



# ENTRANCES

ENergy TRAnSitions from Coal and carbon: Effects on Societies

## D4.3 A Coruña Region Case Study Report



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

Nachatter Singh Garha (University of A Coruña, Spain)  
Ricardo Antonio Garcia Mira (University of A Coruña, Spain)  
Marta Fernandez Preto (University of A Coruña, Spain)  
Eva Maria Espiñeira (University of A Coruña, Spain)

## Contributors

Christoph Schult (Halle Institute for Economic Research, Germany)  
Daniel Škobla (Centre of Social and Psychological Sciences, Slovakia)  
Giovanni Caiati (K&I, Italy)  
Katja Heinisch (Halle Institute for Economic Research, Germany)  
Maëva Bréau (Women Engage for a Common Future, France)  
Oliver Holtemöller (Halle Institute for Economic Research, Martin Luther University Halle-Wittenberg, Germany)  
Tristram Barrett (Leibniz Institute of Ecological Urban and Regional Development, Germany)

## Acknowledgement

We would like to thank Fernando González Laxe, Jesus Miguel Muñoz Cantero and Francisco Rey (UDC) for helpful comments and data support.

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

University of A Coruña, Spain  
Ricardo Antonio Garcia Mira  
email: [ricardo.garcia.mira@udc.es](mailto:ricardo.garcia.mira@udc.es)  
website: [www.udc.es](http://www.udc.es)

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. The A Coruña Region Case Study Report is the Deliverable 4.3 of the project.

Work Package 4: Carbon intensive regions case studies

Lead Organisation: Instytut Gospodarki Surowcami Mineralnymi i Energią PAN, Poland

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: October 2022

## Contents

<b>1</b>	<b>Introduction.....</b>	<b>2</b>
<b>2</b>	<b>Conceptual and methodological framework .....</b>	<b>5</b>
2.1	Case study objectives and organisation .....	5
2.1.1	Main objectives .....	5
2.1.2	Structure of the case study: multiple foci and units of analysis .....	5
2.2	Multidimensional Analytical Framework (MAF).....	8
2.2.1	Overview of the MAF .....	8
2.2.2	Socio-cultural component .....	8
2.2.3	Socio-psychological component.....	10
2.2.4	Socio-economic component.....	11
2.2.5	Socio-political component .....	11
2.2.6	Socio-ecological and technical component .....	12
2.2.7	Synopsis of the five components of the MAF .....	13
2.2.8	Cross-cutting elements .....	14
2.3	Activities .....	14
2.3.1	Desk research .....	14
2.3.2	Focus group (Socio-cultural component).....	14
2.3.3	Survey Data Collection (Socio-psychological component) .....	15
2.3.4	Socio-economic data collection (Socio-economic component).....	16
2.3.5	Text research (Socio-political component) .....	16
2.3.6	Semi-structured interviews (socio-ecological and technical component) .....	17
2.3.7	Data reporting, interpretation and the case study report.....	18
<b>3</b>	<b>Analysis of the Coal and Carbon Territory.....</b>	<b>20</b>
3.1	Overview of the CCT region.....	20
3.1.1	Historical development.....	20
3.1.2	Ecological and environmental situation .....	21
3.2	Socio-cultural component .....	22
3.2.1	Summary of results .....	22
3.2.2	Interpretation .....	26
3.2.3	Gender dimension .....	29
3.3	Socio-psychological component.....	29
3.3.1	Summary of results.....	30
3.3.2	Interpretation .....	31
3.3.3	Gender dimension .....	34
3.4	Conclusion.....	34
<b>4</b>	<b>The socioeconomic situation.....</b>	<b>37</b>
4.1	Introduction to the socio-economic situation .....	37

4.2	Determinants of economic development .....	37
4.3	Sectoral structure.....	39
4.4	Income distribution.....	42
4.5	Gender dimension .....	43
4.6	Conclusion.....	44
<b>5</b>	<b>Analysis of the energy transition in the Political and Administrative Region .....</b>	<b>46</b>
5.1	Overview of the energy transition policies .....	46
5.1.1	Political system and context.....	46
5.1.2	Decarbonisation process .....	47
5.1.3	Public participation.....	48
5.1.4	Clean Energy Transition (CET) .....	49
5.2	Socio-political component .....	50
5.2.1	Summary of results.....	50
5.2.2	Interpretation .....	59
5.2.3	Gender dimension .....	60
5.3	Socio-ecological and technical component .....	60
5.3.1	Summary of results.....	60
5.3.2	Interpretation .....	64
5.3.3	Gender dimension .....	68
5.4	Conclusion.....	68
<b>6</b>	<b>Challenges, coping strategies and gender.....</b>	<b>72</b>
6.1	Challenge 1: Depopulation and ageing .....	72
6.1.1	Challenge description .....	72
6.1.2	Coping strategies.....	72
6.1.3	Gender dimension .....	73
6.1.4	Discussion .....	73
6.2	Challenge 2: Management of industrial waste and rehabilitation of exploited land .....	73
6.2.1	Challenge description .....	73
6.2.2	Coping strategies.....	73
6.2.3	Gender dimension .....	74
6.2.4	Discussion .....	74
6.3	Challenge 3: Industrial reconstruction of As Pontes and surrounding region.....	74
6.3.1	Challenge description .....	74
6.3.2	Coping strategies.....	74
6.3.3	Gender dimension .....	75
6.3.4	Discussion .....	75
6.4	Challenge 4: Consensual proactive agenda for re-industrialisation .....	75
6.4.1	Challenge description .....	75
6.4.2	Coping strategies.....	75
6.4.3	Gender dimension .....	76
6.4.4	Discussion .....	76
6.5	Challenge 5: Ensuring energy availability and affordability.....	76
6.5.1	Challenge description .....	76
6.5.2	Coping strategies.....	77

6.5.3	Gender dimension .....	78
6.5.4	Discussion .....	78
6.6	Challenge 6: Bridging the digital divide and human capital formation.....	78
6.6.1	Challenge description .....	78
6.6.2	Coping strategies.....	78
6.6.3	Gender dimension .....	79
6.6.4	Discussion .....	79
6.7	Challenge 7: Responding to particular social needs.....	79
6.7.1	Challenge description .....	79
6.7.2	Coping strategies.....	79
6.7.3	Gender dimension .....	80
6.7.4	Discussion .....	80
6.8	Challenge 8: Involving the locals in policy development and implementation .....	80
6.8.1	Challenge description .....	80
6.8.2	Coping strategies.....	81
6.8.3	Gender dimension .....	81
6.8.4	Discussion .....	81
6.9	Conclusions .....	81
<b>7</b>	<b>Summary and discussion.....</b>	<b>83</b>
<b>8</b>	<b>References.....</b>	<b>85</b>
<b>9</b>	<b>Appendix .....</b>	<b>88</b>
9.1	Regional delineation .....	88
9.2	Socio-cultural factors .....	88
9.3	Socio-psychological component.....	89
9.4	Socio-economic data .....	91
9.5	Socio-political component .....	92
9.6	Socio-ecological and technological component.....	93

## Index of Figures

Figure 1 - Overview of the MAF: Research foci, components and crosscutting elements.....	8
Figure 2 - Overview of the factors in the socio-psychological model .....	11
Figure 3 - The spatial distribution of the strain situations in the geographical map. ....	25
Figure 4 - Correlation among different factors related to socio-psychological components.....	31
Figure 5 - Economic overview .....	38
Figure 6 - Sectoral structure.....	40
Figure 7 - Growth decomposition (2018-2000) .....	41
Figure 8 - Income distribution.....	43
Figure 9 - Four levels of governance in Spain .....	46
Figure 10 - Different stakeholder involved in the energy transition process in As Pontes, Spain ...	50
Figure 11 - Stakeholder's assessment of transformative capacity in the A Coruña region.....	61
Figure 12 - Assessment of transformative capacity by stakeholders from different sectors .....	62
Figure 13 - Socio-cultural factors .....	88
Figure 14 - The timeline of decarbonisation process in A Coruña case study, Spain.....	92

## Index of Tables

Table 1 - Synoptic table of the five components of the MAF.....	13
Table 2 - List and features of focus group participants .....	15
Table 3 - Text material of different categories .....	16
Table 4 - Stakeholders interviewed by sector and type .....	17
Table 5 - Data reporting in the A Coruña case study .....	18
Table 6 - List of the strain situations identified in the A Coruña case study .....	22
Table 7 - Strain situations across different types mapped in Sulcis .....	25
Table 8 - List of strain situation by time .....	26
Table 9 - Profile of survey respondent in A Coruña case study .....	30
Table 10 - Mean score and standard deviations for all factors in the A Coruña region .....	32
Table 11 - Z score and STAN for all factors in the A Coruña region .....	33
Table 12 - Gender differences in mean score for all constructs in the A Coruña region .....	34
Table 13 - Stakeholders grid in the A Coruña case study.....	55
Table 14 - Stakeholders positions in the power field in the A Coruña case study .....	57
Table 15 - Demographic data for all case deliniations .....	88
Table 16 - Survey questionnaire used in the A Coruña case study .....	89
Table 17 - Economic data overview .....	91
Table 18 - NACE Rev. 2 Classification .....	91
Table 19 - List of keywords used for text material search in A Coruña case study.....	92
Table 20 - List of socio-ecological and technical factors.....	93

## Abbreviations

CCT	Coal and Carbon Territory
CET	Clean-Energy Transition
ENDESA	Empresa Nacional de Electricidad, S.A.
ENTRANCES	ENergy TRANsitions from Coal and carbon: Effects on Societies
EU	European Union
EC	European Commission
GDP	Gross Domestic Product
GVA	Gross Value Added
ILO	International Labour Organization
INE	National Statistics Institute of Spain
LMA	Labour Market Area
MAF	Multidimensional Analytical Framework
NACE	European Classification of Economic Activities
MITECO	Ministry for the Ecological Transition and the Demographic Challenge
PAR	Political Administrative Region
SSH	Social Sciences and Humanities
UDC	University of A Coruña
WP	Work Package



## Executive Summary

This case study report presents the results of the A Coruña case study in the **ENTRANCES project** (ENergy TRANSitions from Coal and Carbon: Effects on Societies). This is a three-year project funded by the European Union's **Horizon 2020 research and innovation programme**. A Coruña is a small province in the autonomous community of Galicia, in northwestern 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 with the objective of reducing 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. The fate of this thermal power plant changed with Spain's signing of the 2015 Paris agreement in 2017. Spain's 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. 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.

La Central thermal power plant was the main source of **income and employment** in the region. Its closure will create a vacuum in the **economic sphere** of the region, which will be difficult to fill with proposed **alternative green energy projects**. The loss of jobs and income, first by the closure of the mines and then by the announcement of the closure of the thermal power plant, has started to affect the **standard of living** in the region. **GDP** has declined since the closure of the mines. Small ancillary businesses and retail outlets are closing due to **falling demand**. The lack of new jobs has accelerated the **emigration of young people** and **brain drain** from the region, which in turn has accelerated the **ageing process** and increased the size of the **dependent population**, affecting the socio-economic fabric of the region. It also affected the **socio-cultural** configuration of the region. In the 1940s, with the installation of the first fertiliser factory in As Pontes, the region witnessed a **transformation of identity** from agrarian to industrial society. This identity transformation was reinforced with the installation of the largest thermal power station in As Pontes in the 1970s. This rupture from the past caused by several external and internal factors created stress in the area and several **situations of conflict** and **contradictions** in the local community. The inhabitants of As Pontes developed their **identity as miners** or plant workers who are proud to have contributed to the economic development of Spain. The high wages from mining and the power plant enabled them to maintain a **good standard of living** and the educational facilities offered by the company helped their children to obtain higher education and move up the **social mobility** ladder. The closure of the mines affected a large number of mining families who had worked in the coal mines for **generations**. It meant the **loss** of an essential part of their **identity**. Similarly, the current closure of the thermal power plant has also created a sense of **loss of identity** among the plant's workers.



Uncertainty about the future has also affected the socio-psychological well-being of the population in the region. The closure of the thermal power plant has increased the **local population's anxiety** about their future and that of future generations. The inhabitants of As Pontes and the surrounding municipalities have a high level of **place attachment**, which creates a sense of disparity among people who feel that their region is dying economically and politically. They have a high level of **perceived stress**, emanating from **economic hardship** and **nostalgia** for their industrial past, which affects their overall **life satisfaction**. This **social stress** manifests itself in the form of **resistance and protests** against the decarbonisation policies adopted by the central government. **Personal reinvention** or efforts to learn new skills and be employable in the changing labour market, is very limited, which worries policymakers. The decarbonisation process also affects the **socio-political** configuration of the region. In Spain, the decarbonisation process is a **top-down process**. All major decisions regarding the closure of large carbon-intensive industrial units, the distribution of EU funds, compensation for workers and companies and the rehabilitation of the territory are taken by the central government. The local government has no competence in this area. However, this closure also affects the source of the **local government's revenue**, which in turn affects their economic and political power. The central government propagates the narrative that “*energy transition is a great business, social and industrial opportunity for the Spanish economy*” to support its decarbonisation policy and increase its acceptance among the local population. However, opposition parties and trade unions propagate the “*energy transition is misleading, unjust and expensive*” narrative to criticise how decarbonisation policies are imposed on the local population.

The energy transition has the potential to disrupt all aspects of life in the affected regions. How the population copes with the adverse effects of the energy transition will depend on the **transformative capacity** of the region. Transformative capacity shows the extent to which a region is able to deviate from its current (carbon-intensive) trajectory towards sustainable outcomes. In the A Coruña region, most stakeholders believe that the **radical sustainability vision** of the energy transition is the most important factor affecting the region's transformational capacity. Similarly, the other important factors are **intermediaries** and **knowledge production**, where the former focuses on the role of intermediaries in the governance of the energy transition and the latter demonstrates the diversity of knowledge produced from different sectors, which relates to regulatory changes to support the energy transition. In contrast, **reflective regulation**, which shows the extent to which regulatory changes have been implemented to support the transition process and overcome barriers, is considered the least important factor affecting the region's transformative capacity, followed by **resource availability** and **community empowerment**, which demonstrates the level of support received by stakeholders and communities to act autonomously for the energy transition.

This extensive research on the different aspects of the energy transition helped us in identifying the various **challenges** and **coping strategies** that have emerged over the last decade. These challenges include: addressing the depopulation and ageing of the local population; emigration of youth and brain drain; managing industrial waste and rehabilitation of exploited land; rebuilding the industrial complex of As Pontes and the Ferrolterra-Eume region with green energy projects; achieving political consensus on the proactive agenda for reindustrialisation; ensuring energy availability and affordability; reducing the digital divide and investment in human capital formation; responding to the particular social needs of different vulnerable groups; and involving local people in policy formulation and implementation.

# CHAPTER 1

---

## INTRODUCTION

# 1 Introduction

This report has been written in the framework of the project - Energy Transition from Coal and Coal: 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 theme of Social Sciences and Humanities (SSH) aspects of the Clean Energy Transition (CET). It is coordinated by the University of A Coruña and is carried out by a consortium of 14 European partners, including universities, research institutes, networks and umbrella organisations.

The overall objectives of this project are to develop a theoretically and empirically based understanding of the cross-cutting issues related to the SSH aspects of the CET in Europe's coal- and carbon-intensive regions and to formulate a set of recommendations capable of addressing these issues. To achieve these objectives, the project investigates the challenges faced by carbon-intensive regions in transition based on the idea that the transition to clean energy should not only be seen as a technological change or an industrial change but also as a complex and multidimensional process that affects the daily lives of local communities. In this sense, the project views the impacts of the transition to clean energy in coal- and carbon-intensive regions as either a potential activation or strengthening of the process of deterritorialisation, i.e., the gradual weakening of the links between a community and its territory or as an opportunity to trigger its re-territorialisation.

One of the key aspects of the project was, therefore, the development of 13 regional case studies dedicated to 13 coal-intensive transition regions in Europe. In this respect, two work packages of the project—Work Package 3 and Work Package 4—were devoted, respectively, to the development of case studies of coal-mining regions and carbon-intensive regions. All case studies were based on the application of the same Multidimensional Analytical Framework (MAF) developed in WP1 and WP2 to capture the multifaceted aspects of the ongoing de/re-territorialisation processes in the regions. In this sense, a set of 13 deliverables have been developed, each of them dedicated to one of the case studies of the project. This report is the one dedicated to the case study of A Coruña, which was developed by the UDC research team in work package 4. In this sense, the report has been written as a stand-alone document, which can be compared with its 12 sister deliverables dedicated to the other case studies. All documents are developed following a similar structure and organisation and all are available on the ENTRANCES website.<sup>1</sup>

The carbon-intensive region of A Coruña is part of the Autonomous Community of Galicia in north-western Spain. It has two of the largest thermal power plants in Spain: La Central in the As Pontes de García Rodríguez municipality and La Central in Meirama. The municipality of As Pontes de García Rodríguez is located in the province of A Coruña. The introduction of industrial coal mining in the 1940s was the beginning of dramatic socio-economic changes for As Pontes. It transformed the economy from primarily agrarian to industrial, doubled the population and permanently altered the town's landscape (Lopez and Blanchette 2020). The construction of the power plant resulted in land acquisitions, causing the displacement of the local people and sometimes entire villages (Aréchaga et al, 2011).

<sup>1</sup> <https://entrancesproject.eu/project-deliverables/>

The As Pontes thermal power station, with an installed capacity of 1400 MW, is the largest coal-fired power station in Spain. This plant was installed in the vicinity of the lignite mines of As Pontes to use local coal. It was commissioned in the 1970s as a public-sector unit, but in the late 1990s it was sold to the private company ENDESA. Since 1998, it has been owned and operated by ENDESA in collaboration with its partner, the Italian energy company ENEL. The company applied for the closure of the thermal power plant in December 2019. The central government approved the request in 2020. However, due to the energy crisis in Europe (increase in the price of natural gas, Russian-Ukrainian conflict, etc.), the plant is still active and generating energy from imported coal.

The As Pontes thermal power plant is the main source of income and employment in the region. The planned closure of the thermal power plant has raised many concerns about the future of this region. This uncertainty makes this region a perfect laboratory to study the impact of the closure of large carbon-intensive units on the territory and population (de/re-territorialisation). It also offers the opportunity to identify the main challenges and study the coping strategies adopted by the different actors to deal with the stresses caused by this energy transition. The knowledge gained in this region can subsequently be used to mitigate the impact of the closure of large industrial units in other parts of the EU and worldwide.

The report is divided into five chapters: Chapter 2 presents the conceptual and methodological framework adopted for the development of the case study, including information on how A Coruña has been operationalised into different interrelated units of analysis. Chapter 3 provides an overview of the socio-economic situation of the region. Chapter 4 focuses on the analysis of the Coal and Carbon Territory of A Coruña, i.e., the territory heavily dependent on fossil fuel-based industries or on fossil fuel extraction itself, with the lenses of socio-cultural and socio-psychological dimensions. Chapter 5 covers the analysis of the ongoing Clean Energy Transition at the regional level through the lenses of the socio-political and socio-technical dimensions. Chapter 6 presents the main territorial challenges, associated coping strategies and gender aspects and analyses them in the light of all the dimensions included in the study (i.e., socio-economic, socio-cultural, socio-psychological, socio-political and socio-technical dimensions). Finally, chapter 7 presents a summary of important findings and opens a discussion on the challenges and coping strategies related to the ongoing energy transition.

In addition to the main text, the deliverable also includes six annexes (9.1 to 9.6) related to different components.

# CHAPTER 2

---

## CONCEPTUAL AND METHODOLOGICAL FRAMEWORK

## 2 Conceptual and methodological framework

This chapter is devoted to presenting the conceptual and methodological framework of the case study.

### 2.1 Case study objectives and organisation

#### 2.1.1 Main objectives

The objective of the case study can be better understood in light of the following research questions of the ENTRANCES project.

RQ1): What are the main socio-economic, socio-technical, socio-ecological, socio-cultural, socio-political, socio-psychological and gender challenges faced by coal and carbon-intensive regions in transition? What coping strategies have emerged in recent years?

RQ2): What variables have most influenced the emergence of the deterritorialisation process and how do they interact? What kinds of strategies determine the success of deterritorialisation?

RQ3): What policies or policy combinations would be most effective in restoring territorial and community ties in coal- and carbon-intensive regions while promoting their transition to clean energy?

These three questions together define the logical itinerary of the project, which starts with an in-depth description of the current situation of the regions (RQ1), moves on to the investigation of the causes of the de/re-territorialisation process (RQ2) and identifies a set of policies to foster the re-territorialisation of the regions (RQ3). The main objective of the case studies is to answer the first research question (RQ1) of the project in each region involved in it, thus also in the region of A Coruña. In addition, the secondary objective of the case studies is to provide the empirical basis for answering the other two research questions, related to the causes of the re-territorialisation processes (RQ2) and the set of policies needed to activate re-territorialisation (RQ3). These two questions will be answered in the following phases of the project, respectively, through case comparisons (RQ2) and case-related scenario building and policy co-creation (RQ3).

As we focus on the challenges and coping strategies faced by coal and carbon transition regions in the different dimensions of change, the main objective of this report is to present the response that researchers have found in the case of A Coruña.

#### 2.1.2 Structure of the case study: multiple foci and units of analysis

To address the complex research question presented above (RQ1), the ENTRANCES case studies have been structured into multiple foci and units of analysis. This articulated approach was deemed necessary to improve the study's clarity and avoid concept confusion regarding the challenges and coping strategies of coal- and carbon-intensive transition regions. In this sense, all ENTRANCES case studies, including the one in A Coruña, have been articulated into three research foci and three corresponding units of analysis.

RF1: *Territorial Change in Coal and Carbon Territories (CCTs)*. The project decided to focus its analysis on the challenges and coping strategies on the territories most exposed to the decarbonisation process. To this end, the concept of Coal and Carbon Territory (CCT) was

developed. CCTs are territories where the “coal and carbon” features are represented as a distinctive part of the local identity or are a key asset for the income and employment opportunities of the local community. It should be noted that CCTs are not administrative regions, but socio-cultural ones. The focus on territorial change in CCTs has been considered the “fulcrum” or the “core” of the ENTRANCES case studies.

While RF1 helps clarify that the research is focused on the territorial challenges and coping strategies of the CCT, the dynamics of de/re-territorialisation of this territory cannot be fully understood without the other two research foci and related units of analysis.

RF2: *Structural change in the labour market area (LMA)*. The case study has investigated the change in socio-economic structure over the last three decades. This is an essential dimension to understanding the underlying dynamics that affected and still affect CCT at the structural level. To investigate structural change, the LMA was established as a secondary unit of analysis. It includes the CCT, in which most of the labour force lives and works.

RF3: *Clean Energy Transition in the Political-Administrative Region (PAR)*. If RF2 investigates the medium and long-term dynamics that are affecting the CCT, the focus on the Clean Energy Transition (CET) ensures that the research considers the incipient change triggered by the intentional transformation of the energy system that is being promoted to address climate change. Such objectives have recently been accelerated through the European Green Deal. Precisely because the CCT is a territory highly dependent on “Coal and Carbon”, understanding the incipient CET implies a better understanding of the emerging challenges for the CCT. In each regional case study, the CET has been observed at the level of the Political-Administrative Region (PAR), i.e. the administrative region encompassing the coal and coal territories most closely related to the governance of the energy transition through a directly elected legislature.

These three research foci and related units of analysis, at least to some extent, overlap with each other. Nevertheless, they offer different and complementary perspectives on the study of coal and carbon-intensive regions in transition. The three research foci jointly contribute to the understanding of the ongoing de/re-territorialisation dynamics in the CCT.

The structure of the case study is reflected in this report, as chapter 3 deals with structural change in the LMA, chapter 4 with territorial change in the CCT and chapter 5 with CET in the PAR. Chapter 6 highlights the main challenges and coping strategies and the gender dimension of the energy transition. Finally, chapter 7 presents some discussions and conclusions.



### Box 1 - The three units of analysis

Following the structure of the case study, three units of analysis have been delineated in the A Coruña case (More information in Appendix 9.1 )



Coal and Carbon Territory

The CCT is understood as the territory in which “coal and carbon” characteristics are represented as a distinctive feature of local identity or are a key asset for income and employment opportunities. The municipality of As Pontes is the CCT in the A Coruña case study. It is a small town in the northwest of the province of A Coruña. With a surface area of 246.60 km<sup>2</sup>, As Pontes is the largest municipality in the province of A Coruña and the eleventh largest in Galicia. It has a population of 11,139 inhabitants. The economy of As Pontes depends mainly on the industry, where the electricity generation sector stands out, although it also has a population dedicated to agriculture and livestock farming. Large-scale exploitation of the lignite mine in As Pontes began in 1942 and especially in 1976, with the installation of the Endesa thermal power station in the locality. As Pontes has the largest coal-fired power plant in Spain (with an installed capacity of 1468.5 MW) installed and operated by Endesa.



Labor Market Area

The LMA describes the region where all people living in the region also work in the region, centred on the Coal Territory. The province of A Coruña is the labour market region in this case study. It is the most north-western province of Spain and one of the four provinces that make up the autonomous community of Galicia. It is the most populated province in Galicia, with 1.1 million inhabitants (INE) in 2019. Of these, 36.5% live in one of the three largest municipalities in the province: A Coruña, Santiago de Compostela and Ferrol. The municipality of A Coruña is the second most populated city in Galicia after Vigo. A large number of workers, who were directly or indirectly involved in coal mining, and its transport from the ports to the power stations, come from different municipalities of A Coruña. According to a recent report published by Endesa, a large part of its permanent and contract workers came from the municipalities of As Pontes, Ferrol, A Coruña and Narón.



Created with Datawrapper

Political Administrative Region

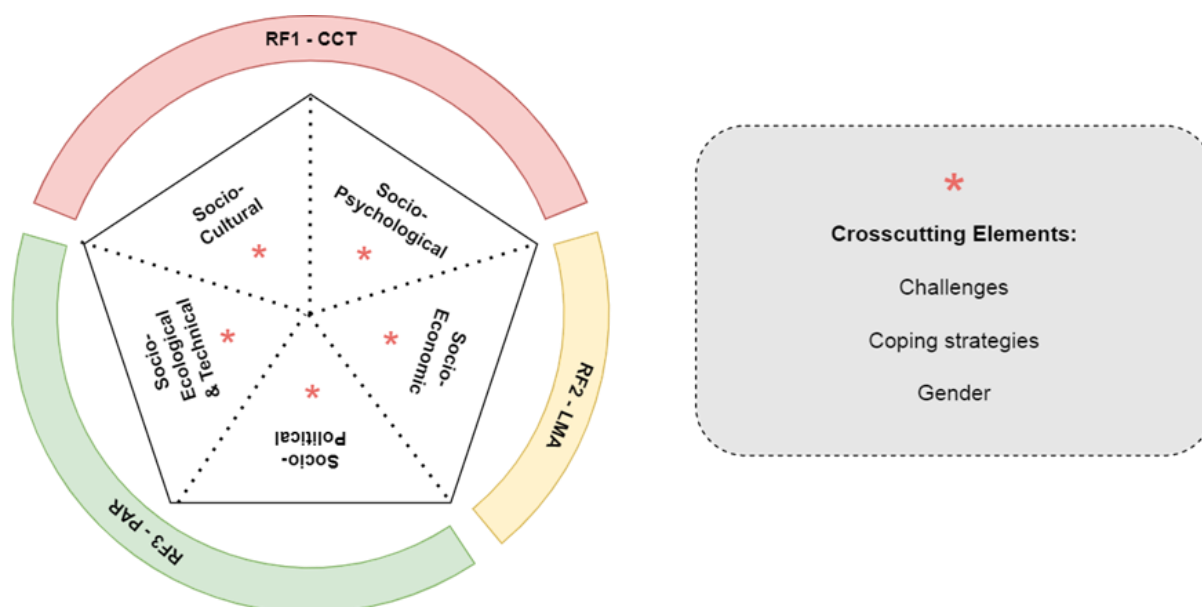
The Autonomous Community of Galicia, located in the northwest of the Iberian Peninsula, is the PAR of this case study. It includes the provinces of A Coruña, Lugo, Ourense and Pontevedra. It is bordered to the south by Portugal, to the east by the Spanish autonomous communities of Castilla y León and Asturias, to the west by the Atlantic Ocean and to the north by the Cantabrian Sea. In 2019, it had a population of 2.7 million inhabitants. It occupies a total area of 29,574 square kilometres. Galicia has partial self-government established on 16 March 1978 and reinforced by the Statute of Autonomy of Galicia, ratified on 28 April 1981. The *Xunta de Galicia* is a collective entity with executive and administrative powers. It is made up of the president, a vice-president and twelve councillors. Administrative power is largely delegated to dependent bodies.

## 2.2 Multidimensional Analytical Framework (MAF)

### 2.2.1 Overview of the MAF

To study the complex and multidimensional dynamics that characterise territorial processes in transition, ENTRANCES adopts theoretical and methodological pluralism—a perspective in which the adoption of different scientific approaches is not considered a problem but an advantage—as a research strategy and relies on a process of knowledge integration (Isgren et al., 2017). In this sense, the project yearned to adopt multiple approaches without losing their distinctive ontological, epistemic, theoretical and methodological characteristics (Olsson and Jerneck, 2018). In this sense, a Multidimensional Analytical Framework (MAF) has been adopted to develop the A Coruña case study as well as its twelve sister cases. The MAF is articulated into five components—each of which is supported by a specific set of concepts and methodology—and three cross-cutting elements, as shown in Figure 1. The figure also shows how the components relate to the research foci and units of analysis mentioned above.

**Figure 1 - Overview of the MAF: Research foci, components and crosscutting elements**



Source: Own elaboration

The following sub-sections will briefly describe the different components with their general approach, the concepts and the methodology adopted. The last two subsections will be devoted, respectively, to a synoptic table showing the main features of all components and to the cross-cutting elements.

### 2.2.2 Socio-cultural component

#### **Domain of enquiry**

The socio-cultural component is based on the assumption that a territory—even an informal one like the CCT—is a form of social organization. The component maps whether and how socio-cultural changes associated with globalisation, such as migration, technological progress, financial flows, climate change, etc., are causing "stresses" in the territorial organisation of the CCT and how they

are causing "stresses" in the territorial organisation of the CCT. In this sense, the component interprets stress as a change pressure for the territorial organization rather than psychological stress caused by socio-cultural factors. The component is based on a theory of the "stress-strain" element of social organizations (Bertrand, 1963), which is designed to analyse the dynamics of change and stability "in action" in a given organization, in our case, the CCT. The core of the theory is simple but insightful: when conflicting or contradictory needs, ideas or processes emerge, processes of disorganisation occur, which induce tensions in the organization and thus require some kind of adjustment. At the same time, the theory helps us to understand the stability (or resilience) of the territorial organization, as all organisations can tolerate some degree of stress. The component identifies the social forces that exert pressure at the structural level, the resistance to change-i.e., the conflicts or tensions that are generated in response-as well as the dynamics of change and stability in the territorial organization.

### **Concepts**

**Stress-strains** The theory is based on the articulation of the "stress-strain" pair. Stress is an inherent element of the social structure in a given institutional or organisational setting, which cannot be observed per se but manifests itself in "strains" of different kinds, such as conflicts, tensions, ambivalences, etc. Therefore, the "strains" can be interpreted as the manifestation of the stress in action at the structural level.

**Strain Situation** The "strain situation" is the operational concept adopted to identify and study on an empirical basis the stress-strain element in the CCT. Three main types of strain situations have been considered: situations of conflicts or disputes (both within and outside the territory), situations of impasses or contradictions and situations of dependence or uncertainties. Strain situations are therefore the unit of observation for this component.

**Stress vector** A stress vector (or stressor) can be defined as a social process that triggers stress in a territorial organisation. Stress vectors vary in a wide range of characteristics: by their origins, which can be both internal and external; by their intensity, as some pressures for change may be stronger than others; by their duration, as some stresses can be temporary or contingent while others may be long-lasting in society; and finally, by their direction, as each stress vector pushes the territory in a certain direction of change.

**Change, resistance to change and ambivalence** The dynamics of change, resistance to change and ambivalence in the CCT are described along four different dimensions of change: *territorial trajectory*, analysing continuities or ruptures; *territorial boundaries*, analysing territorial distinctiveness or alignments; *territorial governance*, analysing endogenous or exogenous governance; and *territorial symbols*, analysing both territorial stigma and territorial myths.

### **Methodology**

The stress-strain analysis was based on a focus group mapping (or participatory mapping) of strain situations in the CCT. The focus group was composed of local key informants who revealed their local knowledge of strain situations generated by a range of factors related to globalisation. The collected data was transcribed and processed into a coherent set of strain situations. An analysis of all the mapped strain situations allowed us to identify stress vectors, recurrent strains and change-stability dynamics that characterise the CCT.

### 2.2.3 Socio-psychological component

#### **Domain of enquiry**

The socio-psychological component studies the socio-psychological impacts of the closure of coal mines and carbon-intensive industrial units, i.e., the decarbonisation process, on the lives of individuals living in the CCT. The component moves under the assumption that the economic, social and political uncertainties caused by the closure of mines and coal-based industrial units can be a strong source of stress, uncertainty and internal conflicts for the local population, as it not only constitutes an existential threat to their way of life and their main source of livelihood but can also lead to an unsatisfactory relationship with the territory. The component investigates how place attachment is threatened by the stress, uncertainties and deprivation induced by the decarbonisation process and what the main coping strategies adopted by the citizens living in the different CCTs are.

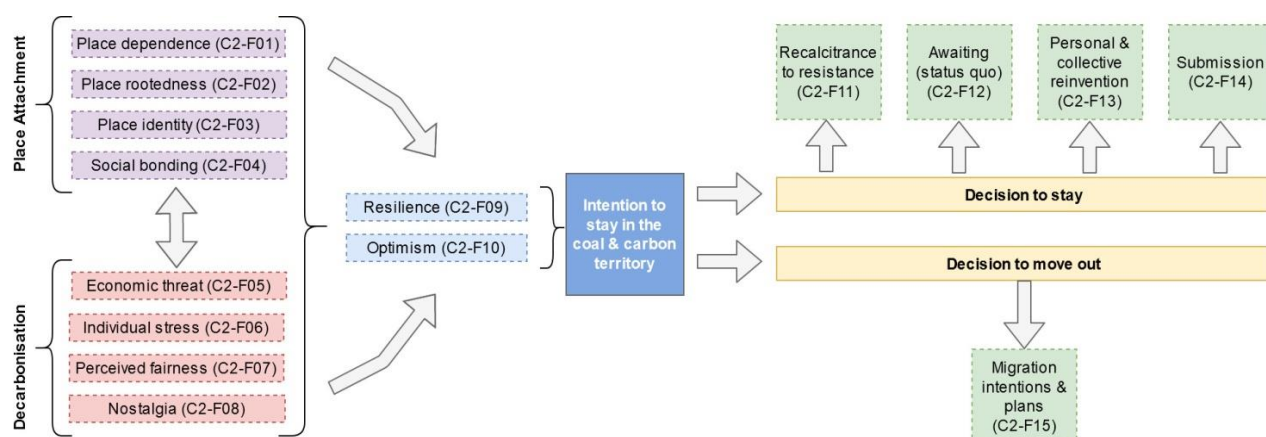
#### **Concepts**

*Place attachment.* The concept of “place attachment” has been used by scholars to understand the bonds that humans share with the physical environment. Leveraging on an integrated model of place attachment (Raymond et al. 2010), the component articulates place attachment in four dimensions: a) place dependence, reflecting the functional dimension; b) place rootedness, reflecting the cognitive dimension; c) place identity, reflecting the symbolic dimension; and d) social bondage, reflecting the emotional dimension. *Resilience.* The term “resilience”, in psychology, refers to positive adaptation in the face of stress or trauma (Luthar, Cicchetti and Becker, 2000). In the socio-psychological component, the study of resilience is used to achieve a more comprehensive understanding of the responses adopted by individuals to the challenges faced by the citizens more directly exposed to decarbonisation in the coal and carbon-intensive regions in transition. *EVLN approach.* The possible copying strategies of citizens are identified in this component based on the “Exit, Voice, Loyalty, Neglect” (EVLN) theory, initially proposed by Hirschman (1970) to study responses to decline in firms, organisations and states (EVL theory). The theory affirms that when dissatisfaction is experienced in a relation—in our case, in territorial belonging—there are a few possible and interrelated coping strategies from the individuals. The aforementioned concepts have been organised into a single model composed of several factors, organised into different areas, marked with different colours in Figure 2. Starting on the left, Place Attachment and Decarbonisation factors reflect how the two joint processes of deterritorialisation and de-carbonisation are being perceived by the citizens living in the CCTs. On the opposite side of the figure are the outcomes, i.e., the dependent variables, which the model tries to explain. At the centre, Resilience and Optimism act as “moderators” as individuals with high resilience and optimism are more able to cope positively with decarbonisation-induced stresses.

#### **Methodology**

The socio-psychological component was surveyed using a structured self-report questionnaire consisting of 90 items representing 17 socio-psychological constructs (i.e. the different factors of the above-mentioned model). Most of these items and latent constructs come from other studies, where different researchers have applied and tested them in different contexts. All items have been assessed by the respondent using scales. The survey was administered to residents of the CCTs using a stratified sampling procedure. A quantitative analysis of the survey data is carried out to study different factors related to this study.

Figure 2 - Overview of the factors in the socio-psychological model



Source: Own elaboration

## 2.2.4 Socio-economic component

### Domain of enquiry

The socio-economic component focuses on structural change in the economy, i.e. the reallocation of economic activity between different economic sectors (Herrendorf, et al., 2014) and regions. Structural change can lead to a change in the economic, financial and demographic composition of a region. Therefore, the component focuses on a descriptive analysis of technological progress, demography, economic inequality, employment and economic activity based on various data sources over the last two decades. The socio-economic component focuses on the LMA but also relies on the other units of analysis for reference and comparison.

### Concepts

Ten different factors are taken into account in the socio-economic component. All factors are investigated mainly from a quantitative perspective. These factors are Demographics (C4-F01), Depletion of coal reserves (C4-F02), Alternative energy sources (C4-F03), Direct employment and production (C4-F04), Indirect and induced employment and production (C4-F05), Capital stock (C4-F06), Economic inequality (C4-F07), Energy security (C4-F08), Technological progress (C4-09) and Migration (C4-10).

### Methodology

For the socio-economic component, a comprehensive set of data was collected from national and multinational sources, mainly from national statistical offices and Eurostat.

## 2.2.5 Socio-political component

### Domain of enquiry

The socio-political component analyses the narrative battles for the interpretation of decarbonisation and energy transition in the PAR of the case study. The component identifies which actors are forming different constituencies: the constituency designing the transition, the constituency opposing the transition, or the constituency opposing the transition. Through the analysis of the narratives of these actors, the component investigates how the constituencies understand the benefits and losses of the decarbonisation process. Finally, the component shows the dynamics of inclusion and exclusion resulting from technological change in the region.



### **Concepts**

The socio-political component is based on the theory of technological dramas (Pfaffenberger, 1992). This approach understands technological changes, such as decarbonisation, as technological dramas, i.e. a narrative battle between different actors to determine the meaning and implications of technology. A technological drama is a discourse of technological statements and counter-statements in which there are three recognisable processes: i) technological regularisation; ii) technological adjustment; iii) technological reconstitution. The three processes can be described as follows: 1) through technological regularisation, a design constituency attempts to impose change, i.e. to appropriate the technological process so that its characteristics implicitly embody the political objective of altering the power relationship; 2) through technological adjustment, the impact constituency, people who lose out when a new technology is introduced or when a technological change occurs, engage in strategies that attempt to compensate for the loss of social prestige or social power; and 3) through technological reconstitution, the impact constituency attempts to reverse the meaning of the imposed technology through regularisation. In contrast to technological adjustment strategies, strategies related to technological reconstitution attack the rationale of technical regularisation and activate a self-conscious “revolutionary” ideology aimed at producing a symbolic reversal and anti-signification of the process of technological regularisation.

### **Methodology**

The socio-political component is based on a semantic analysis of public statements and counter-statements of different social actors on energy transition and coal phase-out. The analysis was carried out at the PAR level and focused on the statements and counter-statements of the main regional actors in the public debate. A variety of sources were included, such as political statements, national and regional newspapers, key strategy documents, etc. Local newspapers were also included as a way of accessing the views of emerging and informal actors. A set of 135 documents was selected for analysis based on a set of keywords that delimited the local discursive scope of the CET. Statements and counter-statements of all the different actors present in the public debate have been coded using a coding grid and with the help of MAXQDA software. Similar, recurrent and correlated statements have been brought together to identify the main emerging narratives. The analysis of the proponents of the narratives has allowed us to identify constituencies as groups of actors sharing the same narrative.

## **2.2.6 Socio-ecological and technical component**

### **Domain of enquiry**

The socio-ecological component provides an overview of the capacity available in the case study region to shape its decarbonisation trajectory. The focus on transformative capacity allows us to discern to what extent a region is able to deviate from its current (carbon-intensive) trajectory towards sustainable outcomes. In this context, transformative capacity is understood as an evolving collective ability to conceive, prepare, initiate and implement a deviational shift towards sustainability within and across the multiple complex systems that constitute the regional or urban area undergoing a CET. As a systemic capability, it is not attributable to a single actor but is the result of the interactions and orientations of multiple actors in the regional or urban economic development system involved in shaping its decarbonisation pathways. Therefore, diagnosing transformative capacities improves knowledge of the key capacities that hinder or facilitate intentional transformation, ultimately allowing them to be addressed as part of capacity development activities.

## Concepts

Transformative capacity is strongly influenced by the governance of the regional decarbonisation or CET in question. Three components of governance and agency are critical for a regional development apparatus to foster system transformability: inclusivity and multiplicity of governance arrangements (C1); polycentric and socially embedded transformational leadership (C2); and empowerment and autonomy of relevant communities of practise (C3). These elements are preconditions for the transformability of a system: there must be connectivity and responsiveness embedded in governance; effective leadership capable of bringing people together around a vision and actors empowered to experiment and innovate. These three attributes need to be developed by stakeholders in capacity development processes to enhance their transformative potential, including improving understanding of the systems they are part of (C4), engaging in participatory visioning and alternative design scenarios (C5), experimenting with novel solutions to societal needs (C6) and ensuring that these innovations can be mainstreamed (C7). Ideally, this can be seen as a learning loop, where understanding of the system helps inform visions and pathways, which in turn guide experimentation, with successful innovations being incorporated and a better understanding of the system as a result of this process. These processes should feed back into governance through social learning (C8) and effective participation of actors at different scales (C9) and levels of agency (C10).<sup>2</sup>

## Methodology

These components were assessed through mixed quantitative and qualitative interviews with various stakeholders involved in the CET. The aim was to obtain and contrast stakeholders' different assessments of transformative capacities. A diverse set of stakeholders were interviewed, representing public, private, third-party and civil society actors. Respondents were asked to assess statements corresponding to each measure of transformative capacity according to whether and how much they agreed with or disagreed with the statements.<sup>3</sup> They were then asked to elaborate on their answers in open follow-up questions, which were subsequently transcribed, coded and analysed.

### 2.2.7 Synopsis of the five components of the MAF

The characteristics of the conceptual strand of the MAF are summarised in [Table 1](#).

Table 1 - Synoptic table of the five components of the MAF

Component	Research focus	Unit of analysis	Domain of enquiry	Unit of observation	Methodology
<b>Socio-Cultural</b>	Territorial change	Coal & Carbon territory	Stress strains in the territorial organisation	Strain Situations	Focus group mapping
<b>Socio-Psychological</b>	Territorial change	Coal & Carbon territory	Place attachment, Decarbonisation, Resilience and Coping	Citizens	Online/ Telephone Survey
<b>Socio-Economic</b>	Structural change	Labour-Market Area	Change in the socio-economic structure	The area as a whole	Quantitative data collection
<b>Socio-Political</b>	The Clean Energy Transition	Political Administrative Region	Narrative battles to determine the meaning and "appropriation" of the energy transition	Statements & Counterstatements	Text research

<sup>2</sup> For full elaboration of transformative capacity and its components, please refer to Wolfram (2016, 2018, 2019).

<sup>3</sup> Possible responses were: 1 – completely disagree; 2 – somewhat disagree; 3 – neither agree nor disagree; 4 – somewhat agree; 5 – fully agree; don't know.



Component	Research focus	Unit of analysis	Domain of enquiry	Unit of observation	Methodology
<b>Socio-Ecological &amp; Technical</b>	The Clean Energy Transition	Political Administrative Region	capacity available in the region to shape its decarbonisation pathway	Multilevel System interaction	Semi-structured interviews

Source: Own Elaboration

## 2.2.8 Cross-cutting elements

The three cross-cutting elements of the MAF, i.e., challenges, coping strategies and gender, are nurtured and can be better understood in light of each component of the MAF.

**Challenge:** In the case study we focus on the challenges faced by CCT, i.e., the challenges for CCT from the perspective of CCT. A challenge can be defined as consisting of two elements (i) an existing situation (as understood by the territory); (ii) the specific desired outcome(s) of a process that aims to change that existing situation. It should be borne in mind that a challenge is a social construct since the meaning of the current situation only exists in a given social context (i) and that the outcome is desirable by the territory itself (ii). Depending on the state of awareness of the territory, the degree of clarity and definition of the challenges can vary greatly. In this sense, depending on the case, the territorial challenge(s) may be rather vague or well structured (e.g. in the latter case, also including indicators to assess success in achieving the challenge).

**Coping strategy:** A coping strategy is defined here as the strategy adopted to successfully address a territorial challenge. For each challenge, there may be several coping strategies. Depending on the case, two or more coping strategies may be coordinated with each other, but also in contrast and competition with each other. A coping strategy can be articulated in (i) a vision or orientation for the territory; (ii) a set of actions undertaken to fulfil the vision and (iii) obstacles faced.

**Gender dimension:** The gender dimension highlights how a challenge may affect men and women differently and how gender differences may be relevant to the coping strategies adopted.

## 2.3 Activities

### 2.3.1 Desk research

The case study began with a desk research activity. The desk research aimed to (i) delimit the case study into its three units of analysis (CCT, PAR, LMA); (ii) collect data and background information on the region; (iii) collect the information necessary for the implementation of the five components (including, among other things, also a stakeholder analysis at PAR level). The desk research allowed for the analysis of a wide range of sources, such as documents and reports, available data sets, previous research and studies, policy documents and others. In total, a set of 160 documents has been analysed in the case of A Coruña. The results of the desk research have been compiled in a state of the art report.

### 2.3.2 Focus group (Socio-cultural component)

To collect empirical data on the socio-cultural component, a focus group was held at the University of A Coruña on 23 and 24 November 2021. The focus group included 9 key informants from the CCT. Of these, 2 were women and 7 were men (Table 2Table 2). The participants comprised the three types of key informants envisaged by the method, i.e. community leaders, memory keepers

and knowledge keepers. The focus group development included the following activities (i) Selection and recruitment of participants including identifying the desired profiles for each of the above key informant types, exchanges with local contact persons to identify relevant candidates, conducting web-based research to identify good candidates and, obviously, direct contact with all selected candidates. (ii) Preparation for the focus groups included a wide range of activities, such as booking the venue, printing materials, communicating with participants and rehearsing the research team. (iii) Conducting the focus group itself. (iv) Transcribing and producing the results of the focus group. This also involved complementary desk research to complete missing information or to make explicit some implicit or unclear references made by the focus group participants. All the data collected have been processed in the brief report of the socio-cultural component.

**Table 2 - List and features of focus group participants**

Code	Profile	Com Leader	Knowl Keep	Memory Keep	Gender
P01	Municipal Council representative	X			F
P02	President of Local business association	X	X		M
P03	Local community worker		X		M
P04	Trade union representative	X		X	M
P05	Director of training centre			X	M
P06	Former trade union leader	X	X	X	M
P07	Former Power Plant Worker		X	X	M
P08	Researcher		X		F
P09	Leader of a citizen committee	X			M

Source: Own elaboration

### 2.3.3 Survey Data Collection (Socio-psychological component)

In the case of A Coruña, a professional survey company, Edesga, was contracted to conduct the survey. The company used telephone numbers to contact respondents and conduct computer-assisted telephone interviews (**SurveyMonkey**). The survey was conducted between September and October 2021. In terms of geographical delimitation, the survey area consisted of the central area, which includes the municipalities of As Pontes (30%), Ferrol (20%) and Narón (10%) and the outer part, which contains the surrounding municipalities (the remaining 40%). Edesga used the postcodes associated with the telephone numbers to control the spatial distribution of the total 506 respondents. The survey was conducted with the help of a structured questionnaire with 17 constructs and 90 items (see appendix 9.3). Most of these items and latent constructs are taken from other studies, where different researchers have applied and tested them in different contexts. The study region of A Coruña has two official languages: Spanish (the national language) and Galician (the official language of Galicia). Therefore, the survey questionnaire was translated into both languages. For the data collection, Edesga used the sequential selection process, as it was much faster and more efficient in taking advantage of the limited number of telephones available in the municipality of As Pontes. To carry out the work, public telephone databases and pay-as-you-go databases were used. All persons in these databases have at some point given their consent for their telephone number to be used for these purposes. The sample was stratified by sex, age, education, marital status, occupation, family structure, nationality and length of stay in the region. The CATI (Computer Assisted Telephone Interviewing) method was used for data collection, whereby the fieldworkers contacted the individuals in the sample by telephone and asked them the

corresponding questions, as appropriate. The answers were automatically recorded in a computer application. The company delivered the results obtained in a purified database created for this purpose. The sample size is 506 complete cases. The processed data, as well as a detailed description of the activities and approaches used, were collected in a short report on the socio-psychological component.

### 2.3.4 Socio-economic data collection (Socio-economic component)

For the socio-economic component, extensive data collection has been carried out. Data collection was mainly based on national sources, such as INE in Spain and Eurostat. However, data collection was also carried out by collecting data from individual industries active in the CCTs, such as Endesa. Data collection covered the period from 2000 to 2021, focusing on (i) data on fossil fuel extraction and carbon-intensive industries; (ii) demographic data; (iii) economic data; (iv) public finance data. Data were collected for the three units of analysis, CCT, PAR and LMA, as well as for the higher levels (NUTS2 region), country and European level. Data collection depended on the data available in the national and European datasets. In the case of A Coruña, demographic data are available at the level of the CCT, however, most of the socio-economic variables are only available at the level of LMA of A Coruña and the PAR of Galicia.

### 2.3.5 Text research (Socio-political component)

For the case study of A Coruña, we have collected several texts representing the perspectives of different actors on the implementation of decarbonisation policies in Spain, with special reference to the case of A Coruña. In total, 135 texts have been collected for textual analysis (Table 3). For the selection of the texts, we use Internet search engines as the main source of data. Relevant text documents are identified by searching with the help of keywords (for more information see appendix 9.5). Other relevant documents related to government policies are downloaded from government portals. Similarly, several reports on the environmental impact of the mines and the power plant are downloaded from the websites of important NGOs, such as *Greenpeace*. For the analysis of the textual material, we have used the deductive coding technique, which is also called concept-based coding. It means that we started with a predefined set of codes and then assigned these codes to the qualitative data in the texts. After the first level of coding, sub-codes were made to code the text related to local issues.

**Table 3 - Text material of different categories**

Text category	# of texts
Policy documents published by the National and regional Governments	16
Press releases and policy documents published by Endesa and other business groups.	22
Policy documents published by the European Commission	11
Press releases and PR campaigns launched by the Regional and National Political Parties.	4
Press releases and flyers published by the Trade Unions.	14
Press releases and PR campaigns launched by the Environmental Groups.	15
News articles on the decarbonisation process in As Pontes and other parts of Spain.	34
Policy documents published by different financial institutions.	8
Interviews of key stakeholders published in newspapers	11

<b>Total number of documents</b>	<b>135</b>
----------------------------------	------------

*Source: Strategies and official documents, Programmes of the political parties, policy papers and statements of interest organisations, NGOs, and Trade Unions, The media.*

In the A Coruña case study, we have focused on the events related to the decarbonisation process that occurred during the last decade (January 2011- December 2021). It includes the period in which the Spanish Government decided to eliminate all uncompetitive coal mines (2011), inaugurated the As Pontes freshwater lake by refilling the coal mine shaft water (2012), signed the Paris agreement (2016), decided to close all coal and nuclear thermal power plants (2018) and accepted the proposal for the decommissioning of the La Central presented by ENDESA (2019). In Coruña, the decarbonisation process started in the late 1990s. The As Pontes coal mines were closed in 2006 and the closure of the La Central thermal power plant was planned for 2021, but due to the energy crisis and the increase in gas prices, the Spanish government allowed Endesa to operate two units of the thermal power plant until March 2022. During the analysis of the texts, we made sure that the whole spectrum of stakeholders was represented in the 135 selected texts. For the analysis, we used a text software package MAXQDA. We worked with deductive (concept-based) coding, which means that we started with a predefined set of codes and then assigned these codes to the data in the texts. These codes came from the factors identified in the initial stages of the research. We then developed a coding framework that represents the structure of the themes. Since the height of the debate began with the discussion of the mine closure in 2016, we focused primarily on the period 2016-2021.

### 2.3.6 Semi-structured interviews (socio-ecological and technical component)

The socio-ecological and technical component was based on 20 semi-structured interviews with key regional stakeholders (Table 4). Respondents were selected using a purposive sampling technique. All respondents represent different interest groups. Most of the respondents belong to the municipality of As Pontes and neighbouring municipalities in the province of A Coruña. All interviews were conducted during the period between December 2021 and February 2022. All interviews were conducted in the local languages, i.e. Spanish or Galician.

**Table 4 - Stakeholders interviewed by sector and type**

Sector / Type	Stakeholders	Respondents
Public Sector A1	Environmental policy actor	1
Public Sector A2	Economic and Industrial policy actor	2
Public Sector A3	Actors representing different scales (local, regional, national/EU)	4
Private Sector B1	Key industry facing decarbonisation / other big players	3
Private Sector B2	SMEs and their representations (skilled crafts)	2
Civil Society C1	Social	2
Civil Society C2	Ecological	1
Third Sector D1	Trade Unions	1
Third Sector D2	NGOs, energy and environment (national/international)	1
Third Sector D3	Scientific and research, social and/or technical (Energy Transition)	1
Third Sector D4	Academics	2
<b>Total number of stakeholders interviewed</b>		<b>20</b>

*Source: Own elaboration.*

The duration of the interviews varied between 40 and 60 minutes. Most of the interviews were conducted online with the help of zoom-in software due to COVID-19 restrictions. MAXQDA

qualitative analysis software was used to analyse the interviews. All interviews were audio-recorded (MP4) and transcribed into text files and stored in a central computer in the socio-psychology laboratory of the Department of Education at the University of Coruña. All interviews were conducted with an open-ended questionnaire, which included quantitative and qualitative questions on socio-technical and socio-ecological aspects of the ongoing energy transition (for more information see appendix 9.6). Respondents were asked to evaluate the statements corresponding to each measure of transformative capacity in terms of whether they agreed or disagreed with them and to what extent. The aim was to elicit and contrast stakeholders' differential assessments of transformational capabilities. The processed data and results were transcribed in the short report on the socio-ecological and technical components.

### 2.3.7 Data reporting, interpretation and the case study report

The extensive set of research activities carried out for the development of the case study involved extensive reporting activity. The reporting activity is summarised in Table 5, which reports the main results in terms of data processed within the case study.

Table 5 - Data reporting in the A Coruña case study

Name	Type	Description	Size	Delivery date
State-of-the-art report	Internal Report	Results of the desk research	37 pages	14-06-2021
Socio-Economic data	Data File	Results of the socio-economic data collection	n.a.	
Stakeholder Grid	Data File	Results of the desk research	n.a.	
Socio-Psychological Short Report	Internal Report	The procedure applied and the overall results of the online survey are described there	17 pages	19-03-2022
Survey data	Data File	Includes the survey data	n.a.	
Socio-Political Short Report	Internal report	Includes a description of the procedure and of the results of the text research	56 pages	15-04-2022
Socio-Cultural Short Report	Internal report	Includes the processed data collected with the focus group	42 pages	30-04-2022
Socio-Ecological and Technical Report	Internal report	Includes a description of the procedure and of the results of the semi-structured interviews	55 pages	31-05-2022
Transformative capacity Dataset	Data File	Includes the quantitative results of the semi-structured interviews	n.a.	

Source: Own elaboration.

The case study team then interpreted all the data collected using two complementary approaches: in light of all other components, and of the research team's holistic understanding of the case. The results of this interpretation are set out in the following paragraphs.

# CHAPTER 3

---

## ANALYSIS OF THE COAL AND CARBON TERRITORY



### 3 Analysis of the Coal and Carbon Territory

#### 3.1 Overview of the CCT region

##### 3.1.1 Historical development

Six phases can be identified in the history of the CCT of As Pontes. These phases are the following:

- **Post-war period (from 1940 to 1970):** As Pontes experienced its first industrial boom in the 1940s with the opening of a small coal mine for electricity generation and the construction of the state-owned fertiliser factory. This phase marked the beginning of the transformation of As Pontes from a rural area to a large industrial complex.
- **Coal boom (from 1970 to 1990):** In the 1970s, As Pontes experienced a second and greater boom when another state-owned company started the construction of the largest coal-fired power station in Spain in As Pontes. This plant started operating in the mid-1970s and, with an installed capacity of more than 1400 MW, became the largest energy supplier in the region. In 1982, it burned 14 million tonnes of lignite, which represented half of all the coal burned in Spain that year.
- **Restructuring of the coal industry (1990 to 2007):** In As Pontes, the first phase of decarbonisation started in the 1990s. In the early 1990s, two things happened that affected mining and electricity generation in As Pontes: the first was a European Community Directive requiring a 40% reduction in Sulphur Dioxide (SO<sub>2</sub>) emissions; and the second was the first signs of the end of the coal deposit, which led ENDESA to reflect on how to extend the life of the plant, taking into account the good condition of the equipment, the commitment to work among the labour force and the good economic results. Thus, the power plant, which was supplied by the adjacent coal mine, was adapted in the 1993-1996 period, to consume a new fuel, obtained from a mixture of local lignite and imported coal with low sulphur content. This imported coal was to be transported from the inland port of Ferrol to As Pontes by lorry. The Ferrol-As Pontes motorway and the infrastructure around the port of Ferrol were created to facilitate this change. This transformation reduced the amount of coal extracted from the mine at an annual rate of about 6 Mt. This decline in coal extraction resulted in a large number of lay-offs and the disappearance of jobs in the mining sector. It affected a large number of miners who were offered early retirements and financial benefits to calm the protests (Perez-Sindin and Van Assche 2020, Perez-Sindin 2015).
- **Final closure of the coal mines and recovery of the territory (2007 to 2012):** Mining remained one of the most important economic activities in As Pontes until 2007. According to one estimate, during the last five decades, the company extracted more than 269 million tonnes of lignite to feed the power plant. It created a surface footprint of 3800 hectares. After three decades of production and two decades of economic boom, lignite mining at the As Pontes opencast mine declined sharply in the late 1990s due to cheaper coal from Indonesia, which pushed the region into an economic depression. The mine was closed in December 2007. However, it left a hole of 900 million cubic metres, with a maximum depth of 230 metres, which was subsequently transformed into a freshwater lake with a surface area of



865 hectares (Lopez and Blanchette 2020). The mine waste deposits are also transformed into natural parks, where several plans to rehabilitate the ecosystem are underway.

- **Phase-out of coal-fired power plants (from 2012 to 2019):** The profound changes in market conditions, due to the increase in the price of CO<sub>2</sub> allowances and the significant fall in the price of gas, have led to thermal power plants suffering from a significant lack of competitiveness to meet market demand, with no prospect of improvement. In addition, Spain's signing of the Paris Agreement in 2016 paved the way for the total closure of thermal power plants in Spain to meet climate targets.
- **The closure of the thermal power plant, La Central (2019 onwards):** In 2019, Endesa presented a plan for the decommissioning of the As Pontes plant. The company plans to prioritise the recruitment of local staff for the decommissioning work. It has planned to offer additional training programmes for people who will work in the decommissioning process to boost local employment. In addition, it will encourage the purchase of materials from local suppliers that promote green industrial development in the area for the implementation of its new renewable projects. The decommissioning process of the As Pontes facility (which has four generating units) is expected to take around four years, generating around 130 direct jobs and 70 additional jobs during peak work phases. The final closure of the thermal power plant was scheduled for June 2021. However, due to changes in the price of natural gas and the high electricity demand, the decommissioning of the thermal power plant was postponed to June 2022. Recently, due to the disturbance in the supply of Russian natural gas to the EU, caused by the Ukraine-Russia conflict, the decommissioning of the thermal power plant has been further postponed for another six months and still there is a lot of uncertainty about the closure of thermal power plant in 2022.

### 3.1.2 Ecological and environmental situation

#### **Land degradation**

Large-scale mining activities, which started in the 1940s and closed in 2007, caused soil degradation in As Pontes and the surrounding regions. During the mining period, 261.3 million tons of lignite and 697.3 million cubic meters of clay sediments were extracted from the tertiary basin. The mining activity involved the creation of an outer heap of 720 cubic meters, an inner heap of 93 cubic meters and a final void of 12 square kilometer. These tailings dumps are a source of pollution, as they have accumulated toxic waste for decades from the exploitation of the coal mine from which the As Pontes thermal power plant was fed. Recently, attempts are being made to restore the waste dumps by creating a layer of healthy soil and planting trees to prevent soil erosion and the escape of toxic materials from the accumulated waste.

#### **Water Pollution**

The extraction and burning of coal at the As Pontes thermal power plant also contributed to the contamination of natural water resources with heavy metals, such as mercury and lead. These heavy metals have very harmful consequences for the local ecosystem and human health. Environmentalists warn of the harmful effects of the presence of highly toxic metals such as mercury, iron and aluminium in the water of the Eume river, which is the main source of fresh water in the region. Between August and November 2021, analyses of the water of the Eume detected high levels (above the maximum levels established by safety regulations) of toxic metals in the water. The Xunta

de Galicia fined Endesa more than 1.8 million euros for polluting the river, but the environmental cost is very high.

### **Air Pollution**

The La Central thermal power plant in As Pontes was one of the main emitters of carbon dioxide in Spain. In 2004, it emitted 10.7 million tons of carbon dioxide into the atmosphere, an amount equivalent to that produced by 2.4 million cars. Ramón Varela, a member of the main local environmental group, Adega, has calculated, with data from the year 2000, that the Galician thermal power stations (especially in As Pontes, owned by Endesa and in Meirama, owned by Unión Fenosa), emit 30% of all the sulfur dioxide emitted in Spain, which in turn is responsible for the acid rain in the neighbouring areas. For this reason, As Pontes has been on the ecologists' black lists for years, together with the large European coal-fired power plants.

## **3.2 Socio-cultural component**

The socio-cultural component focuses on territorial stress induced by globalisation (appendix 9.2). Since territorial stress is not directly observable, a focus group was conducted to map stress situations (i.e. conflicts, impasses, uncertainties, etc.) and related impacts in the labour market area of A Coruña. Furthermore, the analysis elaborated a territorial anamnesis and an overview of current territorial interpretations.

### **3.2.1 Summary of results**

#### **List of identified strain situations**

A total of 51 strain situations were identified in the focus group. Table 6 provides a list of the strain situations and their characteristics. The table summarises the mapped strain situations, classifying each of them in relation to (a) Areas of change (different scapes as mentioned by Appadurai 1996, see appendix 9.2); (b) Strain situation; (c) Type of strain situation (conflict, empassé or uncertainty) (d) Related stress factor; (e) Position in space; and (f) Position in time. The distribution of the strain situations across these different classes and categories will be discussed in the following sub-sections, while a brief description of each strain situation is given in the following section.

**Table 6 - List of the strain situations identified in the A Coruña case study**

No.	Area (Scapes)	Strain Situation	Type	Factor	Geography	Time
1.	Financescapes	Stress due to first lignite extraction and the creation of the Calvo Sotelo fertilizer factory.	B	F09	As Pontes	1940
2.	Financescapes	Conflicts over expropriation and purchase of land by ENCASO	B	F09	As Pontes	1950
3.	Financescapes	Stress due to the creation of ENDESA's new mining-electric complex	B	F09	As Pontes and Region	1972
4.	Financescapes	Conflicts over purchase of land by ENDESA	B	F09	As Pontes and Region	1975
5.	Financescapes	Uncertainty over declining coal-mine production.	D	F13	As Pontes	1993
6.	Financescapes	Stress and uncertainty due to final closure of the mine.	D	F13	As Pontes and Ferrol Region	2007
7.	Financescapes	Dependence and uncertainty over the creation of Endesa's combined cycle plant.	D	F11	As Pontes and Ferrol Region	2008
8.	Financescapes	Disputes over the distribution of Miner's fund.	A	F10	As Pontes and Region	2006

9.	Financescapes	Disputes over the use of national subsidies.	D	F10	North of A Coruña. Galicia	2019
10.	Financescapes	Conflicts over new green energy investment projects.	B	F10	As Pontes, A Coruña and Lugo province	2019
11.	Financescapes	Uncertainty over power plant reopening and new coal purchase.	D	F10	As Pontes and Ferrol	2021
12.	Financescapes	Uncertainty about ENDESA's Futur-e Plan for reindustrialization of As Pontes.	D	F11	As Pontes and Region	2019
13.	Ethnoscapescapes	Stress caused by the immigration of workers to the fertilizer factory and mines in As Pontes and creation of new settlements (A Veiga).	B	F03	As Pontes and Region	1950
14.	Ethnoscapescapes	Stress caused by the immigration of workers to build La Térmica (A Fraga).	B	F03	As Pontes and Region	1970
15.	Ethnoscapescapes	Stress caused by the emigration of workers due to the closure of Calvo Sotelo factory.	A	F02	Other provinces	1972
16.	Ethnoscapescapes	Uncertainty of jobs and brain drain of young people.	D	F01	Provinces and countries	2000
17.	Ethnoscapescapes	Stress of emigration due to the scarcity of land in As Pontes	C	F02	As Pontes and other regions	2000
18.	Ethnoscapescapes	Uncertainty over mine closure and emigration	D	F02	Other counties and provinces	2007
19.	Ethnoscapescapes	Emigration in the face of labor and social uncertainty.	D	F01	As Pontes and Region. Galicia	2010
20.	Ethnoscapescapes	Stress over the return of people from Latin America and other regions	A	F05	As Pontes and other regions	2020
21.	Ethnoscapescapes	Contradictions over tourism investments.	C	F04	As Pontes	2020
22.	Mediascape	Stress due to environmental stigma.	B	F07	As Pontes and other regions	1972
23.	Mediascape	Stress caused by political disorganization and dislocation	B	F07	As Pontes and other region	1980
24.	Mediascape	Structural or regional inefficiency reinforce the territorial stigma	D	F07	As Pontes and Region	2006
25.	Mediascape	Nostalgic feelings about mining past	A	F08	As Pontes	2008
26.	Mediascape	The stigma of being Spain's most polluting power station.	B	F07	As Pontes	2000
27.	Mediascape	Conflict over tourism and new symbols	C	F07	As Pontes	2010
28.	Naturescape	Stress caused by architectural and soil modifications. As veigas	A	F20	As Pontes and Region	1940
29.	Naturescape	Disputes over new land and soil alteration.	B	F20	As Pontes and Region	1972
30.	Naturescape	Conflict due to the disappearance of land and architectural constructions of neighborhoods.	B	F20	As Pontes and Region	1975
31.	Naturescape	Conflicts due to restructuring and installation of green energy projects (wind, solar)	B	F20	As Pontes, A Coruña and Lugo prov.	2008
32.	Naturescape	Stress due to industrial desertification in As Pontes and increase in abandoned territory.	B	F20	As Pontes	2008
33.	Naturescape	Tension over environmental risk from excessive forest fires.	D	F18	As Pontes, A Coruña and Lugo prov.	2008
34.	Naturescape	Conflict over conversion of mine shaft into artificial freshwater lake	A	F20	As Pontes	2008
35.	Naturescape	Conflict over the waste management and creation of clay dumps (escombreras)	A	F20	As Pontes	1998

36.	Technoscape	Stress caused by the transformation of industries and production modes	B	F21	As Pontes	1950
37.	Technoscape	Stress caused by the introduction of new power generation technologies	B	F21	As Pontes	1972
38.	Technoscape	Stress caused by the Quito protocol and adaptation of power plant to reduce emission	B	F21	As Pontes	1993
39.	Technoscape	Uncertainties due to lack of connections in industrial complexes	D	F16	As Pontes and Region	2010
40.	Technoscape	Uncertainty over mine closures and plant adaptation to use natural gas.	D	F21	As Pontes	2008
41.	Technoscape	Stress due to loss of skills of highly skilled workers	A	F17	As Pontes and Region	2010
42.	Technoscape	Conflicts over the installation of green hydrogen projects and its consequences for the territory.	A	F21	As Pontes, A Coruña and Lugo prov.	2019
43.	Technoscape	Conflicts and contradictions for energy alternatives, including biomass.	A	F21	As Pontes	2020
44.	Technoscape	Uncertainty due to insufficient training of dismissed workers under Endesa's Futur-e Plan.	D	F16	As Pontes, A Coruña and Lugo prov.	2021
45.	Technoscape	Conflicts over the installation of renewable energy plants (wind and solar).	A	F21	As Pontes, A Coruña and Lugo prov.	2021
46.	Ideoscape	Stress due to identity transformation: From agrarian society to Industrial	A	F22	As Pontes and Region	1950
47.	Ideoscape	Tension caused by capitalist takeover	A	F22	As Pontes and Region	1970
48.	Ideoscape	Tension due to the class struggle between the company's workers and the local population.	C	F22	As Pontes and Region	1975
49.	Ideoscape	Stress caused by the increased culture of protests over mine worker layoffs and workers' rights	C	F14	As Pontes and Region	2008
50.	Ideoscape	Uncertainty due to green energy ideology (the installation of mega wind turbine parks and green hydrogen projects).	B	F15	A Coruña and neighboring Municipalities	2010
51.	Ideoscape	Uncertainties due to the installation of wind turbine parks and green hydrogen projects.	D	F15	A Coruña and neighboring Municipalities	2019

Sources: Own elaboration with Focus Group data, 22-23 November 2021.

In the region of A Coruña, the focus group has mapped out the four types of strain situations (Table 7). The most common type of strain situation is type B (exogenous conflict), which represents one-third of the total. It describes conflicts and disputes between the local community and external actors or between external actors. In Spain, the process of energy transition and decarbonisation, which is responsible for the closure of the As Pontes thermal power plant, is a top-down process. It results in the involvement of different actors from the national to the local level, which creates a space for conflicts between different actors on various issues, including the use of resources, the distribution of funds and local versus national interests. The second most common type of strain situation is type D (Dependence/Uncertainty), which describes uncertainties or dependence on decisions and choices made beyond the local community. It also demonstrates the effect of the top-down process, which limits the local community's contribution to decision-making and makes it dependent on national authorities, who are often more interested in national interests. In addition to

these conflicts mentioned above, there are also some type A strain situations, which include conflicts and disputes within the local community. These conflicts mainly concern the exploitation of local natural resources, land expropriation, changing local demographics and the distribution of funds from the national and European Commission. Finally, there are also some impasses and contradictions within the local community, which are referred to as type C strain situations. These strain situations reflect the heterogeneity of views on the use of national and EU funds and the implementation of policies at the local level.

**Table 7 - Strain situations across different types mapped in Sulcis**

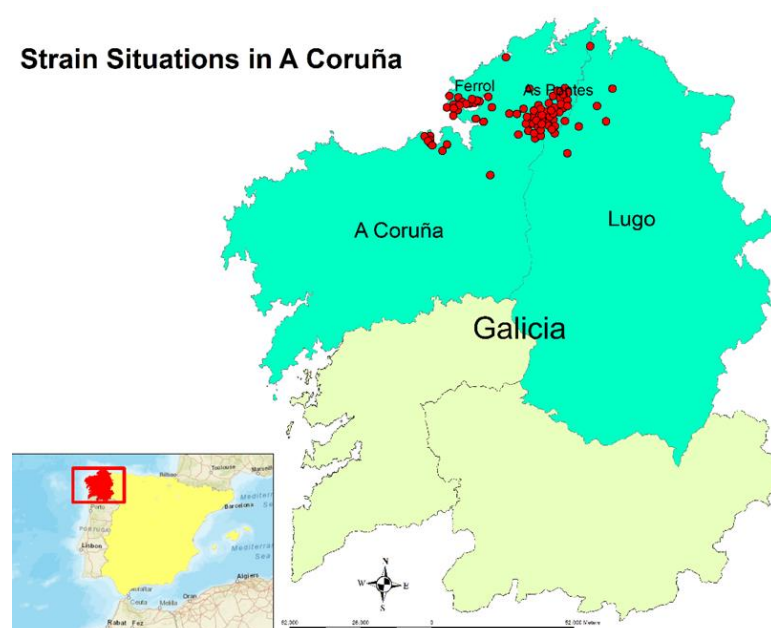
Type	Endogenous conflict (A)	Exogenous conflict (B)	Impasse/ contradiction (C)	Dependence/ Uncertainty (D)
N.	13	18	5	15
%	25.5	35.3	9.8	29.4

Source: Own elaboration with Focus Group data, 22-23 November 2021.

### **Distribution of the strain situation in the geographical map**

Of the 51 mapped strain situations, two-thirds are concentrated in the As Pontes CCT (Figure 3Bład! Nie można odnaleźć źródła odwołania.). It has the highest proportion of the population affected by the closure. The main restoration projects are also concentrated in this municipality and it is expected to receive a large share of the transition funds allocated for the restoration of the affected areas and to assist the affected population. The second largest concentration of strain situations is around the port city of Ferrol and A Coruña. The port of Ferrol had played an important role in supplying the imported coal to the plant. The truck unions of the regions are most affected due to the closure of the power plant. There are some strain situations in the north of the autonomous community of Galicia and in the neighbouring provinces of A Coruña due to the installation of big green energy projects, which are disturbing the natural environment in these areas. And finally, some strain situations do not have fixed geographical limits.

**Figure 3 - The spatial distribution of the strain situations in the geographical map**



Sources: Own elaboration with Focus Group data, 22-23 November 2021.



### ***Distribution of the strain situations in the time map***

All the strain situations identified in the focus group are distributed over the time scale from 1940 to 2022 (Table 8). One-third of the total number of strain situations is concentrated in the fifth phase (2000-2010), which has seen the closure of coal mines and the restoration of mine shafts and landfills. The second largest concentration of strain situations is in the sixth phase (2010-2022), which has seen the acceleration of the decarbonisation process and the closure of the power plant. The third largest concentration of strain situations is in the third phase (1970-1990), which has seen the acceleration of coal mining activities and the installation of the largest power plant in Spain at As Pontes. The period before 1970 and between 1990 and 2000 have seen very few stressful situations in the LMA of A Coruña.

**Table 8 - List of strain situation by time**

Years	Phase	# of Strain Situation	Duration (years)
1940-1950	1. Postwar period	2	10
1950-1970	2. First Industrialization phase	4	20
1970 -1990	3. Installation of power plants and acceleration of coal extraction.	11	20
1990 -2000	4. Decline in local coal extraction	3	10
2000 - 2010	5. The closure of coal mine and restoration of mine shafts and landfills	16	10
2010 - 2022	6. The closure of power plant <i>La Central</i>	15	12

Sources: Own elaboration with Focus Group data, 22-23 November 2021.

### **3.2.2 Interpretation**

#### ***Stress vectors***

For each of the factors considered in the research - which identifies a class of possible stressors in the territory -, a set of specific stress vectors - i.e. a real change process producing stress in the territory - can be identified by analyzing the mapped strain situations. While the strain situations have been represented using the strain symbol (e.g. ≈01), the stress vectors will be coded in progressive order and marked using another special symbol (↗01). Some of the main strain situations and stress vectors in the A Coruña region are:

- **Top-down development projects.** The participatory mapping shows that the 'Top-down development projects are the most important stress factor in the A Coruña region. Some of the stress vectors identified with the top-down development projects are ↗01: The initial investments made by the central government in the region to exploit the lignite deposits and the creation of the Calvo Sotelo fertilizer factory (≈01), leading to conflicts over expropriation and purchase of land (≈02). ↗02: Large public investment and the increase in real estate prices, related to the stress caused by the creation of ENDESA's new mining-electric complex (≈03) and conflicts over the purchase of land by ENDESA (≈04).
- **Public transfers and subsidies.** The use and misuse of public transfers and subsidies are also a major source of stress in the A Coruña region. ↗03: The misuse of the Miner's fund, which was created to help the miners who became unemployed due to the closure of mines, created a lot of stress in the local community. This resulted in local disputes over the distribution of the Miner's fund (≈08) and the use of national subsidies (≈09). ↗04: National



funding of large energy corporations and neglect of local small businesses, which has created several conflicts over new green energy investment projects (≈10) and uncertainties over the reopening of the power plant and the purchase of imported coal (≈11).

- **Exogenous private investments.** Private investment from outside the region, by national and multinational companies, is also a vector of stress in the A Coruña region. ↗05: Large-scale private investment by ENDESA and ENEL in combined cycle plant has increased dependence on fossil fuels and uncertainty about the future of As Pontes as an industrial centre (≈07). ↗06: The use of Next Generation EU funds. The large energy companies in Spain want a big share of the funds to invest in renewables, the uncertainty regarding the availability of funds creates doubts about ENDESA's Futur-e Plan for the reindustrialization of As Pontes (≈12) and creates conflicts about the restructuring and installation of green energy projects (wind, solar) (≈31).
- **Youth emigration.** ↗07: The emigration of youth from the region is also an important stress factor in the A Coruña region. This emigration is mainly associated with the uncertainty of jobs and social security (≈19) and leads to brain drain (≈16), which in turn results in the loss of human capital.
- **Territorial stigma.** ↗08: The territorial stigma associated with the mining and industrial past of the A Coruña region also functions as a stress factor in the region. The As Pontes thermal power plant is the main source of pollution in the region (≈26), which reinforces the environmental stigma (≈22). ↗09: Stress caused by political disorganization and dislocation. The lack of coordination between different political actors causes stress (≈23) and this structural and regional inefficiency reinforce the territorial Stigma (≈24).
- **Nostalgia.** ↗10: Nostalgic feelings about the mining past and emotional attachment to the thermal power plant also function as stress vectors in the A Coruña region. The closure of the mines has created a lot of stress in the mining community because of the loss of identity and mining traditions (≈25). People are also concerned about the disappearance of landmarks, cultural artefacts and architectural constructions in their neighbourhoods (≈30).
- **Disinvestments.** This is one of the key factors causing stress in the CCT. The main vectors of change associated with this factor are: ↗11: Public and private disinvestments from the coal mining sector, caused by the future uncertainties about coal-fired power plants (≈05). It also includes the stress and uncertainty due to the decommissioning of mines (≈06). ↗12: Private disinvestment in other subsidiary businesses. The loss of income and employment in the region is also reflected in the stress caused by industrial desertification and the rising abandoned territory in As Pontes (≈32).
- **Digital divide.** ↗13: The digital divide between the population in the CCT and that in the main cities also generates a lot of stress. A large part of the affected population has limited access to new technologies and there are many uncertainties due to insufficient training of dismissed workers under Endesa's Futur-e Plan (≈44).

### ***Stress-strain***

Conflict and disputes. The analysis of the strain situations allows us to distinguish a set of recurrent conflicts within the CCT of As Pontes. These conflicts can be classified as endogenous and

exogenous conflicts. Some of the main endogenous conflicts (within the local community) are disputes among the mine workers trade unions and the company over the distribution of the Miner's fund, the conflict among the local population and the company over land grabbing and land degradation, the conflict among the environmental groups and the company over waste management and the conflict over the settlement of immigrants in the town. The main exogenous conflicts (with outer world) are conflicts among environmental groups and large companies over the expropriation of land by multinational companies, conflict over the use of local natural resources and conflict over the distribution of funds for green energy projects.

Impasses and contradictions. Many of the impasses mapped in the research are related to the management, reuse and re-invention of former mining or industrial sites or landfills. Some of the main impasses are the dispute among the local businesses and central government over investment in the tourism sector; disputes among the local mining community and local administration related to the preservation of patrimonial sites and symbols related to the mining and industrial past; disputes between plant workers, coal transporters and the company; and issues of environmental safety and rehabilitation of mined sites.

Dependence and uncertainties. Through the analysis of strain situations, we have identified different forms of stresses by dependence and uncertainty. The main uncertainties of the local population are related to the economic future of the region. During the last five decades, many factors have caused this feeling of uncertainty, such as the distribution of national subsidies for coal regions, the restriction imposed on the coal industry under international agreements, the modernisation of the power plant, the closure of mines and more recently, the closure of the thermal power plant, which also affected a large number of transporters, who supplied coal from the port of Ferrol to the power plant.

Strategies for coping with territorial stress. Despite all the ongoing strain situations in the area, very few attempts have been made to diffuse the stress and address the adverse effects. Our research has found that the lack of clear vision and leadership, the absence of adequate participatory mechanisms devoted to defusing, reducing or solving conflicts; the lack of attempts to introduce institutional changes aimed at overcoming impasses; the lack of mechanisms aimed at balancing power and reducing the dependency of the territory on national and regional policy-making and by other actors, is making the energy transition difficult and painful for many actors including power plant workers, transporters, small businesses and local government.

### ***Change, resistance to change and ambivalence***

The analysis of the strain situations and the complementary information gathered on the CCT allowed us to describe some key dynamics of change, resistance to change and ambivalence in the territorial organisation of the CCT, which are the following.

#### **a. Territorial Trajectory: between continuity and rupture.**

In the CCT of As Pontes, people are still proud of their miner and industrial identity. They want to continue with their industrial past. However, they want to get rid of being identified as the most polluted area and grow as a centre of renewable energy production and consumption. New companies in the region are invited to revive the industrial complex and generate employment opportunities for local youth. It shows that the current visions are in an perspective of continuity with the past.

b. Territorial boundaries: between distinctiveness and alignment.

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 identity as an industrial centre. Efforts are being made to bring in new companies to replace the thermal power station, but as yet there has been little success. It will be very difficult for any other company to fill the vacuum created by the closure of the thermal plant. Some believe that the town will return to its pre-industrial past with limited prospects.

c. Territorial governance: between endogenous and exogenous.

An important dynamic of territorial identity is related to the diminished capacity of key actors in the territory to steer territorial development. The closure of mines and thermal power plants harmed the economic and political power of the region. The decarbonisation process in Spain is a top-down process, where the central government controls everything related to the transition and local governments have no competencies. The local administration plays an important role in solving local environmental and economic problems and demanding the rights of the local population that will be affected by the closure of thermal power plants.

d. Territorial Symbols: between myth and stigma.

The CCT of As Pontes is undergoing a restoration phase. The closure of the mines in 2007 left a large mine shaft and two large clay and mining waste dumps. The restoration work of these territorial elements created by the exploitation of the mines has been completed and the new symbols of green growth, a large freshwater lake and parks, have emerged. The demolition of the largest chimney of the thermal power plant, which was the symbol of the industrialisation of this region, will erase the stigma of being the most polluted region in Spain and the installation of green energy projects will help to improve the region's image as a pioneer in green energy projects. However, it will affect some people who have lived all their lives in the shadow of this chimney. They will have feelings of nostalgia for the disappearance of these symbols. A museum will be created to commemorate the mining past and the thermal power plant, which will become a symbol of change in the CCT.

### 3.2.3 Gender dimension

The focus group was organised by the researchers of the UDC team, composed of one female and three male researchers. Among the focus group participants, 2 were women (25%) and 6 were men (75%). Unfortunately, despite the attempts made by the research group, they have not been able to involve more female participants. The women participants were from the local community and live in the LMA of the A Coruña case study. They have provided a very comprehensive insight into the socio-cultural aspects of this energy transition and have made a very valuable contribution to the focus group discussion regarding the gender aspects of the energy transition.

## 3.3 Socio-psychological component

The transformation of the energy system and the decarbonisation process is expected to have a noticeable impact on the socio-psychological well-being of people living in coal- and carbon-intensive regions across Europe. In this component, we have measured the long-term and short-term impacts of the decarbonisation process on people's socio-psychological well-being and the de/re-territorialisation of the affected regions. It can provide crucial support to policy makers and investors,

helping them make informed decisions on immediate and appropriate measures and actions to retain the population and maintain the demographic, social and economic configuration of these regions while achieving a sufficient level of decarbonisation in the coming decades. Our main objective is to measure the socio-psychological stress in the general population of the territories most directly affected by the ongoing decarbonisation process, conventionally referred to in the project as CCT. Through a quantitative survey (for more detail see appendix 9.3), the project aims to create new knowledge on the impact of the different decarbonisation policies implemented in the CCT on people's socio-psychological well-being and their coping strategies to deal with this transition.

### 3.3.1 Summary of results

#### *Profile of respondents*

In the case of the A Coruña region, we have a very diverse sample of 506 respondents, representing the total population of the region (Table 9). This sample shows the demographic, socio-economic and territorial diversity of the region. Of the total of 506 respondents, 53.2% were women and 46.8% were men. This gender distribution represents approximately the proportion of both sexes in the total population of the region. In terms of age distribution, the majority of the 181 respondents (35.8%) belong to the 46-65 age group, followed by 137 (27.1%) respondents from the 31-45 age group, 122 (24.1%) from the 65+ age group and the remaining 66 (13.1%) from the 18-30 age group. Education is an important characteristic affecting living standards and labour market position. Among the respondents, 146 (28.9%) had university degrees and 131 (25.9%) had completed some vocational training. The rest, 118 (23.3%), had primary education or less and 100 (19.8%) had completed secondary education. As for the professional profile of the respondents, most of them worked in the service sector (148, 29.2%), followed by pensioners (140, 27.7%) and industrial workers (94, 18.6%). A small number of respondents were unemployed (45, 8.9%) or inactive (28, 5.5%) or worked in the agricultural sector (23, 4.5%). Of the total number of respondents, only 8 (1.6%) were currently working in carbon-intensive industrial units. However, 76 (15.6%) respondents had previously worked in these or similar industrial units. In terms of marital status, more than half (272, 53.8%) of the total respondents were married and a small number (33, 6.5%) were living with a partner. Of the remainder, 131 (25.9%) were single, 40 (7.9%) were divorced or separated and 30 (5.9%) were widowed. As per their family situation, of the total 506 respondents, 264 (52.2%) were living with dependents (under 16 or over 65). The level of place attachment and the social bond with the local population depend to a large extent on the length of time spent in the region. People who were born in the region or who migrated when they were very young have more attachment to the place compared to newcomers. Of those surveyed, 401 (79.2%) were born in the province of Coruña, followed by 67 (13.2%) born in other Spanish provinces and only 38 (7.5%) were born outside Spain. More than two-thirds of them had been in the region for more than 20 years, with a small number of newcomers.

**Table 9 - Profile of survey respondent in A Coruña case study**

Sample Size	506 Complete cases			
Gender	Males (237, 46.8%)		Females (269, 53.2%)	
Age	18-30 (66, 13.1%)	31-45 (137, 27.1%)	46-65 (181, 35.8%)	65+ (122, 24.1%)
Education	Primary (118, 23.3%)	Secondary (100, 19.8%)	University (146, 28.9%)	Professional (131, 25.9%)

Occupation	Industry (94, 18.6%)	Agriculture (23, 4.5%)	Services (148, 29.2%)	Public Servants (28, 5.5%)	Unemployed (45, 8.9%)	Retired (140, 27.7%)	Inactive (28, 5.5%)
Work in Coal Industry	Yes (8, 1.6%)				No (498, 98.4%)		
Worked in Coal Industry	Yes (79, 15.6%)				No (427, 84.4%)		
Marital Status	Not Married (131, 25.9%)	With Partner (33, 6.5%)	Married (272, 53.8%)	Divorced/ Sep. (40, 7.9%)		Widowed (30, 5.9%)	
Living with dependents	Yes (264, 52.2%)				No (242, 47.8%)		
Nativity	Born in Coruña (401, 79.2%)	Born in another province (67, 13.2%)		Born outside country (38, 7.5%)			
Duration of Stay	0-5 years (40, 7.9%)	6-10 years (100, 19.8%)			11-20 years (9, 1.8%)		20+ years (357, 70.6%)

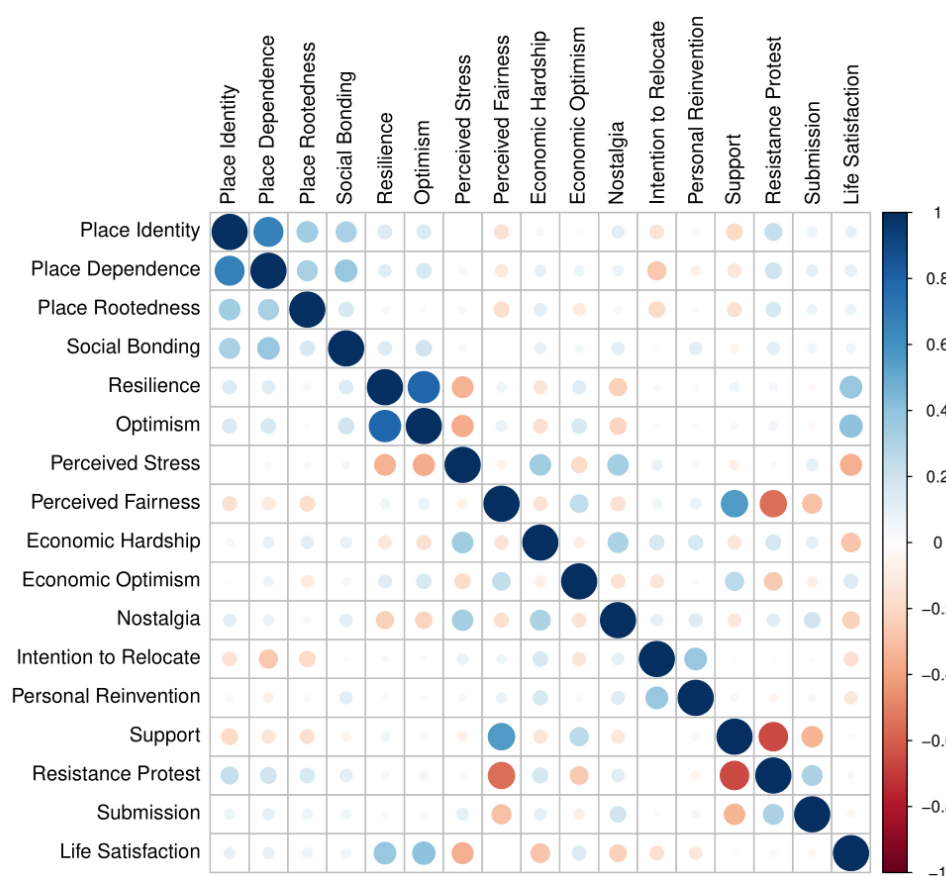
Source: Survey data 2021.

### 3.3.2 Interpretation

#### **Correlation between different factors related to the socio-psychological component**

In the case study of A Coruña, we found a strong positive correlation between the different elements of place attachment, especially place identity and place dependence. Similarly, we found a strong positive correlation between the factors “Resilience” and “Optimism”, which we used as moderators in this study.

**Figure 4 - Correlation among different factors related to socio-psychological components**



Source: Survey data 2021.

Note: Pearson's pairwise correlation is used to identify groups of highly correlated factors. It is used to select the factor so that our model can have the highest predictive power using as few factors as possible.



Both moderators are negatively correlated with the “Perceived Stress” factor. In terms of coping strategies, there is a strong negative correlation between the factors “Support” and “Resistance and Protest”. This is evident because if a person supports the decarbonization process, they are unlikely to engage in resistance and protest activities. Similarly, there is a strong negative correlation between the Perceived Fairness and Resistance and Protest factors and a positive correlation between the Perceived Fairness and Support factors, which is to be expected. The Resilience and Optimism factors have a strong positive correlation with the Life Satisfaction factor, indicating that individuals with higher levels of Resilience and Optimism also have higher scores on Life Satisfaction. On the contrary, Perceived stress and Economic hardship have a negative correlation with Life Satisfaction (Figure 4).

### **Mean score with standard deviations for all constructs**

Mean scores of the survey data shows a strong sense of place identity, place dependence and social bonding among the people of A Coruña, which are mainly responsible for their high place attachment scores. They also have a high level of resilience and optimism, which may be the main reason for their low level of perceived stress and their intention to relocate. Most of them do not support the development and implementation of decarbonisation policies by the Spanish central government and actively participate in protest and resistance activities. Very few want to migrate from this region, but at the same time, they do not want to reinvent themselves by learning new skills to adapt to the labour market. It will therefore be a matter of concern for policy-makers to convince people to change occupations according to the needs of the labour market. Regarding the general level of life satisfaction, people in A Coruña have a high level of life satisfaction, which may be related to their high level of place attachment, resilience and optimism (Table 10).

**Table 10 - Mean score and standard deviations for all factors in the A Coruña region.**

Factors/ Latent constructs	Sub constructs	Mean score	Standard deviation	Cronbach's Alpha
Place Attachment	Place Identity	4.33	0.85	0.93
	Place Dependence	3.66	1.06	0.88
	Place Rootedness	3.60	0.47	0.59
	Social Bonding	3.52	1.01	0.81
Moderators	Resilience	3.99	0.69	0.88
	Optimism	3.88	0.77	0.91
Decarbonisation Impacts	Perceived Stress	2.54	0.67	0.81
	Perceived Fairness	2.28	0.77	0.73
	Economic Hardship	2.85	1.26	0.93
	Economic Optimism	2.69	0.61	0.78
	Nostalgia	2.90	1.03	0.86
Coping Strategies	Intention to relocate	2.00	1.07	0.88
	Personal reinvention	1.98	1.14	0.77
	Support	2.09	1.24	0.93



	Resistance and Protest	3.72	0.95	0.83
	Submission	3.81	0.84	0.33
<b>Life Satisfaction</b>		3.58	0.77	0.87

Source: Survey data 2021.

Note: The factor mean is the average of all respondents' scores for each construct. A mean score close to 5 shows a higher value for all constructs and a mean score close to 1 shows a lower value for all constructs. Cronbachs' Alpha provides a measure of the internal consistency of a test or scale indicate (Cronbach 1951); it is expressed as a number between 0 and 1. Internal consistency describes the extent to which all the items in a test measure the same concept or construct and, hence, it is connected to the inter-relatedness of the items within the test. The alpha score below 0.7 is not acceptable.

### Regional differences in mean factor scores

A comparison of the mean scores of the different constructs at the EU level shows that people from A Coruña region have higher-than-average levels of place dependence, place identity and social connectedness, which may be responsible for their high scores on resilience and optimism about the future of the energy transition compared to others. They have higher-than-average levels of economic optimism and nostalgia. Conversely, they have lower-than-average levels of personal reinvention and support for decarbonisation policies, which is in line with their lower-than-average level of perceived fairness. They also have a higher-than-average level of resistance and protest, which may be associated with a higher-than-average level of stress and perception of economic hardship. Despite a higher-than-average level of nostalgia for their mining and industrial past, they have a higher-than-average level of life satisfaction (Table 11).

**Table 11 - Z score and STAN for all factors in the A Coruña region**

Factors/Latent constructs	Sub-constructs	Z-score	STEN
<b>Place Attachment</b>	Place Identity	0.18	5.86
	Place Dependence	0.25	6.00
	Place Rootedness	-0.28	4.94
	Social Bonding	0.19	5.88
<b>Moderators</b>	Resilience	0.13	5.76
	Optimism	0.08	5.66
<b>Decarbonisation Impacts</b>	Perceived Stress	-0.13	5.24
	Perceived Fairness	-0.74	4.02
	Economic Hardship	-0.16	5.18
	Economic Optimism	-0.05	5.40
	Nostalgia	0.00	5.50
<b>Coping Strategies</b>	Intention to Relocate	-0.21	5.08
	Personal Reinvention	-0.29	4.92
	Support	-0.81	<b>3.88</b>
	Resistance and Protest	1.02	7.54
	Submission	0.55	6.60
<b>Life Satisfaction</b>		0.21	5.92

Sources: ENTRANCES survey data.

Note: The Z-score provides an indication of how far from the mean a data point is, more technically it is a measure of how many standard deviation below or above the population mean a raw score is. The STEN scores (Standard Ten) shows results using a simple standardized scale from 1 to 10 that have a normal distribution. They have a mean of 5.5 and a standard deviation of 2 and are then rounded to the nearest integer. To interpret the STEN scores, all case studies will focus on STEN scores below 4 (which should be interpreted as low compared to the case studies as a whole) and above 6 (the high scores). All STEN scores around 5 show that the case study is not very different from the other ENTRANCES case studies.

### 3.3.3 Gender dimension

Gender is one of the important dimensions of our study. Descriptive analysis of the survey data shows that women have significantly higher levels of place identity, place dependence and social bonding, demonstrating their higher level of place attachment compared to men. There is not much difference in the level of resilience and optimism between the two sexes. Similarly, both sexes have similar scores on the impacts of decarbonization and coping strategies. In contrast, women have significantly higher levels of life satisfaction than men (Table 12).

**Table 12 - Gender differences in mean score for all constructs in the A Coruña region**

Factors/ Latent constructs	Sub constructs	Mean score		T-test (df 504)	P-values
		Men	Women		
Place Attachment	Place Identity	4.21	4.43	-2.836	0.00
	Place Dependence	3.52	3.78	-2.751	0.00
	Place Rootedness	3.62	3.58	0.850	0.39
	Social Bonding	3.42	3.61	-2.027	0.04
Moderators	Resilience	3.98	4.00	-0.421	0.67
	Optimism	3.83	3.92	-1.380	0.17
Decarbonisation Impacts	Perceived Stress	2.51	2.56	-0.698	0.48
	Perceived Fairness	2.26	2.29	-0.420	0.67
	Economic Hardship	2.77	2.92	-1.352	0.17
	Economic Optimism	2.68	2.69	-0.236	0.81
	Nostalgia	2.89	2.90	-0.089	0.93
Coping Strategies	Intention to Relocate	2.05	1.96	0.930	0.35
	Personal Reinvention	1.99	1.97	0.259	0.79
	Support	2.19	2.01	1.686	0.08
	Resistance and Protest	3.71	3.73	-0.252	0.79
	Submission	3.77	3.84	-0.916	0.35
Life Satisfaction	Life Satisfaction	3.51	3.64	-1.964	0.05

Sources: ENTRANCES survey data.

Note: Mean-score indicates the average score for all constructs for both sexes. Mean score close to 5 shows higher value for all constructs and mean score close to 1 shows lower value for all constructs. A p-value less than 0.05 (typically  $\leq 0.05$ ) is statistically significant.

## 3.4 Conclusion

In conclusion, we can say that the CCT of As Pontes in the LMA of the province of A Coruña has witnessed a six-decade history of emergence as an industrial region and is now on the verge of losing its status as an industrial centre. This rapid transformation of an agricultural village into an industrial complex has created several socio-cultural and socio-psychological tensions that have shaped the lives of the inhabitants of this region over the last five decades.

Initially, the rapid industrialisation of the region had an impact on the socio-cultural environment that affected the way of life of the local population and their future prospects. It created many

stresses, conflicts and contradictions related to changes in the labour market, exploitation of natural resources, immigration of people from different cultural backgrounds, environmental degradation, distribution of huge public investments and the rising cost of living. Well-paid jobs in the mining sector and at the power plant enabled miners and power plant workers to have a good standard of living. Fully paid education for their children enabled them to obtain higher education and move up the ladder of social mobility. However, it created an income gap between the company workers and the local population, which in turn created a rupture in the social fabric of As Pontes. The large-scale immigration of people to the small town of As Pontes raised the price of living also for the local population, who did not receive wages similar to those of the plant's workers.

The large-scale exploitation of natural resources, i.e. land, water and air, also created tension in the territory. The company extracted profits from local natural resources and the local community suffered externalities in the form of pollution of land, water and air and loss of agricultural land. This expropriation of land and natural resources led to several conflicts between the company and local people and environmental groups. The closure of the mines has not only meant the loss of income, but also the loss of identity for a large number of families who worked in the mining sector for many generations. It has also meant the loss of mining heritage and traditions. The old symbols of industrialisation, i.e. the mine shaft, the large coal mining machines, the thermal power station, chimneys and power grids are losing their importance as significant landmarks and the new symbols of the green energy industry, i.e. solar panels, windmills and hydrogen plants are emerging as new symbols of industrialisation. This change has created several tensions in terms of the transformation of the territorial identity of As Pontes.

The lack of industrial diversification and the existence of a single large industrial unit, which is the main source of income and employment in the region, made the region dependent on a single type of economic activity and vulnerable to changes in economic activity. This vulnerability became evident when, with the closure of the coal mines, many people became unemployed and had to take early retirement or leave the region. This shift away from coal-intensive industries has a major impact on the socio-psychological well-being of people in the region of A Coruña, which is visible by their higher levels of perceived stress and economic hardship. However, higher levels of Place Attachment, Resilience and Optimism help them cope with the problems caused by the closure of their main sources of income and livelihood. What might worry local policy-makers is a lower level of personal reinvention and a higher level of resistance and protest among the local population. This shows that people are not interested in learning new skills that are needed in the changing labour market but use more energy and resources to protest against the company and the central government. This reduces the level of human capital and employability of people and increases unrest in society.

# CHAPTER 4

---

## THE SOCIOECONOMIC SITUATION

## 4 The socioeconomic situation

### 4.1 Introduction to the socio-economic situation

The socio-economic component focuses on structural change in the economy, i.e., the reallocation of economic activity between different economic sectors and regions. Structural change can lead to a change in the economic, financial and demographic composition of a region. This chapter provides a descriptive analysis of technological progress, demographics, economic inequality, employment and economic activity, based on a variety of data sources. We refer to the three delineations of the region described in Box 1 (section 2.1.2). The delineations correspond to the Nomenclature Units of Territorial Statistics (NUTS).

### 4.2 Determinants of economic development

An important indicator of economic development is real gross domestic product (GDP) per capita ( $Y/N$ )<sup>4</sup>. It can be decomposed into three components, namely labour productivity ( $Y/L$ ), the employment rate ( $L/E$ ) and the share of the working-age population ( $E/N$ ):

$$\frac{Y}{N} = \frac{Y}{L} \times \frac{L}{E} \times \frac{E}{N} \quad (1)$$

where  $Y$  is real GDP,  $N$  is population,  $L$  is employed person and  $E$  is working-age population.<sup>5</sup>

The first component, labour productivity ( $Y/L$ ), depends on technological progress and capital intensity (Solow, 1956; Solow, 1957). Due to the lack of relevant data sources, we do not know how labour productivity has evolved in As Pontes CCT over the last two decades. However, from the existing data at the provincial level, we can say that the LMA of A Coruña had higher productivity than the PAR of Galicia and lower than the national average (Figure 5a). A comparison at the EU28 level shows that labour productivity is lower in the three different delineations of the case study. Since 2000, labour productivity was increasing at a steady pace, but the economic crisis (between 2008-2013) caused by the bursting of the real estate bubble, decreased labour productivity in Spain. After the economic crisis, labour productivity started to increase again, but the increase was slower than the EU28 average.

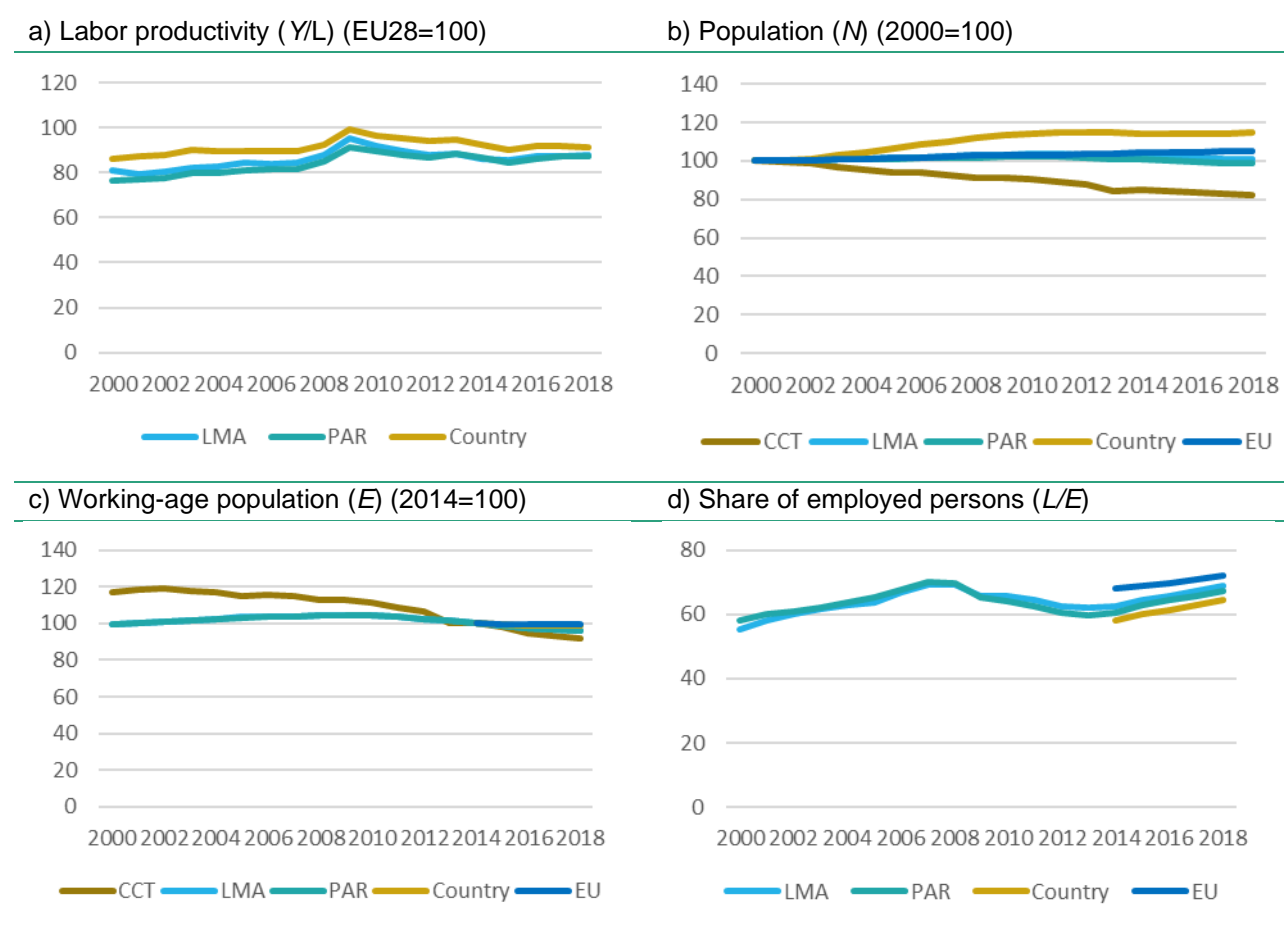
In terms of population change, over the last two decades, the population of As Pontes (CCT) shrunk from 12,477 inhabitants in 1998 to 10,138 in 2019, 18.7% of the total inhabitants (Figure 5b). Even though the decarbonisation process started in the early 1990s and the company (Endesa) started to reduce the number of workers in the late 1990s, the population of As Pontes started to decrease from 2002 onwards. The rate of depopulation increased considerably after the closure of the coal mines in 2007, caused by the emigration of a large number of men of working age from the locality. The province of A Coruña (LMA) had about 1.1 million inhabitants in 1998. In the last two

<sup>4</sup> Gross domestic product is not created to measure welfare. It measures the transaction value of goods and services over a specific period (see Eurostat 2014, p. 146). Other measures such as mortality, leisure and inequality show a high cross-country correlation with GDP (see Jones and Klenow 2016). Therefore, GDP is a good proxy for welfare despite its apparent shortcomings. Nevertheless, one should use various indicators to finally assess the welfare of a region (see Fleurbaey 2009).

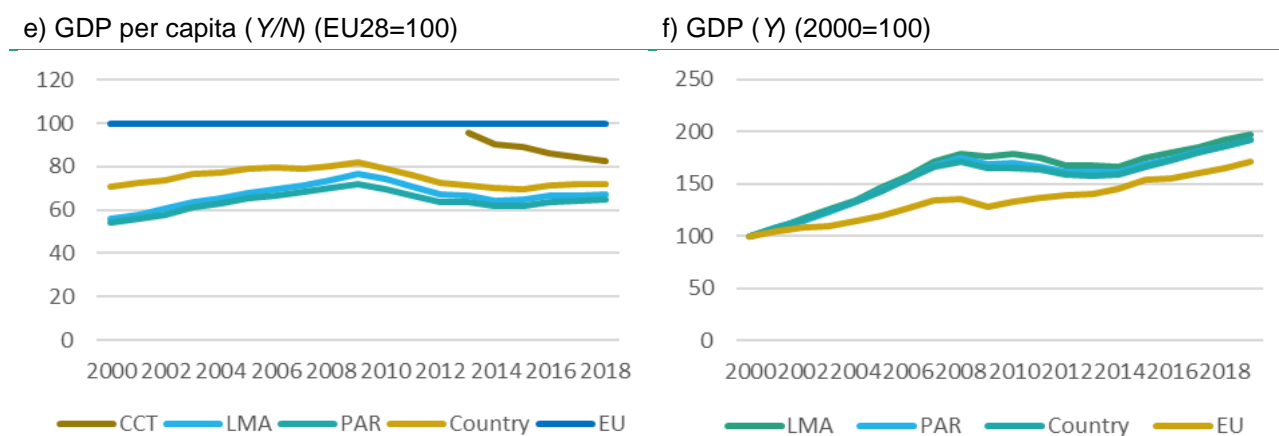
<sup>5</sup> The population in working age refers to the persons aged 15-64 years. Expected effects of legislated pension reforms will increase the participation rate of older persons in the future.

decades, its population has registered a small increase of 13,000 people. This growth is mainly related to the immigration of Latin Americans to the province. The Autonomous Community of Galicia (PAR) had a total population of 2.72 million people in 1998, which increased to 2.79 million in 2010 and then started to decrease again to 2.70 million in 2019. This decline was mainly associated with declining fertility and the emigration of young people from Galicia due to the financial crisis and the loss of employment opportunities. At the national level, the total population of Spain increased from 40.3 million in 2000 to 47.3 million in 2019. This population increase is mainly due to large-scale immigration of the working-age population to the countries. Population growth at the national level was higher than that of the EU28. A comparison between population growth in the study region and the national and EU28 average shows a more pronounced decline in population size in the study region. Similar to the decline in the total population, since 2000, the proportion of working-age population (15-64 years) has also decreased in the CCT of As Pontes (Figure 5c). However, it remained almost similar in the LMA of A Coruña and in the PAR of Galicia. This decline in the CCT is mainly associated with the emigration of young people and redundant workers to neighbouring cities in search of employment opportunities and with the ageing process. The average age of men and women in As Pontes has increased from 38.9 and 40.2 years in 1998 to 47.1 and 48.8 years in 2019, respectively. At the national level, the share of the working population in the total population has increased considerably, however, it is mainly due to the large-scale immigration of the working-age population from Latin America, East Europe, Africa and Asia.

Figure 5 - Economic overview







Sources: National Institute of Statistics (INE), Spain

In the period between 2000 and 2008, the share of the employed population in the total population registered an increase in A Coruña and Galicia (Figure 5d). However, after 2008, the economic crisis hit Spain and the share of employed population declined throughout the country. The situation remained the same until 2013 and the recovery process started in 2014. From 2014 onwards, the share of employed population started to grow positively. In 2019, compared to the PAR of Galicia and the EU28, the proportion of employed population was higher in the LMA of A Coruña. GDP per capita is one of the most important indicators of the overall economic development of a region. In 2019, the CCT of As Pontes had a higher GDP per capita than the LMA of A Coruña and the PAR of Galicia (Figure 5e). It was also above the national average but below the EU28 level. During the last five years, GDP per capita in As Pontes has decreased significantly. This can be associated with the closure of mines and the reduction of activity in the thermal power plant. In general, during the last two decades, GDP per capita has registered a remarkable increase in the LMA of A Coruña and PAR of Galicia. In 2000, the GDP per capita in A Coruña and Galicia was very similar and almost 15 points below the national average. Compared to the EU28 level it was almost 55%. In the following decade, it grew and reached almost 80% of the EU28 level in 2008. In the following years, GDP per capita decreased due to the economic crisis that affected the Spanish economy and stopped the growth until 2014. After 2014, GDP per capita in A Coruña, Galicia and at national level started to increase and to approach the EU28 level. However, during the same period GDP per capita in As Pontes decreased and converged to the national level. Finally, the general economic situation can be described by GDP growth. In the case of As Pontes CCT, GDP data are only available from 2013 onwards. In As Pontes, GDP is decreasing rapidly from €313 million in 2013 to €291.5 million in 2019, showing that the closure of mine and the thermal power plant is negatively affecting the economic growth of the region. In contrast, there is an upward trend in GDP in A Coruña (LMA), Galicia (PAR) and nationally (Figure 5f). GDP in A Coruña, Galicia and nationally has doubled since 2000, which is a positive sign for the economic development of the country (for more information see appendix 9.4).

### 4.3 Sectoral structure

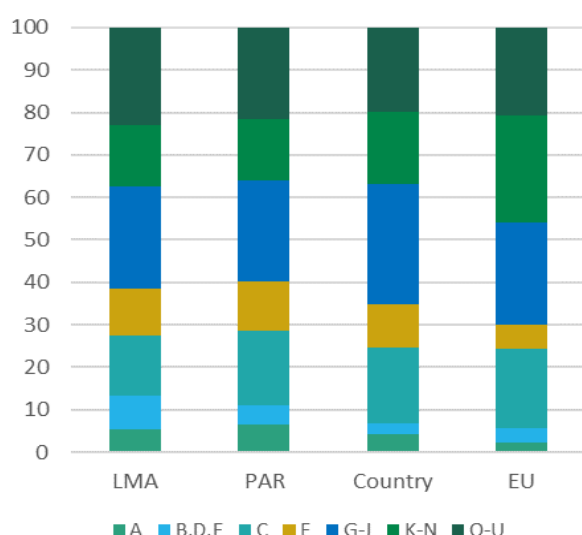
Over the last two decades, gross value added (GVA) in the LMA of A Coruña has increased from €12684.1 million in 2000 to €24252.8 million in 2018 (INE 2020). The share of the different sectors

in the total GVA has changed considerably at all territorial levels. At the provincial level, in the LMA of A Coruña, the share of Agriculture (-1.3%), Producing industries (-2.1%), Manufacturing industry (-2.9%) and Construction (-3.9%) in total GVA has decreased significantly, however, the share of Retail to IT (1.8%), Finance, real estate and other professional services (6.9%) and Other services (1.4%) have registered an increase. Similarly, in the PAR of Galicia, where the total GVA in 2018 was €56490 million, the share of Agriculture (-1.3%), Manufacturing industry (-3.9%) and Construction (-4.6%) in the total GVA has decreased notably, at the same time, the share of Producing industries (0.1%), Retail trade to IT (1.7%), Finance, real estate and other professional services (6.2%) and Other services (1.9%) have registered an increase.

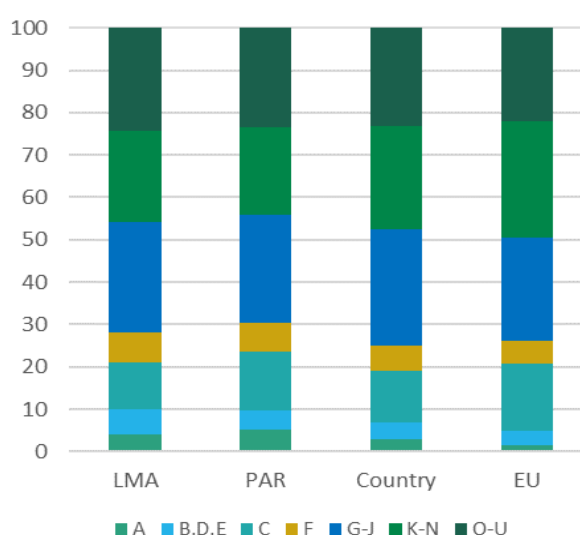
At the national level, the share of Agriculture (-1.1%), Manufacturing industry (-5.7%), Construction (-4.2%) and Retail trade to IT (0.8%) in total GVA has decreased significantly; on the contrary, the share of Producing industries (1.1%), Finance, real estate and other professional services (7.5%) and Other services (3.1%) have registered positive growth. Overall, we can conclude that the Finance and Other services sectors have emerged as important sectors in all territorial delineations, while the Construction and Manufacturing sectors have lost their importance in the economic sphere. At the EU level, the share of Agriculture (-0.6%), Producing industries (-0.1%), Manufacturing (-2.8%) and Construction (-0.3) sectors in total GVA has also declined, although this decline has been smaller than that of in the case study region. Similarly, the share of Retail trade to IT (0.1%), Finance (2.5%) and Other services (1.3%) increased, although this was lower than in the region under study (Figure 6).

Figure 6 - Sectoral structure

a) Gross value added in 2000 (in percent)



b) Gross value added in 2018 (in percent)



Sources: National Institute of Statistics (INE), Spain.

Note: The sectors are classified by: A Agriculture, forestry and fishing; B,D,E Mining and Utilities; C Manufacturing; F Construction; G-J Retail and IT; K-N Finance, real estate and other professional services; O-U Other services (Eurostat 2008).

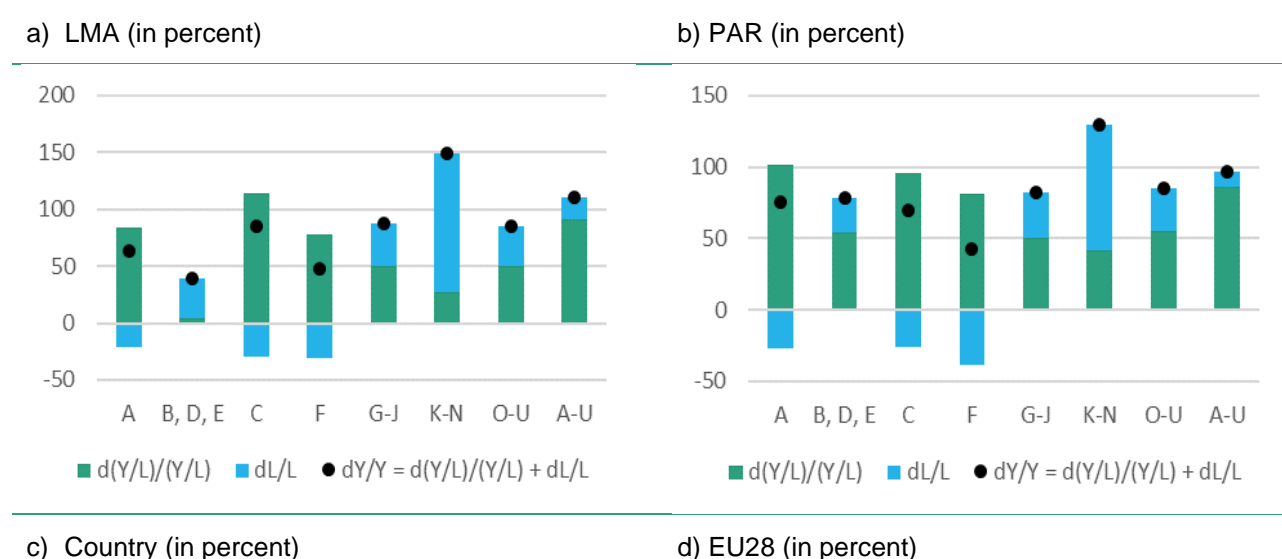
In 2018, the comparison between the LMA of A Coruña and the EU28 shows that the share of Agriculture (2.5%), Producing industries (2.6%), Retail to IT (1.9%), Construction (1.6%) and Other services (2.3%) in total GVA was higher in A Coruña compared to the EU28 average, however, the

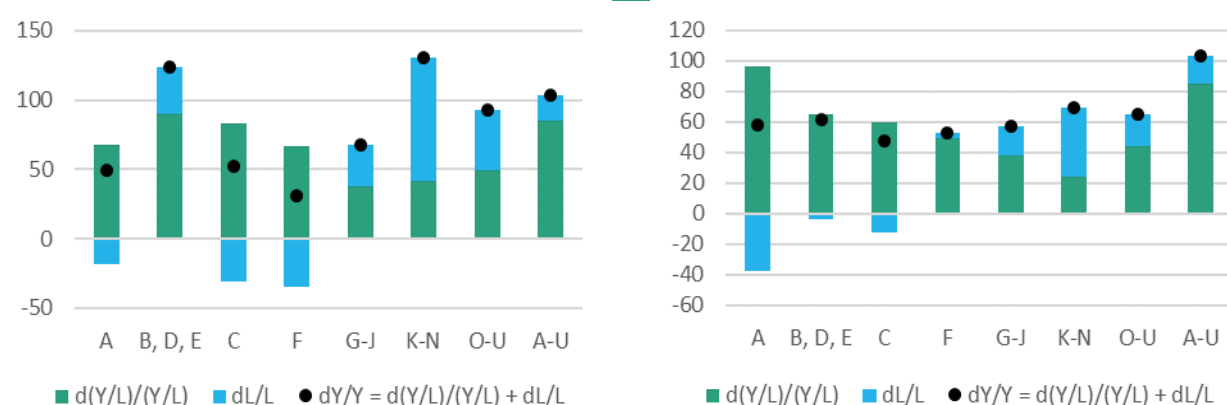
share of Manufacturing (-4.8%) and Finance (-6.9%) in total GVA was higher in the EU28 compared to A Coruña. Similarly, a comparison of Galicia (PAR) with the EU28 shows that the share of Agriculture (3.6%), Producing industries (1.3%), Retail to IT (1.4%), Construction (1.5%) and Other services (1.4%) in the total GVA is higher than in the EU28. However, the share of Manufacturing (-2.1%) and Finance, real estate and other professional services (-7.1%) in the total GVA is higher in the EU28 in comparison to the PAR of Galicia. At the national level, the comparison with the other EU28 countries show that the share of Agriculture (1.4%), Producing industries (0.6%), Retail to IT (3.3%), Construction (0.5%) and Other services (1.1%) in the total GVA in Spain was higher than in the EU28. However, the share of Manufacturing (-3.7%) and Finance, real estate and other professional services (-3.2%) in total GVA was below the EU28 level.

All aggregate sectors show positive labour productivity growth between 2000 and 2018. Figure 7a to Figure 7d show that labour productivity, i.e., the ratio of sectoral output to employed persons, in the Finance, Real estate and other professional services sector grew more than in any other sector in the LMA of A Coruña and PAR of Galicia. In contrast, the Mining and Utilities sector recorded the lowest growth in the LMA of A Coruña and the Construction sector recorded the lowest growth in the PAR of Galicia. At the national level, in addition to the Finance, real estate and other professional services sector, the Mining and Utilities sector also registered a notable increase.

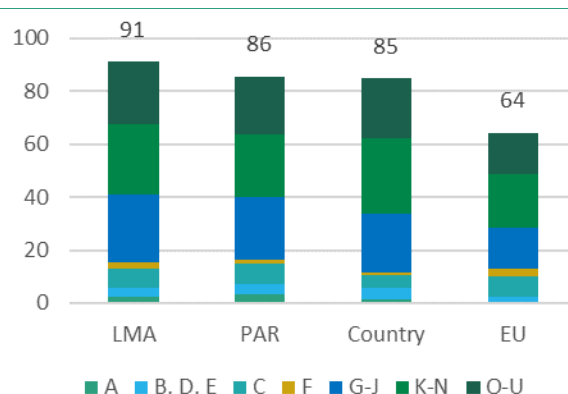
Figure 7e shows that all territorial delineations of the case study region have recorded higher GVA growth compared to the EU28 level. In the LMA of A Coruña, the retail and IT, finance, real estate and other professional services and other services sectors contributed 75.7 percentage points to the overall GVA growth of more than 90% in the period between 2000-2018. Therefore, the economic development in the LMA of A Coruña between 2000 and 2018 was not mainly driven by development in the mining and utility sector, but the contribution of other sectors was exceptionally high. At the PAR level, in addition to the retail and IT, finance, real estate and other professional services and other services sectors, the manufacturing sector also contribute significantly to GVA growth.

**Figure 7 - Growth decomposition (2018-2000)**





e) Regional gross value added growth contribution by sector (in percent)



Sources: National Institute of Statistics (INE), Spain.

Note: Sectoral growth ( $dY/Y$ ) is decomposed into labour productivity growth ( $d(Y/L)/(Y/L)$ ) and labour growth ( $dL/L$ ). The growth contribution by each sector ( $i$ ) is the initial share of the sector ( $Y_i/Y$ ) in the year 2000 times the sectoral growth rate between 2000 and 2018 ( $dY/Y$ ). Abbreviations for the sectors are provided in Figure 6 and tabulated in Table 18.

#### 4.4 Income distribution

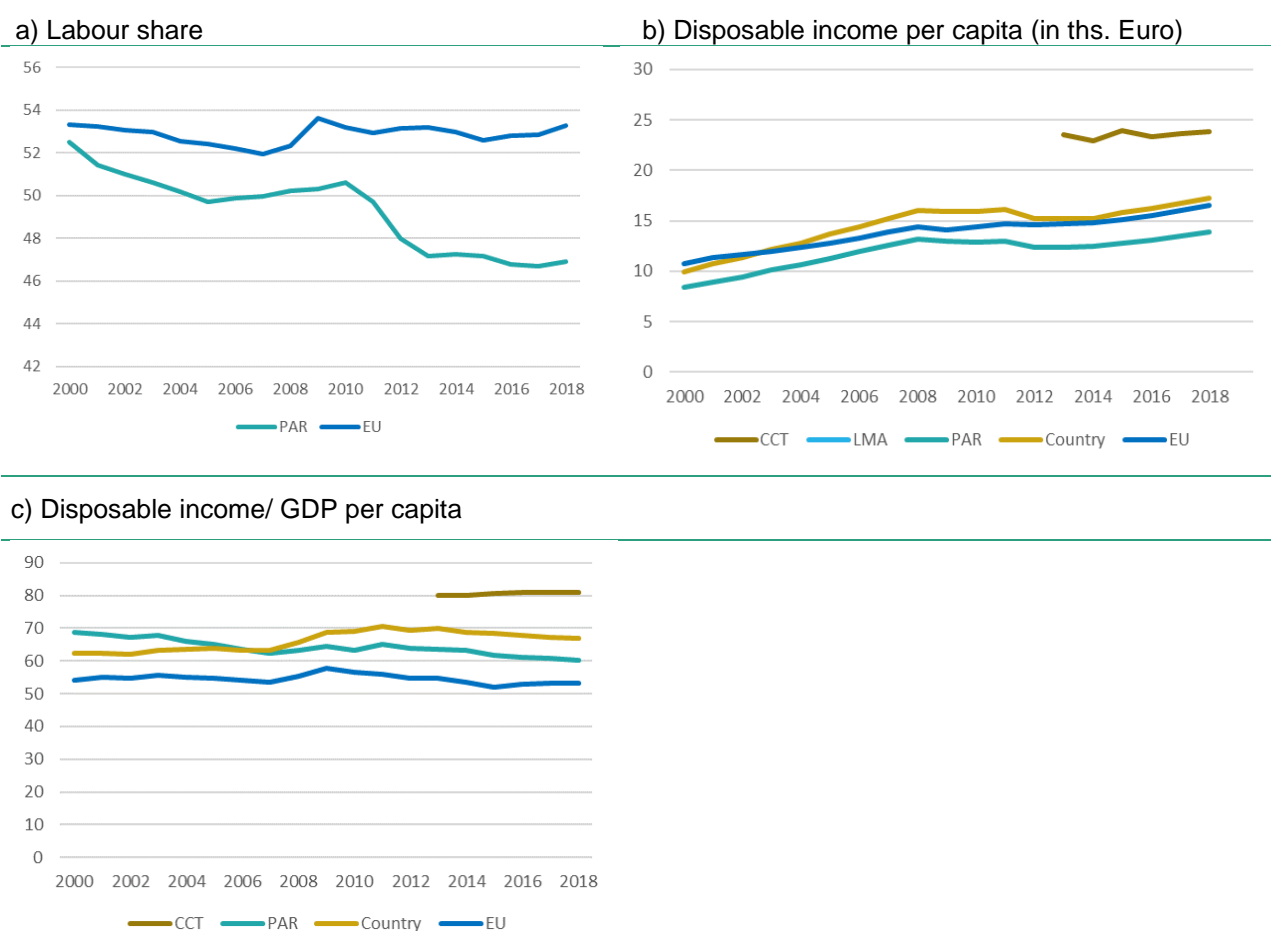
At the sub-national level, no harmonized data on income distribution at the household or individual level are available. However, it is possible to analyse the development of the functional distribution of income in the region. The income approach states that a region's GDP is the compensation of employees (labour income), gross operating surplus, mixed-income (e.g., compensation of owners), taxes on production and imports minus subsidies on production.<sup>6</sup> Figure 8a shows the labour share, defined as labour income divided by total gross value added, as a key economic indicator of the income distribution (between labor income and capital income). Since 2000, the labour share in the PAR of Galicia has been below the EU28 level. Moreover, between 2000 and 2005, the labour share in the PAR of Galicia and the EU28 decreased from almost 52.5% and 53.2% in 2000 to 49.8% and 52.1%, respectively (Figure 8a). The decline in Galicia was stronger than in the EU28. In the following years, 2006-2010, the labour share in Galicia increased, but with the country's economic crisis it fell again. In 2018, the labour share in Galicia was almost 6 percentage points below the EU28 level.

Figure 8b shows the disposable income per capita for all the territorial units in the case study and at the national and EU28 level, respectively. Data on disposable income per capita for the CCT

<sup>6</sup> [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Income\\_approach](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Income_approach)

of As Pontes are only available for the period between 2013 and 2018. This period has shown a stagnation of disposable per capita income in the CCT. However, disposable income per capita in the CCT was higher than that of in the PAR of Galicia and at the national and EU28 levels. Contrary to the trends in the CCT, since 2000, the disposable income per capita has increased notably at the PAR, national and EU28 levels. The ratio of disposable income to GDP measures the tax burden and the amount of redistribution in the respective regions. During 2013-2018, this ratio remained almost 80% in the CCT of As Pontes (Figure 8c). It was above the national, the PAR and the EU28 levels. Since 2000, this ratio has decreased in all territorial units except CCT, which shows an increase in the tax burden on the Spanish population.

**Figure 8 - Income distribution**



Sources: National Institute of Statistics (INE), Spain.

Note: Labour share is the labour income divided by total gross value added.

## 4.5 Gender dimension

In the case of A Coruña, the mining sector was historically dominated by men. The majority of workers in the mines, power plants and the transport sector were men and women were mostly engaged in office and dispatch work. The closure of mines, which began in the late 1990s and ended in 2007, therefore affected the employment prospects of men disproportionately more than those of women. Similarly, the closure of the thermal power plant is also affecting a large number of male

workers who were directly or indirectly employed at the plant or who worked in ancillary industries or the transport sector. The loss of well-paid male jobs led to the massive emigration of young men from the county, which changed the gender composition of the population of As Pontes from 1.02 men per woman in 1998 to 0.92 men per woman in 2019. In contrast, during the last two decades, the sex-ratio in the LMA of A Coruña and the PAR of Galicia remained stable at 0.92 men per woman, which can be associated with a large portion of Latin American women in the region. The growth of the service sector, traditionally dominated by women in Spain, is increasing the proportion of women in the labour force. However, they face competition from laid-off men who used to work in the industrial sector and are now forced to work in the service sector. As gender equality has become one of the main priorities of the current Spanish government, future energy projects are obliged to offer job opportunities to both sexes. Therefore, in the future, it is to be expected that there will be more female workers in the energy sector.

#### 4.6 Conclusion

The decarbonisation process initiated in the 1990s and accelerated in the last decade has several negative consequences for the economy of the CCT of As Pontes and the LMA of A Coruña. The CCT of As Pontes has registered a decline in total population, working age population, total GDP and GDP per capita, which shows that the region is becoming economically weaker and demographically dependent. Furthermore, labour productivity in the LMA of A Coruña and the PAR of Galicia has been virtually stagnant over the last two decades, showing that the region is lagging in reaping the benefits of technological development around the world. Among the economic sectors, Finance, real estate and other professional services and Other services have emerged as important sectors in all territorial delimitations, while Agriculture, Construction and Manufacturing have lost their economic importance.



# CHAPTER 5

---

## ANALYSIS OF THE ENERGY TRANSITION IN PAR

## 5 Analysis of the energy transition in the Political and Administrative Region

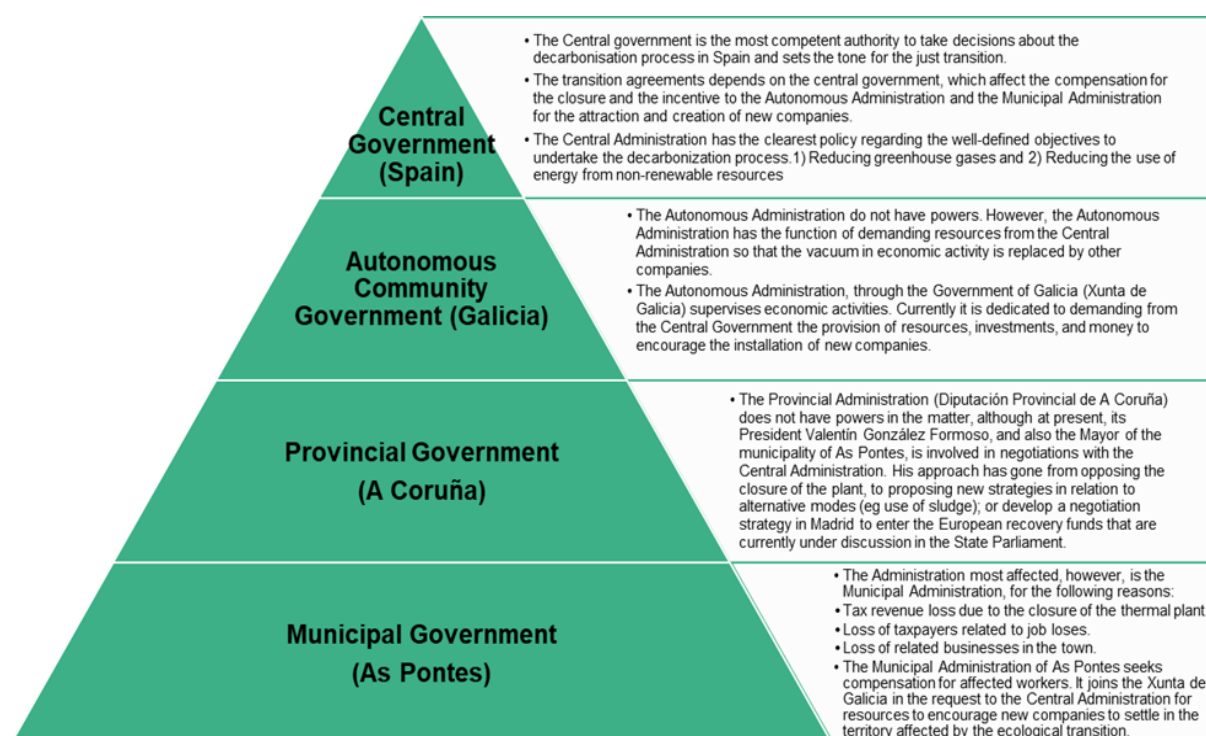
### 5.1 Overview of the energy transition policies

#### 5.1.1 Political system and context

Spain currently has four levels of governance with different powers and competencies in the decarbonisation process (Figure 9). The Spanish National Government is the main administration involved in the process of decarbonisation and just transition of the coal and carbon intensive regions. It has full competence over decarbonisation policies and transition agreements in Spain. It takes decisions on the amount of compensation to industries and workers affected by the closure of carbon intensive activities and encourages autonomous and municipal administrations to attract and support new companies. It has a clear policy, with well-defined objectives to undertake the decarbonisation process, which are reducing greenhouse gas emissions, maintaining energy sovereignty and eliminating energy poverty in the country and limiting the use of non-renewable resources and promoting renewable energy sources.

The regional governments (Autonomous, Provincial and Municipal) has no competencies in the process of decarbonisation and Just Transition of the coal regions. However, they claim resources from the national administration to fill the gap created by this energy transition in local economies and to compensate workers and small businesses affected by this transition. They also encourage the installation of new industries in the affected areas. They also regulates the activities of large private companies to safeguard the environment and workers' rights.

Figure 9 - Four levels of governance in Spain



Source: Own elaboration.

### 5.1.2 Decarbonisation process

#### ***The first phase***

In As Pontes, the first phase of decarbonisation began in the last decade of the 20th century. In the early 1990s, two things happened that affected mining and electricity generation in As Pontes: the first was a European Community Directive requiring a 40% reduction in Sulphur Dioxide (SO<sub>2</sub>) emissions; and the second was the first signs of the end of the coal deposit, which led the company to reflect on how to extend the life of the plant, taking into account the good condition of the equipment, the commitment to work and the good economic results. Thus, the power plant, which was supplied from the adjacent coal mine, was adapted over four years, i.e., from 1993 to 1996. The company adopted the four units of the plant to run on a new fuel, obtained from a mixture of local lignite and imported low-sulphur coal. This imported coal was to be transported from the inland port of Ferrol to As Pontes by lorry. The Ferrol-As Pontes motorway and the infrastructure around the port of Ferrol were created to facilitate this change. This transformation resulted in a decrease in coal extraction from the mine at an annual rate of about 6 Mt of coal per year.

#### ***The second phase***

In December 2007, all lignite mining activity at As Pontes was stopped to reduce CO<sub>2</sub> emissions. Since the closure of the lignite mine, the As Pontes thermal power plant began to consume imported coal, which is cheaper and has lower emissions. In addition, a new natural gas combined cycle thermal power plant with an installed capacity of 800 MW was commissioned in 2008. Environmental reclamation of the mine shaft began in 2008 and was completed in April 2012. The history of the lake begins with the exploitation of the open-cast mine from which lignite was extracted to supply the thermal power plant. Once the mine was closed, the company proposed to the Xunta de Galicia a project to fill the gap left with 547 million m<sup>3</sup> of water. It was decided to opt for this project as it was considered to be the most viable for the recovery of the land, as it was located in the middle of a valley and the rains would end up flooding the land. To fill the entire hole, it was necessary to divert part of the water from the Eume river (96 hm<sup>3</sup>/year), the surface water from the external landfill (24 hm<sup>3</sup>/year), the runoff water from the hole itself (21 hm<sup>3</sup>/year) and the water from the TEL plant (8 hm<sup>3</sup>/year). In 2005, the Xunta de Galicia granted the concession for the abstraction of water from the River Eume at the As Pontes Thermal Power Station weir to fill the mine shaft (granted by resolution of the autonomous body Aguas de Galicia, dated 10 August 2005, published in the A Coruña Official Gazette of 31 August 2005, with correction of errors on 27 September 2005). The works began in January 2008 and were completed in April 2012. The artificial lake is 5 kilometres long and has a maximum depth of 206 metres. It is the largest artificial lake in Europe and is the second largest freshwater reserve in Galicia, with 547 cubic hectometres, behind only the Belesar reservoir.

#### ***The third phase***

The third phase (completion of the carbon phase and follow-up management) started in the middle of the last decade. In February 2019, the Spanish government approved the Strategic Framework for Energy and Climate, through which measures will be implemented to facilitate the shift towards a sustainable and competitive economic model that contributes to curbing climate change. This Strategic Framework is structured into three pillars: the preliminary draft Climate Change Law, the draft National Integrated Energy and Climate Plan (PNIEC) and the Just Transition Strategy (ETJ). Finally, in 2019, ENDESA presented a plan for the decommissioning of the As Pontes plant. The

company has planned to prioritise the hiring of local people for the decommissioning work. It plans to offer additional training programmes for people who will work on the decommissioning process to boost local employment. In addition, it will encourage the purchase of materials from local suppliers that promote green industrial development in the area for the implementation of its new renewable projects. The decommissioning process of the As Pontes facility (which has four generation units) is expected to take around four years, generating around 130 direct jobs and 70 additional jobs during peak work phases. The final closure of the thermal power plant is scheduled for June 2021. Thereafter, the site will be available for new industrial projects to generate employment.

### 5.1.3 Public participation

Energy transition projects require greater involvement of citizens, institutions and local businesses. The aim is that these projects also bring social, economic and environmental benefits that have an impact at the local level, leading to greater acceptance of these actions. At the end of 2016, the European Commission proposed in the “Winter Package” to put citizens at the heart of the energy transition. In particular, the Renewable Energy Directive requires member states to guarantee consumers the right to produce, consume, store and sell their own renewable energy. The involvement of citizens and local authorities in renewable energy projects, through local energy communities, can generate significant added value in terms of local uptake of renewables and access to additional private capital. This will lead to local investment, greater freedom of choice for consumers and greater involvement of citizens in the energy transition. The transition to a decarbonised energy system is a major social and technological challenge, but also an opportunity to give a central role to citizens in the energy sector.

At the European level, this citizen participation takes the form of energy cooperatives, municipal initiatives or local systems supported by citizens through crowdfunding or crowdlending. The challenge is to promote the proactive role of citizens in the energy transition, to develop the social potential, based on a model in which part of the citizenry actively participates in tasks for the benefit of the community in the field of energy in a way that is both social and economic. Directive (HAT) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources establishes the obligation of Member States to ensure that consumers have the right to participate in a renewable energy community while maintaining their rights or obligations as end-consumers. It also establishes that renewable energy communities have the right to produce, consume, store or sell renewable energy, or to share within the community the renewable energy production units generated by the community and to access all energy markets. It also establishes a benchmark for member states to provide a framework to promote and facilitate the development of renewable energy communities.

In Spain, the transposition of certain aspects of renewable energy communities has been carried out through Royal Decree 23/2020, of 23 June, which approves measures in the field of energy and other areas for economic reactivation, by amending several sections of Law 24/2013, of 26 December, on the Electricity Sector. Article 4 defines Renewable Energy Communities as “legal entities based on open and voluntary participation, autonomous and effectively controlled by the partners or members located in the environment of renewable energy projects, whose ownership corresponds to the legal entities that have developed them, whose partners or members are natural persons, SMEs or local entities, including local councils and whose main objective is to provide environmental benefits to the economic or social partners or members or to the local areas in which

they operate, rather than financial benefits”. Therefore, these communities can be based on premises of any energy vector, where and when renewable.

The Strategic Energy and Climate Framework launched in February 2019 contains special measures to ensure the involvement of citizens and local authorities in the development of policies related to the transition process. The long-term decarbonisation strategy (ELP) 2050, in chapter 7.1. “The role of citizens”, also includes the importance of involving society in the transformation of the energy system and the economy towards a climate-neutral country in 2050, placing citizens at the centre of the energy system. Finally, in a context of economic recovery and reconstruction after the health crisis, local energy communities can play an important role in job creation, not only directly but also through the pull of different local value chains and energy cost savings for domestic, industrial or service and public sector consumers.

### 5.1.4 Clean Energy Transition (CET)

#### ***Closure of coal-mines***

Between 1976 and 2007, Endesa exploited the As Pontes mine to supply fuel to a thermal power plant it owned located at the foot of the mine. In total there were 19 lignite layers ranging in thickness from 1 to 28 metres. The mining area was approximately 6 km long and 2,5 km wide, with a partial narrowing in the centre, known as the sill, which divides the mining area into two fields: West and East. The maximum excavation depth is 288 metres in the west and 235 metres in the east. These mines were finally closed in 2007.

#### ***Restoration of waste dumps and open-cast mine***

During the mining period, 261.3 million tonnes of lignite and 697.3 million cubic metres of clayey sediments were extracted from the tertiary basin and the shales on the edge of the deposit. The mining activity involved the creation of an outer heap of 720 cubic metres, an inner heap of 93 cubic metres and a final void area of 12 square kilometres. Restoration of the outer heap began in 1985 and was completed in 2006. Environmental remediation of the waste dump began in 2008 and was completed in April 2012 in the form of a freshwater lake. The heap in its current and final situation occupies an area of 1,150 hectares, has a volume of 720 million cubic metres and a height of 160 million cubic metres. hectares, has a volume of 720 million cubic metres and a height of 160 metres.

#### ***Closure and dismantling of La Central thermal power plant***

Due to the lack of competitiveness and the high price of carbon emissions, ENDESA has decided to retire the coal-fired units of the As Pontes thermal power plant in December 2019. The decommissioning process of the plant, which was scheduled to start in June 2021, has been postponed due to the shortage and increase in the price of natural gas and the higher demand for electricity for domestic and industrial use. The delay is also related to the request made by the Ministry for Ecological Transition and Demographic Challenge on 10 June 2020 to assess the environmental impact of this decommissioning procedure. ENDESA had presented a plan to sell land, at a very low price, to new companies that want to start their activity in As Pontes. This will involve a change of land use. The land that was a coal dump will be converted into an industrial complex.

#### ***Installation of wind, solar and hydrogen plants***

The last decade has seen a large increase in the installation of green energy projects in the As Pontes region. Several new projects are on the table awaiting confirmation from the central and



regional governments and financial support from the reconstruction and transition funds announced by the European Commission. Endesa has installed a large wind farm complex, Carballeira, located in As Pontes with a total capacity of 161.70 MW. Secondly, the Bustelo wind farm is a wind farm complex located between As Pontes and Muras with 124 wind turbines with an installed capacity of 40.5 MW, making it one of the largest in Spain with wind turbines with a capacity of between 600 and 1650 KW. As Pontes Town Council has equipped its municipal facilities, such as the swimming pool, sports centres and administrative buildings, with solar panels to create enough energy to heat water boilers, air conditioning and lighting.

## 5.2 Socio-political component

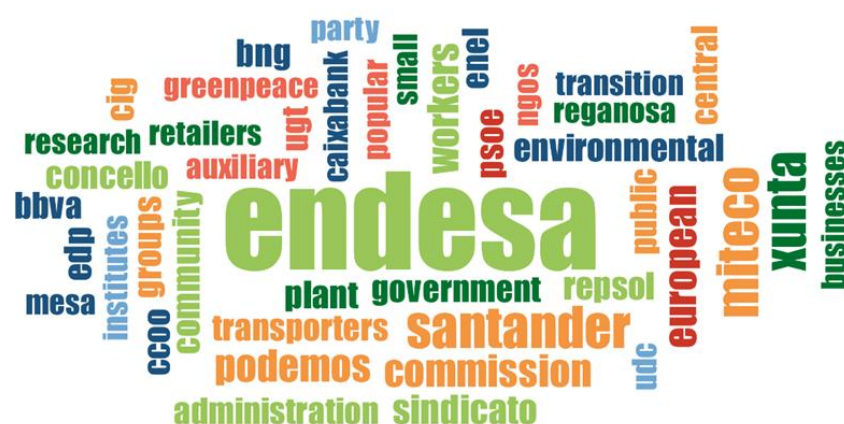
### 5.2.1 Summary of results

### ***Issues, statements and conflicts***

A detailed analysis of the textual material shows that there are several issues and conflicts surrounding the development and implementation of decarbonisation policies and the distribution of funds for the just transition of areas affected by the decarbonisation process. Some of the main issues and conflicts:

- Conflicts over the distribution of EU funds for the recovery of mining regions.
- Conflict over the relocation of workers and transporters.
- Issue of the survival of auxiliary businesses.
- Issue of pollution and its impact on health.
- Issue of the installation of renewable energy plants in the area.
- Conflict over the decommissioning of the thermal power units.
- Conflict over the financial and technical support for new industries.
- Conflict over the recovery of land affected by mining and thermal power units.
- Issue of loss of revenue for the local municipality.
- Issue of energy security and affordability.
- Issue of inflation and rising cost of living.
- Issue of job creation, youth emigration and depopulation.

**Figure 10 - Different stakeholder involved in the energy transition process in As Pontes, Spain**



Source: Text material collected the June 2021 to February 2021.

*Note:* The size of the words represents the frequency of occurrence



Different stakeholders (Figure 10) construct their narratives on the progress of the energy transition process using these issues and conflicts. These issues show the vulnerabilities of local people, institutions and carbon-intensive regions and highlight the shortcomings of the ongoing energy transition process.

### **Discourse and narratives**

Narratives are often described as “socially constructed stories” (Hinkel et al 2020). They help people to make sense of events and phenomena by integrating them into worldviews (van der Leeuw 2020). In this way, narratives shape preferences and opinions of the different stakeholders that in turn give direction to their actions (Fløttum and Gjerstad 2017). There are multiple narratives propagated by different actors to support or resist the ongoing energy transition in different parts of Spain, including As Pontes. These narratives are used by different stakeholders to promote their interests and to strengthen their constituencies. Broadly speaking, we can classify the narratives into two categories, first that support the energy transition process and the implementation of the decarbonisation measures as it is and second that criticise how the energy transition measures are implemented. Some of the main narratives in the first category are the following.

---

*The energy transition is a great business, social and industrial opportunity for the Spanish economy*

---

This is the dominant narrative regarding the energy transition propagated by the central government, the European Commission (EC), Endesa and financial institutions. Proponents of this narrative see the energy transition and the growth of renewable energy sources as a win-win scenario that will create new green jobs, increase investment opportunities in green businesses, produce regional development and generate clean energy and a safe environment. Spain’s central government is the biggest proponent of this narrative. According to the long-term strategy of the Ministry for Ecological Transition and the Demographic Challenge (MITECO), which is responsible for developing and implementing transition policies in Spain, “the energy transition is a great business, social and industrial opportunity for the Spanish economy” (*ELP\_MITECO, 2020, P. 6*) and “Spain has the potential to become one of the European countries driving this energy transition” (*ELP\_MITECO, 2020, P. 7*). Secondly, the EC, which is the main funder of decarbonisation projects in Spain, also supports this narrative and has endorsed the Recovery, Transformation and Resilience plan (2021) proposed by the Spanish government. The plan consists of 112 investments and 102 reforms, which will be supported by €69.5 billion in grants. Forty per cent of the plan will support the climate objectives and 28 per cent will foster the digital transition. The EC assessment report states that “the reforms and investments in the plan will help Spain become more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions.” (*Spain’s recovery and resilience plan \_ European Commission, P. 1: 38*). Thirdly, the largest business groups in the energy sector in the As Pontes region, such as Endesa, Reganosa, EDP and Naturgy, also support this narrative. All these groups are the main energy suppliers in Spain. In the recent past, they used fossil fuels to generate energy, which made them the richest companies and the biggest polluters in Spain. Now, they are planning to benefit from the European funds to switch to renewable energy and clean up their image as responsible and sustainable companies. Endesa’s CEO states that “the Next

Generation funds represent a great opportunity for the recovery of the economy.” (*Endesa ubicará en As Pontes un centro logístico y de operación*, P. 3).

---

### *Green growth and sustainability narrative*

---

Another dominant narrative around the energy transition presents it as the only hope for ensuring the survival of life on earth. They refer to the latest IPCC report on climate change<sup>7</sup> to justify their concerns about the severity of climate change impacts around the world. This narrative is championed by environmental groups, left and centrist political parties and community associations. Environmental groups, such as Greenpeace, Galiza un Futuro sen Carbón, Verdegaiá and Petón do Lobo, active in the As Pontes region, played an important role in raising awareness of the adverse effects of large fossil fuel-based industrial units and contributed to the creation and propagation of the ‘green growth and sustainability’ narrative. The latest report on decarbonisation by the Sustainability Observatory noted that “Repsol, Endesa and Naturgy are the most polluting companies in 2020. All three companies have plants in the province of A Coruña and together they have produced 26.3 million tonnes of environmentally harmful gases” (*Repsol, Endesa and Naturgy, on the podium of the most polluting companies*, P. 2: 1220). This demonstrates the importance of phasing out of these industrial units to meet the climate targets set by the Spanish government for 2030 and 2050. The environmental platform Galiza, un Futuro sen Carbón blames the denialism of Endesa, public institutions, political parties and trade unions, which “despite climate warnings, did everything possible to maintain the activity indefinitely and did not want nor knew how to prepare for the current scenario” (*As Pontes does not want to pay the price for the transition disaster*, P. 2: 1260). Left and centrist political parties, such as Galicia en Común, which is an offshoot of Unidas Podemos in the centre and the Socialist Party of Galicia (PSdeG-PSOE) also support this narrative.

---

### *Sun and wind are the new oil*

---

The third main narrative in favour of decarbonization policies and the energy transition is: “*Sun and Wind are the new oil*”. Proponents of this narrative portray the energy transition as an opportunity to attract more private and public investment in the renewable sector and reap long-term benefits. The main proponents of this narrative are financial institutions, including major banks and investment groups with large stakes in the energy sector. Recently, due to the expected closure of carbon intensive activities under the various decarbonization policies, all financial institutions have started to shift funds away from the fossil fuel sector to renewables and have encouraged companies to move towards green energy solutions. All major banks see this energy transition as an opportunity to expand their sustainable business model. The CEO of Banco Santander said: “Climate change is a global emergency. As one of the world’s largest banks, with 148 million customers, we have a responsibility and an opportunity to support the green transition and encourage more people and

---

<sup>7</sup> <https://www.ipcc.ch/report/ar6/wg2/>

businesses to go green. There is much, much more to be done, but today's commitments are important steps on the journey." (*Santander, P. 1: 1755*). Likewise, when speaking about the energy transition, the BBVA chairman stated that "the energy transition represents a tremendous opportunity to generate growth and well-being" (*BBVA, P. 2: 4484*) and that "Spain has a competitive advantage in the energy transition" (*BBVA, P. 1: 1767*). Regarding the situation of electricity generation in Spain, which is the main contributor to emissions, the BBVA chairman said that "the electrification and the decarbonization of electricity is a key aspect. We are going to multiply the installed capacity by three. Spain is very competitive in this because it has the natural resource - the 'new oil', which is the sun and the wind" (*BBVA, P. 2: 10*). Similarly, CaixaBank, in line with its sustainability strategy and its commitment to zero emissions by 2050, is financing green hydrogen initiatives that will incentivise the overall transition towards decarbonisation. CaixaBank has highlighted the importance of hydrogen in this ongoing energy transition, as a substitute for other fossil fuels with high carbon content and as a means of storing energy produced through renewables. Among the major financial groups, Fundación Repsol is one of the leading groups in the energy sector. In 2020, reinforcing its commitment to energy transition and society, the chairman of this group describes that "the investment [in the company Hispaled] represents an opportunity to drive the scaling up of a truly innovative company, which responds to the challenges of advancing a fair and inclusive energy transition" (*Repsol, P. 2: 320*).

Conversely, narratives highlighting the shortcomings of this decarbonisation process and criticising the implementation of energy transition policies include:

---

*The energy transition is neither Just nor Transition*

---

Proponents of this narrative describe the energy transition as an abrupt and unfair process, imposed on people living in carbon-intensive regions and consumers who are forced to pay high energy prices. They claim that the energy transition, in its current form, is highly devastating for carbon-intensive regions and harms the interests of people directly or indirectly involved in carbon-intensive industries. The main proponents of this narrative are trade unions, small businesses, regional and local governments and the general public. Firstly, the trade unions of the thermal power plant and transport workers are extremely unhappy with how the transition policies are framed and implemented in As Pontes. The first major concern of the unions is the relocation of the plant workers to other provinces outside Galicia. Endesa had promised to reallocate the workers close to their homes but is now failing to keep its promise. The workers' union representatives denounce that "more than 90% of the vacancies where the workforce will be relocated are outside the Galician community, so employment in the area around the municipality of A Coruña is not guaranteed." (*Endesa traslada al personal de As Pontes fuera de Galicia, P. 1: 430*). Similarly, describing the situation of the transport workers, the president of the Association of Coal Transporters and member of the Board of Directors of the Galician Federation of Transport, denounced that "we are mortgaged. Three or four months before announcing the closure, they ordered us to renew the vehicles to make them less polluting, telling us that Endesa was going to operate at least until 2040-2045. There are colleagues in a desperate situation." (*La central de As Pontes hace acopio de carbón ante la amenaza, P. 3: 1956*). Local governments also support this narrative. They are also very unhappy

with Endesa and the central government, which are mainly responsible for this transition process. The municipal councillor of As Pontes and the president of the regional government in A Coruña, states that "a private company [Endesa] makes its decisions and does not share them... it deceives the society to which it owes so much. It is not necessary to deceive society with a report full of falsehoods that only makes all the administrations and society itself angry, which has long perceived that Endesa's commitment to As Pontes and to Galicia can be summed up in a future wind plan with hundreds of wind farms that will be in the vicinity of the place where it is doing so much damage", (*El alcalde de As Pontes ve \_lleno de falsedades\_ el informe de Endesa, P. 1: 1323*). He added that "the transition has been very disruptive and disruptive measures are needed to deal with it." (*Cambio climático\_ La otra cara de la transición ecológica, P. 1: 1403*). The leader of the opposition party BNG in Galicia explained that "this is not a just energy transition, but a pure and simple shutdown and we are facing a tremendous political irresponsibility that portrays the inability of both executives to manage a truly just energy transition" (*Ana Pontón visita la acampada de As Pontes y pide a la Xunta, P. 2: 933*). Small and auxiliary companies also criticise the energy transition process for its neglect and the unfair distribution of European funds for regional development. The work council of the auxiliary workers affirms that "if the closure decision materialises in June 2021, there is no alternative employment in the area, neither for the company's staff nor the auxiliary staff." (*Endesa traslada al personal de As Pontes fuera de Galicia, P. 3: 583*).

---

*The energy transition is misguided and expensive.*

---

Proponents of this narrative portray the energy transition as a misguided and costly process that will lead to high energy prices, energy insecurity, energy poverty and frequent blackouts, which will negatively affect industrial growth and the country's competitiveness in the global market. The main proponents of this narrative are the centre and right-wing political parties, the general public and small businesses, which are ultimately paying the price for this transition. The Partido Popular, a conservative political party in Spain, which is the main opposition in the central government and the ruling party in the Galician regional government, criticised Endesa for not consulting them before the closure of the thermal plant in As Pontes and criticised the central government for an 'unfair, chaotic and disorderly energy transition, which allowed the company to do whatever it wanted' (*Endesa cierra la térmica de As Pontes (A Coruña) por la inviabilidad, P. 10: 715*). Speaking about the recent increase in the energy bills, PP representatives said that "month-by-month, lighting bills, heating bills, the cost of petrol and diesel, food, housing and transport just keep going up. The whole of society is suffering" (*In Spain, soaring prices fuel growing social unrest – EURACTIV., P. 2: 88*). This public anger on the increasing energy bills have contributed to the rise of far-right party Vox in Spain. It has become the third largest political party in Spain and experiencing a surge in support. It has capitalised on widespread discontent, especially in rural areas, accusing the government of being "a factory of misery that ruins the middle classes and the most disadvantaged" (*In Spain, rising prices fuel growing social unrest - EURACTIV., P. 2: 1475*).

### **Major constituencies**

The ongoing energy transition process in A Coruña affects (directly or indirectly) a large number of people and institutions. The qualitative analysis of the text material helped us to identify the main

stakeholders in As Pontes, including government bodies (EC, central government of Spain - MITECO, regional government of Galicia and municipal council of As Pontes), producers of energy (ENDESA, Reganosa, EDP), trade unions (plant workers, transport employees, auxiliary workers etc.), consumers of energy (general public, small businesses) and other affected groups (environmental groups, political parties, financial institutions, women and other social organisations). All of these stakeholders have varying levels of power and interest in the decarbonization and energy transition process. Based on power and interest, they can be classified into four categories (Table 13). In the first category, we include stakeholders with high power and interest. These are the European Commission, the central government (MITECO), the company Endesa and financial institutions such as Santander, BBVA and CaixaBank. As mentioned above, the energy transition is a top-down process in Spain, therefore, all of these stakeholders are active simultaneously at national and local levels and frame policies that affect transition in As Pontes. The first important stakeholder in this category is the European Commission. As a member of the European Union, Spain is obliged to follow EU climate plans and to implement EU rules and regulations related to environmental protection. Most decarbonization policies and measures in Spain depend on direct funding from the European Commission, which makes them an important factor in the energy transition process with great power and interest. Secondly, the central government has the maximum power and interest in the energy transition and decarbonization process in Spain. All major policies regarding the phasing out of carbon-intensive activities and support for transition regions are framed and implemented by the Ministry for Ecological Transition and Demographic Challenge (MITECO), which is a central government body and is headed by the vice president of the government. The third important player with great power and interest is ENDESA, owner and manager of the As Pontes thermal power plant. ENDESA is the largest industrial group in the region. For decades, it has exploited a large number of local resources (coal, water, land and air) and has employed a large part of the local population, which makes it an important stakeholder with a lot of responsibility for recovering the land and water resources contaminated during coal extraction, transportation, storage and combustion and for relocating workers who become unemployed after the closure of the plant.

**Table 13 - Stakeholders grid in the A Coruña case study**

	<b>INTERESTS</b>	
	<b>High Power/Low Interest:</b>	<b>High Power/High Interest</b>
	Trade Unions (CIG, UGT, CCOO) Political parties (PPdeG)	Central Government (MITECO) EU Institutions Big Business (Endesa-Enel) Financial Institutions (BBVA, Santander, La Caixa, Repsol foundation) Research and Investigation Institutions (UDC)
	<b>Low Power/Low Interest</b>	<b>Low Power/High Interest</b>
<b>POWER</b>	General Public, Local small businesses and Women and other community associations	Regional governments (Autonomous, Provincial and Municipal administrations) Environmental groups (Greenpeace, Verdegai, ADEGA)

*Source: Own elaboration, with textual material collected during June 2021 to February 2022.*

Finally, the fourth important stakeholders with great power and interest are the financial institutions, such as Santander, BBVA, CaixaBank and Repsol Foundation. These financial



institutions have major interests in the energy sector in Spain. They are influencing the decarbonization process by cutting funding for non-renewable energy sources and shifting the budget towards large renewable energy projects. They are also encouraging their private investors to transfer funds to renewable energy projects. In the second category, we include stakeholders with high power and low interest, such as trade unions (UGT, CCOO) and conservative political parties (PP, Vox). Trade unions are very strong organizations in the mining and power generation sectors in Spain. In the past, on the occasion of the closure of the coal mines in 2007, they succeeded in defending the rights of the miners and now they are pressuring the central government and the company for the outplacement or early retirement of the workers laid off by the closure of the thermal power plant. The unions agree with the need for the closure of carbon-intensive activities to protect the environment but show little interest in the decarbonization process and certainly do not want to sacrifice the welfare of plant workers for the sake of environmental protection. Conservative political parties such as the PP, which is the main opposition party in the central government and the ruling party in the autonomous community of Galicia and Vox, which is the third largest far-right nationalist political party in Spain, have also shown little interest in the decarbonisation policies implemented by the central government. On the contrary, they are mobilising protests against the closure of industrial units and criticising the government for mismanaging the transition funds and putting the carbon-intensive region's economic growth and the country's energy security at risk.

In the third category, we include actors with low power and high interest, such as regional governments (autonomous, provincial and municipal), environmental groups (*Greenpeace*, *Galicia sin carbono*) and research institutes. In Spain, regional governments have little power to affect central government policies, but they are very interested in the decarbonisation process affecting their population, territory and resources. The regional governments of the As Pontes region (*Xunta da Galicia* and *Concello de As Pontes*) are lobbying the central government to get the lion's share of funds from the European Commission to mitigate the adverse impacts of the closure of the thermal power plant and to restructure the economies of the affected regions. Similarly, environmental groups have limited power and a strong interest in the decarbonisation process. Environmental groups, such as *Greenpeace* and *Galicia un futuro sin carbono*, organise protests against the delayed closure of thermal power plants, which are the main source of CO<sub>2</sub> and other toxic gas emissions in the region. They have limited power to influence government policies, but they continue to inform the government about the environmental damage caused by the thermal power plants in the As Pontes region. Finally, research institutes, such as the University of A Coruña, are also very interested in the process of developing and implementing decarbonisation policies for the As Pontes region but have limited power to influence government decisions. Several university research groups have raised questions regarding the impacts of decarbonisation policies on the local economy, population and territory and have assisted regional governments in presenting evidence-based arguments to the central government regarding the impact of the closure of the thermal power plant. In the fourth category, we include stakeholders with little power and little interest, such as small local businesses and community associations. In the As Pontes region, local small businesses have little power and interest in shaping decarbonization policies. They are limited to bearing the adverse impacts of the closure of thermal power plants, which leads to the loss of customers for them. Likewise, there are no significant community associations protesting or supporting decarbonization policies and energy transition in the region. There is total silence in the published material on gender issues related to this energy transition.



### **Constituencies, the local field of power and outcomes**

All these stakeholders can be classified into three constituencies involved in the decarbonization process (Table 14):

#### Constituency 1: Technological regularisation (IMPOSE)

In the case of A Coruña, the imposing constituency includes the European Commission, central government, Endesa, financial institutions and environmental groups. Its main function is to frame and implement decarbonisation policies and distribute funds to different green energy projects and support regions and people affected by the closure of carbon-intensive economic activities. Among the imposing constituency, at the top is the European Commission. It approves the various decarbonisation policies made by national governments and provides resources for their implementation and assesses their impact on the economy and society at large. In the report 'Europe's long-term strategic vision for a prosperous, modern, competitive and climate-neutral economy', the EC states its long-term goal as "The objective of this long-term strategy is to confirm Europe's commitment to lead global climate action and to present a vision that can lead to achieving zero net greenhouse gas emissions by 2050 through a socially just transition in a cost-effective way. It highlights the opportunities this transformation offers to Europe's citizens and its economy, while identifying the challenges ahead".

The second major component of the imposing constituency is Spain's central government. MITECO is responsible for the development and implementation of decarbonisation policies. They have supreme authority in relation to the distribution of funds and the management of the closure of carbon-intensive activities. They are also responsible for ensuring that no one is left behind in this transition. Endesa, which is the largest business group in the A Coruña case study region, is the third largest component of the imposing constituency. It has a lot of power to influence the pace of the energy transition and the implementation of decarbonisation policies. Endesa has decided to close the As Pontes thermal power plant in December 2019 due to the high carbon price and they are now willing to invest more in renewable energy sources (wind and solar power plants) and hydrogen plants to produce clean energy and increase energy storage capacity to maintain regular electricity supply at peak hours. Financial institutions, such as banks and large investment groups, are also an important part of the imposing constituency. By withdrawing investment funds from fossil fuel industries and transferring them to renewables, they are supporting the energy transition to clean energy and helping companies adopt sustainable growth models. Finally, environmental groups are also an important part of the imposing constituency. They help the government promote awareness of the adverse impacts of fossil fuel use on the climate and mobilise people to protest against big polluters.

**Table 14 - Stakeholders positions in the power field in the A Coruña case study**

	<b>POWER (LOW →HIGH)</b>	
<b>AGREEMENT (LOW →HIGH)</b>	<b>Υ SUPPORTERS</b> Regional government (Autonomous, Provincial and Municipal) Environmental groups	<b>Υ DRIVERS</b> Central Government (MITECO) EU Institutions Big Business (Endesa-Enel) Financial Institutes (BBVA, Santander, La Caixa, Repsol foundation) Research and Investigation Institutions (UDC)
	<b>Υ ABSTEINERS</b>	

Υ <b>BYSTANDERS</b> General Public Local small businesses Women and other community associations	Υ <b>BLOCKERS</b> Trade Unions (Workers, Transporters) Centerist and Far-right Political parties (PPdeG)
---	--

Source: Own elaboration, with textual material collected during June 2021 to February 2022.

#### Constituency 2: Technological adjustment (COPY)

The coping constituency includes regional and local administrations, small businesses and independent local actors (women and community associations). Their main role is to address the adverse impacts of decarbonisation policies. Among the response groups, regional governments are the most important components. Regional governments have limited power to affect decarbonisation policies, but they are coping with the huge loss of revenues due to the closure of thermal power plants and ancillary companies. Regional governments receive a large amount of tax money from these large companies and their allies, which they use for community development and social welfare activities for vulnerable groups. This loss of revenue will affect the functioning of local government and will have dire consequences for the continuation of social support projects. Regional governments are playing a major role in addressing the needs of workers and other stakeholders who are affected by the closure of economic activities responsible for emissions. The second main component of the coping constituency is small businesses. The closure of the thermal power plant will affect a large number of small businesses (mechanical workshops, spare parts shops, retail shops, ancillary businesses, etc.), which have developed around the thermal power plant over the last five decades. All these small businesses are coping with falling demand and customers. Some businesses have reached the brink of closure and others are barely struggling to survive with no hope for the future. Finally, local people, women and community associations are also an important part of the coping constituency. The drop in employment opportunities due to the closure of the thermal power plant and other related enterprises is affecting the future employment prospects of many young people, who have no choice but to seek employment outside the region. It is accelerating the process of youth migration and depopulation. The lack of funding for social welfare projects initiated by local governments is affecting vulnerable groups.

#### Constituency 3: Technological reconstitution (RESIST)

The resistance group includes trade unions and right-wing or centrist political parties. Their main role is to resist the implementation of decarbonisation policies and the phasing out of large industrial units such as power plants. In Spain, trade unions, especially in the coal mining and power generation sectors, are having great power to influence the decisions of the central government and Endesa in favour of the workers affected by the closure of the thermal power plant. In the region of A Coruña, they have mobilised a large number of workers at the plant to resist the decision to close the thermal power plant and to raise the demands of the plant workers to be relocated to other new economic activities in the region before the closure. The association of transporters, who were involved in the supply of imported coal from the port of Ferrol to the As Pontes thermal power plant, is also organising protests and raising the voice of the transporters and workers, who will be left without work due to the closure of the thermal power plant. The second important component of the resisting electorate is the right-wing or centrist political parties. In Spain, the Partido Popular and Vox parties resist the implementation of decarbonisation policies and the closure of large industrial units. The recent increase in energy prices has strengthened the PP's support in the region of A Coruña. Similarly, the far-right Vox party experienced an increase in support in rural areas of Spain.

### 5.2.2 Interpretation

A detailed analysis of the textual material showed that during the last decade, energy transition remained a hotly debated topic in Spanish politics and society at large. The closure of the As Pontes thermal power plant, which had the largest thermal power plant in Spain, affected a large number of people and institutions in the region of A Coruña, who are also the main stakeholders in this transition process. Depending on their power and interest in the decarbonisation process, we have classified all these stakeholders into four categories: 1) stakeholders with high power and high interest, which are the European Commission, the central government (MITECO), large companies (Endesa) and financial institutions (Santander; BBVA, Caixabank, etc.); 2) stakeholders with high power and low interest, which are trade unions (UGT, CCOO) and centre and right-wing political parties (PP, Vox); 3) stakeholders with low power and high interest, which are regional governments (autonomous, provincial and municipal), environmental groups (Greenpeace, Galicia sin carbono) and research institutions (UDC); and 4) stakeholders with low power and low interest, which are the general public, small local businesses and community associations. These stakeholders form different constituencies that can be classified as 1) Imposing constituency, which includes the EC, the central government (MITECO), large companies (Endesa) and financial entities (Santander; BBVA, Caixabank, etc.), environmental groups (Greenpeace) and research institutions (UDC); 2) Resisting constituency, which includes regional governments (autonomous, provincial and municipal), the general population, local businesses and community associations; and 3) Resisting constituency, which includes trade unions (UGT, CCOO) and centre and right-wing political parties (PP, Vox).

These stakeholders have created and propagated several narratives to support or resist the decarbonization policies and the energy transition process. The narratives that support energy transition are '*Energy transition is a great business, social and industrial opportunity for the Spanish economy*', '*Green growth and sustainability narrative*' and '*Sun and wind are the new oil*' and the narratives that resist energy transition are '*Energy transition is neither Just nor Transition*' and '*Energy transition is misguided and costly*'. All these narratives are affecting the pace of the energy transition in different parts of Spain, including A Coruña. In November 2021, despite the acceptance of Endesa's closure report, which they submitted in December 2019, the increase in the price of natural gas on the world market and the shortage of electricity in the country forced the central government to allow Endesa to start up two units of the As Pontes thermal power plant to cover the energy needs of households. This action delayed the decarbonisation process in the A Coruña region and opened a debate on our dependence on fossil fuels and the economic viability of this transition. The recent aggression by Russia, the EU's largest supplier of natural gas to Ukraine, has aggravated the energy situation in many European countries. Rising energy prices have affected the budgets of many governments across Europe. Acceptance of coal has increased slightly and many eastern and central European countries plan to delay the phase-out of coal-fired power plants to secure energy supplies and reduce dependence on Russian gas. In Spain, energy prices have doubled since the war began, leading to massive protests in the country. This price increase has changed the narrative against energy transition policies and people are beginning to blame the central government's decarbonisation policies for rising energy bills. Right-wing political parties, taking advantage of this critical situation, propagate the narrative that the energy transition is wrong and costly for middle-class households and that they are the scapegoat for this energy transition. Although the central government is trying to provide relief to vulnerable households by reducing the electricity tax, it is still unable to stop the rise in energy prices, which is eroding its credibility among

the masses. In the future, it will be interesting to see how the narratives propagated by the central government, the European Commission and financial and research institutions will sway public opinion in favour of the energy transition and help accelerate the process of decarbonising the Spanish economy for a just and sustainable future.

### 5.2.3 Gender dimension

In the case of A Coruña, women play an important role in the decarbonisation process in different positions. Most importantly, the central government ministry, MITECO, which is responsible for the elaboration and implementation of decarbonisation policies, is chaired by a female minister, Teresa Ribera Rodríguez, who is also the third vice-president of the central government. Similarly, in local government, women also play an important role in the implementation of decarbonisation policies and in mitigating their impacts on the local population. In the City Council of As Pontes, the Councillor for Employment, Industry and Human Resources, Ana Pena, plays an important role in the reactivation of the industrial sector. In addition to the administration, women also play an important role in unpacking the different narratives around the energy transition. As domestic end-users of energy, women are most affected by energy security and affordability. There is a very strong presence of women in environmental protection groups. They participate in all demonstrations called by environmental groups, such as Greenpeace. However, there is a lack of women in private sector energy companies. Among the textual material collected for this study, 30% was written by women and 30% by men and the remaining 40% had no information on the gender of the author. It is therefore difficult to say which gender has more presence in the public sphere.

## 5.3 Socio-ecological and technical component

### 5.3.1 Summary of results

#### ***Determinants of transformative capacity***

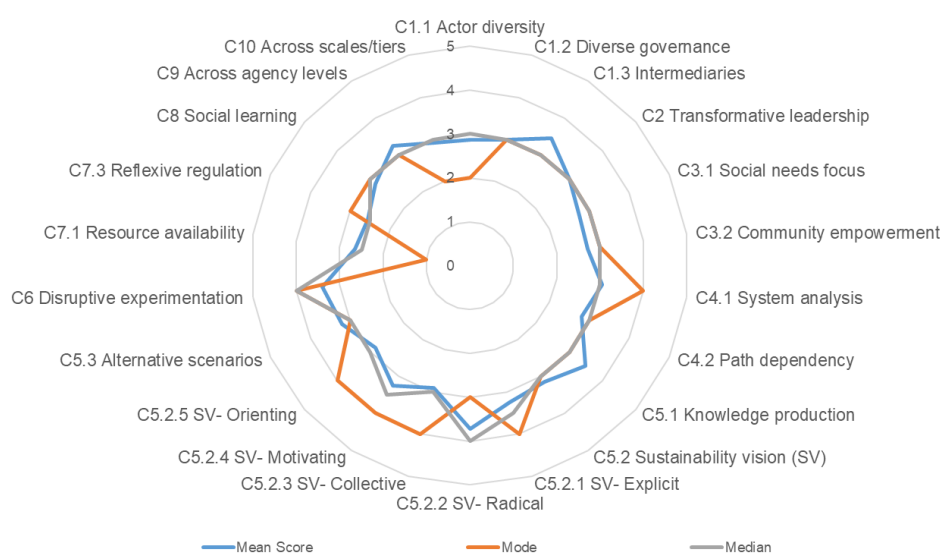
This section provides an overview of the capacity available in the case study region to shape its decarbonisation pathway. The focus on transformative capacity allows us to discern the extent to which a region is capable of deviating from its current (carbon-intensive) trajectory toward sustainable outcomes. Transformative capacity is understood in this context as an evolving collective ability to conceive of, prepare for, initiate and perform path-deviant change towards sustainability within and across the multiple complex systems that constitute the regional or urban area undergoing a CET. As a systemic capacity, it is not attributable to any single actor but rather results from the interactions and orientations of multiple actors in the regional or urban economic development system involved in shaping its decarbonisation pathways. The diagnosis of transformative capacities thus enhances knowledge of key capacities hindering or facilitating purposeful transformation, ultimately permitting them to be addressed as part of capacity development activities. Transformative capacity is strongly influenced by the governance of the regional decarbonisation or clean energy transition in question. Three governance and agency components are critical to the ability of a regional development apparatus to foster the transformability of a system: the inclusiveness and multiformness of governance arrangements (C1); polycentric and socially embedded transformative leadership (C2); and the empowerment and autonomy of relevant communities of practice (C3). These elements are preconditions for the transformability of a system: there needs to be connectivity

and responsiveness built into governance, effective leadership able to bring people together around a vision and actors empowered to experiment and innovate. These three attributes must be developed by stakeholders in capacity development processes to enhance their transformative potential, including enhancing understanding of the systems of which they are a part (C4), engaging in participatory visioning and alternative design scenarios (C5), experimenting with novel solutions to social needs (C6) and ensuring that these innovations can be embedded (C7). Ideally, this can be seen as a learning loop, where system(s) understanding helps inform visions and pathways, which in turn orient experimentation, with successful innovations being embedded and better system understanding resulting from this process. These processes should be fed back into governance through social learning (C8) as well as the effective involvement of actors at different scales (C9) and levels of agency (C10). These components were assessed through mixed quantitative and qualitative interviews with various stakeholders engaged in the CET.

### Overall Assessment

According to stakeholders in the A Coruña region, the *radical sustainability vision* (C5.2.2) of the energy transition is the most important factor affecting the region's transformative capacity. All stakeholders believe that the transition process in the A Coruña region is radical and far-reaching and provides a clear direction for their actions. Similarly, the other important factors are *intermediaries* (C1.3) and *knowledge production* (C5.1), where the former focuses on the role of intermediaries in the governance of the energy transition process in the region and the latter demonstrates the diversity of knowledge produced from different sectors, which relates to regulatory changes to support the energy transition and overcome barriers. *Reflexive regulation* (C7.3) shows the extent to which regulatory changes have been implemented to support the transition process and overcome obstacles, is considered to be the weakest factor affecting the region's transformative capacity, followed by *resource availability* (C7.1), which shows the support received by different stakeholders to improve inclusiveness, increase participation, development of visions and scenarios and experimentation and *community empowerment* (C3.2), which demonstrates the level of support received by stakeholders and communities to act autonomously for the energy transition (Figure 11).

**Figure 11 - Stakeholder's assessment of transformative capacity in the A Coruña region**



Source: Semi-structured interviews conducted during Dec. 2021 – Feb. 2022.

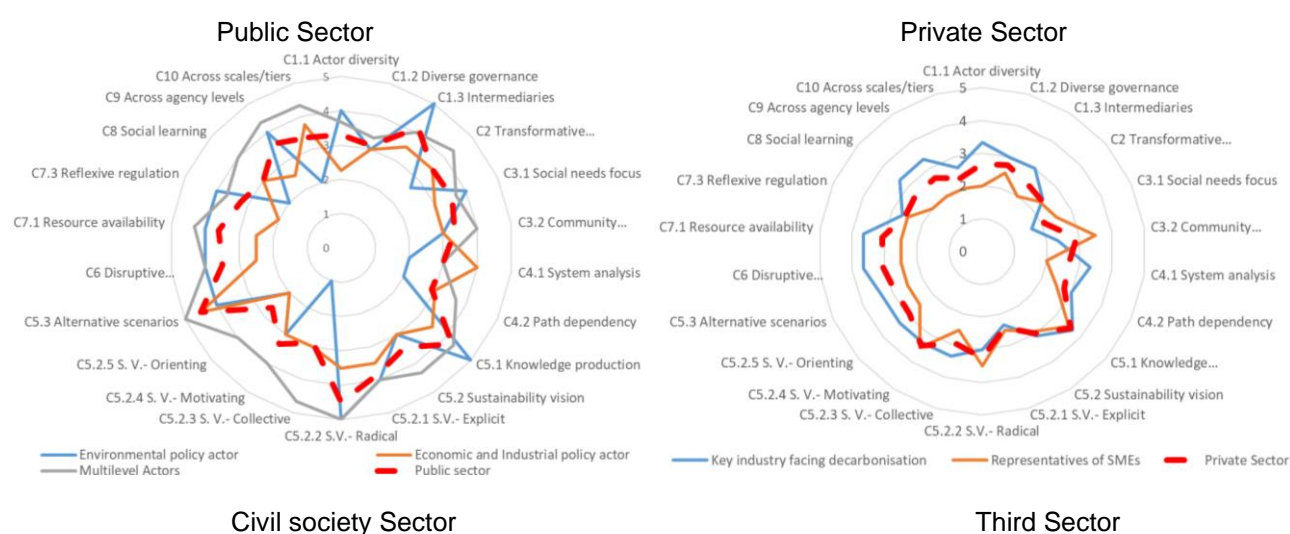
Note: Due to the wide range of responses, all measures of central tendency are included.



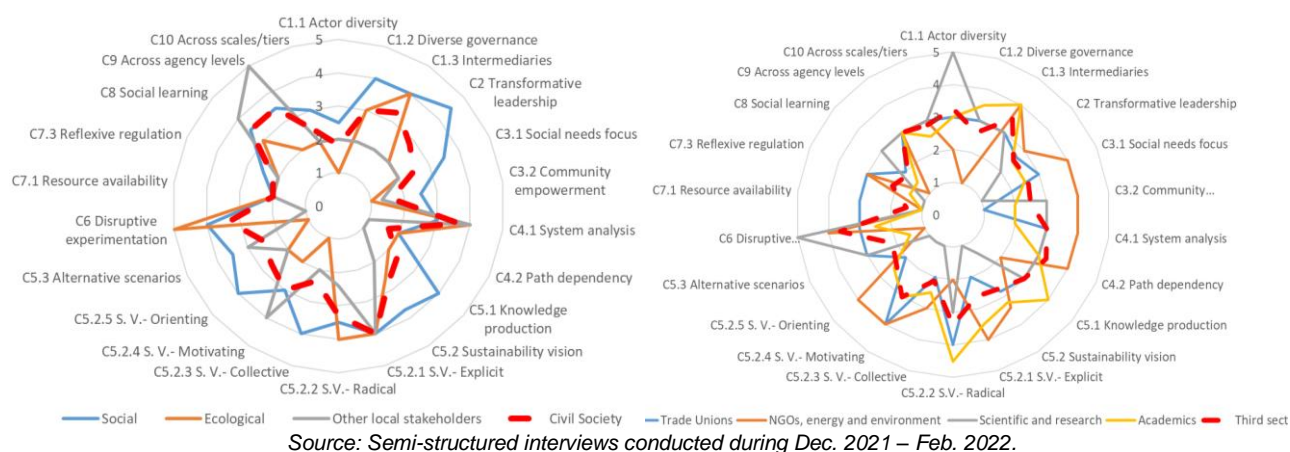
### Differences between stakeholders

With a detailed analysis of the quantitative data collected through the interviews, we found that there are large differences among stakeholders in their ratings of the various factors (Figure 12). Among public sector stakeholders, multilevel stakeholders have rated all factors notably higher than other stakeholders. They have given the highest rating to two factors: *Alternative scenarios* (C5.3) and *Radical sustainability vision* (C5.2.2), where the former focuses on transition planning and implementation making use of future scenarios with alternative development options, based on stakeholder choices, uncertainties and interdependencies between socio-economic, technological, institutional and ecological factors and the latter is related to the radical vision of sustainability for the region of A Coruña. They have given the lowest score to the factor *System analysis* (C4.2), which is related to the evaluation of the level of understanding of the interdependencies between socioeconomic, ecological and technical aspects of the transition. The second most important stakeholder in the public sector, the environmental policy actors, have given the highest scores to three factors: *Intermediaries* (C1.3), *Knowledge production* (C5.1) and *Radical sustainability vision* (C5.2), where the first factor shows the importance of intermediaries in governing the energy transition at the regional level, the second factor focuses on the wide diversity of knowledge produced from different sectors (e.g., technical science, social science, civil society, government, industry) that inform the transition process and finally the third factor is related to the radical vision of sustainability for the region. They have given the lowest rating to the collective vision of sustainability. The third public sector stakeholder, the economic and industrial policy actors, who are involved in the decarbonization process and are responsible for managing the energy transition, have given lower scores to all factors compared to all other public sector stakeholders. According to them, *alternative scenarios* (C5.3) are the strongest factor affecting the transformational capacity of the A Coruña region and *reflective regulations* (C7.3) and *sustainability vision orientation* (C5.2.5) are the least important factors. In the private sector actors, we have representatives of key industries facing decarbonization and representatives of SMEs. Representatives of key industries facing decarbonization have rated all factors higher than SME representatives.

**Figure 12 - Assessment of transformative capacity by stakeholders from different sectors.**







According to the representatives of key industries, *knowledge production* (C5.1), *disruptive experimentation* (C6) and *availability of resources* (C7.1) are the most important factors related to the transformative capacity of the A Coruña region. Within these factors, the first focuses on the wide diversity of knowledge produced from different sectors that inform the transition process, the second focuses on the diversity of actors involved in experiments that aim to fundamentally alter current ways of doing things and the third is related to the support provided to stakeholders to enhance inclusion and participation, the development of visions and scenarios and experimentation to mitigate the impacts of the energy transition. On the other hand, SME representatives have given the highest scores to the factors of *community empowerment* (C3.2), *knowledge production* (C5.1), *radical* (C5.2.2) and *motivating sustainable vision* (C5.2.4). In these factors, the first one focuses on the level of support that stakeholders and communities have to act autonomously in the energy transition, the second and third ones have been explained above and the last one is related to the motivating sustainable vision for the region.

Among civil society, social actors have rated all factors higher than others. According to them, *transformational leadership* (C2) is the most important factor affecting the transformative capacity of the A Coruña region. This factor focuses on the role of leadership in the energy transition process and tries to find out whether this leadership comes from all sectors (public, private, civil society), offers motivating visions and drives collaboration between actors or not. On the contrary, the factors *path dependence* (C4.2) shows the extent to which actors recognize these systemic interdependencies, in institutions, regulations, infrastructures, social values, etc., as potential barriers to change and *availability of resources* (C7.1), which is related to the support provided to stakeholders to enhance inclusion and participation, development of visions and scenarios and experimentation, scored the lowest. The second leading civil society actors are representatives of environmental and ecological groups. They have given the highest score to *disruptive experimentation* (C6), which is related to the diversity of actors involved in experiments aimed at fundamentally altering current ways of doing things (generating, supplying and consuming energy). In contrast, the factors *actor diversity* (C1.1), which shows the degree of direct involvement of various actors, from citizens and civil society to companies and their representatives, in the governance of the energy transition, *community empowerment* (C3.2), which shows the level of support actors and communities have to act autonomously in the energy transition, *collective sustainability vision* (C5.2.3), which is related to the collective sustainability of the region and *alternative scenarios* (C5.3), which shows how transition planning and implementation makes use of future scenarios with

alternative development options, based on stakeholder choices, uncertainties and interdependencies between socioeconomic, technological, institutional and ecological factors, received the lowest ratings. Finally, the other local civil society actors give the highest score to the factor '*across agency levels* (C9)', which is related to the involvement of a wide range (diversity) of social actors, including individuals and households, as well as groups, organizations, networks and society in advancing the energy transition. They have given the lowest rating to the factors *path dependence* (C4.2), *knowledge production* (C5.1) and *disruptive experimentation* (C6).

Lastly, among the third sector stakeholders, trade unions play an important role in affecting the transformative capacity of the A Coruña region. They have rated the *radical* (C5.2.2) and *motivating* (C5.2.4) *sustainability visions* as the most important factors in shaping the transformative capacity of the region. In contrast, they gave the lowest rating to community empowerment (C3.2). Secondly, energy and environmental NGOs in the third sector have given the highest rating to *social needs focus* (C3.1), which is related to the identification and prioritization of social needs by different stakeholders, *community empowerment* (C3.2), *system analysis* (C4.1), *path dependence* (C4.2), *disruptive experimentation* (C6) and *explicit* (C5.2.1), *motivational* (C5.2.4) and *guiding* (C5.2.5) *sustainability visions*. In contrast, they give the lowest rating to the factors *diverse governance* (C1.2), *alternative scenarios* (C5.3) and *social learning* (C8). Third, stakeholders from the scientific and research community gave the highest scores to the factors *stakeholder diversity* (C1.1) and *disruptive experimentation* (C6). However, they have given the lowest scores to the factors *availability of resources* (C7.1), *reflective regulation* (C7.3), *collective* (C5.2.3), *motivation* (C5.2.4), *orientation* (C5.2.5) and *explicit* (C5.2.1) *sustainability visions* and *social needs focus* (C3.1). Finally, academics have given the highest score to the *radical sustainability vision* (C5.2.2) and the lowest to *resources availability* (C7.1).

### 5.3.2 Interpretation

#### **Governance and agency**

##### C1. Inclusive and multiform governance

In the region of A Coruña and Spain in general, there are participants from both civil society (environmentalists) and the third sector (academics) who indicate that the energy transition is a top-down process, with the central government having ultimate control over policy formation and implementation and regional governments playing an important role in raising local issues related to transition policies. There are also participants from the third sector (scientists and researchers) who doubt that there is a clear governance style. Some participants from the private sector (SME representatives) criticise the current style of governance for being exclusionary and unfair and propose a new type of governance that should be more inclusive and effective. In the opinion of multi-level actors and public sector environmental policy actors, the type of governance that is missing is related to the need for more sovereignty of municipalities mediated by the involvement of trade unions to meet the particular needs of the local population and the environment and the need for more efficient use of resources. In terms of inclusivity, key stakeholders interviewed from the public sector (environmental policy actors) and the third sector (scientists and researchers) confirm the participation of different actors in the transition process, however, they point out several aspects that should be taken into account to improve the type of participation: firstly, the need for the participating actors to have sufficient knowledge to be able to make the appropriate contributions; secondly, the need to improve ways of making this participation feasible by addressing the needs

and concerns of stakeholders; and finally, the need to find an interlocutor representing all political actors in the area. There are also some actors from the public sector (economic and industrial policy actors), the private sector (key industries facing decarbonisation or SME representatives), the third sector (academics) and civil society (social and ecological actors) who feel neglected in this process. They consider that such participation does not exist except on the part of businesses, political parties, public authorities or companies interested in presenting feasibility projects. Among the stakeholders with no or little participation, the company's employees, neighbours and society in general also share the opinion that there are few ways to participate in the process and influence decisions related to decarbonisation and energy transition.

Among the intermediaries identified, the actors interviewed focused on the following: the crisis committee (pointed out by local actors), environmentalists (by academics), companies or other types of associations involved (by multilevel actors and NGOs, by energy and environmental organisations), public administrations (pointed out by multilevel actors), trade unions (by SME representatives and multilevel actors), transporters and citizens of both As Pontes and Ferrol (by NGOs, by energy and environmental organisations). Regarding the role of intermediaries in the energy transition process, we can say that the main stakeholders have very different opinions. Some see them as an important link between the company (Endesa), the national government and the affected population and others see them as an obstacle in the energy transition process. There are also stakeholders from both the public and private sectors (multi-level actors and SME representatives) who then criticise the intermediary associations for putting their interests before national ones and undermining the rapid transition of energy systems in Spain, which is necessary to meet climate targets and maintain the levels of economic development of the country and especially of the region of A Coruña.

## C2. Transformative leadership

In relation to transformative leadership, the responses reflect the almost general agreement that leadership for the energy transition in the region of A Coruña does not come from all sectors, i.e. public, private and civil society. There are civil society stakeholders (environmentalists) who consider that it comes mainly from the private sector, while third sector actors (academics) consider that it comes from the public sector. At the same time, there are third sector stakeholders (academics, scientists and researchers) and private sector stakeholders (SME representatives) who consider that there is no shared leadership. In the opinion of public (environmental policy actors), private (key industry facing decarbonisation), third sector (academia, trade unions, NGOs, energy and environmental organisations) and civil society (social and ecological actors) stakeholders, the reasons why this shared leadership seems to fail are related to the lack of time to carry it out in a more rhythmic and less rushed way. In terms of the type of leadership to be exercised, third sector actors (trade unions) and civil society actors (environmentalists) call for shared and coordinated leadership; leadership that is not executed in the form of action-reaction but is endowed with proactivity. According to the third sector actors interviewed (academics), the represented leadership leaves no room for motivational visions. They claim that the lack of leadership is damaging the energy transition process and leading to the economic destruction of the country. However, there are some third sector and private sector actors (key industry for decarbonisation) that have inspired enthusiasm in their responses.

### C3. Empowered and autonomous communities of practice

Most of the main actors interviewed from civil society, the third sector (scientists and researchers and academics) and the private sector (key industries facing decarbonisation), consider that the energy transition in As Pontes is not addressing social needs adequately. They have stated that the lack of involvement of local actors is responsible for the neglect of social needs. The main gaps in social security are expressed by public, private and third sector actors. In contrast, public sector actors (multi-level actors, economic and industrial policy actors and environmental policy actors) consider that social needs are being or will be met. In explaining social needs, they focus mainly on employment and the sustainability of the area in economic terms. Most of the stakeholders interviewed regarding community empowerment in the energy transition process in the region of A Coruña consider that citizens, innovators and communities are not being supported to act autonomously. These include environmentalists (civil society), third sector actors (academics, scientists and researchers) and private sector actors. Those who do consider that citizens, innovators and communities are supported, such as public sector actors (multi-level actors and SME representatives), refer to the fact that certain measures support actors' autonomous activities and actions, but are dependent on aid funds. Other public sector actors, such as environmental policy actors, consider that they receive some financial support, but that other aspects fail, which means that this support is not being used adequately to solve community problems.

### **Capacity development processes**

#### C4. System(s) awareness and memory

The interviewed stakeholders have diverse opinions on the cultural, social and technical relations of the energy transition in the region of La Coruña. Some of the civil society stakeholders (environmentalists and other local authors) and economic and industrial policy stakeholders hold that people are sufficiently aware of the technical, social and cultural aspects of the energy transition and can make coping strategies to deal with the adverse impacts of the energy transition. In contrast, there are stakeholders from civil society (social actors), the third sector (academics), the private sector (SME representatives) and the public sector (environmental policy actors), who claim that there is a clear lack of awareness among the different actors. They believe that technical awareness is much higher than social and cultural awareness.

#### C5. Sustainability foresight

Some stakeholders from civil society, the public sector (multi-level actors, environmental, economic and industrial policy actors), the private sector (representatives of SMEs and key industry facing decarbonisation) and the third sector (academics) believe that the different stakeholders involved in the energy transition process bring new multi- and trans-disciplinary knowledge on the subject. On the contrary, there are some stakeholders from civil society (environmentalists, trade unions or NGOs) and the third sector (energy and environmental organisations) who highlight the lack of mechanisms to create new knowledge on the different aspects of the energy transition. Regarding the nature of the vision of the energy transition for the region of A Coruña, civil society actors (social and environmental actors), third sector actors (academics), multilevel actors and public sector actors (environmental, economic and industrial policy actors) support the explicit and radical visions. In contrast, trade unions, NGOs and third sector energy and environmental organisations, multi-level actors from the public sector, other local civil society actors and representatives of private SMEs are in favour of a motivational vision. Finally, in terms of its guiding character, very few actors (civil



society social partners and multi-level public sector actors) are in favour of the guiding vision. Similarly, a small number of actors (civil society social partners, multi-level public sector actors and NGOs and third sector energy and environment organisations) are in favour of the collective vision. Likewise, in terms of alternative scenarios and future paths for the transition, some public sector actors focus on alternative scenarios derived from the signing of the agreement between the Ministry and the Xunta de Galicia, improving planning between the parties, enhancing the value of the local renewable resource and identifying lines of work that had not been identified so far. In general, we can say that most of the actors interviewed are very positive about the alternative scenarios and future pathways for the energy transition in the region of A Coruña. Especially public sector actors (multi-level actors, environmental, economic and industrial policy actors) stress the importance of alternative scenarios for the overall development of A Coruña region.

#### C6. Disruptive experimentation

Regarding the role of diverse community experimentation with disruptive solutions in the energy transition process in the Coruña region, the general view of the stakeholders interviewed is that the energy transition in the region is taking place taking into account different alternative ways of thinking and organising things. Community experimentation plays an important role in guiding the policy measures taken by the central government. This view is expressed to a greater extent by civil society actors (social and ecological), by third sector actors (scientists and researchers, as well as NGOs and energy and environmental organisations), by public sector actors (multi-level actors, social policy actors) and by some of the private sector actors (key industry facing decarbonisation). On the contrary, some civil society stakeholders highlight the lack of participation and engagement of citizens in policy development and implementation in the Coruña region. There are also some civil society and public sector stakeholders who criticise the mandatory way of obtaining community participation, which leads to a lack of expected results from such participation.

#### C7. Innovation embedding and coupling

Stakeholders interviewed consider that there are not enough resources, nor have regulatory changes been implemented, to support the energy transition and overcome barriers in the A Coruña region. In terms of resources, they consider that more basic resources are needed for the development of transformative capabilities, including human, knowledge and organizational resources. Regarding the changes that have been able to be established in legislation, rules and regulations, most of the actors interviewed refer to the Just Transition agreements, which are the tools proposed by the central government to support the regions affected by this energy transition. In addition, they refer to the regulations related to energy self-consumption, power generation and the regulatory frameworks for wind and solar energy. In this case, the main ideas come from the public sector (multilevel and environmental policy actors), third sector (scientists) and civil society (social actors).

### **Relational factors**

#### C8. Reflexivity and social learning

In general, we can say that most of the actors interviewed agree that they are (and entire society in general) is learning a lot from the transition process that is taking place in the region of A Coruña. However, they criticise that the information coming from the company and the different public institutions is incomplete and vague, which affects the level of awareness of the company's workers and other related collectives regarding what is happening and how it will end.

#### C9. Cooperation across human agency levels

Regarding the relational dimensions of transformative capacity, i.e. both at the levels of scale (local to global) and of agency (individual, household, organisation, association) necessary for system change in the region of A Coruña, there are some stakeholders, such as public sector actors (multilevel actors and environmental policy actors) and social and other local civil society actors, who consider that energy transition measures in the region of A Coruña involve different social actors such as individuals, families, groups, organisations, networks and associations. However, there are other actors, such as the economic and industrial policy actors, the environmental policy actor and multilevel actors, who consider that the participation of social actors in the elaboration and implementation of the energy transition policy is minimal. When they indicate that participation does not exist, they mean that it is really difficult to achieve citizen participation, given the complexity of the issue. Some of the civil society actors explain the participation of social actors in terms of the level of social mobilisation that is being achieved in the region of A Coruña.

#### C10. Cooperation across political-administrative levels

Regarding the interaction between the different levels of governance (local, national, international and EU authorities), some public sector actors, such as multi-level actors and economic and industrial policy actors, have raised the need for more dialogue and coordination. There is a big difference between actors as to the level of coordination they consider most important. For economic and industrial policy actors, coordination should take place at least at three levels: local, regional and national; for third sector actors, it should take place at Brussels, European, national and Endesa levels; and for civil society actors, it should take place at all four levels, i.e. local, regional, national and European Union level.

### 5.3.3 Gender dimension

In the region of A Coruña, four out of 20 stakeholders interviewed were women. Despite the efforts made by the research team, it was a challenge to find and convince women for the interviews. As there were no direct questions related to gender differences in the interview questionnaire, all we have are the differences between men and women respondents when explaining the different aspects of the energy transition and the process of transformational capacity development in the region of A Coruña.

## 5.4 Conclusion

A detailed analysis of the interviews with key actors in the A Coruña region helped us to identify the different factors affecting the transformative capacity of the A Coruña region. From the quantitative analysis of the Likert scale questions asked during the interviews, we found that decarbonisation policies in Spain hold a radical vision of sustainability, which is achieved with the help of intermediaries and contribute to the production of knowledge about the different aspects of this ongoing energy transition in the region of A Coruña. Changes in the regulatory framework, availability of resources and community involvement in the installation of green energy projects (wind and solar) are seen as the strongest factors affecting the transformative capacity of the region, which in turn affects the pace and direction of the transition process. Interestingly enough, stakeholders interviewed underestimated the role of regulatory frameworks and community participation, which are two of the crucial elements of any structural change.



The qualitative analysis of the interviews shows that the key stakeholders have more differences in their discourse than similarities. In the interviews, much of their focus was on Capability Development Processes (with 287 excerpts), followed by Governance, Agency and Interaction (with 195 excerpts), Relational Dimensions (with 100 excerpts) and to a lesser extent, Social Learning (with 25 excerpts). In the Capacity Development Processes category, most stakeholders focused on the factors Sustainability Foresight and Sustainability Visions. This shows that sustainability is one of the main concerns for all stakeholders. Similar to the results of the quantitative part, the radical sustainability vision for the A Coruña region is favored by the majority of the interviewed stakeholders. In relation to the Sustainability Foresight, the involvement of scientists, economists, politicians, businessmen, citizens and universities is noted, although the lack of a clear process for obtaining knowledge that would allow greater involvement on their part is also highlighted. Regarding the factor Alternative scenarios and ways forward, most of the actors state that the signing of the Just Transition agreement between the Ministry and the Xunta de Galicia is an important step, however, the valorisation of local renewable resources or even the identification of lines of work are not identified so far. In the factor Awareness and Memory of the System, different actors focus on the importance of cultural, social and technical relationships in the energy transition in the region of A Coruña. They also recognize that some parts lack such relationships and that there are no connections between cultural, institutional, socioeconomic, ecological and technical aspects, which is a critical obstacle to change in the region. Regarding the Innovation embedding and Coupling, most stakeholders agree that there are sufficient resources to support the energy transition, but their proper allocation is a major problem. Regulatory frameworks need a drastic change to support green energy projects and stop misuse. The solution to this problem would involve the creation of a working group that coordinates all local actors, together with economic resources allocated from the EU. Finally, regarding the factor Diverse community-based experimentation with disruptive solutions. There is a generalized idea that the transition is being carried out with the participation of diverse actors. Gaps in the process are pointed out, especially in relation to the mandatory nature of such participation or the failure to obtain the expected results from it.

In the Governance, Agency and Interaction category, the stakeholders interviewed focused their responses mainly on Transformational Leadership, followed by Inclusive and Multiform Governance and Empowered and Autonomous Communities of Practice. Regarding Transformative Leadership, most stakeholders believe that there is no shared leadership in the A Coruña region. Collaborative processes are lacking and most decisions are made by central government ministries. This may be due to the hasty nature of the decisions taken in relation to the implementation of decarbonization policies. Regarding the Inclusive and Multiform Governance, what is most important is the different perceptions of the actors regarding their participation in the energy transition process in the Coruña region. Regardless of what they point out as positive or negative, there are several aspects that they consider should be taken into account to improve the type of participation being carried out: the participation of people with sufficient knowledge, providing answers to the needs of the stakeholders, proposing an interlocutor representing the political actors in the area and involving the company's workers and citizens and civil society. Regarding the need for intermediaries, third sector stakeholders (academics, scientists and researchers) state that they are a very relevant or key element in the process, referring to stakeholders that can generate added value in employment. However, there are also people from both the public and private sectors who are against their existence because, in their opinion, these intermediaries are focused on their interests. Regarding

the factor Empowered and Autonomous Communities of Practice, the general opinion is that social needs are not being adequately addressed. As expressed by participants from the third sector (trade unions) and the private sector (SME representatives), not having taken into account the opinion of the people, leads to low expectations of what is going to happen and the situation of the area itself. Aspects such as the price of housing, the decrease in services or the abandonment are reflected.

In the Relational dimensions category, stakeholders focused on two factors: Working across the human agency and Working across political-administrative levels and geographical scales. In the first factor, most stakeholders highlight that the participation of the different social actors is minimal, since, in their opinion, such participation is difficult due to the complexity of the case. However, the level of social mobilization that is being achieved is highlighted as an indicator of social participation. Overall, they explain that citizen participation is encouraged, but there are no mechanisms to convert them into political action. In the second factor, the majority of stakeholders highlighted that there is a lack of cooperation between the different levels of government and most of the processes are governed by the central government, with a top-down mechanism. Finally, social learning is the category to which stakeholders responded the least. In this category, all stakeholders focused on the factor of Reflective normative and social learning. Most of them focus on the fact that learning, if any, has been minimal; it is only highlighted in the case of the contributions made to the transition committee, which come from universities and societal interest in the topic. However, it is necessary to take more account of the knowledge of the workers themselves and to have clear guidelines for action, not monopolized by the political or economic sphere.

# CHAPTER 6

---

## CHALLENGES, COPING STRATEGIES & GENDER

## 6 Challenges, coping strategies and gender

### 6.1 Challenge 1: Depopulation and ageing

#### 6.1.1 Challenge description

##### **Current situation**

Since the beginning of the decarbonisation process, the CCT of As Pontes has registered an accelerated rate of depopulation. In the last two decades, the population of As Pontes (CCT) has gone from 12,477 inhabitants in 1998 to 10,138 in 2019, 18.7% of the total population. In addition to depopulation, with declining fertility and increasing emigration of young people, the CCT is also facing an acute ageing problem, which results in a decrease in the proportion of the working-age population.

##### **Desired outcome**

The desired outcome is to reverse demographic trends and stabilise the size of the population and slow down the ageing process.

#### 6.1.2 Coping strategies

##### **Coping strategy 1: [Job creation to retain youth].**

(a) *Vision:* Creation of high quality and well paid jobs, enabling young people to earn a decent living and remain in their home town.

(b) *Actions undertaken:* New companies are invited to open businesses in the As Pontes industrial complex. Subsidies and cheap land are made available to new companies willing to open their production and distribution units in As Pontes.

(c) *Results achieved so far:* In the last decade, a small number of local youth got jobs in the new green energy projects. However, a large number of low skilled workers feel forced to go out in search of work in the service sector.

(d) *Obstacles faced:* The industrial monoculture of As Pontes for many decades is a major problem for progress. This area lacks human capital infrastructure and a market for new high-tech companies.

##### **Coping strategy 2: [Provision of cheap, affordable and adequate housing].**

(a) *Vision:* To provide cheap, affordable and adequate living conditions for young couples to start their own families.

(b) *Actions undertaken:* Large-scale rehabilitation of residential buildings is being undertaken to increase the supply of suitable housing for young people wishing to become emancipated.

(c) *Results achieved so far:* Despite the investment of public funds, there has been little success in retaining the population.

(d) *Obstacles faced:* The lack of future job prospects in the region is the main obstacle to retaining the population.

##### **Coping strategy 3: [Investment in Human Capital].**

(a) *Vision:* Investing in providing new skills to redundant workers and improving the skills of young people seeking their first job.

(b) *Actions undertaken:* Public institutions and Endesa provide training courses for redundant workers and prepare them to work in new green energy projects. Local young people are encouraged to learn computers and new technologies to find work in new industries.

(c) *Results achieved so far:* The success rate is very low and most of the beneficiaries of the vocational courses are still unemployed. Those who get employed leave the region.

(d) *Obstacles faced:* Lack of investment funds and the bureaucracy involved in running the vocational courses is one of the main obstacles.

### 6.1.3 Gender dimension

In the CCT of As Pontes, the sex ratio has increased in favour of women, from 1.02 men per woman in 1998 to 0.92 men per woman in 2019. This is related to the emigration of young men from the town after the closure of mines. Women also have a higher average age than men and a large part of the elderly population is made up of women.

### 6.1.4 Discussion

Depopulation and ageing in As Pontes are the clear symptoms of demographic stress, caused by the closure of the main economic activities in the region. This depopulation causes the erosion of the social fabric of the region and accelerates the process of degradation of services and living conditions, forcing the population to leave the region and migrate to neighbouring large cities. Only the availability of jobs can retain the population in the region and stabilise the demographic metabolism.

## 6.2 Challenge 2: Management of industrial waste and rehabilitation of exploited land

### 6.2.1 Challenge description

#### **Current situation**

The management of industrial waste and the rehabilitation of exploited land is one of the main concerns of environmental activists, policy-makers and the local population. The local administration and Endesa are working together to repair the damage caused by the company to the environment over the past five decades.

#### **Desired outcome**

The desired results include the rehabilitation of the natural areas exploited by the company and making these areas available for other industrial and public uses.

### 6.2.2 Coping strategies

#### **Coping strategy 1: [Conversion of the mine shaft into a freshwater lake].**

(a) *Vision:* Reclamation of areas affected by mining and related industrial activities.

(b) *Actions taken:* Action taken in this regard includes the backfilling of the mine shaft with fresh water and the conversion of the mine-waste heaps into nature parks.

(c) *Results achieved to date:* The open pit created by coal mining is filled with fresh water from the river Eume and converted into a fresh-water lake. The mountains of clay and tailings created by the mining activities have been converted into natural parks and recreational sites.

(d) *Obstacles faced:* Shortage of funds and lack of agreement between the local administration, environmental groups and the company is the main obstacle to the implementation of rehabilitation projects.

**Coping strategy 2: [Sale of land and abandoned industrial equipment to new companies].**

(a) *vision*: To use the land and industrial machinery that Endesa has put on sale after the closure of the mines and the coal units of the thermal power station. Invite new companies by giving them subsidies for the purchase of land and machines.

(b) *Actions taken*: The sale of land is underway and usable machinery will be sold to local companies.

(c) *Results achieved so far*: Very few plots of land have been sold to new companies and the thermal units have not yet been de-mined for sale on the second-hand market.

(d) *Obstacles faced*: Growing energy demand and rising natural gas and oil prices have forced the government to restart two units of the thermal power plant, which is delaying the process of de-mining and land reclamation. Bureaucratic and administrative hurdles are also delaying the process.

**6.2.3 Gender dimension**

The statements of the people participating in the study do not refer to the gender dimension. However, it is visible that women in different positions in local administration and environmental groups are playing an important role in raising awareness about the environmental damage caused by the company and how to restore the natural landscape of the region.

**6.2.4 Discussion**

The management of industrial waste dumps and land reclamation are very important steps to mitigate the impact of industrial activities on the natural environment and reactivate the industrial park of As Pontes. Collaboration between different actors, such as the local administration, environmental groups, Endesa, local companies and the national government and the allocation of funds are necessary steps to accelerate the recovery process.

**6.3 Challenge 3: Industrial reconstruction of As Pontes and surrounding region****6.3.1 Challenge description****Current situation**

As Pontes has a six-decade history of mining and industrialisation. Industrial monoculture has made this region dependent on a few basic industrial units. The closure of the mine and the thermal power station has created a vacuum in the As Pontes industrial complex that is difficult to fill with any of the proposed new projects. A new and comprehensive reindustrialisation plan is needed for the As Pontes area to enable the population and companies to remain in the area.

**Desired outcome**

The desired result is to facilitate the renewal and reconversion of the industrial fabric in the region of As Pontes, which will help to generate new employment opportunities in the area and turn it into a prosperous and competitive region. The second desired outcome is to turn As Pontes into the sustainable industrial hub of Galicia with the help of the circular economy and green hydrogen projects that will be implemented in the Ferrolterra-Eume region.

**6.3.2 Coping strategies**



**Coping strategy 1: [Genuine social and industrial transition process - Just transition].**

(a) *Vision.* Effective planning of the process of just transition in the renewal of the industrial fabric of As Pontes region. Respect, loyalty and clarity in decision-making to favour a fair social and industrial transition plan.

(b) *Actions undertaken.* The new green hydrogen project is underway. Endesa's Futur-e plan will allow the development of industrial projects based on the creation of new companies related to renewable energies.

(c) *Results obtained so far.* A consensus has been reached between politicians and businessmen to reindustrialise the region of As Pontes through innovative green hydrogen projects.

(d) *Obstacles encountered.* The definitive closure of the thermal power plant and its dismantling is delayed, pending new orders from the Ministry for Ecological Transition. All reindustrialisation plans will start with the decommissioning of the thermal power plant. These delays cause great uncertainty among the population.

**6.3.3 Gender dimension**

The Women's Institute of As Pontes offers guidance, information and support to promote gender equality in the region. It aims to provide social, labour, legal and psychological guidance to women. Together with this service, both the Department of Entrepreneurship and the Social Welfare area of the City Council are contributing to the development of skills and competencies of women so that they can opt for jobs in auxiliary and parent companies of the new circular and sustainable economy. The Women's Information Centre (CIM) of the City Council of As Pontes, through the Provincial Council of A Coruña, developed the Women's Empowerment School with the aim of strengthening the self-esteem and social skills of the participating women through experiential and participatory work.

**6.3.4 Discussion**

The social and economic development aspects are quite unbalanced in the energy transition process in As Pontes. For the company the loss is economic, but for all workers, the loss is moral, cultural and emotional. Therefore, in the transition processes and those who make the decisions, must take special care of these aspects. The reindustrialisation of As Pontes is necessary not only to maintain economic development but also to maintain the social fabric of the region.

**6.4 Challenge 4: Consensual proactive agenda for re-industrialisation****6.4.1 Challenge description****Current situation**

The lack of effective leadership, dialogue and coordination between the different representative sectors has repercussions on the social, political and economic progress of the region of As Pontes.

**Desired outcome**

Generate consensual policies in a proactive agenda for all institutions involved in the development of the region of As Pontes.

**6.4.2 Coping strategies**

**Coping strategy 1: [Consensus in political and social actions to meet common objectives].**

(a) *Vision*: To achieve a consensus between different political and social actors for the re-industrialisation of the area.

(b) *Actions undertaken*: Efforts have been made to speed up the procedures for the implementation of projects for As Pontes and to achieve institutional collaboration and participation in the joint development of the area.

(c) *Results achieved so far*: Negotiations between the different parties involved in the decarbonisation and reindustrialisation processes are underway.

(d) *Obstacles faced*: Lack of political culture. Decision-making is pyramidal, which places the authorities of As Pontes and its inhabitants on the bottom rung of the decision-making ladder. Potential conflicts and tough negotiations with new sectors involved and influenced by the implementation of the new green hydrogen projects, such as fishermen and farmers. The new announcement of the opening of the thermal power plant will once again test the degree of consensus between workers, employers, trade unions, the Ministry and the Xunta de Galicia. In the present and immediate future projects, the agreements reached will be fulfilled on time.

**Coping strategy 2: [Digitisation and internal and external visibility of communication and participatory processes in the negotiation, transition and implementation phases].**

(a) *Vision*: Achieving internal and external visibility of communication processes between authorities, workers, employers and social and business representatives and participatory processes in the negotiation, transition and implementation phases of new projects through digitisation.

(b) *Actions undertaken*: Opening of virtual communication spaces between the population groups involved in the transition process. Access to fast connection networks for companies.

(c) *Results achieved so far*: As Pontes is currently immersed in this process of digital transformation.

(d) *Obstacles faced*: Negotiation and dialogue processes are vague and non-transparent. People in the region are also not prepared to participate in the virtual meetings.

**6.4.3 Gender dimension**

There are no gender differences in the debate on the proactive agenda of reindustrialisation. However, communication, digitalisation and sustainability represent new fields of action for men and women. They represent the opportunity to initiate and start work trajectories in the territory, providing new job opportunities that will have an impact on the development and employment and social stability of the area and the region.

**6.4.4 Discussion**

The Local or Municipal Inter-institutional Coordination Committees (MLCI) are a collaboration platform made up of the different public administrations present in the municipality of As Pontes in the labour, legal, educational, health, police and social services fields. From this body, the proactive agendas derived from the reindustrialisation process can be favoured and promoted. Its local character is a guarantee of security in the implementation and execution phase of any negotiated project.

**6.5 Challenge 5: Ensuring energy availability and affordability****6.5.1 Challenge description**

**Current situation**

Rising energy bills have made it difficult for middle-class households to meet their monthly expenses. Many households feel forced to divert money to energy bills or suffer from excess heat and cold due to a lack of heating and cooling services. Similarly, many businesses feel pressured to raise prices due to the rising cost of energy and transport. In A Coruña regions, rising energy prices have played an important role in changing the narrative against energy transition and decarbonisation policies.

**Desired outcome**

The desired outcome is the availability of affordable green energy for all households and businesses. It will ease the burden on the local population and help curb inflation, which is affecting the living standards of poor and middle-class households.

**6.5.2 Coping strategies****Coping strategy 1: [Short-term reopening of the La Central Power plant].**

(a) *Vision:* Supplying cheap and affordable energy to all households and businesses and relieving the pressure of energy bills on households and small businesses.

(b) *Actions taken:* The thermal power plant, La Central, which was in the process of being decommissioned, has now reopened for the next six months and two of its units are generating electricity to supply cheap energy for domestic and industrial use.

(c) *Results achieved so far:* Thanks to the reopening of the thermal power plant, Endesa has managed to supply electricity to all households and businesses in the region. It also helped to curb the rise in energy prices in the short term.

(d) *Obstacles faced:* The reopening of the thermal power plant was a setback for Spain's decarbonisation policy. Although it was a temporary measure to absorb the impact created by the high price of natural gas and the war between Ukraine and Russia, environmental groups are protesting against the reopening of the power plant.

**Coping strategy 2: [Installation of green energy projects].**

(a) *Vision:* Installation of solar and wind power plants to replace the thermal power plant. Installation of a hydrogen plant to be used as an energy storage unit.

(b) *Actions undertaken:* Three wind farms have been installed in the region to supply electricity for domestic and industrial use. A hydrogen plant to store the renewable energy produced by windmills and photovoltaic panels will be installed in this region in the next one to two years.

(c) *Results achieved so far:* The wind farms are contributing to the energy supply in the region, however, it is insufficient to fill the gap created by the closure of the thermal power plant.

(d) *Obstacles faced:* Lack of investment, especially from the private sector, is the main obstacle to the installation of solar and wind farms. Secondly, complicated regulatory rules, corruption and bureaucratic hurdles discourage international investors from investing in new projects.

**Coping strategy 3: [Subsidies and tax rebates on energy]**

(a) *Vision:* Subsidies and tax breaks are offered to help households and small businesses to survive this period of energy transition.

(b) *Actions taken:* Just transition agreements are signed with the regions concerned so that no region feels left behind in this transition process.

(c) *Results achieved so far:* The electricity tax rebate has helped people to survive the cold winter, but most of the benefit from the subsidies goes to big businesses and energy companies.

(d) *Obstacles faced:* The rising price of natural gas on the international market and the war between Ukraine and Russia have aggravated the availability and affordability of energy in the country.

### 6.5.3 Gender dimension

The supply and affordability of energy affects a large number of women who are often responsible for household chores that depend on electricity supply. Fluctuating electricity prices have affected the schedules of many women, who are now forced to run washing machines and other energy-intensive appliances at certain times of the day and on certain days of the week. Also, the majority of single-person households with energy security problems are occupied by women, most of whom are retired and living on a state pension. Rising energy prices have decreased their quality of life.

### 6.5.4 Discussion

The availability and affordability of energy have become a major concern in several regions of the country, which were major energy producers in the golden age of the coal industry. Energy shortages, caused mainly by the closure of coal and nuclear power plants, have increased the price of energy and its availability to all.

## 6.6 Challenge 6: Bridging the digital divide and human capital formation

### 6.6.1 Challenge description

#### **Current situation**

There is a large gap between the human capital needed and available in the region. New firms require a large number of skilled workers with multiple skills. The shortage of skilled workers discourages new firms from setting up in the region.

#### **Desired outcome**

The desired outcome is to reduce the digital divide between the CCT of As Pontes and the LMA of A Coruña and to prepare local young people for the changing labour market.

### 6.6.2 Coping strategies

#### **Coping strategy 1: [Investment in new professional courses].**

(a) *Vision:* Helping redundant workers and equipping young people with the new skills needed to be employed in new companies. Young people will be prepared to fill the gap of skilled workers in the green energy sector.

(b) *Actions undertaken:* Endesa, in collaboration with the public administration, has launched some courses to train some of the redundant workers to be employable in the new green energy projects.

(c) *Results obtained so far:* Very few workers have benefited from these courses and most of them are not happy with their new jobs which are not equally paid and provide less social security compared to their previous jobs in the thermal power plant.

(d) *Obstacles faced:* The less optimistic attitude towards retraining courses and the general difficulty of learning from a certain age are the main problems. The lack of jobs in the area also discourages people from learning new skills and obtaining credentials.

#### **Coping strategy 2: [Investment in the digital infrastructure].**

(a) *Vision:* to provide a good digital infrastructure for young people to connect with the outside world and new businesses so that they can operate globally without any problems.

(b) *Actions taken:* Optical fibre has been extended to connect the industrial complex with the main city of A Coruña and the outside world.

(c) *Results achieved so far:* The 5G internet service reaches all homes and new businesses.

(d) *Obstacles faced:* Lack of investment in infrastructure is the main problem.

***Coping strategy 3: [Reversing brain drain and youth migration].***

(a) *Vision.* To recover talent and young personnel through training courses, training and relocation of talent that emigrated due to lack of job and social expectations.

(b) *Actions carried out.* Endesa's compensation programme for decarbonisation also includes the qualification of personnel who have worked in the auxiliary industry of its power plants. The new industries and companies planned in the area of As Pontes will facilitate the incorporation of new labour and young people trained in technologies and renewables, among other skills.

(c) *Results obtained so far.* Too few young people get jobs in the region.

(d) *Obstacles faced.* Underinvestment and lack of job opportunities in the region are the main obstacles to retaining talented workers.

### 6.6.3 Gender dimension

There is not much difference between the sexes in terms of digital literacy and level of human capital.

### 6.6.4 Discussion

Personal reinvention is an important element of all strategies to cope with the effects of the ongoing energy transition on the labour market. The changes introduced by decarbonisation policies and automation in the labour market have left a large number of workers who were employed in carbon-intensive industries unemployed. These workers have few skills to work in other industries and economic sectors. To make them useful again for the economy, new training courses are needed and people have to learn new skills to survive in the labour market. There is a rather low level of personal reinvention among the inhabitants of the As Pontes CST, which worries local policy-makers.

## 6.7 Challenge 7: Responding to particular social needs

### 6.7.1 Challenge description

***Current situation***

As Pontes Town Council has highlighted the need for greater attention to the particular social needs arising from the closure of the thermal power station, which was the main source of employment and income for the municipality. These needs are not being adequately addressed and have affected employment, the unsustainability of the area, housing prices, council services and the progressive abandonment of the area with a consequent decline in the population.

***Desired outcome***

The desired outcome is to serve the people directly (plant workers and their families) and indirectly affected (ancillary businesses) by the closure of carbon-intensive activities.

### 6.7.2 Coping strategies

***Coping strategy 1: [Focusing on employment and sustainability of the area].***

(a) *Vision:* to achieve a quality of life similar to that which existed before the closure of the plant.

(b) *Actions undertaken:* Alternatives have been proposed which, in the opinion of the people interviewed, would create social structures and an economic fabric required for the development of the region. Some projects have been presented that will be implemented in As Pontes through the funds that will be received from the national government and the EC.

(c) *Results obtained:* Projects have been presented that are estimated to generate even more employment than currently exists in the plant and with a more diversified production. These projects are sustainable and revolve around green energy. The people of As Pontes are enterprising, they are looking for the future and will not put any problem for any type of industry to be installed in As Pontes and that is also very important for any company that wants to invest.

(d) *Obstacles faced:* Some of the proposed alternatives were complex to articulate and the lack of time has a negative influence on the generation of new opportunities.

### ***Coping strategy 2: [Social support to the vulnerable population group].***

(a) *Vision:* To provide social support to all vulnerable groups, including the elderly, young adults, single parents (especially women) and the disabled.

(b) *Actions undertaken:* The local administration is assisting vulnerable groups, but its sources are limited. The national security system is assisting people who have lost their jobs due to the closure of the power plant.

(c) *Results achieved so far:* Monthly unemployment benefit payments have helped people cope with the short period of unemployment. The company has also paid a lump sum, negotiated with the unions, to the workers who were laid off and some of them transferred to other units of the company.

(d) *Obstacles faced:* Lack of funds and high dependence on EU funds.

## **6.7.3 Gender dimension**

The statements made by the participants in the study do not refer to the gender dimension. However, the alternatives presented should consider the gender dimension.

## **6.7.4 Discussion**

The closure of the mines and the thermal power plant hurts socially vulnerable groups that received some support from the local administration in different projects. The thermal power plant was a major source of income for the local administration. The closure of the thermal power plant means a loss of income, which in turn affects all projects funded by the local administration.

## **6.8 Challenge 8: Involving the locals in policy development and implementation**

### **6.8.1 Challenge description**

#### ***Current situation***

The City Council of As Pontes has highlighted the need to improve the level of participation of the local community in the transition process. At present, the level of participation is minimal, which leads to a lack of knowledge among the different actors about the short- and long-term consequences of the closure of the thermal power plant.

#### ***Desired outcome***

The desired outcome is to improve the type of participation that is taking place; firstly, sufficient knowledge must be provided to all actors involved in the decision-making process to enable them to



contribute effectively to policy development and implementation; secondly, ways of making this participation feasible must be improved, providing stakeholders with answers to their needs and concerns; and thirdly, Stakeholders representing all policy actors in the area must be identified and empowered.

### 6.8.2 Coping strategies

#### ***Coping strategy 1: [Encourage collegial decision-making].***

(a) *Vision:* To increase the involvement of different stakeholders (companies, universities, research centres, environmental protection groups, trade unions, etc.) in the development and implementation of decarbonisation policies at all levels.

(b) *Actions undertaken:* The formation and operation of the Crisis Committee, under pressure from the transport companies, supported by the rest of the residents of As Pontes and the Ferrol region, was an important step in dealing with the adverse impacts of the transition process. The crisis committee brings together the employers' associations and the trade unions.

(c) *Results achieved:* Efforts have been made to involve various stakeholders through a public participation process. Government, cultural sections, universities, social and technological partners and the business community have been invited to propose and participate in the transition process.

(d) *Obstacles encountered:* The problem is that the actions proposed by the Crisis Committee do not seem to have been implemented by the political authorities. The compulsory and hierarchical way of achieving this participation is not giving the expected results.

### 6.8.3 Gender dimension

There is a clear gap in women's participation in the transition process. Attempts are made to involve more women in the debates on the transition process, but their presence remains limited. It is important to mention that women hold positions of power in the Crisis Committee and in the local administration.

### 6.8.4 Discussion

Stakeholder participation is very important for the successful implementation of decarbonisation policies and to reduce the adverse impacts of thermal power plant closures. Local and national administrations have tried to involve local stakeholders in the process, but this participatory process has still not achieved the desired results. It is also due to the lack of knowledge of different stakeholders about the long- and short-term impacts of the energy transition.

## 6.9 Conclusions

The challenges and coping strategies outlined above present a very clear picture of the real situation in the As Pontes region. It highlights the problems related to the demographic, economic, social, cultural and political configuration of the area that can help policy-makers to develop policies to address the problems faced by the different stakeholders. The initial results obtained from the different coping strategies help us to identify the strategies that are working well in the region.

# CHAPTER 7

---

## Summary and Discussion

## 7 Summary and discussion

ENTRANCES explores the SSH aspects of the ETS in 13 European coal and carbon intensive regions. This report has presented the main results for the region of A Coruña. It is a small province in the autonomous community of Galicia, in northwest Spain, and 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. ENDESA, the owner of the thermal power plant, formally requested the closure of the plant in December 2019, and the Spanish central government approved its request, paving the way for the final closure of the thermal power plant. The plant was commissioned in the early 1970s to exploit the lignite mines at As Pontes. To reduce emissions, the plant was restructured in 1993-96 to use a mixture of local lignite and imported coal. Ferrol port was developed and the necessary infrastructure was built to transport the imported coal to the plant. Due to the lower price of imported coal, the local mines became uncompetitive and closed in 2007. The mine shaft was filled with water to create the largest artificial freshwater lake in the region, which was completed in 2012. Since 2007, the plant only burns imported coal, which is less polluting and cheaper. Spain's ratification of the 2015 Paris Agreement in 2017 and its commitment to reduce emissions paved the way for the closure of all coal-fired power plants, including As Pontes. This closure is crucial to meet the proposed 2030 climate targets but is expected to have dire consequences for the well-being of local society.

The La Central thermal power plant was the main source of income and employment in the region. Its closure will create a vacuum in the region's economic sphere, which will be difficult to fill with alternative green energy projects. The loss of jobs and income, first by the closure of the mines and then by the announcement of the closure of the thermal power plant, has begun to affect the standard of living in the region. Since the closure of the mines, labour productivity, labour force participation, disposable income, GDP and GDP per capita have declined. Small ancillary businesses and retail outlets are closing due to falling demand. The lack of new jobs has accelerated the brain drain and emigration of the region's youth, which in turn has accelerated the ageing process and increased the size of the dependent population, affecting the socioeconomic fabric of the region.

It has also affected the socio-cultural configuration of the region. In the 1940s, with the installation of the first fertiliser factory in As Pontes, the region witnessed a transformation of identity from agrarian to industrial society. This identity transformation was reinforced with the installation of the largest thermal power station in As Pontes in the 1970s. This rupture from the past created stress in the area and created several situations of conflicts and contradictions in the local community. The inhabitants of As Pontes developed their new identity as miners or plant workers who are proud to have contributed to the economic development of Spain. The high wages from mining and the power plant enabled them to maintain a good standard of living and the educational facilities offered by the company helped their children to obtain higher education and move up the social mobility ladder. The closure of the mines meant the loss of an essential part of the identity of a large number of mining families who had worked in the coal mines for generations. Similarly, the announcement of the closure of the thermal power plant has created a fear of loss of identity among the plant's workers.

The economic uncertainty and loss of identity caused by the decarbonisation process have also affected the socio-psychological well-being of the inhabitants of As Pontes and the surrounding municipalities. Their anxiety about their future and that of the next generations has increased. Their high level of place attachment creates a sense of disparity in the economic and cultural decline of the region. They have a high level of perceived stress, emanating from economic hardship and

nostalgia for their industrial past, which affects their overall life satisfaction. This social stress manifests itself in the form of resistance and protests against the decarbonisation policies adopted by the central government. However, personal reinvention or efforts to learn new skills and become employable in the changing labour market are very limited, which worries policy-makers.

This decarbonisation process has an impact on the socio-political structure of the region. In Spain, it is a top-down process. The central government takes all major decisions regarding the closure of large carbon-intensive industrial units, the distribution of EU funds, compensation for workers and businesses and the rehabilitation of the territory. The local government has no competencies in this area. However, it affects its source of revenue, which in turn affects its functioning and welfare projects. The central government propagates the narrative of “*Energy transition is a great business, social and industrial opportunity for the Spanish economy*” to support its decarbonisation policy and increase its public acceptance. However, opposition parties in central government and local government and trade unions propagate the “*Energy transition is wrong, unfair and expensive*” narrative to criticise how decarbonisation policies are imposed on the local population. Overall, the decarbonisation process has weakened the political power of the region, which has contributed to the rise of the conservative and separatist political parties in the region.

The successful implementation of the decarbonisation process also depends on the socio-ecological and technical aspects of the energy transition. How the population copes with the adverse effects of the decarbonisation process will depend on the transformative capacity of the region. Transformative capacity shows the extent to which a region is able to deviate from its current (carbon intensive) trajectory towards sustainable outcomes. In the A Coruña region, most stakeholders believe that the radical sustainability vision of the energy transition is the most important factor affecting the region's transformational capacity. Similarly, the other important factors are intermediaries and knowledge production, where the former focuses on the role of intermediaries in the governance of the energy transition and the latter demonstrates the diversity of knowledge produced from different sectors, which relates to regulatory changes to support the energy transition. In contrast, reflective regulation, which shows the extent to which regulatory changes have been implemented to support the transition process and overcome barriers, is considered the least important factor affecting the region's transformative capacity, followed by resource availability and community empowerment, which demonstrates the level of support received by stakeholders and communities to act autonomously for the energy transition.

This extensive research on the multiple dimensions of the energy transition helped us to identify the different challenges and coping strategies that have emerged over the last decade. These challenges include addressing depopulation and ageing of the local population, emigration of youth and brain drain, managing industrial waste and rehabilitation of exploited land, rebuilding the industrial complex of As Pontes and the Ferrolterra-Eume region with green energy projects, achieving political consensus on the proactive agenda for reindustrialisation, ensuring energy availability and affordability, reducing the digital divide and investment in human capital formation, responding to the particular social needs of different vulnerable groups and involving local people in policy formulation and implementation. All these challenges require a set of coping strategies, a sustainable vision for the future and a lot of funding from the public and private sector. In the near future, it will be interesting to see how the Spanish government addresses these challenges and achieves its goals in terms of emissions control and economic development in carbon intensive regions in transition.

## 8 References

- Aréchaga, F., Ferreiro T., Gil A., Menéndez, J.A., & Valle, R. (2011). *Restored Wealth. History of the As Pontes mine*. ENDESA.
- Appadurai, A. (1996). *Modernity at Large, Cultural Dimensions of Globalization*. University of Minnesota Press.
- Baxter, M. & King, R. G. (1993). Fiscal policy in general equilibrium. *The American Economic Review*, 315–334. <https://www.jstor.org/stable/2117521>.
- Bertrand, A. L. (1963). The Stress-Strain Element of Social Systems: A Micro Theory of Conflict and Change. *Social Forces*, 42(1), 1-9. <https://doi.org/10.2307/2574939>
- Cronbach, L. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*. 16, 297-334. <https://doi.org/10.1007/bf02310555>.
- European Commission (2021). *The 2021 Ageing Report, Economic & Budgetary Projections for the EU Member States (2019-2070)*, s.l.: Institutional Paper 148. <https://doi.org/10.2765/84455>.
- Eurostat (2008). *NACE Rev. 2 Statistical classification of economic activities*, Luxembourg: Office for Official Publications of the European Communities. <https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-ra-07-015>.
- Eurostat (2014). Essential SNA: Building the basics. <https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-gg-14-008>.
- Fleurbaey, M. (2009). Beyond GDP: The quest for a measure of social welfare. *Journal of Economic Literature*, 47(4), 1029-75. <https://doi.org/10.1257/jel.47.4.1029>.
- Fløttum K, Gjerstad Ø (2017) Narratives in climate change discourse. *WIREs Climate Change*, 8:e429. <https://doi.org/10.1002/wcc.429>
- Herrendorf, B., Rogerson, R. & Valentinyi, A., (2014). Growth and structural transformation. *Handbook of Economic Growth*, 2(1): 855-941.
- Hinkel, J., Mangalagiu, D., Bisaro, A. et al. (2020). Transformative narratives for climate action. *Climatic Change*, 160, 495–506. <https://doi.org/10.1007/s10584-020-02761-y>
- Hirschman, A. O. (1970). *Exit, voice and loyalty: Responses to decline in firms, organisations and states*. Cambridge, MA: Harvard University Press.
- Isgren, E., Jerneck, A. & O'Byrne, D. (2017). Pluralism in search of sustainability: ethics, knowledge and methodology in sustainability science. *Challenges in Sustainability*, 5(1), 2-6. <http://dx.doi.org/10.12924/cis2017.05010002>
- INE (2020) Contabilidad Regional de España. Serie 2016-2020. <https://www.ine.es/jaxi/Tabla.htm?path=/t35/p010/rev19/I0/&file=02001.px&L=0>
- Jones, C. I. (2005). The shape of production functions and the direction of technical change. *The Quarterly Journal of Economics*, 120, 517–549.
- Jones, C.I. and Klenow, P.J. (2016). Beyond GDP? Welfare across countries and time. *American Economic Review*, 106(9), 2426–2457. <https://doi.org/10.1257/aer.20110236>.
- Kropp, P., Sujata, U., Weyh, A. & Fritzsche, B. (2019). *Kurzstudie zur Beschäftigungsstruktur im Mitteldeutschen Revier*, s.l.: s.n.
- Lopez, X.P.S., & Blanchette, M.L. (2020). IMWA Insight: Understanding Public Perceptions of a New Pit Lake in As Pontes, Spain. *Mine Water Environ* 39, 647–656. <https://doi.org/10.1007/s10230-020-00651-4>



- Lucas Jr, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22, 3–42. [https://doi.org/10.1016/0304-3932\(88\)90168-7](https://doi.org/10.1016/0304-3932(88)90168-7).
- Lucas Jr, R. E. (2009). Ideas and growth. *Economica*, 76, 1–19. <https://doi.org/10.1111/j.1468-0335.2008.00748.x>.
- Luthar S. S., Cicchetti, D., & Becker B. (2000). The construct of resilience: a critical evaluation and guidelines for future work. *Child Development* 71(3): 543-62. <https://doi.org/10.1111/1467-8624.00164>
- Mankiw, N. G., Romer, D., & Weil, D. N., (1992). A contribution to the empirics of economic growth. *The Quarterly Journal of Economics*, 107, 407–437. <https://doi.org/10.2307/2118477>
- Olsson, L., & A. Jerneck. (2018). Social fields and natural systems: integrating knowledge about society and nature. *Ecology and Society* 23(3):26. <https://doi.org/10.5751/ES-10333-230326>
- Pérez-Sindín, X. (2015). *Megaproyectos y comunidad: Impacto De Un Proyecto Minero-Eléctrico a Gran Escala Desde Una Perspectiva Sociológica*. Universidad de A Coruña.
- Perez-Sindín, Xaquín & Van Assche, Kristof (2020). From coal not to ashes but to what? As Pontes, social memory and the concentration problem, *The Extractive Industries and Society*, 7(3), 882-891. <https://doi.org/10.1016/j.exis.2020.07.016>
- Pfaffenberger, B. (1992). Social Anthropology of Technology. *Annual Review of Anthropology*, 21, 491–516. <http://www.jstor.org/stable/2155997>
- Raymond, C. M., Brown, G., & Weber, D. (2010). The measurement of place attachment: Personal, community and environmental connections, *Journal of Environmental Psychology*, 30(4), 422-434, <https://doi.org/10.1016/j.jenvp.2010.08.002>.
- Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, 98, p. S71–S102. <https://doi.org/10.1086/261725>.
- Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, 70(1): 65–94. <https://doi.org/10.2307/1884513>.
- Solow, R. M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics*, p. 312–320. <https://doi.org/10.2307/1926047>.
- Uzawa, H. (1965). Optimum technical change in an aggregative model of economic growth. *International Economic Review*, 6(1): 18-31. <https://doi.org/10.2307/2525621>.
- Wolfram, M. (2016). Conceptualizing urban transformative capacity: A framework for research and policy. *Cities*, 51:121–130. <https://doi.org/10.1016/j.cities.2015.11.011>.
- Wolfram, M. (2019). Assessing transformative capacity for sustainable urban regeneration: a comparative study of three South Korean cities. *Ambio*, 48, 478–493. <https://doi.org/10.1007/s13280-018-1111-2>.
- Wolfram, M, Sara Borgström, & Megan Farrelly. 2019. Urban transformative capacity: From concept to practice. *Ambio*, 48, 437–448. <https://doi.org/10.1007/s13280-019-01169-y>.
- van der Leeuw S (2020) The role of narratives in human-environmental relations: an essay on elaborating win-win solutions to climate change and sustainability. *Climate Change*, 160, 509-519. <https://doi.org/10.1007/s10584-019-02403-y>



# APPENDIX

---

## 9 Appendix

### 9.1 Regional delineation

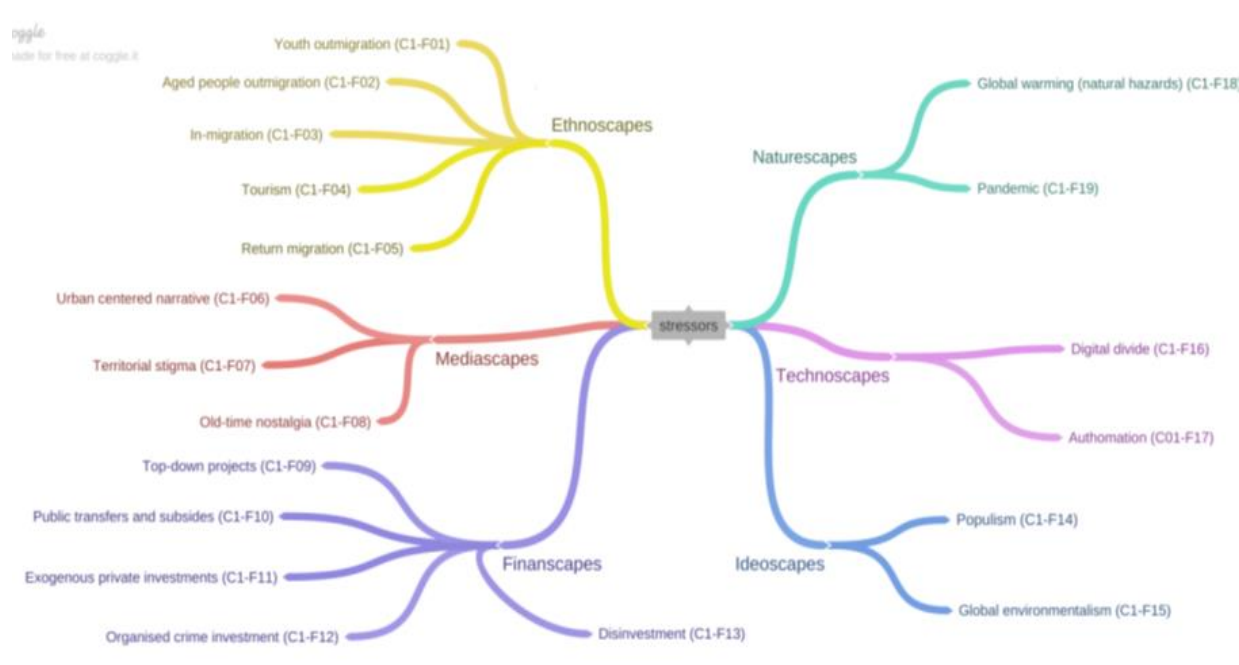
Table 15 - Demographic data for all case deliniations

	CCT	LMA	PAR
<b>Territory (in sq km)</b>	249.4	7,950	29,575
<b>Population (2019)</b>			
<b>total</b>	10,138	1,119,596	2,699,499
...female	5,204	583,126	1,400,535
...male	4,934	536,470	1,298,964
<b>Share of people over 50 years (%)</b>	48.4	44.8	45.1
<b>Population Density</b>	40.7	140.8	91.3

Source: INE, Spain and own calculations

### 9.2 Socio-cultural factors

Figure 13 - Socio-cultural factors



Source: *Modernity at Large, Cultural Dimensions of Globalization* (Arjun Appadurai, 1996).

### 9.3 Socio-psychological component

Table 16 - Survey questionnaire used in the A Coruña case study

Factor	Sub-factor	Item code	Item
Place Attachment	Place Identity (Williams & Vaske, 2003).	PA_PI01	Coruña means a lot to me.
		PA_PI02	I am very attached to Coruña.
		PA_PI03	I identify strongly with Coruña.
		PA_PI04	I feel Coruña is a part of me.
	Place dependence (Williams & Vaske, 2003).	PA_PD01	No other place can compare to Coruña.
		PA_PD02	I would not substitute any other area for the activities I do in Coruña.
		PA_PD03	Doing my activities in Coruña is more important to me than doing them in any other place.
		PA_PD04	Coruña is the best place for the activities I like to do.
	Place Rootedness (McAndrew, 1998). Desire for Change PA11-PA16, Home/Family PA17-PA20.	PA_PR01	Moving from place to place is exciting and fun.
		PA_PR02	I could not be happy living in Coruña for the rest of my life.
		PA_PR03	There is not much of a future for me in Coruña.
		PA_PR04	Living close to Atlantic coast (certain natural features such as the ocean or mountains) is very important to me.
		PA_PR05	I am extremely satisfied with my present home in Coruña.
		PA_PR06	My family is very close-knit and I would be unhappy if I could not see them on a regular basis.
		PA_PR07	I love to reminisce about the places I played when I was a child.
		PA_PR08	I have several close, life-long friends that I never want to lose.
	Social Bonding (Raymond et al. 2010)	PA_SB01	Belonging to volunteer groups in Coruña is very important to me.
		PA_SB02	The friendships developed by doing various community activities strongly connect me to Coruña.
Moderators	Resilience (Campbell-Sills and Stein 2007)	MO_RE01	I can deal with whatever comes
		MO_RE02	I try to see humorous side of problems.
		MO_RE03	I tend to bounce back after illness or hardship.
		MO_RE04	I can achieve goals despite obstacles.
		MO_RE05	I am not easily discouraged by failure.
		MO_RE06	I think of myself as strong person.
		MO_RE07	I can handle unpleasant feelings
	Optimism (Pedrosa 2015)	MO_OP01	I believe that I will achieve the main goals of my life.
		MO_OP02	When I think about the future I am positive.
		MO_OP03	I see every challenge as an opportunity for success.
		MO_OP04	No matter how bad things turn out, I find positive aspects.
		MO_OP05	I see the positive aspects of things.
		MO_OP06	I am confident in overcoming problems.
		MO_OP07	I am confident in the future.
Decarbonisation impacts	Individual Perceived Stress (Remor 2006).	DI_PS01	In the last month, how often have you been upset because of something that happened unexpectedly?
		DI_PS02	In the last month, how often have you felt that you were unable to control the important things in your life?
		DI_PS03	In the last month, how often have you felt nervous and "stressed"?
		DI_PS04	In the last month, how often have you felt confident about your ability to handle your personal problems?
		DI_PS05	In the last month, how often have you felt that things were going your way?
		DI_PS06	In the last month, how often have you found that you could not cope with all the things that you had to do?
		DI_PS07	In the last month, how often have you been able to control irritations in your life?
		DI_PS08	In the last month, how often have you felt that you were on top of things?
		DI_PS09	In the last month, how often have you been angered because of things that were outside of your control?
		DI_PS10	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

	Perceived Fairness	DI_PF01	The environmental benefits of decarbonization are greater than the damage it produces to the people living in our region.
		DI_PF02	Our region faces greater losses than gains as a result of decarbonization
		DI_PF03	Judging its benefits and costs, decarbonization is a fair process for the people living in this region.
		DI_PF04	People in my region pay the decarbonization price and others enjoy its gains.
	Economic hardship (Marjanovic, et al., 2013).	DI_EH01	How uncertain do you feel?
		DI_EH02	How much do you feel at risk?
		DI_EH03	How much do you feel threatened?
		DI_EH04	How much do you worry about it?
		DI_EH05	How much do you think about it?
	Economic optimism (Patel, S. 2012) Adapted and revised	DI_EO01	People in my region will be better off financially a year from now on.
		DI_EO02	In my region there will be less unemployment during the coming 12 months.
		DI_EO03	I feel optimistic about the economic future of my region in the next 5 years.
		DI_EO04	The degree of poverty will decrease in my region over the next 5 years.
	Nostalgia (Newman, et al. 2020)	DI_NO01	How nostalgic do you feel?
		DI_NO02	To what extent do you feel sentimental for the past?
		DI_NO03	How much do you feel a wistful affection for the past?
		DI_NO04	To what extent do you feel a longing to return to a former time in your life?
Coping Strategies	Intention to relocate	IR01	I would accept a job which requires a change of residence in another region.
		IR02	It is likely that I will move from my region during the next 2 years.
		IR03	I actively search for information about new places to live and work in.
		IR04	I am always searching for new places to live and work in.
	Personal reinvention	PR01	I am now learning new skills in order to adapt the current decarbonization process in the region I live and work
		PR02	I have been learning new skills in order to change my profession
		PR03	I am taking school/course classes in order to learn a new profession
	Support	SU01	I fully support the decarbonization process in the region I live and work
		SU02	I agree with the decarbonization process in the region I live and work
	Resistance and Protest	RP01	I don't believe that my region should have undergone a decarbonization.
		RP02	I support those protesting against the decarbonization process for the region I work and live in.
		RP03	I don't like the decarbonization plan for the region where I live and work.
		RP04	I am actively involved in a union / organization that fights against decarbonization process in the region I live and work
		RP05	I would participate in a meeting/protest against the decarbonization process in the region I live and work.
	Submission	SM1	I feel that the organisations behind the decarbonisation process in my region are very strong.
		SM2	I believe that I cannot do anything to stop this process of decarbonisation in the region I live and work.
Socio-demographic Characteristics		SD01	Age
		SD02	Sex
		SD03	Education
		SD04	Occupation
		SD05	Are you currently employed in the coal/carbon industry?
		SD06	Have you been employed in this industry in the past?
		SD07	Marital Status
		SD08	Do you have dependent people (les than 16 or above 65) in your household?
		SD09	Nativity
		SD10	Time of stay in the region
Life Satisfaction	Life Satisfaction (Vita et al. 2020)	LS01	In most ways my life is close to ideal.
		LS02	The conditions of my life are excellent.
		LS03	I am satisfied with my life.
		LS04	So far I have gotten the important things I want in life.
		LS05	If I could live my life over again, I would change almost nothing.

Source: Own elaboration.

## 9.4 Socio-economic data

Table 17 - Economic data overview

	CCT- NUTS 3	LMA A Coruña	PAR Galicia	Country Spain	EU28
Working age Population total	5,395	589,676	1,412,817	29,739,540	330,714,969
Unemployment Rate (%) <sup>a)</sup>					
Male	8.1	12.7	10.3	12.5	6.2
Female	9.3	13.1	13.2	15.9	7.0
Total	8.7	12.9	11.7	14.1	6.9
Employment Shares by Industries (%)					
Manufacturing	na	9.8	12.2	10.1	13.7
Services	na	77.2	73.7	78.5	74.1
Mining and utilities	na	1.5	1.2	1.3	1.5
Gross Value Added Total (Bn Euro real)	na	24	56	1,088	14,240
Gross Value Added Shares (%)					
Manufacturing	na	11.1	13.8	12.2	15.9
Services	na	71.8	69.6	74.9	73.7
Mining and utilities <sup>b)</sup>	na	5.8	4.6	3.9	3.3
GDP per capita (Euro)	28,950	24,532	23,837	26,290	31,087
in relation to country Ø	110.1%	93.3%	90.7%		
in relation to EU Ø	93.1%	78.9%	76.7%	84.6%	
Disposable Income per capita (Euro)	23,619	14,536	14,515	22,169	17,068
in relation to country Ø	106.5%	65.6%	65.5%		
in relation to EU Ø	138.4%	85.2%	85.1%	129.9%	

Notes: Data refers to 2018 because data on the NUTS 3 level is only available until 2018.

Sources: INE, Spain. Destatis (13312, 82411, 82111), Eurostat (nama\_10\_gdp, nama\_10r\_2hhinc, tps00203, ifsa\_egan2, nama\_10\_a10) and own calculations.

Table 18 - NACE Rev. 2 Classification

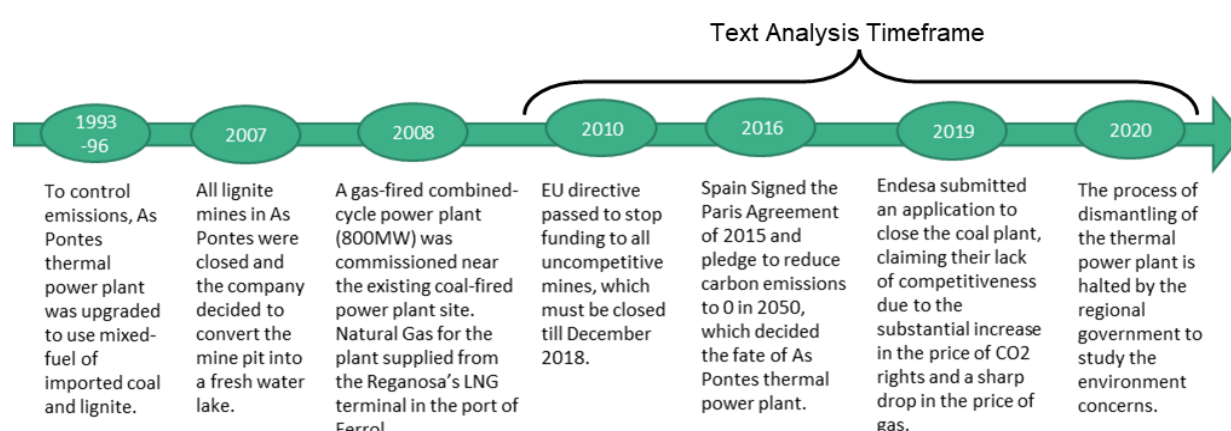
NACE Rev. 2	Description
A	Agriculture, forestry and fishing
B	Mining and quarrying
C	Manufacturing
D	Electricity, gas, steam and air-conditioning supply
E	Water supply, sewerage, waste management and remediation
F	Construction
G	Wholesale and retail trade
H	Transportation and storage
I	Accommodation and food service activities
J	Information and communication
K	Financial and insurance activities
L	Real estate activities
M	Professional, scientific and technical activities
N	Administrative and support service activities

O	Public administration and defence; compulsory social security
P	Education
Q	Human health and social work activities
R	Arts, entertainment and recreation
S	Other service activities
T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
U	Activities of extraterritorial organisations and bodies

Source: Eurostat, 2008, p.47.

## 9.5 Socio-political component

Figure 14 - The timeline of decarbonisation process in A Coruña case study, Spain



Source: Own elaboration.

Table 19 - List of keywords used for text material search in A Coruña case study

Keywords related to Stakeholders	Keywords related to "decarbonisation" or "energy transition" Processes	Keywords related to Region	Keywords related to Impact
<ul style="list-style-type: none"> <li>-MITECO and La Central in As Pontes</li> <li>-National government's policy on decarbonisation</li> <li>-Xunta de Galicia and phase-out of La Central</li> <li>-Municipal council of As Pontes and closure of La Central</li> <li>-Endesa and La Central in As Pontes</li> <li>-Trade Unions and phase-out of La Central</li> <li>-Transporters Association</li> <li>-Small businesses and phase-out of La Central</li> <li>-Greenpeace on the closure of La Central</li> <li>-Environmental groups on the closure of La Central</li> <li>-Financial institutions and decarbonisation.</li> <li>-Political parties in Galicia and decarbonisation.</li> <li>-Gender and decarbonisation.</li> </ul>	<ul style="list-style-type: none"> <li>-Decarbonisation in Spain</li> <li>-Closure of Mines in As Pontes</li> <li>-Closure of La Central thermal power plant in As Pontes</li> <li>-Energy Transition</li> <li>-Just Transition</li> <li>-Renewable green energy</li> <li>-Wind and solar plants</li> <li>-Hydrogen project</li> <li>-Energy storage and Carbon capture techniques</li> </ul>	<ul style="list-style-type: none"> <li>-As Pontes</li> <li>-Ferrol</li> <li>-A Coruña</li> <li>-Galicia</li> <li>-Spain</li> <li>-Southern Europe</li> <li>-European Union</li> </ul>	<ul style="list-style-type: none"> <li>-Energy security</li> <li>-Energy poverty</li> <li>-Rise in fuel prices</li> <li>-Economy of As Pontes and Coruña</li> <li>-Worker's Protests in As Pontes</li> <li>-Job loss and Unemployment in As Pontes</li> <li>-Youth Migration from As Pontes</li> <li>-Environmental impact of mines and power plant</li> <li>-Loss of revenue</li> </ul>

Source: Own elaboration.



## 9.6 Socio-ecological and technological component

**Table 20 - List of socio-ecological and technical factors**

T.C. Factor	Description	Corresponding Question	Question Text
C1.1	actor diversity	Q2	To what extent are diverse stakeholders, from citizens and civil society to businesses and their representatives, directly participating in governing the energy transition?
C1.2	diverse governance	Q5	How diverse are 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, etc.?
C1.3	intermediaries	Q6	How influential are intermediaries in governing the energy transition at present?
C2	transformative leadership	Q7	Does leadership for the energy transition (i) come from all sectors (public, private, civil society), (ii) offer motivating visions and (iii) drive collaboration between stakeholders?
C3.1	social needs focus	Q8	To what extent are these social needs identified and prioritised by stakeholders?
C3.2	community empowerment	Q9	What level of support do actors and communities have to act autonomously for the energy transition?
C4.1	system analysis	Q10	How would you assess the level of understanding of interdependencies across socio-economic, ecological, and technical aspects of the transition? [and institutional?]
C4.2	path dependency	Q11	How far do actors recognise these systemic interdependencies in institutions, regulations, infrastructures, social values, etc., as potential obstacles to change?
C5.1	knowledge production	Q12	"There is a broad diversity of knowledge produced from different sectors (e.g., technical science, social science, civil society, government, industry) informing the transition."
C5.2	sustainability vision	Q13	"The transition vision for [region] is explicit, radical, collectively produced, and motivates and provides clear orientation for stakeholder actions."
C5.2.1	– explicit	Q13.a	...explicit?
C5.2.2	– radical	Q13.b	...radical / far-reaching?
C5.2.3	– collective	Q13.c	...collectively produced?
C5.2.4	– motivating	Q13.d	...motivates action?
C5.2.5	– orienting	Q13.e	...provides clear orientation?
C5.3	alternative scenarios	Q14	"Transition planning/implementation makes use of future scenarios with alternative development options, based on stakeholder choices, uncertainties and interdependencies between socio-economic, technological, institutional, and ecological factors."
C6	disruptive experimentation	Q15	"There is a diversity of actors involved in experiments intended to fundamentally alter present ways of doing things."
C7.1	resource availability	Q16	How much support is provided for stakeholders [/ To what extent are stakeholders able to access resources] to enhance inclusion and participation, vision- and scenario-development, and experimentation?

C7.2	organisational adjustment	– n/a –	– n/a –
C7.3	reflexive regulation	Q17	To what extent have regulatory changes been implemented to support the transition and overcome obstacles?
C8	social learning	Q18	“There is the monitoring of and learning about the transition that feeds back into its implementation.”
C9	across agency levels	Q3	“Measures to move the energy transition forward actively involve a broad range (diversity) of social actors, including individuals and households, as well as groups, organisations, networks, and society.”
C10	across scales/tiers	Q4	“Measures in support of the transition involve strong dialogue and coordination across spatial scales, from local to regional to national, inter-/transnational and EU.”

### SETS Transformative Capacity Assessment Questionnaire

Q1. Before we start, can you briefly describe in your own words what you understand by the **[clean energy transition]** that is **[being planned/beginning/underway]** in **[region]**, what does it seek to achieve and by what means is it being implemented? .....

Q2. To what extent do you agree or disagree that: **“Beyond public authorities, diverse stakeholders are actively participating in steering/designing/governing the **[clean energy transition]** – citizens, civil society, businesses, NGOs and academia –”?**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Don't Know

2.1 Who is excluded?.....

Q3. To what extent do you agree or disagree that: **“Measures to move the **[clean energy transition]** forward actively involve all different types of social actors; including individuals and households, as well as groups, organisations, networks and associations”?**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Don't Know

3.1 Which social actors are least involved?.....

Q4. To what extent do you agree or disagree that **“Measures in support of the **[clean energy transition]**, as it is presently unfolding, involve strong dialogue and coordination across spatial scales; from local to regional, national, inter- or transnational and EU”?**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Don't Know

4.1 Where is cross-scale coordination strongest? For instance, between local and municipal levels, or regional and national?.....

4.2 And where would better cross-scale coordination be most important?.....

Q5. To what extent do you agree or disagree that “**Governance/steering approaches used for the [clean energy transition] are varied and hybrid – including formal AND informal processes, centralised AND decentralised, top-down AND bottom-up arrangements, as well as governing through hierarchy, market and networks**”?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

5.1 What governance/steering approaches are particularly missing?.....

Q6. Intermediaries are independent actors (individuals or organisations) that connect multiple other actors in transition processes. They facilitate dialogue, agreement and joint action of different stakeholders, e.g., between the public, private and civil sectors, across administrative levels or territorial boundaries and/or regarding different policy/action domains. These could be, for instance, energy agencies, professional associations or an engaged activist. To what extent do you agree or disagree that: “**Intermediaries are playing an influential role in governing the [clean energy transition] at present**”?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

6.1 If any, which intermediaries are particularly influential (across sectors, levels, territories, domains)?.....

Q7. To what extent do you agree or disagree that: “**Leadership for the energy transition (i) comes from all sectors (public, private, civil society), (ii) offers motivating visions and (iii) drives collaboration between stakeholders**”?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

7.1 What critical gaps exist in these three aspects of leadership?.....

7.2 Is leadership oriented toward deep, encompassing and rapid (i.e. transformative) change? Please explain.....

Q8. To what extent do you agree or disagree that: “**The [clean energy transition] addresses social needs**”?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

8.1 Which social needs does the [clean energy transition] address? .....

8.2 And which social needs does the [clean energy transition] not address?.....

8.3 Who decides and prioritises which social needs are addressed?.....

Q9. To what extent do you agree or disagree that: “**Support is given to citizens, innovators and communities of change (e.g., energy cooperatives, local sustainability networks, start-ups) to act autonomously to advance the energy transition**”?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

9.1 If any, what kind of measures support autonomous stakeholder activities?.....

Q10. Research emphasises that energy transitions require *co-evolution* between different spheres of society, i.e. simultaneous and interdependent changes in ways of thinking (values, norms), ways of organising (institutions, technologies) and everyday practices (routines, habits). For instance, new technical solutions or innovative practices alone do not suffice to accomplish a transition, but need to be accompanied by broader shifts in governance, infrastructures and culture. To what extent do you agree or disagree that: **“There is a widely shared awareness among stakeholders of the importance of (systemic) interdependencies between the cultural, institutional, socio-economic, ecological and technical aspects of the [transition]”?**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

10.1 Which stakeholders need more awareness of these (systemic) interdependencies?.....

Q11. To what extent do you agree or disagree that: **“Stakeholders recognise (systemic) interdependencies between the cultural, institutional, socio-economic, ecological and technical aspects of the transition as critical obstacles to change”?**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

11.1 If any, which interdependencies do you see as the most critical obstacles facing the present transition?.....

Q12. To what extent do you agree or disagree that: **“There is a broad diversity of knowledge produced from different stakeholders that informs the transition (e.g., technical science, social science, civil society, government, industry)”?**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

12.1 What kinds of knowledge are missing?.....

Q13. As intentional, politically initiated transitions, decarbonisation transitions are generally implemented according to a normative vision of a desirable sustainable future for the region. In some cases these may be produced by governance actors – those “leading” the transition – in others they may result from participatory processes with citizens and stakeholders. To what extent do you agree or disagree that: **“The transition vision for [region] is explicit, radical, collectively produced, motivates action and provides clear orientation for stakeholder actions”?**

The vision is...	1 Strongly Disagree	2 Disagree	3 Neither agree nor disagree	4 Agree	5 Strongly Agree	Don't Know
“explicit”	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
“radical/far-reaching”	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
“collectively produced”	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
“motivates action”	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>

“provides clear orientation”	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
------------------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	--------------------------

13.1 What are particular strengths/weaknesses of the transition vision in your view?.....

Q14. To what extent do you agree or disagree that: **“Present implementation of / planning for the [transition] makes use of future scenarios, including alternative development options based on stakeholder choices and addressing uncertainties and (systemic) interdependencies (between the cultural, institutional, socio-economic, ecological and technical aspects)”**?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

14.1 Please explain your answer.....

Q15. To what extent do you agree or disagree that: **“There is a diversity of experiments undertaken to develop fundamental alternatives to current ways of thinking, organizing and doing”**? For instance, this may involve social, technological and environmental innovations as well as experimental actions to explicitly phase-out problematic institutions, practices and technologies.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

15.1 If such experimentation is occurring, in what domains is it happening?.....

15.2 Which actors are most strongly engaged in experimentation?.....

15.3 Where are there clear gaps in experimentation? For instance, social (institutional, behavioural), technical, environmental, or other fields.....

Q16. To what extent do you agree or disagree that: **“Stakeholders are given access to resources that enhance their organisation and cooperation, their inclusion and participation, or enable vision- and scenario-development and experimentation”**?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

16.1 What type of resources are most lacking? For instance, financial resources, technical resources, human resources, information.....

Q17. To what extent do you agree or disagree that: **“Regulatory changes have been implemented to support the transition and overcome obstacles”**?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

17.1 If anywhere, where has regulatory change occurred?.....

Q18. To what extent do you agree or disagree that **“There is monitoring of and active learning of all stakeholders about the transition process that feeds back into its implementation”**?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
1	2	3	4	5	
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Don't Know

18.1 If any, what kind of monitoring and learning approaches are used?.....





# ENTRANCES

ENergy TRANsitions from Coal and carbon: Effects on Societies



UNIVERSIDADE DA CORUÑA



Halle Institute for Economic Research  
Member of the Leibniz Association



Leibniz Institute of  
Ecological Urban and  
Regional Development



Mineral and Energy  
Economy Research  
Institute  
Polish Academy of Sciences

