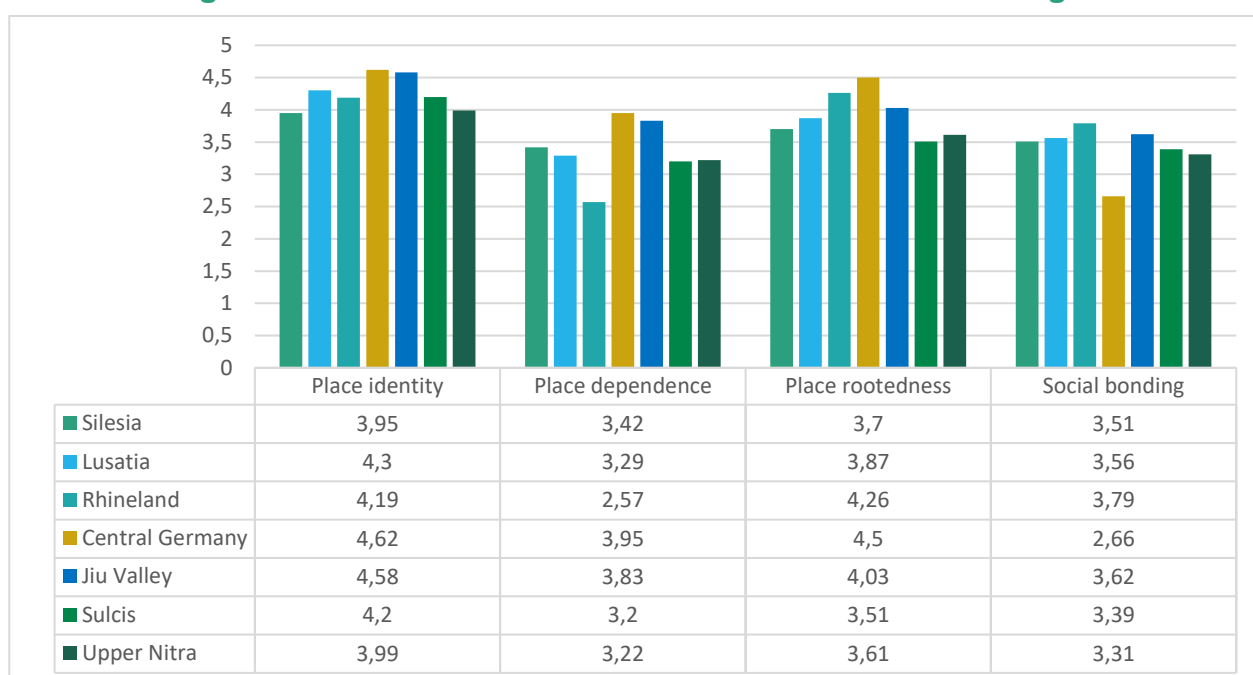
## 1.6 Socio-psychological component

The descriptive analysis of the socio-psychological component was based on the data file obtained from the survey in the coal and carbon-intensive regions. The data file contains the average score of each case study on the socio-psychological factors, namely (1) place attachment (place identity, place dependence, place rootedness, social bonding), (2) moderators (resilience, optimism), (3) decarbonization impacts (perceived stress, perceived fairness, economic hardship, economic optimism, nostalgia), (4) coping strategies (intention to relocate, personal reinvention, support, resistance and protest, submission), and (5) life satisfaction.

Furthermore, the descriptive analysis focused on comparing the results obtained in each case study, separately for the coal-intensive regions and for the carbon-intensive case studies.

The analysis of the first socio-psychological factor, *place attachment*, in the coal-intensive areas, suggested that Central Germany, closely followed by Jiu Valley, Lusatia, and Rhineland, participants reported the highest levels of place identity. Secondly, the participants from Central Germany and Jiu Valley reported higher levels of place dependence. In terms of place rootedness, the highest level reported was encountered in Central Germany, Rhineland, and Jiu Valley, whereas higher levels of social bonding were reported in Rhineland, Jiu Valley, Lusatia, and Silesia (see Figure 9).

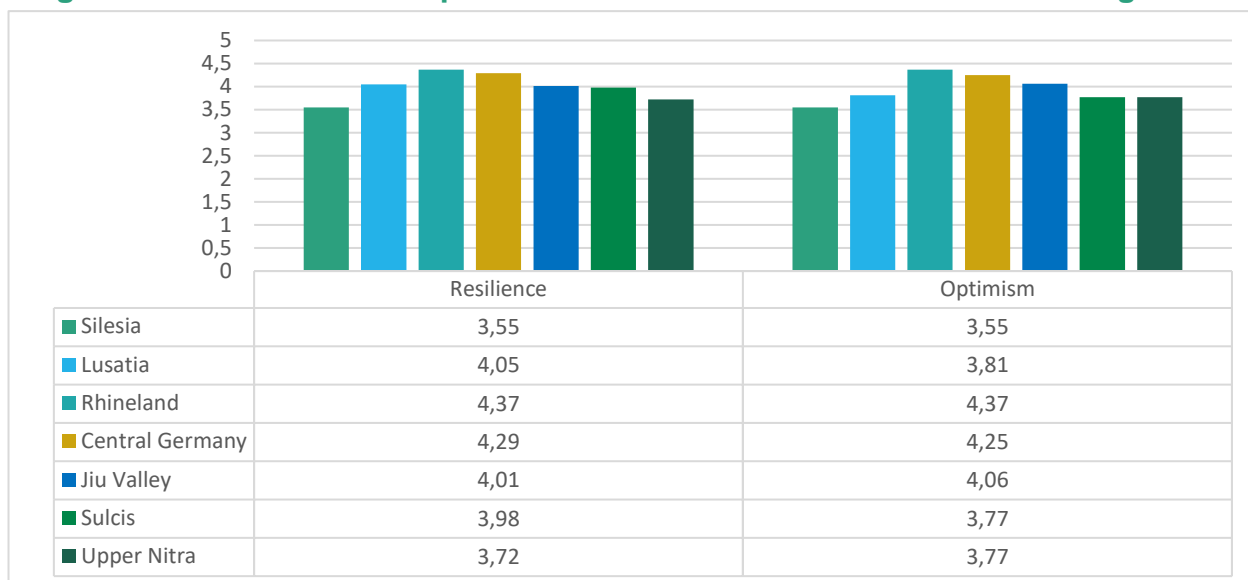
**Figure 12. Place attachment between the coal intensive regions**



Source: ENTRANCES focus group results and own compilation of data

Furthermore, from all the coal-intensive regions, resilience levels were higher in Rhineland, Central Germany, and Jiu Valley, whereas optimism scored higher in Rhineland, Central Germany, and Jiu Valley (see Figure 10).

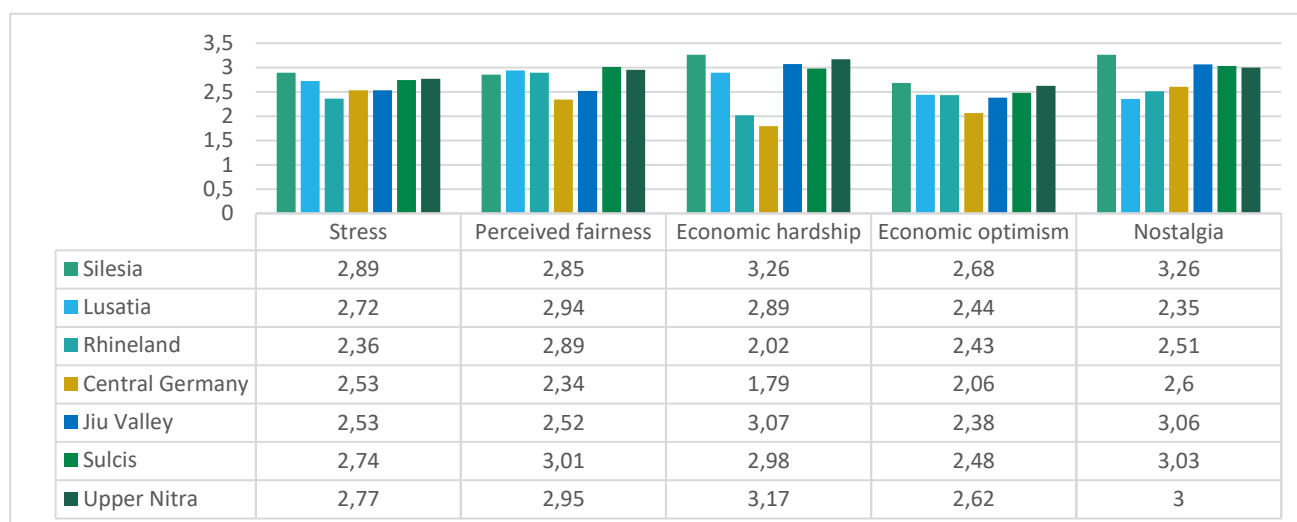
**Figure 13. Resilience and optimism levels between the coal-intensive regions**



Source: ENTRANCES survey results and own compilation of data

All the coal-intensive regions reported medium levels of stress, perceived fairness, economic hardship, economic optimism, and nostalgia, with the exception of Central Germany which reported lower levels of economic hardship (see Figure 11).

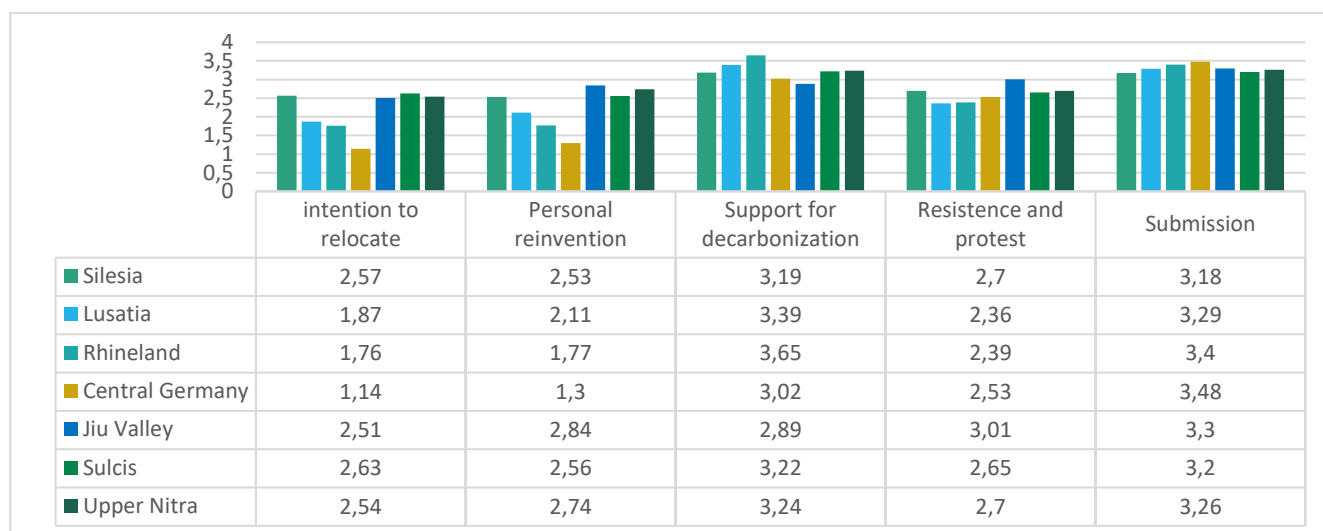
**Figure 14. Decarbonization impact levels between the coal-intensive regions**



Source: ENTRANCES survey results and own compilation of data

Intention to relocate from the CCT in the coal-intensive regions were at the lowest point in the three regions from Germany (i.e., Central Germany, Rhineland, and Lusatia); in terms of personal reinvention, results suggested that participants from Central Germany and Rhineland reported the lowest levels, whereas the other coal-intensive regions reported medium levels. Furthermore, all the seven coal-intensive case regions reported medium levels of support for decarbonization, resistance and protest, and submission (see Figure 12).

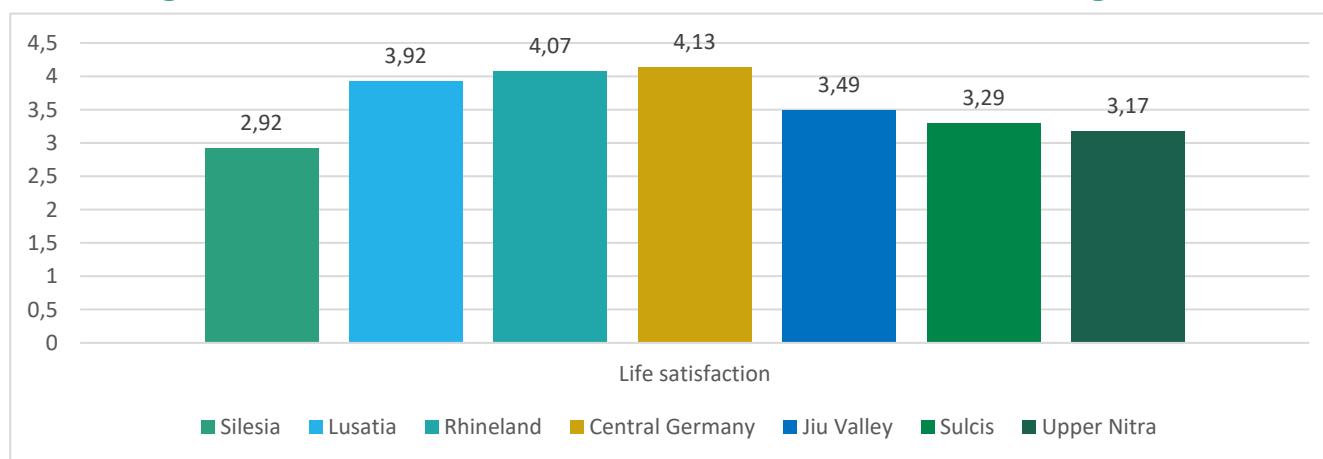
**Figure 15. Coping strategies between the coal-intensive regions**



Source: ENTRANCES survey results and own compilation of data

Higher levels of life satisfaction were reported in Central Germany and Rhineland, whereas the other case studies reported medium levels of this factor (see Figure 13).

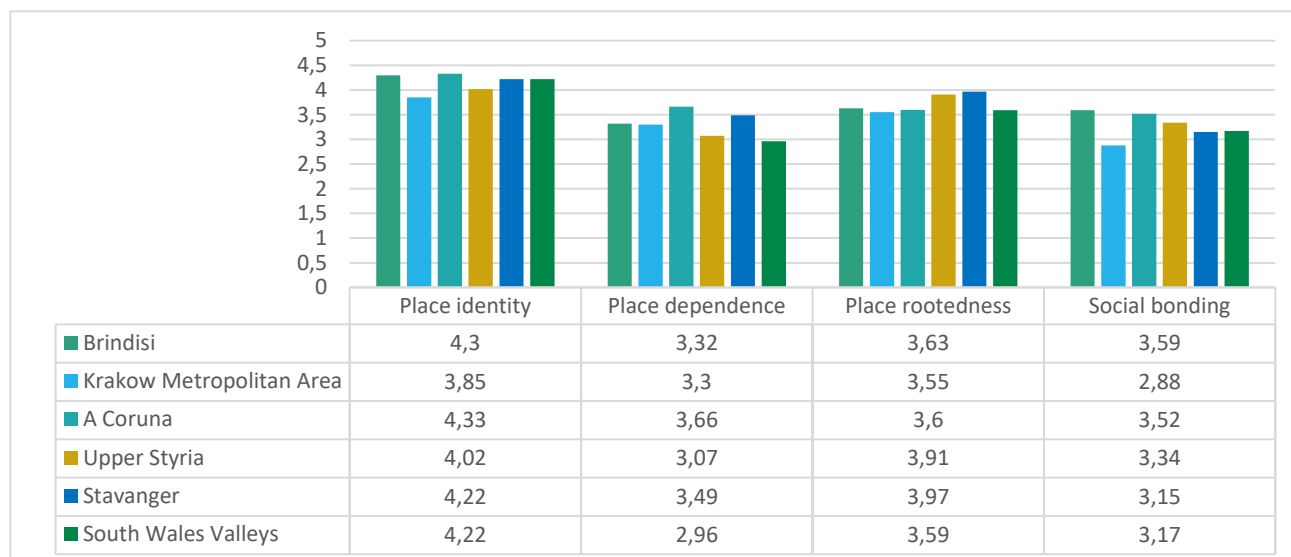
**Figure 16. Life satisfaction levels between the coal-intensive regions**



Source: ENTRANCES survey results and own compilation of data

The analysis of place attachment between the carbon-intensive areas yielded different results. Firstly, A Coruna and Brindisi reported higher levels of place identity, closely followed by Stavanger and South Wales Valley, whereas all the case studies reported medium levels of place dependence, place rootedness, and social bonding (see Figure 14).

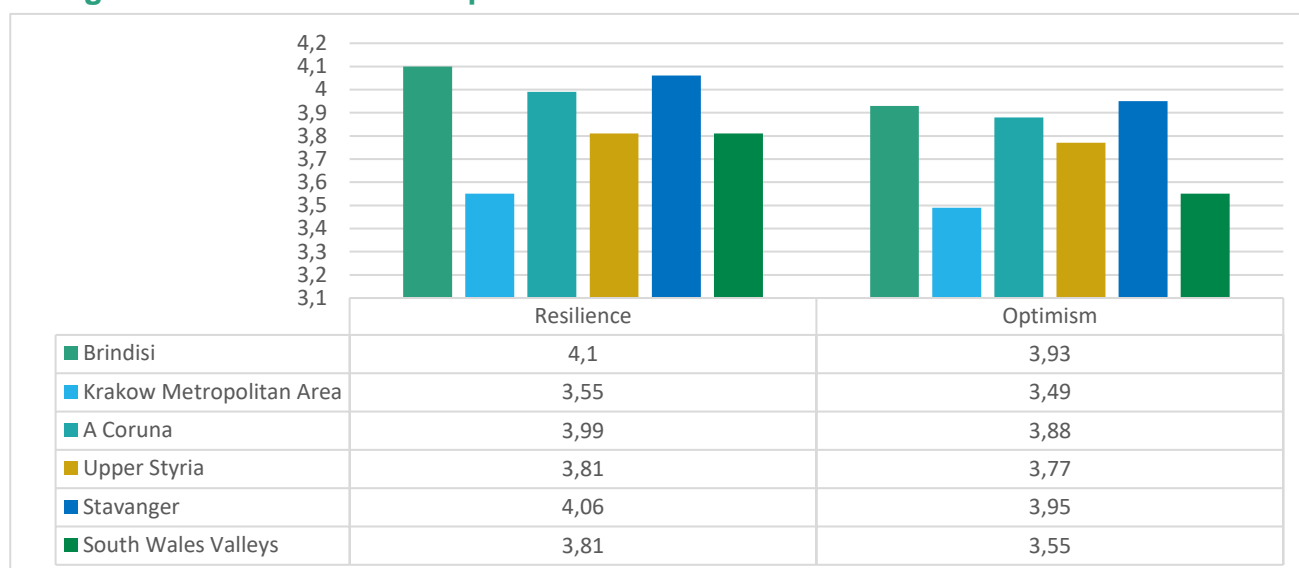
**Figure 17. Place attachment levels between the carbon-intensive case studies**



*Source: ENTRANCES survey results and own compilation of data*

In terms of resilience and optimism, Brindisi and Stavanger reported higher levels of resilience, whereas all the six carbon-intensive regions reported medium levels of optimism (see Figure 15).

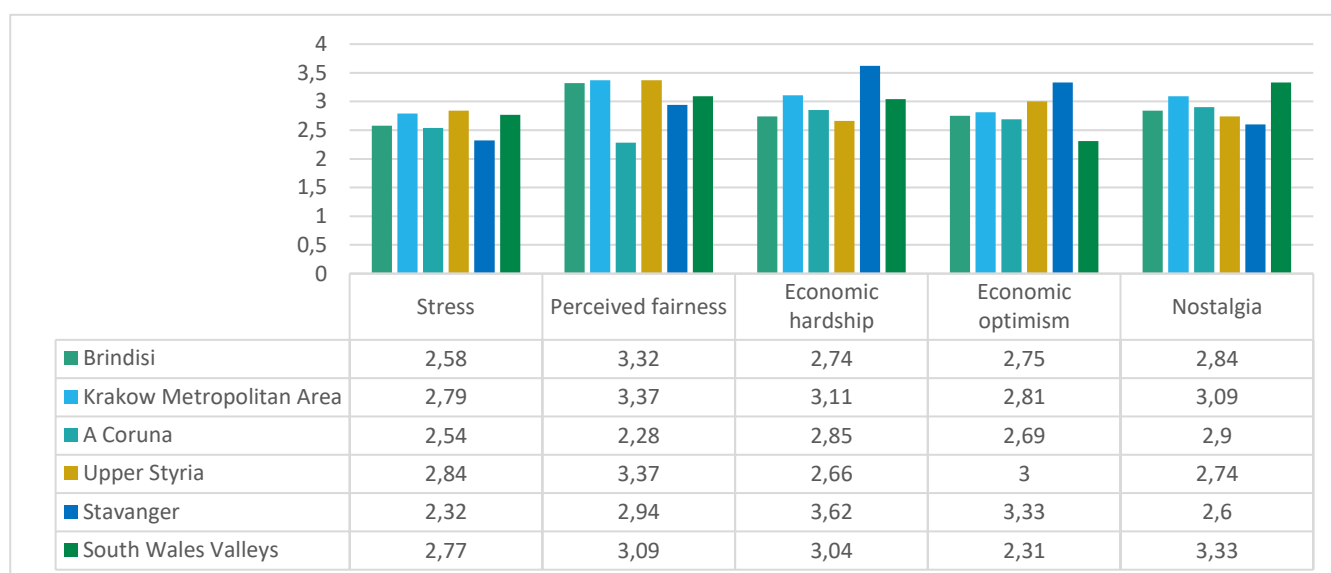
**Figure 18. Resilience and optimism between the carbon-intensive case studies**



Source: ENTRANCES survey results and own compilation of data

Concerning the decarbonization impacts (i.e., individual stress, perceived fairness, economic hardship, economic optimism, nostalgia), all the six carbon-intensive case studies reported medium levels on each of the analyzed element of impact (see Figure 16).

**Figure 19. Decarbonization impacts levels between the carbon-intensive case studies.**

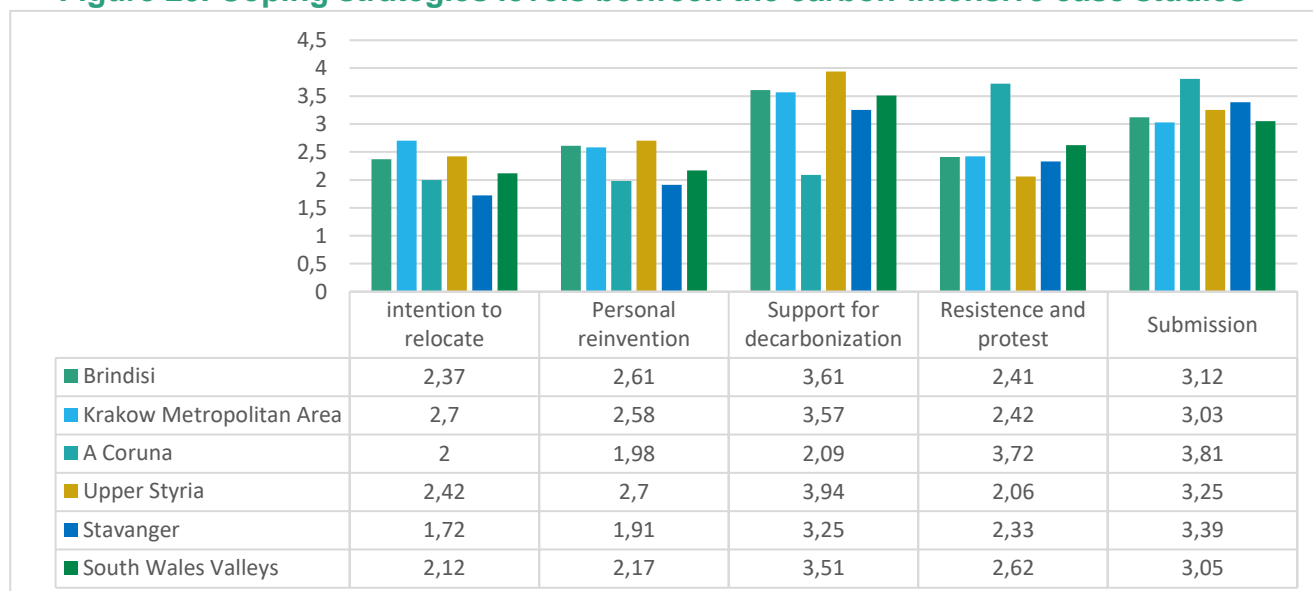


Source: ENTRANCES survey results and own compilation of data

Overall, the carbon-intensive case studies reported medium levels of the coping strategies (i.e., intention to relocate, personal reinvention, support for decarbonization, resistance and protest,

submission), apart from Stavanger's results that suggested lower levels for intention to relocate, and A Coruna and Stavanger that indicate a lower level of personal reinvention. Moreover, Upper Styria's results indicated a higher level of support for decarbonization, and A Coruna's results suggested a higher level of resistance and protest, respectively submission (see Figure 17).

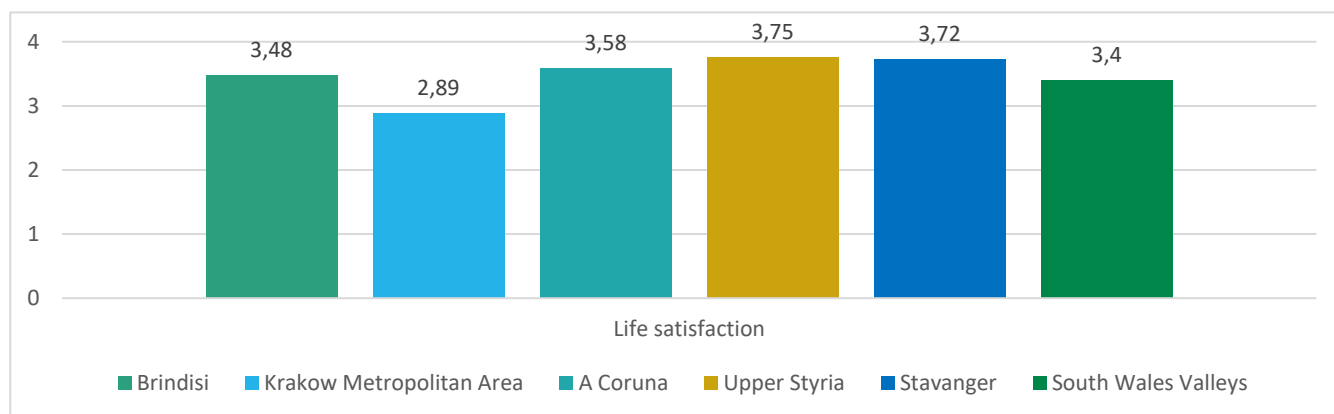
**Figure 20. Coping strategies levels between the carbon-intensive case studies**



Source: ENTRANCES survey results and own compilation of data

Lastly, life satisfaction levels were higher in Upper Styria and Stavanger (see Figure 18).

**Figure 21. Life satisfaction levels between the carbon-intensive case studies**



Source: ENTRANCES survey results and own compilation of data

## 1.7 Socio-political component

The socio-political data file contains data obtained from the text analysis for each case study. The data file contains the number of occurrences based on the statements and counterstatements of the public discourse on each of the socio-political factors, for each technological drama encountered, namely: (a) *technological regularization* (i.e., Exclusion: from access to benefits of decarbonization, uneven incorporation: lack of space for the carbon industries, polarization: stigmatization vs the idea of progress, Segregation: "de-facto" barriers to access decarbonization advantages, centralization: higher regional dependence on the center), (b) *technological adjustment* (i.e., Counter signification: claim for a just transition, Counterdelegation: negotiating clean coal technology) and (c) *technological reconfiguration* (i.e., Antisignification: rejecting and denial of decarbonization). Some of the socio-political factors were described through cumulative sub-factors: (1) Exclusion: from access to benefits of decarbonization (employment opportunities, unequal impact of decarbonization of different societal groups, impact on gender roles, education, social mobility), (2) Uneven incorporation: lack of space for the carbon industries (change in power dynamics), (3) Polarisation: stigmatization vs. idea of progress (discourse about carbon industry), (4) Segregation: "de-facto" barriers to access decarbonization advantages (public infrastructure necessary to partake in decarbonization, spatial distribution of benefits, business barriers to participate in decarbonization), (5) Centralisation: higher regional dependence on the center (centralization, dependence on the center, dependence on EU), (6) Countersignification: claim for a just transition (just transition), (7) Counterdelegation: negotiating clean coal technology (clean technologies, debate about the sense of transition), and (8) Antisignification: rejecting and denial of decarbonization (denial of climate change, downplaying of climate change, anti-EU sentiments).

Firstly, the ratios of each socio-political factor from the total number of coded statements by each case was calculated. These ratios were used to describe the differential proportions of each factor within each case study.

Secondly, the ratios of each socio-political factor from the total number of coded statements by all case study was calculated. These ratios were used to describe the differential proportions of each factor between the case studies.

Finally, the results present the different ratios for each case study within and between its' category, namely, for the coal-intensive regions and, separately, for the carbon-intensive regions.

Overall, the public discourse in the coal case studies regions regarding the energy transition and coal phase-out differed across each political factor and across regions.

In the *Silesia* case, the public discourse focused on technological regularization, namely, unequal impact of decarbonization on different Societal Groups (24.27% of the Silesia coded statements), and education (10.68% of the Silesia coded statements), and technological reconfiguration, namely Antisignification: rejecting and denial of decarbonization – with a focus on anti-EU statements (11.65% of the Silesia coded statements).

The *Lusatia* public discourse concentrated on the technological adjustments, namely Countersignification: claim for a just transition (75% of the Lusatia coded statements) and Antisignification: rejecting and denial of decarbonization – with an emphasis on downplaying of climate change (25% of the Lusatia coded statements). The *Rhineland* public discourse accentuated

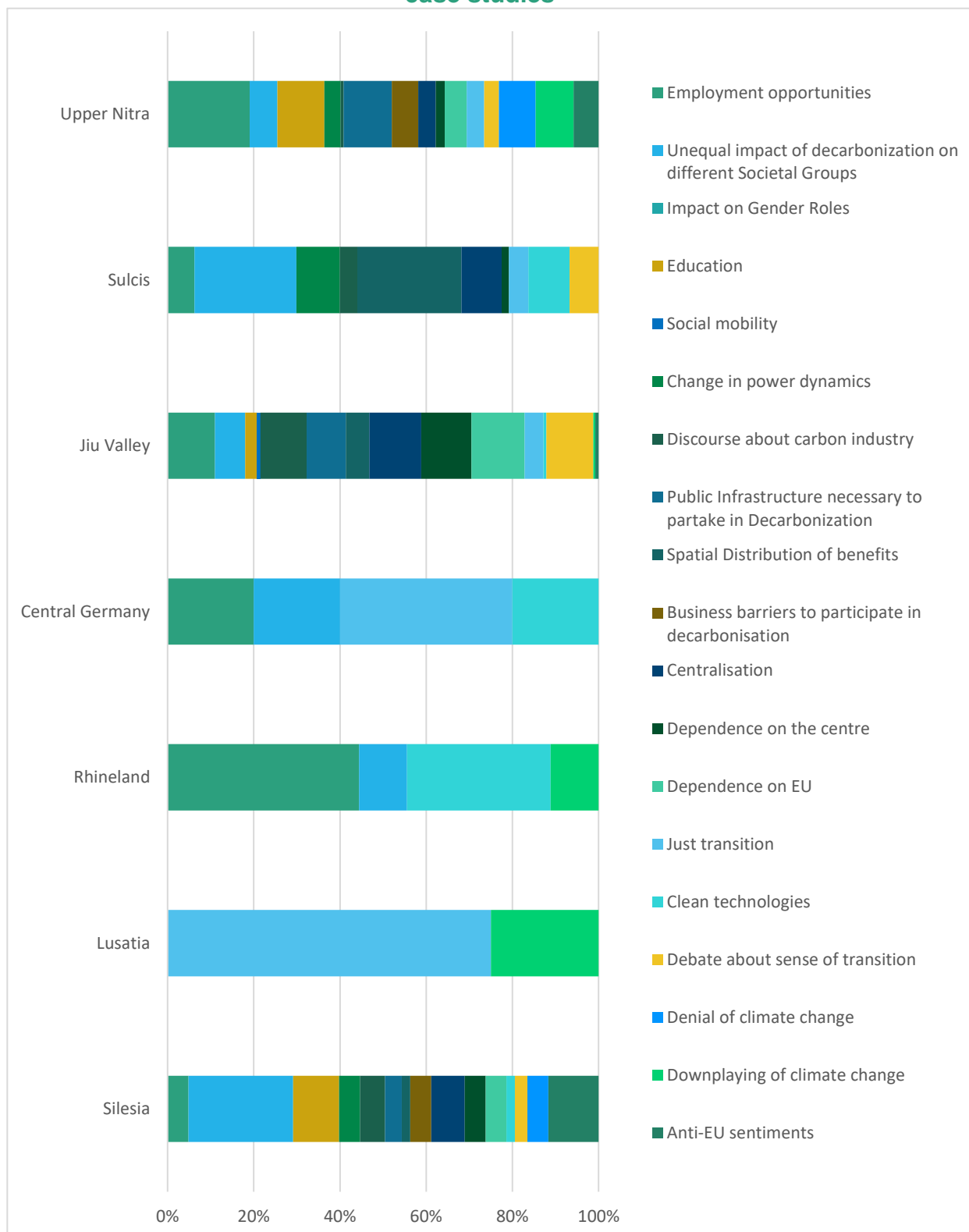


the technological regularization theme, namely the employment opportunities from access to benefits of decarbonization (44.44% of the Rhineland coded statements), closely followed by the technological adjustments theme through negotiating clean coal technology (33% of the Rhineland coded statements). The public discourse in *Central Germany* presented a similar pattern of themes, namely, a solid focus on the technological adjustments (40% of the Central Germany coded statements), and technological regularization – access to benefits of decarbonization: employment opportunities and unequal impact of decarbonization on different Societal Groups (20% each theme of the Central Germany coded statements).

The *Jiu Valley* public discourse concentrated on technological regularization through centralization (12.09% of the Jiu Valley coded statements), dependence on the center (11.61% of the Jiu Valley coded statements), and dependence on the EU (12.33% of the Jiu Valley coded statements). Further, a similar focus was given to employment opportunities (11% of the Jiu Valley coded statements).

The *Sulcis* case study's thematic analyses suggested that the public discourse focused primarily on technological regularization through the unequal impact of decarbonization on different societal groups (23.68% of Sulcis coded statements) and spatial distribution of benefits (24.16% of coded statements). *Upper Nitra* public discourse showed a similar pattern, focusing on technological regularization, namely: employment opportunities (19.05% of Upper Nitra coded statements), education (10.88% of Upper Nitra coded statements), and the need for the public infrastructure necessary to partake in decarbonization (11.22% of Upper Nitra coded statements).

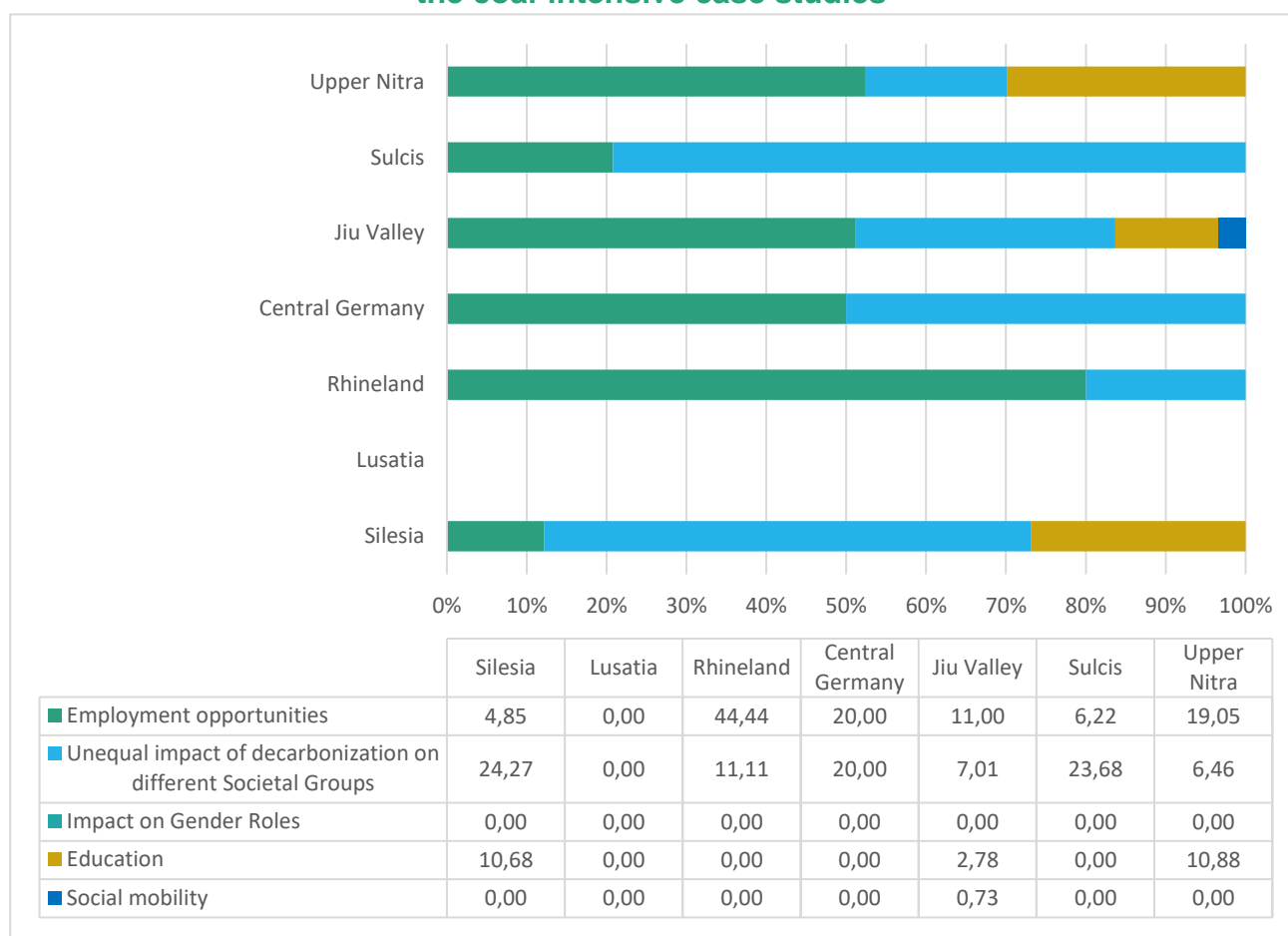
**Figure 22. The ratios of each coded socio-political factor within the coal-intensive case studies**



Source: ENTRANCES text analysis results and own compilation of data

Figure 20 depicts the differential focus of each coal-intensive case study on the sub-factors of exclusion. In this theme, Silesia primarily focused on the unequal impacts of decarbonization on different Societal Groups and education. Rhineland and Central Germany focused on employment opportunities and education. Jiu Valley public discourse on the accessibility of the benefits of decarbonization concentrated on employment opportunities and the unequal impact of decarbonization on different Societal Groups. Sulcis's thematic analysis suggested that the public discourse on this theme focused on the unequal impact of decarbonization and employment opportunities. Upper Nitra results suggested that employment opportunities and education are the primary areas of concern in the public discourse on the access to benefits of decarbonization.

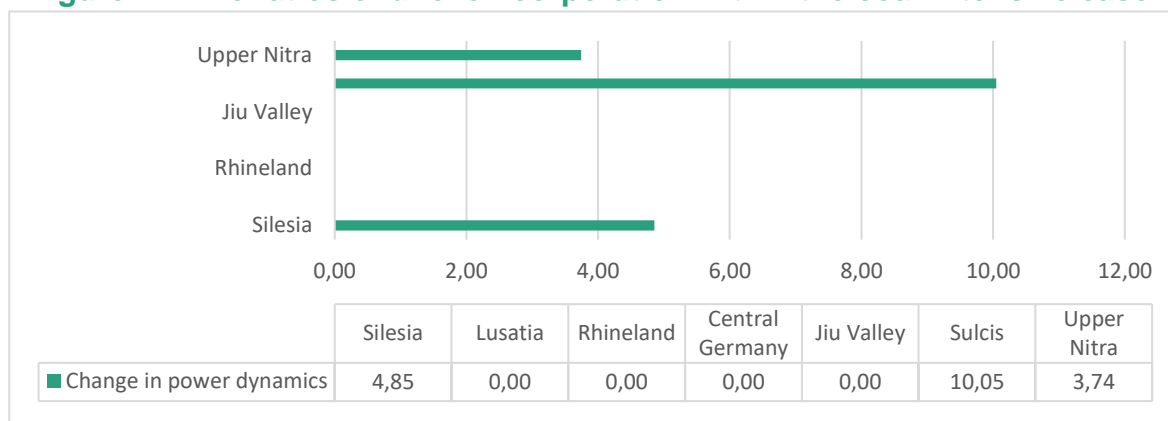
**Figure 23. The ratios of Exclusion: from access to benefits of decarbonization within the coal-intensive case studies**



Source: ENTRANCES text analysis results and own compilation of data

The second factor, *uneven incorporation: lack of space for the carbon industries*, tapped themes regarding *Change in power dynamics*. In this regard, of all the seven coal-intensive case studies, Sulcis, Silesia and Upper Nitra were the whole coal case regions that indicated that change in power dynamics was an essential factor in the public discourse on the energy transition and coal phase-out (see Figure 21).

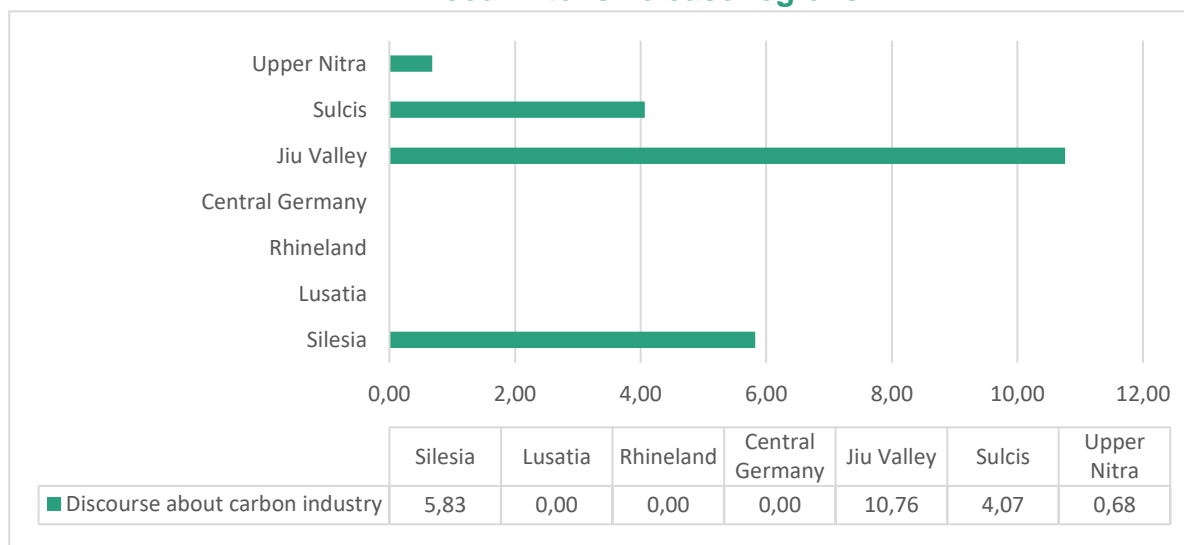
**Figure 24. The ratios of uneven corporation within the coal-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

The third factor, *Polarisation: stigmatization vs. idea of progress*, explored themes around *discourse about the carbon industry*. In this matter, the overall statements of Jiu Valley, Silesia, and Sulcis's public discourse showed an essential focus in this area (see Figure 22).

**Figure 25. The ratios of Polarisation: stigmatization vs idea of progress within the coal-intensive case regions**

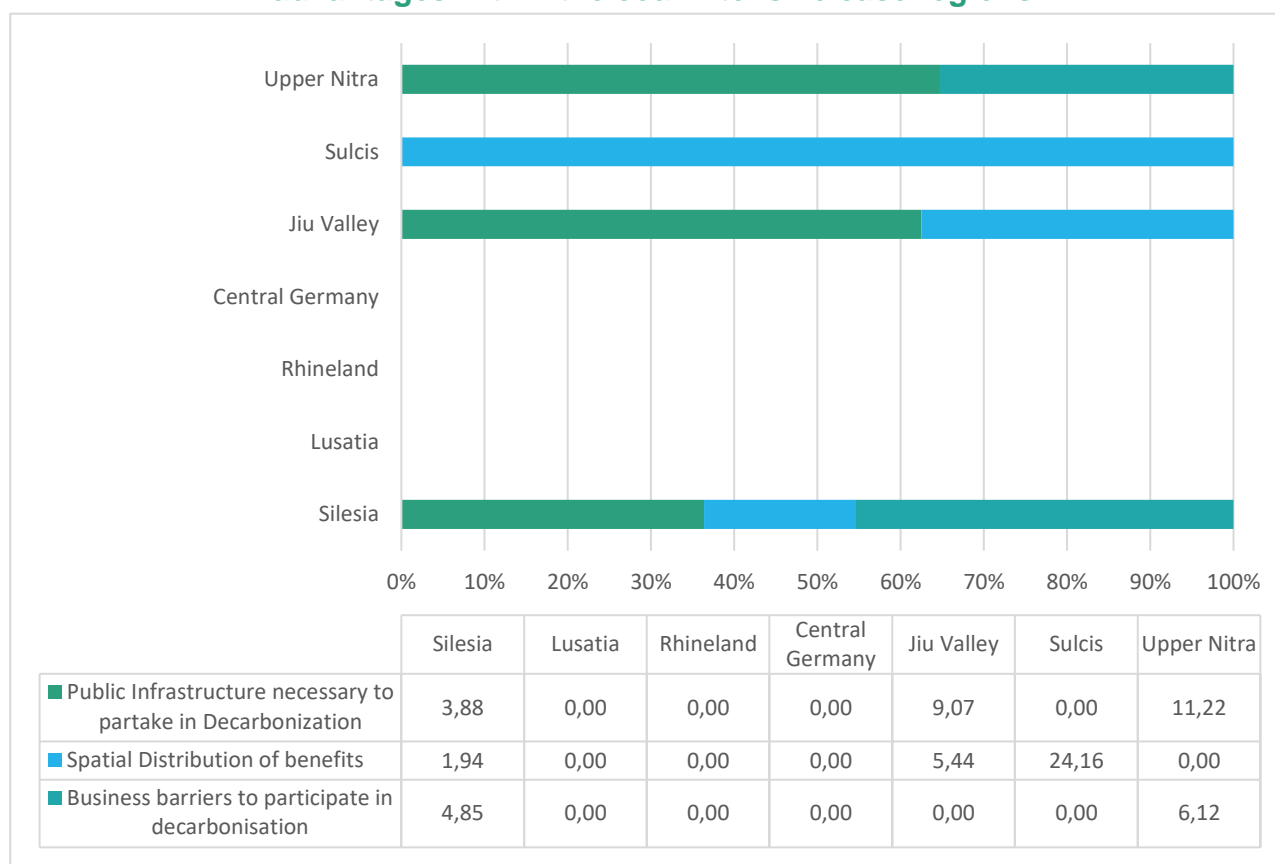


Source: ENTRANCES text analysis results and own compilation of data

The fourth factor, *Segregation: "de-facto" barriers to access decarbonization advantages*, focused on themes related to three different areas, namely: (1) Public infrastructure to partake in decarbonization, (2) Spatial distribution of benefits, and (3) Business barriers to participate in decarbonization.

These three areas of thematic interest presented different loadings in the total codes of each coal-intensive case study. Specifically, Silesia's results suggested that the public discourse is accentuated on the presence of business barriers to participate in the decarbonization process; Jiu Valley's and Upper Nitra's public discourse focused on the public infrastructure necessary to partake in decarbonization. The Sulcis case results' indicated that the public discourse on "de-facto" barriers to access decarbonization advantages concentrated solely on the spatial distribution of benefits (see Figure 23).

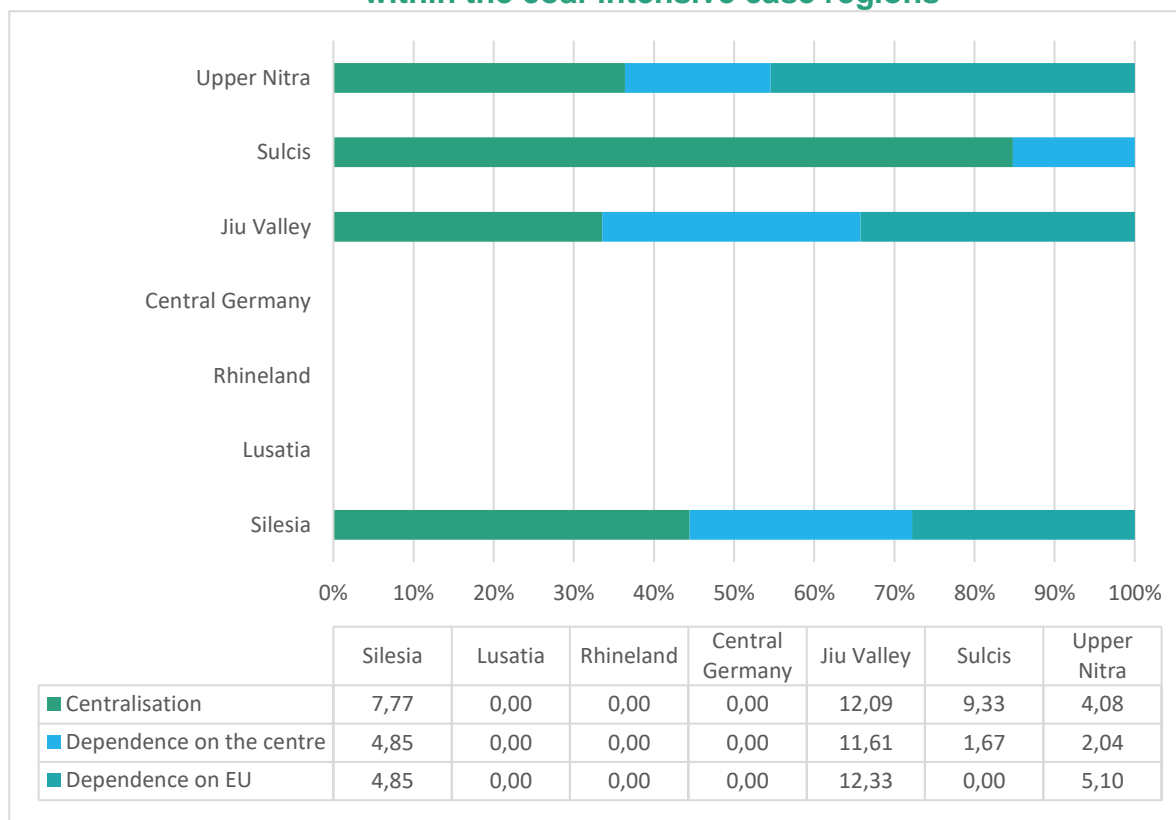
**Figure 26. The ratios of Segregation: "de-facto" barriers to access decarbonization advantages within the coal-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

The fifth factor in the socio-political component, *Centralization: higher regional dependence on the center*, was analyzed through three thematic areas, namely: (1) Centralization, (2) Dependence on the center, and (3) Dependence on the EU. Results suggested that Silesia's public discourse emphasized the importance of centralization and Jiu Valley's equally concentrated statements throughout the three thematic areas. Sulcis emphasized the theme of centralization and Upper Nitra equally distributed centralization and dependence on the EU for this factor (see Figure 24).

**Figure 27. The ratios of Centralization: higher regional dependence on the center within the coal-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

The sixth factor, *Countersignification: claim for a just transition*, focused solely on statements and counterstatements following just transition. In this case, except Rhineland and Silesia, all coal-intensive regions coded statements emphasizing the just transition theme, Lusatia being the region in which this factor was the most important (see Figure 25).

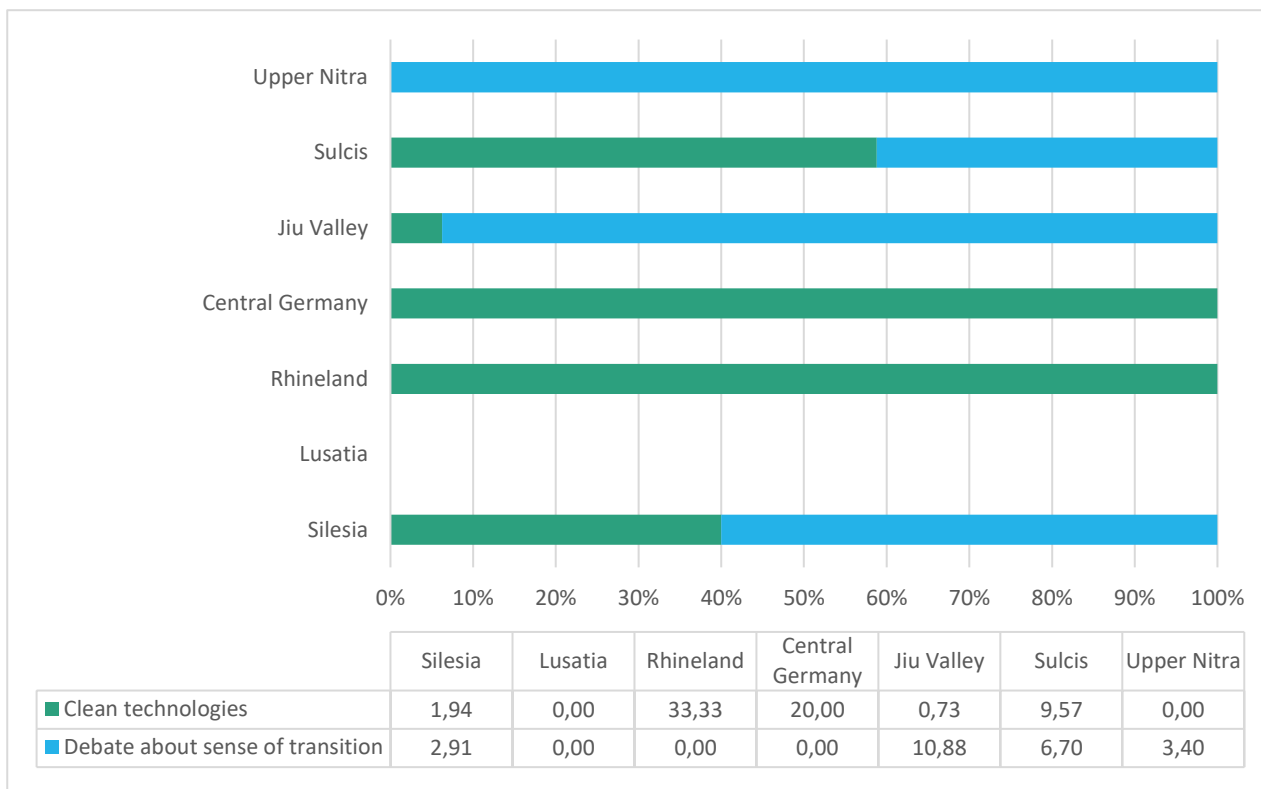
**Figure 28. The ratios of Countersignification: claim for a just transition within the coal intensive case regions**



*Source: ENTRANCES text analysis results and own compilation of data*

The seventh factor in the socio-political component, *Counterdelegation: negotiating clean coal technology*, was depicted through statements and counterstatement about clean technologies and the debate about the sense of transition. Thus, in the Silesia case, result suggested that the public discourse emphasized the need for debate about the sense of transition; Central Germany and Rhineland accentuated the discourse of stakeholders on clean technologies. Jiu Valley's results suggested that the public discourse depicts the need for debate about the sense of transition, whereas Sulcis's region accentuated the clean technology theme. Upper Nitra public discourse is solely focused on the debate about the sense of transition (see Figure 26).

**Figure 29. The ratios of Counterdelegation: negotiating clean coal technology within each coal-intensive regions**

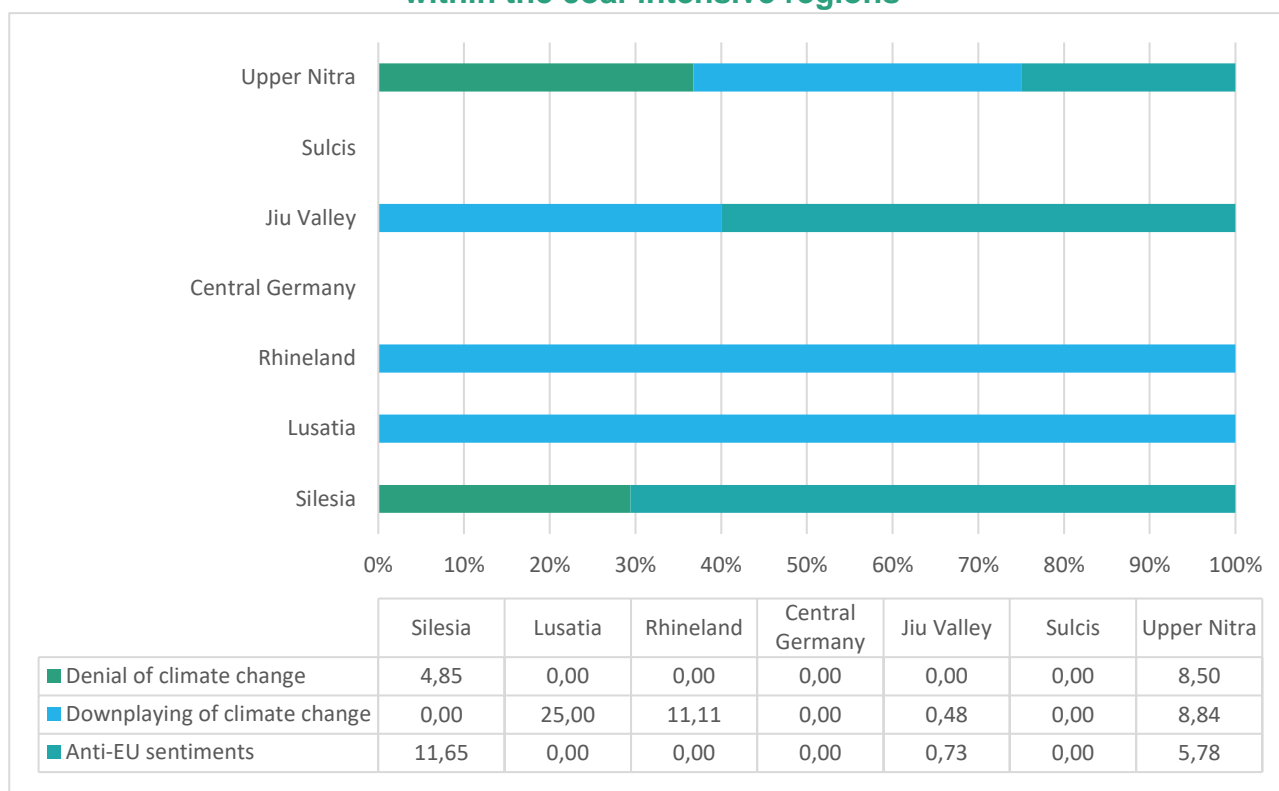


Source: ENTRANCES text analysis results and own compilation of data

Finally, *Antisignification: rejecting and denial of decarbonization*, was described through three different themes, namely (1) denial of climate change, (2) Downplaying of climate change, and (3) Anti-EU sentiments. Silesia's results indicated that the public discourse in this region was accentuated on anti-EU sentiments, whereas Rhineland and Lusatia's results suggested that the public discourse is solely focused on the downplaying of climate change theme. Jiu Valley's analysis indicated that the public discourse is almost equally concentrated on downplaying the climate change and anti-EU sentiments, and Upper Nitra's results suggested a focus of the public discourse on the denial of climate change theme (see Figure 27).

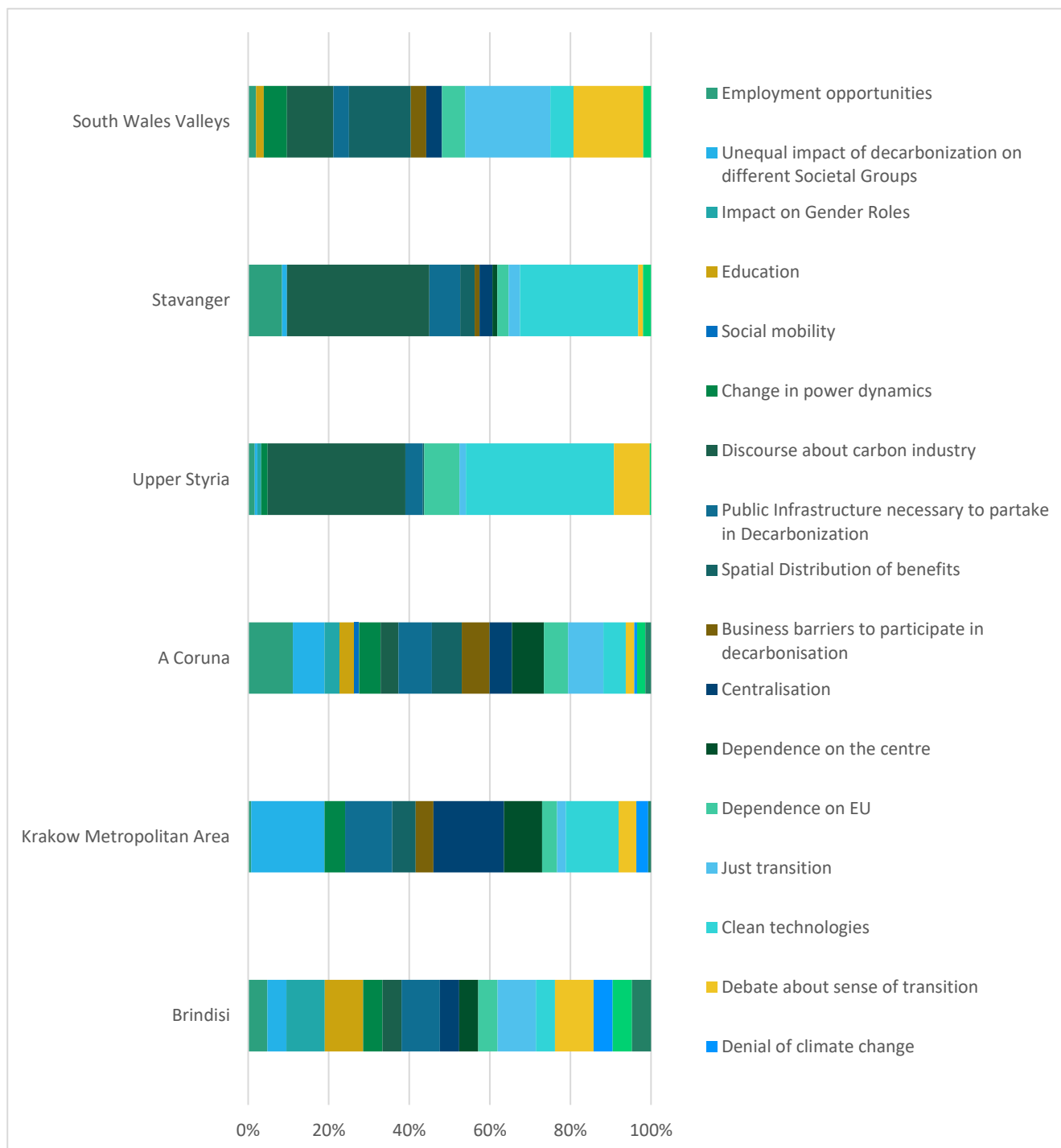


**Figure 30. The ratios of Antisignification: rejecting and denial of decarbonization within the coal-intensive regions**



Source: ENTRANCES text analysis results and own compilation of data

**Figure 31. The ratios of each coded socio-political factor within the carbon-intensive case studies**



Source: ENTRANCES text analysis results and own compilation of data

The public discourse in carbon intensive regions pondered differently the socio-political factors (see Figure 28).

In the *Brindisi* case, the public discourse was equally focused on technological regularization (e.g., impact on gender roles, education, public infrastructure necessary to partake in decarbonization) and technological adjustment (e.g., just transition, debate about sense of transition), each presenting 9.52% of the Brindisi coded statements.

*Krakov Metropolitan area* results suggested that the public discourse is centered on technological regularization, namely unequal impact of decarbonization on different Societal Groups (18.25% of the Krakow Metropolitan area coded statements), centralization (17.52% of the Krakow Metropolitan area coded statements) and technological adjustment through the debate about clean technologies (13.14% of the Krakow Metropolitan area coded statements).

*A Coruna* results indicated that the public discourse acknowledged mostly technological regularization, with an emphasis on employment opportunities (11.11% of the A Coruna coded statements) and public infrastructure to partake in decarbonization (8.33% % of the A Coruna coded statements) and technological adjustment, namely just transition (8.80% % of the A Coruna coded statements).

In the case of *Upper Styria*, the public discourse focused on technological regularization, with an emphasis on discourse about the carbon industry (34.14% % of the Upper Styria coded statements) and technological adjustment, namely the debate about clean technologies (36.73% % of the Upper Styria coded statements).

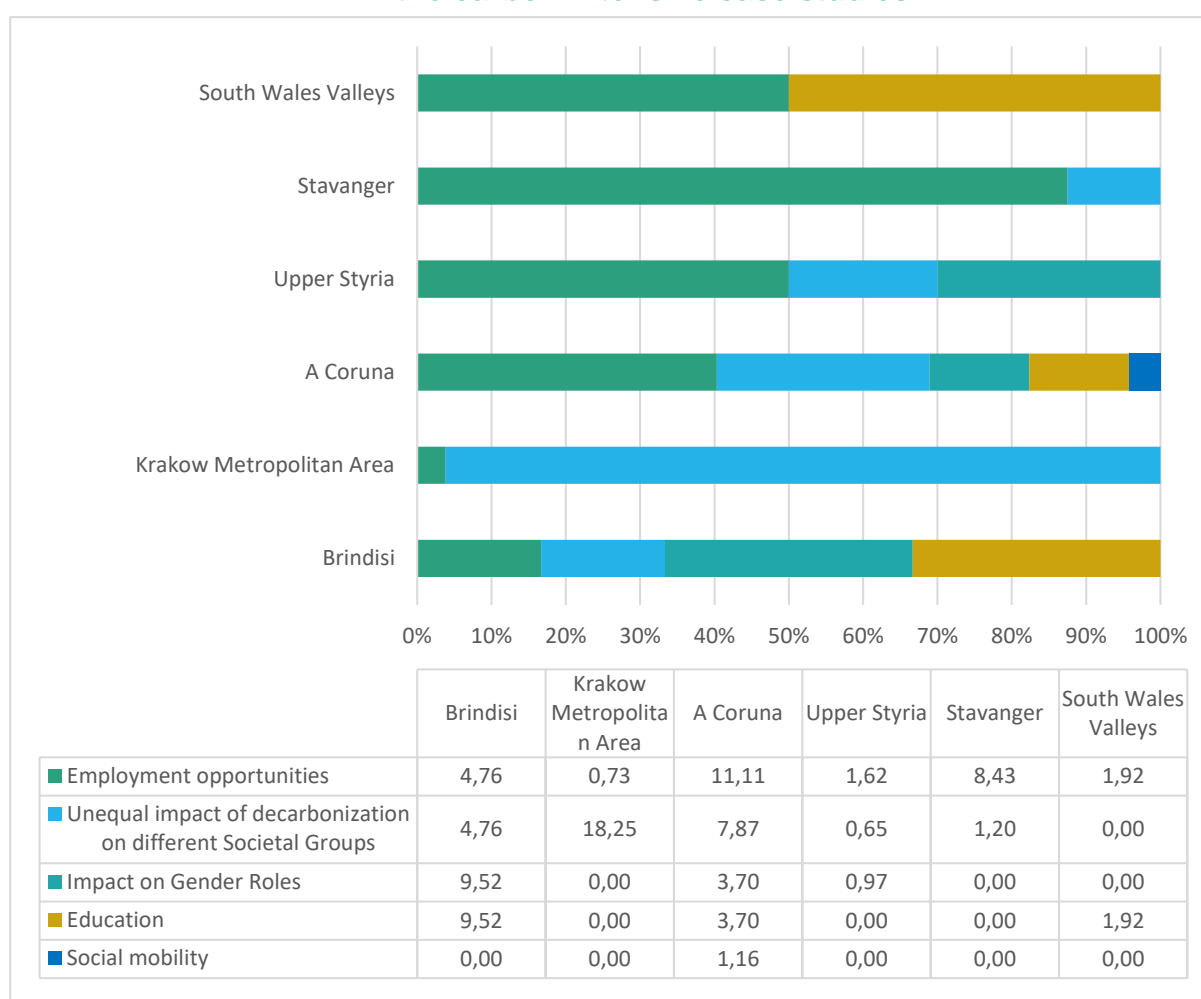
A similar focus of the public discourse was observed in *Stavanger*; the public discourse centered on technological regularization, specifically – discourse about the carbon industry (35.34% of the Stavanger coded statements) and technological adjustment, namely clean technologies (29.32% of the Stavanger coded statements).

The public discourse in *South Wales Valley* centered on technological regularization with an emphasis on the discourse about carbon industry (35.34% of the South Wales Valley coded statements) and technological adjustment through clean technologies (29.32% of the South Wales Valley coded statements).

The first factor of the technological regulation tapped different areas in the theme of *Exclusion: from access to benefits of decarbonization*, namely: (1) Employment opportunities, (2) Unequal impact of decarbonization on different Societal Groups, (3) Impact on gender roles, (4) Education, and (5) Social Mobility. Figure 29 depicts the differential focus of each carbon-intensive case study on these areas.

In this factor, Brindisi primarily focused on the impact on gender roles and education. Krakow Metropolitan area focused on the unequal impact of decarbonization on different Societal Groups. A Coruna's, Upper Styria's, Stavanger's public discourse concentrated on employment opportunities. South Wales Valleys results suggested an equally focused public discourse on employment opportunities and education (see Figure 29).

**Figure 32. The ratios of Exclusion: from access to benefits of decarbonization within the carbon-intensive case studies**

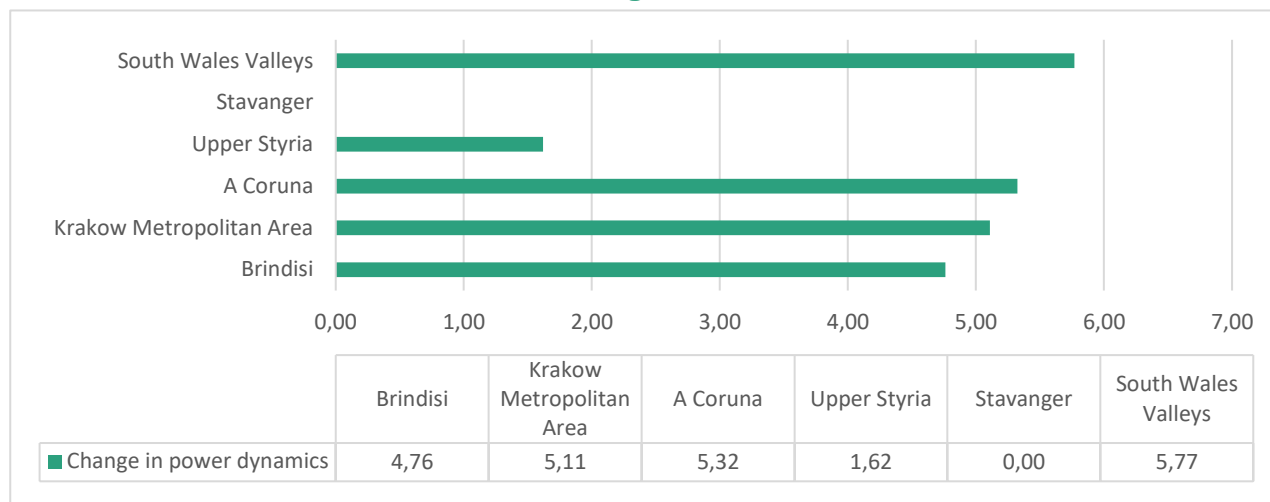


Source: ENTRANCES text analysis results and own compilation of data

The second factor, *uneven incorporation: lack of space for the carbon industries*, tapped the theme of *Change in power dynamics*. In this regard, the results from South Wales Valley, A Coruna, Krakow Metropolitan area, Brindisi, and Upper Styria suggested that the public discourse in this carbon

intensive areas acknowledge change in power dynamics as an important theme for uneven incorporation (see Figure 30).

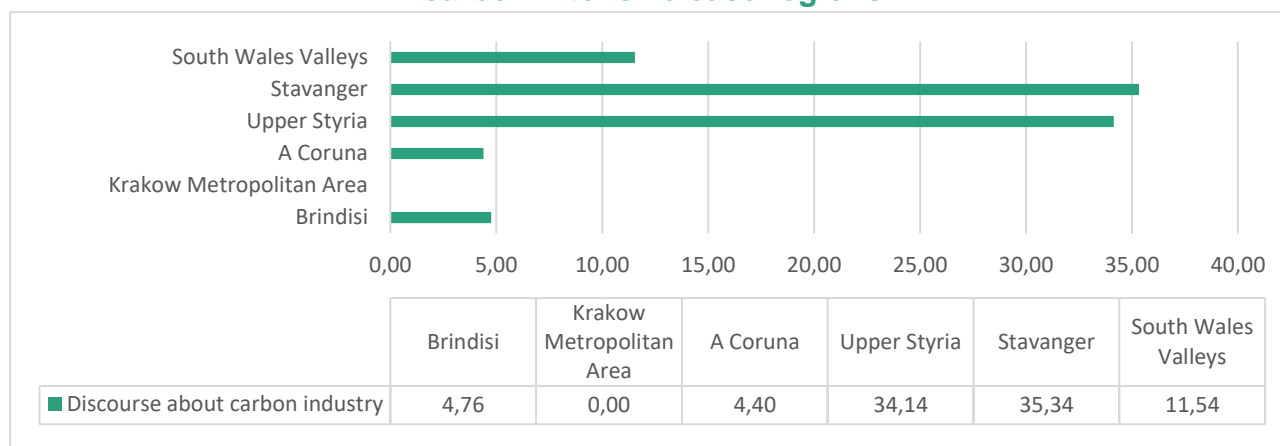
**Figure 33. The ratios of uneven corporation within the carbon-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

The third factor, *polarisation: stigmatization vs the idea of progress*, showed a high interest in the public discourse of these carbon-intensive regions. The discourse about carbon industry was a theme especially important for Stavanger and Upper Styria (see Figure 31).

**Figure 34. The ratios of Polarisation: stigmatization vs idea of progress within the carbon-intensive case regions**

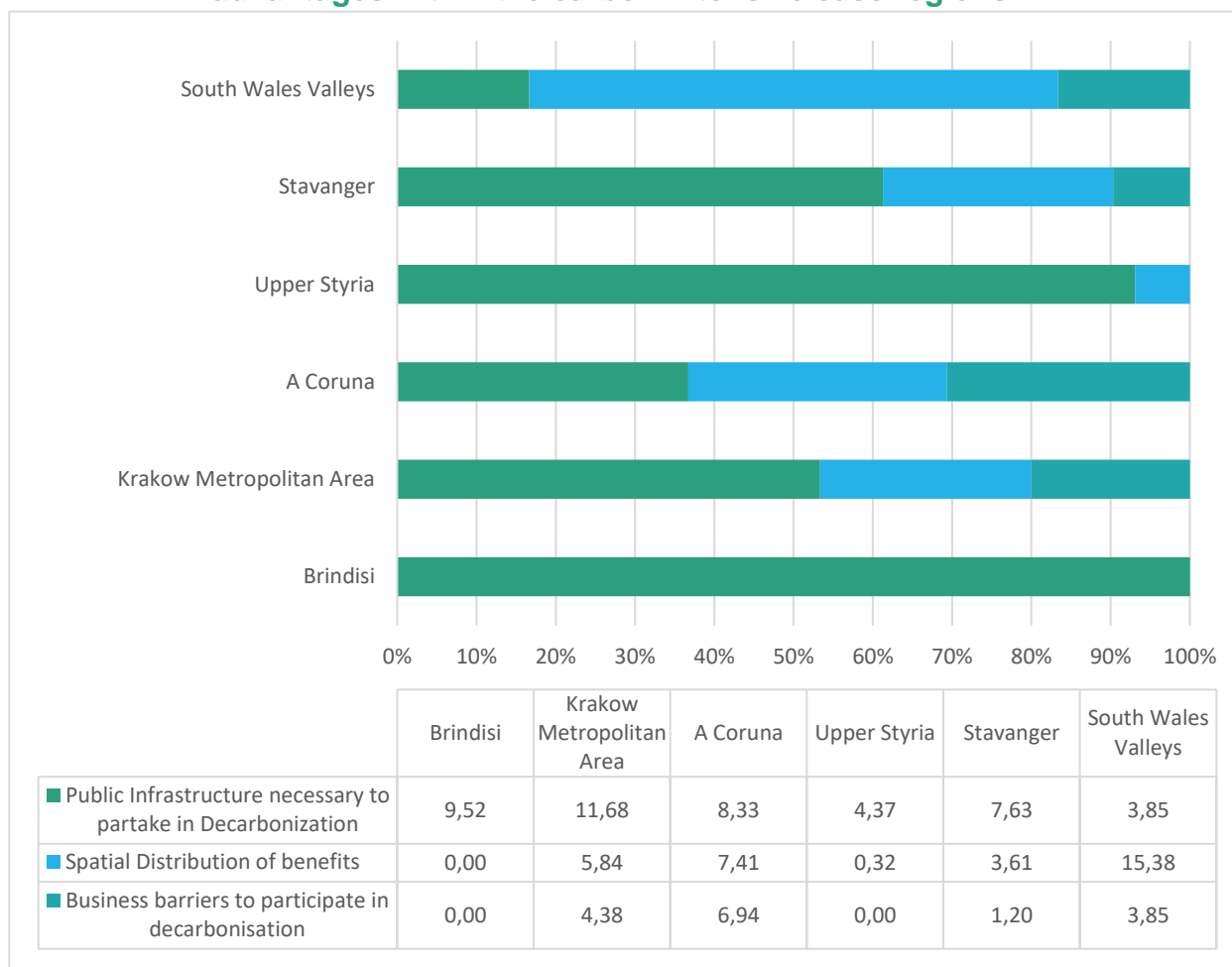


Source: ENTRANCES text analysis results and own compilation of data

The fourth factor, *segregation: “de-facto” barriers to access decarbonization advantages*, indicated that the six carbon-intensive regions accentuated different aspects of this socio-political factor. Brindisi’s results indicated that the public discourse in this area is exclusively concentrated around the need for public infrastructure necessary to partake in decarbonization. Similarly, the results from Krakow Metropolitan area suggested an increase of occurrences for the same, whereas A Coruna

almost equally distributed public infrastructure, spatial distribution of benefits, and business barriers to participate in decarbonization. The results from Upper Styria and Stavanger indicated that these two carbon-intensive regions emphasized the need for public infrastructure for decarbonization. Lastly, the South Wales Valley's results indicated spatial distribution of benefits as primary theme in the segregation factor (see Figure 32).

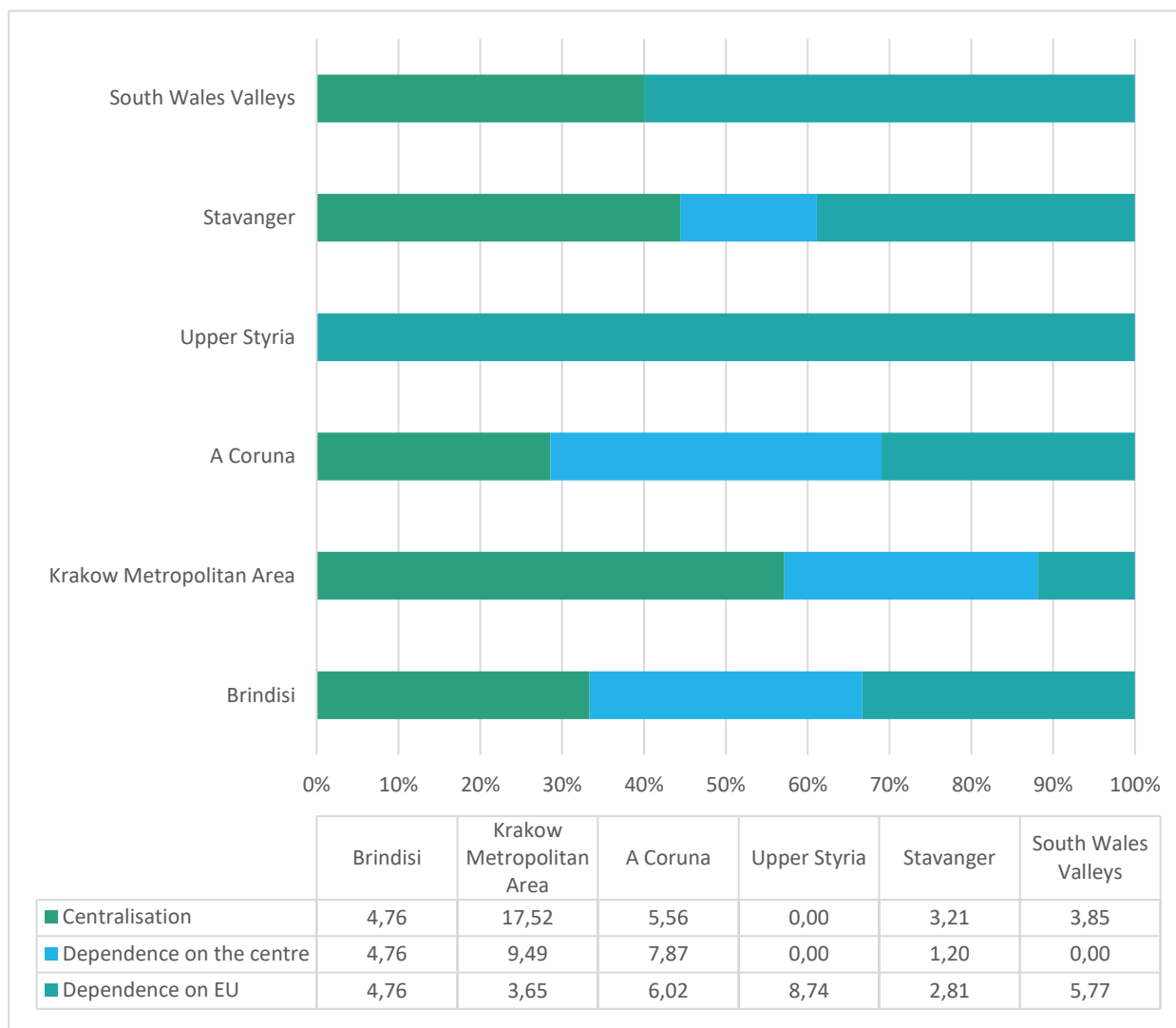
**Figure 35. The ratios of Segregation: "de-facto" barriers to access decarbonization advantages within the carbon-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

The analysis of the fifth factor, *Centralisation: higher regional dependence on the center*, indicated that the public discourse of Brindisi and A Coruna equally concentrated their statements around centralization, dependence on the center and dependence on the EU. Krakow Metropolitan area's results indicated an emphasis on centralization; Upper Styria's results suggested dependence on the EU as the core aspect of centralization in this area. Stavanger's results indicated an approximately equal relevance for centralization and dependence on the EU and South Wales Valley's results indicated dependence on the EU as being an emerging theme in the public discourse (See Figure 33).

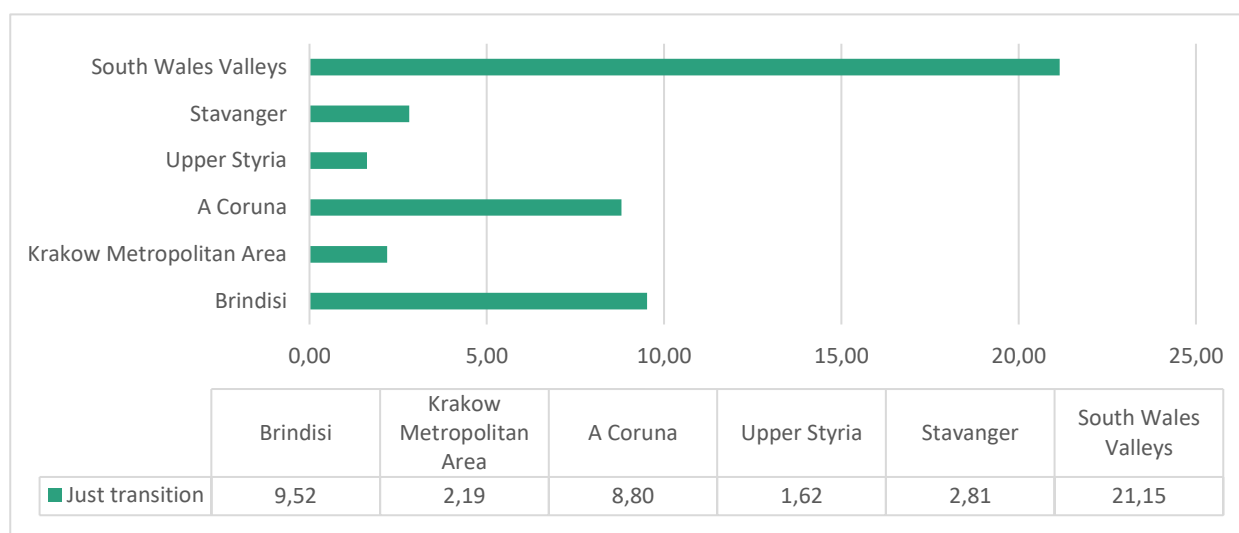
**Figure 36. The ratios of Centralization: higher regional dependence on the center within the carbon-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

The analysis of the sixth socio-political factor, *Countersignification: claim for a just transition*, indicated that the political discourse of all carbon-intensive regions sustain the need for just transition, South Wales Valley showing a higher importance to this factor (see Figure 34).

**Figure 37. The ratios of Countersignification: claim for a just transition within the carbon- intensive case regions**

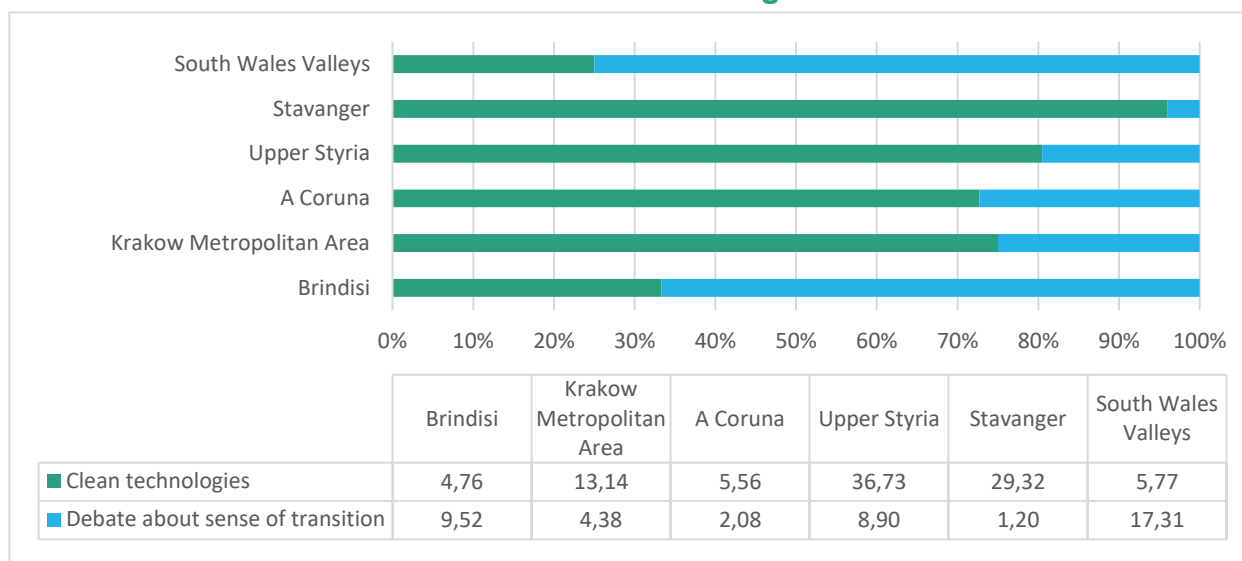


Source: ENTRANCES text analysis results and own compilation of data

Furthermore, the *counterdelegation: negotiating clean coal technology* factor analysis of the carbon-intensive areas suggested that the public discourse of Krakow Metropolitan area, A Coruna, Upper Styria, and Stavanger, was concentrated on the need for clean technologies in the clean energy transition. Brindisi and South Wales Valley's results indicated the debate about the sense of transition to be of a focal point in the public discourse (see Figure 35).



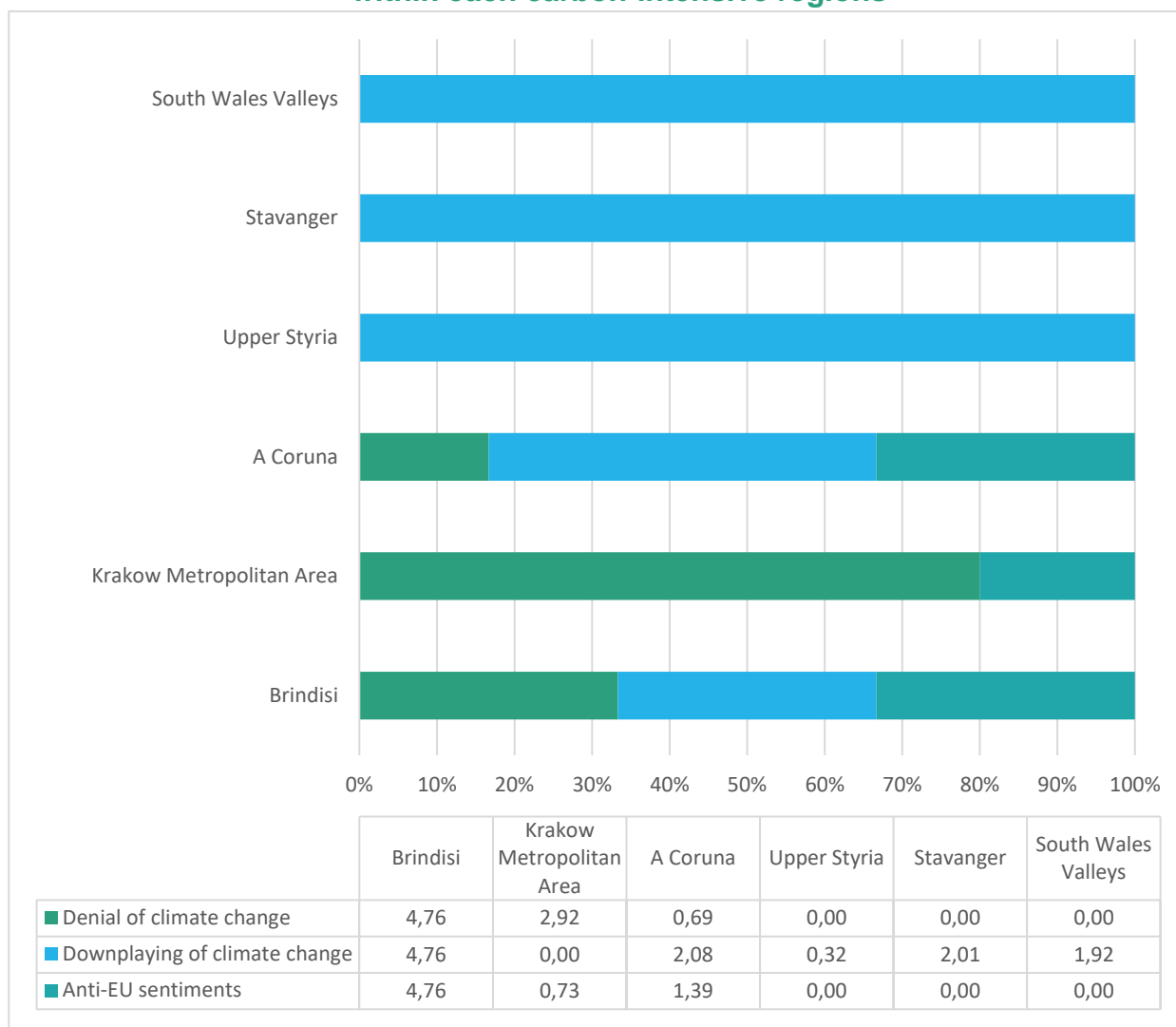
**Figure 38. The ratios of *Counterdelegation: negotiating clean coal technology* within each carbon-intensive regions**



Source: ENTRANCES text analysis results and own compilation of data

The results of the last factor, *Antisignification: rejecting and denial of decarbonization*, indicated that the carbon intensive regions analyzed differently pondered the three areas of this theme. Brindisi's public discourse was equally centered on denial of climate change, downplaying of climate change and anti-EU sentiments. Krakow Metropolitan area's results indicated that the public discourse of this region was focused on the denial of climate change. A Coruna case study's results suggested a higher occurrence in the public discourse of downplaying climate change. Lastly, Upper Styria, Stavanger, and South Wales Valley presented an identical pattern of results: in all three cases, downplaying of climate change was the sole theme of the analyzed public discourse (see Figure 36).

**Figure 39. The ratios of Antisignification: rejecting and denial of decarbonization within each carbon-intensive regions**



Source: ENTRANCES text analysis results and own compilation of data

The total statements coded for the *Exclusion: from access to benefits of carbonization* factor, indicated that the coal-intensive regions differently pondered the respective areas of debate. In terms of employment opportunities, the public discourse of Jiu Valley and Upper Nitra showed a higher interest in this regard as compared to the other case studies; at the opposite end, the three regions from Germany (i.e., Lusatia, Central Germany, and Rhineland) showed little interest in this matter. The unequal impact of decarbonization on different Societal Groups was highly discussed in the public discourse of Sulcis and Jiu Valley. Impact on gender roles was not supported in the statements of the public discourse in either of the seven coal-intensive regions. The public discourse around the education theme has higher in Upper Nitra, Jiu Valley, and Silesia; the social mobility theme was only found in the public discourse of Jiu Valley. The public discourse from the three cases from Germany (i.e., Lusatia, Rhineland, Central Germany) showed little to none interest on the themes regarding the exclusion of access to the benefits of decarbonization (see Figure 37).

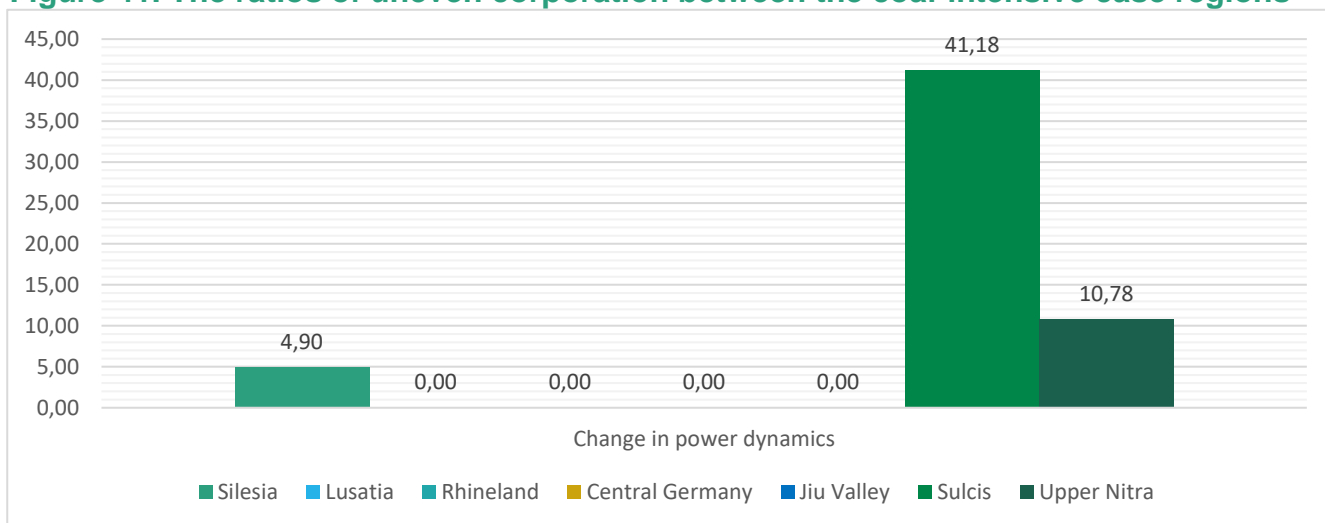
**Figure 40. The ratios of Exclusion: from access to benefits of decarbonization between the coal-intensive case studies**



Source: ENTRANCES text analysis results and own compilation of data

The public discourse about the change in power dynamics was supported in Sulcis, Upper Nitra, and Silesia; the other coal-intensive case studies did not report any statements or counterstatements of the public discourse on this matter (See Figure 38).

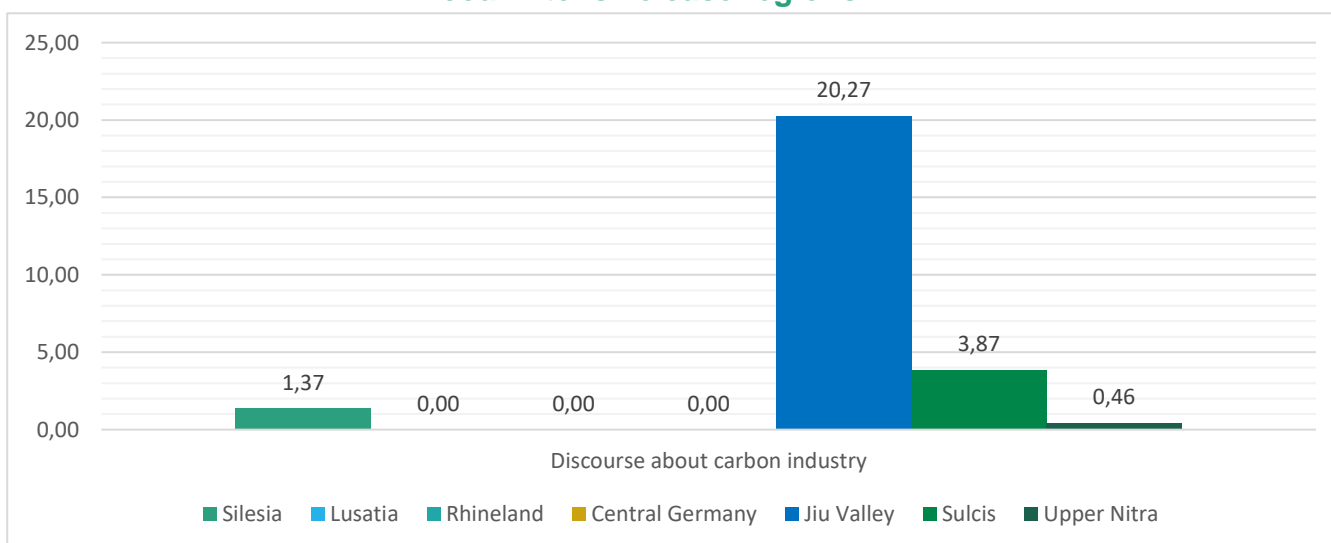
**Figure 41. The ratios of uneven corporation between the coal-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

The discourse about the carbon industry was an emerging factor in the public discourse of Jiu Valley, Sulci, Silesia, and Upper Nitra (See Figure 39).

**Figure 42. The ratios of Polarisation: stigmatization vs idea of progress between the coal-intensive case regions**

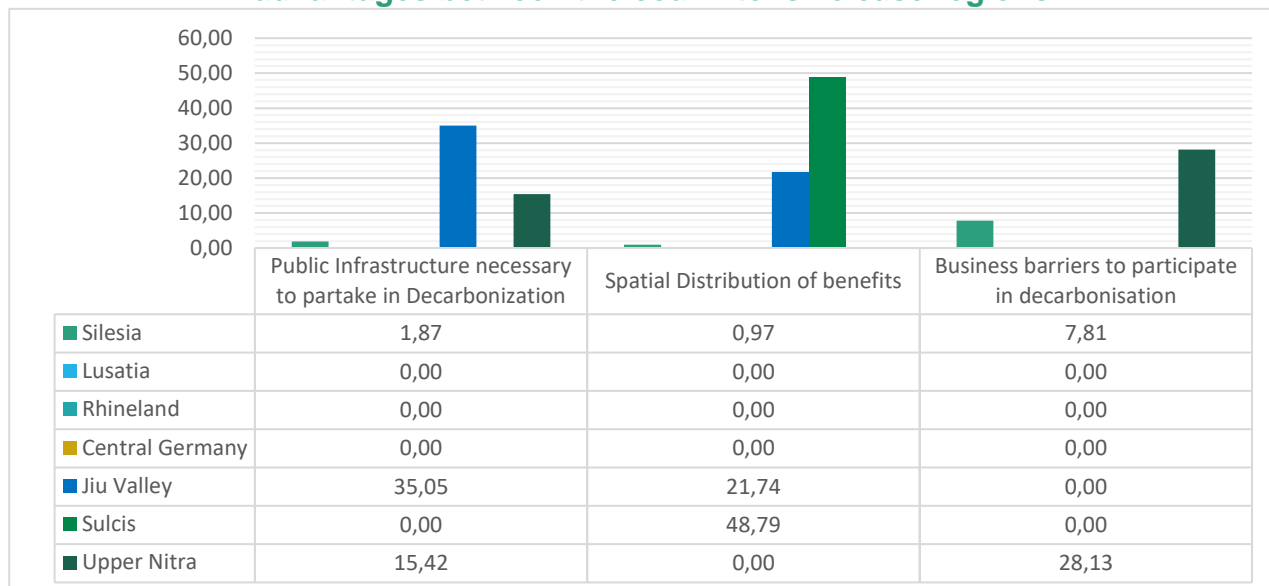


Source: ENTRANCES text analysis results and own compilation of data

The need for public infrastructure to partake in decarbonization was a common theme for the public discourse in Jiu Valley and Upper Nitra; The debate around the spatial distribution of benefits of decarbonization was an important theme in the public discourse of Sulcis and Jiu Valley, whereas

Upper Nitra's results indicated that the debate around business barriers to participate in decarbonization was an important theme for the public discourse from this region (see Figure 40).

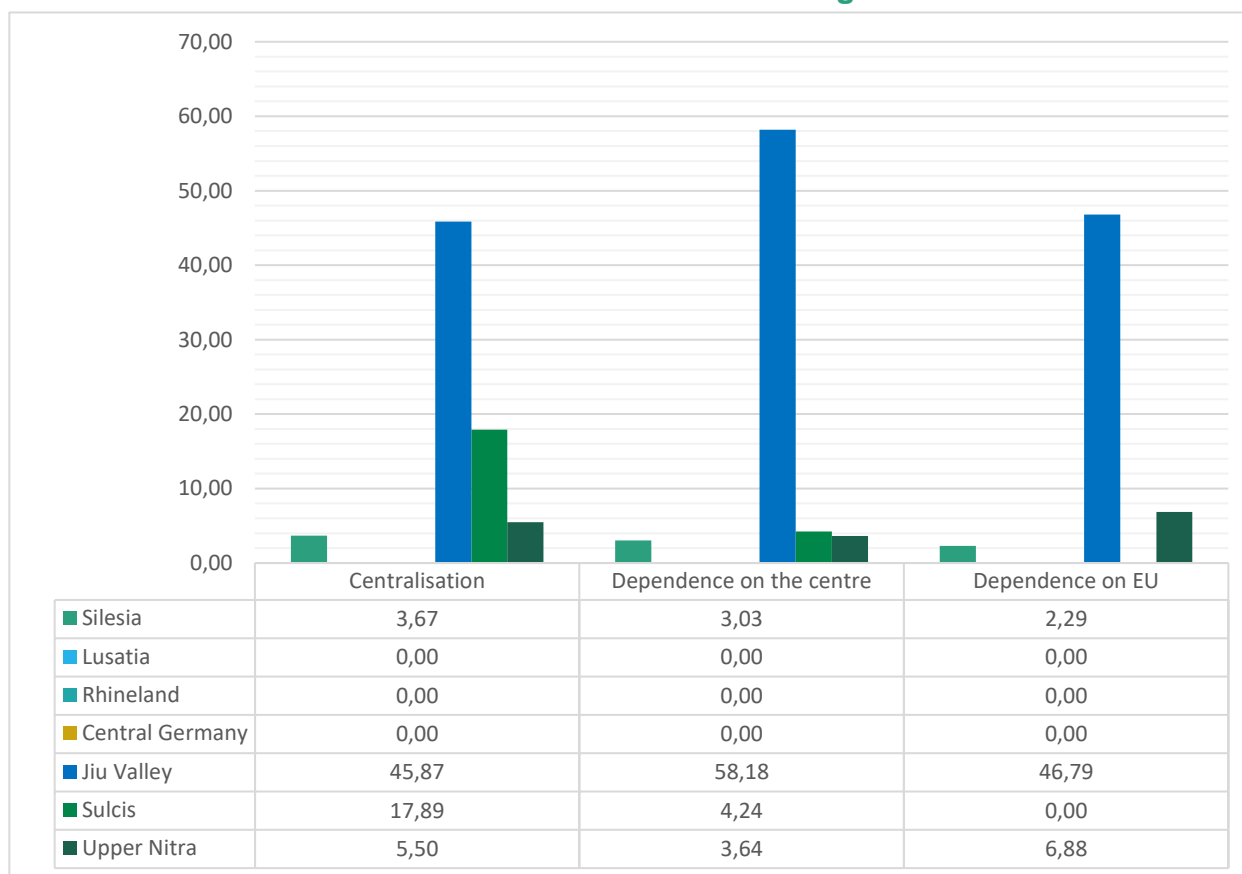
**Figure 43. The ratios of Segregation: "de-facto" barriers to access decarbonization advantages between the coal-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

The analysis of the fifth factor of the socio-political component, *Centralization: higher regional dependence on the center*, indicated that Jiu Valley's public discourse had the higher focus on all three areas of this theme (i.e., centralization, dependence on the center, dependence on EU) (see Figure 41).

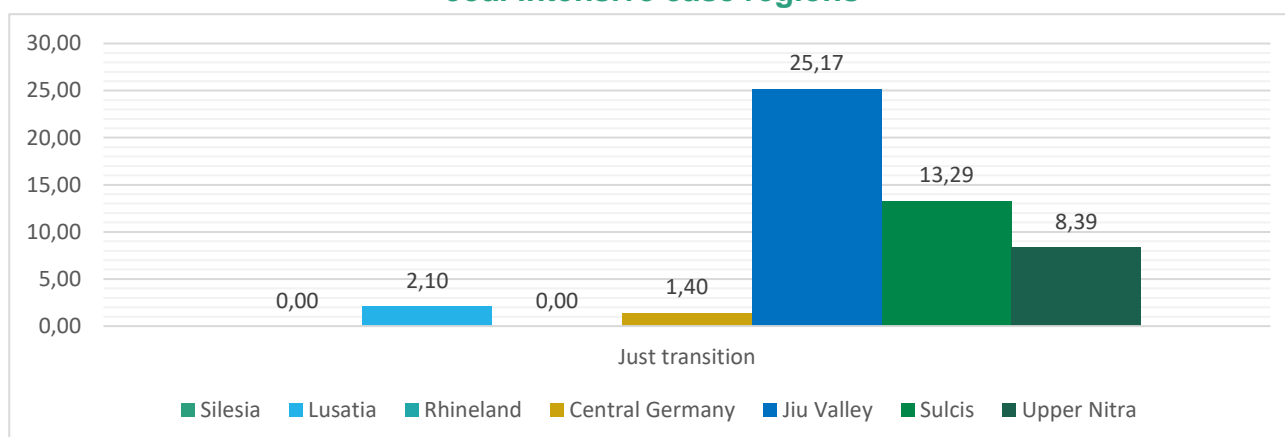
**Figure 44. The ratios of Centralization: higher regional dependence on the center between the coal-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

Furthermore, from the overall codes for *Countersignification: claim for a just transition* factor, Jiu Valley, Sulcis, and Upper Nitra's public discourse accentuated the need for just transition (see Figure 42).

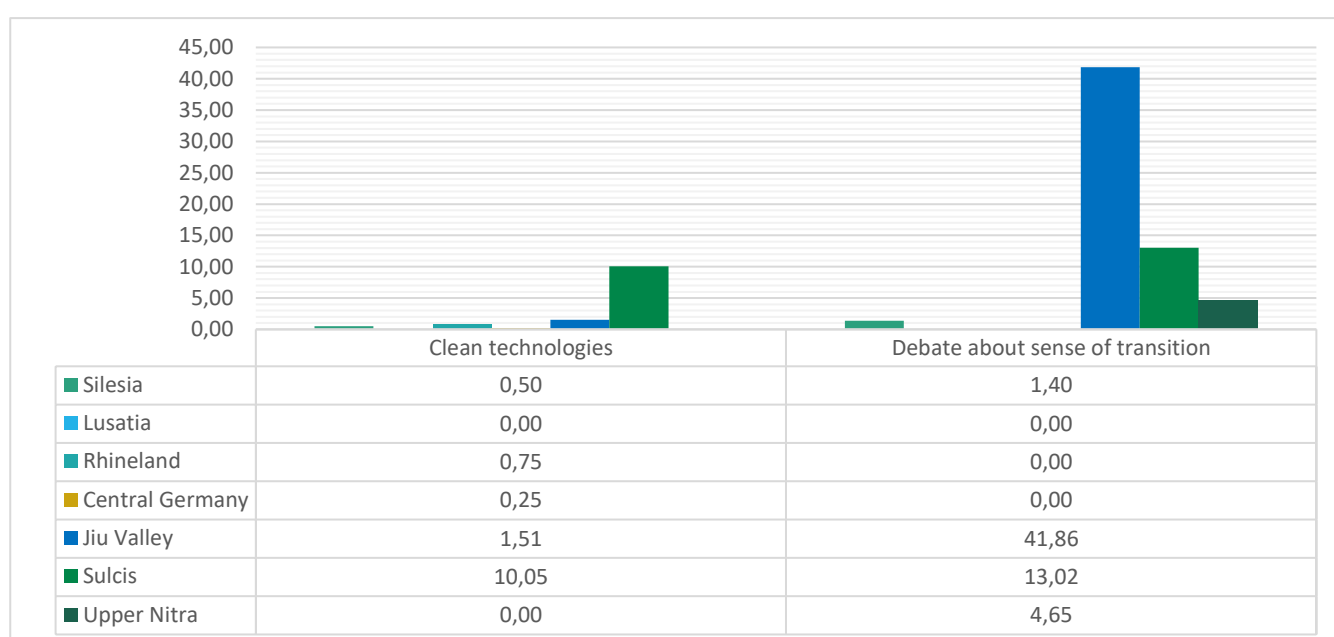
**Figure 45. The ratios of Countersignification: claim for a just transition between the coal intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

The analysis of the factor regarding *counterdelegation: negotiating clean coal technology* suggested that the public discourse from Sulcis emphasized the need for clean technologies, and the debate about the sense of transition was a particular focus for Jiu Valley and Sulcis (see Figure 43).

**Figure 46. The ratios of Counterdelegation: negotiating clean coal technology between coal-intensive regions**

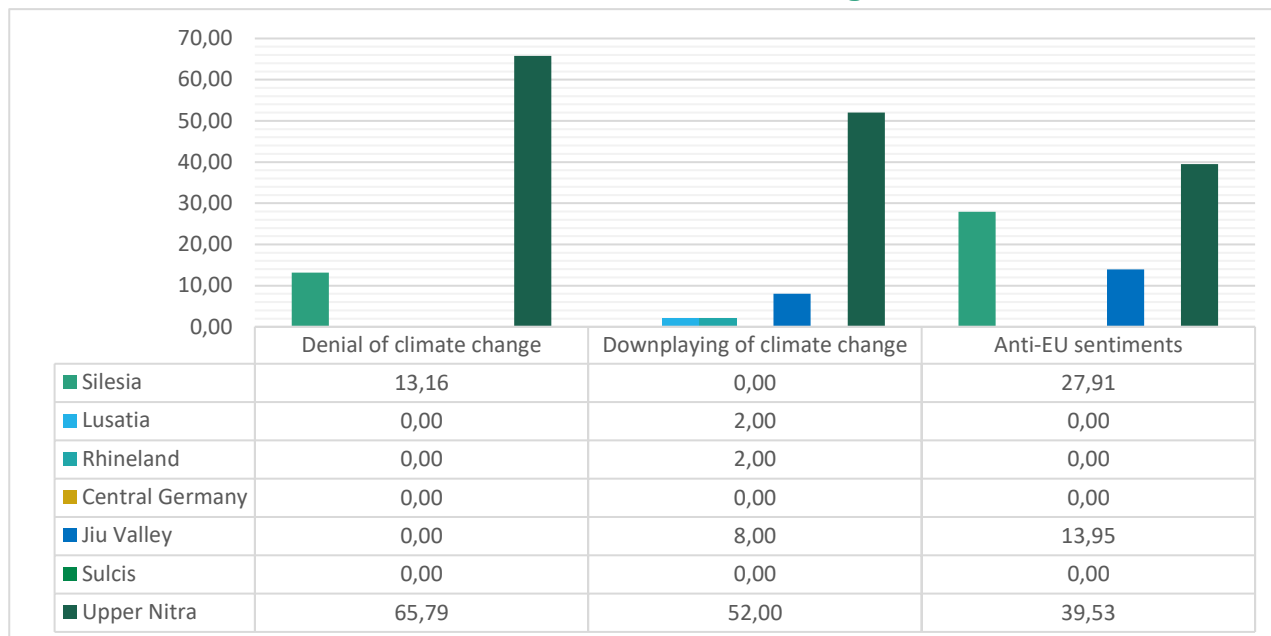


Source: ENTRANCES text analysis results and own compilation of data

Lastly, the analysis of the *Antisignification: rejecting and denial of decarbonization* factor suggested that the loadings on this factor were observed in Upper Styria. Thus, the public discourse of this coal-intensive region was centered on denial of climate change, downplaying of climate change and anti-

EU sentiments. Moreover, Silesia's results suggested an emphasis on anti-EU sentiments (see Figure 44).

**Figure 47. The ratios of Antisignification: rejecting and denial of decarbonization between each coal-intensive regions**

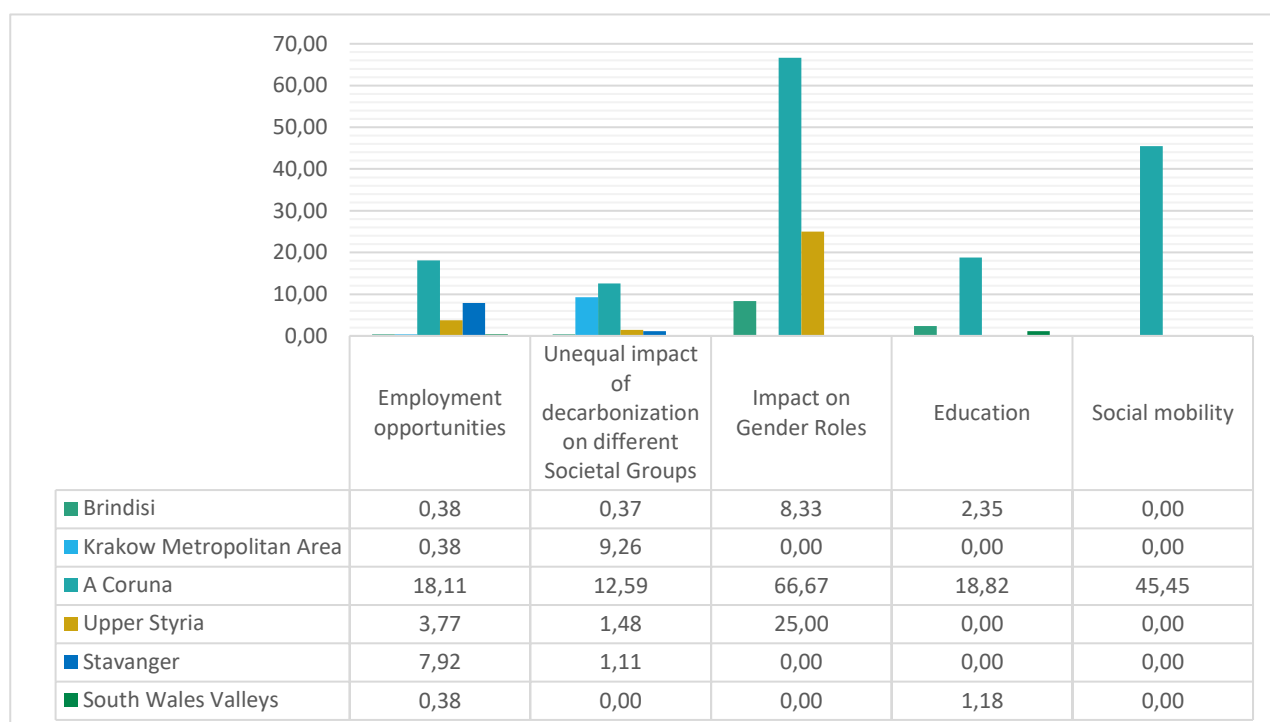


Source: ENTRANCES text analysis results and own compilation of data

In the carbon-intensive case regions, the *Exclusion: from access to benefits of decarbonization* factor was pondered differently for each case. Namely, employment opportunities are more common in the A Coruna's public discourse, whereas the unequal impact of decarbonization was frequently used in both Krakow Metropolitan area and A Coruna. Moreover, the impact of decarbonization on gender roles was mostly discussed in A Coruna and Upper Styria; the need for education and social mobility were mostly discussed by A Coruna (see Figure 45).



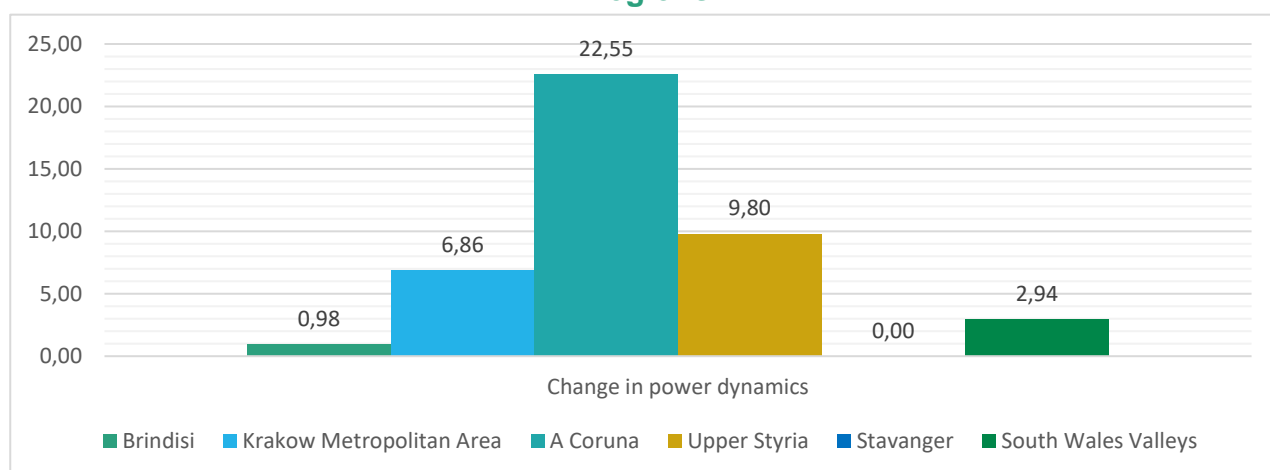
**Figure 48. The ratios of Exclusion: from access to benefits of decarbonization between the carbon-intensive case studies**



Source: ENTRANCES text analysis results and own compilation of data

Change in power dynamics, as a theme for *uneven incorporation: lack of space for the carbon industries*, was mostly discussed in A Coruna and Upper Styria (see Figure 46).

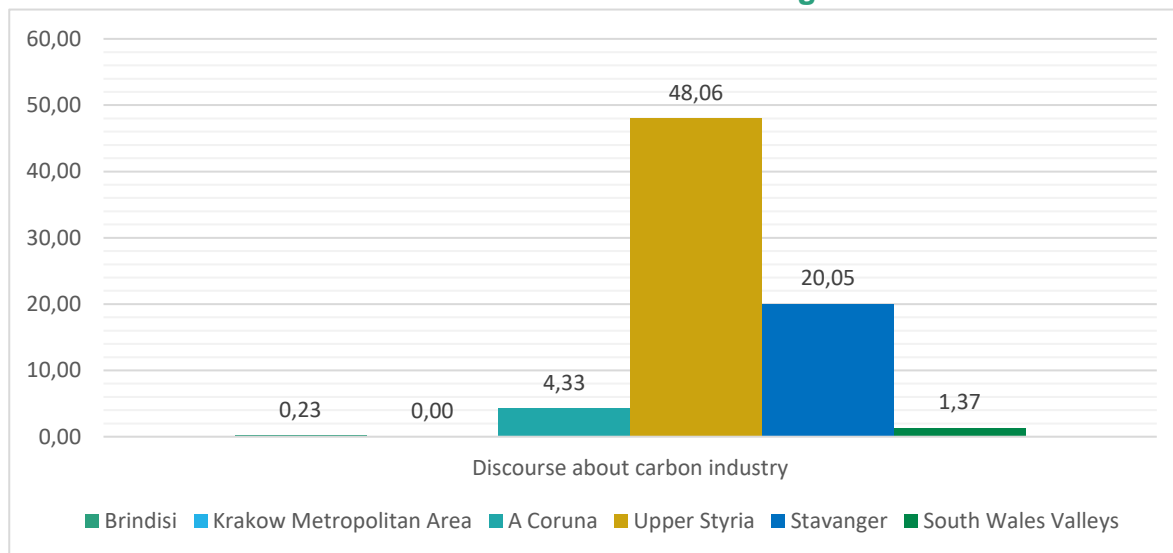
**Figure 49. The ratios of uneven corporation between the carbon -intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

Furthermore, the discourse about carbon industry, as an element of *Polarisation: stigmatization vs. idea of progress* was mostly in the public discourses of Upper Styria and Stavanger (see Figure 47).

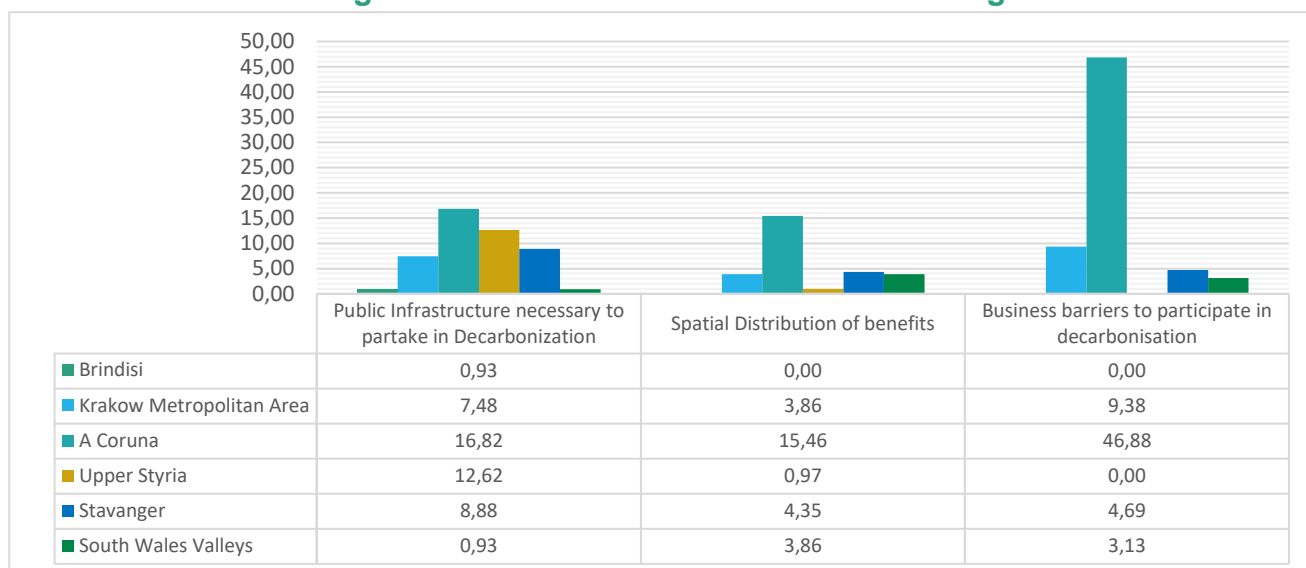
**Figure 50. The ratios of Polarisation: stigmatization vs idea of progress between the carbon-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

The analysis of the *Segregation: “de-facto” barriers to access decarbonization advantages* factor indicated that the theme of public infrastructure was mostly discussed by A Coruna and Upper Styria. Further, the public discourse of A Coruna mostly discussed both the spatial distribution of benefits and the theme of business barriers to participate in the decarbonization (see Figure 48).

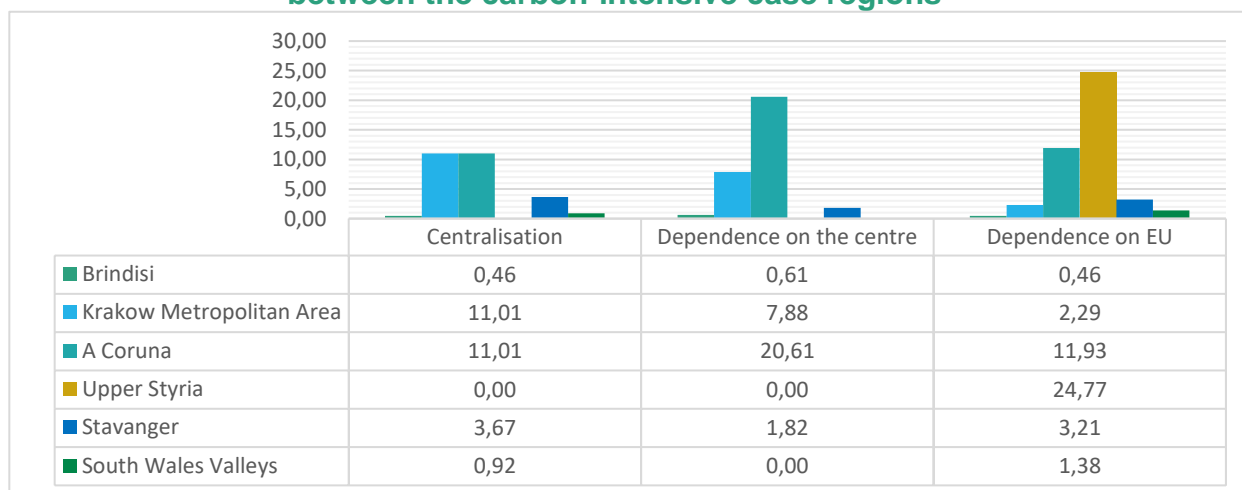
**Figure 51. The ratios of Segregation: "de-facto" barriers to access decarbonization advantages between the carbon-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

The centralization and dependence on the center themes of the regional dependence on the center were mostly discussed by the public discourse of Krakow Metropolitan area and A Coruna, whereas dependence on the EU was strongly discussed by Upper Styria (see Figure 49).

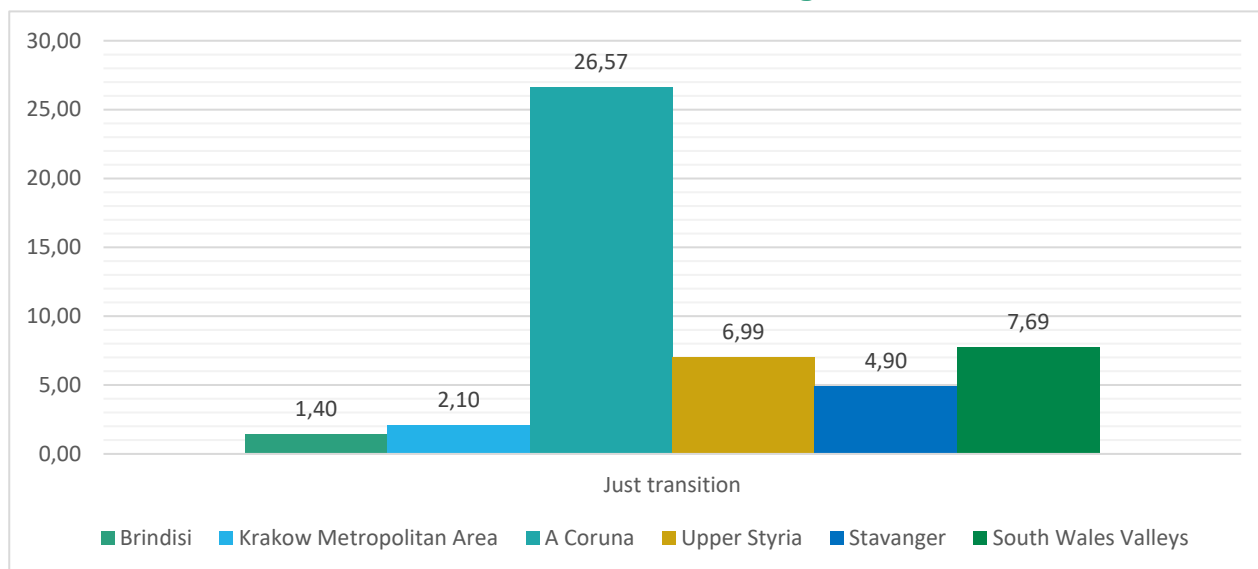
**Figure 52. The ratios of Centralization: higher regional dependence on the center between the carbon-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

Concerning the claim for a just transition factor, results suggested that just transition was mostly discussed in A Coruna as compared to the other carbon-intensive regions (see Figure 50).

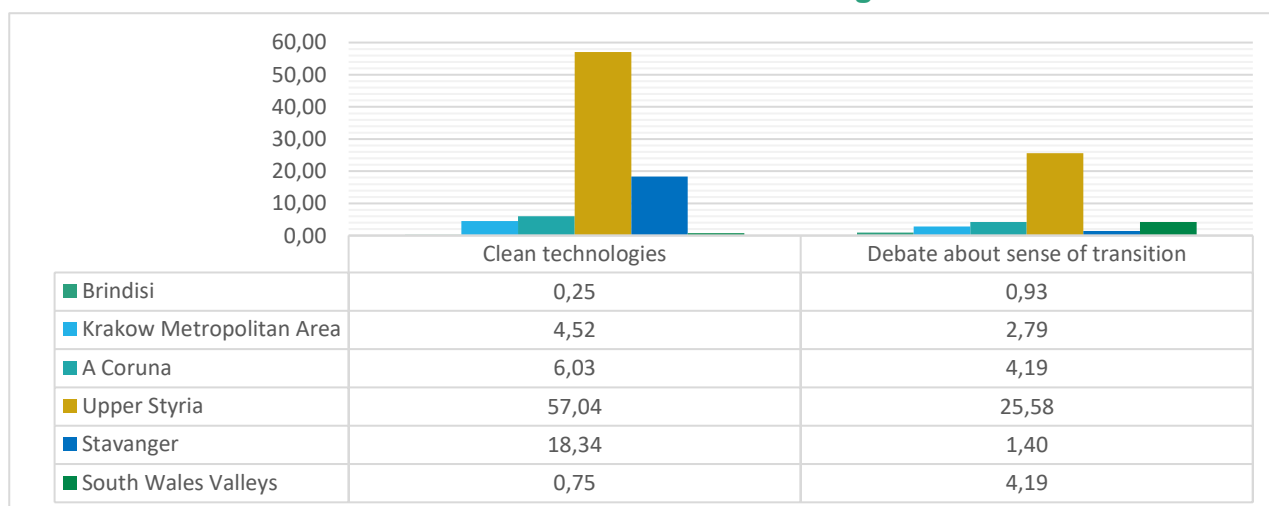
**Figure 53. The ratios of Countersignification: claim for a just transition between the carbon-intensive case regions**



Source: ENTRANCES text analysis results and own compilation of data

Furthermore, the negotiating clean coal technology was mostly supported by the public discourses from Upper Styria, both for the need of clean technologies and the debate about the sense of transition (see Figure 51).

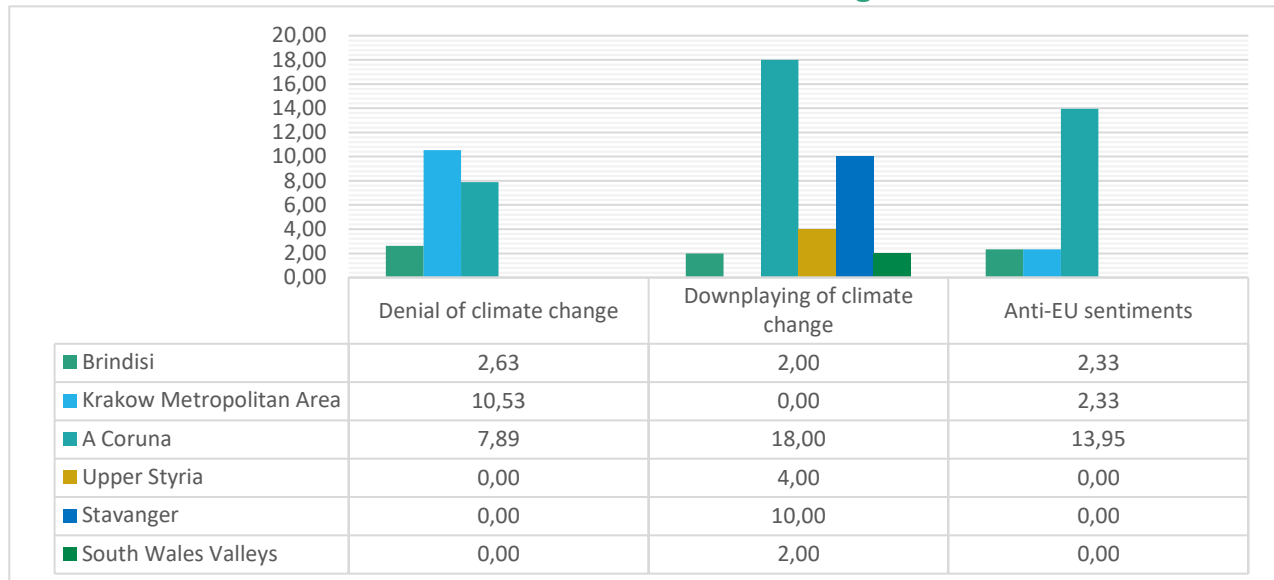
**Figure 54. The ratios of Counterdelegation: negotiating clean coal technology between the carbon-intensive regions**



Source: ENTRANCES text analysis results and own compilation of data

Lastly, rejecting and denial of decarbonization was strongly discussed in A Coruna – leading the loadings for downplaying of climate change and anti-EU sentiments, whereas Krakow Metropolitan area led the occurrences of denial of climate change (see Figure 52).

**Figure 55. The ratios of *Antisignification: rejecting and denial of decarbonization* between the carbon-intensive regions**



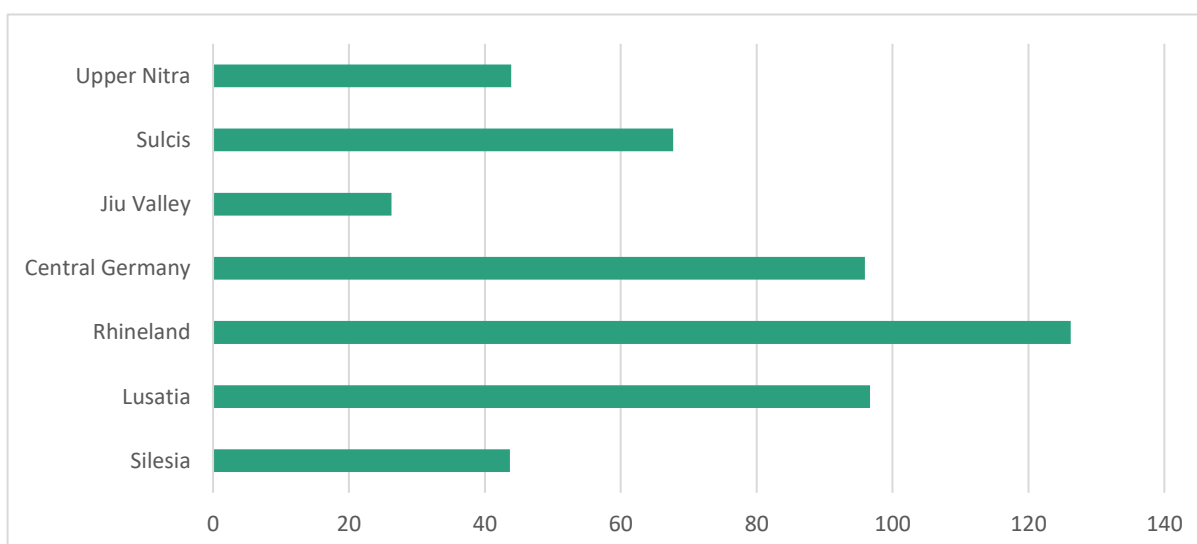
Source: ENTRANCES text analysis results and own compilation of data

## 1.8 Socio-economic component

The socio-economical data contains information for each of the 13 case studies (i.e., LMA, PAR, and CCT), as well as national and EU levels, from the national and European statistical databases in the 1991 – 2020 timeframe concerning the socio-economic factors, namely (1) GDP per capita in 2019 relative to EU28, (2) change in population (addressed as both Population in 2019 relative to 2000, and as Population change in the region relative to population change in the country from 2000), and (3) share of employed persons in 2019.

The coal-intensive case studies vary greatly in their GDP per capita. Specifically, the three cases from Germany (i.e., Rhineland, Central Germany, and Lusatia) had the highest GDP per capita, whereas Jiu Valley had the lowest (see Figure 53).

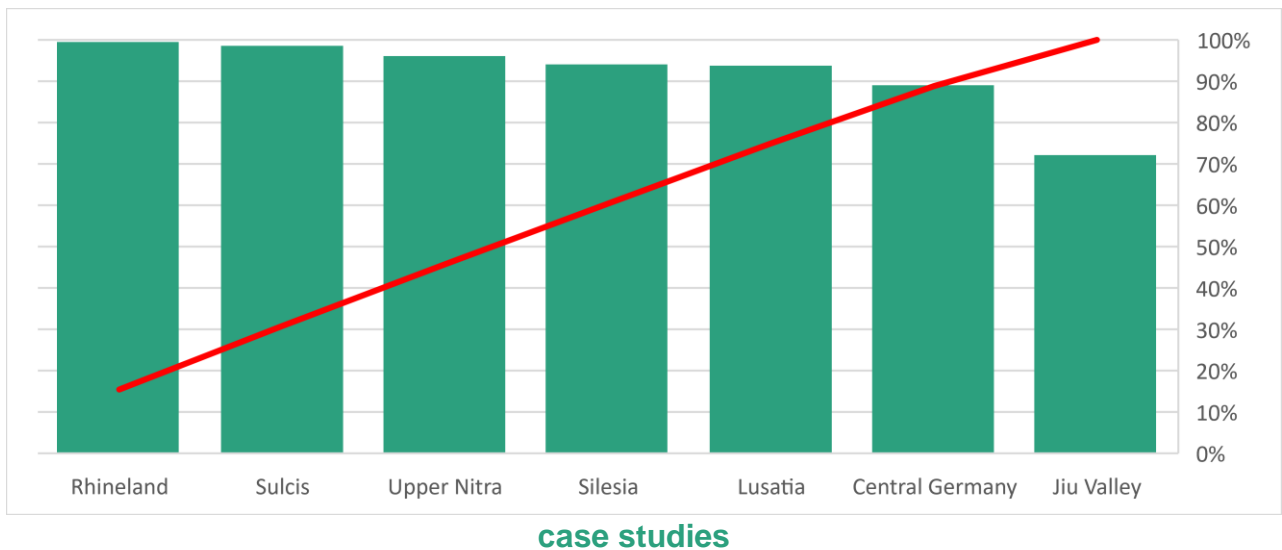
**Figure 56. GDP 2018 per Capita relative to EU28 between the coal-intensive case studies**



Source: Eurostat and own compilation of data

All the coal-intensive case studies presented a decrease in population, Jiu Valley being the case that presented the strongest depopulation (see Figure 24).

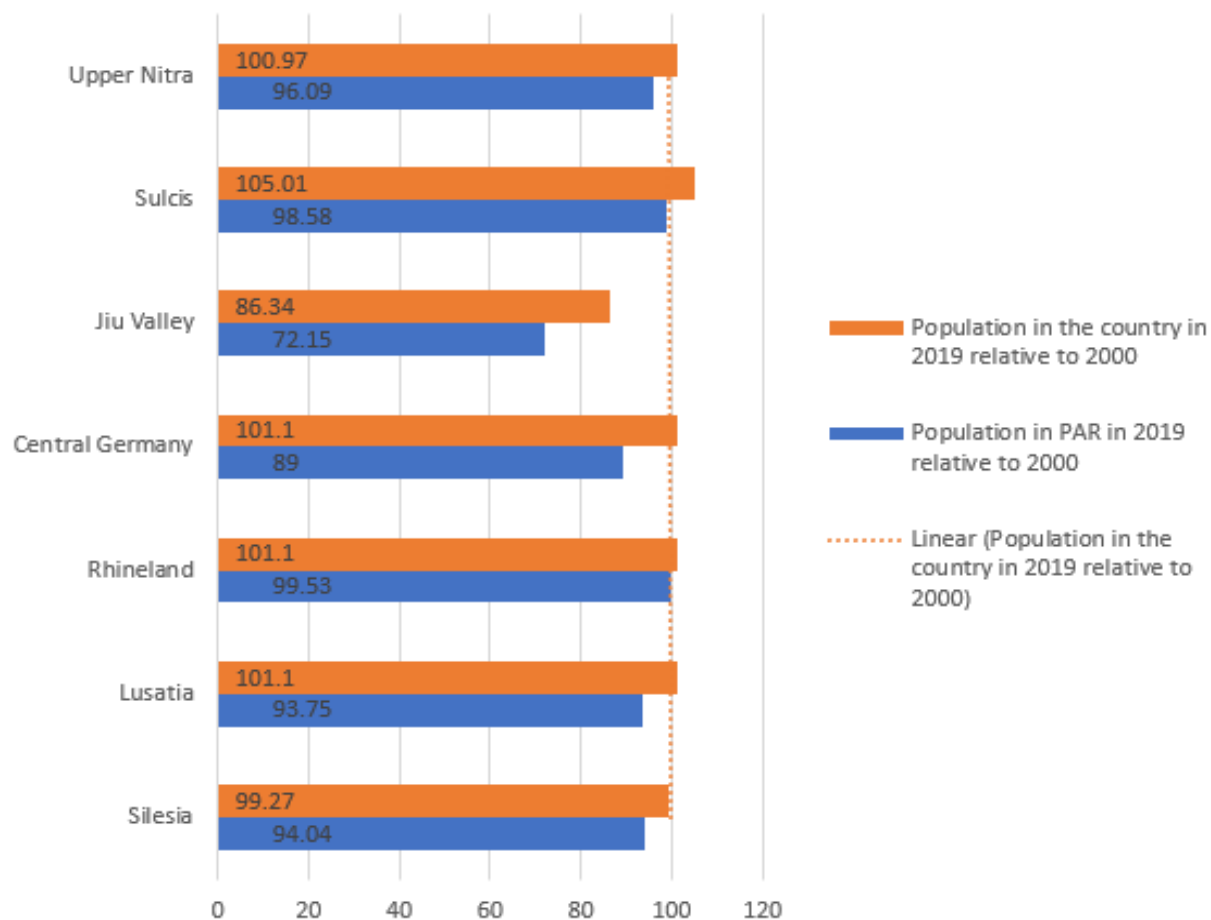
**Figure 57. Population in PAR in 2019 relative to 2000 between the coal-intensive**



*Source: Eurostat and own compilation of data*

Furthermore, in most countries the population has grown over the past 20 years, but the population change in most of the coal-intensive regions was below the country population changes, indicating a larger depopulation in these coal-intensive case studies (see Figure 55).

**Figure 58. The comparison between the population changes of the coal-intensive region and that of the country**

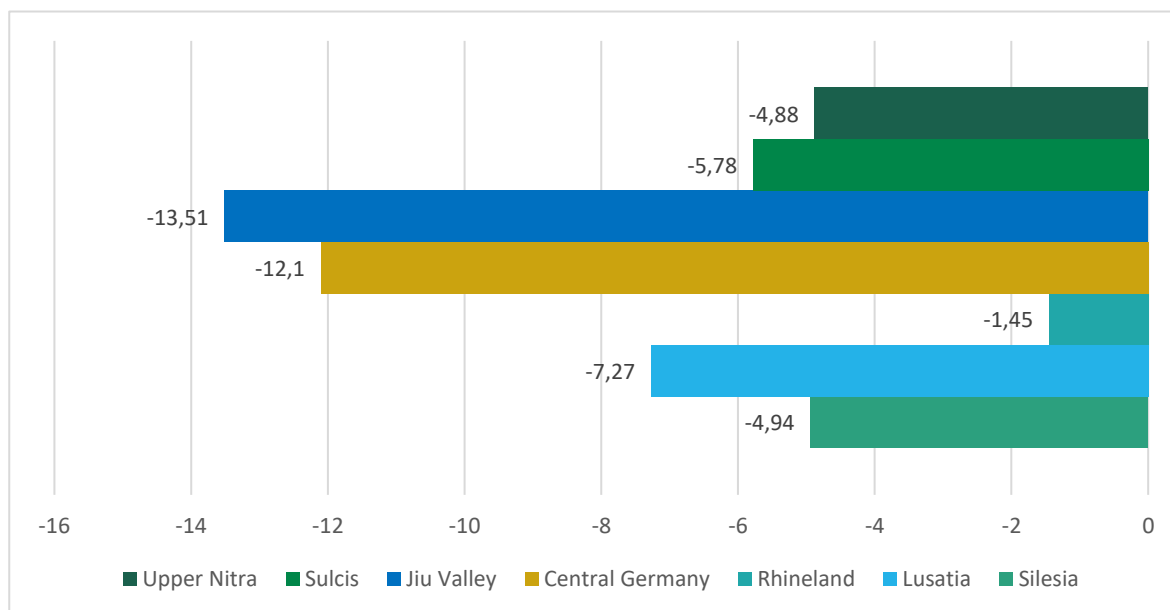


Source: Eurostat and own compilation of data

The population changes in most coal-intensive regions are below the country population changes, suggesting a lower growth in the regions, specifically in Jiu Valley and Central Germany (see Figure 56).



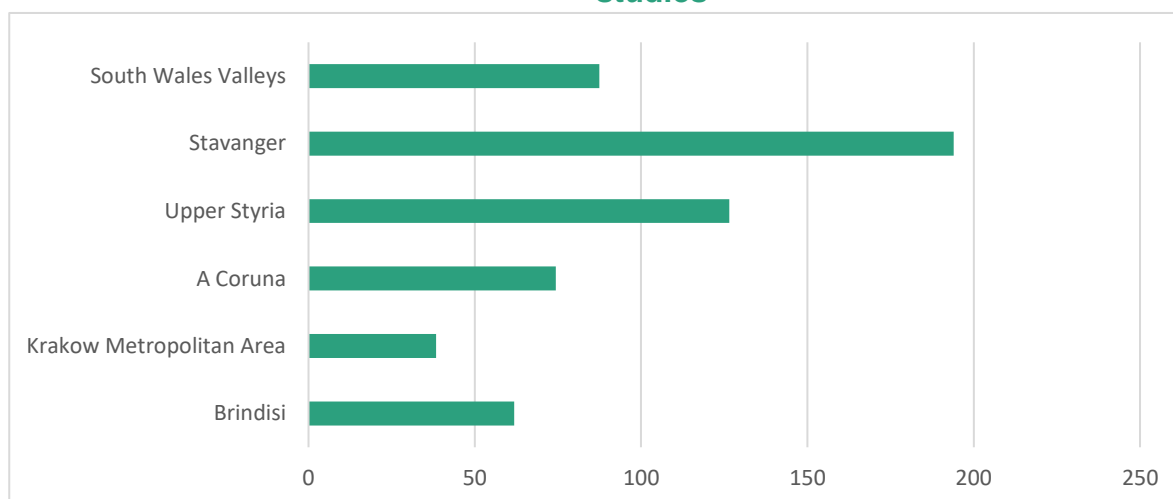
**Figure 59. Population changes in the coal-intensive regions relative to population change in the country from 2000**



Source: Eurostat and own compilation of data

In the carbon-intensive case studies, the highest level of the GDP per capita was reported in Stavanger and Upper Styria, whereas the lowest level was observed in Krakow Metropolitan area (see Figure 57).

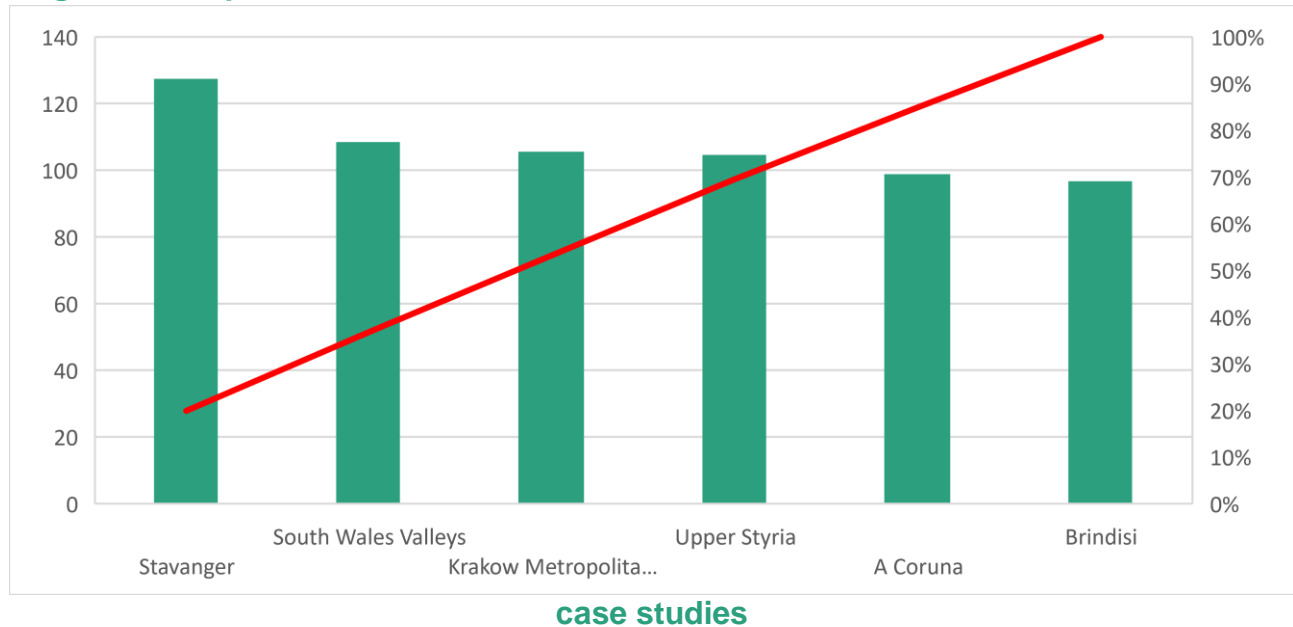
**Figure 60. GDP 2018 per Capita relative to EU28 between the carbon-intensive case studies**



Source: Eurostat and own compilation of data

In terms of depopulation, Brindisi and A Coruna exhibited a decrease of population in 2019 relative to 2000 in the PAR, whereas Stavanger, South Walley Valleys, Upper Styria, and Krakow Metropolitan area's results indicated an increase in population relative to 2000 (see Figure 58).

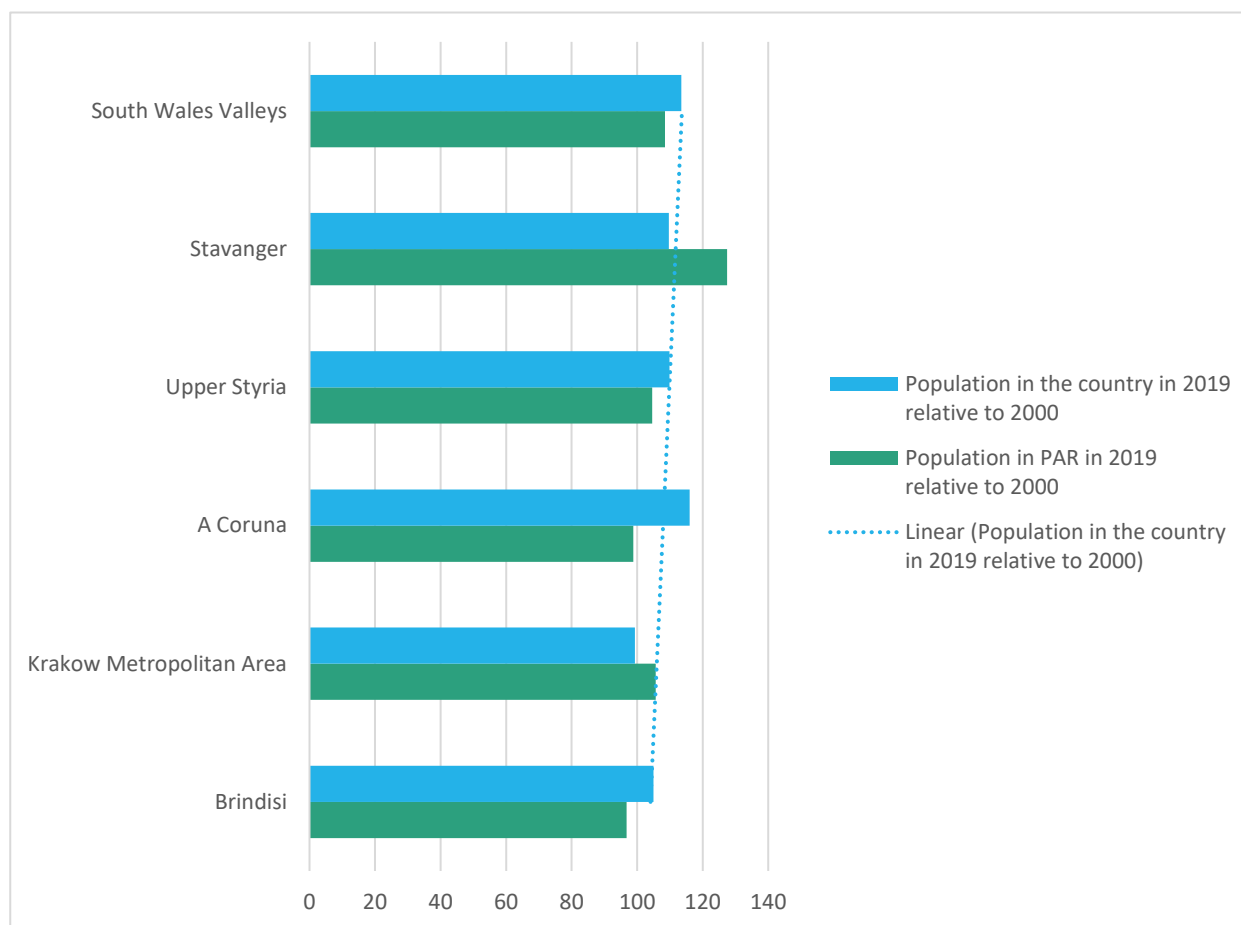
**Figure 61. Population in PAR in 2019 relative to 2000 between the carbon-intensive**



*Source: Eurostat and own compilation of data*

All the six countries of the carbon-intensive regions showed an increase in population in the last 20 years; nevertheless, in Stavanger and Krakow Metropolitan area carbon-intensive regions an increase of the PAR population was also observed while in the other case studies, a depopulation in the PAR was present (see Figure 59).

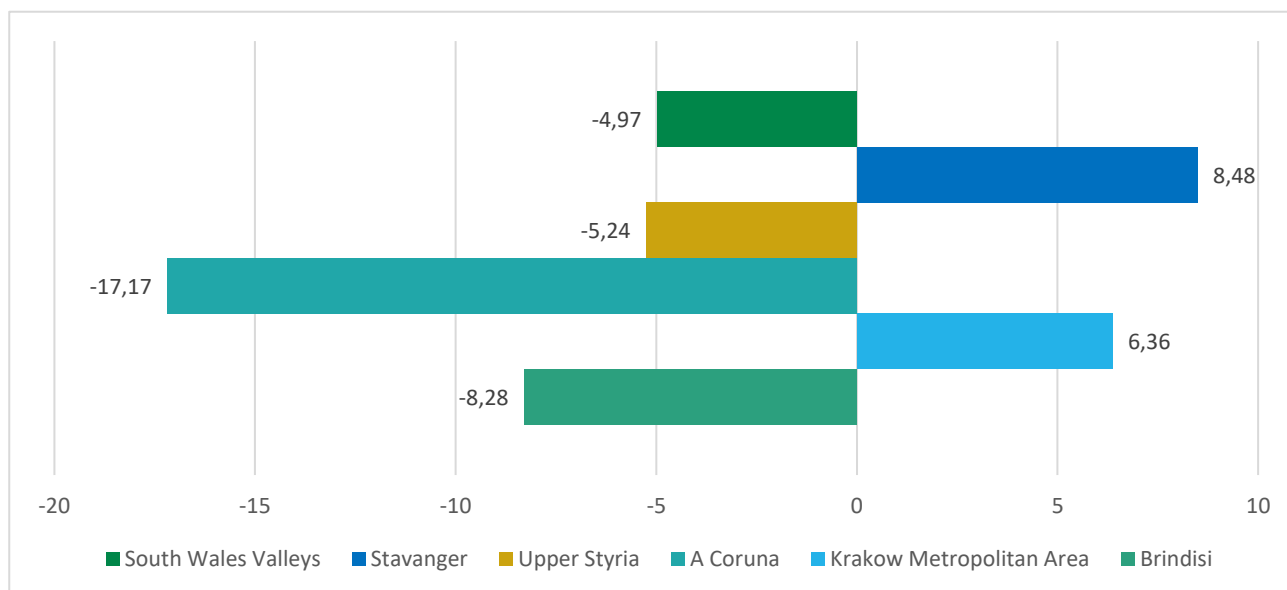
**Figure 62. The comparison between the population changes of the carbon-intensive region and that of the country**



Source: Eurostat and own compilation of data

The population changes in Stavanger and Krakow Metropolitan are above the country level, while in the other case studies, a depopulation growth was observed, especially in A Coruna (see Figure 60).

**Figure 63. Population changes in the carbon-intensive regions relative to population change in the country from 2000**



Source: Eurostat and own compilation of data

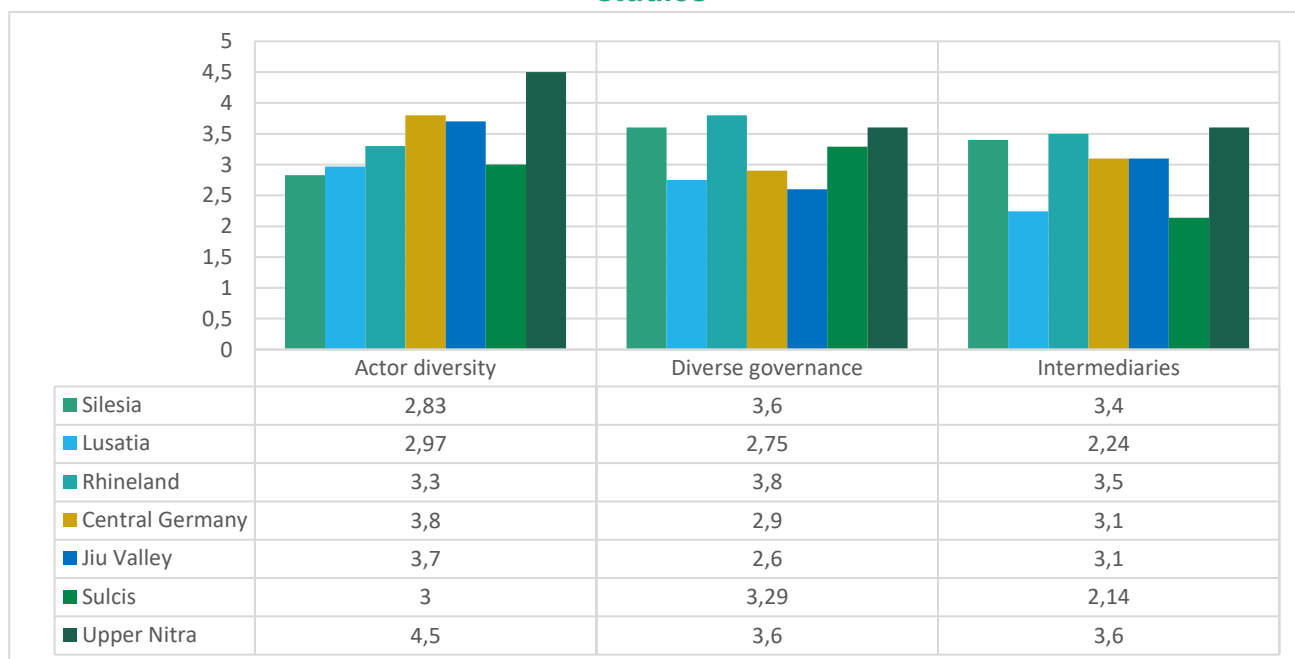
## 1.9 Socio-technical & socio-ecological component

The descriptive analysis of the socio-technical and socio-ecological component was based on the data file obtained from the interview in each of the 13 case studies. The data file contains the average score of each case study to the socio-ecological and technical factors, namely (1) inclusive and multiform governance (actor diversity, diverse governance, intermediaries), (2) transformative leadership, (3) empowered and autonomous communities of practice (social needs focus, community empowerment), (4) system(s) awareness and memory (system analysis, path dependency), (5) sustainability foresight (knowledge production, sustainability vision, alternative scenarios), (6) diverse community - based experimentation with disruptive solutions (disruptive experimentation), (7) innovation embedding and coupling (resource availability, reflexive regulation), (8) reflexivity and social learning (social learning), (9) working across human agency levels and (10) working across political-administrative levels and geographical scales.

Furthermore, the descriptive analysis focused on comparing the results obtained in each case study, separately for the coal-intensive regions and for the carbon-intensive case studies.

Results suggested that Upper Nitra citizens' and civil society organizations, as well as private business and representations partake in a stronger way in the decarbonization process, as compared to the other coal-intensive case studies. Further, Rhineland, Upper Nitra, Silesia, and Sulcis supported a higher diversity of formal and informal actor networks and governance modes than the other case studies. Lastly, Upper Nitra, Rhineland, and Silesia's results indicated that in these three regions there is a higher focus on sustained intermediaries and hybridization (see Figure 61).

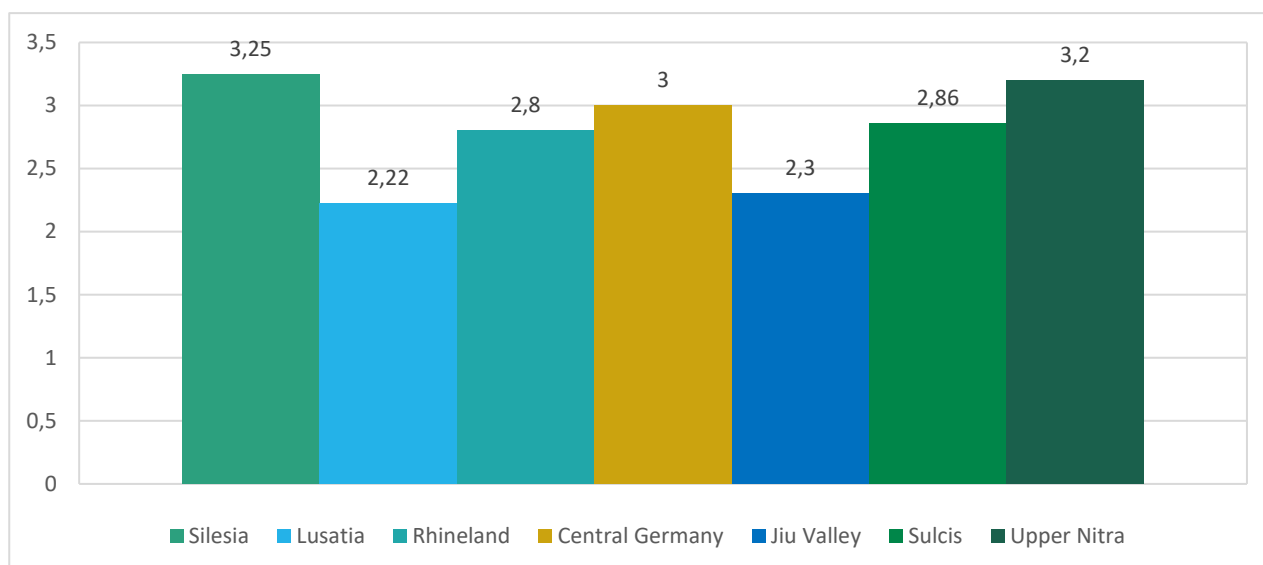
**Figure 64. Inclusive and multiform governance between the coal-intensive case studies**



Source: ENTRANCES interview results and own compilation of data

Secondly, Silesia, Upper Nitra, and Central Germany's obtained higher levels of transformative leadership, whereas Lusatia and Jiu Valley were at the opposite end (see Figure 62).

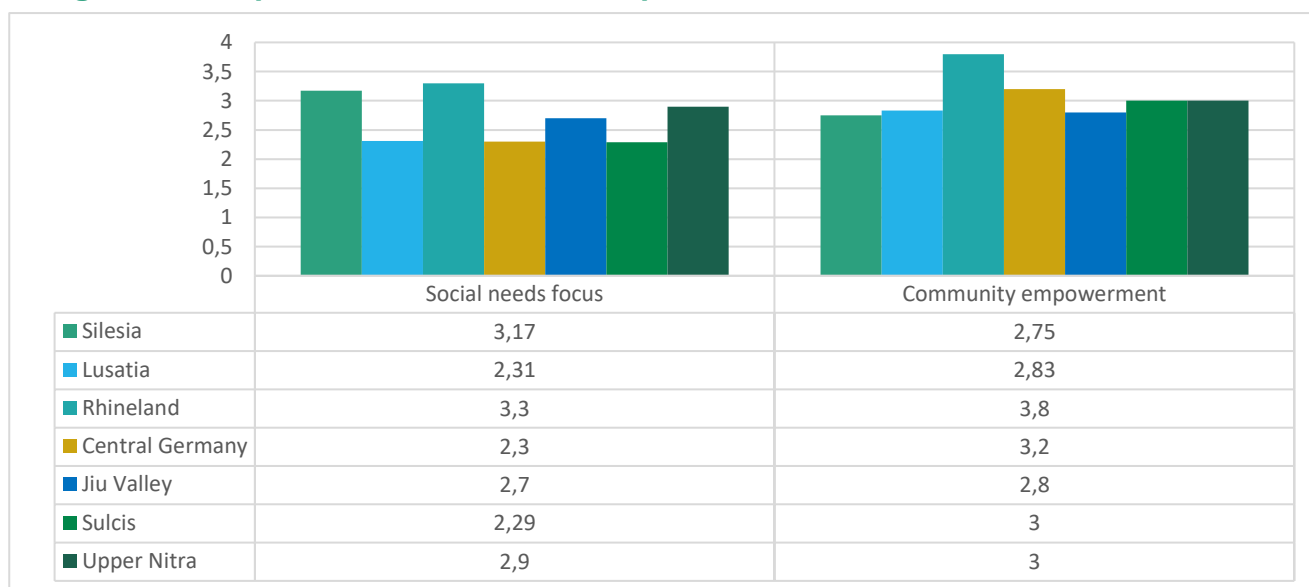
**Figure 65. Transformative leadership between the coal-intensive case studies**



Source: ENTRANCES interview results and own compilation of data

Further, Rhineland and Silesia obtained higher levels of social needs focus, whereas the community empowerment was stronger in Rhineland and Central Germany (see Figure 63).

**Figure 66. Empowered communities of practice between the coal-intensive case studies**

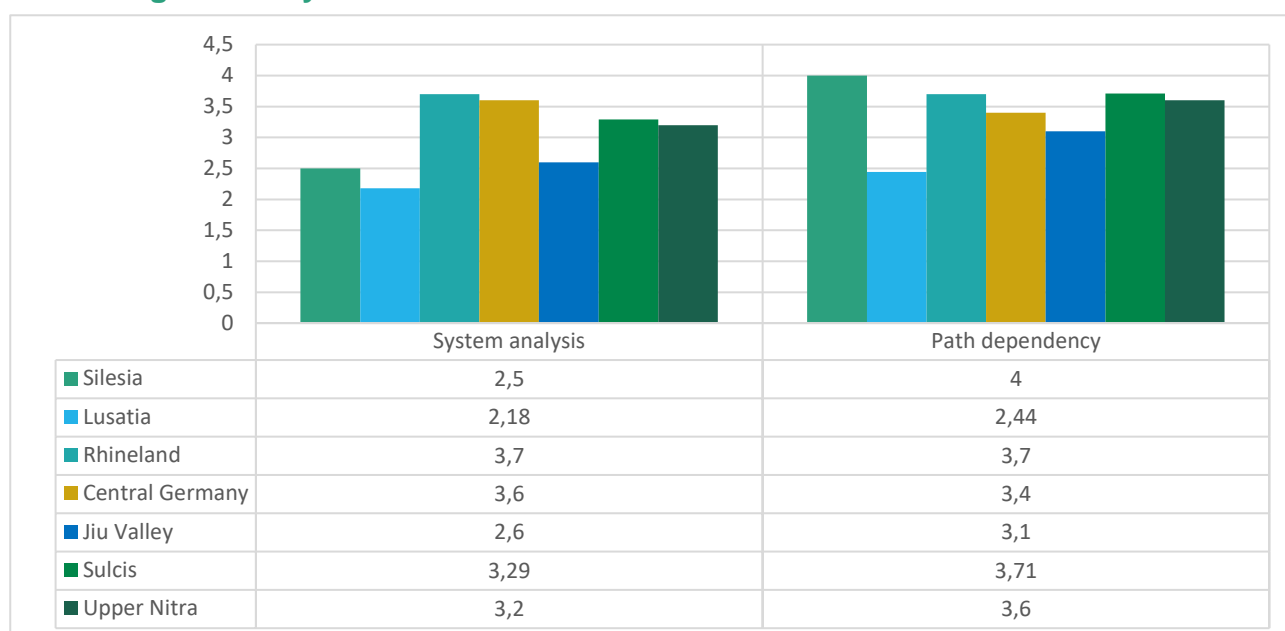


studies

Source: ENTRANCES interview results and own compilation of data

In terms of system awareness, Rhineland and Central Germany's results indicated a higher tendency to emphasize on agendas aiming to tackle sustainability challenges after deliberate analysis of relevant systems, whereas Lusatia obtained the lowest score on explicitly tackling systemic barriers to change (i.e., recognition of path dependencies); at the opposite end, Silesia scored higher on path dependency (see Figure 64).

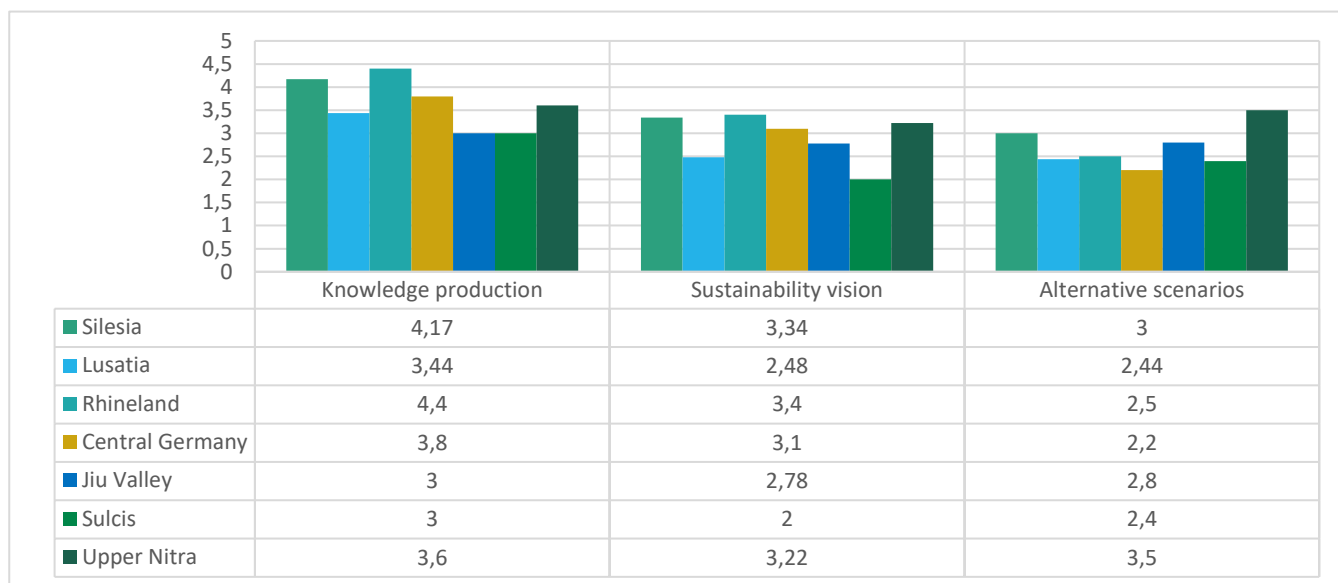
**Figure 67. System awareness between the coal-intensive case studies**



Source: ENTRANCES interview results and own compilation of data

Regarding sustainability foresight, Rhineland and Silesia scored higher on knowledge production, whereas Jiu Valley and Sulcis scored the lowest. Secondly, Sulcis, Jiu Valley, and Lusatia scored lowest on sustainability vision, whereas Rhineland and Silesia showed a higher explicit future vision as a means for motivating partners and fostering commitments. Lastly, Upper Nitra and Silesia showed the higher interest in creating alternative scenarios for decarbonization, whereas the lowest interest in this direction was shared by Central Germany, Lusatia, Rhineland and Sulcis (see Figure 65).

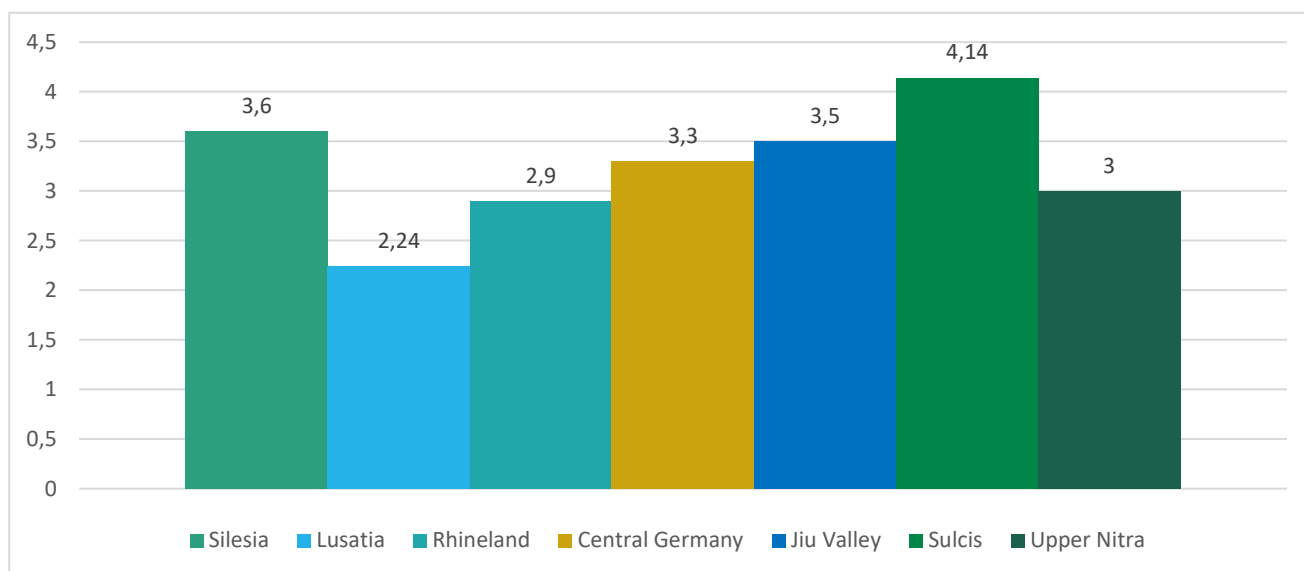
**Figure 68. Sustainability foresight between the coal-intensive case studies**



Source: ENTRANCES interview results and own compilation of data

Disruptive experimentation was most commonly used in Sulcis and Silesia, at the opposite end being Lusatia (see Figure 66).

**Figure 69. Diverse community - based experimentation with disruptive solutions between the coal-intensive case studies**

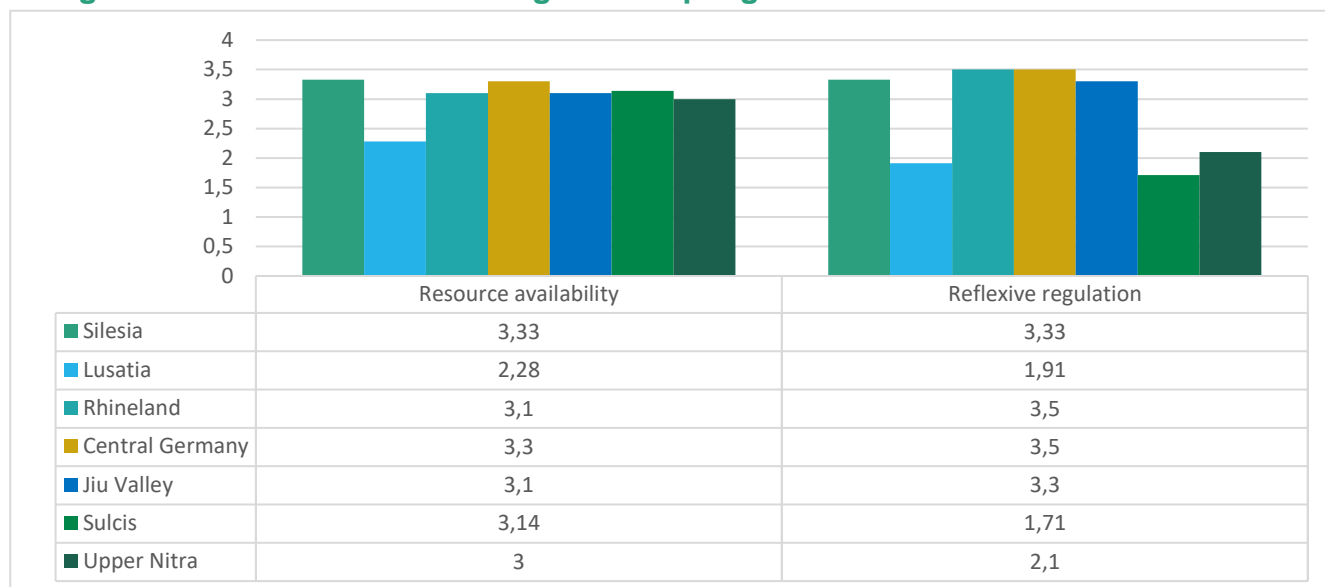


Source: ENTRANCES interview results and own compilation of data



Concerning innovation embedding, results suggested that Silesia and Central Germany scored higher on resource availability, whereas Lusatia scored lower on this factor. Secondly, Sulcis and Lusatia scored lowest on reflexive regulations, whereas Rhineland and Central Germany scored highest on this factor (see Figure 67).

**Figure 70. Innovation embedding and coupling between the coal-intensive case**

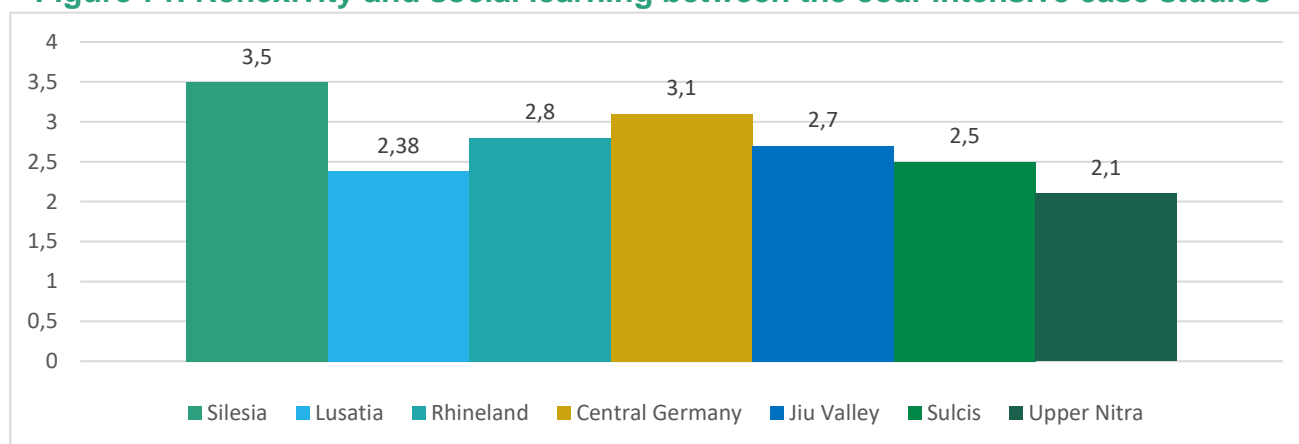


studies.

Source: ENTRANCES interview results and own compilation of data

Social learning was mostly acknowledged by Silesia and Central Germany, whereas Upper Nitra and Lusatia scored lowest on this factor (see Figure 68).

**Figure 71. Reflexivity and social learning between the coal-intensive case studies**



Source: ENTRANCES interview results and own compilation of data

Capacity building activities occurring across individuals, households, social groups, organizations, network, and society (i.e., working across human agency levels) was mostly present in Rhineland, Sulcis, Central Germany, and Upper Nitra, whereas the lowest capacity for human agency levels was found in Jiu Valley. Lastly, Rhineland and Central Germany scored higher on having different initiatives involved in capacity building at different levels of government, including local, municipal, regional, national, and supranational levels (i.e., working across scales/tiers); at the opposite end, Sulcis's results indicate a lower tendency of working across different levels and scales (see Figure 69).

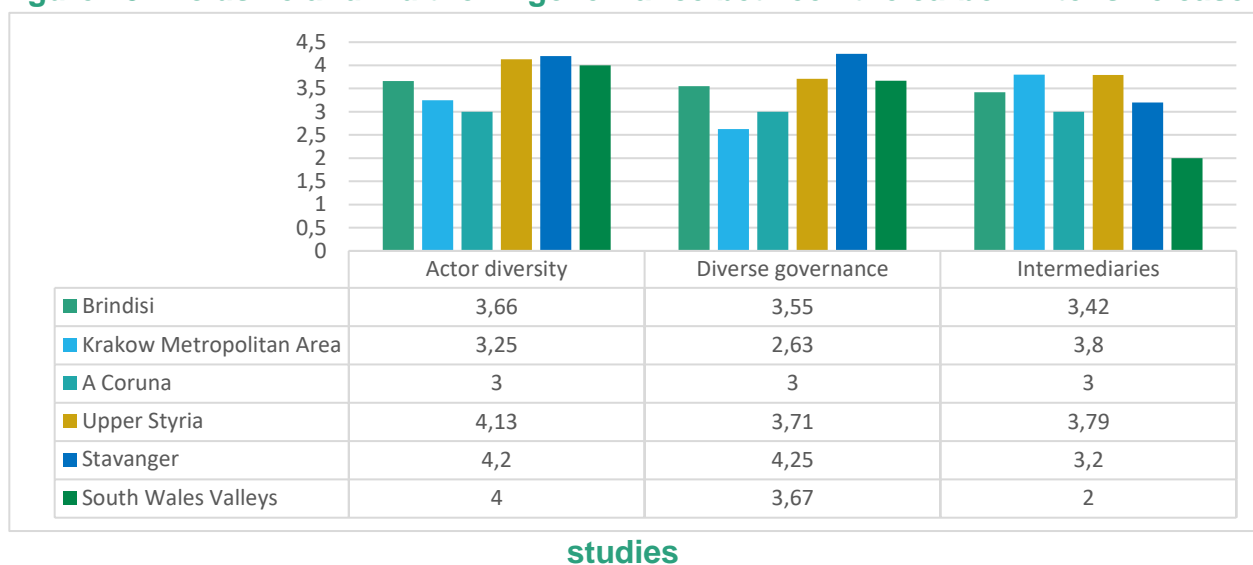
**Figure 72. Working across human agency and political-administrative levels between the coal-intensive regions**



Source: ENTRANCES interview results and own compilation of data

In the carbon-intensive case studies, higher scores on actor diversity were obtained by Stavanger, Upper Styria, and South Wales Valleys, whereas the presence of diverse governance was rarely supported by Krakow Metropolitan area and A Coruna. Furthermore, South Wales Valleys scored lowest on intermediaries, suggesting a lower tendency towards sustained intermediaries and hybridization (see Figure 70).

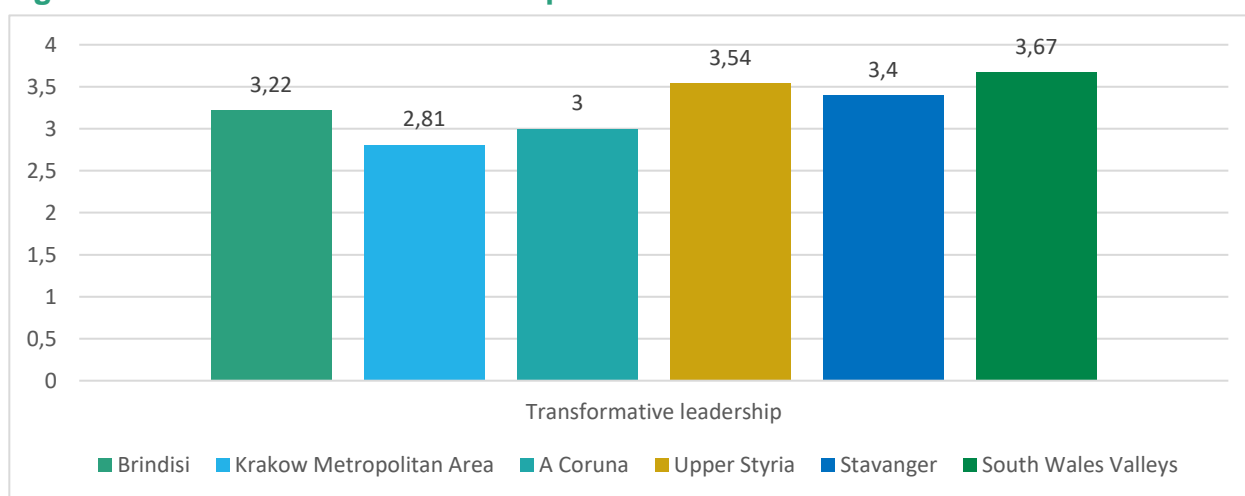
**Figure 73. Inclusive and multiform governance between the carbon-intensive case**



Source: ENTRANCES interview results and own compilation of data

Krakow Metropolitan area obtained the lowest scores on transformative leadership; at the opposite end, South Wales Valleys and Upper Styria scored highest on this factor (see Figure 71).

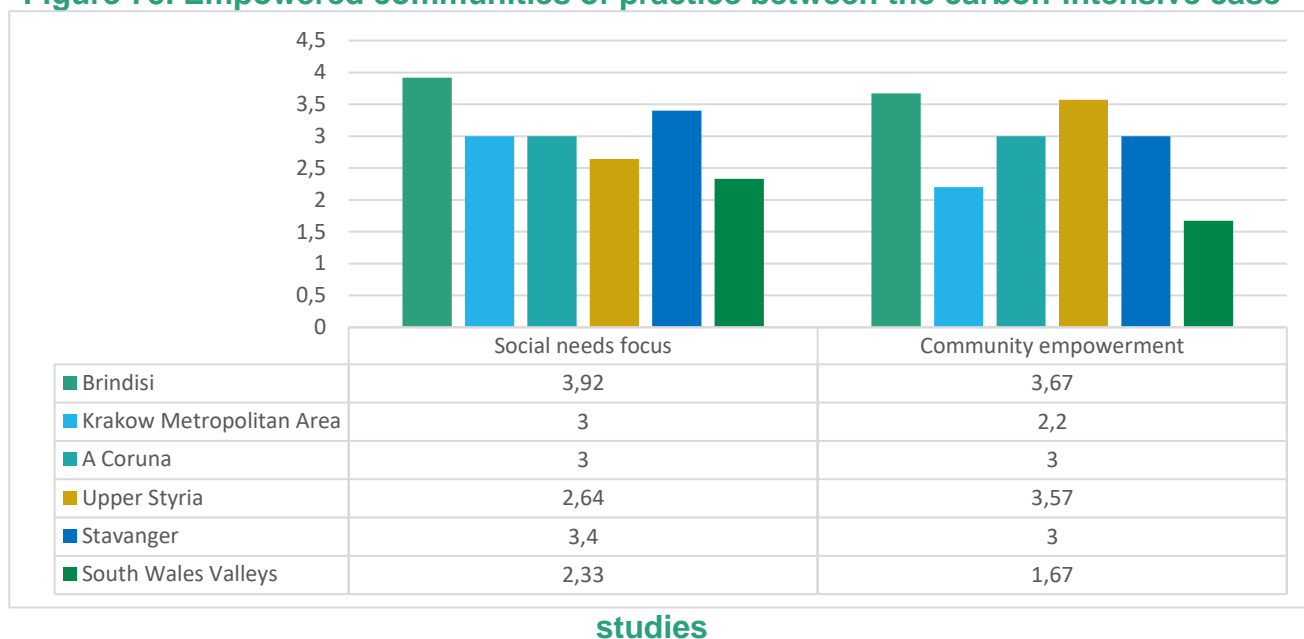
**Figure 74. Transformative leadership between the carbon-intensive case studies**



Source: ENTRANCES interview results and own compilation of data

Furthermore, Upper Styria and South Wales's results indicated a lower focus on social needs, Brindisi being the carbon-intensive case study with the highest score on this dimension. Secondly, the idea of community empowerment is strongly present in Brindisi and Upper Styria, whereas South Wales Valleys and Krakow Metropolitan area scored lowest on community empowerment (see Figure 72).

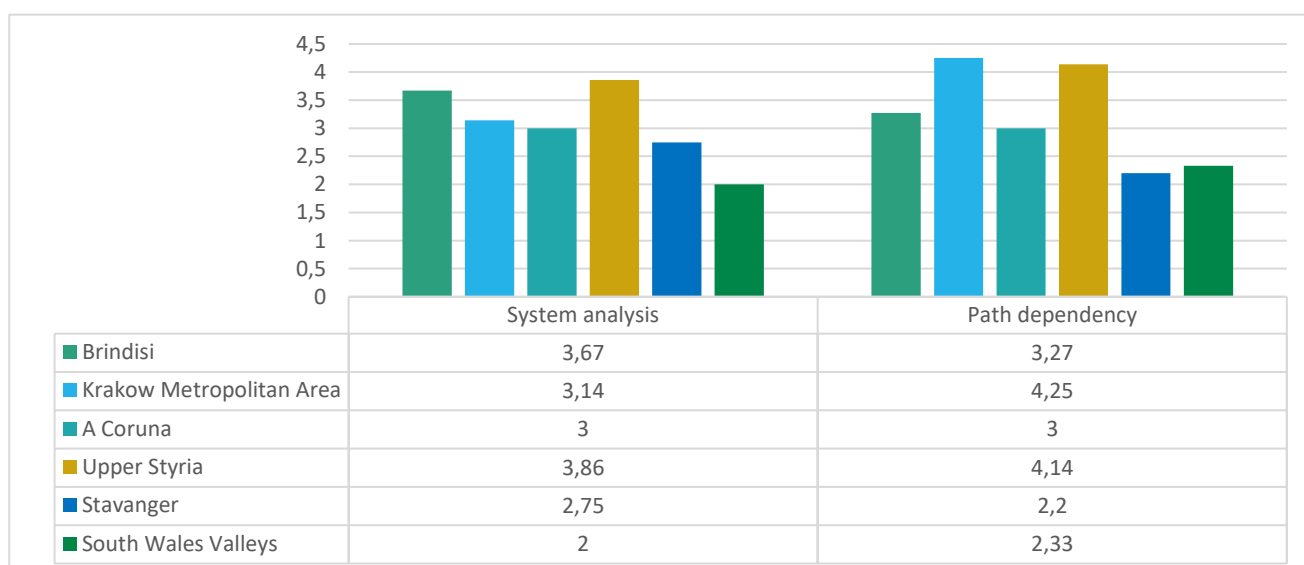
**Figure 75. Empowered communities of practice between the carbon-intensive case**



Source: ENTRANCES interview results and own compilation of data

The strongest focus on system analysis was observed in the cases of Upper Styria, Brindisi and Krakow Metropolitan area, whereas the presence of path dependency was lowest supported by Stavanger and South Wales Valles. At the opposite end, Krakow Metropolitan area and Upper Styria strongly acknowledge the path dependency factor (see Figure 73).

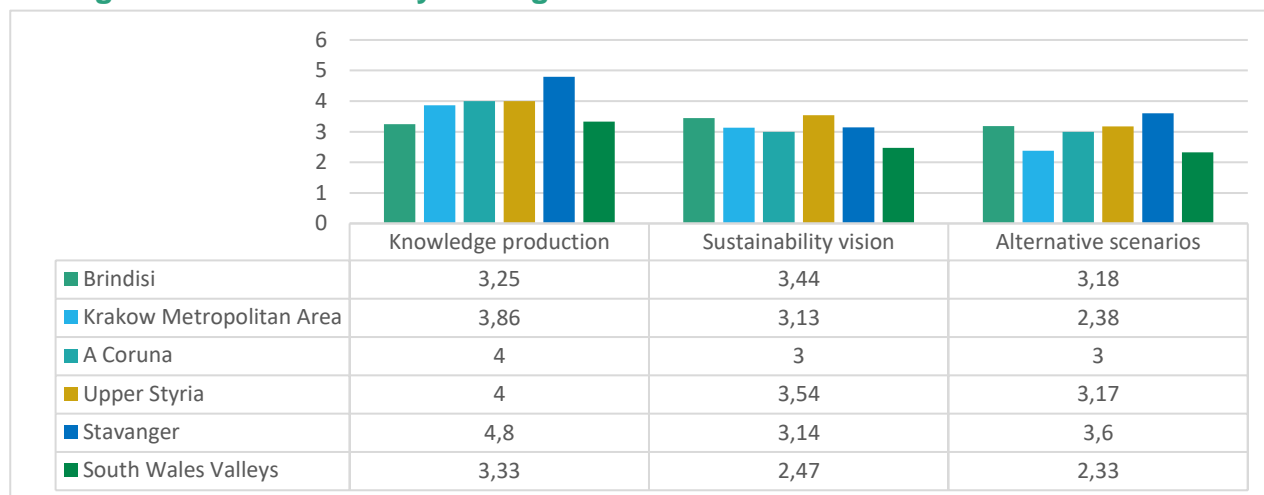
**Figure 76. System awareness between the carbon-intensive case studies**



Source: ENTRANCES interview results and own compilation of data

The knowledge production element of sustainability foresight was strongly present in the cases of Stavanger, A Coruna, and Upper Styria. Sustainability vision was highest reported in the cases of Upper Styria and Brindisi. Lastly, alternative scenarios were mostly present in Stavanger; South Wales Valleys and Krakow Metropolitan area showing little concern on this theme (see Figure 74).

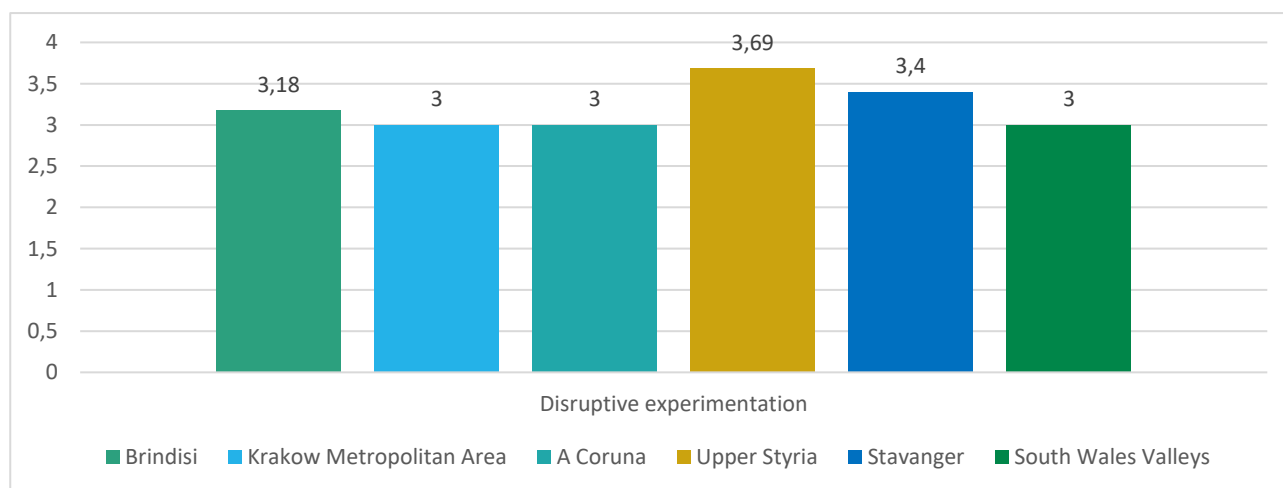
**Figure 77. Sustainability foresight between the carbon-intensive case studies**



Source: ENTRANCES interview results and own compilation of data

Disruptive experimentation was mostly shown in Upper Styria (see Figure 75).

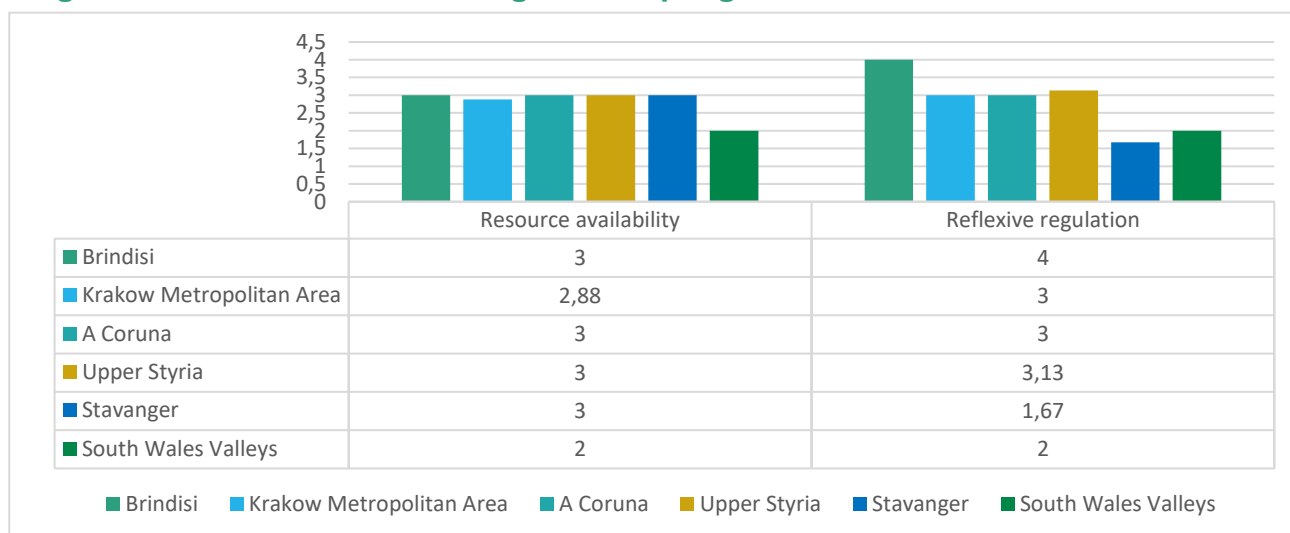
**Figure 78. Diverse community - based experimentation with disruptive solutions between the carbon-intensive case studies**



Source: ENTRANCES interview results and own compilation of data

In terms of resource availability, South Wales Valleys and Krakow Metropolitan area's results suggested a lower focus on this domain; also, Stavanger and South Wales Valleys reported the lowest scores on reflexive regulation, whereas Brindisi scored higher on this factor (see Figure 76).

**Figure 79. Innovation embedding and coupling between the carbon-intensive case**

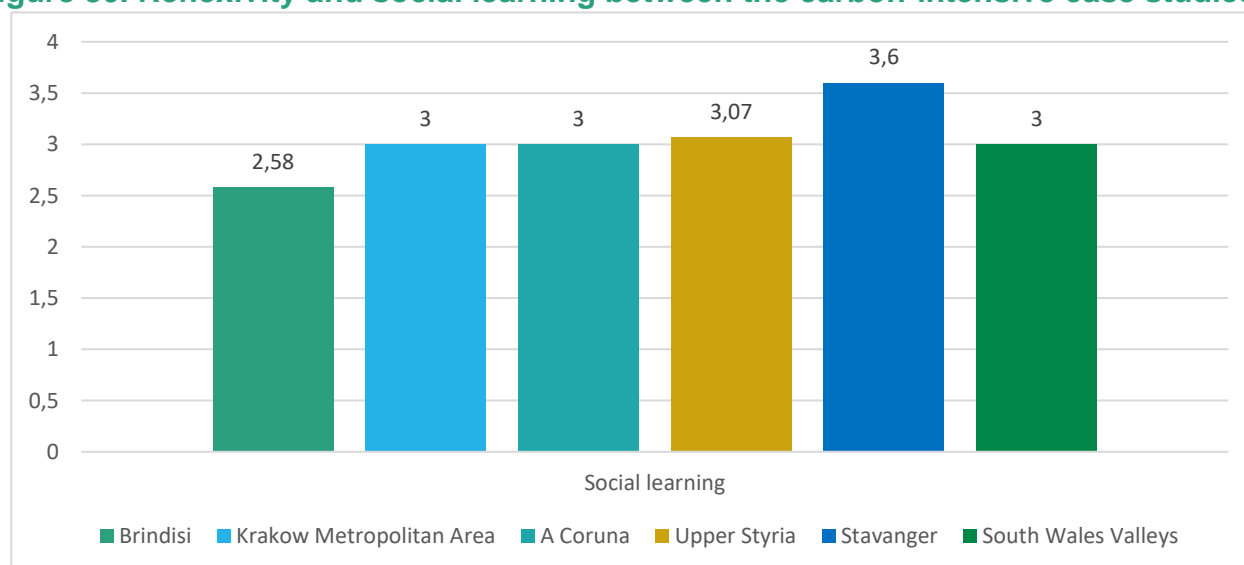


studies.

Source: ENTRANCES interview results and own compilation of data

Social learning was a special focus for Stavanger (i.e., obtained the highest score on this factor) and of less importance for Brindisi (see Figure 77).

**Figure 80. Reflexivity and social learning between the carbon-intensive case studies**

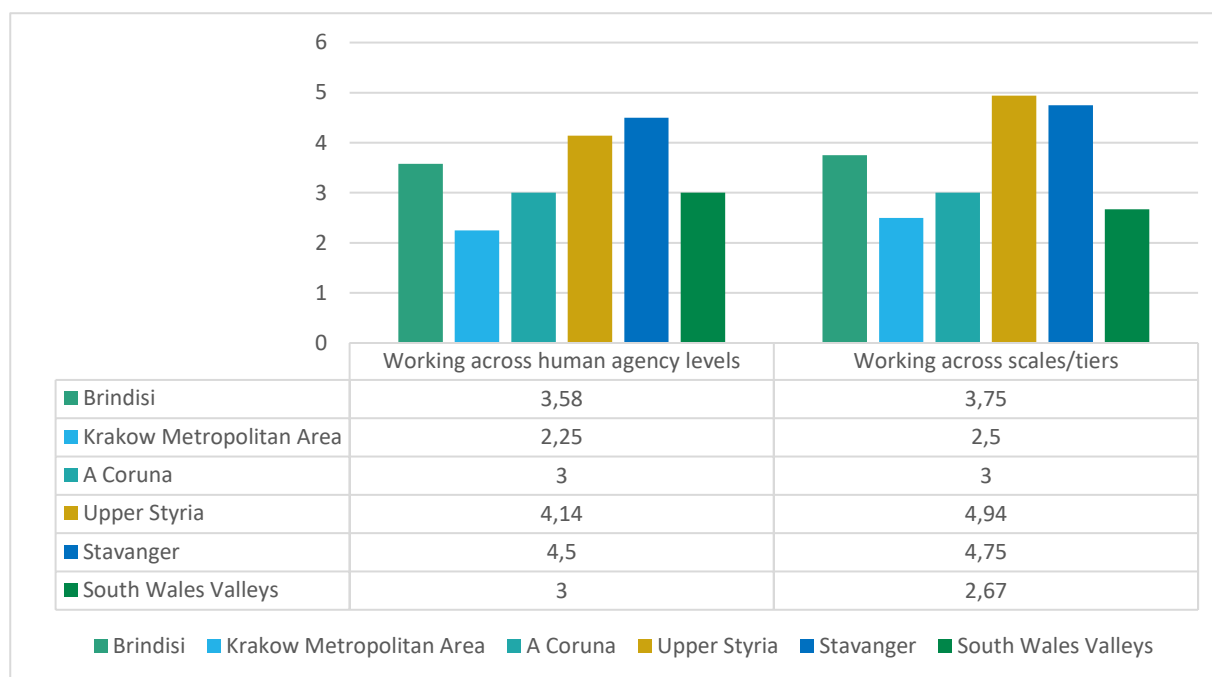


Source: ENTRANCES interview results and own compilation of data

Capacity building activities occurring across individuals, households, social groups, organizations, network, and society (i.e., working across human agency levels) was mostly present in Stavanger, Upper Styria, and Brindisi, whereas the lowest capacity for human agency levels was observed in Krakow Metropolitan area. Lastly, Upper Styria and Stavanger scored higher on having different

initiatives involved in capacity building at different levels of government (i.e., working across scales/tiers); at the opposite end, Krakow Metropolitan area and South Wales Valley's results indicated a lower tendency of working across different levels and scales (see Figure 78).

**Figure 81. Working across human agency and political-administrative levels between the carbon-intensive regions**



Source: ENTRANCES interview results and own compilation of data

# CHAPTER 3

---

## Correlation analysis



### 3 Correlation analysis

#### 1.10 Correlation results

The next stage of quantitative data analysis aimed to examine the relationships between the variables measured in the five empirical studies in the 13 regions under scrutiny. To this aim, we computed the Kendall's tau-b correlations between each pair of variables. The most indicative statistically significant relationships pinpointed by the correlation matrix are highlighted hereafter.

A. **Correlations** between the variables measured in the 13 case studies through the research on the **Socio-Cultural Component** and variables pertaining to the other components of the conceptual framework of ENTRANCES:

- The frequency of the *Endogenous conflicts* type of strain situations emerged as:
  - positively correlated ( $r = .50$ ) to *economic optimism* (measured in the research through the Socio-Psychological Component). This indicates that the residents in regions with more frequent endogenous conflicts have higher levels of economic optimism.
  - positively correlated ( $r = .41$ ) to the “*alternative scenarios*” factor of Transformative Capacity (measured in the research on the Socio-Ecological and Technical Component). This suggests that in regions with more frequent endogenous conflicts, the stakeholders who participated in the research on this latter component evaluated to a higher degree the transition planning/implementation in their regions as making use of future scenarios with alternative development options.
  - positively correlated ( $r = .44$ ) to the “*disruptive experimentation*” factor of Transformative Capacity. This suggests that in regions with more frequent endogenous conflicts, the interviewed stakeholders expressed stronger agreement with the idea that there is a diversity of actors governing the energy transition in their region who are involved in experiments intended to fundamentally alter present ways of doing things.
- The frequency of the *Exogenous conflict* type of strain situations emerged as positively correlated ( $r = .47$ ) to the intensity of *stress* experienced by the samples of participants in the research on the Socio-Psychological Component. This indicates that the residents in regions with more frequent exogenous conflicts experience higher levels of stress.
- The frequency of the strain situations (conflicts) related to *Ideoscapes* emerged as positively correlated ( $r = .46$ ) to the within-region share of the occurrences of the code “*Unequal impact of decarbonization on different Societal Groups*” among the texts analyzed in the research on the Socio-Political Component. This indicates that in regions with more frequent strain situations related to ideologies (such as populist social movements), the relative weight of this topic of the unequal impact on different societal groups in the public discourse on decarbonization is larger (in terms of occurrences in public statements).
- The frequency of the *Finance* related conflicts emerged as:

- positively correlated ( $r = .42$ ) to the strength of the *intention to relocate* expressed by the samples of participants in the research on the Socio-Psychological Component. This indicates that the residents in regions with more frequent strain situations related to the financial dimension have stronger intentions to relocate.
- negatively correlated ( $r = -.49$ ) to the “*actor diversity*” factor of Transformative Capacity. This suggests that in regions with more frequent strain situations related to the financial dimension, the interviewed stakeholders expressed weaker agreement with the idea that there are diverse stakeholders, from citizens and civil society to businesses and their representatives, directly participating in governing the energy transition in their region.
- The frequency of the *Media* related conflicts emerged as:
  - negatively correlated ( $r = -.49$ ) to the *perceived fairness of the decarbonization process* in their region (as evaluated by the samples of participants in the research on the Socio-Psychological Component). This suggests that the residents in regions with more frequent strain situations related to the Media representations (such as those reflecting territorial stigma of the region and nostalgia of its residents) perceive the decarbonization process as less fair.
  - negatively correlated ( $r = -.49$ ) to the degree of *support for decarbonization* (as expressed by the samples of participants in the research on the Socio-Psychological Component). This suggests that the residents in regions with more frequent strain situations related to the Media representations are less personally supportive of decarbonization.
  - positively correlated ( $r = .54$ ) to “*resistance and protest*” as individual strategies to cope with the impact of decarbonization (measured in the samples of participants in the research on the Socio-Psychological Component). This suggests that the residents in regions with more frequent strain situations related to the Media representations are more inclined to protest against the decarbonization process in their region.
  - negatively correlated ( $r = -.54$ ) to the index of *population change in PAR relative to population change in the country from 2000* (as measured in the research on the Socio-Economic Component). This indicates that the regions with a higher rate of depopulation (relative to the country to which they belong) are characterized by more frequent strain situations related to the Media representations.
  - positively correlated ( $r = .90$ ) to the within-region share of the occurrences of the code “*Social mobility*” among the texts analyzed in the research on the Socio-Political Component. This indicates that in regions with more frequent strain situations related to Media representations, the relative weight of the topic of decarbonization as a cause of downwards social mobility in the public discourse is larger (in terms of occurrences in public statements).
  - positively correlated ( $r = .48$ ) to the within-region share of the occurrences of the code “*Dependence on the centre*” among the texts analyzed in the research on the Socio-Political Component. This indicates that in regions with more frequent strain situations related to Media representations, the relative weight in the public discourse of the topic of the funding received by the respective regions from the central government / authorities is larger.

- positively correlated ( $r = .47$ ) to the within-region share of the occurrences of the code “*Dependence on the European Union*” among the texts analyzed in the research on the Socio-Political Component. This indicates that in regions with more frequent strain situations related to Media representations, the relative weight in the public discourse of the topic of the funding received by the respective regions from the European Union is larger.
- The frequency of the strain situations (conflicts) related to *multiple areas* emerged as:
  - positively correlated ( $r = .42$ ) to the strength of the *intention to relocate* expressed by the samples of participants in the research on the Socio-Psychological Component. This indicates that the residents in regions with more frequent strain situations related to multiple areas have stronger intentions to relocate.
  - positively correlated ( $r = .54$ ) to “*personal reinvention*” as individual strategy to cope with the impact of decarbonization (measured in the samples of participants in the research on the Socio-Psychological Component). This suggests that the residents in regions with more frequent strain situations related to multiple areas are more motivated to develop new employability and work skills in order to adapt to the socio-economic impact of decarbonization.

B. **Correlations** between the variables measured in the 13 case studies through the research on the **Socio-Psychological Component** and variables pertaining to the entire set of components of the conceptual framework of ENTRANCES (besides the correlations already reported above):

- *Resilience* was found to be:
  - positively correlated ( $r = .64$ ) to *life satisfaction* and negatively related to *stress* ( $r = -.69$ ), indicating that residents with higher levels of resilience have higher life satisfaction and lower stress, and thus highlighting the importance of resilience as a personal psychological resource for the people in the coal and carbon territories we investigated.
  - negatively related to the *perceived economic hardship* generated by decarbonization ( $r = -.44$ ) and to *nostalgia* ( $r = -.51$ ), indicating that residents with higher levels of resilience are more adapted, at least in their perception, to the economic consequences of decarbonization in their region, and less prone to nostalgia.
  - negatively related to the strength of the *intention to relocate* ( $r = -.67$ ), indicating that residents with higher levels of resilience have lower intentions to relocate, conceivably as a consequence of the better adaptation to the current socio-economic conditions of the region fostered by high levels of resilience.
- *Optimism* was found to be:
  - positively correlated ( $r = .64$ ) to *life satisfaction* and negatively related to *stress* ( $r = -.74$ ), indicating that residents with higher levels of optimism have higher life satisfaction and lower stress, and thus highlighting the importance of optimism as another personal psychological resource for the people in the coal and carbon territories we investigated.

- negatively related to the *perceived economic hardship* generated by decarbonization ( $r = -.44$ ), to *nostalgia* ( $r = -.51$ ), related to the strength of the *intention to relocate* ( $r = -.56$ ) indicating that residents with higher levels of resilience are more adapted, at least in their perception, to the economic consequences of decarbonization in their region, less prone to nostalgia, and, consequently, have lower intentions to relocate.
- *Place identity* was found to be:
  - positively correlated ( $r = .46$ ) to *life satisfaction*, indicating that residents with stronger place identity have higher life satisfaction.
  - negatively related to *stress* ( $r = -.69$ ), indicating that residents with stronger place identity experience lower stress.
  - negatively related to the strength of the *intention to relocate* ( $r = -.44$ ), indicating that residents with stronger place identity have lower intentions to relocate.
  - negatively related ( $r = -.62$ ) to the index of *population change in PAR relative to population change in the country from 2000* (as measured in the research on the Socio-Economic Component). This indicates that residents in the regions with a higher rate of depopulation (relative to the country to which they belong) have lower levels of place identity.
- *Place rootedness* was found to be:
  - positively correlated ( $r = .56$ ) to *life satisfaction*, indicating that residents with stronger place rootedness have higher life satisfaction.
  - negatively related to the strength of the *intention to relocate* ( $r = -.49$ ), indicating that residents with stronger place rootedness have lower intentions to relocate.
  - positively correlated ( $r = .54$ ) to “*submission*” as an individual strategy to cope with the impact of decarbonization. This suggests that residents with stronger place rootedness are more inclined to adopt a passive stance towards the decarbonization process in their region.
- *Stress* was found to be:
  - negatively correlated ( $r = -.49$ ) to *life satisfaction*, indicating that residents who experience higher levels of stress have lower life satisfaction.
  - positively related to the strength of the *intention to relocate* ( $r = .51$ ), indicating that residents who experience higher levels of stress have stronger intentions to relocate.
  - negatively correlated ( $r = -.51$ ) to “*submission*” as an individual strategy to cope with the impact of decarbonization. This suggests that residents who experience higher levels of stress are less inclined to adopt a passive stance towards the decarbonization process in their region.
  - negatively correlated ( $r = -.30$ ) to *GDP per Capita relative to EU28* (as measured in the research on the Socio-Economic Component). This indicates that residents in the regions with a lower GDP per Capita relative to EU28 experience higher levels of stress.

- negatively correlated ( $r = -.30$ ) to the number of persons employed relative to population aged between 15 and 64 years (*employment rate*). This indicates that residents in the regions with a lower employment rate experience higher levels of stress.
- *Perceived economic hardship* generated by decarbonization was found to be:
  - positively related ( $r = .41$ ) to nostalgia, indicating that residents who perceive the decarbonization in their region as generating more economic hardship on them are more prone to experience intense nostalgia towards the past.
  - negatively correlated ( $r = -.54$ ) to *life satisfaction*, indicating that residents who perceive the decarbonization in their region as generating more economic hardship on them have lower life satisfaction.
  - negatively correlated ( $r = -.48$ ) to the “*community empowerment*” factor of Transformative Capacity. This suggests that residents who perceive the decarbonization in their region as generating more economic hardship live in regions in which actors and communities have less support to act autonomously for the energy transition, according to the stakeholders in that region.
  - positively related ( $r = .44$ ) to the within-region share of the occurrences of the code “*Business barriers to participate in decarbonization*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents who perceive the decarbonization in their region as generating more economic hardship live in regions in which the relative weight in the public discourse of the topic of the barriers faced by private companies against involving in the decarbonization process in the region is larger.
  - positively related ( $r = .40$ ) to the within-region share of the occurrences of the code “*Centralisation*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents who perceive the decarbonization in their region as generating more economic hardship live in regions in which the relative weight in the public discourse of the topic of the centralization of the decarbonization process and of new companies for the green economy being mostly based in larger cities is larger.
  - positively related ( $r = .35$ ) to the within-region share of the occurrences of the code “*anti-EU sentiments*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents who perceive the decarbonization in their region as generating more economic hardship live in regions in which the relative weight in the public discourse of the topic of the anti-EU sentiments that are raised in connection to the decarbonization is larger.
- *Perceived fairness of the decarbonization process* in the region was found to be:
  - positively related ( $r = .62$ ) to the degree of *support for decarbonization*. This suggests that residents who perceive the decarbonization process as more fair are more personally supportive of decarbonization.
  - negatively correlated ( $r = -.39$ ) to “*resistance and protest*” as individual strategies to cope with the impact of decarbonization. This suggests that the residents who perceive the decarbonization process as more fair are less inclined to protest against the decarbonization process in their region.

- positively correlated ( $r = .39$ ) to the index of *population in PAR in 2019 relative to 2000* (as measured in the research on the Socio-Economic Component). This indicates that residents in the regions with a higher rate of depopulation perceive the decarbonization process in the region as less fair.
- negatively correlated ( $r = -.50$ ) to the within-region share of the occurrences of the code “*Social mobility*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents who perceive the decarbonization process as less fair live in regions in which the relative weight of the topic of decarbonization as a cause of downwards social mobility in the public discourse is larger (in terms of occurrences in public statements).
- *Economic optimism* was found to be:
  - positively correlated ( $r = .41$ ) to the index of *population in PAR in 2019 relative to 2000* (as measured in the research on the Socio-Economic Component). This indicates that residents in the regions with a higher rate of depopulation are less optimistic about their economic future.
  - positively correlated ( $r = .50$ ) to the “*alternative scenarios*” factor of Transformative Capacity. This suggests that residents in regions in which the transition planning/implementation was evaluated by stakeholders as making more use of future scenarios with alternative development options are more optimistic about their economic future.
- *Nostalgia* was found to be:
  - negatively correlated ( $r = -.46$ ) to *life satisfaction*, indicating that residents with lower life satisfaction are more prone to experience intense nostalgia towards the past.
  - positively correlated ( $r = .49$ ) to the strength of the *intention to relocate*. This indicates that residents who experience more intense nostalgia towards the past have stronger intentions to relocate.
  - negatively correlated ( $r = -.44$ ) to “*submission*” as an individual strategy to cope with the impact of decarbonization. This suggests that residents who experience more intense nostalgia towards the past are less inclined to adopt a passive stance towards the decarbonization process in their region.
  - negatively correlated ( $r = -.51$ ) to *GDP per Capita relative to EU28* (as measured in the research on the Socio-Economic Component). This indicates that residents in the regions with a lower GDP per Capita relative to EU28 are more prone to experience intense nostalgia towards the past.
  - negatively correlated ( $r = -.46$ ) to the number of persons employed relative to population aged between 15 and 64 years (*employment rate*). This indicates that residents in the regions with a lower employment rate are more prone to experience intense nostalgia towards the past.
  - negatively correlated ( $r = -.56$ ) to the “*community empowerment*” factor of Transformative Capacity. This suggests that residents who experience more intense nostalgia towards



the past live in regions in which actors and communities have less support to act autonomously for the energy transition, according to the stakeholders in that region.

- negatively correlated ( $r = -.45$ ) to the “*working across agency levels*” factor of Transformative Capacity. This suggests that residents who experience less intense nostalgia towards the past live in regions in which measures to move the energy transition forward actively involve a broader range (diversity) of social actors, including individuals and households, as well as groups, organizations, networks, and society, according to the stakeholders in that region.
  - positively related ( $r = .59$ ) to the within-region share of the occurrences of the code “*Centralisation*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents who experience more intense nostalgia towards the past live in regions in which the relative weight in the public discourse of the topic of the centralization of the decarbonization process and of new companies for the green economy being mostly based in larger cities is larger.
  - positively correlated ( $r = .41$ ) to the within-region share of the occurrences of the code “*Dependence on the centre*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents who experience more intense nostalgia towards the past live in regions in which the relative weight in the public discourse of the topic of the funding received by the respective regions from the central government / authorities is larger.
  - positively correlated ( $r = .37$ ) to the within-region share of the occurrences of the code “*Dependence on the European Union*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents who experience more intense nostalgia towards the past live in regions in which the relative weight in the public discourse of the topic of the funding received by the respective regions from the European Union is larger.
  - positively correlated ( $r = .54$ ) to the within-region share of the occurrences of the code “*Debate about sense of transition*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents who experience more intense nostalgia towards the past live in regions in which the relative weight of the topic of decarbonization as unrealistic and/or of the “green” energy transition measures as inappropriate (at least on the short term) and/or of the economic and efficiency benefits of coal is larger (in terms of occurrences in public statements).
  - positively related ( $r = .38$ ) to the within-region share of the occurrences of the code “*anti-EU sentiments*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents who experience more intense nostalgia towards the past live in regions in which the relative weight in the public discourse of the topic of the anti-EU sentiments that are raised in connection to the decarbonization is larger.
- *Intention to relocate* was found to be:
    - negatively correlated ( $r = -.72$ ) to *life satisfaction*, indicating that residents who have lower life satisfaction tend to have stronger intentions to relocate.

- positively correlated ( $r = .62$ ) to “*personal reinvention*” as individual strategy to cope with the impact of decarbonization. This suggests that residents with stronger intentions to relocate are more motivated to develop new employability and work skills in order to adapt to the socio-economic impact of decarbonization.
- negatively correlated ( $r = -.49$ ) to “*submission*” as an individual strategy to cope with the impact of decarbonization. This suggests that residents with stronger intentions to relocate are less inclined to adopt a passive stance towards the decarbonization process in their region.
- negatively correlated ( $r = -.56$ ) to *GDP per Capita relative to EU28* (as measured in the research on the Socio-Economic Component). This indicates that residents in the regions with a lower GDP per Capita relative to EU28 have stronger intentions to relocate.
- negatively correlated ( $r = -.54$ ) to the number of persons employed relative to population between 15 and 64 (*employment rate*). This indicates that residents in the regions with a lower employment rate have stronger intentions to relocate.
- negatively correlated ( $r = -.35$ ) to the “*community empowerment*” factor of Transformative Capacity. This suggests that residents with stronger intentions to relocate live in regions in which actors and communities have less support to act autonomously for the energy transition, according to the stakeholders in that region.
- negatively correlated ( $r = -.37$ ) to the “*working across scales/tiers*” factor of Transformative Capacity. This suggests that residents with stronger intentions to relocate live in regions in which measures in support of the transition involve stronger dialogue and coordination across spatial scales, from local to regional to national, inter-/transnational and EU, according to the stakeholders in that region.
- positively related ( $r = .61$ ) to the within-region share of the occurrences of the code “*Centralisation*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents with stronger intentions to relocate live in regions in which the relative weight in the public discourse of the topic of the centralization of the decarbonization process and of new companies for the green economy being mostly based in larger cities is larger.
- positively correlated ( $r = .41$ ) to the within-region share of the occurrences of the code “*Dependence on the centre*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents with stronger intentions to relocate live in regions in which the relative weight in the public discourse of the topic of the funding received by the respective regions from the central government / authorities is larger.
- positively correlated ( $r = .35$ ) to the within-region share of the occurrences of the code “*Debate about sense of transition*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents with stronger intentions to relocate live in regions in which the relative weight of the topic of decarbonization as unrealistic and/or of the “green” energy transition measures as inappropriate (at least on the short term) and/or of the economic and efficiency benefits of the carbon is larger (in terms of occurrences in public statements).



- positively correlated ( $r = .38$ ) to the within-region share of the occurrences of the code “*Denial of climate change*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents with stronger intentions to relocate live in regions in which the relative weight of the statements of denial of climate change (and associated misinformation) is larger (in terms of occurrences in public statements).
- positively related ( $r = .44$ ) to the within-region share of the occurrences of the code “*anti-EU sentiments*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents with stronger intentions to relocate live in regions in which the relative weight in the public discourse of the topic of the anti-EU sentiments that are raised in connection to the decarbonization is larger.
- *Support for decarbonization* was found to be:
  - positively correlated ( $r = .39$ ) to the index of *population change in PAR relative to population change in the country from 2000* (as measured in the research on the Socio-Economic Component). This indicates that the residents in regions with a higher rate of depopulation (relative to the country to which they belong) are less personally supportive of decarbonization.
  - negatively correlated ( $r = -.54$ ) to the within-region share of the occurrences of the code “*Social mobility*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents less personally supportive of decarbonization live in regions in which the relative weight of the topic of decarbonization as a cause of downwards social mobility in the public discourse is larger (in terms of occurrences in public statements).
- *Personal reinvention* (an individual strategy to cope with the impact of decarbonization) was found to be:
  - negatively correlated ( $r = -.44$ ) to *life satisfaction*, indicating that residents who are more motivated to develop new employability and work skills in order to adapt to the socio-economic impact of decarbonization (i.e., to personally reinvent themselves) have lower life satisfaction.
  - negatively correlated ( $r = -.49$ ) to *GDP per Capita relative to EU28* (as measured in the research on the Socio-Economic Component). This indicates that residents in the regions with a lower GDP per Capita relative to EU28 are more motivated to develop new employability and work skills in order to adapt to the socio-economic impact of decarbonization.
  - negatively correlated ( $r = -.53$ ) to the number of persons employed relative to population aged between 15 and 64 years (*employment rate*). This indicates that residents in the regions with a lower employment rate are more motivated to develop new employability and work skills in order to adapt to the socio-economic impact of decarbonization.
  - positively related ( $r = .43$ ) to the within-region share of the occurrences of the code “*Centralisation*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents more motivated to develop new employability and work skills in order to adapt to the socio-economic impact of decarbonization live in regions in which the relative weight in the public discourse of the topic of the centralization

of the decarbonization process and of new companies for the green economy being mostly based in larger cities is larger.

- positively correlated ( $r = .38$ ) to the within-region share of the occurrences of the code “*Dependence on the centre*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents more motivated to develop new employability and work skills in order to adapt to the socio-economic impact of decarbonization live in regions in which the relative weight in the public discourse of the topic of the funding received by the respective regions from the central government / authorities is larger.
- positively correlated ( $r = .48$ ) to the within-region share of the occurrences of the code “*Dependence on the European Union*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents more motivated to develop new employability and work skills in order to adapt to the socio-economic impact of decarbonization live in regions in which the relative weight in the public discourse of the topic of the funding received by the respective regions from the European Union is larger.
- positively correlated ( $r = .59$ ) to the within-region share of the occurrences of the code “*Debate about sense of transition*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents more motivated to develop new employability and work skills in order to adapt to the socio-economic impact of decarbonization live in regions in which the relative weight of the topic of decarbonization as unrealistic and/or of the “green” energy transition measures as inappropriate (at least on the short term) and/or of the economic and efficiency benefits of coal is larger (in terms of occurrences in public statements).
- positively related ( $r = .35$ ) to the within-region share of the occurrences of the code “*anti-EU sentiments*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents more motivated to develop new employability and work skills in order to adapt to the socio-economic impact of decarbonization live in regions in which the relative weight in the public discourse of the topic of the anti-EU sentiments that are raised in connection to the decarbonization is larger.
- *Resistance and protest* (an individual strategy to cope with the impact of decarbonization) was found to be:
  - negatively correlated ( $r = -.56$ ) to *GDP per Capita relative to EU28* (as measured in the research on the Socio-Economic Component). This indicates that residents in the regions with a lower GDP per Capita relative to EU28 are more inclined to protest against the decarbonization process in their region.
  - negatively correlated ( $r = -.48$ ) to the “*working across agency levels*” factor of Transformative Capacity. This suggests that residents less inclined to protest against the decarbonization process in their region live in regions in which measures in support of the transition involve stronger dialogue and coordination across spatial scales, from local to regional to national, inter-/transnational and EU, according to the stakeholders in that region.
  - positively correlated ( $r = .37$ ) to the within-region share of the occurrences of the code “*Unequal impact of decarbonization on different Societal Groups*” among the texts

analyzed in the research on the Socio-Political Component. This indicates that residents more inclined to protest against the decarbonization process in their region live in regions in which the relative weight of this topic of the unequal impact on different societal groups in the public discourse on decarbonization is larger (in terms of occurrences in public statements).

- positively correlated ( $r = .54$ ) to the within-region share of the occurrences of the code “*Social mobility*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents more inclined to protest against the decarbonization process in their region live in regions in which the relative weight of the topic of decarbonization as a cause of downwards social mobility in the public discourse is larger (in terms of occurrences in public statements).
- positively related ( $r = .44$ ) to the within-region share of the occurrences of the code “*Business barriers to participate in decarbonization*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents more inclined to protest against the decarbonization process in their region live in regions in which the relative weight in the public discourse of the topic of the barriers faced by private companies against involving in the decarbonization process in the region is larger.
- positively related ( $r = .45$ ) to the within-region share of the occurrences of the code “*Centralisation*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents more inclined to protest against the decarbonization process in their region live in regions in which the relative weight in the public discourse of the topic of the centralization of the decarbonization process and of new companies for the green economy being mostly based in larger cities is larger.
- positively correlated ( $r = .49$ ) to the within-region share of the occurrences of the code “*Dependence on the centre*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents more inclined to protest against the decarbonization process in their region live in regions in which the relative weight in the public discourse of the topic of the funding received by the respective regions from the central government / authorities is larger.
- positively related ( $r = .41$ ) to the within-region share of the occurrences of the code “*anti-EU sentiments*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents more inclined to protest against the decarbonization process in their region live in regions in which the relative weight in the public discourse of the topic of the anti-EU sentiments that are raised in connection to the decarbonization is larger.
- *Submission* (an individual strategy to cope with the impact of decarbonization) was found to be:
  - positively correlated ( $r = .56$ ) to *life satisfaction*, indicating that residents with higher life satisfaction are more inclined to adopt a passive stance towards the decarbonization process in their region.
  - positively related ( $r = .54$ ) to the within-region share of the occurrences of the code “*Employment opportunities*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents more inclined to adopt a passive stance

towards the decarbonization process in their region live in regions in which the relative weight in the public discourse of the topic of the new employment opportunities is larger.

- *Life satisfaction* was found to be:
  - positively correlated ( $r = .54$ ) to *GDP per Capita relative to EU28* (as measured in the research on the Socio-Economic Component). This indicates that residents in the regions with a lower GDP per Capita relative to EU28 have higher levels of life satisfaction.
  - positively correlated ( $r = .49$ ) to the number of persons employed relative to population aged between 15 and 64 years (*employment rate*). This indicates that residents in the regions with a lower employment rate have lower levels of life satisfaction.
  - positively correlated ( $r = .45$ ) to the “*community empowerment*” factor of Transformative Capacity. This suggests that residents in regions in which actors and communities have less support to act autonomously for the energy transition, according to the stakeholders in that region, have lower levels of life satisfaction.
  - negatively related ( $r = -.64$ ) to the within-region share of the occurrences of the code “*Centralisation*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents in regions in which the relative weight in the public discourse of the topic of the centralization of the decarbonization process and of new companies for the green economy being mostly based in larger cities is larger have lower levels of life satisfaction.
  - negatively correlated ( $r = -.52$ ) to the within-region share of the occurrences of the code “*Dependence on the centre*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents in regions in which the relative weight in the public discourse of the topic of the funding received by the respective regions from the central government / authorities is larger have lower levels of life satisfaction.
  - negatively correlated ( $r = -.51$ ) to the within-region share of the occurrences of the code “*Denial of climate change*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents in regions in which the relative weight of the statements of denial of climate change (and associated misinformation) is larger have lower levels of life satisfaction.
  - negatively correlated ( $r = -.53$ ) to the within-region share of the occurrences of the code “*anti-EU sentiments*” among the texts analyzed in the research on the Socio-Political Component. This indicates that residents in regions in which the relative weight in the public discourse of the topic of the anti-EU sentiments that are raised in connection to the decarbonization is larger have lower levels of life satisfaction.

C. **Correlations** between the variables measured in the 13 case studies through the research on the **Socio-Economic Component** and variables pertaining to the entire set of components of the conceptual framework of ENTRANCES (besides the correlations already reported above):

- *GDP per Capita relative to EU28* was found to be:
  - positively correlated ( $r = .41$ ) to the index of *population in PAR in 2019 relative to 2000*. This indicates that the regions with a higher rate of depopulation have a lower GDP per Capita relative to EU28.
  - positively correlated ( $r = .69$ ) to the number of persons employed relative to population aged between 15 and 64 years (*employment rate*). This indicates that the regions with a lower employment rate have a lower GDP per Capita relative to EU28.
  - positively correlated ( $r = .40$ ) to the “*diverse governance*” factor of Transformative Capacity. This suggests that the regions with a higher GDP per Capita relative to EU2 are especially those in which the governance approaches used for the energy transition (for instance, involving formal and informal, centralised and decentralised, top-down and bottom-up arrangements, political hierarchies, markets, networks and negotiations) were more diverse, according to the stakeholders in that region.
  - positively correlated ( $r = .59$ ) to the “*working across agency levels*” factor of Transformative Capacity. This suggests that the regions with a higher GDP per Capita relative to EU2 are especially those in which measures to move the energy transition forward actively involve a broader range (diversity) of social actors, including individuals and households, as well as groups, organizations, networks, and society, according to the stakeholders in that region.
  - negatively related ( $r = -.67$ ) to the within-region share of the occurrences of the code “*Centralisation*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher GDP per Capita relative to EU2 are especially those in which the relative weight in the public discourse of the topic of the centralization of the decarbonization process and of new companies for the green economy being mostly based in larger cities is lower.
  - negatively related ( $r = -.66$ ) to the within-region share of the occurrences of the code “*Dependence on the centre*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher GDP per Capita relative to EU2 are especially those in which the relative weight in the public discourse of the topic of the funding received by the respective regions from the central government / authorities is lower.
  - positively related ( $r = .48$ ) to the within-region share of the occurrences of the code “*Clean technologies*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher GDP per Capita relative to EU2 are especially those in which the relative weight in the public discourse of the topic of the clean technologies that can or were implemented in the decarbonization process is higher.
  - negatively correlated ( $r = -.48$ ) to the within-region share of the occurrences of the code “*Denial of climate change*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher GDP per Capita relative to EU2 are especially those in which the relative weight of the statements of denial of climate change (and associated misinformation) is lower.



- negatively correlated ( $r = -.56$ ) to the within-region share of the occurrences of the code “*anti-EU sentiments*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher GDP per Capita relative to EU2 are especially those in which the relative weight in the public discourse of the topic of the anti-EU sentiments that are raised in connection to the decarbonization is lower.
- *Population change in PAR relative to population change in the country from 2000* was found to be:
  - positively correlated ( $r = .45$ ) to the “*diverse governance*” factor of Transformative Capacity. This indicates that the regions with a higher rate of depopulation (relative to the country to which they belong) are especially those in which the governance approaches used for the energy transition (for instance, involving formal and informal, centralised and decentralised, top-down and bottom-up arrangements, political hierarchies, markets, networks and negotiations) were less diverse, according to the stakeholders in that region.
  - negatively correlated ( $r = -.54$ ) to the within-region share of the occurrences of the code “*Social mobility*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher rate of depopulation (relative to the country to which they belong) are especially those in which the relative weight of the topic of decarbonization as a cause of downwards social mobility in the public discourse is larger (in terms of occurrences in public statements).
- The number of persons employed relative to population aged between 15 and 64 years (*employment rate*) was found to be:
  - positively correlated ( $r = .40$ ) to the “*diverse governance*” factor of Transformative Capacity. This indicates that the regions with a higher unemployment rate are especially those in which the governance approaches used for the energy transition (for instance, involving formal and informal, centralised and decentralised, top-down and bottom-up arrangements, political hierarchies, markets, networks and negotiations) were less diverse, according to the stakeholders in that region.
  - negatively related ( $r = -.61$ ) to the within-region share of the occurrences of the code “*Centralisation*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher unemployment rate are especially those in which the relative weight in the public discourse of the topic of the centralization of the decarbonization process and of new companies for the green economy being mostly based in larger cities is higher.
  - negatively related ( $r = -.49$ ) to the within-region share of the occurrences of the code “*Dependence on the centre*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher unemployment rate are especially those in which the relative weight in the public discourse of the topic of the funding received by the respective regions from the central government / authorities is higher.
  - positively related ( $r = .37$ ) to the within-region share of the occurrences of the code “*Clean technologies*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher employment rate are especially

those in which the relative weight in the public discourse of the topic of the clean technologies that can or were implemented in the decarbonization process is higher.

- negatively related ( $r = -.51$ ) to the within-region share of the occurrences of the code “*Debate about sense of transition*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher unemployment rate are especially those in which the relative weight of the topic of decarbonization as unrealistic and/or of the “green” energy transition measures as inappropriate (at least on the short term) and/or of the economic and efficiency benefits of coal is larger.
- negatively correlated ( $r = -.42$ ) to the within-region share of the occurrences of the code “*Denial of climate change*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher unemployment rate are especially those in which the relative weight of the statements of denial of climate change (and associated misinformation) is larger.
- negatively correlated ( $r = -.50$ ) to the within-region share of the occurrences of the code “*anti-EU sentiments*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher unemployment rate are especially those in which the relative weight in the public discourse of the topic of the anti-EU sentiments that are raised in connection to the decarbonization is larger.

D. **Correlations** between the variables measured in the 13 case studies through the research on the **Socio-Ecological & Technical Component**, each pertaining to a factor of the Transformative Capacity of the region, and other variables (besides the correlations already reported above):

- *Diverse governance* was found to be:
  - Positively related ( $r = .55$ ) to the *transformative leadership* factor of the same component. This indicates that the regions with higher levels of perceived diverse governance are especially those in which individuals consider the region to benefit from higher levels of transformative leadership.
  - Positively related ( $r = .60$ ) to the *working across human agency levels* factor of the same component. This result indicates that the regions with a higher level of diverse governance are especially those in which individuals and households are highly involved in capacity building activities.
  - Positively related ( $r = .42$ ) to the within-region share of the occurrences of the code “*discourse about carbon industry*” among the texts analyzed in the research on the Socio-Political Component. This indicated that the regions with a higher level of formal and informal diversity in actor networks and governance modes are especially those in which the relative weight in the public discourse of the topic of discourse about the carbon industry is larger.
  - Negatively related ( $r = -.40$ ) to the within-region share of the occurrences of the code “*dependence on the centre*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher level of formal and

informal diversity in actor networks and governance modes are especially those in which the relative weight in the public discourse of the topic of dependence on the center is lower.

- *Social needs focus* was found to be:
  - Positively related ( $r = .53$ ) to the *sustainability vision* factor of the same component. This result indicates that regions with a higher level of focus on the social needs of the individuals are especially those with a higher levels of sustainability vision.
  - Positively related ( $r = .47$ ) to the *alternative scenarios* factor of the same component. This result indicates that regions with a higher level of focus on the social needs of the individuals are especially those with a higher interest in creating alternative scenarios for decarbonization.
  - Positively related ( $r = .37$ ) to the within-region share of the occurrences of the code “*denial of climate change*” among the texts analyzed in the research on the Socio-Political Component. This indicated that the regions with a higher level of focus on the social needs of the individuals from the region are especially those in which the relative weight in the public discourse of denial of climate change is larger.
  - Positively correlated ( $r = .42$ ) to the within-region share of the occurrences of the code “*anti-EU sentiments*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher focus on the social needs of the individual from the region are especially those in which the relative weight in the public discourse of the topic of the anti-EU sentiments that are raised in connection to the decarbonization is larger.
- *Community empowerment* was found to be:
  - Positively correlated ( $r = .72$ ) with the *system analysis* factor of the same component. This result indicates that regions with a higher level of community empowerment are especially those with a higher tendency to emphasize on agendas aiming to tackle sustainability challenges after deliberate analysis of relevant systems.
  - Positively related ( $r = .40$ ) with the *sustainability vision* factor of the same component. This result indicates that regions with a higher level of community empowerment are especially those with a higher sustainability vision.
  - Positively correlated ( $r = .64$ ) with the *working across agency levels* factor of the same component. This result suggests that regions with a higher level of community empowerment are especially those with a higher level of working across individuals and households for capacity building.
  - Positively related ( $r = .58$ ) with the *working across scales/tiers* factor of the same component. This result indicated that regions with a higher level of community empowerment are especially those with a higher level of capacity building at different levels of government.
  - Positively correlated ( $r = .37$ ) to the within-region share of the occurrences of the code “*employment opportunities*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher level of community



empowerment are especially those in which the relative weight in the public discourse of the topic of employment opportunities that are raised in connection to the decarbonization is larger.

- Negatively related ( $r = -.42$ ) to the within-region share of the occurrences of the code “*Centralization*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher level of community empowerment are especially those in which the relative weight in the public discourse of the topic of centralization is lower.
- *Working across agency levels* was found to be:
  - Positively related ( $r = .63$ ) with the *working across scales/tiers* factor of the same component. This result indicates that regions with a higher level of participation from individuals and households in capacity building are especially those with a higher level of involvement in capacity building at different levels of government.
  - Negatively related ( $r = -.47$ ) to the within-region share of the occurrences of the code “*Centralization*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher level of individuals involvement in capacity building are especially those in which the relative weight in the public discourse of the topic of centralization is lower.
  - Negatively correlated ( $r = -.44$ ) to the within-region share of the occurrences of the code “*Dependence on the centre*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher level of individuals involvement in capacity building are especially those in which the relative weight in the public discourse of the topic of dependence on the centre is lower.
  - Positively associated ( $r = .42$ ) to the within-region share of the occurrences of the code “*Clean technologies*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher level of individuals involvement in capacity building are especially those in which the relative weight in the public discourse of the topic of the use of clean technologies is higher.
- *Working across scales/tiers* was found to be:
  - Negatively correlated ( $r = -.51$ ) to the within-region share of the occurrences of the code “*Change in power dynamics*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher level of different levels of government involvement in capacity building are especially those in which the relative weight in the public discourse of the topic of change in power dynamics is lower.
  - Negatively related ( $r = -.52$ ) to the within-region share of the occurrences of the code “*Centralization*” among the texts analyzed in the research on the Socio-Political Component. This indicates that the regions with a higher level of government involvement in capacity building are especially those in which the relative weight in the public discourse of the topic of centralization is lower.

## 1.11 Discussion

The results of this stage of quantitative data analysis highlighted a large set of significant relationships between the variables measured in the five empirical studies in the 13 regions under scrutiny. Overall, these findings support the hypotheses at the core of the Multidimensional Analytic Framework that was developed as the theoretical background of the empirical research in ENTRANCES, by indicating significant associations between indicators and variables across different components of the conceptual framework, and thus pinpointing relationships between the socio-economic, socio-cultural, socio-psychological, socio-political and socio-ecological and technical facets of the ENTRANCES theoretical and empirical approach on decarbonization.

The numerous associations between variables reported above can be partitioned in a more restricted number of classes, each suggesting different patterns of relationships between the various indicators considered. Across the five components of the Multidimensional Analytic Framework, our findings suggest that regions with a more **successful socio-economic adaptation** to decarbonization, in terms of higher GDP per Capita relative to EU28, higher employment rates and more positive (or at least less negative) population change over the last 20 years are especially those that, in contrast to their counterparts, have certain key specificities on the other components of our conceptual framework:

- On the socio-psychological component, our findings show that the residents in these regions have stronger place identity, lower stress, perceive the decarbonization process in the region as fairer, are more optimistic about their economic future and less nostalgic towards the past, have higher levels of life satisfaction and weaker intentions to relocate, are more personally supportive of decarbonization, are less motivated to personally reinvent by developing new employability and work skills in order to adapt to the socio-economic impact of decarbonization, and are less inclined to protest against the decarbonization process in their region
- On the socio-cultural component, our findings indicate that these regions have less frequent conflicts related to the Media representations.
- From the perspective of the Transformative Capacity towards energy transition of the regions, these regions are especially those in which, according to the stakeholders in that region:
  - the governance approaches used for the energy transition (for instance, involving formal and informal, centralised and decentralised, top-down and bottom-up arrangements, political hierarchies, markets, networks and negotiations) were more diverse (*diverse governance*);
  - measures to move the energy transition forward actively involve a broader range (diversity) of social actors, including individuals and households, as well as groups, organizations, networks, and society (*working across agency levels*);

Regions facing **socio-economic difficulties** (lower GDP, unemployment and depopulation) also have distinguishable socio-political features, as highlighted by our findings on the relationships between the socio-economic indicators and the frequency of occurrences in public statements of the

various issues we analyzed. Specifically, these regions are characterized by a public discourse in which the relative weight of certain topics is higher, such as:

- the centralization of the decarbonization process and of new companies for the green economy being mostly based in larger cities (*Centralization*);
- the funding received by the respective regions from the central government / authorities (*Dependence on the centre*);
- the anti-EU sentiments that are raised in connection to the decarbonization (*Anti-EU sentiments*);
- decarbonization as a cause of downwards social mobility (*social mobility*);
- decarbonization as unrealistic and/or of the “green” energy transition measures as inappropriate (at least on the short term) and/or of the economic and efficiency benefits of coal (*Debate about the sense of transition*).
- *denial of climate change* (and associated misinformation).

Residents’ **intentions to relocate** were also found to be related to several key variables across all the five dimensions of the conceptual framework. In a transversal perspective, residents with stronger intentions to relocate not only leave in more socio-economically challenged regions, but they also tend to experience higher levels of stress and nostalgia, and lower life satisfaction. From the perspective of the Transformative Capacity towards energy transition, this type of residents with stronger intentions to relocate also tend to live in regions in which, according to stakeholders:

- actors and communities have less support to act autonomously for the energy transition (*community empowerment*);
- measures in support of the transition involve less dialogue and coordination across spatial scales, from local to regional to national, inter-/transnational and EU (*working across scales/tiers*);

Moreover, the regions in which residents have stronger intentions to relocate are characterized by a public discourse in which the relative weight of the topics listed above, as specific to regions facing socio-economic difficulties (*centralization, Dependence on the centre, Anti-EU sentiments, Debate about the sense of transition, denial of climate change*), is also higher. Also, the socio-cultural environment of these regions is characterized by more frequent Finance-related conflicts, which were found, in turn, to be negatively related to the “actor diversity” factor of Transformative Capacity.

The set of the three **psychological dimensions** significantly related to the intention to relocate (stress, nostalgia and life satisfaction) emerged as also associated to two of the components of place attachment that we included in our research, i.e., place identity and place rootedness. Overall, residents with stronger place identity and place rootedness experience less stress and nostalgia, and have higher levels of life satisfaction. On the other hand, residents living in regions with a higher frequency of Exogenous conflicts tend to experience higher levels of stress.

These various patterns of significant relationships between the variables in our five-component research were summarized in Figure 79, in accordance to the conceptual framework of the

ENTRANCES empirical investigation. Although the statistical indicators computed on the data collected (i.e., correlations), constrained by the multidimensional nature of this data, do not imply any causal relationships between variables, certain directions of determination are more plausible according to the conceptual framework and the previous relevant research in these areas. Thus, the model represented in Figure 79 includes not only the most relevant and consistent relationships between variables (or sets of variables), as emerged in our findings, but also causal paths between them, which are hypothesized in accordance to the relevant body of knowledge.

**Figure 82. Plausible causal paths between variables**

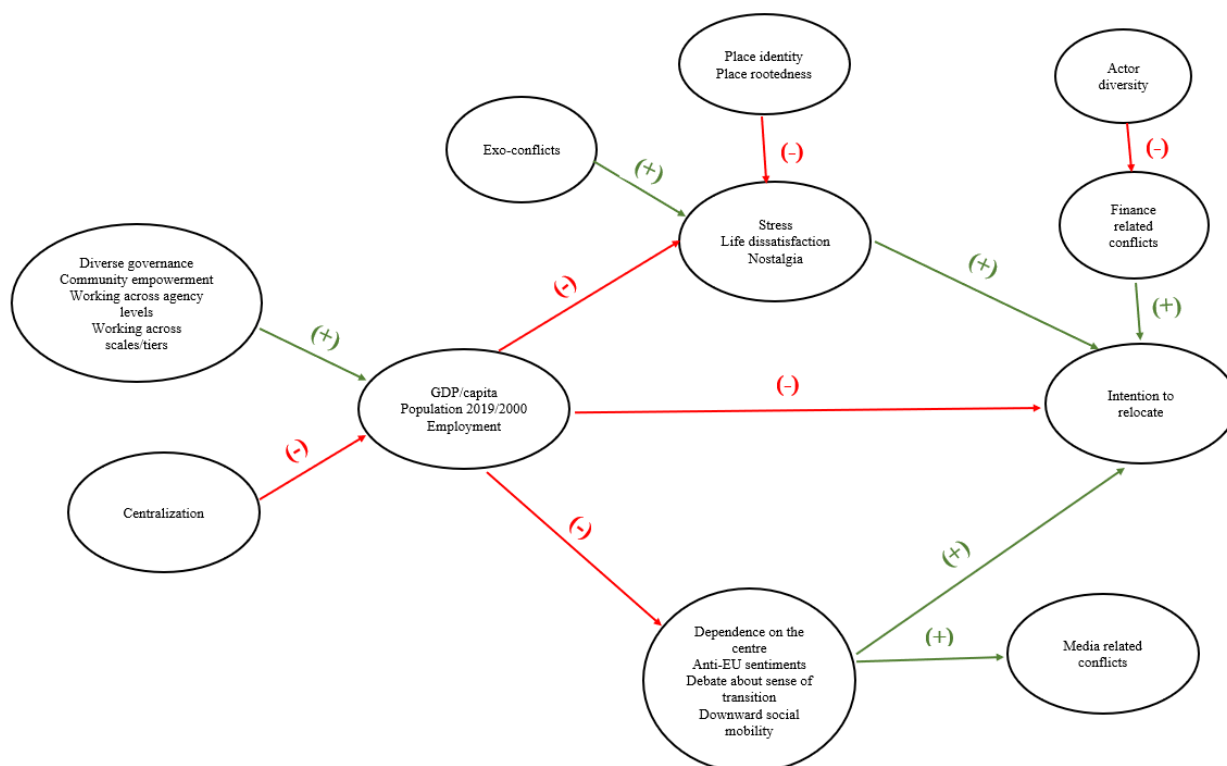


Figure 79 graphically represents several lines of influence between the variables in our empirical investigation from all the five components of the conceptual framework. First, several key dimensions of the Transformative Capacity of the region in managing the decarbonization process (i.e., Diverse governance, Community empowerment, Working across agency levels, Working across scales/tiers) emerged as significantly related to the key indicators of the socio-economic adaptation to decarbonization of the coal and carbon territories (CCT) we examined (i.e., GDP per Capita relative to EU28, population change over the last 20 years and employment rate). It is conceivable that this relationship entails a positive influence of these aspects of transition and decarbonization management, in the regions where they occur, on the socio-economic adaptation to decarbonization of the respective regions. On the other hand, a key socio-political dimension (as resulted from the correlational analyses), i.e., the centralization of the decarbonization process, exerts a negative influence on this socio-economic adaptation.

The three facets of socio-economic adaptation further have three direct effects, as represented in Figure 79. First, they are negatively related to residents' intention to relocate from the region, as residents living in more prosperous (in terms of GDP per Capita, employment rates and population size) are less inclined to decide to relocate in other areas. Furthermore, this direct effect on the intention to relocate is complemented by two other indirect effects, each through other key variables from other components of the multidimensional conceptual framework:

- A. socio-economic adaptation (i.e., its three facets) is negatively related to residents' stress, life dissatisfaction and nostalgia, a result that suggests that the socio-economic context of the region exerts an effect on these psychological dimensions. Specifically, living in more socio-economic prosperous CCT leads to lower stress and nostalgia, and more satisfaction with life. Furthermore, these psychological dimensions are related to residents' intention to relocate, as stress, nostalgia and life dissatisfaction foster this intention in the CCT residents.

It is also important to highlight the other two sets of variables impacting these key socio-psychological dimensions. Firstly, the frequency of exogeneous conflicts of the region, i.e., conflicts between the local community and external entities, or between external entities but with negative effects on the local community, is related to higher levels of stress, life dissatisfaction and nostalgia in residents. This indicates that these conflicts have a detrimental influence on the socio-psychological climate of the region, negatively impacting residents' personal adaptation to their social and economic environment, and their perception of the future of their region.

Secondly, residents' place identity and place rootedness buffer the negative influences of the other components. Specifically, residents who are more personally attached to their region have lower stress and nostalgia, and more satisfaction with life, which indicates that the detrimental effects on these socio-psychological dimensions that we commented above tend to be weaker in this type of residents. Conversely, low place identity and place rootedness is related to a more negative psychological profile of CCT residents.

- B. socio-economic adaptation is also negatively related to several key facets of the socio-political climate in the region. This relationship can be conceived as implying that socio-economic difficulties of the region (low GDP, unemployment and depopulation) are reflected in the public discourse through several prevalent topics. Some of these topics (i.e., *Dependence on the centre* and *Downward social mobility*) characterize and emphasize the socio-economic consequences of a badly managed decarbonization process of the CCTs. The other topics in this set (i.e., *Anti-EU sentiments* and *Debate about sense of transition*) even question and protest against the transition and decarbonization, and the EU as the institutional entity that imposed this process on the region. Furthermore, the high prevalence of these issues in the public discourse, denoting a socio-political climate that opposes energy

transition and is mostly interested in preserving the status-quo, fosters residents' intention to relocate, probably by decreasing their confidence in the future development of the region.

Another route of influence from these key facets of the socio-political climate in the region is that of fostering Media-related conflicts, a dimension of the socio-cultural area. This suggests that regions in which these socio-political debates occur frequently tend to be represented in the media in ways that are perceived by the local community as inflicting conflicts, such as reflecting the territorial stigma of the region and the nostalgia of its residents in derogatory fashions. This further enforces the symbolic “enclavization” of the region in the public discourse.

Intention to relocate is represented in Figure 79 as also affected by the frequency of finance-related conflicts, besides the other three sources of influence discussed above. The finance-related conflicts are related to stronger intentions to relocate, suggesting that they reflect the inefficient, atomized and publicly questioned management of the financial resources of the region, which transposes at the individual level by fostering relocation intentions in residents living in such regions. Our findings further highlight a component of the Transformative Capacity towards energy transition of the regions that is negatively related to these finance-related conflicts, namely Actor diversity. This indicates that regions with a more distributed management of decarbonization, with diverse stakeholders, from citizens and civil society to businesses and their representatives, directly participating in governing the energy transition in their region, have a lower share of finance-related conflicts. Consequently, regions in which the management of decarbonization and, implicitly, of the resources that have been invested in this process, is more centralized tend to be those in which the financial decisions made have create more conflicts.

### Individual coping strategies

Our multidimensional approach also targeted three types of individual coping strategies, conceptualized as residents' different manners of adapting to the impact of decarbonization on the region. All of them emerged as related to various indicators of the five components of the ENTRANCES framework, as follows:

1. *Personal reinvention*, addressing the residents' motivation to develop new employability and work skills in order to adapt to the socio-economic impact of decarbonization, emerged as more frequent in the regions confronted with more socio-economic difficulties (in terms of GDP and unemployment), and with a socio-political climate characterized by a high prevalence of the issues discussed above as related to intention to relocate (*Dependence on the centre*, *Anti-EU sentiments* and *Debate about sense of transition*). Also, this strategy is related to residents' lower levels of life satisfaction.
2. *Resistance and protest* against the decarbonization process in the region emerged as more frequent in the CCTs less economically developed (according to the GDP per Capita relative to EU28 indicator), and also in those in which the management of the transition has been more centralized. Moreover, the regions in which this strategy has a higher appeal to their residents are those with a socio-political climate heavily marked by Anti-EU sentiments and Debates about sense of transition (as the previous coping strategy), but also by issues reflecting a more critical approach on the way in which decarbonization has been managed in that region, i.e., *Unequal impact of decarbonization*

*on different Societal Groups, Downwards social mobility and Business barriers to participate in decarbonization.*

3. *Submission*, reflecting the residents' tendency to accept and adopt a passive stance towards the decarbonization process in their region, emerged as positively related to life satisfaction, and as also more typical for regions less economically affected by the transition, as suggested by its relationship with the socio-political indicator of the occurrences in the public discourse of the topic of new employment opportunities.



# CHAPTER 4

---

Clusters of regions and their key characteristics



## 4 Clusters of regions and their key characteristics

### 1.12 Statistical approach

The third stage of data analysis aimed to develop of a classification of the 13 coal and carbon regions in several groups or clusters, each characterized by specific positions on the key variables pertaining to the challenges encountered by the territories and the changes that they have undergone. This analysis was performed on a new database, generated on the basis of the initial cross-cases database and including the variables that emerged in the previous stage of data analysis as meaningfully related to the key indicators of the adaptation to transition and of de/re-territorialization across regions. The variables included in this stage of data analysis are listed in Table 1.

The new database includes transformations of these selected variables in order to render them suitable for a transversal and cross-component comparative statistical approach. More specifically, the preparation of this new database entailed the generation of standardized evaluative variables that would share the same measurement units across the various instruments and indicators used in the different studies on each of the five components. To this aim, for each of the variables we first computed the standardized (z) scores of each region as the initial value of that variable (e.g., GDP per capita in that region, or the mean of the survey sample on the socio-psychological variables) minus the overall mean (the mean of the distribution of that variable across the 13 regions), divided by the standard deviation of the distribution of that variable. In the case of the socio-psychological data, this statistical transformation also has the benefit of controlling for the differences in sample size among case studies. Secondly, we further transformed these standardized z variables by generating their Standard Ten (STEN, S10) scores, through the formula:  $S10 = 5.5 + 2 \cdot z$ . These STEN scores have values from 1 to 10, with a theoretical mean of 5.5, and they have the advantage of reflecting the value or intensity of all variables in each region on a common evaluative space ranging from 1 to 10. Thus, they offer, for all the variables, irrespective of the component to which they pertain and of their raw measurement scale, a numerical indicator of the negative or positive differences between the respective region and the overall set of regions.

The set of STEN variables was then submitted to a cluster analysis in SPSS v. 20 in order to classify the 13 regions on the basis of the communalities and differences among them on these input variables. For all the clustering procedures applied we used Euclidean distance as the dissimilarity measure of the data, computed as the square root of the sum of the squared differences between values for the variables, which is the default measure for interval data. The first step of this analysis was Hierarchical cluster analysis (HCA), which aims to identify relatively homogeneous groups of cases based on the input variables. This procedure uses a bottom-up classification approach, in which each case is first considered as a separate cluster, then the clusters that are closer on the input variables (i.e., that have a lower dissimilarity measure or distance) are progressively combined in an iterative fashion, until all cases are merged in a single final cluster. This approach also suggests a recommended clustering solution in terms of the number of clusters that best fits with the amount of communalities and differences among cases on the input variables. In our case, the number of clusters suggested by the HCA was 5.

The second statistical clustering procedure we used was K-Means clustering, which complements the results of the previous one mainly by providing an assessment of the importance

of each of the variables considered for differentiating among the different clusters of cases emerged, as well as the positions of each cluster on these variables. Therefore, this method allows for the examination of the specificities of the cases in each cluster in what regards the key significant variables considered from all the five components of our multidimensional framework.

### 1.13 Results

The variables that emerged as having a significant contribution to the five-cluster solution of our clustering approach, thus differentiating in a substantive amount among the five groups of cases, are indicated by a  $p$ -value below the .05 threshold or, in a more relaxed but still valid approach, by marginally significant  $p$ -values (i.e., below .10), more suitable for our database that includes a small number of cases (13). The results of this analysis, i.e., the  $p$ -values (and the  $F$ -values emerged from the ANOVA test that provides this significance testing) for each of the variables included in the clustering analysis are presented in Table 2.

**Table 1. Variables included in the cluster analyses and their statistical significance in differentiating clusters**

<b>Variables</b>	<b>F</b>	<b>Sig.</b>
<b>Exo-conflicts</b>	36.154	.000
<b>Endo-conflicts</b>	6.858	.011
<b>Place identity</b>	2.135	.168
<b>Place rootedness</b>	3.358	.068
<b>Stress</b>	3.365	.068
<b>Economic hardship</b>	5.453	.020
<b>Nostalgia</b>	12.852	.001
<b>Intention to relocate</b>	6.259	.014
<b>Personal re-invention</b>	4.266	.039
<b>Life satisfaction</b>	14.224	.001
<b>Debate about sense of transition</b>	1.763	.229
<b>Centralization</b>	2.083	.175
<b>GDP per Capita</b>	9.240	.004
<b>Population Change 2019/2000</b>	3.661	.056
<b>Employment</b>	12.704	.002
<b>Diverse governance</b>	.994	.464
<b>Community empowerment</b>	1.769	.228
<b>Working across agency levels</b>	2.897	.094

Table 1 indicates that 13 variables from the set that we included in the cluster analysis have  $p$ -values significant or marginally significant: Exo-conflicts, Endo-conflicts, Place rootedness, Stress, Nostalgia, Economic hardship, Intention to relocate, Personal re-invention, Life satisfaction, GDP per Capita, Population Change 2019/2000, Employment rate and Working across agency levels.

The clustering algorithm also computes, in an iterative fashion, the “center” for each variable (as the mean for that variable) for each cluster. Table 2 presents these final cluster centers for all

the variables that emerged as significant for differentiating among the five clusters. Moreover, as the legend of the table also indicates, it marks (through different colors) the relative position of each of these mean values in a classification based on the statistical nature of the STEN variables that we used, which differentiates among five classes of size or intensity of the variables (from *Very low* to *Very high*). This allows for a better understanding of the characteristics of the typical case for each cluster as reflected by the final cluster centers.

**Table 2. Clusters characteristics**

<b>Variables</b>	<b>Cluster</b>				
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Exo-conflicts	5.37	3.84	9.73	4.66	4.25
Endo-conflicts	4.73	8.13	8.75	4.15	4.83
Place rootedness	4.09	6.44	5.05	8.05	4.82
Stress	7.26	1.95	6.02	4.31	5.18
Nostalgia	7.54	3.66	5.14	2.93	6.21
Economic hardship	6.65	8.59	5.07	2.94	5.78
Intention to relocate	6.80	3.50	5.63	2.94	6.91
Personal re-invention	6.42	3.82	5.70	3.04	7.15
Life satisfaction	3.33	6.51	6.20	8.11	4.98
GDP per Capita	4.20	10.30	6.24	6.50	4.14
Population Change 2019/2000	5.86	10.10	5.96	4.74	3.95
Employment rate	4.90	8.39	6.09	7.48	2.97
Working across agency levels	4.01	9.67	6.51	5.59	5.33

	Very high > 8.5
	High 7.01 – 8.5
	Medium 4 – 7
	Low 2.5 – 3.99
	Very low < 2.5

Table 3 presents the cluster in which each of the 13 regions was included by our statistical procedures. Moreover, the clusters are not perfectly homogenous on the variables that differentiate between clusters. Therefore, Table 3 also reports the *distance* indicator, which reflects the differences between the regions included in a common cluster, as regions which are more different on the key underlying variables have higher values of this indicator. For instance, the distance indicators suggest that in cluster 4 Lusatia has a certain degree of specificities from the other two regions in this cluster (Rhineland and Central Germany), which are much more closely positioned on the key variables considered.

**Table 3. Cluster membership and distances**

Case number	Case name	Cluster	Distance
1	Silesia	1	3.616
2	Lusatia	4	5.335
3	Rhineland	4	4.674
4	Central Germany	4	4.798
5	Jiu_Valley	5	5.512
6	Sulcis	5	3.621
7	Upper Nitra	1	3.850
8	Brindisi	5	3.723
9	Krakow Metropolitan Area	1	5.673
10	A Coruna	3	4.722
11	Upper Styria	3	4.722
12	Stavanger	2	.000
13	South Wales Valleys	1	6.886

Finally, Figure 80 presents the information extracted through this third stage of data analysis in a condensed manner, by specifying both the coal and carbon regions in each of the five clusters, as well as their positions on all the key variables that emerged as significant for differentiating the regions, in terms of the level of magnitude or intensity on each of these variables.

The *first cluster* includes four carbon and coal-intensive regions: Silesia, Upper Nitra, Krakow Metropolitan area, and South Wales Valleys. This cluster of regions is described by medium levels of both endo- and exo-conflicts (as all STEN values, in comparison to the other regions considered). Further, the regions in this cluster are characterized by medium levels of place rootedness, perceived economic hardship, intention to relocate, personal re-invention, and high levels of stress and nostalgia. Moreover, low life satisfaction levels characterize the regions in this cluster. Lastly, the regions in this cluster are characterized by medium levels of GDP per capita, population change, employment rate, and working across agency levels.

The main specificities of the regions in this cluster are the high stress and nostalgia of their residents, and their low life satisfaction, although these factors are not associated with a high intention to relocate (which is at its medium level), probably due to the medium level of the other key factors of this intention, which counteracts the effect of these psychological factors.

The *second cluster* includes Stavanger. Low levels of exo-conflicts describe this cluster, and – at the opposite end, high levels of endo-conflicts. Further, the region is characterized by medium levels of place rootedness, very low levels of stress, low levels of nostalgia, very high perceived economic hardship, low levels of intention to relocate, low levels of personal re-invention, and medium levels of life satisfaction. Concerning the economic variables, the region is described by a very high GDP per capita and population change, and a high employment rate. Lastly, this cluster is described by very high levels of involvement of different human agencies in capacity building.

The main specificities of the region in this cluster (Stavanger) are a very high GDP per capita in comparison to the others and a very high population change (one of the few regions analyzed that had population growth in the 2000 – 2019 interval), as well as a very high level of Working across agency levels. At the same time, its residents tend to perceive a very high Economic hardship generated by decarbonization. The high employment rate and endo-conflicts, low level of exo-

conflicts, and the very low level of stress, together with the low intention to relocate of its residents and their low nostalgia also characterize this region.

The *third cluster* includes two carbon-intensive regions: A Coruna and Upper Styria. This cluster of regions are characterized by very high levels of both endo- and exo-conflicts in the area. Secondly, the regions are described by medium levels of place rootedness, stress, nostalgia, perceived economic hardship, intention to relocate, personal re-invention, and life satisfaction. Thirdly, these regions are characterized by medium levels of GDP per capita, population change, and employment rate. Lastly, this cluster of regions is characterized by medium levels of involvement of different human agencies in capacity building.

The main specificities of the regions in this cluster are the very high levels of both endo- and exo-conflicts in the area, while all the other variables are at a medium level.

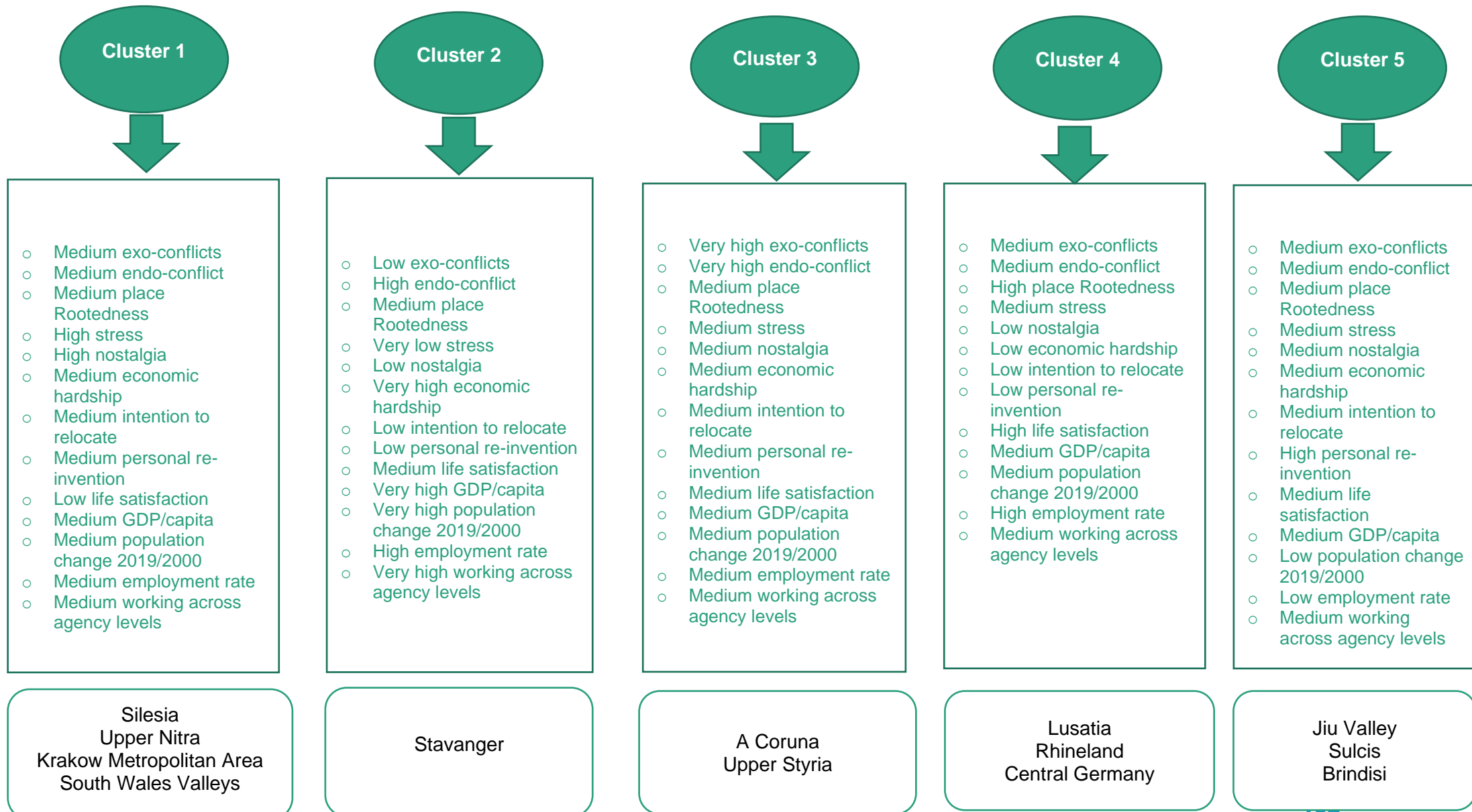
The *fourth cluster* of regions includes three coal-intensive regions: Lusatia, Rhineland, and Central Germany. This cluster of regions is characterized by medium levels of both endo- and exo-conflicts. Secondly, the regions in this cluster are described by high levels of place rootedness, medium levels of stress, low levels of nostalgia, low levels of perceived economic hardship, low levels of intention to relocate, low levels of personal re-invention, and high levels of life satisfaction. Further, these regions are described by medium GDP per capita, population growth levels, and high employment rate. Lastly, the regions in this cluster are described by medium levels of involvement of different human agencies in capacity building.

The main specificities of the regions in this cluster are the high employment rate, life satisfaction and place rootedness of their residents, as well as their low nostalgia, intention to relocate and economic hardship.

The *fifth cluster* of regions includes three areas: Jiu Valley, Sulcis, and Brindisi. The regions in this cluster are characterized by medium levels of both endo- and exo-conflicts. Moreover, these regions are described by medium levels of place rootedness, medium levels of stress, medium levels of nostalgia, medium levels of perceived economic hardship, medium levels of intention to relocate, high levels of personal re-invention, and medium levels of life satisfaction. Furthermore, this cluster of regions is described by medium levels of GDP per capita, and low levels of both population growth and employment rate. Lastly, the regions in this cluster are defined by medium levels of involvement of different human agencies in capacity building.

The main specificities of the regions in this cluster are the low index of population change, indicating the highest rate of depopulation from 2000 to 2019, and the low employment rate, together with a high propensity of their residents towards personal reinvention as an individual coping strategy with the adverse consequences of decarbonization.

Figure 83. Cluster description







# ENTRANCES

ENergy TRAnstitions from Coal and carbon: Effects on Societies

## Annex 2 - Qualitative Comparative Analysis

## Authors

Giovanni Caiati (Knowledge & Innovation, Italy)

## Contributors

G. Quinti, F. Feudo (K&I)

N. Singh Gartha, (UDC)

D. Skobla (CSPS)

K. Heinisch, C. Shultz, (IWH)

T. Barrett (IOER)

N. Cerone (ENEA)

M. Lang, M. Spiesberger (ZSI)

K. Vilhelmsen (NTNU)

A. Haley (UC)

A. Holman (UAIC)

W. Kowalik, W. Huber, A. Komorowska (IGSMiE PAN).

We gratefully acknowledge the valuable contribution to the research we received from all the participants of the focus group, the in-depth interviews, and the online survey. All choices and interpretations in the current text, are, however, our own responsibility.

This report is delivered in the framework of the European Commission H2020 funded project - ENergy TRANSitions from Coal and carbon: Effects on Societies - ENTRANCES, G.A. 883947.

Work Package 5: Comparative analysis

Lead Organisation: Alexandru Ioan Cuza University of Iași, Romania

### **ENTRANCES project**

Project coordinator: Ricardo García Mira (University of A Coruna, Spain)

Project email: [info@entrancesproject.eu](mailto:info@entrancesproject.eu)

Project website: <https://entrancesproject.eu/>



## Table of contents

<b>1</b>	<b>Introduction.....</b>	<b>4</b>
1.1	Premises.....	4
1.2	Objectives.....	4
<b>2</b>	<b>Theoretical framework.....</b>	<b>5</b>
2.1	A quadripartite model of territory.....	5
2.2	Coal and carbon territories and de/re-territorialisation.....	6
2.3	The analysis of transition and identity processes in coal and carbon territories.....	8
<b>3</b>	<b>Profiles of territorialisation of the coal and carbon territories .....</b>	<b>9</b>
3.1	The development of the profile.....	9
3.2	As Pontes (Spain).....	10
3.3	Brindisi (Italy).....	11
3.4	Central Germany (Germany).....	13
3.5	Jiu Valley (Romania).....	14
3.6	Katowice (Poland).....	15
3.7	Krakow (Poland) .....	17
3.8	Lusatia (Germany) .....	18
3.9	Port Talbot (United Kingdom).....	20
3.10	Rhineland (Germany).....	21
3.11	Stavanger (Norway) .....	23
3.12	Sulcis (Italy) .....	24
3.13	Upper Nitra (Slovakia).....	26
3.14	Upper Styria (Austria) .....	27
<b>4</b>	<b>Territorialisation attributes in the 13 cases.....</b>	<b>30</b>
4.1	Territorialisation elements.....	30
4.2	Territorialisation components .....	32
4.3	Territorialisation type.....	37
<b>5</b>	<b>Recurring Territorial Dynamics.....</b>	<b>39</b>
5.1	Dynamics related to the vision .....	39
5.2	Dynamics related to governance.....	40
5.3	Dynamics related to boundaries and transactions.....	42
5.4	Dynamics related to symbols .....	43
5.5	Dynamics across cases .....	44
<b>6</b>	<b>Territorial Drift Patterns.....</b>	<b>47</b>
6.1	Peripheralisation .....	47
6.2	Absorption or incorporation .....	47
6.3	Polarisation.....	47
6.4	Shrinkage and Desertification .....	48
<b>7</b>	<b>References.....</b>	<b>48</b>

## 2 Introduction

### 3 Premises

This report is focused on the outcome of Task 5.3 “Qualitative Comparative Analysis of the ENTRANCES Project”, based on the research outcomes produced in the previous phases of the project, i.e., in WP3 and WP4 dedicated to developing 13 case studies on coal and carbon-intensive regions in transition. The Task was developed in parallel with two other tasks, i.e., Task 5.2 “Quantitative comparative analysis” and Task 5.4 “Inventory of challenges and coping strategies”. The results of Task 5.3. – presented in this report – together with those of the other two tasks will provide input for the development of a taxonomy of trajectories, challenges and coping strategies for coal and carbon-intensive regions in transition (D5.3). This report is drafted by K&I as task leader and was nurtured with input from the case study leaders (Chapter 3) and by all the ENTRANCES partners.

### 4 Objectives

In the previous WPs, the research described the case study regions by providing a detailed portrait of the peculiar features of each case. WP5 aims to develop an analysis of coal and carbon-intensive regions as a class of cases. To do that, the WP5 compares results across cases to identify differences and commonalities in the regions. In this context, the overall objective of the qualitative comparative analysis is to describe the differentiated processes of de/re-territorialisation ongoing in coal and carbon-intensive regions and identify recurring territorial dynamics and patterns.

This overall aim was pursued through a set of four specific objectives, each of them corresponding to one of the chapters of this report. The specific objectives of the analysis are as follows.

- Articulating a theoretical framework devised for the analysis of de/re-territorialisation dynamics in the regions (chapter 2)
- Describing each of the 13 regions through the lenses of de/re-territorialisation (chapter 3)
- Assessing the territorialisation process to identify common types of territorialisation paths and related weaknesses and strengths (chapter 4)
- Identifying a set of recurring and differentiated dynamics in coal and carbon-intensive regions (Chapter 5)
- Singling out a set of potential territorial drift patterns (Chapter 6).

## 5 Theoretical framework

*To implement the qualitative analysis across cases, we developed a conceptual itinerary made of three steps. Firstly, we identified a quadripartite theoretical model for describing territory as a social assemblage. Secondly, the changes occurring in coal and carbon-intensive regions will be considered and theoretically framed as territorialisation processes. Thirdly we illustrate how the model might be used as an analytic tool for describing the territorialisation process ongoing in coal and carbon-intensive regions.*

### 5.1 A quadripartite model of territory

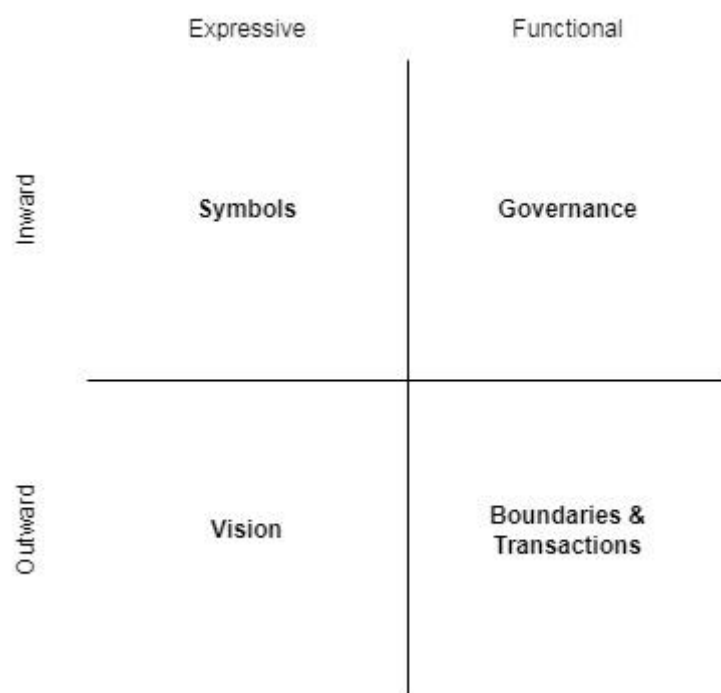
For the aim of our analysis, we understand “territory” as a social assemblage (Sassen, 2006) aimed at exercising control over the inhabited space. In this respect, a territory operates across different dimensions and levels.

Firstly, a territory has both expressive and functional dimensions (Brighenti, 2010). The expressive dimension highlights the cognitive and discursive elements of territorial assemblage, while the functional dimension provides the material and relational elements. This means that the territorial assemblage is kept together and is recognisable as it produces a shared context of meaning about what the territory is and what it is meant for, as well as guarantees some basic functions such as those providing subsistence and protection to its inhabitants.

Secondly, the territorial assemblage works in two directions or levels: inward, meaning that it should ensure that the constitutive relationships of the territorial assemblage are kept together; and outward, meaning that the territory should manage and negotiate the relationship with the broader outside, e.g., other territories or over-imposed territorial units, as well as actors operating on the outside.

Combining these levels and dimensions a territory can be analysed through a quadripartite model composed of the four resulting elements, as illustrated in the picture below.

Figure 1 – The quadripartite model of territory



**Symbols** express the singularity of a territory, the continuity between its past and its future and provide the member of the local community with life meaning and individual identity. Symbols play an important role in keeping the territory united. Albeit being a long-lasting element of the territory, symbols are not static, they can evolve or lose relevance and value.

The **Vision** reflects the shared interpretation of a territory and how it is expected to provide subsistence to its inhabitants. The vision also reflects the distinctive role of the territory in the broader context, including surrounding territories or higher-level regions where the territory is encased, thus the Ad-extra feature of the territory.

**Boundaries and transactions** reflect the essential feature of the territory of drafting boundaries with the outside. A territory exercises control over transactions with the outside, to some extent defend itself from undesired influences, actions, or violation. The control over boundaries and transactions contributes to making the territory a safe space for its inhabitants.

**Governance** reflects rules, norms, practices, and mechanisms devoted to managing internal strains & conflicts, as well as managing risks and opportunities as they arise and ensuring some form of participation of territorial actors in the decision-making process. Governance norms practices and mechanisms might be both formal and informal.

## 6 Coal and carbon territories and de/re-territorialisation

Coal and carbon territories are defined in ENTRANCES as the territories in which the “coal and carbon” features are represented as a distinctive part of the local identity and are a key asset for the subsistence (meaning income and employment opportunities) of the local community (Caiati et al., 2021).

One of the main assumptions of the ENTRANCES project is that the pattern of territorial organisation of coal and carbon territories is entered into crisis. The situation of coal and carbon territory can be better understood in terms of de/re-territorialisation.

De/re-territorialisation theory tells us that all territories are exposed to continuous processes of de-territorialisation and re-territorialisation (Deleuze & Guattari, 1988; Nail, 2017), meaning weakening of the current inward and outward territorial relationships and establishment of new territorial relationships. While in a period of relative stability such dynamics results in simple adjustments of the territorial assemblage, in periods of rapid and deep change, such dynamics a more profound modification of the assemblage.

This dynamic can also be explained in terms of stress in the territorial organisation (Caiati et al. 2021; Bertrand, 1963). When a territory is exposed to just a few relatively weak stress vectors, the territorial organisation can reduce stress by only adjusting its constitutive relationships. On the other hand, when a territory is exposed to several strong and overlapping stress vectors more profound changes are needed to keep the organisation together. Most of these dynamics are linked to the growing weight of globalization processes, which affect all territories and can produce different effects in terms of de/re-territorialisation. As part of the study, different components of globalization were considered, including economic flows, population flows, and cultural flows (Appadurai, 1990).

In our analysis, we assume that the exposure to several long-lasting stress vectors has put in crisis the model of territorial organisation coal and carbon territories and that major changes – not adjustments – are needed to cope with them.

From the theoretical point of view, this leads to two considerations.

First, the coal and carbon territories have engaged with or are engaging in a process of territorial transition, where for the transition we mean a purposive transformation of the territorial organisation model. The territorial transition is not the same across different coal and carbon region, as there are different points of departure and different envisaged arrival points for the transition. It is worth mentioning that territorial transition should not be conflated with the energy transition even though the energy transition is of course a key variable for the territorial transition (exactly because these are coal and carbon territories).

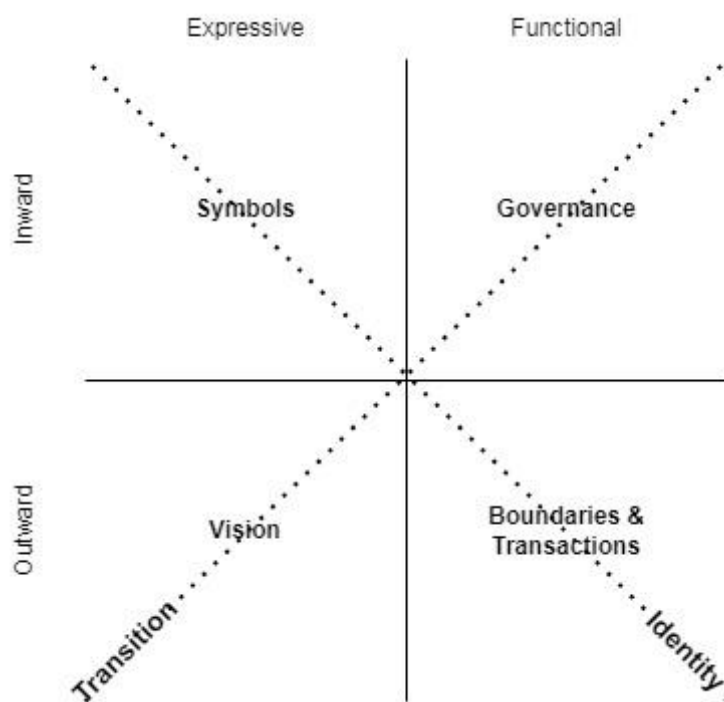
Second, exposure to prolonged and profound stress means that coal and carbon territories are already experiencing a process of change in their identity, intended in two different perspectives, i.e., a) as a sense of similarity, ownership, and distinctiveness and b) as a continuity on which solidarity rests (e.g., see Pollice et al., 2003).

In summary, the study of the territorialisation process of coal and carbon territories may be understood by looking at two components: the ongoing transition process, i.e., how the local community is pursuing a purposive transformation, and the ongoing identity process, i.e., how the territory is being transformed in terms of identity by the combined actions of several ongoing changes that are exercising pressure on the territory.

## 7 The analysis of transition and identity processes in coal and carbon territories

We used the model of territory presented in section 2.1. to analyse the transitional and identity processes ongoing in the coal and carbon territories. Two diagonal lines might be traced to identify the two components of the territorialisation process as illustrated in the picture below.

Figure 2 – Transition and identity components in the quadripartite model



The model allows us to describe the transition process by looking at the emerging vision of the territory and which forms of governance are being implemented to manage and orient the transition. At the same time, identity processes might be described by looking at how territorial symbols and territorial boundaries are changing. The two components represent different forces that are in action in the territorialisation process. It is worth highlighting that each of the two components has both an expressive and a functional element and operates both “inward” and “outward”.

Overall, this approach aims to avoid conflating the territorialisation dynamics just on the transition processes, which is often measured in terms of policy action but considering territorial identity as a key aspect of the ongoing transformation. The approach has thus an aim to look at territory more broadly and holistically, but without overcomplicating the analysis, thus making it feasible and clear.

## 8 Profiles of territorialisation of the coal and carbon territories

We used the analytic model described in Chapter 2 to develop a profile of territorialisation for each of the 13 coal and carbon territories included in the project. Each profile provides a case summary and a short description of the four elements of the model. Altogether, the profiles constitute a structured empirical basis for the analysis of territorialisation in the coal and carbon territories analysed by the project. The first section of this chapter illustrates the methods adopted for developing the profiles, while the 13 following sections are dedicated to the profiles of the 13 coal and carbon territories analysed by the project.

### 9 The development of the profile

The profiles were developed following a three-step itinerary: setting up an observation grid; secondary analysis of the case study data; profile drafting and validation.

#### *Setting up an observation grid*

Based on the theoretical framework provided in Chapter 2, for each of the four elements of the model, a set of questions have been identified to guide the interpretation (see the table below). Besides the four dimensions, some questions concerned the case as such. The case summary provides the reader with the context in which all the other information should be inserted. The guiding questions used to develop the profile are summarised in the table below.

Table 1 – Observation grid

Profile Item	Questions
<b>Case Summary</b>	What is the territory and where is placed?
	Why is it a coal and carbon territory?
	How did the territory evolve over the recent past?
	What is the institutional context of the undergoing territorial transition?
<b>Territorial Vision</b>	Is there a vision of the territorial transition?
	Is it a plausible vision, is it shared by the local community?
	Is it in continuity or is it a rupture with the past?
<b>Transition Governance</b>	Is there a governance mechanism for the transition?
	Are there significant conflicts/divisions concerning the territorial transition?
	Is there effective territorial governance to support and drive the transition?
<b>Boundaries and Transactions</b>	Are there investments for the territory / is it a target of predatory investments?
	Are there processes for redrafting territorial boundaries? (absorption, merging, division, expansion, shrinkage, etc.) Who is drafting?
	Is the territory managing to defend its boundaries/distinctiveness?
<b>Territorial Symbols</b>	Is there an erosion of the territorial symbols? Is there a territorial stigma?
	Are there new emerging symbols for the territory?

#### *Secondary analysis of the case study data*

Through secondary analysis of the data collected in the previous phases of the research, we questioned the case studies to answer the guiding questions. Key information was retrieved from the case study reports, state-of-the-art reports, and focus group reports of each case. Given the heterogeneity of the data sources, not all the questions were answered for all the cases. In any case, the data collected allowed us to describe all four elements for all the cases.

### *Profile drafting and validation*

The information collected was summarised in a case profile sheet and sent back to the case study leader for updates and reviews on the cases. The feedback received was incorporated into the profile sheets.

## **10 As Pontes (Spain)**

### *Case Summary*

A Coruña is a small province in the autonomous community of Galicia, in north-western Spain. It is home to the largest coal-fired power plant in Spain, La Central de As Pontes, with an installed capacity of more than 1400 MW. The plant was commissioned in the early 1970s to exploit the lignite mines in the As Pontes region. In the 1993-96 period, this plant was restructured to use a mixture of local lignite and imported coal intending to reduce emissions. The port of Ferrol was developed and the necessary infrastructure was built to transport the imported coal to the plant. The lower price of imported coal made the local mines uncompetitive and eventually the As Pontes coal mines were permanently closed in 2007. The mine shaft was filled with water to create the largest artificial freshwater lake in the region, which was inaugurated in 2012. From 2007 onwards, the thermal power plant started burning only imported coal, which was less polluting and cheaper. Spain's recent commitment to reducing emissions paved the way for the closure of all coal-fired power plants, including As Pontes. The owner of the thermal power plant, ENDESA, formally requested the closure of the thermal power plant in December 2019 and the Ministry for Ecological Transition and Demographic Challenge of the central government of Spain has approved its request, paving the way for the definitive closure of the thermal power plant. The ongoing war between Russia and Ukraine and the energy crisis caused by the reduction of Russian gas supplies have delayed the closure of this plant. This closure is critical to meeting the Spanish government's proposed 2030 climate targets, but it is expected to have serious consequences for the local community's well-being.

### *Vision*

The vision for the territorial Transition of As Pontes is still dominated by industry and energy production. Due to the great potential of wind energy, the region is seen as a possible pole for attracting investments by industrial companies and for renewable energy production. While there is a shared interpretation of As Pontes as an industrial town, it is not yet clear if the vision of reviving the industrial complex is plausible. Another vision is developing As Pontes as a tourism attraction deploying the artificial lake recently developed to cover the coal mining area. However, the research has found that there is scepticism in the local community about the actual potential of the lake as an attraction for tourists, due to poor infrastructure, problems with the water of the artificial lake and closeness to the sea. Finally, there is another vision of making this region a digital industry hub, which now seems less plausible to the local community due to the emigration of well-educated young people from the region, creating a shortage of human resources for the establishment of the high-tech industry.

### *Governance*

A set of plans have been developed at the national level, in the Galician Region, by As Pontes municipality and by the ENDESA company for the transition toward green energy and climate neutrality. However, according to the research results, no overall plans have been developed for the territorial transition. In this respect, it is worth mentioning that the region was among the receivers of the EU Just Transition Fund – which required the development of a Territorial Just Transition Plan.



A so-called bottom-up approach was adopted for the allocation of these funds, which was based on the submission of a set of uncoordinated project proposals presented individually by local stakeholders. This procedure for the development of the TJTP shows that there was a lack of a negotiation process about the priority and perspective of the territory as such. More in general, the research has shown that the territory is characterised by conflicts and high fragmentation, across different autonomous communities and municipalities in the area. This fragmentation is testified, among other things, by conflicts and competition over the allocation of limited governmental resources, and a lack of a unified vision or plan for the development of the area. In the absence of such a development perspective, past attempts to regenerate the area resulted in benefits for a set of enterprises but not for the territory as such. Finally, territorial governance is made difficult by the disproportionate power of the ENDESA company as the owner of the Power Plant.

### *Boundaries and Transaction*

The CCT of As Pontes has maintained its own identity as an industrial town in contrast to its agrarian environment. With the abandonment of the mines and the closure of the thermal power station, the region risks losing its distinctiveness as an industrial centre. Another possible risk is the relative desertification of the territory. The lack of land and its increasing value, along with the employment crisis is among the factors inducing companies and the population to relocate to neighbouring counties and nearby towns. However, the territory still attracts public investments, as well as the interest of some international companies to invest in the area.

### *Symbols*

The territory of Pontes is affected by a territorial stigma. In the public discourse, the territory is equated with irremediable pollution, including environmental and health damage, and is perceived as an abandoned territory – as the remains of the old mines and other industrial structures and former residential areas dominate the local landscape. A nostalgia for the old times is widespread in the territory, and such time refers both to the time of coal mining and to the time of flourishing industries. The nostalgia is represented in the town's decision to maintain the chimney of the thermal power station as a symbol of what As Pontes was. On another note, the freshwater lake developed following the closure of the coal mine is seen as a symbol of a new and more green growth of the territory. However, due to the disputed role of the lake and the appearance of cracks in the lake walls, this “new symbol” also cast a divisive and declining image on the territory.

## **11 Brindisi (Italy)**

### *Case Summary*

The case study is focused on the city of Brindisi, a port city on Puglia's Adriatic coast. The economic landscape of the city is dominated by coal-fired generation and the chemical industry, as well as by related port activities. Since WWII the city has had an industrial vocation, starting with the aeronautic industry and with intensive development of the oil refinery and chemical industry. With the crisis of the oil industry in the 70s, national plans were implemented to develop two coal power plants in the area to absorb the job losses from the oil refinery and provide the local industries with the power needed for their operations. The Brindisi port infrastructures were developed accordingly, i.e., for coal transport. Despite the successful transition from oil to coal, the sector of energy generation entered into a new crisis in the 90s, that led to the shutdown of one of the two coal-fired power plants. At the end of 2010s, the Italian government established a national coal phase-out, thus including the shutdown of the Brindisi Power plant with the related impacts on the port activities as well as on all

the other activities indirectly related to the power plants. The envisaged transition plans foresee, among other proposals, the development of a wind energy park on the Brindisi coast.

### *Vision*

There are different and to some extent conflicting visions and interpretations of the territory in the local community. On one side, the territory is still interpreted as an industrial and energy area. This interpretation is reflected in the plans that are under development for saving the jobs threatened by the coal phase-out, such as the former plans – now abandoned – to convert the coal power plant to natural gas and plans to deploy the Brindisi area to produce clean energy. On the other hand, the energy transition is seen as an opportunity to change territorial vocation and re-orienting the territory toward new sectors, such as tourism, maritime tourism, natural environment, cultural heritage, food, fisheries, etc. This turn is locally interpreted as a rediscovery of the vocation that the territory had before its relatively recent industrial exploitation.

### *Governance*

Although there is a lot of discussion and plans around energy transition and coal phase-out, there is not an overall plan addressing the transition of the territory as such, addressing the direction and the steps that Brindisi should take to cope with the changes related to the coal phase-out and decarbonisation. As there is not a designated institutional space for negotiating the transition, there is also a lack of inclusion of local stakeholders in the decision-making process. Brindisi as the bearer of key national assets and strategic value is exposed to and dependent on national and European decisions in the matter of energy and industrial development. The research has shown that key decisions about the energy transition are mainly driven at the national level, either by the government or ENEL – the owner of the local power plant.

### *Boundaries*

The CCT of Brindisi has maintained its distinctive feature of the reliance on coal and coal power stations and its own identity as an industrial town, dictated by the central government over 30 years ago, even though, through the intervention of support from the National and Regional governments. With the coal phase-out, the region risks losing its identity as an industrial centre and energy generation. The efforts and the fights with the national and regional governments for the development of renewable energetic sources are examples of how the whole territory is involved in preserving territorial boundaries and benefits, rather than dissolving such benefits in the market.

### *Symbols*

The territory of Brindisi is pictured as characterised by the bureaucratic slowness of the authorization processes by local institutions, and disorganisation. This bureaucratic slowness affects very negatively on the will of potential and possible investors regarding new investments and provides a negative image of Brindisi, as there is a tendency to say no to industrial investments. Also, environmental stigma affects the Brindisi territory. Brindisi, without a reason, is equated to the nationally well-known Taranto from an environmental point of view. This association creates a negative image of Brindisi which is seen as a territory with irremediable pollution, including environmental and health damages. Despite these detrimental images, the research has also registered a positive and motivating symbol for the territory: the harbour is perceived as an element of territorial rebirth. The harbour identity is now assuming a new meaning, as the harbour is seen as a gateway to tourism. Thus, the harbour is no longer linked only to coal and industrial activities but also to tourism with all its high potential. However, the research has shown that the harbour, as a

new symbol is highly ambivalent as it is interpreted both as a symbol of the old industrial path and as the symbol of a new path marking Brindisi as an attractive touristic city.

## 12 Central Germany (Germany)

### *Case Summary*

Central Germany belongs to the three regions in Germany which still mine lignite to produce electricity. In general, the Central German coal region is located between the German states of Saxony and Saxony-Anhalt and comprises three opencast mines (Amsdorf, Profen and Schleenhain), three power plants (Schkopau, Lippendorf and Chemnitz) and several refining operations. Until the 1970s, Central Germany was the largest lignite mining region in Germany. After the German Reunification, the first opencast mines were shut down, and the role of lignite increasingly declined. The East German energy industry was not able to compete with Western standards, which produced at lower costs and had higher efficiency.

In line with the drop in production at the beginning of the 1990s, employment decreased from about 60,000 in 1988 to only 2,190 persons that were employed in the lignite coal industry (including power plants) in Central Germany in 2020. However, after a rough transition process, the chemical industry and the coal industry remained stable and reliable employers in the region, even though on a much smaller scale. Central Germany has a relatively old population due to substantial out-migration during the 1990s and 2000s. Due to other economic sectors such as optics, microelectronics, biotechnology and the chemical industry, the Central German mining area is, on the whole, much less dependent on the lignite industry than Lusatia. Unlike many other areas in East Germany, Central Germany has always benefited from the spill over effects of its industrial centres and big cities such as Leipzig and Halle. Nevertheless, lignite is of great importance for the regional economy. Its loss will pose major challenges for the affected municipalities. In July 2020, the German government adopted the Act on the Phase-out of Coal-fired Power Plants and the Structural Reinforcement Act for Mining Regions, including compensation for the increase in energy prices, adjustment payments for older employees working in the coal sector, and a dedicated fund for the development of the coal regions.

### *Vision*

The territory is dominantly interpreted in continuity with the past and with its present as a coal mining and industrial area. All development plans for the area reflect this. Most of them aim at keeping open the industries and helping Central Germany to stay a region with a strong energy sector. Strategies that are aimed at changing territorial vocation and re-orienting the territory toward new sectors, such as R&D and tourism, only depart weakly from known territories. There is a deep and widespread pro-industrial attitude, which leads to the focus on industrial or energy production activities in the area. Inhabitants of Central Germany consider industrial jobs and employment as crucial steps for the future development of the region. The motivation for this is that industrial activities have already proven to be profitable and stable; environmental and social damages can be reduced by proper regulation. According to the research result, the emerging vision is about the region becoming a modern industrialized region connected with sustainable high technology.

### *Governance*

While the coal phase-out act establishes a clear timeline and provides significant resources for the region, the research has shown that the mechanism established to fund spending is controversial and divisive in the region. There is no final plan for the assignment of the funds yet, rather such funds are assigned with “bottom-up” calls, where proposals from different public authorities are assessed

at the state level, thus with little decision-making space for the local and territorial level. This process generates internal conflicts within the territory and results in overall dissatisfaction about the use of “coal money” and even a lack of consensus in some of the flagship projects funded. Overall, the region is largely dependent on subsidies and transfers from other regions. This implies that regional actors cannot freely decide how to shape regional development. It seems as if everyone is gearing up to receive funding, while funding is associated with conditions and influences from outside.

### *Boundaries & Transactions*

The coal mining areas of Central Germany are losing their centrality in regional life. Economic developments, cultural discourses and political power in the region are focused on the urban areas while the rural parts of the region – where the coal mines are located – risk losing their role and peculiarity. This trend is accelerated by the decarbonisation process, as the skills and infrastructures needed for renewing the industry – such as digital skills and infrastructure, seem not to fit with the territories of the coal mining sites, which due to youth outmigration, have an older population. Due to a lack of local entrepreneurship and dependence on national funds, the Central German CCT risks being shrunk or exploited as an extended workbench of other successful regions.

### *Symbols*

The region is affected by a stigma, which it shares with the whole of East Germany. However, overall the stigma is losing weight, and today parts of the region are no longer affected (e.g., Leipzig), while other parts – such as the City of Halle – are still struggling to re-invent their identity. No emerging symbols connected with the territorial transition path have been identified during the research.

## **13 Jiu Valley (Romania)**

### *Case Summary*

Jiu Valley is a micro-region in the Hunedoara County of România, comprising seven municipalities in which coal mining has represented the dominant employment opportunity. At the beginning of 1990, the Jiu Valley could be characterised as a strong urbanised zone, almost exclusively related to coal mining, with more than 60,000 of the inhabitants employed directly or indirectly in this industry and with 17 coal mining perimeters exploited. The downfall of the Jiu Valley coal mining began after the fall of communism in 1989 to now. Massive layoffs in the mining industry began in 1997 when the Romanian government implemented a program of labour contract buyouts, enticing miner participation with large severance packages along with regular unemployment benefits, and several mines were closed. This program decreased mining employees from roughly 42,000 in 1997 to about 15,000 by late 2000, enabled the closure of two of thirteen mines, and prompted talk of the closure of another five to eight mines. This downward process is still underway, with only 4 mines still operational in the area. In the framework of the EU efforts toward climate neutrality, a plan for territorial transition has been developed to ensure a future for Jiu Valley beyond coal mining. Jiu Valley is a recipient of the EU Just Transition Fund and has participated in the work of the Platform for coal+ regions in transition.

### *Vision*

In Jiu Valley, there are conflicting visions about the territory's trajectory. On the one hand, the energy transition is seen as an opportunity to operate a rupture in the current territorial trajectory dominated by coal mining, by diversifying its economy and especially developing the tourism sector. On the other hand, such vision, and the related plans, which are based on the assumption of full decarbonisation of the area, are criticised by a part of the population which sees the future of the region still linked to coal mining, which is today the larger employers in the area. However, the latter

vision acknowledges that Jiu Valley needs to modernise the mines for increased economic and environmental sustainability.

### *Governance*

A strategic plan was devised up to 2030 to accompany the phase-out from coal by diversifying the local economy, improving the quality of life, valorising the local specificities, and improving mobility and digital connectedness of the region. Moreover, a complex governance mechanism including different actors, municipalities, businesses, citizens, and others was designed to accompany the implementation of the plan. However, the research has shown that the Jiu Valley has experienced a dissolution of its territorial cohesiveness, where the practice of having unified plans and administration of the area during the communist period was lost. The dissolution process resulted in independent and even inter-competitive separate administrative units, and a fragmentation of decision-making in the area. This cast doubts about the effectiveness of the transition policies prepared.

### *Borders & Transactions*

The identification of Jiu Valley as a recipient of the Just Transition Fund means that the borders of the territory are recognised externally, as well as that the territory is attracting public investment for territorial transition. It is worth mentioning that this transaction (providing funds for taking away coal mining) might also be interpreted as an attempt to re-draw the Jiu Valley borders as a coal and carbon territory and dissolve them in the broader region of Hunedoara. A sign of this is the need to include among the strategic objectives that of “Valorising of the local specificities”. However, the attempts to redesign the region's features are perceived by a significant proportion of the local population as unnecessary bottom-up imposition and forms of resistance to change and border defence are present in the region.

### *Symbols*

There is a significant erosion of the territorial symbols based on coal mining. This is attested by a widespread sense of stigma toward Jiu Valley which is often portrayed in the public discourses as “the valley of tears” and the low social status of the miners (low pay, delay in payment, considered as politically manipulable, etc.). No new symbols or re-interpretation of the old symbols were detected during the research.

## **14 Katowice (Poland)**

### *Case Summary*

Katowice is one of the seven regions in the Silesian Coal Basin in Poland. The Silesian Province is characterised by a high concentration of hard coal mines, steelworks, power plants and heavy industry on a large part of its territory. In 2019, 74,500 people were working in hard coal mining in Silesia. This represents 94% of all people employed in hard coal mining in Poland. This subregion currently operates 6 coal mines which will undergo the closing process. Moreover, in the territory of the Katowice subregion, there are 3 combined heat and power plants. Hard coal mining began on an industrial scale in the second half of the 18th century, setting this as among the main economic activities in the area. After WWII, the government of the Polish People's Republic took over all mines in Poland into the property of the state and incorporated them into the national socialist economy. Coal production increased steadily and reached its high in the 70s. The mining industry in Silesia starts its decline in the 80s which was characterised by deepening economic collapse, price rises and shortages of basic products, as well as extensive and dramatic mining strikes, which contributed



to the political breakthrough. The following years saw the restructuring of the mining activities – as Poland switched from a planned economy to the market – and a set of reforms aimed at cutting costs and increasing the productivity of the mining and metallurgical sectors, which were in dire financial shape, and on the verge of bankruptcy. However, despite a never-ending set of reforms adopted to cope with the debt of the mining industry – and steady disinvestment from coal – over the last decades Katowice diversified its economy attracting investments from several industries (above all the automotive industry which count for more than half of the invested funds), as well as services, cultural institution, academy, research & innovation. Silesia was among the region's recipients of the Just Transition Fund.

### *Vision*

The vision of the region is to continue the development of areas that are gaining increasing economic importance, such as manufacturing, processing, and logistics, and that have already allowed Katowice to diversify its economy. In addition, the Katowice subregion has been trying for years to draw attention to its unique natural assets and green areas, as well as interesting industrial monuments, which may increase the region's attractiveness for tourists in the future. It is worth mentioning that the vision of development of the area is centred on the province capital city of Katowice, while few considerations are drawn about the other cities included in the subregion, i.e., Chorzów, Mysłowice, Ruda Śląska, Siemianowice Śląskie and Świętochłowice.

### *Governance*

The governance of the energy transition is managed at the level of the Silesia province. In March 2019, a special team for the just transformation of the Silesian province was established, including a set of different stakeholders at the regional and municipal levels, as well as representatives of NGOs, trade unions, businesses, and the academy. The Board of the Silesian Province is working on the Territorial Just Transition Plan (TJTP), which is necessary for the planning of financial support in the region from European funds under the Just Transition Fund. On the other side, the development of Katowice is largely addressed by the city. Many of the conflicts identified by the research concern other cities outside the provincial capital of Katowice.

### *Borders and Transaction*

The Katowice subregion (and more largely the Katowice metropolitan area) are among the more dynamic regions in Poland and Europe in terms of private investment attraction. Silesia is also among the more attractive regions for EU funding. However, the research has shown that there is an ongoing peripheralization of the satellite cities, where the local economy and employment are still mostly based on coal mining which is still exposed to huge disinvestments, while Katowice city has an increasing centrality in the Region, as this is the place where most of the investments are concentrated. This results also in outmigration from satellite cities to Katowice.

### *Symbols*

In the identity of its inhabitants, but also the eyes of people in other regions of Poland, the Katowice subregion is still seen through the prism of mining and heavy industry. For Silesians themselves, this is one of the most important elements of their regional identity. Progressive disinvestment in the mining sector, however, means that to some extent these elements of identity are no longer so vivid and relevant. This does not change the fact that attempts are being made to incorporate industrial heritage into new visions of the region. This can be observed mainly in Katowice, which for several years now has been trying to erase the now largely outdated stereotypes of a dirty, industrial landscape and air pollution. After renovation, former post-industrial buildings are becoming part of

the city's industrial character but are being given new functions. Its application to be the European Capital of Culture was even entitled 'Katowice – City of Gardens'. The image of contemporary Katowice is much more positive than it was a dozen or so years ago.

## 15 Krakow (Poland)

### *Case Summary*

Krakow is the second largest city in Poland. It is located in the southern part of the country, in a region called Małopolska. Apart from its rich history, numerous monuments, universities and cultural institutions, Krakow has also been an important industrial centre for centuries. The traditions of Krakow's industry date back to the mid-19th century. The turn of the 19th and 20th centuries marked the beginning of the development of the large-scale factory industry, and it developed the most after World War II. The largest investment of that period was the Lenin Smelter, the city's largest industrial facility. It was also the biggest emitter of air pollution and had the highest odour intensity in the region. The smelter was established in 1954. In the 1970s, the company employed over 40,000 people and produced over 6.7 million steel per year. Steel production was based on coke that was produced in the same location. In the 1990s, the most environmentally burdensome branches of the plant were closed. Changes in the global market and environmental costs led to a reduction in the workforce to 3,500 in 2018. In May 2019, the mill owner, ArcelorMittal Poland, decided to extinguish the blast furnace and steel plant due to high electricity prices, the costs of carbon certificates and a global slowdown in the steel market. Among the key aspects making Krakow a “coal and carbon territory”, there is its dependence on coal-fired heaters for domestic use, as coal usage for house heating was and is widespread in the city and its surrounding. The issue was recently dealt with as the city adopted the Anti-Smog Act, marking a city-level coal phase-out for residential heating. Despite this policy, the city is still affected by low air quality, as the surrounding cities have not adopted a similar measure. The city faces also increased car traffic, due to the fast-growing city and spreading of the conurbation.

### *Vision*

Over the last years, during the gradual closure of large industrial plants or their relocation outside the KMA, Krakow successfully promoted its image as an ideal city for investment by companies building business centres and the IT industry. Looking at the changes taking place, Kraków is slowly breaking with its industrial past and trying to establish itself as a region focused on business services, deep-tech and IT-related industries. In the future, the city plans to allocate post-industrial land for the creation of new business and residential districts. New visions for these areas are emerging, focusing, for example, on efforts to comprehensively rework and change the image of Nowa Huta, a neighbourhood associated with the steelworks and a district inhabited mainly by metalworkers.

### *Governance*

Territorial governance supporting change (energy transition) appears significant compared to other cities and regions in Poland. Krakow is seen as the city that was the first to initiate effective measures to improve air quality, becoming an example for local governments. The city is promoting a comprehensive strategy up to 2030 for the clean energy transition and city development. Among the other aspects, this plan includes in its objectives, the intensification of the cooperation between Krakow and the province, particularly with the surrounding communes. The establishment of a strategic frame for the Krakow Metropolitan Area reflects the difficulties encountered so far to cope with problems in the relationship between the city and its surroundings, an element of key importance as many of the problems of the surrounding area are reflected within the city. The research has

shown that many of the unsolved and divisive problems of the area are due to the lack of a common orientation between the city and its surroundings.

### *Boundaries*

Thanks to universities and highly qualified staff, its convenient geographical location, the relatively cheap labour force and its well-developed transport infrastructure, Krakow quickly attracted a lot of investment from high-tech industries, which resulted in a steady influx of new residents. The growing population in the city and surrounding areas is experienced as a threat to the city's integrity and results in attempts to “defend” the city borders such as those for limiting the number of cars accessing the city. In other terms, under the push of different stress vectors (investments, growing population, etc.) the city risks being merged with its metropolitan area, and a set of defensive strategies are being deployed (leading to conflicts in the area).

### *Symbols*

After 1989, there was a rather pronounced shift towards building the image of Krakow as a unique tourist attraction. At some point, however, with the accession to the European Union and the dynamic growth in the popularity of low-cost airlines, Krakow became a very popular city for low-cost weekend tourism, mainly centred around music clubs, pubs, etc. Initially, the revenue from this encouraged the city to continue to promote such an image. However, the problematic and conflicting nature of this type of tourism prompted the KMA to take steps to change its image. At the same time, the local authorities have successfully built an international image of the KMA as a territory characterised by innovation and high-quality human capital. Krakow is one of the most important university centres in Poland, which has certainly contributed to the city's position as one of the most attractive cities for investment, above all in the area of IT and business centres. Unofficially, Krakow is referred to as the Dragon Valley, in imitation of Silicon Valley in the USA. Finally, it is worth mentioning here that the city also is also identified with poor air quality, even though after the Air Quality Act and other measures the situation is improving.

## 16 Lusatia (Germany)

### *Case Summary*

Comprising an area of 11,726 km<sup>2</sup> and a population of 1.1 million, Lusatia is a heterogeneous region that lies across the federal states of Brandenburg and Saxony and borders Poland and Czechia. The core of the region is the Lusatian mining area, the second largest of the German lignite coalfields and the largest in former East Germany. Lusatia established the sobriquet of Energy Land, with its lignite mining and power stations meeting 71 % of the GDR's energy needs by 1985 (Strzodka, 1985) and employing some 79,000 in Lusatia. This led to population expansion in local towns, such as Hoyerswerda, which exploded from 8,000 inhabitants before 1950 to more than 71,000 in 1985, before becoming Germany's fastest-shrinking city as employment in the mining industry collapsed in the 1990s. As a result of the mass outmigration of workers, its population has declined (and aged) to some 32,400 today. This demographic trend is common to Lusatia as a whole: the region's population has declined by over 20 % in the past quarter century, from more than 1.4 million in 1995 to around 1.1 million in 2019. The reunification was accompanied by a precipitous decline, as deindustrialisation led to job losses and massive out-migration. Many power plants were both unprofitable and unable to meet German and European air quality standards and were closed down with miners being added to the ranks of the East German unemployed during the “*Wende*”, the transition from socialism. The remaining operations were privatised. To give a sense of the scale of change, the still-active power station Schwarze Pumpe, for instance, provided work to more than



12,600 people, yet nowadays requires a workforce of fewer than 300. Cottbus-based LausitzEnergieBergbau AG (LEAG) operates the four remaining opencast mines in the region that mainly supply three lignite-fired power plants. As a result of the Coal Phase-out Act, plans to expand opencast mines were halted, and mining activities and coal-fired power stations will be progressively decommissioned up to 2038. While the legal framework and objectives have been set by the federal government, federal states are responsible for defining structures to manage the transition process and involve districts, municipalities, and private actors.

### *Vision*

Both state governments and the federal legislation seek to affirm the continued future of Lusatia as an energy region, while also seeking to add a new dynamic to this by drawing on the region's proximity to Poland and Czechia, for example, emphasising its potential to become a "European model-region for structural change" and identifying focus points for the region's further development, such as research and innovation and enhanced digital and physical infrastructure. Although both seek to promote investment in energy (hydrogen, renewables, large-scale battery storage), the state governments otherwise differ in how they allocate funds, with Brandenburg opting to strategically develop particular sectors through workshops and Saxony leaving these decisions to municipalities and the RBA. The peripheralised status of the region may pose an obstacle to these ambitions. A recent opinion survey has shown increasing popular scepticism regarding the CET, which may also risk its transformative potential. The research also has shown that there is also a lack of a shared sustainability vision for the region.

### *Governance*

The coal phase-out of Lusatia is regulated by the Coal Phase-out Act (KVBG) and the Structural Reinforcement Act for Mining Regions/Coal Regions Investment Act (StStG/InvKG) of August 2020. These laws provide for a timetabled phase-out of coal-fired electricity generation by 2038 at the latest as well as compensations for losses and a fund to support the lignite regions. Moreover, at the regional level, in 2017, the Lusatia Economic Region (WRL) was established as a cooperative community of Lusatian districts, north and south of the state border and oversaw the ZukunftswerkstattLausitz project to develop a collaboratively produced vision for new development perspectives for the region, transcending the administrative divide between Brandenburg and Saxony. In November 2020 the product of this process, the Lusatia Development Strategy 2050, was published. Nevertheless, there are questions regarding the local administrative capacity to implement a CET and the contradiction between particular local interests and the broader vision of a sustainability transition that the CET is supposed to serve. The local administration has reportedly been eaten out by district reforms (Brandenburg District Reforms of 1993, Saxon District Reforms of 1994/6 and 2008) which saw districts amalgamated, meaning that competencies were assumed over larger and more heterogeneous territories. Communes and districts have also faced cuts which makes them generally underfunded and understaffed. Additionally, from 2014, Lusatian municipalities received no more trade taxes from the lignite industry due to a lack of profits, and from 2015 many in the CCT had to repay millions in trade taxes from the lignite industry going back to 2005. This left several municipalities in a budgetary deficit.

### *Boundaries & Transaction*

The territory is experiencing an increasing disadvantage from financial flows, as the financial flows landing on the territory are not invested for the territory. Since the 90s Lusatia has experienced a loss of ownership of the territory, in fields such as education – many schools, kindergartens and other amenities were closed; mobility – small railway stations were closed and connections severed;

in terms of regional quality of life – public facilities such as cinemas, theatres, sports clubs and study groups were closed. Other trends that are redefining regional boundaries are the increasing urban-rural divide in the region. The boundaries & transactions of the region are increasingly drawn by EU, national and state actors as well as by private actors.

### *Symbols*

Lusatia is affected by territorial stigma related to coal mining and pollution. As with East Germany as a whole, the region faces a territorial stigma as backward, conservative, and prone to right-wing sentiment. No new emerging territorial symbols have been identified during the research.

## **17 Port Talbot (United Kingdom)**

### *Case Summary*

The South Wales Case study evaluated the town of Port Talbot and the contiguous area where the steel plant is significant to the UK industry, employing 4,000 direct employees of an estimated 24,000 steel industry jobs in the UK. In the region, there are a further 3 – 4,000 agency and contract workers and up to an estimated 4,000 additional indirect jobs. However, this carbon-dependent territory contributes an estimated 47% of 2018 industrial emissions in Wales and 15% of overall emissions in Wales emanate from the Tata steel plant in Port Talbot. Port Talbot and the surrounding areas have been subject to significant and ongoing economic restructuring since the 1980s, with job losses from the steelworks and the closure of coal mines. These factors have adversely shaped the socio-economic situation in the town with limited opportunities for career advancement and reduced employment opportunities. Further, in 2010, the steel industry contributed around 3% of Welsh GVA, the largest contribution of any single private sector employer (Pinto and Jones, 2012), showing the integrality of the steel industry. No territorial transition plans were identified during the research, while the Welsh government has developed plans for emission reduction including investments in clean steel research and innovation in Port Talbot and surrounding areas.

### *Vision*

There are two overlapping visions visible in the Port Talbot case – a long-standing territorial vision centred on economic diversification and regeneration that has been in place for some time and a, more recent, nascent and still emergent, vision on the decarbonisation of the carbon-intensive industry – i.e., mainly the Tata steelwork in Port Talbot. The former includes the development of the tourist sector by benefitting from the rising attraction of the surrounding tourism offer but also the development of cultural events such as the Port Talbot Passion and the Street Art festival. Concerning the latter, the dominant vision promoted in policymaking is that of pursuing decarbonisation of steel production through innovation, so as to continue with the business as usual and avoid de-territorialisation dynamics in the area. Moreover, the research has shown that there are various emerging visions within Port Talbot, built upon the area's rich cultural and natural heritage. While these emerging visions are not merged into a unified vision for the territory, they are broadly aligned around creating positive narratives of Port Talbot and stimulating new social and economic opportunities. In summary, in the context of decades of economic restructuring, the territory is moving from a vision anchored to a vocation focused on industry to a plurality of visions encompassing a decarbonised industry, tourism and culture among others.

### *Governance*

While some plans and policies have been developed by the Welsh Government to decarbonise the steel production in Port Talbot, no direct territorial transition plans or governance mechanisms were

identified during the research. On the other side, the research showed how the territory is losing control of its own governance as the locus of power has been raised to a larger administrative unit (Neath Port Talbot County Borough), whilst there has been a centralisation of powers both by the Welsh Government as part of the devolution of powers from Westminster and by the UK government. However, a new locus of self-governance is emerging within the locality as the community rediscovers, reinvents and reasserts its identity. Local activism is on the rise with a strong community spirit.

### *Boundaries & Transaction*

The disinvestments from key industries in the area, such as coal mining and steel works, and decades of economic restructuring have put at risk the distinctiveness and thus the boundaries of the territory. The analysis of the stress vectors intervening in the area shows that the public investments in infrastructures, such as the M4 road a commercial route to connect Ireland UK and the European market and economic diversification, have pushed the territory towards a service role for national and international market rather than be focused on local territorial needs. These investments were accompanied by a set of disinvestments in territorial service. The conjugated effect of these vectors is resulting in a progressive detachment of the local community to the territory, as increasingly there is a short distance as well as a long-distance outmigration of the local population. This trend might be interpreted as a low capacity of the territorial boundaries to keep the community together (blurring boundaries with the outside). However, the research has also shown that this long-lasting trend has been recently balanced, as a new distinctiveness to Port Talbot is emerging, based upon community rebuilding and a new confidence in the future. There are signs of new growth, new houses, and new businesses. Port Talbot has benefited from a long-standing environmental regeneration strategy, a strong coastal location and relatively affordable housing stock that has proved attractive to incoming residents.

### *Symbols*

The research highlighted that although external perceptions of Port Talbot may be characterised by territorial stigma, this was not the case internally. External perceptions tend to light on themes of air pollution, noise pollution, social deprivation and visual cues suggesting industrial pollution. However, the territory contends whilst there is substance in the factual data for many of the negative imageries, there is a bad image from the outside but not from within the community. The research has shown that new territorial symbols are emerging that point to the vibrancy of Port Talbot. Among them, there is the Port Talbot Passion. Port Talbot Passion Play had been a highly successful community-based open-air production event that ran between 1978 and 1999, that since 2011 has been re-imagined and reinvented as a 72-h festival by Michael Sheen, receiving national and international acclaim. The Passion and, more recently, a festival of street art, are providing Port Talbot with new symbols for its future development, cutting the closely coupled imagery of the town and the steelworks.

## **18 Rhineland (Germany)**

### *Case Summary*

The Rhineland refers to an area in Western Germany, which is located in North Rhine-Westphalia in the city triangle between Cologne, Aachen and Düsseldorf. In the Rhenish coalfield, lignite is extracted and used for energy production. Rhineland is the largest lignite coal region in Germany. It accounts for about 50% of the total extraction of lignite and also 48% of employment in the lignite industry in Germany. The mining region itself is surrounded by dynamic agglomerations, higher education institutions and world-class science centres. As a high-performance industrial and science

region, the Rhenish mining area is facing major challenges in the structural transformation against the backdrop of climate change and the energy transition. The extraction and conversion of lignite into electricity will end in 2038 at the latest based on the closure list provided in the Coal Phase-out Act in 2020. This decision will significantly impact the Rhenish mining district, contributing to around half of Germany's lignite used for electricity generation. The political motivation for the phase-out of lignite mining went hand in hand with a programme of regional structural development creating a remarkable framework for planning. The focus is on expanding renewable sources and infrastructure, protecting the security of supply, keeping electricity prices affordable, helping businesses to stay competitive, boosting the hydrogen sector and making a success of what is called the 'heating transition'. The RWE Power AG, which is the only lignite extractor in the CCT, does not see itself as a victim of structural change in the Rhenish mining district but actively helps to shape it. The RWE Group is now constructing and operating wind and solar farms and biomass plants in the mining district, ensuring that the region remains a vital energy location.

### *Vision*

The region wants to become a model and pilot region for new energy and mobility as well as sustainable production and to create an attractive living environment geared towards this. It strives to use its competitive advantage in the energy industry, in resource and bioeconomy, in industrial production, in science and research, as well as in the reorganisation of space and infrastructures to promptly create the necessary new gross value-added – and to develop employment potential in the CCT.

### *Governance*

The clean energy transition in Rhineland is determining a change in the governance mechanism of the territory. Formerly, many regional developments were decided upon in a democratically embedded corporatist arrangement of political and large economic actors. With the new funding programme for structural change in the region towards the coal phase-out, new local actors can apply for funding through various programmes, but the decision about the approval of different projects is made by the state of North-Rhine Westphalia. At the same time, large economic actors, such as RWE, reorient their economic activities to new fields, which are partially located outside the region. The clean energy transition is thus contributing to a loss of endogenous governance of the region and increased dependence on the state and large economic actors. However, this trend is balanced by the development of a new and complex governance mechanism, including several regional activities of coordination and strategy formation. One of the most visible examples is the establishment of the ZukunftsagenturRheinisches Revier, the agency that administers these funds and strives to coordinate these activities. Furthermore, the formulation of the Economic and Structural Programme for the Rhenish coalfield represents the attempt to develop a new technological profile for the region that will be sustainable during the coming decades. The decision-making process includes expert networks, regional conferences, the mayors of the 20 municipalities of the coal basin, as well as citizens' committees to ensure their participation. Among the challenges to face, there are recurring conflicts on land use – either for resettlements or suburbanisation -, political cleavage between economic and ecological interests in the region, and the competition for compensation funds and regional economic development funds.

### *Boundaries*

There is an increasing urban-rural peripheralization in the region. Policy actions as well as private investments are increasingly focused on the cities in the region, while rural areas are increasingly peripheralized. In this regard, it seems that the regional boundaries and distinctive traits are drafted

or shaped by external actors. The peripheral areas of the territory are more exposed to depopulation.

### *Symbols*

The Rhineland does not seem to be affected by a territorial stigma. Lignite mining has coined the regional landscape as well as the identity of the region. It has significantly contributed to its wealth. At the same time, different from the Ruhr region, Rhineland is not exclusively associated with mining, especially from an external point of view.

## **19 Stavanger (Norway)**

### *Case Summary*

The case study focuses on the Stavanger/Sandnes urban area – encompassing the densely populated territories of Stavanger, Sandnes, Randaberg and Sola municipalities. In 1969 oil was discovered in the North Sea and Stavanger was chosen to be the onshore centre for the oil industry in the Norwegian sector of the North Sea. This has resulted in a period of hectic growth in Stavanger and its three neighbour municipalities (i.e., Sandnes, Randaberg and Sola). Today, the business structure of the region is dominated by oil and gas-related activities, i.e., the Stavanger/Sandnes urban area houses about 35 oil and gas companies and 400+ oil service and technology companies. The oil companies, and a large number of subcontractors, have more than 45,000 employees. This constitutes around 50% of all employees in petroleum-oriented activities in Norway. Together, they constitute a complete value chain within this segment, affecting the income and labour market in these municipalities. Forus Business Park is located on the municipal border between Stavanger, Sandnes, and Sola, and it is one of the country's largest business parks with 2,500 companies providing almost 40,000 jobs. It is worth noticing that, while no direct oil and gas extraction activities are being conducted in the area, many of the operations in the North Sea oil and gas fields are administered and steered from Stavanger. Recently, a decision has been made to invest in clean energy in Stavanger and rebrand the city as the green energy capital. The strategy is geared to reduce emissions from oil and gas, by developing innovative and full-scale Carbon Capture Storage (CCS) technologies, through the expansion of the renewable energy sector and hydrogen.

### *Vision*

The research has shown that the dominant vision of Stavanger is still geared toward oil and gas exploitation, and no clear vision of how the territory will go beyond its oil and gas dependence has been developed yet. As the green transition advances in Europe, this lack of vision is increasingly seen as a problem. The research has also found that some local initiatives have been promoted to advance Stavanger as a green city.

### *Governance*

The decision-making in the territory is limited and defined by strict regulations and national governing. There is a lack of initiative for triggering the energy transition and there is a lack of territorial leadership in that regard. There is also a lack of space for negotiating how the territory might approach the issue of the energy transition.

### *Boundaries*

Money from investors is not invested back into the local infrastructure. Global forces from outside the country invest money but only take the profit. Norwegian companies and local municipalities risk buying back from large companies what they exploited from the local companies or municipalities.



The national government makes financial decisions while ignoring the local population and the environment. An example of the national actors “redrawing” the territory is a set of infrastructural changes that have been planned or are underway, as a result of the oil revolution and continuous investments in the region. Such changes include the development of giant cable connections, underground tunnels, new roads and houses on agricultural land. These interventions generate conflicts as they are seen as a negative or controversial action by the local community, i.e., advantaging the investors but creating strains at the territorial level.

### *Symbols*

The region does have a very strong identity connection with the oil and gas industry, however, which is emphasized strongly both by the size and scope of the Forus park (which houses over 45.000 employees from the industry and stretches across three municipalities) as well as the Norwegian Petroleum Museum, which details the entirety of the Norwegian oil history from the late 1950s until today. The myth of an unfinished “golden age of oil” is likely gaining traction because of the inflated gas prices that are happening due to the ongoing armed conflict between Russia and Ukraine, which has once again contributed to making Norwegian oil seem “green” and “ethical” by comparison to other sources of European energy – such as Russian gas. However, the oil and gas industry is now commonly demonised and branded as “dirty” in the local media. What was once considered to be a profession that one could be proud of, has now become a profession that is associated with what Norwegians call “oljeskam” (EN: oil shame). In this regard, there are symbolic actions taken to generate attempts at moving away from the understanding of Stavanger as the oil capital of Norway. The current mayor, for example, refuses to use the moniker Oljehovedstaden (EN: The Oil Capital) about the city of Stavanger, and the population has slowly begun to adopt the more all-encompassing nickname Energihovedstaden (EN: The Energy Capital) instead. The territory has other myths, such as the belief that the “siddis” – i.e., the “true” Stavanger inhabitant, have some special entrepreneurial skill.

## **20 Sulcis (Italy)**

### *Case Summary*

The Sulcis Case study is centred on the Sulcis “coal and carbon territory”, the portion of Sulcis territory composed of nine municipalities that has a strong identification with coal mining and that is dependent on carbon-intensive industries. This is the area that historically hosted the only Italian coal mine (that stopped production in 2015), where the non-ferrous metal industries proliferated, and where one of the two main coal-fired power plants of Sardinia is based. The area is relatively small (534.6 sq. Km) and with a limited population (64474 inhabitants), a good part of which lives in the Sulcis capital, Carbonia (26,813 inhabitants), a city founded in the 30s by the fascist regime and whose name means “city of coal”. The Sulcis coal and carbon territory has been subject to significant and ongoing economic restructuring since the 90s when the publicly owned aluminium companies were privatised. In the period 2008-2012, following the economic crisis, two out of three of the biggest employers in the local non-ferrous metal industry closed or stopped production. It has been estimated a loss of 3000 direct and 10000 indirect jobs in the area. In the same period, following an infringement investigation on competition rules by the EU, the extractive activities of the local coal mine stopped, with a further loss of jobs. In this critical context, further pressure on the territory arrived with the decision of the Italian government to phase out coal in Italy by 2025, and with the energy crisis started before the Russian war in Ukraine. The combined effect of these events in the area endangered other two main employers, the coal-fired power plant and the PortovesmeSrl, the

only non-ferrous metal industry still active after the economic crisis of 2008-2012. Sulcis has been one of the two Italian territories to benefit from the EU Just Transition Fund.

### *Vision*

There is a lack of a clear and shared vision of territorial transition in Sulcis. Multiple visions about the future of the area are coexisting, including those aiming at a new development of the metallurgic industry, those that see a rupture with the mining and industrial vocation of the region as a necessity for looking for new areas (such as tourism, agriculture, food, fisheries, etc.), and those that pursue a continuity but with a strong diversification of the economy across different sectors (including R&D, mining heritage, boat construction, etc.). The research has shown an ambivalence between continuity and rupture in the desired trajectory for the territory which is also proved by the co-presence of old-time nostalgia and anti-industrial attitudes.

### *Governance*

The latest attempt to develop a unitary transition plan for Sulcis has been the Sulcis Plan. The plan envisaged huge funding for a set of targets such as relaunching the metal industries, diversifying the economy, and environmental remediation. However, the plan only managed to spend a portion of its budget and the plan itself was blocked by the Sardinia Region. The research has highlighted a set of problems of territorial governance. Among them there is the weakening of the province and the lack of representation of the territory as a whole; the fragmentation of the territory in individual municipalities, and a lack of a common voice; the switch of power toward the region, which adopts a Cagliari centric perspective, where Cagliari is often in competition with Sulcis for the resources available; the tendency of relying on the national government for problem-solving in the territory rather than on endogenous responses. The lack of governance in the Sulcis case was also demonstrated with the formulation of the Territorial Just Transition Plan, where the initiative was all in the national and regional actors, and where the territory participated in submitting several projects in a fragmented and divided way, without a shared vision of the transition in the territory. In general, most of the interventions envisaged, planned or started in the last years, resulted threatened, slowed down or blocked by conflicts, impasses and uncertainties that were not managed.

### *Boundaries & Transaction*

The analysis of the stress vectors shows that the territory is highly exposed to external decisions both in the public domain, e.g., European and national decisions on energy issues, and by private investments, e.g., metallurgic enterprises that leave the territory when not profitable anymore. However, the territory has always managed to attract funding for its development and block undesired investments. The conjugated effects of several change vectors are producing emerging effects on territorial boundaries. Among them: (a) a loss of autonomy and subordination to the Metropolitan area of Cagliari; (b) the development of a new centrality of the two islands (Sant'Antioco and Carloforte) and a loss of centrality of Carbonia.

### *Symbols*

At the symbolic level, the research has documented the presence of a strong Territorial Stigma. The stigma characterises both the Sulcis territory, which is represented as characterised by irremediable pollution, unemployment, detrimental disorganisation, and without a future, and the population, which is portrayed as disorganised, lazy, and with other moral deficiencies. The territorial stigma portrays the whole of Sulcis as a polluted and declining industrial area, despite the industries being concentrated just in a small area of the historical region of Sulcis. The stigma is perpetuated both from within the community and from the outside and is reinforced by the social problems that affect

the area. Despite these detrimental images, the research has also registered a re-emergence of “coal” as a positive and motivating symbol for the territory. With the success of the national museum of Coal and the launch of avant-garde R&D projects carried out by Carbosulcis in the Nuraxi Figus coal mine, a symbolic inversion has started. Even though this process is just at its inception, the stigma on coal as a dirt and polluting element is also perceived as an element of territorial rebirth. Finally, the research has shown that Sulcis territory has available a rich symbolic reservoir, including Sulcis as a cradle of civilisation and the territory as a frontrunner of social rights in Italy.

## 21 Upper Nitra (Slovakia)

### *Case Summary*

The case is focused on the Prievidza district, where the coal mining activities of Upper Nitra are concentrated. The main development pole in the region is Prievidza. It is not the place of the mining activities itself (this is located outside of the town), but the town provides dwellings for a significant number of the miners, and it is the industrial hub where most of the investors are concentrated. Prievidza is located in the middle and at the crossroads of mining activities. The mining itself is located in Nováky (11 km from the town), Cígeľ (10 km), and Handlová (16 km). The mining activities stopped in 2017 in Cígeľ, and 2021 in Handlová, where now refurbishment activities are ongoing. The only mining operation in which coal mining is actively taking place until the end of 2023 is Nováky. The district is located in the industrial region of Trenčín (NUTS3). The political decision to phase out coal mining in Upper Nitra was made in 2018, and the mines will be closed in 2023. There are several factors leading to this decision: the low quality of brown coal and lignite produced; the public subsidies to coal mining are increasingly unpopular and are disputed by experts and the public; the energy company owners of the local coal-fired power plant are reluctant to do the investments for operating the power plant without state support; the competition with other energy sources produced in the country (nuclear energy); and the declining productivity of the coal mines. Recently and partly driven by foreseen closure of the mining, HBP – the employee-joint-stock company that owns the Upper Nitra coal mines – started with the diversification of activities and opening new businesses in agriculture and machinery construction. Upper Nitra is among the recipient regions of the Just Transition Fund.

### *Vision*

The vision elaborated in the Action Plan for Regional Transformation foresees the substitution of coal mining and thermal power plant with supporting of SMEs in different sectors such as tourism and sustainable agriculture. However, the research has shown that there are some conflicts between the different territorial challenges, e.g., a conflict in situations in which there is enough suitable land for agriculture but the use of which is blocked by mining activities and former mining activities, or a conflict between tourism development and environmental considerations, or – concerning the absorption of the EU funds – a conflict between versus investments in infrastructure versus investments in human capital.

### *Governance*

After some mismatched attitudes in the previous decade, there has been consensus on the mine closure and the emphasis is given to organising the process in a structured way and utilizing available support from the different financial mechanisms (Different EU sources, national funds, etc.). A multi-stakeholder working group was set up to coordinate transformation in the region. Moreover, a Partnership Council was established to define priorities and propose projects for funding from the Just Transition Fund. An Action Plan for The Regional Transformation in Upper Nitra was developed



in July 2019 and updated in January 2022. A territorial just transition plan was also developed and approved by the EC in November 2022 as a pre-requisite for access to the EU Just Transition Fund. There was a bottom-up approach stimulated in the region, where local stakeholders may generate project ideas for funding. However, the research has shown that there is a lack of engagement of the average people in the decision-making process. The research has also shown that representatives of the local municipalities presented fragmented views on the transition process, often resulting from their particular interests, which are emanating from their social class, professional or political affiliation, rather than on common territorial stakes. Another key aspect to be improved for the governance of the transition is improving the capacity to absorb and deploy EU funds.

### *Boundaries & Transaction*

The region has attracted several public investments, including EU funds and private investments. As for the latter, the structure of the economy in the Priedviza district diversified in the 2000s. Foreign investors built on the relatively cheap but skilled labour force. They developed activities in the automotive sector, machinery, manufacture of plastics, and production of safety and control technologies. The research shows that the process of redrawing the area is mostly driven by external actors such as the national state, the EU, and big private businesses with an interest in the area.

### *Symbols*

The Upper Nitra region is relatively affected by territorial stigma. It must be noted that such stigma does not have such a decisive power over the interpretation of the region, albeit it has been both openly and latently present in the discourse on Upper Nitra. The region is portrayed, in contrast to reality, as characterised by an obsolete economy, mostly related to coal mining and scarcely inclined towards innovation; as characterised by coal-related pollution and health risks associated with it; and as a place with a low quality of life especially for young people. This stigma is perpetuated and reinforced both from the outside and by the local population. However, the research has shown that the population increasingly associates the region with its tourism potential, taking the Bojnica Castle as an emerging territorial symbol.

## **22 Upper Styria (Austria)**

### *Case Summary*

The case study is focused on the “coal and carbon territory” of the Upper Styrian region, encompassing eight municipalities with a high number of employees in the steel industry ( $n > 100$ ), i.e., Kapfenberg ( $> 1000$ ), Leoben including Donawitz ( $> 1000$ ), Kindberg ( $> 1000$ ), Judenburg ( $> 700$ ), Bruck an der Mur ( $> 500$ ), Zeltweg ( $> 500$ ), Krieglach ( $> 300$ ), Sankt Barbara im Mürztal ( $> 300$ ). The region of Upper Styria has long been shaped by mining and the production of metals. Steel production in Styria started relatively late around 1660, but in the 19th century, the Styrian steel industry began growing rapidly, from about 20.000 metric tons in 1820 to more than 80.000 in 1860. In the late 20th century, however, the industry faced several crises and productivity issues due to open trade rules introduced at the time by the World Trade Organisation which led to increased competition with low-wage economies. This ultimately resulted in massive layoffs and high unemployment rates: about 46% of workers overall lost their jobs in the region between 1981 and 1991 (Hoffmann, 2015). The overall population of Styria began to shrink between 1971 and 1991, something unthinkable in most other European regions at that time, further illustrating the severity of the crisis (Hoffmann, 2015). To address the crisis, policymakers and industry leaders adopted the economic cluster idea and implementation of distributed leadership styles within those industry

clusters, which helped to rebuild the Styrian economy and managed to turn many of the remaining companies into high-tech clusters that are still relevant for the Styrian and Austrian economy of today (MacNeill & Steiner, 2010). The steel industry is today an innovative and flourishing business, but it faces the difficult task of decarbonising its production processes and securing its huge energy requirements. Voestalpine's plants in the region still use fossil fuels (coal/coke and natural gas) for steel production, but a transformation process is underway leading to energy savings and decarbonisation of the production in the long run up until 2050. A pilot plant using hydrogen is in operation in Leoben-Donawitz, while some plants in the region use electricity for their steel-producing processes. Upper Styria also has a coal production past, which ended in 2004. In the spring of 2020, the last coal-fired power plant in Austria was shut down. It was switched to a stand-by plant based on natural gas.

### *Vision*

The vision of the territory is in continuity with its recent developments, geared to steel production, innovation, and sustainability. In fact, the Upper Styria CCT features a flourishing industry not only in specialised steel production but also in other fields (e.g., semiconductors, paper industry, etc.). Green tech and a strong focus on sustainability, climate and energy are overall important topics in the Styrian science, research and economic strategy, and these are becoming a dominant interpretation of the territory.

### *Governance*

The Climate and Energy Strategy 2030, approved by the Styrian Government in 2018, follows the regional tradition of energy plans and strategies since 1984 when Styria had been the first European region to do so. Styria also relies on a strong tradition of local self-government through mayors and municipal councils. The ability to steer territorial development is, not exclusively, but strongly influenced by regional and municipal governments. However, the research has also shown that when it comes to the energy transition, there is a lack of structured governance and constant and unpredictable changes in funding structures (12), as well as a lack of priority in national politics. The research has also shown that some of the more pressing issues for the territory, such as soil sealing, and the desertification of the city centres have remained unaddressed so far.

### *Boundaries*

Some trends affecting the control of territorial boundaries and transactions in the region have been identified. Among them, there is a progressive loss of the ownership of the territory, testified by the “sell-out” of real estate to private investors as well as the vanishing and loss of regional groceries and local supplies (29), e.g., local post offices, restaurants and small cafes or pharmacies in the town centres to the benefit of shopping malls at the outskirts. Moreover, empty apartment buildings (28), and the flight from the municipality's centres and local towns towards the outskirts are phenomena that contribute to abandoning city centres and intensify the soil sealing problems in the region. The peripheralisation and the loss of own centrality of the territory are reflected in the mobility investments, where an important tunnel project (*Semmering Basis Tunnel*) will speed up train connections from the capital Vienna, but no actions are taken to face the weakness of the local public transport, e.g., no direct rapid transit railway (*S-Bahn*) connection between some of the main municipalities which in turn makes it difficult to switch to public transport.

### *Symbols*

The crisis of the state-owned steel industry in the 1980s and memories of this time still have an impact on some parts of the local population today. In addition, Austrian-wide this crisis image is still present among the population above 50 years. This stigma is primarily socio-economic, recalling times of restructuring the local steel industry, related job losses, high unemployment, and social consequences. To a far lesser extent, it is also an environmental stigma, linked to the pollution of traditional steel production in the early 1980s, which was lacking appropriate emission control. The stigma is perpetuated mainly from the outside of the CCT; from inside the picture is mixed, reflecting some pessimistic views on the region, but there is also a tendency to counter the stigma and promote a positive image of a successfully restructured region with a flourishing and innovative industry. New territorial symbols or regional images are related to the Styrian region as a “showcase” for technological development (expressed e.g., in terms such as *Styrian spirit*, Green Tech Valley as a symbolic terminology approach to the US Silicon Valley). This also includes Voestalpine’s image which is directed to green steel and emerging technological solutions to boost the energy transition.

## 23 Territorialisation attributes in the 13 cases

We use the profiles drafted in the previous chapter as an empirical basis to single out a set of comparable territorialisation attributes across cases. We focus on three types of attributes:

- Territorialisation elements, which are drawn from the description of the four elements of each case, i.e., vision, governance, boundaries & transactions, and symbols*
- Territorialisation components, i.e., transition and identity, are drawn from a combination of the four elements*
- Territorialisation mode, which is drawn from the combination of the two components.*

We singled out comparable territorialisation attributes across cases adopting cases assessment, and score combination methods. Each method is described in the related section. It is worth mentioning that the initial attempt was to apply the Qualitative Comparative Analysis – QCA approach. This approach aims to identify a set of 'attributes' to briefly describe each case and to identify combinations of attributes that lead to positive or negative outcomes. However, given the heterogeneity of the cases in terms of policy implementation, territorial size, and forms of dependence on coal mining or carbon-intensive industries, it was not possible to develop a full application of QCA as originally planned. We, therefore, adopted a different approach by assessing theoretically based attributes of the territorialisation process.

## 24 Territorialisation elements

Based on a set of qualitative criteria for each regional case study, the four key elements of the model have been assessed with a “+” when the analysis indicated an increased or maintained control over the territory and with a “-” when the analysis indicated a decreased control over the territory, and a “/” when the analysis indicated an intermediate or more ambiguous situation. The assessment criteria adopted are reported in Table 4.

Table 2– Assessment criteria of the territorialisation elements

	+	/	-
<b>Vision</b>	There is a shared interpretation of the territory in its transition pathway	There is a clear vision of the transition pathway, but there are also scepticism/conflicts about it in the territory	There is not a clear transition vision/presence of multiple contrasting visions
<b>Governance</b>	The territorial transition is an explicit process and is governed by specific plans, mechanisms and resources. The transition is also aligned with or improving the governance of the territory	The transition is an explicit process and is governed by specific mechanisms and resources. However, the transition is not aligned with territorial governance mechanisms.	Lack of explicit territorial transition plan or spaces. Territorial governance is fragmented, de-powered or dependent on external actors
<b>Boundaries and Transactions</b>	New boundaries or transactions are promoted	Territorial boundaries and distinctive features	Territorial boundaries are defined by external

	+	/	-
	directly by local actors and/or the territory retains significant negotiating power with new transactions.	are defended (e.g., undesired investments are blocked), but the territory is only on a defensive pose, as they are not proactively promoting/ negotiating positive changes.	actors, while the territory is not able to defend or negotiate changes. The transaction toward the territory resulted in a loss of territorial relations.
<b>Symbols</b>	New symbols emerge that can counter past territorial stigma (if any) at least for the local community. Presence of positive territorial symbols in absence of stigma.	New symbols are emerging but they are not able to counter territorial stigma (yet).	Presence of territorial stigma or erosion of past territorial symbols. No new symbols are emerging in the territory.

The results of the application of the assessment criteria to the case study are reported in Table 5 below.

*Table 3 – Assessment of the territorialisation elements in the 13 ENTRANCES cases*

Cases	Vision	Governance	Boundaries & Transaction
<b>As Pontes &amp; Ferrol</b>	-	-	-
<b>Brindisi</b>	-	-	+
<b>Central Germany</b>	+	-	-
<b>Jiu Valley</b>	/	/	/
<b>Katowice</b>	+	/	/
<b>Krakow</b>	+	+	+
<b>Lusatia</b>	/	/	-
<b>Port Talbot</b>	+	/	/
<b>Rhineland</b>	+	/	-
<b>Stavanger</b>	+	-	-
<b>Sulcis</b>	-	-	/
<b>Upper Nitra</b>	+	/	-
<b>Upper Styria</b>	+	+	-

## 25 Territorialisation components

Based on the results of the assessment of the territorialisation components, for each case, we assessed the two territorialisation components, i.e., the transition component and the identity component. Following the model presented in chapter two, we combined two elements – vision and governance – for obtaining the transition components and two other elements – borders & transactions and symbols – for obtaining the identity component.

The combination of the elements followed a principle of prevalence. When the combined elements are both positive (+) we assessed the resulting component as positive (+). When the combined elements are both negative (-) we assessed the resulting component as negative (-). When one of the elements is positive (+) and the other is neutral (/) we assessed the resulting component as positive (+). When one of the elements is negative (-) and the other is neutral (/) we assessed the resulting component as negative (-).

When one of the two combined elements is positive (+) and the other is negative (-), we gave prevalence to the functional dimension over the expressive one to determine the sign of the resulting component. For example, in a case where vision is negative (-) but governance is positive (+) we assessed the transition component – resulting from the combination of these two elements – as positive (+). Finally, in the case where both combined elements are neutral (/), we assessed the resulting components as negative (-), as no clear positive elements emerged from the analysis.

This method allowed us to assess the two components in each case. The results are presented in a set of tables each dedicated to one of the cases. Besides the scores of each case, the tables below provide a short description of each component to show how the model is anchored to the empirical basis presented in Chapter 3.

*Table 4 – Assessment of the territorialisation components in **As Pontes & Ferrol***

Vis	Gov	C1	Transition Component
-	-	-	Lack of a shared territorial plan setting a common vision and shared priorities and strategies for the territory. The territory has a low negotiation power.
B&T	Symb	C2	Identity Component
-	-	-	The closure of the coal mines and the power plant is a vital threat to the territory's distinctiveness. The funds attracted are exploited by individual actors, not as a territory. Lack of new positive territorial symbols.

*Table 5 – Assessment of the territorialisation components in **Brindisi***

Vis	Gov	C1	Transition Component
-	-	-	There is a lack of shared visions or plans for territorial transition. Key decisions are taken at the national level.
B&T	Symb	C2	Identity Component
+	+	+	While decarbonising power generation Brindisi is set to preserve its identity as an industrial town. At the same time, the city is opening up to new opportunities such as tourism. The harbour is a symbol of the move from coal to a new perspective.

*Table 6 – Assessment of the territorialisation components in **Central Germany***

Vis	Gov	TC	Transition Component
+	-	-	Despite a clear vision of the region as an industrial and energy generation centre, Central Germany is experiencing a lack of governance in exploiting transition funds toward shared territorial goals.
B&T	Symb	C2	Identity Component
-	-	-	The coal territory is symbolically and practically geared to coal mining. Being in a position of structural disadvantage, with decarbonisation, the territory is losing its distinctive traits and is exposed to shrinkage, abandonment or exploitation from the outside.

*Table 7 – Assessment of the territorialisation components in **Jiu Valley***

Vis	Gov	TC	Transition Component
/	/	-	Despite the development of visions, plans and governance structures for full decarbonisation, such plans are strongly contested in the region. Part of the population considers such plans unnecessary and unrealistic and is still geared toward coal mining.
B&T	Symb	IC	Identity Component
/	-	-	Jiu Valley's distinctiveness as a coal mining region is threatened by decarbonisation. Public funds are available but increasingly in bargains with the coal identity. Jiu Valley is affected by territorial stigma and there is an erosion of its symbols linked to coal. No new symbols emerged.



Table 8 – Assessment of the territorialisation components in **Katowice**

Vis	Gov	TC	Transition Component
+	/	+	In the Katowice region, a transition from coal mining and carbon-intensive industries toward a diversified economy is already ongoing. There is a shared vision for territorial development, even though this vision is mainly focused on Katowice City.
B&T	Symb	IC	Identity Component
-	+	-	There is an ongoing trend of modification of the coal and carbon territory, with increasing centrality of Katowice city, and an increasing peripheralization of the surrounding villages where the coal mines are sited. Katowice City has countered the coal stigma by promoting the image of a green city.

Table 9 – Assessment of the territorialisation components in **Krakow**

Vis	Gov	TC	Transition Component
+	+	+	Krakow has almost completed its territorial transition away from carbon-intensive industries. The city presents a diverse portfolio of activities, including IT, R&I, Tourism and others.
B&T	Symb	IC	Identity Component
+	+	+	The city of Krakow while extending its influence over the metropolitan area is also defending its boundaries from threats such as increased car traffic. Past territorial stigma related to tourism and pollution has been countered with both practical and symbolic actions.

Table 10 – Assessment of the territorialisation components in **Lusatia**

Vis	Gov	TC	Transition Component
/	/	-	Territorial transition is supported by the federal and national governments pursuing the plan of continuing Lusatia's development as an energy region. New forms of trans-state governance are developing on the territory. However, there is scepticism about the current visions for territorial development. Moreover, territorial institutions have been weakened over the last decades, and there are doubts they can align with and implement the plans.
B&T	Symb	IC	Identity Component
-	-	-	Since the 90s the territory is experiencing a disadvantage from financial flows, leading to the closure or seizure of education services, mobility infrastructures, and public facilities. Territorial boundaries are almost drawn exogenously by EU, national, state and large private



			actors. Stigma is affecting the region and no new symbols were identified.
--	--	--	--

*Table 11 – Assessment of the territorialisation components in Port Talbot*

Vis	Gov	TC	Transition Component
+	/	+	Despite the lack of a transition plan and the decreasing power of local authorities, a new locus of self-governance based on local activism is emerging. A new vision of the region is spreading encompassing, industry, culture and tourism.
B&T	Symb	IC	Identity Component
/	+	+	Over the last decades, the territory's boundaries have been mainly drafted by external actors, pushing the territory to play a service role for national and international actors with a loss of local life and services. However, this trend has been recently balanced by the emergence of new local symbols, businesses and activities.

*Table 12 – Assessment of the territorialisation components in Rhineland*

Vis	Gov	TC	Transition Component
+	/	+	Following the vision of becoming a role model region for new energy, mobility and sustainable production Rhineland has developed new governance mechanisms for actors' coordination and strategy formation. Despite that, funding mechanisms are perceived as state-led with small decision-making power for the locals.
B&T	Symb	IC	Identity Component
-	/	-	The territory is characterised by an urban-rural polarisation with an increasing peripheralisation of the rural areas. This trend is the outcome of external actions in terms of policy interventions and private investments. Rhineland is not affected by territorial stigma. The region is not exclusively associated with mining.

*Table 13 – Assessment of the territorialisation components in Sulcis*

Vis	Gov	TC	Transition Component
-	-	-	No territorial transition plan was developed in recent years in the framework of the CET. The territorial institutions have been weakened, the territory is fragmented and divided across different towns and has not developed a unitary vision of its future development.

B&T	Symb	IC	Identity Component
-----	------	----	--------------------

+	/	+	The territory is exposed to European and national decisions on energy issues and private investments. However, the territory has always managed to attract funding for its development and block undesired investments. A strong territorial stigma is only partially countered by new positive reinterpretation of coal symbols.
---	---	---	---

*Table 14 – Assessment of the territorialisation components in Stavanger*

Vis	Gov	TC	Transition Component
+	-	-	The vision of the region is in continuity with its trend of continuous development, i.e., the oil boom started in the 60s. National rules increasingly constrain territorial governance. There is a lack of initiative or even immobility in local decision-making.
B&T	Symb	IC	Identity Component
-	-	-	Most of the investments in the territory are not invested back on territorial development. The redrawing of the territory is largely in the hands of national actors, sparking conflicts with the local communities. There is an erosion of territorial symbols, which are mostly associated with oil ("oil shame").

*Table 15 – Assessment of the territorialisation components in Upper Nitra*

Vis	Gov	TC	Transition Component
+	/	+	A set of new mechanisms have been developed for energy transition governance. There is a common agreement on phasing out coal as an opportunity to develop new sectors such as SMEs and Tourism. However, the territory is still fragmented on how to approach this challenge.
B&T	Symb	IC	Identity Component
-	/	-	The research shows that the process of redrawing the area is mostly driven by external actors such as the national state, the EU and big private businesses with an interest in the area. The territory is still portrayed as an obsolete economy, a stigma that is only partially countered by new symbols linked to tourism.

*Table 16 – Assessment of the territorialisation components in Upper Styria*

Vis	Gov	TC	Transition Component
+	+	+	The vision of the territory is in continuity with its recent developments, geared to steel production, innovation and sustainability. The Styria

			region has a strong tradition in planning, and local authorities contribute to steering territorial development.
<b>B&amp;T</b>	<b>Symb</b>	<b>IC</b>	<b>Identity Component</b>
-	+	-	The territory is characterised by a progressive loss of the internal ownership of the territory, abandonment of the city centres, and peripheralisation. The territory is still affected by stigma from its past, however, such stigma is now countered with the image of a dynamic and innovative region.

## 26 Territorialisation type

The combination of the two components is identified in section 4.2. allow us to single out four different types of de/re-territorialisation “modes” or “postures” as illustrated in the picture below.

*Figure 3 – Four types of modes or postures of de/re-territorialisation*

		Identity Component	
		-	+
Transition Component	-	De-territorialisation	Unfulfilled re-territorialisation
	+	Managed de-territorialisation	Re-territorialisation

When a territory is both governing the transition and preserving its identity, it is in a posture of Re-territorialisation. This means that the territory is implementing a guided change that is also oriented at preserving and/or renewing its identity.

In the opposite case, when there is a lack of control over both the transition and the identity components, the territory is in a mode of de-territorialisation, meaning that there is a loss of identity.

The two remaining modes pertain to cases where the situation is more controversial.

When a territory is in an unfulfilled re-territorialisation, the territory is protecting or renewing its identity, i.e., defending its borders and actively negotiating transactions as well as preserving or renewing its symbols. However, in these cases, there is no coordination of actions and vision for the transition of the territory towards new patterns of organisation. In this mode, which is highly ambivalent, a reactive or even a creative process is started, but it is not supported adequately, thus the re-territorialisation process is still unfulfilled.

Finally, when a territory is in a managed de-territorialisation mode, there is active governance and a vision of the transition, but the transition process somehow clashes with territorial identity. As the transition is focused and shaped around targets that are not aligned with territorial identity, this leads to a depletion of the territorial relationships and a consequent weakening of the territorial assemblage.

The ENTRANCES cases are distributed across these four types as illustrated in the table below.

*Table 17 – Territorialisation modes across the ENTRANCES cases*

Cases	Transition component	Identity component	Territorialisation Mode
<b>As Pontes &amp; Ferrol</b>	-	-	De-territorialisation
<b>Brindisi</b>	-	+	Unfulfilled re-territorialisation
<b>Central Germany</b>	-	-	De-territorialisation
<b>Jiu Valley</b>	-	-	De-territorialisation
<b>Katowice</b>	+	-	Managed de-territorialisation
<b>Krakow</b>	+	+	Re-territorialisation
<b>Lusatia</b>	-	-	De-territorialisation
<b>Port Talbot</b>	+	+	Re-territorialisation
<b>Rhineland</b>	+	-	Managed de-territorialisation
<b>Stavanger</b>	-	-	De-territorialisation
<b>Sulcis</b>	-	+	Unfulfilled re-territorialisation
<b>Upper Nitra</b>	+	-	Managed de-territorialisation
<b>Upper Styria</b>	+	-	Managed de-territorialisation

## 27 Recurring Territorial Dynamics

*The comparative analysis allowed us to identify a set of recurring dynamics of the de/re-territorialisation process ongoing in coal and carbon-intensive regions. We focused mostly on “critical dynamics”, meaning dynamics that constitute weaknesses or limits of the current territorialisation processes. This critical approach allows us to single out aspects that might be relevant to orient policy and actions toward “territory making”. The dynamics have been identified by combining a deductive and an inductive approach. We used the lenses of the four elements of territorialisation (vision, governance, boundaries & transactions, and symbols) to observe the dynamics of each case; then we singled out the recurring dynamics in an inductive fashion. The list of dynamics presented below, thus, does not exhaust all the possible dynamics ongoing in coal and carbon territories across Europe. However, given the internal diversity of the regions surveyed by ENTRANCES and their recurring feature, the list of dynamics presented here are certainly relevant for any policy oriented toward territory-making in European coal and carbon territories.*

*We present first the recurring dynamics of the different territorialisation elements analysed in the previous chapter, i.e., vision (section 5.1.), governance (section 5.2.), boundaries & transactions (section 5.3.), and symbols (section 5.4.). In the final section (5.5.) we show how the dynamics have been singled out across the different cases in ENTRANCES.*

## 28 Dynamics related to the vision

### *Old-time nostalgia*

A common dynamic that was identified in the research is an interpretation of the territory characterised by old-time nostalgia, in which the present territorial condition is persistently and negatively compared with a positively idealised past. Old-time nostalgia assumes different forms in coal and carbon-intensive regions, such as mining nostalgia, coal-fired nostalgia, and smokestack nostalgia. This dynamic was identified in several of the coal and carbon territories analysed in ENTRANCES.

### *Scepticism about the dominant vision(s)*

The visions of territorial transition of coal and carbon territories are often developed or pushed by actors at the regional or national level. In some cases, there is widespread scepticism about the proposed visions for the territory. Such visions are often seen as too radical, or unrealistic. This dynamic is particularly strong in cases where several failed or unfulfilled plans and visions were proposed over time, and when there is an exogenous-driven vision.

### *Conflicting visions*

Some coal and carbon territories are characterised by conflicting visions on what direction the territory should take in its transition path. We refer here to cases where different visions are in overt conflict with each other, meaning that there are public disputes about the future of the territory. Many of the conflicting visions singled out in the research are related to the clean energy transition and the coal phase-out as opposed to the well-established path of reliance on coal and carbon-intensive industries as a pillar of the local economy.

### *Ambivalent vision*

In some other cases, the conflicts are latent and not addressed. In these cases, different visions of the territory (e.g., a relaunch of carbon-intensive industries and the broader development of tourism) are considered compatible with each other, but, as a matter of fact, they enter into conflict with each other. When two or more visions are in a latent conflict, the territory lives a condition of deep ambivalence, which hinders the possibility to take action in one direction or the other.

### *Exogenous-driven vision*

Often the transition vision for the coal and carbon territories across Europe is driven by the policy agenda at the European, national and regional levels. In most cases, such an agenda is linked to the target of climate neutrality and the national plan for coal phase-out. The research has shown that despite stakeholder consultations the transitional vision for the coal and carbon territories is often perceived as exogenous, i.e., imposed on the territory by external actors. This is also due to the lack of representativeness of the traditional and stakeholders of the population at large. It is worth noticing that this dynamic was also common in the cases where a Territorial Just Transition Plan should be developed as a pre-requisite for the grant of Just Transition Funds. In some cases,

### *Endogenous-driven vision*

In some coal and carbon territories, a new transitional vision emerges directly from within the territory. In the window of regions that the ENTRANCES project has studied, it seems that these endogenous visions are more likely to emerge in the later stage of transition – such as those of acceleration or stabilisation of change, in which the policy input is less at the centre and where there is more room to creative territory making promoted by local actors. The research also shows that the emergence of emerging vision is easier in the urban territories, in which the territory is identified with just one administrative unit, rather than in the coal and carbon territories which are composed of a sum of different towns or cities.

## **29 Dynamics related to governance**

### *Fragmentation or division in local governance*

In some cases, coal and carbon territories are composed of several municipalities sharing a common territorial stake. The research has shown that in many cases such municipalities are unable to pursue common objectives or to cooperate for coping with common territorial challenges. The fragmentation of the governance across different municipalities – each of them pursuing its small-scale objectives – was found among the key dynamics hindering the development of common territorial governance. Similarly, in other cases, when the territory is split into a major city and its surrounding, it was found that the governance is divided between the urban centre and its surrounding, as they pursue different and uncoordinated objectives. The efforts to overcome these divisions, such as through the establishment of governance at the level of the metropolitan area, were found to be challenging.

### *Depowering of territorial institutions/regionalisation*

Many coal and carbon territories across Europe have been affected by an overall trend of depowering or even dismantlement of territorial institutions (e.g., local administrative units encompassing different municipalities, or small regional units), in favour of broader regional units, which increasingly incorporate powers and competencies once attributed to lower regional levels. Such depowering includes a wide range of aspects, such as budget cuts, and loss of competencies. This dynamic is bolstered by “reform populism”, which emphasizes the need to cut expenses considered inefficient and to some extent useless. This dynamic, which was found among several of

the coal and carbon territories analysed by ENTRANCES, is also a key factor hindering the effectiveness of their territorial transition as territorial governance is increasingly distanced from the perspective of the territory.

#### *Dependence on national or private decision-making*

Coal and carbon territories as bearers of national strategic assets have developed over decades and in some cases centuries a privileged relationship with national governments. If this relationship means special attention and access to national resources, it also means that key decisions on the territory are taken at the national level. After the privatisation of coal mining and carbon-intensive industries, that was introduced in the 90s across Europe, coal and carbon territories are increasingly dependent also on the strategic decisions of private international actors (such as steel or energy companies). The result of this dependence is a reduced capacity to orient and steer the territorial transition by the local actors.

#### *Discontinued territorial transition plans*

The territorial transition plans of coal and carbon territory are in some cases discontinued, due to changes in political priorities (including change of ruling parties) or to changes in the socio-economic and socio-political landscape. Discontinued transition plans are among the key dynamics determining a breakdown or a stall of the territorial transition process in coal and carbon territories.

#### *Administrative and financial barriers to participation*

In several coal and carbon territories, even when a robust governance structure is being developed, there are some administrative and financial barriers to participation. Many regional transition plans rely on bottom-up proposals and funding schemes, but these schemes require administrative and financial capacities that few actors possess. This tends to generate a barrier to participation to a broader set of actors, especially those active at the territorial or community level.

#### *Uncertainty in a volatile environment*

The rapid ongoing change, including European target toward climate neutrality, national coal phase-out plans, and the volatility of the energy market connected with the Russian war in Ukraine, have even increased the uncertainty of the coal and carbon territories hindering the capacity to design and implement territorial transition plans.

#### *Bottom-up decision-making/participation*

Maybe due to all the dynamics presented above, only in a few cases, we have observed the emergence of bottom-up governance or genuine participatory processes in coal and carbon territories in transition. From what has been observed in the ENTRANCES project, this dynamic is more likely to occur in cases where the territorial transition is in a later stage when political input is weaker, and the overall context is more stabilised and less unstable.



### 30 Dynamics related to boundaries and transactions

#### *Increasing urban-rural divide*

In some coal and carbon territories, there is an increasing urban-rural divide, where the main urban centre is attracting people and investments and diversifying its economy, while the surrounding towns – which are still dependent on coal mining and carbon-intensive industries – are lagging.

#### *Rejection of private or public investments*

The research has shown that Coal and carbon territories are the targets of several public and private financial investments. Some coal and carbon territories exercise control over such investments as they have shown the capacity to block or reject undesired investments when such investments are considered or perceived as disadvantageous transactions, harmful (e.g., for local landscape) or territorial encroachment. In the cases studied in ENTRANCES, such rejected investments include renewable energy plants, infrastructures (bridges, roads), accommodation structures and others.

#### *Unbalanced disinvestments from coal mining and carbon-intensive industries*

While Coal and carbon territories are targets of investments (see above), the research has shown they are also targets of huge disinvestments in coal mining and carbon-intensive sectors. This kind of disinvestment is a decades-long trend that appears across Europe that is now enhanced by climate policies. Such disinvestments are only partially compensated by public transfer and subsidies, and, only in a few cases, they have been compensated by equal investments in sectors able to support local employment and territorial development. We have interpreted this dynamic as a loss of control over territorial transactions.

#### *Loss of territorial facilities*

Another common dynamic found in some coal and carbon territories is the loss of territorial facilities, e.g., local libraries, kindergartens, small shops, schools, etc. This loss is connected with the defunding of public institutions and local authorities, raising estate prices, and the concurrency of multinational or national companies building big commercial centres in the city outskirts.

#### *Weakening of transaction management via national actors*

Coal and carbon territories have often developed a privileged relationship with the national government, that allowed them to negotiate territorial transactions with national actors. This is reflected in the availability of funds, special rules (e.g., the establishment of special economic zones), compensation subsidies etc. However, the research has shown that the negotiation power of coal and carbon territories with the national state of many coal and carbon territories has declined over the last two decades. In many territories analysed by ENTRANCES, a low capacity to manage transactions was particularly visible in the energy transition plans, including the development of Territorial Just Transition Plans.

#### *Territorial override*

Many coal and carbon territories are experiencing a progressive loss of control over their territorial transactions. Larger actors, such as supra-national organisations, national governments, and international enterprises are increasingly overriding the capacity of the territory to select and negotiate exchange with the outside.

#### *Youth out-migration*



One of the more common dynamics in coal and carbon territories is youth out-migration. This outmigration was found to be due to several factors, not only linked to the economy or employment opportunities but also to lifestyle, education opportunities and territorial services offered by other territories, e.g., regional or national capitals. This dynamic was found to be relevant in most of the coal and carbon territories analysed in the research.

### *In-migration*

While most coal and carbon territories suffer from youth outmigration (see above), few others, mostly those that are large cities, are on the contrary experiencing a rapid population increase due to immigration. Large immigration and growing population in the city and its surroundings is a dynamic that challenges the tenure of the endurance of territorial boundaries.

### *Defence of territorial boundaries*

Some coal and carbon territories are actively defending the physical, social and economic boundaries of the territories. In the cases analysed by ENTRANCES such defence takes different forms, such as controlling the access to the territory of people (e.g., by limiting the access to a city with cars); providing some advantages only to those internal to the territories (e.g., the establishment of special economic zones, targeted benefits to those living in the territories); negotiating the distribution of compensation funds to all the inhabitants rather than only to some categories (e.g., also to professionals and SMEs operating in the area, rather than only to workers that lost their jobs).

## **31 Dynamics related to symbols**

### *Territorial Stigma*

A territorial stigma – i.e., a detrimental collective representation – is attached to many coal and carbon territories across Europe. Depending on the cases, coal and carbon territories are represented as unsafe and polluted, economically backward, irremediably disorganised, or morally dissolute, with all these representations present in some of the cases. In some cases, the territorial stigma was reinforced by a stigma on coal (or oil) which is increasingly perceived as a dirt and immoral product. Territorial stigma was found to be perpetrated depending on the case from the outside or from the inside, and in some cases from both the outside and the inside. Through territorial stigma, external actors distance and detach themselves from the territory. These cancerous representations also trigger acceptance of unfavourable situations and inaction within the territory. Territorial stigma was found across several of the coal and carbon territories analysed in ENTRANCES.

### *Active countering of territorial stigma*

In some cases, coal and carbon territories are actively countering the stigma attached to them. The countering of the stigma might be focused both on changing the factual circumstances that were at the basis of territorial stigma (e.g., extreme pollution) and promoting a counter representation of the stigma. Active countering of territorial stigma was found only in some of the 13 coal and carbon territories analysed by ENTRANCES.

### *Persistence of Coal and Carbon territorial symbols*

Coal and carbon territorial symbols are present in several if not all the coal and carbon territories analysed. Coal and carbon territorial symbols might be physical places, buildings or structures, events in local history, local heroes, etc. Some coal and carbon territories still rely mainly on coal and carbon symbols with no other symbols in local memory or no new symbols emerging now.

### *Re-interpretation of coal symbols*

In some coal and carbon territories, traditional coal symbols are reinterpreted following some transformations in the organisation of socio-economic activities in the territory. In some cases, coal mining and carbon-intensive industries' structures have been re-used in other sectors such as culture, tourism, R&I, and others, allowing rejuvenation and a reinterpretation of the related territorial symbols.

### *The emergence of new territorial symbols & myths*

In some cases, new territorial symbols and myths emerged in recent years. In the cases analysed in ENTRANCES, such symbols are often linked to attractive places or local events as mirrors of new economic activities in the tourism and culture sectors.

### *Other traditional territorial symbols & myths*

Some coal and carbon territories rely also on other territorial symbols and myths such as symbols from the territory's ancient past, symbols linked to worker rights movements, or myths of special features or skills attributed to local people.

## **32 Dynamics across cases**

The dynamics described above have been singled out across the 13 coal and carbon territories considered as case studies by ENTRANCES. It is worth mentioning that not all the dynamics apply to all the cases. Some dynamics are present in almost all cases, while some of them are present in only a few cases.

However, it is also worth remembering here that the dynamics have not been directly surveyed in each case, and they are the secondary product of other research tools (as explained in Chapter 1, this report is the outcome of a second-level analysis of all the cases). So, some dynamics might also be present in cases where they have not been singled out.

Table 18 – Dynamics singled out across cases

Factors	Dynamics and Pattern	A&F	BRI	CG	JV	KAT	KRA	LUS	PT	RHI	STA	SUL	UN	US
<b>Vision</b>	Old time nostalgia	x		x	x									
	Scepticism about the dominant vision(s)	x			x			x						
	Conflicting visions		x		x			x				x	x	
	Ambivalent vision		x									x		
	Exogenous-driven vision	X		x	x			x		x	x		x	x
	Endogenous-driven vision					x	x		x					
<b>Governance</b>	Fragmentation or divisions in local governance	x		x	x	x	x				x	x	x	
	Depowering of territorial institutions/ regionalisation				x			x	x		x	x		
	Dependence on national or private decision making	x	x	x	x					x	x	x		
	Discontinued territorial transition plans	x			x							x		x
	Administrative and financial barriers to participation		x	x						x		x	x	x
	Uncertainty in a volatile environment	x	x								x	x		x
	Bottom-up decision-making/participation								x					
<b>Border &amp; Transactions</b>	Increasing urban-rural divide			x		x	x	x		x				
	Rejection of private or public investments				x		x					x		
	Unbalanced disinvestments from coal and carbon	x	x								x	x		x
	Loss of territorial facilities							x	x					x
	Weakening of transaction management	x			x			x	x		x	x	x	x

Factors	Dynamics and Pattern	A&F	BRI	CG	JV	KAT	KRA	LUS	PT	RHI	STA	SUL	UN	US
	Territorial override	x	x	x	x			x				x		
	Youth out-migration	x	x	x	x			x	x	x		x	x	x
	In-migration						x		x		x			
	Defence of territorial boundaries					x	x					x		
<b>Symbols</b>	Territorial Stigma	x	x	x	x		x	x	x		x	x		x
	Active countering of stigma						x		x		x			x
	Persistence of Coal and Carbon symbols	x	x	x	x	x		x		x	x	x	x	
	Re-interpretation of coal symbols					x						x		
	The emergence of new territorial symbols & myths	x	x				x		x				x	x
	Other traditional territorial symbols & myths										x	x		

### 33 Territorial Drift Patterns

*The dynamics presented in Chapter 5, combined with each other, produce very different situations. However, it is possible to identify some patterns created by recurring configurations of these dynamics. During the analysis, the main focus has been on critical situations, which we might call "potential territorial drifts." We refer here to detrimental transformation in the territory that might occur if no concrete actions are undertaken to counter, balance or guide the ongoing territorial trends. The territorial drift patterns have been identified inductively based on the cases analysed by ENTRANCES. The list of paths identified, therefore, does not exhaust all the possible types of territorial drift patterns for coal and carbon territories but reflects only the patterns identified during the research.*

### 34 Peripheralisation

According to research results, some coal and carbon territories are experiencing or might experience a peripheralisation path. In these cases, the coal and carbon territories are increasingly framed as functional to the interests of other “centres” (being geographical or economic centres), e.g., they are increasingly exploited as the workbench of other successful regions or international private actors. The territories that are facing this potential territorial drift pattern are losing their character of “centre”, which attracts people and offers a territorial dimension of its own. This feature is often reflected in transport infrastructures, which connect the coal and carbon territory to regional and national centres but have weak internal connections. This is also reflected in a loss of territorial facilities in favour of big commercial sites in the outskirts. The research has shown that in the territories on a path of peripheralisation critical choices for territorial development are taken by national, state or regional actors or even by the national or international private actors investing in the area.

### 35 Absorption or incorporation

For some of the cases, there is the risk that the distinctive features of the regions are lost and that their increasingly looser boundaries might dissolve into those of other territories. In the cases with these territorial drift patterns, similarly, with the peripheralisation path, key decisions are taken by state or regional actors or by private investors, but differently from that path, there are low prospects for the preservation of the distinctive traits of the territory – i.e., coal mining and carbon-intensive industry.

### 36 Polarisation

In some cases, the coal and carbon territory is being polarised between urban and rural areas. While the urban centres have already differentiated their economy, the surrounding rural areas are still highly dependent on coal extraction and carbon-intensive activities, which, in turn, are increasingly becoming less profitable and sustainable. The



coal and carbon territories once relying on the urban-rural interaction and common strategies and plans, are thus taking different directions, with an increasing appeal of urban centres, and an increased marginalisation of the rural areas. While in some cases, the risk of peripheralisation is being countered through the establishment of specific institutions – such as the Metropolitan Areas, it is still to be understood whether these strategies will work or not.

### 37 Shrinkage and Desertification

Finally, some coal and carbon territories might potentially be on a path of shrinkage and desertification. In these cases, no main actions have been undertaken to counter the losses determined by the interruption of coal mining or carbon-intensive industries. Without viable alternatives or the capacity to attract investments, these territories risk severe depopulation or even abandonment.

### 38 References

- Appadurai, A. (1990). Disjuncture and difference in the global cultural economy. *Theory, culture & society*, 7(2-3), 295-310.
- Bertrand, A.L. (1963). The stress-strain element of social systems: a micro theory of conflict and change. *Social forces*, 1-9
- Brighenti, A. M. (2010). On territorology: Towards a general science of territory. *Theory, culture & society*, 27(1), 52-72.
- Caiati, G. et al. (2021). *Report on Multi-dimensional Key Factors, Dynamics and Patterns*. ENTRANCES project. Retrievable at: <https://entrancesproject.eu/wp-content/uploads/2021/06/D1.2.-Report-on-Multidimensional-Key-Factors.pdf>
- Deleuze, G., & Guattari, F. (1988). *A thousand plateaus: Capitalism and schizophrenia*. Bloomsbury Publishing.



# ENTRANCES

ENergy TRANsitions from Coal and carbon: Effects on Societies

## **Annex 3 - Inventory of changes, challenges and coping strategies**

## Authors

Nachatter Singh (UDC)

## Contributors

Ricardo Mira (UDC)

We gratefully acknowledge the valuable contribution to the research we received from all the participants of the focus group, the in-depth interviews, and the online survey. All choices and interpretations in the current text, are, however, our own responsibility.

This report is delivered in the framework of the European Commission H2020 funded project - ENergy TRANSitions from Coal and carbon: Effects on Societies - ENTRANCES, G.A. 883947.

Work Package 5: Comparative analysis

Lead Organisation: Alexandru Ioan Cuza University of Iași, Romania

### **ENTRANCES project**

Project coordinator: Ricardo García Mira (University of A Coruna, Spain)

Project email: [info@entrancesproject.eu](mailto:info@entrancesproject.eu)

Project website: <https://entrancesproject.eu/>



## Table of Contents

<b>Changes, challenges and coping strategies.....</b>	<b>2</b>
1.1 Socio-economic dimension .....	2
1.1.1 Changes.....	2
1.1.2 Challenges .....	3
1.1.3 Coping Strategies.....	4
1.2 Socio-political dimension .....	8
1.2.1 Changes.....	8
1.2.2 Challenges .....	8
1.2.3 Coping Strategies.....	9
1.3 Socio-cultural dimension.....	9
1.3.1 Changes.....	9
1.3.2 Challenges .....	11
1.3.3 Coping Strategies.....	12
1.4 Socio-ecological and technical dimension.....	13
1.4.1 Changes.....	13
1.4.2 Challenges .....	14
1.4.3 Coping Strategies.....	16
1.5 Socio-psychological dimension .....	17
1.5.1 Changes.....	17
1.5.2 Challenges .....	18
1.5.3 Coping Strategies.....	18
1.6 Gender .....	18
1.6.1 Changes.....	18
1.6.2 Challenges .....	19
1.6.3 Coping Strategies.....	19

## Changes, challenges and coping strategies

During the ENTRANCES research in 13 carbon-intensive regions of the 9 EU countries, we have observed several **changes** (in socio-economic, demographic, political, cultural, ecological, psychological and gender dimensions) taking place in carbon-intensive regions, which are posing new **challenges** to local people and policy makers, and motivating them to design and implement **coping strategies** to mitigate the adverse effects of decarbonisation policies and the closure of large industrial units. Some of the important changes, challenges and coping strategies related to different dimensions include:

### 1.1 Socio-economic dimension

#### *Changes*

##### ***Ageing population***

An ageing population is a demographic trend that refers to a situation where there is a growing proportion of older individuals in a population. This is typically the result of declining birth rates, high youth-migration and increased life expectancy, which can lead to a variety of social, economic and political challenges. An ageing population can have significant economic implications, as older people may retire from the workforce, reducing the available labour supply, and increasing the burden on social welfare programs. This can also lead to a decrease in economic growth and productivity. Overall, an ageing population requires careful planning and investment in healthcare, social welfare and economic policies to address the challenges and opportunities associated with demographic change. Among the selected case studies Silesia, Lusatia, Central Germany, Jiu Valley and A Coruña have registered this change in their total resident population.

##### ***Youth emigration***

Youth emigration refers to the phenomenon of young people leaving their home region to seek better opportunities, education, or quality of life in another region. This can have a significant impact on the origin, as it may result in a brain drain of talented and educated young people, which can in turn affect economic growth and development. There are several reasons why young people choose to emigrate, including a lack of job opportunities, political instability, limited access to education or healthcare, and social or cultural factors. Overall, youth emigration is a complex issue that requires a multifaceted approach to address the underlying economic, social, and political factors that drive emigration, while also ensuring that emigrants have access to the resources and support they need to succeed in their new homes. Among the selected case studies Central Germany, Jiu Valley, Sulcis and A Coruña have registered this change in their total resident population.

##### ***Unemployment and underemployment***

Unemployment and underemployment are significant social and economic issues that can affect individuals and communities, and they are often linked to broader economic and environmental trends, such as decarbonisation. Energy transition lead to job losses in industries that rely heavily on fossil fuels, such as coal mining or oil drilling. This can exacerbate existing unemployment and underemployment issues and create significant social and economic challenges. Among the selected case studies Rhineland, Central Germany, Sulcis, Brindisi and A Coruña have registered high rate of unemployment and underemployment.

### ***De-industrialisation***

Decarbonisation is resulting in de-industrialisation in certain sectors that rely heavily on fossil fuels or energy-intensive production processes. This can lead to job losses and economic disruption in affected communities. Among the selected case studies Silesia, Rhineland, Sulcis, Brindisi, Upper Styria, Stavanger, South Wales and A Coruña have registered high rate of de-industrialisation.

### ***Industrial Monoculture***

The lack of industrial diversification is a significant problem for carbon-intensive regions, which have historically relied heavily on a single industry, such as coal mining or oil and gas production, which has provided jobs and economic growth. However, the continued use of these carbon-intensive industries is incompatible with the need to reduce greenhouse gas emissions to mitigate climate change. The lack of industrial diversification creates economic and social challenges, as well as obstacles to the transition towards a low-carbon economy. For example, if a carbon-intensive industry declines or becomes obsolete, there may not be other industries in the region to replace it, leading to job losses and economic instability. Among the selected case studies Silesia, Rhineland, Sulcis, Brindisi, Upper Styria, Stavanger, South Wales and A Coruña have registered high rate of de-industrialisation.

### ***Challenges***

#### ***Meet the needs of old population (health care, domestic services) and improve their quality of life.***

Carbon-intensive regions often face demographic challenges, including an aging population, a declining workforce, and a shrinking tax base. This can create significant economic and social challenges, as well as obstacles to the transition towards a low-carbon economy. One of the key challenges of meeting the needs of an aging population in carbon-intensive regions is ensuring that older residents have access to the services and support they need to maintain their health, well-being, and independence. This can include access to quality healthcare, affordable housing, and transportation services that enable older residents to remain active and engaged in their communities. In addition, older residents may face unique challenges related to the transition towards a low-carbon economy, such as the need to retrofit their homes or adopt new technologies to reduce their carbon footprint. It is important to provide targeted support and resources to help older residents make this transition, such as financial assistance, training programs, and technical assistance. To address the challenge of meeting the needs of an aging population in carbon-intensive regions, it is important to adopt a comprehensive approach that engages a range of stakeholders, including government, industry, and civil society. This can involve identifying and addressing barriers to access to services and support, promoting innovative solutions and technologies, and investing in infrastructure and services that support the needs of older residents. Overall, meeting the needs of an aging population is a critical challenge for carbon-intensive regions in Europe, but it is also an opportunity to build a more inclusive and equitable society that supports the needs of all residents, both young and old. By prioritizing the needs of older residents, stakeholders can help ensure that the transition towards a low-carbon economy is just and sustainable for all.

### ***Attracting and retaining young people***

Attracting and retaining young people in carbon-intensive regions in Europe is a challenging task, as these areas not offer the same level of job opportunities, quality of life, and cultural experiences as larger urban centres.

### ***Job creation***

Job creation in carbon-intensive regions in Europe can be a complex issue, as it involves balancing the need to address climate change and reduce carbon emissions with the need to support the economic well-being of these regions and their communities. One strategy to support job creation in these regions is to invest in renewable energy sources and technologies, such as wind and solar power, which can create new job opportunities in manufacturing, installation, and maintenance. This approach not only reduces carbon emissions, but also provides new economic opportunities for workers in these regions. Another strategy is to support the transition of carbon-intensive industries to lower-carbon technologies and processes. This could involve providing financial incentives for companies to invest in cleaner technologies, as well as supporting research and development to improve the efficiency and effectiveness of these technologies. This approach can help to preserve jobs in these industries while also reducing their environmental impact. In addition, there are opportunities to support job creation in other sectors that are not directly related to energy production or heavy industry. For example, investing in sustainable agriculture, forestry, and tourism can create new job opportunities while also promoting environmental sustainability.

### ***Re-industrialisation and Diversifying local economy***

Diversifying local economies is a major challenge for carbon-intensive regions in Europe. It requires identifying and supporting new industries that can provide employment and economic growth while also being environmentally sustainable. This can involve a range of strategies, such as promoting entrepreneurship, supporting innovation, investing in infrastructure, and attracting new businesses and industries to the region. One approach to diversifying local economies in carbon-intensive regions is to leverage existing strengths and resources to support the development of new industries. For example, regions with a strong engineering or manufacturing sector may be well positioned to develop expertise in renewable energy technologies or energy-efficient building materials. Another approach is to support the development of new economic sectors that align with the region's unique assets and resources. For example, regions with abundant natural resources may be able to develop a thriving eco-tourism industry, while regions with a strong agricultural sector may be able to capitalize on the growing demand for organic and locally-sourced food. However, diversifying local economies in carbon-intensive regions can be a complex and challenging process, requiring significant investment, coordination, and collaboration among stakeholders. It is important to involve a range of actors, including government, industry, academia, and civil society, to ensure that the diversification process is inclusive and equitable, and that it supports the needs and aspirations of local communities.

### ***Coping Strategies***

#### ***Older people support by providing special urban living facilities.***

As the global population ages, it is important to provide support for older people living in carbon-intensive regions. These regions are often associated with high levels of air pollution, which can

have significant impacts on the health of older adults. Here are some ways to support the ageing population in carbon-intensive regions:

- **Health services:** It is essential to provide comprehensive healthcare services to older people living in carbon-intensive regions. This includes regular health check-ups and access to treatment for respiratory and cardiovascular diseases that are associated with air pollution exposure.
- **Energy-efficient housing:** Energy-efficient housing can help to reduce energy consumption and lower the cost of living for older people. It can also reduce exposure to indoor air pollution, which can be particularly harmful to older adults with pre-existing respiratory conditions.
- **Transportation:** Older people often rely on transportation to access healthcare, social support, and other essential services. Providing affordable and accessible public transportation can help to reduce the use of private vehicles, which are a significant source of carbon emissions.
- **Social support:** Isolation and loneliness are common problems among older people, particularly in carbon-intensive regions where outdoor activities may be limited. Creating opportunities for social interaction, such as community programs and group activities, can help to improve mental health and wellbeing.

### ***Provision of educational and training opportunities***

Providing educational and training opportunities can help to reduce youth migration from carbon-intensive regions. Here's how:

- **Create job opportunities:** Providing education and training opportunities can help young people acquire the skills and knowledge needed to enter the workforce. By creating job opportunities in carbon-intensive regions, young people can find meaningful employment close to home, reducing the need for migration.
- **Promote entrepreneurship:** Providing training in entrepreneurship and business skills can help young people start their own businesses in carbon-intensive regions. This can create jobs and stimulate economic growth, making the region a more attractive place to live and work.
- **Develop local industries:** Developing local industries that are less carbon-intensive can create job opportunities and economic growth in carbon-intensive regions. For example, renewable energy and sustainable agriculture are industries that can create jobs while reducing carbon emissions.

- **Support sustainable development:** Providing education and training opportunities in sustainable development can help young people understand the importance of reducing carbon emissions and promoting sustainability. This can inspire them to work towards a more sustainable future in their own communities.

By providing education and training opportunities, we can help young people develop the skills and knowledge needed to succeed in the workforce and contribute to their communities. This can help reduce the need for migration from carbon-intensive regions, promote economic growth, and support a more sustainable future.

### ***Easy access to business loans and Support for Self employment***

Easy access to business loans and support for self-employment can help reduce unemployment in carbon-intensive regions by following ways:

- **Create job opportunities:** Access to business loans and support for self-employment can help local entrepreneurs start businesses in carbon-intensive regions. This can create new job opportunities for local residents and reduce unemployment rates.
- **Promote entrepreneurship:** By providing support for self-employment, young people and other individuals who may have difficulty finding employment in traditional jobs can start their own businesses. This can promote entrepreneurship and help create new job opportunities in carbon-intensive regions.
- **Develop local industries:** Access to business loans can help local businesses develop industries that are less carbon-intensive. This can create new job opportunities in industries such as renewable energy, sustainable agriculture, and eco-tourism.
- **Stimulate economic growth:** By providing easy access to business loans and support for self-employment, we can help stimulate economic growth in carbon-intensive regions. This can create new job opportunities and reduce unemployment rates.

### ***Attracting external investments***

External investments can help revive the economy of carbon-intensive regions by:

- **Attracting new businesses:** External investments can help attract new businesses to carbon-intensive regions. This can create new job opportunities and stimulate economic growth, helping to revive the local economy.
- **Developing new industries:** External investments can help develop new industries in carbon-intensive regions, such as renewable energy, sustainable agriculture, or eco-tourism. This can create new job opportunities and help transition the region away from carbon-intensive industries.
- **Upgrading infrastructure:** External investments can be used to upgrade infrastructure in carbon-intensive regions, such as transportation networks, energy systems, or water

treatment facilities. This can help attract new businesses and support existing industries, helping to revive the local economy.

- Providing training and education: External investments can be used to provide training and education opportunities for local residents. This can help them acquire the skills and knowledge needed to participate in new industries and attract new businesses to the region.

Overall, external investments can help revive the economy of carbon-intensive regions by attracting new businesses, developing new industries, upgrading infrastructure, and providing training and education opportunities. This can create new job opportunities and support economic growth, helping to build a more sustainable future.

### ***Incentives to renewable energy projects***

To address this challenge, it is important to support the development of new low-carbon industries and infrastructure in carbon-intensive regions. This can include providing funding and incentives for research and development of new technologies, promoting entrepreneurship and innovation, and investing in infrastructure such as renewable energy systems, energy storage, and smart grids. In addition, it may be useful to leverage existing strengths and resources in carbon-intensive regions to support the development of new industries. For example, regions with a strong mining or engineering sector may be well positioned to develop expertise in renewable energy technologies such as geothermal or wind energy. Overall, addressing the lack of industrial diversification in carbon-intensive regions is critical for achieving a successful transition towards a low-carbon economy in Europe. By supporting the development of new low-carbon industries and infrastructure, stakeholders can create new jobs and economic opportunities, and support a just transition for workers and communities affected by the shift away from carbon-intensive industries.

### ***Investment in service sector (IT, tourism, catering)***

investment in the service sector can help revive the economy of carbon-intensive regions in following ways:

- Information Technology (IT): Investing in the IT sector can create new job opportunities in carbon-intensive regions. This can include developing tech hubs, providing training and education opportunities in digital skills, and attracting tech companies to the region. IT jobs are often less carbon-intensive than traditional manufacturing or resource extraction jobs, making it a good option for economic diversification.
- Tourism: Investing in the tourism sector can help revive the economy of carbon-intensive regions by promoting local attractions and cultural heritage. This can include developing infrastructure such as hotels, restaurants, and tourist facilities, and providing training and education opportunities for local residents to work in the tourism industry. This can create new job opportunities and attract new businesses to the region.
- Catering: Investing in the catering sector can create new job opportunities in carbon-intensive regions, particularly in the form of restaurants and cafes. This can include developing local



food production systems that can supply the catering industry with local, sustainable food products.

## 4.1 Socio-political dimension

### *Changes*

#### ***Regional conflicts***

Regional conflicts are significant obstacles to the transition towards a low-carbon economy in carbon-intensive regions in Europe. These regions often rely heavily on industries such as coal mining or oil and gas production, which can provide jobs and economic growth. However, the continued use of these carbon-intensive industries is incompatible with the need to reduce greenhouse gas emissions to mitigate climate change. In some cases, there may be resistance from local communities or workers who fear the loss of jobs and economic opportunities associated with the transition away from carbon-intensive industries. These concerns may be compounded by regional conflicts or tensions, which can make it difficult to build the consensus and cooperation necessary to achieve a smooth and just transition. Moreover, regional conflicts can make it difficult to access funding or support from national or international sources for the development of new low-carbon industries and infrastructure. This can lead to a lack of investment and innovation in these regions, which in turn can exacerbate economic disparities and social tensions. To address these challenges, it is important to engage with local communities and workers in carbon-intensive regions, to listen to their concerns and perspectives, and to involve them in the development and implementation of transition plans. This can help to build trust and cooperation, and to ensure that the transition is equitable and benefits all stakeholders. Additionally, governments and other stakeholders can provide targeted support and funding for the development of low-carbon industries and infrastructure in these regions, to help create new jobs and economic opportunities and to facilitate the transition towards a more sustainable future. Among the selected case studies, Rhineland, Jiu Valley, Sulcis Iglesiente, Upper Nitra, Krakow Metropolitan Area, A Coruna, Upper Styria and South Wales witnessed some types of regional conflicts.

### *Challenges*

#### ***Solve regional conflicts and strengthen collaboration***

Solving regional conflicts and strengthening collaboration are important challenges in carbon-intensive regions. These regions are often characterized by complex social, economic, and political dynamics that can create tensions and obstacles to the transition towards a low-carbon economy. Regional conflicts can arise for various reasons, such as differences in values and priorities, conflicting interests, or historical grievances. These conflicts can make it difficult to build the consensus and cooperation necessary to develop and implement effective transition plans. Strengthening collaboration among stakeholders in carbon-intensive regions is crucial for overcoming these challenges. This can involve bringing together diverse groups of stakeholders, such as government officials, industry representatives, environmental groups, and community leaders, to develop shared visions and strategies for the transition. To address regional conflicts and strengthen collaboration, it is important to promote dialogue and mutual understanding among stakeholders, to listen to their perspectives and concerns, and to identify areas of common ground.



It may also be useful to involve independent mediators or facilitators to help manage conflicts and build trust. In addition to promoting collaboration and addressing conflicts, it is important to provide targeted support and resources for the development of new low-carbon industries and infrastructure in carbon-intensive regions. This can help to create new jobs and economic opportunities, and to support a just transition for workers and communities affected by the shift away from carbon-intensive industries. Overall, solving regional conflicts and strengthening collaboration are critical challenges that must be addressed in order to achieve a successful transition towards a low-carbon economy in Europe.

## ***Coping Strategies***

### ***Involvement of regional governments in policy making and implementation***

Involving regional governments in policy making and implementation is essential to resolving regional conflicts in carbon-intensive regions in Europe. Regional governments are often closest to the communities and industries affected by the transition, and they can provide important insights into local perspectives, values, and priorities. Regional governments can play an important role in facilitating dialogue and cooperation among stakeholders in carbon-intensive regions. They can help to identify shared goals and strategies for the transition, and to involve diverse groups of stakeholders in the policy-making process. In addition, regional governments can provide targeted support and resources for the development of low-carbon industries and infrastructure in their regions. This can include funding for research and development, support for training and education programs, and incentives for businesses to invest in low-carbon technologies and practices. To ensure effective involvement of regional governments in policy making and implementation, it is important to establish strong partnerships between regional, national, and international stakeholders. This can involve establishing regular communication channels, sharing best practices and knowledge, and providing technical assistance and capacity building support as needed. Overall, involving regional governments in policy making and implementation is crucial for resolving regional conflicts in carbon-intensive regions in Europe. By working together, stakeholders can develop effective and equitable transition plans that meet the needs of all stakeholders and support the transition towards a low-carbon economy.

## **7.1 Socio-cultural dimension**

### ***Changes***

#### ***Lack of human capital***

The lack of human capital and brain drain is a significant problem in carbon-intensive regions, especially in areas where the coal, oil, and gas industries have dominated the local economy for decades. One of the main reasons for this issue is that highly skilled and educated workers often seek out opportunities in other industries or locations where they can find better job prospects and quality of life. This can leave carbon-intensive regions with a shortage of skilled workers and a workforce that is less diverse and adaptable to changing economic conditions. In addition, the decline of the carbon-intensive industries can exacerbate the problem by reducing job opportunities and creating economic uncertainty, leading to further migration of skilled workers away from these regions. To address this issue, it is important for policymakers and industry leaders to focus on

diversifying the local economy and creating new opportunities for skilled workers in other industries such as renewable energy, advanced manufacturing, and technology. This can help to attract and retain highly skilled workers in these regions and ensure a more stable and sustainable economic future. Investing in education and training programs that help local workers develop new skills and transition to new industries is also essential. This can help to ensure that the workforce is equipped with the knowledge and skills needed to adapt to the changing economic landscape and contribute to the growth of new industries in these regions. Among the selected case studies, Jiu Valley, Brindisi, A Coruna and South Wales, have identified this problem in their respective regions.

### ***Identity issues***

For many communities that have traditionally relied on carbon-intensive industries such as coal mining, oil and gas production, and heavy manufacturing, the shift towards renewable energy and other low-carbon industries is seen as a threat to their cultural identity and way of life. This can lead to a sense of alienation and resentment among some members of these communities, and make it more difficult to build support for the transition to a low-carbon economy. In addition, the decline of carbon-intensive industries can also have a ripple effect on other aspects of local culture, such as traditional crafts, music, and cuisine, that have developed in these regions over many years. This can further erode a sense of cultural identity and leave communities feeling disconnected from the broader society. To address this issue, it is important for policymakers and industry leaders to work closely with local communities to understand their concerns and priorities, and to develop strategies for supporting the transition to a low-carbon economy in ways that are culturally sensitive and inclusive. This may involve investing in new industries and job opportunities that align with local values and traditions, as well as supporting cultural initiatives that help to preserve and celebrate local traditions. At the same time, it is important to recognize that the transition to a low-carbon economy is necessary to address the urgent challenge of climate change and to create a sustainable future for all. By engaging with local communities and working together to find solutions that balance economic, social, and environmental priorities, it is possible to ensure a just and equitable transition to a low-carbon economy that benefits everyone. Among the selected case studies, Rhineland, Stavanger and South Wales have identified this problem in their respective regions.

### ***Regional Heterogeneity***

The regional heterogeneity of carbon-intensive regions in Europe makes policy making challenging, as the issues and priorities facing these regions can vary widely depending on a range of factors, such as the specific industries involved, the local geography and climate, and the cultural and social context. For example, a policy that may be effective in one carbon-intensive region, such as investing in renewable energy infrastructure, may not be appropriate or feasible in another region where the local economy is more heavily dependent on fossil fuels. Similarly, policies that focus primarily on economic development may not be effective if they do not take into account the cultural and social factors that are important to local communities. To address this challenge, policymakers need to adopt a nuanced and context-specific approach to policy making in carbon-intensive regions, one that takes into account the unique circumstances and priorities of each region. This may involve engaging with local stakeholders, such as industry leaders, community groups, and environmental advocates, to better understand the issues and concerns facing these regions and to develop policy solutions that are tailored to their specific needs. In addition, it may be necessary to adopt a flexible and adaptive approach to policy making that can respond to changing economic and environmental conditions in these regions. This may involve regularly assessing the effectiveness of policies and

programs, and making adjustments as needed to ensure that they are achieving their intended goals. Ultimately, by taking a collaborative and context-specific approach to policy making in carbon-intensive regions, policymakers can help to ensure that their policies are effective, sustainable, and equitable, and that they support a just transition to a low-carbon economy for all. Among the selected case studies, Jiu Valley has identified this problem in their respective regions.

## **Challenges**

### ***Bridging the digital divide and human capital formation***

Bridging the digital divide and human capital formation are significant challenges for carbon-intensive regions in Europe, as these regions often face a range of social and economic barriers that can make it difficult to attract and retain highly skilled workers and to compete in an increasingly digital and knowledge-based economy. One of the main challenges is the lack of access to high-speed internet and other digital infrastructure, which can make it difficult for businesses to operate and for individuals to access education and training opportunities. This can also exacerbate other social and economic challenges in these regions, such as a lack of job opportunities and limited access to health care and other essential services.

### ***Preserve mining and industrial heritage***

Preserving mining and industrial heritage while transitioning to a low-carbon economy is a significant challenge for carbon-intensive regions in Europe. These regions have a rich history of mining and heavy industry, which has played a significant role in their economies and communities for decades or even centuries. However, the transition to a low-carbon economy means that these regions must reduce their greenhouse gas emissions, which requires a shift away from fossil fuel-based industries such as coal mining and steel production. This transition can have significant economic and social impacts on these regions, including job losses and a decline in the local economy. Despite these challenges, there are opportunities for these regions to preserve their industrial heritage while also embracing a low-carbon future. One approach is to repurpose former industrial sites for renewable energy production, such as building wind turbines on old coal mines or converting former factories into solar farms. This can help to create new economic opportunities while also preserving the region's industrial heritage. Another approach is to invest in retraining and reskilling programs for workers in carbon-intensive industries, so that they can transition to new roles in the low-carbon economy. This can help to mitigate the impact of job losses and ensure that the region's workforce is equipped with the skills needed for the future. Overall, preserving mining and industrial heritage while transitioning to a low-carbon economy is a significant challenge, but one that can be overcome with careful planning and investment in new economic opportunities and workforce development.

### ***Valorising local specificities***

Valorising local specificities, or recognizing and leveraging the unique characteristics of a region, is a significant challenge for carbon-intensive regions. These regions often have specific natural resources, cultural traditions, and economic structures that have been shaped by their history and geography. Transitioning to a low-carbon economy requires a fundamental shift in the way these regions produce and consume energy, which can have significant economic and social impacts. However, by valorising their local specificities, these regions can identify new opportunities for economic development and create a more sustainable and resilient future. One approach is to develop new economic sectors that build on the region's existing strengths and resources. For

example, a region with a strong agricultural tradition could develop a bio economy based on sustainable agriculture and forestry practices, while a region with a rich cultural heritage could focus on developing cultural tourism or creative industries. Another approach is to foster innovation and collaboration within the region, by bringing together businesses, universities, and research institutions to develop new technologies and solutions tailored to the region's specific needs. This can help to create new economic opportunities and promote sustainable development. Finally, it is essential to engage and empower local communities in the transition to a low-carbon economy. This can include initiatives such as community-owned renewable energy projects or participatory decision-making processes that involve local residents in shaping the future of their region. Overall, valorising local specificities is a significant challenge for carbon-intensive regions in Europe, but it is also an opportunity to build a more sustainable, resilient, and prosperous future. By identifying and leveraging their unique strengths and resources, these regions can create a low-carbon economy that is tailored to their specific needs and priorities.

## ***Coping Strategies***

### ***Provision of broadband connection and digitalisation***

To address this challenge, policymakers need to focus on investing in digital infrastructure, such as high-speed internet and other digital technologies, that can help to bridge the digital divide and create new opportunities for economic growth and human capital formation in these regions. This may involve partnering with private sector firms and other stakeholders to develop and deploy new technologies and services, as well as investing in training and education programs that can help local workers develop the skills needed to succeed in a digital economy. At the same time, it is important to recognize that human capital formation is also a key challenge in carbon-intensive regions, as many of these regions have historically been characterized by low levels of educational attainment and limited access to training and development opportunities. To address this challenge, policymakers need to focus on investing in education and training programs that can help to build a highly skilled and adaptable workforce in these regions, one that is equipped to succeed in a range of industries and to respond to changing economic and technological conditions. By addressing these challenges, policymakers can help to create a more inclusive, resilient, and sustainable future for carbon-intensive regions in Europe, one that supports economic growth and human capital formation for all members of these communities.

### ***Investment in heritage preservation***

Investment in heritage preservation is critical to preserve the cultural heritage in carbon-intensive regions in Europe. These regions have a rich history and cultural heritage that has been shaped by their industrial past, and this heritage is an essential part of their identity and sense of place. However, the transition to a low-carbon economy can pose a significant threat to this heritage, as many of the buildings, sites, and artefacts associated with the region's industrial past may be at risk of decay, neglect, or demolition. Investing in heritage preservation can help to safeguard this cultural heritage and ensure that it is passed down to future generations. This investment can take many forms, from restoring historic buildings and sites to creating museums, cultural centres, and other educational resources that celebrate the region's industrial heritage. By preserving the cultural heritage of carbon-intensive regions, we can also help to promote sustainable development and foster a sense of community pride and identity. Heritage preservation can be a catalyst for economic development and cultural tourism, creating new opportunities for businesses and creating jobs in the

local economy. In conclusion, investment in heritage preservation is a must to preserve the cultural heritage of carbon-intensive regions in Europe. It is an investment in the future, ensuring that the region's unique identity and cultural heritage are passed down to future generations and celebrated for years to come.

### ***Community-based cultural activity***

Community-based cultural activities help to increase valorising local specificities. These activities involve local communities coming together to celebrate their shared cultural heritage and to develop new ways of promoting their unique characteristics. By involving local communities in cultural activities, they can contribute to the preservation of local traditions and help to foster a sense of community pride and identity. This can be especially important in carbon-intensive regions, where the transition to a low-carbon economy can pose significant challenges to the social fabric of the community. Community-based cultural activities can take many forms, from traditional festivals and music events to arts and crafts workshops and historical re-enactments. These activities can help to promote the region's unique cultural heritage and can also be a source of economic development, by attracting visitors and promoting cultural tourism. By valuing local specificities and promoting cultural activities, carbon-intensive regions can build a more sustainable and resilient future. By investing in these activities, they can create a more diversified local economy, foster social cohesion and resilience, and build a sense of pride and identity in the community. Overall, community-based cultural activities are a powerful tool for valorising local specificities in carbon-intensive regions in Europe.

## **10.1 Socio-ecological and technical dimension**

### ***Changes***

#### ***Air Pollution***

Pollution is a major problem in carbon-intensive regions. Carbon-intensive regions are those where the economy is heavily reliant on industries that emit high levels of carbon dioxide and other pollutants, such as the fossil fuel industry, heavy manufacturing, and transportation. The emissions from these industries can have a range of negative impacts on the environment and human health. Carbon dioxide emissions contribute to climate change, which can lead to rising sea levels, more frequent and severe weather events, and other environmental impacts. Other pollutants such as particulate matter, sulfur dioxide, and nitrogen oxides can cause respiratory problems, heart disease, and other health issues. Pollution from carbon-intensive industries can also have a significant impact on local communities, particularly those who live in close proximity to these industries. These communities may be exposed to higher levels of pollutants than the general population, which can have a range of negative health impacts. Among the selected case studies, Sulcis Iglesiente, Brindisi, Krakow Metropolitan Area and Stavanger have identified this problem in their respective regions.

#### ***Land degradation***

Land degradation is another major problem in carbon-intensive regions, which can result from a range of factors, including deforestation, intensive agriculture, and mining activities. Land degradation can have a range of negative impacts, including soil erosion, loss of biodiversity, and



reduced land productivity, which can have significant economic and social consequences. In carbon-intensive regions, land degradation can occur as a result of the extraction and transportation of fossil fuels, which can damage ecosystems and disrupt local communities. For example, coal mining can lead to soil erosion and water pollution, while oil and gas extraction can result in habitat destruction and air pollution. Among the selected case studies, Rhineland, Sulcis Iglesiente, Brindisi, KMA, A Coruna and Upper Styria have identified this problem in their respective regions.

### ***Water pollution and shortage***

Water pollution and shortage are major problems in many carbon-intensive regions. Water pollution can occur when pollutants such as heavy metals, chemicals, and fertilizers enter waterways, either through direct discharge or runoff. This pollution can harm aquatic ecosystems and make water unsafe for human consumption and recreation. In addition, water scarcity can result from overuse of water resources, as well as climate change, which can reduce precipitation and cause drought conditions. Among the selected case studies, Lusatia and Rhineland have identified this problem in their respective regions.

### ***Lack of Access***

Lack of infrastructure in these regions can hinder economic development, making it difficult for businesses to operate efficiently and for communities to access essential services. In particular, the lack of transportation infrastructure can make it difficult to transport goods and people, while inadequate energy infrastructure can limit the availability and reliability of energy resources. Among the selected case studies, Lusatia has identified this problem in their respective regions.

## ***Challenges***

### ***Control pollution and industrial waste***

Controlling pollution and industrial waste is a significant challenge for carbon-intensive regions in Europe. These regions typically have a high concentration of heavy industry, such as power generation, steel, cement, and chemicals production, which are significant emitters of carbon dioxide and other pollutants. The European Union has set strict environmental regulations to reduce emissions from these industries, such as the Industrial Emissions Directive, the Large Combustion Plant Directive, and the Waste Framework Directive. These regulations require industrial facilities to use the best available techniques to limit their emissions and to monitor and report their pollution levels. However, implementing these regulations can be challenging, especially in regions where heavy industry is a crucial source of employment and economic activity. The transition to more sustainable practices may require significant investments in new technology and infrastructure, which can be difficult for smaller, less financially stable companies. Additionally, carbon-intensive regions may face social and political resistance to these changes, as workers and communities may fear the loss of jobs and economic activity. Therefore, finding a balance between economic growth and environmental protection is a critical challenge for these regions.

### ***Rehabilitation of land***

Rehabilitation of land is a significant challenge for carbon-intensive regions as they often have a long history of heavy industrial activity, which can leave behind contaminated and degraded land that requires remediation. Remediating contaminated land can be a complex and expensive process that requires specialized knowledge and resources. In some cases, the contamination may be so severe that the land cannot be rehabilitated at all, which can limit future economic and development

opportunities. Furthermore, the transition to more sustainable practices in these regions may require the repurposing of former industrial land for other uses, such as renewable energy production or green spaces. However, this can also be a challenge, as there may be competing interests and conflicting land-use demands. Despite these challenges, there are also opportunities for carbon-intensive regions to rehabilitate their land and promote sustainable development. For example, reforestation and the creation of green infrastructure can help to mitigate the environmental impacts of industrial activity, while also providing important ecosystem services and promoting biodiversity. In summary, the rehabilitation of land is an important challenge for carbon-intensive regions in Europe, but with the right investments and planning, it is possible to promote sustainable development and mitigate the environmental impacts of past industrial activity.

### ***Ensure water quality and availability***

Industrial and agricultural activities can contribute to water pollution through the discharge of chemicals and pollutants into waterways. These contaminants can have serious health and environmental impacts, such as harmful algal blooms, fish kills, and drinking water contamination. Furthermore, carbon-intensive regions may also face challenges related to water availability, particularly in areas with low rainfall or high demand for water. Climate change is expected to exacerbate these challenges, with changing precipitation patterns and more frequent droughts. To address these challenges, the European Union has set strict regulations on water quality and the management of water resources. These regulations include the Water Framework Directive, which aims to achieve good ecological and chemical status in all European water bodies by 2027, and the Urban Waste Water Treatment Directive, which regulates the discharge of urban wastewater into surface waters and coastal areas. However, ensuring water quality and availability in carbon-intensive regions requires ongoing monitoring and management, as well as investments in water treatment infrastructure and sustainable water use practices. It also requires collaboration between industry, agriculture, government, and local communities to address the complex and interconnected issues related to water resources.

### ***Combating infrastructural peripheralisation***

Infrastructural peripheralisation refers to the marginalization of regions that are geographically distant from urban centres or that lack adequate infrastructure to support economic development. In carbon-intensive regions, this can be a particular challenge, as heavy industry is often concentrated in specific geographic areas, which can lead to a concentration of economic activity in those areas, while other regions may be left behind. This can create economic and social disparities between regions, as well as environmental impacts related to transportation and infrastructure development. To address infrastructural peripheralisation, governments and policymakers need to prioritize investments in infrastructure, including transportation, energy, and telecommunications networks, in regions that have been historically marginalized. This can include improving the connectivity between rural and urban areas, supporting the development of renewable energy projects in remote areas, and investing in digital infrastructure to support remote work and economic development. Furthermore, addressing infrastructural peripheralisation requires a coordinated approach that involves multiple stakeholders, including industry, local communities, and government. It also requires a long-term perspective that looks beyond short-term economic gains and considers the social and environmental impacts of infrastructure development.

## ***Coping Strategies***

### ***Force industries to cut emissions by increasing carbon prices and implement pollution control technologies***

Carbon pricing is a market-based mechanism that puts a price on carbon emissions, encouraging industries to reduce their emissions to avoid the costs of the carbon tax. This is incentivizing companies to switch to cleaner energy sources, invest in energy-efficient technologies, and reduce waste and pollution. In addition to carbon pricing, implementing pollution control technologies is also helping reduce emissions from industries. These technologies include improved processes, cleaner fuels, and better waste management. By investing in these technologies, industries reduce their environmental impact and comply with stricter emissions standards. Overall, a combination of carbon pricing and pollution control technologies is helping reduce emissions from industries and control pollution in Europe. However, it is important to ensure that these measures are implemented in a way that is fair and effective, taking into account the needs and concerns of all stakeholders, including businesses, consumers, and communities.

### ***Strict laws to punish polluting firms***

Strict laws to punish polluting firms can serve as a deterrent to companies that might otherwise prioritize profits over environmental responsibility. By imposing heavy fines, penalties, and other sanctions on polluting firms, governments can incentivize businesses to reduce their environmental impact and invest in cleaner technologies. In Europe, there are a number of laws and regulations in place to control pollution, including the Industrial Emissions Directive, the Integrated Pollution Prevention and Control Directive, and the Emissions Trading System. These regulations set strict limits on emissions and pollutants, require companies to monitor their environmental impact, and mandate the use of the best available techniques to reduce pollution. To ensure that these laws are effective, it is important for governments to have strong enforcement mechanisms in place. This can include regular inspections and audits of industrial facilities, as well as penalties and sanctions for noncompliance. Additionally, it is important for governments to work closely with businesses and industry groups to promote environmental responsibility and encourage the adoption of cleaner technologies. However, it is important to ensure that these laws are implemented fairly and effectively, taking into account the needs and concerns of all stakeholders, including businesses, consumers, and communities.

### ***Conversion of mine pit to freshwater lake or recreation park***

Mining can cause significant environmental damage, including soil erosion, deforestation, and the disruption of local ecosystems. The creation of a freshwater lake or park can help to restore some of the natural features of the landscape and provide a new habitat for local wildlife. In addition to providing environmental benefits, the conversion of a mine pit to a recreational area can also provide social and economic benefits. The park or lake can be used for a variety of recreational activities, such as swimming, boating, fishing, and hiking, which can provide opportunities for local communities to engage in outdoor activities and promote tourism in the area. However, it is important to ensure that the conversion of a mine pit to a recreational area is done in a responsible and sustainable manner. This can include measures such as soil stabilization, water management, and the planting of native vegetation to prevent erosion and promote biodiversity. Additionally, it is important to consider the potential impacts of recreational activities on the local environment and to take steps to minimize these impacts.



### ***Installation of water treatment plants***

One common issue in mining areas is the contamination of water sources with pollutants such as heavy metals, chemicals, and other toxic substances that can have negative impacts on both the environment and human health. Water treatment plants can be designed to remove these contaminants from water sources and make them safe for human consumption and other uses. However, it is important to note that water treatment plants can be expensive to install and maintain, and they may not always be the most sustainable or long-term solution to water problems in mining areas. In some cases, it may be more effective to focus on reducing the amount of pollutants released into water sources in the first place, through measures such as improved mining practices and waste management.

### ***Investments in infrastructure***

Investing in transportation infrastructure, such as roads, railways, and ports, can improve connectivity and make it easier for businesses to transport goods and people. Expanding energy infrastructure, such as building new power plants, transmission lines, and distribution networks, can help to improve the availability and reliability of energy resources. Promoting public-private partnerships can help to attract private investment in infrastructure projects, while also ensuring that projects are aligned with public policy goals. Focusing on sustainable infrastructure, such as energy-efficient buildings and renewable energy systems, can help to reduce the environmental impact of infrastructure projects and promote a more sustainable economy.

## **13.1 Socio-psychological dimension**

### ***Changes***

#### ***Stress caused by displacement***

Displacement refers to the forced or voluntary movement of people from their homes or communities due to conflict, natural disasters, or other reasons. It can cause significant stress and trauma for individuals and families, as they may be forced to leave their homes and communities, often with little or no warning. Displacement can also lead to the loss of homes, possessions, and social networks, which can further exacerbate stress and trauma. The stress caused by displacement can have a range of negative physical and mental health impacts, including anxiety, depression, post-traumatic stress disorder (PTSD), and other mental health conditions. Displaced individuals and families may also experience physical health problems related to living in crowded and unsanitary conditions, as well as the lack of access to healthcare. To address the stress caused by displacement, it is important to provide support and assistance to displaced individuals and communities. This can include access to healthcare, housing, education, and employment opportunities. It is also important to address the underlying causes of displacement, such as conflict, poverty, and environmental degradation, to prevent future displacement and promote more sustainable and resilient communities. Among the selected case studies, A Coruña has identified this problem in their respective regions.

## **Challenges**

### ***Prevent displacement of local population***

Preventing displacement of local populations in carbon-intensive regions can be a complex and challenging task, as it involves addressing a range of social, economic, and environmental issues. The transition to a low-carbon economy can have significant impacts on local populations, particularly those who are employed in carbon-intensive industries. These workers and their families may face the risk of displacement, job loss, and economic disruption.

## **Coping Strategies**

### ***Invest in renewable energy and low-carbon industries***

Transitioning to renewable energy and low-carbon industries can help to reduce the carbon footprint of the region while also creating new employment opportunities for local populations. This can help to reduce the economic reliance on carbon-intensive industries and reduce the risk of displacement.

### ***Provide education and training***

Providing education and training programs can help local populations acquire the skills and knowledge they need to transition to new industries and job opportunities. This can help to reduce the risk of displacement by ensuring that local populations have the skills needed to participate in the new low-carbon economy.

### ***Engage with local communities***

Engaging with local communities can help to build trust and understanding, and ensure that the needs and concerns of local populations are taken into account in decision-making processes. This can help to reduce the risk of displacement by ensuring that the transition to a low-carbon economy is done in a way that is equitable and inclusive.

## **16.1 Gender**

### **Changes**

#### ***Unequal participation of women in transition process***

Women are underrepresented in the energy sector, both in terms of employment and leadership positions, which can have a negative impact on the transition to cleaner and more sustainable energy systems. According to a report by the International Renewable Energy Agency (IRENA), women make up only 32% of the renewable energy workforce globally. Women are also underrepresented in technical and leadership roles, with only 28% of women in senior management positions in the energy sector. The unequal participation of women in the energy transition process is a concern because it can limit the diversity of perspectives and solutions that are needed to address the complex challenges of the energy transition. Women have unique experiences, knowledge, and skills that can contribute to the development of more sustainable and equitable energy systems. To address this issue, it is important to promote gender equality and women's empowerment in the energy sector. It is also important to raise awareness about the importance of women's participation in the energy transition and to advocate for policies and programs that promote gender equality and

women's empowerment. Among the selected case studies, Rhineland, Sulcis Iglesiente and A Coruna have identified this problem in their respective regions.

## **Challenges**

### ***Increase participation of women in transition process (policy making and implementation)***

Increasing the participation of women in the energy transition process is a big challenge. Women are underrepresented in the energy sector, both in terms of employment and leadership positions. This gender gap is particularly pronounced in the fields of science, technology, engineering, and math (STEM), which are critical for driving the energy transition. One major barrier to women's participation in the energy transition is societal norms and gender biases that limit women's access to education and employment opportunities. Another challenge is the lack of role models and mentors for women in the energy sector, which can make it difficult for them to envision themselves as leaders in this field. Women also tend to have less access to networks and resources that can help them succeed in the energy industry.

## **Coping Strategies**

### ***Quota for women in policy making and jobs in renewable sector***

The implementation of quotas for women in policy making and jobs in the renewable sector can have several positive impacts. In terms of policy making, quotas for women can help to ensure that diverse perspectives and experiences are represented in decision-making processes, which can lead to more inclusive and effective policies. This can be particularly important in the context of climate change and the transition to a low-carbon economy, which will require a range of perspectives and expertise to address complex challenges. In the renewable sector, quotas for women can help to address gender disparities in employment and ensure that women have equal opportunities to participate in the transition to a low-carbon economy. This can help to promote gender equality and support the development of a more diverse and inclusive workforce.

### ***Involvement of women in the implementation of green energy projects***

The involvement of women in the implementation of green energy projects is essential for several reasons. Firstly, women can bring unique perspectives and experiences to the development and implementation of green energy projects, which can lead to more inclusive and effective solutions. For example, women may have a better understanding of the local context, social dynamics, and community needs, which can help to ensure that projects are designed and implemented in a way that is sensitive to these factors. Secondly, involving women in green energy projects can help to address gender disparities in employment and promote gender equality. This can help to build a more diverse and inclusive workforce, which is essential for creating sustainable and resilient communities. Finally, the involvement of women in green energy projects can help to promote women's empowerment and support the development of women's leadership skills. This can help to address broader issues of gender inequality and promote greater social and economic inclusion. To ensure the involvement of women in the implementation of green energy projects, it is important to take a gender-sensitive approach to project design and implementation. This may involve initiatives such as gender assessments, gender-responsive budgeting, and the development of gender-sensitive indicators to track progress and ensure accountability. Additionally, efforts should be made to promote women's participation in training and education programs related to green energy, as

well as to provide mentorship and leadership development opportunities for women in the sector. Overall, the involvement of women in the implementation of green energy projects is a critical component of efforts to promote gender equality, build more resilient and sustainable communities, and accelerate the transition to a low-carbon economy.



# ENTRANCES

ENergy TRAnsitions from Coal and carbon: Effects on Societies

