



ENTRANCES

ENergy TRANSitions from Coal and carbon: Effects on Societies

D4.5 Stavanger Region Case Study Report



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Abbreviations

CCT	Coal and Carbon Territory
ENTRANCES	ENergy TRANsitions from Coal and carbon: Effects on Societies
LMA	Labour Market Area
PAR	Political Administrative Region

SSH	Social Sciences and Humanities
WP	Work Package
CET	Clean Energy Transition
EU	European Union
MAF	Multidimensional Analytic Framework
NACE	European Classification of Economic Activities
GDP	Gross domestic product
NGO	non-governmental organisation
NUTS	Nomenclature des unités territoriales statistiques

Executive Summary

This case study report presents the results of the ENTRANCES project, (ENergy TRANSitions from Coal and carbon: Effects on Societies) for the Stavanger Case. Stavanger with its surrounding municipalities of Sandnes, Sola, and Randaberg constitutes the Stavanger area and after the discovery of oil in the North Sea in 1969 Stavanger became the seat of the Norwegian oil and gas industry and is called the Oil Capital of Norway. In the last years, there have been made efforts to transition to clean energy.

This report is divided into seven sections followed by references and an appendix, and the purpose of this report is to summarize the work done in five short reports covering different aspects of the clean energy transition in the Stavanger region.

The first introductory chapter introduces the Stavanger area and describes why this area is being investigated while briefly describing the situation and outlining the future for the Stavanger area to transition to greener energy.

The second chapter called *Conceptual and methodological framework* describes the research question, conceptual framework, and methodological framework for the five different short reports. In this part, the different methods used to investigate the socio-economic data, the focus groups, the semi-structured interviews, the text analysis, and the survey data collection process are described.

The third chapter called *Analysis of the Coal and Carbon Territory* describes the Stavanger CCT area from pre-World War 2 to the discovery of oil in the North Sea, to today and the increase in focus on the green shift describing the effects of oil and plans for the future. The ecological and environmental situation is described, together with fish farming, planned construction of wind farms and their environmental consequences. The lack of funding for environmental protection is discussed and the problems with monetizing environmental damages are followed by the damages of invasive species. Then the environmental effects of oil production are described and the impact of accidents (Efofisk oil field blow-out), and finally the damages to marine sea-life and marine sediments in the harbour of Stavanger. The following part describes the finding on the socio-cultural component and the different strain situations related to financescapes, technoscapes, ideoscapes, mediascapes, naturescapes, and ethnocapes. Then a discussion on recurring types of the stress-strain present in the region and then some key dynamics of change, resistance to change, and ambivalence in the territorial organisation of the CCT is described, followed by a discussion on the relevant gender dimensions. Lastly, the socio-psychological component is described, where a survey, containing 17 factors, measuring the socio-psychological stress of inhabitants of the Stavanger region was conducted. It was found that participants in the case study survey had low intention to relocate and low on personal reinvention. Meanwhile, they indicated a strong place identity, resilience, place rootedness and optimism. They also seemed to be satisfied with their life despite indicating some level of economic hardship challenging them. There were also found gender differences where women showed higher place attachment, and higher levels of support, while men showed higher levels of resistance and protest.

The fourth chapter called *The Socio-economic situation* presents data on economic development, sectoral structure, and income distribution from around 2000 to the present day. Economic development is described in terms of labour productivity where the Stavanger region (the political and administrative region and the labour market area) is substantially higher compared to the EU

average as a result of the oil and gas industry. GDP per capita, GDP, working-age population, and share of employed persons are also higher compared to the EU average. The sectoral structure is described in terms of gross value added, and employment in agriculture, forestry and fishing, mining and utilities, manufacturing, construction, retail and IT, finance, real estate and other professional services, and other services in the years 2010 and 2018. Both the PAR and Norway in total shows that the highest added gross value was in other services followed by retail and IT, and finance and real estate. The share of employment in the carbon-intensive industry has increased from 2016 to 2020, indicating that the oil and gas industry shows no signs of decreasing despite efforts and plans to transition from non-renewable energy. Growth distribution is shown for the CCT, LMA, PAR, Country, and EU average, as well as regional gross value-added growth contribution by sector.

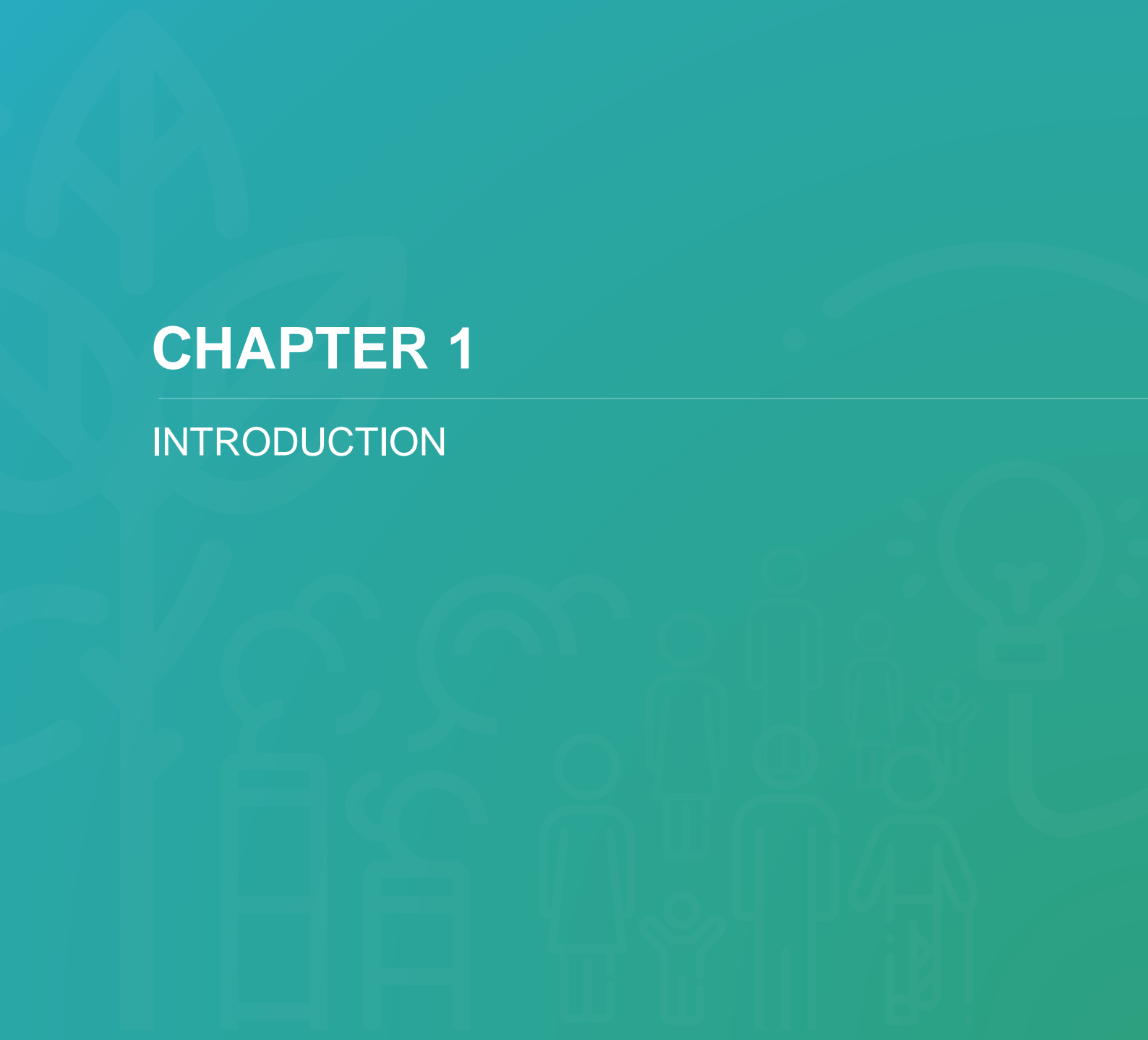
The fifth chapter called *Analysis of the energy transition in the political-administrative region* gives an overview of the energy transition policies and starts by describing the political system and context explaining the political system in Norway and Rogaland. Following is the description of the Norwegian Climate Strategy for 2030 and the plans to reduce climate gas emissions, the national energy policy, and energy policies for Rogaland County and the municipalities of Stavanger/Sandnes. The socio-political component is described, and issues, statements, and conflicts are described where the debate on whether to set an end-date for petroleum activities, which new energy sources are needed and the effect on employment and economic growth. Three defining constituencies were identified: 1) technological regularization, 2) technological adjustments, and 3) technological reconstitution. The socio-ecological and -technical component was described and this report discusses and evaluates the transformative capacity in the region. A semi-structured interview was conducted with key stakeholders and their evaluations of the region's capacity were identified, and four main themes were identified. These themes were: 1) Possible lack of perspective-taking and systems thinking, 2) Our 'Common Future'? Worries about regular citizens and their lacking involvement in the Stavanger CET debate, 3) Nature – A Pushover, and 4) The possible need for action in regulatory activity.

The sixth chapter called *Challenges, coping strategies, gender* describes the challenges that the Stavanger region faces such as 1) a regional oil identity crisis as a result of the desire to maintain the production of oil and gas while also wanting to increase the environmental profile, 2) funding issues for environmental protection, 3) that nature comes last and is overshadowed by the financial benefits of the oil and gas industry, and 4) tensions between private industry and national and local governance where private businesses desire faster-adapting regulations and framework conditions.

Chapter seven presents conclusions that summarize the findings from the different components and studies conducted in the Stavanger region and the effects of the oil and gas industry and the CET. There were identified four challenges: 1) Regional oil identity crisis as people want to maintain and also intensify the search for oil, while also increasing the environmental profile and becoming the “energy capital of Norway.” 2) Funding issues for environmental protection and also the defining cost of environmental damages and introducing knowledge-building arenas where the importance of nature and a healthy relationship with it is highlighted. 3) Nature comes last focused on the problem that economic and financial growth are prioritized over, e.g., wind farms. 4) Tensions between private industry, and national and local governance highlighted the desire from private actors for framework conditions and regulations to be implemented so that companies are not forced to wait.

CHAPTER 1

INTRODUCTION



1 Introduction

The project ENergy TRANSitions from Coal and carbon: Effects on Societies ENTRANCES, which is a three-year project funded by the European Union's Horizon 2020 research and innovation programme, addresses the Social Sciences and Humanities (SSH) aspects of clean energy. ENTRANCES is coordinated by the University of A Coruña and is conducted by a consortium of 14 European partners, including universities, research institutes, networks and umbrella organisations.

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

One of the key aspects of the project was thus the development of 13 regional case studies dedicated to just as many European coal and carbon intensive regions in transition.¹ All the case studies were based on the application of the same Multidimensional Analytical Framework (MAF) within the project to grasp the multi-faceted aspects of the de/re-territorialisation processes ongoing in the regions. This report is the one dedicated to the case study of the Stavanger region that was developed by the Norwegian University of Science and Technology (NTNU).

In 1969 oil was discovered in the North Sea and Stavanger was chosen to be the onshore centre for the oil industry in the Norwegian sector of the North Sea. This has resulted in a period of hectic growth in Stavanger and its three neighbour municipalities (i.e., Sandnes, Randaberg and Sola). Today, the business structure of the region is dominated by oil and gas-related activities, i.e., the Stavanger/Sandnes urban area houses about 35 oil and gas companies and 400+ oil service and technology companies. The oil companies, and a large number of subcontractors, have more than 45,000 employees. This constitutes around 50% of all employees in petroleum-oriented activities in Norway. Together, they constitute a complete value chain within this segment, affecting the income and labour market in these municipalities. Forus Business Park is located on the municipal border between Stavanger, Sandnes, and Sola, and it is one of the country's largest business parks with 2,500 companies providing almost 40,000 jobs.

Based on the ENTRANCES' working definition of a Coal and Carbon Territory (CCT), i.e., the territory in which the "coal and carbon" features are considered a distinctive part of the local identity or are considered a key asset for income and employment opportunities for the local community, the densely populated territories of Stavanger, Sandnes, Randaberg and Sola municipalities - i.e., Stavanger/Sandnes urban area - is considered as the CCT in the Stavanger Case study. It should

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

be noted that no direct oil and gas extraction activities are being conducted in the area, but that many of the operations in the North Sea oil and gas fields are administered and steered from Stavanger.

A decision has been made to invest in clean energy in Stavanger and rebrand the city as the green energy capital. The national government has

- stage 1: phase out/decarbonisation started.
- stage 2: in the midst of the process.
- stage 3: phase out completed /follow-up management.

The main strategy from the Norwegian government, i.e., Oil and Gas for the 21st century – OG21, highlights the need to maximize resource utilization, improve industry productivity, reduce cost and reduce greenhouse gas emissions. It further describes that great potential for further extraction of Norwegian petroleum resources exists in the North Sea, the Norwegian Sea, and the Barents Sea. According to OG21, research and technology development will be crucial for both resource utilization on the Norwegian continental shelf and the industry's international competitiveness. Two large-scale CCS projects are in operation in Norway – Sleipner (in the North Sea) and Snøhvit (in the southern Barents Sea). In total, 21 million tonnes (Mt) of CO₂ have been injected offshore across these projects in two distinct storage sites.

One of the technology areas that the Norwegian government accords great importance to is Carbon Capture and Storage (CCS). The planned full-scale CCS project in Norway comprises the capture of CO₂ from industry emissions, transport, and storage of CO₂. The Norwegian government has also set the course for the government's efforts to stimulate the development of hydrogen-related technologies¹. Coupled with offshore areas for wind power, these strategic commitments are thought to significantly decrease CO₂ emissions from the Norwegian oil and gas industry while increasing the proportion of renewables through green technologies. The opening of the "Utsira Nord" area, outside the coast of Haugesund in Rogaland County, for offshore renewables signals the starting of the energy transition at the heart of the Norwegian oil and gas industry. It is said to create new jobs for the future and reduce emissions.

Based on the available resources mentioned above, the Stavanger case, according to ENTRANCES' stage of transition, is barely at the beginning of stage 1.

The importance of the Stavanger case in the context of ENTRANCES comes from its interconnectedness with oil and gas – substances that have had (and continue to have) a profound impact on the Norwegian economy, employment, industry, and culture. As mentioned previously, the Stavanger region with its surrounding municipalities of Sandnes, Sola and Randaberg, constitutes the very heart of the Norwegian oil and gas industry. By this role, it is clear that the region has great importance for the main purposes of the ENTRANCES project – especially when considering that over 45.000 individuals are employed by Forus alone – Forus being Norway's biggest business conglomerate of oil and gas companies. Additionally, while it might be argued that the entirety of Norway benefits financially and industrially from oil and gas, Stavanger is the primary region where oil and gas constitute part of the regional and cultural identity – it is not uncommon to encounter references, monuments, or tributes to the importance of oil in the region (e.g., the Norwegian Petroleum Museum, Industriminnet, etc.).

The report is articulated in five chapters: Chapter 2 presents the **conceptual, methodological framework** adopted for the development of the case study, including information on how the Stavanger area has been operationalised in different interrelated units of analysis. Chapter 3

provides an overview of the **socio-economic situation** of the region. Chapter 4 is focused on **the analysis of the Stavanger Carbon Intensive Territory**, i.e., the territory heavily dependent on fossil-fuel-based industries or the extraction of fossil fuels themselves, with the lenses of the socio-cultural and socio-psychological dimensions. Chapter 5 covers the **analysis of the Clean Energy Transition** underway 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-related aspects**, and discusses 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, some conclusions formulated by the case study team complete the Stavanger case study report.

CHAPTER 2

CONCEPTUAL AND METHODOLOGICAL FRAMEWORK

2 Conceptual and methodological framework

2.2 Case study objective(s) and organisation

2.1.1 The case study objective(s)

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

- 1) What are the principal socio-economic, socio-technical, socio-ecological, socio-cultural, socio-political, socio-psychological, and gender-related challenges facing coal and carbon intensive regions in transition? What coping strategies have emerged in recent years?
- 2) What variables have been most influential in the appearance of the *deterritorialization* process and how do they interact? What kinds of strategies are the key determinant of success in terms of *re-territorialisation*?
- 3) What policies or combination of policies would be most appropriate to recover the ties of the territory and community in coal and carbon intensive regions while fostering their transition toward clean energy?

The three questions define the logical itinerary of the project, which starts from an in-depth *description* of the current situation of the regions (RQ1), moves to search the *causes* of the de/re-territorialisation process (RQ2), and identify a set of *policies* for fostering the re-territorialisation of the regions (RQ3).

The main aim of the regional case studies is to answer the first research question (RQ1) of the project in all the regions involved in the project, thus also in the Stavanger region. Moreover, the secondary aim of the case studies is to provide the empirical basis for answering the other two research questions, related to the causes of de/re-territorialisation processes (RQ2) and the set of policies needed to activate re-territorialisation (RQ3). However, such two questions will be answered in the next phases of the project respectively through case comparisons (RQ2) and case-related scenario building and policy co-creation (RQ3).

For describing the challenges and coping strategies faced by coal and carbon intensive regions in transition across different dimensions of change, the main aim of this document is to report the answer that the research has found in the case of the Stavanger region.

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

To deal with the complex research question presented above (RQ1) the ENTRANCES case studies have been structured into multiple foci and units of analysis. This articulated approach is necessary to enhance the clarity of the study and avoid conflation of concepts as concerns the challenges and the coping strategies of the coal and carbon intensive regions in transition. In this regard, all the ENTRANCES case studies, thus also including the case study of the Stavanger region, have been articulated into three research foci and three corresponding units of analysis (Figure 1).

RF1: Territorial Change in the Coal and Carbon Territories (CCTs). The project decided to focus its analysis of challenges and coping strategies on the territories that are more exposed to the decarbonisation process. To this aim, the concept of Coal and Carbon Territory (CCT) was developed. CCTs are the territories in which 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 is worth noticing that, in many cases, the CCTs are not administrative regions. The focus on territorial change in the 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 if not in the light of 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 the socio-economic structure over the last three decades. This is an essential dimension for understanding the underlying dynamics that affected and that still affect the CCT at the structural level. To investigate structural change, *Labour Market Area (LMA)* was established as a secondary unit of analysis. The Labour Market Area was defined as the area including the Coal and Carbon Territory in which the bulk of the labour force lives and works.

RF3: The clean energy transition in the Political Administrative Region (PAR). If RF2 investigates medium and long period dynamics that are affecting the CCT, the focus on the clean energy transition ensures that the research considers the incipient change triggered by the purposive transformation of the energy system that is promoted to deal with climate change. Such objectives have been recently accelerated through the European Green Deal. In each regional case study, the clean energy transition has been observed at the level of the Political Administrative Region (PAR), i.e., the administrative region encompassing the Coal and Carbon Territories more closely associated with governing the energy transition through a directly elected legislature.

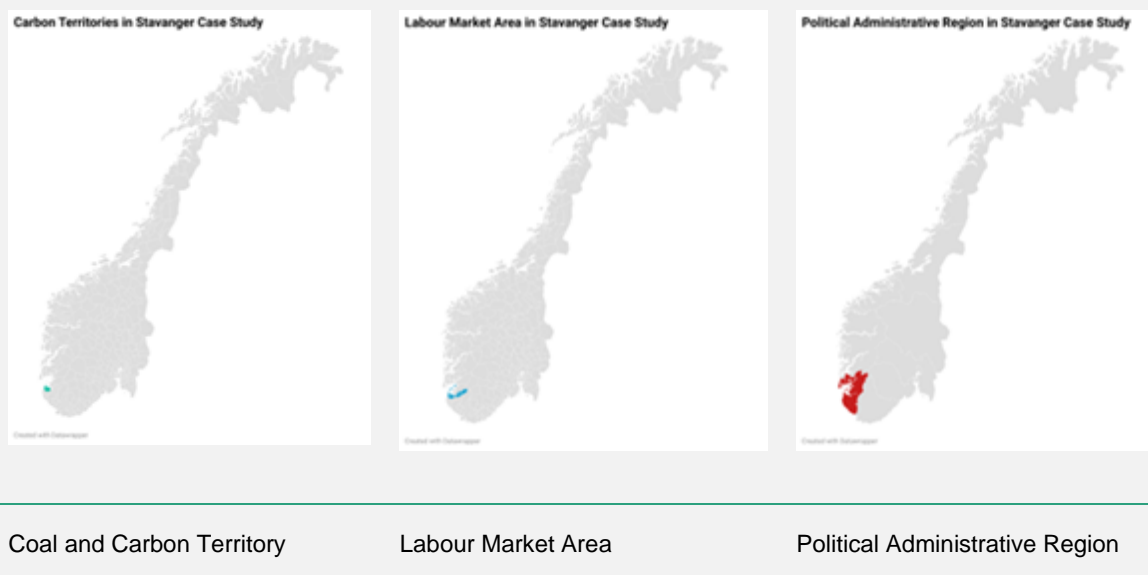
These three research foci and related units of analysis, at least to some extent, overlap with each other. Despite that, they offer different and complementary perspectives in the study of coal and carbon intensive regions in transition. They jointly contribute to understanding the de/re-territorialisation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

The structure of the case study is mirrored in this report as Chapter 3 will deal with territorial change in the CCT; Chapter 4 with structural change in the LMA; and Chapter 5 with the clean energy transition in the PAR.

Box 1: The three units of analysis

Following the structure of the case study, three units of analysis have been delineated in the Stavanger region case as shown in Figure 11

Figure 1 – Case delineation

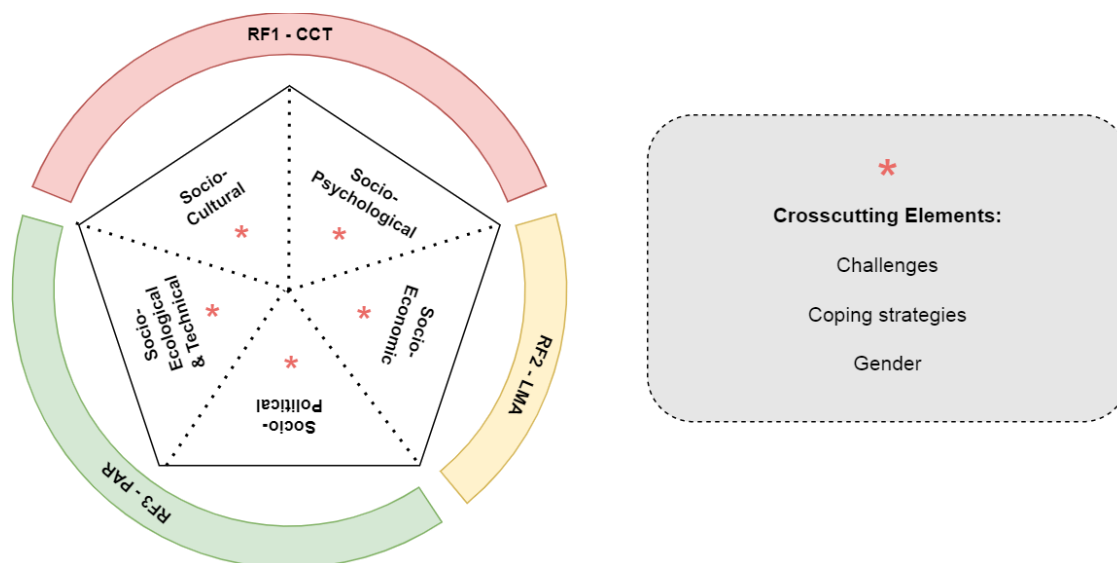


The CCT has been defined as Stavanger, Sandnes, Sola, and Randaberg (see Table 8). The Labour Market Area (LMA), relevant for the case study, consists of Stavanger, Sandnes, Sola, and Randaberg municipalities. The key administrative unit for the case study is Rogaland County.

2.2 Overview of the Multidimensional Analytic Framework

For studying the complex and multidimensional dynamics characterizing the processes of territory in transition, ENTRANCES embraces theoretical and methodological pluralism – a perspective in which the adoption of different scientific approaches is not considered as a problem but as an asset – as its research strategy and it relies on a process of knowledge integration (Isgren et al., 2017). In this regard, the project yearned for adopting multiple approaches without losing their distinctive ontological, epistemic, theoretical, and methodological features (Olsson and Jerneck, 2018). Therefore, a multidimensional analytic framework (MAF) has been adopted. The multidimensional analytic framework is articulated in five components – each relying on a set of specific concepts and methodology – and three cross-cutting elements, as shown in Figure 2. It also shows how the components relate to the above-mentioned research foci and units of analysis.

Figure 2 – Overview of the multidimensional analytic framework: research foci, components, and crosscutting elements



In the following subparagraphs, all the different components will be shortly described with their overall approach, the concepts and the methodology adopted. Two final sub-paragraphs will be dedicated respectively to a synoptic table, showing the main features of all the components together, and to the cross-cutting elements.

2.2.1 Socio-cultural component

Domain of enquiry

The socio-cultural component relies on the assumption that a territory – even an informal one such as the CCT – is a form of social organisation. The component maps whether and in which way the socio-cultural changes associated with globalisation – such as migrations, technological advancement, financial flows, climate change, etc. – are provoking “stress” in the territorial organisation of the CCT. In this respect, the component interprets stress as a pressure to change for the territorial organisation, rather than as the psychological stress produced by socio-cultural factors. The component relies on a theory of the “stress-strain” element of social organisations (Bertrand, 1963), which is devised to analyse change and stability dynamics “in action” in a certain organisation, in our case in the CCT. The core of the theory is simple but insightful: when conflictual or contradictory needs, ideas or processes arise, processes of disorganization take place inducing stress on the organisation which therefore necessitates some sort of adjustment. At the same time, the theory helps us in understanding the stability (or resiliency) of the territorial organisation as all the organisations can tolerate a certain amount of stress. The component identifies the social forces that are exercising pressure at the structural level, the resistance to change – i.e., conflicts or strains generated as a response –, as well as change and stability dynamics in the territorial organisation.

Concepts

Stress-strains. The theory is based on the articulation of the “stress-strain” pair. Stress is an element inherent to the social structure in a given institutional or organisational field, that cannot be observed

per se but manifests itself in “strains” of different types such as conflicts, tensions, ambivalences, etc. Therefore, the “strains” can be interpreted also as the manifestation of the stress in action at the structural level.

Strain situation. This is the operational concept adopted for identifying and studying on an empirical base 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 and related uncertainty. The strain situations are therefore the unit of observation of this component.

Stress vector. It can be defined as a social process that activates stress in the territorial organisation. Stress vectors (or stressors) vary over a wide range of characteristics: for their origins, which can be either from within or from outside; for intensity, as some pressure to change can be stronger than others; for the duration, as some stress-strain can be temporary or contingent while other can be long-lasting in society; for their direction, as each stress vector pushes the territory in a certain direction of change.

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

Methodology

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

2.2.2 Socio-psychological component

Overall approach

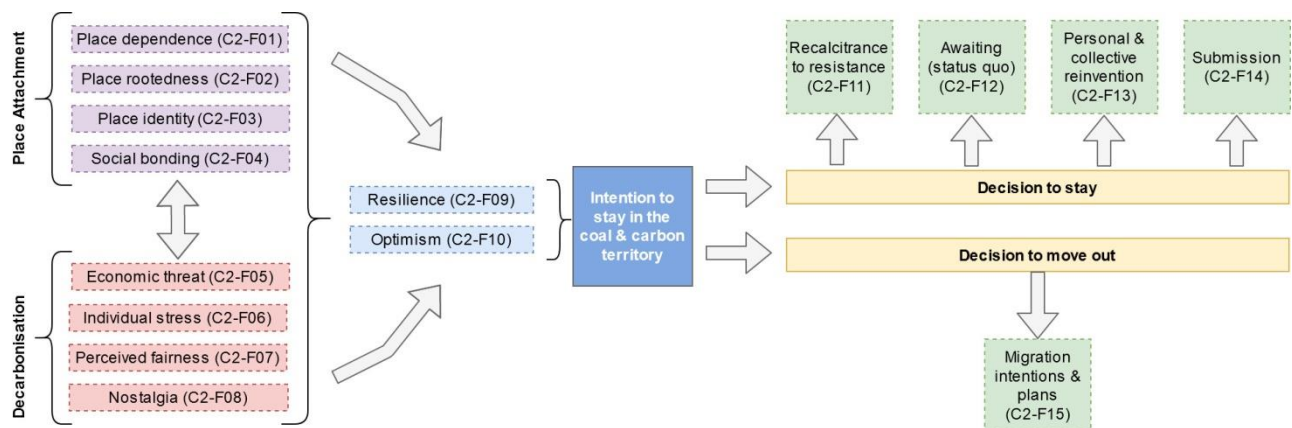
The socio-psychological component studies the socio-psychological impacts of the closure of coal mines and carbon intensive industrial units, i.e., the decarbonisation process, on the lives of individuals living in the CCT. The component moves under the assumption that the economic, social, and political uncertainties caused by the closure of mines and coal-based industrial units may 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 primary source of livelihood but also it may turn out in a dissatisfactory relationship with the territory. The component investigates how place attachment is threatened by stress, uncertainties, and deprivation induced by the decarbonisation process, and what are the main coping strategies adopted by the citizens living in the different coal and carbon territories.

Concepts

Place attachment. The concept of place attachment has been used by scholars to understand the bonds 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 for achieving a more comprehensive understanding of the response 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 coping 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 (EVLN theory). The theory affirms that when dissatisfaction is experienced in relation – in our case in territorial belonging - there are a few possible and interrelated coping strategies from the individuals.

The above-mentioned concepts have been organised in a single model composed of several factors, organised in different areas, marked with a different colour in Figure 3.

Figure 3: Overview of the factors in the socio-psychological model



Starting on the left, Place Attachment and Decarbonisation factors reflect how the two joint processes of deterritorialization and de-carbonisation are being perceived by the citizens inhabiting the CCT. On the opposite side of the picture, there are the outcomes, i.e., the dependent variables, that the model tries to explain. In the centre, resilience acts as a “moderator” as individuals with high resilience are more able to cope positively with decarbonisation-induced stress.

Methodology

The socio-psychological component was surveyed through a structured self-report online 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 are taken

from other studies, where different researchers have applied and tested them in different contexts. All the items have been assessed by the respondent using scales.

2.2.3 Socio-economic component

Domain of enquiry

The socio-economic component focuses on structural change in the economy, i.e., the reallocation of economic activity across different economic sectors (Herrendorf, et al., 2014) and regions. Structural change can lead to a change in a region's economic, financial, and demographic composition. The component is thus focused on a descriptive analysis of technological progress, demography, economic inequality, employment, and economic activity based on various data sources over the last three decades. The socio-economic component focuses on the Labour Market Area but also relies on the other units of analysis as a reference and as a comparison.

Concepts

In the socio-economic component, ten different factors are taken into consideration. All the factors are investigated mainly from a quantitative perspective. The clean energy transition leads to structural change, which impacts the demography (C4-F01). Further, it has direct implications for the depletion of coal reserves (C4-F02), the expansion of alternative energy sources (C4-F03), direct employment and production (C4-F04) in the coal industry and carbon intensive industry, indirect employment, and production (C4-F05) effects on other industries. Investments into the stock of capital (C4-F06) will respond to regional economic development. Further, the clean energy transition can change economic inequality (C4-F07), energy security (C4-F08), technological progress (C4-F09) and migration patterns (C4-F10).

Methodology

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

2.2.4. Socio-political component

Domain of enquiry

The component analyses the narrative battles for the interpretation of decarbonisation and energy transition in the Political Administrative Region of the case study. The component identifies which are the actors that are forming different “constituencies”: the constituency designing the transition, the constituency coping with the transition, or opposing the transition. Through analysing the narratives of such actors, the component investigates how the constituencies understand the benefits and losses from the decarbonisation process. Finally, the component shows the inclusion and exclusion dynamics resulting from technological change in the region.

Concepts

The socio-political component relies on the theory of *Technological Dramas* (Pfaffenberger, 1992). This approach understands technological shifts – such as decarbonisation – as technological

dramas, i.e., a narrative battle among different actors to determine the meaning and implications of the technology. A technological drama is a discourse of technological “statements” and “counterstatements”, in which there are three recognisable processes: i) technological regularisation; ii) technological adjustment; iii) technological reconstitution. The three processes can be described as follows:

- *technological regularisation*, a design constituency tries to impose change, i.e., to appropriate the technological process so that its features implicitly embody the political aim of altering power relations.
- *technological adjustment*, the impact constituency – the people who lose when a new technology is introduced or when a technological shift is ongoing – engage in strategies that try to compensate for the loss of social prestige or social power.
- *technological reconstitution*, the impact constituency tries to reverse the meaning of the technology imposed through regularisation. Differently from technological adjustment strategies, the strategies related to technological reconstitution attack the foundation of technical regularisation and activate a self-conscious “revolutionary” ideology aimed at producing a symbolic inversion and anti-signification of the technological regularisation process.

Methodology

The socio-political component was based on a semantic analysis of public statements and counterstatements of different social actors about the energy transition and coal phase-out. The analysis was carried out at the level of the PAR and was focused on statements and counterstatements of key regional stakeholders in the public debate.

2.2.5 Socio-ecological and technical components

Domain of enquiry

The socio-ecological component 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 how far a region is actually able to deviate from its current (carbon intensive) path 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 clean energy transition (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.

Concepts

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 multiform 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)².

Methodology

These components were assessed by way of mixed quantitative-qualitative interviews with various stakeholders engaged in the CET. The aim was to obtain and contrast differential stakeholder assessments of transformative capacities. A diverse set of stakeholders were interviewed, representing public, private, third 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 statements³. They were then asked to elaborate their answers in open follow-up questions, which were subsequently transcribed, coded and analysed.

2.2.6 Synopsis of the five components

The features of the conceptual side of the Multidimensional Analytic Framework are summarised in the synoptic table reported in Table 1.

² For full elaboration of transformative capacity and its components, please refer to Wolfram (2016, 2019) and Wolfram et al (2019).

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

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

Component	Research focus	Unit of analysis	Domain of enquiry	Unit of observation	Methodology
Socio-Cultural	Territorial change	Coal & Carbon territory	Stress strains in the territorial organisation	Strain Situations	Focus group mapping
Socio-Psychological	Territorial change	Coal & Carbon territory	Place attachment, Decarbonisation, Resilience and Coping	Citizens	Online Survey
Socio-Economic	Structural change	Labour-Market Area	Change in the socio-economic structure	The area as a whole	Quantitative data collection
Socio-Political	The clean energy transition	Political Administrative Region	Narrative battles to determine the meaning and “appropriation” of the energy transition	Statements & Counterstatements	Text research
Socio-Ecological & Technical	The clean-energy transition	Political Administrative Region	capacity available in the region to shape its decarbonisation pathway	Multilevel System interaction	Semi-structured interviews

2.2.7 Cross-cutting elements

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

Challenge: In the case study we focus on the challenges faced by the CCT, i.e., from the perspective of the CCT. A challenge can be defined as composed of two elements: (i) a current situation (as the territory makes sense of it); (ii) the specific desired outcome(s) of a process intended to change that existing situation. Please note that a challenge is a social construct as the sense 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 may vary a lot. In this respect, depending on the cases, the territorial challenge(s) may be rather vague or well structured (e.g., in the latter case also including indicators to assess the success in achieving the challenge).

Coping strategy. A coping strategy is defined here as the strategy adopted to cope successfully with a territorial challenge. For each challenge, there can 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.

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

2.3 Activities

2.3.1 Desk research

The case study started with a desk research activity. The desk research was aimed at (i) delineating the case study across its three units of analysis (CCT, PAR, LMA); (ii) collecting relevant dates and basic information on the region; (iii) collecting information needed for the implementation of the five components (including, inter alia, also a stakeholder analysis at the PAR level). The desk research

allowed analysing of a wide set of sources, including documents and reports, available data sets, previous research and studies, policy documents and others. The results of the desk research have been collected in the State-of-the-Art Report.

2.3.2 Focus groups (socio-cultural component)

Focus groups support qualitative measurement on research issues in which an inter-subjective agreement is needed, and for those issues, different types of actors need to triangulate. The analysis focused on the territorial stress induced by globalisation in the CCT. As “territorial stress” is not directly observable, following the socio-cultural component guidelines, the focus group aims at mapping the “strain situations” (i.e., conflicts, impasses, etc.) and related impacts in the CCT.

A focus group was conducted on the 22. April 2022 in Sola Strand Hotel. Four participants accepted the invitation, and of these, there were two female and two male participants. Three of the participants were from the municipality and one participant was a retired Oil and Gas Engineering Manager. The workshop was divided into several blocks, and each block was designated for Financescapes, Technoscapes, Mediascapes, Ethnoscapes, Ideoscapes, and Naturescapes. The participants were provided with information and given examples of each scape. The participants then discussed the topics. For the first two spaces (Finance- and Technoscapes) the participants spent approximately 90 minutes discussing, while for the rest of the scape approximately 45-60 minutes were used. The focus group was recorded on a pair of sound recording devices supplied by one of the lead researchers in accordance with the respondents’ expressed consent. The sound recordings were then shared with the remaining members of the research team to ensure a smooth process of analysis. Illustrative quotations are supplied where they are necessary to understand the context and relevance to the strain situation being described. In addition, notes were taken during the discussion by three separate researchers throughout the day. When the researchers were unclear as to what the respondents meant, e.g., which area they referred to, when a particular strain situation arose, or uncertainty about locations, researchers asked questions to clarify such statements. After analysing the recordings several strain situations were listed and name, type, area, factor(s), geo-location, and time were registered. Each strain situation was then described, a territorial interpretation was included, and the territorial stigma was discussed, as well.

2.3.3 Survey data collection process (socio-psychological component)

A questionnaire operationalising 17 socio-psychological constructs (e.g., place attachment subconstructs, resilience, perceived stress, resistance, support etc.) and sociodemographic with 90 items were developed by the ENTRANCES survey methodology group in spring 2021. Most of these operationalising items and the corresponding latent constructs are taken from other studies, where different researchers have applied and tested them in different contexts. InFact AS, which was contracted for conducting the survey, carried out data collection using the questionnaire in October 2021.

The survey questionnaire was translated from English into Norwegian by the InFact AS. Whenever a questionnaire item referred to geographical location, Stavanger/Sandnes was used. The term Stavanger/Sandnes was also used as a reference category for people when they needed to answer questions related to their link with the territory. Otherwise, the questionnaire items remained the same.

The respondents were recruited via two channels: from the Syno AS panel (an existing online panel), and pre-recruitment via a population-representative telephone survey. The reason was that the entire

sample taken from the Syno panel was not sufficient for such a limited area as Stavanger and Sandnes.

The InFact AS, therefore, conducted a pre-recruitment, i.e., an automatic telephone survey, among all adult residents in Stavanger and Sandnes and asked if they would participate in the online survey. Those who said yes were asked to provide a telephone number. These telephone numbers were then handed over to the Syno AS, which subsequently sent out an SMS asking for an email address to which a link to the survey would be sent. The Syno AS merged thereafter its panel sample in the Stavanger and Sandnes area with the sample obtained through the above process and conducted the survey.

In the Stavanger/Sandnes case, InFact AS called blindly on extracts from public telephone directories. It used its data collection system that deletes all telephone numbers before a data file could be retrieved from the system. The Syno AS used SMS and its online survey application for the survey data collection.

During the recruitment of respondents and under/after the data collection process, both national and EU data protection regulations were strictly followed. To ensure the privacy of the study participants, the telephone numbers file, which was used in pre-recruitment, was deleted from the InFact AS computer systems right after it was handed over to the Syno AS. With such pre-recruitment via a telephone survey, there were no identifiable data points between the numbers collected and the respondent in the telephone survey.

To avoid a direct link between a telephone number and a response to the survey, the URL to the survey was sent via email, which was obtained by SMS, by the Syno AS. The responses collected through the Syno AS survey platform were then anonymised before they were sent to the InFact AS. There were no personally identifiable data points in the data file. It was thus not possible to connect individual answers to individuals. The InFact AS then aggregated and systematized the data file and sent it to the ENTRANCES NTNU team.

Neither InFact AS nor NTNU thus possesses any data sets that affect GDPR. The Syno AS, which is Europe's largest panel operator for web-based measurements, is highly affected by the GDPR and complies with all regulations.

The InFact AS delivered an anonymised dataset in SPSS format (i.e., .sav file) to the ENTRANCES NTNU team. The dataset contains 483 cases. The NTNU team has legal ownership of the data. The data was checked and controlled for quality, and preliminary data cleaning/analysis was carried out by the NTNU team.

The main challenge in carrying out the survey was related to the recruitment process. Due to an insufficient panel for a limited area such as Stavanger and Sandnes, a pre-recruitment via an automatic telephone interview had to be conducted. This led to further complications in the recruitment process and issues regarding both national and EU regulations on personal data protection. Another challenge was to identify and reach respondents who have direct and indirect connections to the carbon industries (e.g., oil and gas industry, related services sector).

2.3.4 Socio-economic data (socio-economic component)

Socio-economic data has been collected from national sources, in particular the national statistical office (i.e., Statistics Norway), but also firm-level data. Furthermore, Eurostat data has been used to provide an overview of the region's economic, financial, and demographic composition based on a descriptive analysis. Sector-specific and region-specific peculiarities were located and processed. The data will be used further for the comparative analysis and the macroeconomic modelling and simulation in WP5.

2.3.5 Text analysis (socio-political component)

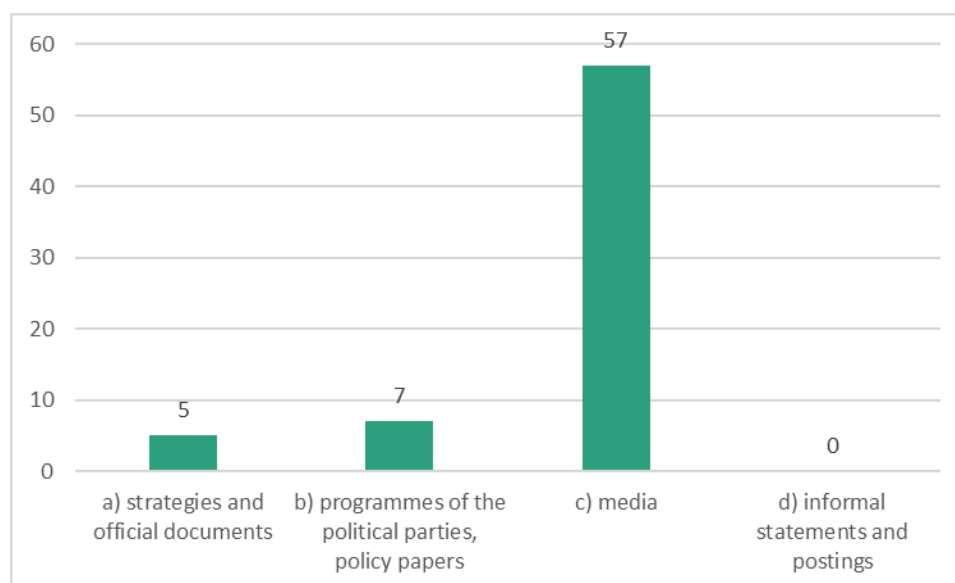
Several **sources for the text analysis** have been investigated, covering the **period** from the unit of analysis for the text research method is the Political Administrative Region (PAR) in this case the Stavanger area with its surrounding municipalities of Sandnes, Sola and Randaberg. This is the heart of the Norwegian oil and gas industry, and over 45.000 employees live and conduct their work here. Stakeholders relate to the broader territorial frame the Coal and Carbon Territory (CCT).

The unit of analysis for the text research method is the Political Administrative Region (PAR) in this case the Stavanger area with its surrounding municipalities of Sandnes, Sola and Randaberg. This is the heart of the Norwegian oil and gas industry, and over 45.000 employees live and conduct their work here. Stakeholders relate to the broader territorial frame the Coal and Carbon Territory (CCT). The text collection was conducted in August and September 2021, and the collected text documents were analysed based on ENTRANCES Socio-political coding grid between December 2021 and early February 2022 by the NTNU research team. Data interpretation and reporting were conducted by the end of February 2022.

The text collection was conducted in August and September 2021. Both local newspapers (i.e., Stavanger Aftenblad, Dagsavisen – Roagalandsavis) and national press/media (e.g., Aftenposten, VG, E24, TV2 Nyheter, NRK Nyheter) were scanned for articles, which are relevant for energy transition issues in the region. A general term, i.e., nature and environment (i.e., in Norwegian: natur og miljø), and specific terms such as oil/gas (i.e., in Norwegian: olje og gass), energy supply (i.e., in Norwegian: energiforsyning), greenhouse gas emissions (i.e., in Norwegian: klimagassutslipp), energy transition (i.e., in Norwegian: energiomstilling), green shift (i.e., in Norwegian: det grønne skiftet), green transition (i.e., in Norwegian: grønn omstilling), and sustainable development (i.e., in Norwegian: bærekraftig utvikling) were used to identify the press articles published between 1 January 2017 to 10 September 2021. In total, 57 documents (i.e., 21 articles from Dagsavisen – Roagalandsavis, 25 articles from Stavanger Aftenblad, 6 articles from NRK Nyheter, 2 articles from E24, 1 article from Aftenposten, 1 article from VG, 1 article from TV2 Nyheter) from the Norwegian press were identified. In addition, the most recent energy and environment plans of the local municipalities, Rogaland County, and the central government (i.e., 8 documents) were also included in the text collection.

The collected text documents were analysed using NVivo version 1.5.1. ENTRANCES Socio-political coding grid was used under the text analysis. The coding of the text documents was carried out between December 2021 and early February 2022 by the NTNU research team. Figure 4 shows the different types of sources for the text analysis and the number of articles for each class.

Figure 4 – Types of sources for text analysis



Note: The number of articles used to analyse local discourse, narratives and field of power is shown for each source type.

Source: own representation.

The sources can be described as follows:

Strategies and official documents

Programmes of the political parties, policy papers and statements of interest organisations, NGOs, and Trade Unions

The media

Informal statements and postings

Social Media

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

Mixed quantitative-qualitative interviews with various stakeholders engaged in the CET have been conducted. The aim was to obtain and contrast differential stakeholder assessments of transformative capacities. In total, 5 stakeholders were interviewed, representing public, private, trade unions, higher education, science, non-governmental organisations, research institutions and civil society actors. Respondents were asked to assess statements corresponding to each measure of transformative capacity.

These components were assessed by way of mixed quantitative-qualitative interviews with various stakeholders engaged in the CET. The aim was to obtain and contrast differential stakeholder assessments of transformative capacities.

The tools utilized in the interview sessions consisted of relevant recording and transcription software (Microsoft Teams), as well as a copy of the interview guide provided by the ENTRANCES project managers. To ensure that the data collection would go smoothly, and to prevent any issues or misunderstandings related to language barriers, one of the lead researchers provided a translated version of the interview guide and shared it with the rest of the team for use.

In total 5 stakeholders were interviewed, representing civil society, trade unions, scientific and research, social and/or technical in relation to the transition, and higher education. 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.² The questionnaire consisted of 18 questions where participants were asked to respond on a 5-point Likert scale where 1 represented disagree/ and 5 represented strongly agree/, and an option for “don’t know” was included in each question. For each question, there was a follow-up question where participants were asked to elaborate if they had anything to add.

All of the interviews were conducted online in May of 2022 and using case-relevant online software with recording and transcription opportunities (Microsoft Teams.) One participant filled out the questionnaire personally as no time could be spared to conduct the interview online. One respondent, representing an NGO, was not able to meet for an interview but gave additional information via e-mail to one of the lead researchers. The other interviews were automatically stored as video- and audio files. Some secondary data, such as newspaper and journal articles as well as scientific and technical business reports, were utilized as supplementary material where necessary.

The interview data were stored on password-protected PCs owned by the lead researchers. The respondents were anonymized in accordance with Norwegian regulations for the ethical treatment of social sciences research data, and any personal identification data was removed.

2.3.7 Data reporting, interpretation and the case study report

The broad set of research activities carried out for the development of the case study implied an extensive data processing and reporting activity. For each of the above-mentioned components, a short report describing the data collection procedure as well as a dataset was produced. This will allow making the data collected available to the public in the future in accordance with the FAIR principles. All the data collected have been interpreted by the case study team with two complementary approaches: through a component-focused interpretation in the light of a holistic understanding of the case. The results of such an interpretation are reported in the next chapter of the case study reports.

CHAPTER 3

ANALYSIS OF THE COAL AND CARBON TERRITORY

3 Analysis of the Coal and Carbon Territory

3.1 Overview of the coal and carbon territory

3.1.1 Historical Development

The following is a brief historical overview of the regional development of the oil and gas industry. The overview is adapted from the Stavanger Sociocultural Component Report of the ENTRANCES project, as well as a historical timeline of oil and gas from the Norwegian Petroleum Museum.

Post-war period (1945-1953): The pre-oil ages. This period in Stavanger saw an economy revolving around herring fishing, but also the growing canning industry as exemplified by the fact that around 65% of all regional industrial workplaces would eventually be connected to canning.

First oil searches – first discovery (1958-1969): Despite some negativity and pessimism from NGU (The Geological Survey of Norway), which stated that the chances of finding resources such as oil or coal off the coast of Norway were extremely low, the Ekofisk field is eventually discovered – thus kickstarting the golden age of oil in Norway. Many farmers, fishers and municipality workers started working in the oil industry because the sector paid very well and new jobs in the sector were close to where they lived. For example, previous fishers who had experience with captaining large vessels started their new role as captains of ships delivering supply the newly built oil rigs in the North Sea. There was also an influx of work force, even without formal education related to the oil industry, from all over Norway moving to the CCT due to the better employment conditions.

Going commercial (1970s – 1980s): In the 1970s, Phillips Petroleum notes that the Ekofisk field was to be developed, and a national oil policy is introduced alongside Statoil and the Norwegian Petroleum Directorate. Stavanger is also firmly established as the “oil capital”, or “Oljehovedstaden”, under the slogan “Stavanger er stedet” (Stavanger’s the spot). The industry is faced with helicopter accidents, fires, blowouts and wrecking as well as oil and shipping crises. The first concrete project is also arranged for the Norwegian continental shelf – which had taken two years to build at Jättåvågen in Stavanger. There are also gas pipes established between Norway and the UK. Although the oil and gas industry has taken over the leading position in the region, fish farming has been another important industry due to the long coastline in the Stavanger region.

Carbon taxation, merging of companies, a success story and new Statoil (1990s - 2000s): In August of 1991, a significant error occurs in the Sleipner A platform as its concrete gravity base structure breaks off and plummets into the Gands Fjord of Stavanger. Higher production of offshore oil and gas and therefore also carbon emissions led to the introduction of a carbon tax in 1991 to persuade oil companies to reduce gas flaring on platforms and install more efficient gas turbines for offshore power generation. In the late 90s, a crisis occurred in the oil market, prompting an extensive merging and acquisitions process to cope with low oil prices. Oil companies would become fewer and larger, starting with BP and Amoco, and ending with Conoco and Phillips.

New discovery and difficult times (2010 - 2020): In 2010, another giant oil field is located, and given the name Johan Sverdrup after the father of the Norwegian parliamentary. This is also the first Norwegian field with only Scandinavian licensees – from Norway (Statoil, Det Norske oljeselskap, Petoro), Sweden (Lundin Norway), and Denmark (Maersk Oil). Four years later, in 2014, a crisis

occurred once again in the industry, forcing companies to sell off expensive projects and significantly downsize their workforce. These turbulent times would then go on to become a symbol of the fluctuating hills and valleys of the oil market.

Pandemic and intensification of the green shift (2020 onwards): The beginning of 2020 saw the introduction of the COVID-19 pandemic, a highly contagious and deadly disease which would very rapidly spread across borders. The virus caused immense damage to the world economy, and the full extent of its influence is yet to be determined as the pandemic is still ongoing in 2022. Simultaneously, there is also an increasing emphasis on the green shift and decarbonization, which has made headway since the Brundtland commission presented its cornerstone 1987 report on sustainable development. This has also forced some changes in the oil and gas industry in recent years, with oil companies changing their branding and the Stavanger CCT slowly steering their moniker “Oljehovedstaden” (EN: The oil capital) over to “Energihovedstaden” (The energy capital). Moreover, the Stavanger region is striving to stand on more legs in the future than just the oil and gas centred industry sector.

3.1.2 Ecological and environmental situation

The region has been described as struggling with several prominent and critical ecological and environmental issues, such as 1) fish farming emissions, 2) issues pertaining to the construction of wind farms, 3) a lack of funding for environmental protection, 4) widespread influx of invasive species such as *didymium vexillum*, 5) environmental challenges from oil production, and 6) widespread pollution of the seabed and marine sediments, primarily in the harbour area due to cruise traffic and boating. The factors in this section are sourced and adapted from the SETS and Sociocultural Components Reports of the Stavanger ENTRANCES case.

Fish farming emissions: The Stavanger CCT, being a coastal region, is experiencing growing aquaculture with fish farming (NO: fiskeoppdrett) being one of the primary drivers. Fish farming, however, often results in a flourishing of the salmon louse (*Lepeophtheirus salmonis*), which is known to increase sickness and mortality in fish. Negative trends within regional fish farming include 1) a high mortality rate among migrating post-smolt salmon, 2) a high degree of salmon louse (*Lepeophtheirus salmonis*) infestations among wild salmon from migrated fish farming salmon, and 3) a high degree of salmon louse emissions from fish farming stations. Additionally, the oceanic temperature is suitable for salmon louse breeding, which makes for a compound issue. Additionally, the downfall of nutrient salts from fish sewage and pellets is shown to cause regional species extinctions – such as in the case of the Lyse Fjord and the Høgs Fjord, where the crab population is now gone.

Issues on the construction of wind farms: The Stavanger CCT suffers from occasional foreign interferences in wild nature, often as a direct consequence of the increased attention toward wind parks for producing electricity. This has led to the use of the term ‘green colonization’, referring to how Norwegian nature is demolished by international companies for profit. This has led to the formation of nationwide interest organizations such as La Naturen Leve (<https://lanaturenleve.no>) and locally focused Facebook groups, which are dedicated to combating the formation of wind power parks. Certain NGOs, such as Naturvernforbundet (EN: Friends of the Earth Norway), also oppose the formation of larger wind parks.

A lack of funding for environmental protection: The systems set in place for project management in the oil industry are financially focused and other aspects are forced into the background. The

reasons for these finance-oriented ideas may be various, but it seems that the difficulty of monetizing environmental costs is used as a justification or excuse. The financial costs of projects can be budgeted and are predictable, but the environmental costs are not. In addition, adding the financial costs of environmental concerns would increase costs and make certain projects unviable. No outside pressure from the government is exerted to hold the oil industry responsible for environmental damages. This could be a result of the financial interests that national and regional governments have, thus resulting in inaction from both sides. Furthermore, reasons such as foreign oil producers being more detrimental to the environment compared to Norwegian companies result in national producers being given a pass. Historically the financial models that have been used in the private sector have never reflected the abovementioned issues. There are limited financial resources in the private sector and if the long-term costs are included in a project, then it will not be considered financially viable, and the proposed project will not survive global competition. This is a common argument from the Norwegian oil industry: if Norway were to stop producing then other companies/countries with possibly, more lax regulations would produce the oil/gas that Norway would not.

The widespread influx of invasive species: As the oceans get warmer and shipping traffic increases, invasive species are occasionally carried from one region to another through e.g., ballast water. It is speculated that this might be one of the main causes behind the increasingly aggressive spread of a newly discovered species of colonial tunicate in the Stavanger region called sea vomit (NO: havnespy). It is a rapidly spreading marine organism that blankets the seabed and spreads via ship traffic and fishing equipment. It has received the highest risk classification for invasive species in Norway - svært høy (EN: very high), with a high potential for invasion and a high potential for ecological effects.

Environmental challenges from oil production: Being a CCT focused on oil and gas, the Stavanger region has a high degree of vulnerability to a variety of oil and gas-related accidents and disasters – such as oil spills and blowouts. As a large amount of the industry is located offshore, however, it is difficult to pinpoint to what extent an offshore oil disaster impacts the CCT specifically, or the natural areas associated with the CCT. One such example is the 1977 Ekofisk oil field blowout, where approx. 13.000 tons of oil were spilt into the North Sea and eventually reached land. As a likely result of this, certain numbers related to the oil and gas industry emissions remain comparatively low when seen in relation to other sources of emission, such as traffic and transportation on land and at sea. Since 2015, however, oil spills from ship traffic have been relatively low – a possible result of efforts made by the Norwegian Coastal Administration (Kystverket) to avoid larger incidents that could lead to spills.

A lack of regulation has resulted in a more effective system of development in the oil and gas industry. The duration from early phases of the discovery of oil to the extraction took about 18 months in 1970. Today this same process is expected to take 15 years, due to bureaucracy and an abundance of regulations. These regulations were easy to circumvent, however, and environmental protection regulations were just as easily ignored. This has now changed, and current regulations set in place to protect the environment are worded to make it significantly more difficult to ignore or bypass. New regulations were set in place due to the increased knowledge that legislators got over time. The environmental consequences of ignoring or bypassing regulations were seen, and this led to improved regulations to protect the environment. It can be argued that the knowledge of the negative effects that the oil industry has on the environment is still lacking, however, and that we still need to know the effects the oil industry has on the environment.

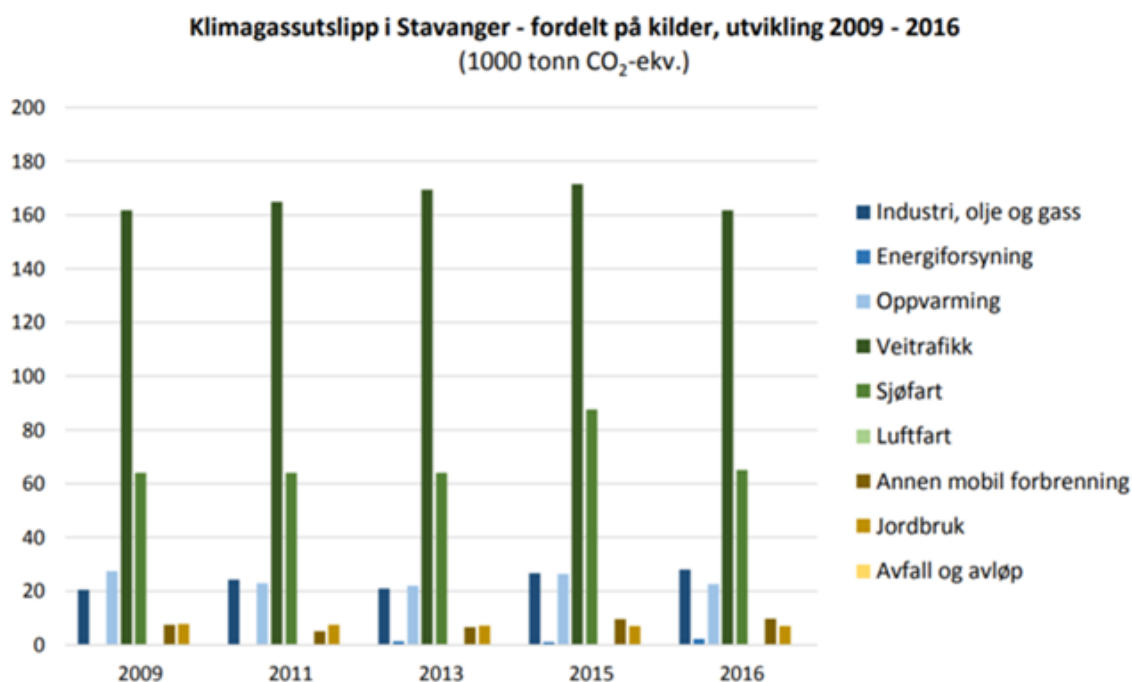


Figure 5: Overview of emission sources in Stavanger – divided by source, development through 2009 – 2016. Road traffic and seafaring are the highest emissions sources but can be argued as being closely connected to industry, oil and gas – which are listed as separate categories in Norwegian statistics.

Widespread pollution of the seabed and marine sediments: The harbour area of Stavanger is known to suffer from localized pollutants, such as polychlorinated biphenyls (PCB), polycyclic aromatic hydrocarbons (PAH) and tributyltin (TBT). It is generally accepted that there are multiple sources of this pollution, such as old or defunct industry and shipbuilding, old waste management plants, and runoff from the city itself. The environmental toxins noted above carry DNA-altering and carcinogenic properties. Additional sources of harbour-based pollution can be attributed to the region's cruise tourism industry, which is among the country's biggest emitters of sulphur and nitrogen oxide (NO_x).

3.2 Socio-cultural component

3.2.1 Summary of results

List of the strain situations mapped

Table 2 represents a complete overview of the strain situations identified in the focus group for the Stavanger CCT, with appropriate geographical locations and timeframes. Most of the strain situations are ongoing, with some of them stretching back to the beginning of the golden age of oil (NO: Det norske oljeeventyret). Some are regional (e.g., 04), whereas others are offshore (e.g., 12) or even nationwide (e.g., 11). It is generally accepted among the respondents of the focus group that all the listed strain situations appear to be relevant to the case of the Stavanger CCT.

Table 2 – List of the strain situations mapped

❧	Name	Type	Area	Factors		Geo	Time
				1st	2 nd		
1	A lack of funding for environmental protection	Exogenous	Finance-	F11	-	Stavanger	Ongoing
2	Top-down pressure from large actors	Endogenous	Finance-	F09	-	Stavanger	Ongoing
3	Challenges with globalisation	Exogenous	Finance-	F11	-	Stavanger	Ongoing
4	Conflicts around construction projects	Endogenous	Finance-	F09	-	Sunde	2021 - Ongoing
5	Bridge and tunnel projects	Endogenous	Finance-	F09	-	Langøy, Vassøy, Hellesøy	2021 - Ongoing
6	Forced media exclusion of the elderly in transportation practices	Endogenous / Dependence	Techno-	F16	F08 ; F19	Stavanger	Likely 2010s - Ongoing
7	Perceived media-based spread of misinformation	Exogenous / Dependence	Techno-	F16	-	Stavanger	Ongoing
8	Technological solutions – at any cost?	Endogenous / Dependence	Techno-	F17	-	Stavanger	Ongoing
9	Replacement of the culture of old with a new wasteful one	Endogenous	Ethno-	F08	-	Stavanger	1969 - Ongoing
10	Foreigners living in separated communities	Endogenous / Exogenous	Ethno-	F03	-	Stavanger	1969 - Ongoing
11	Preventing youth/competence outmigration	Endogenous / Dependence	Ethno-	F01	F06	Nationwide	Pre-1969 - Ongoing
12	Wage differences created animosity	Endogenous	Ethno-	-	-	Offshore	1960s - Ongoing
13	Who makes the decisions? Who pulls the trigger? Responsibility and inaction	Impasse	Ideo-	F14	-	Nationwide and regional	Ongoing
14	A shift in tone - the pride of the "siddis" to "oil shame"	Endogenous	Ideo-	F15	-	Stavanger	Ongoing
15	Increased fish farming's negative environmental impact	Endogenous / Dependence	Nature-	F18	-	Offshore	Ongoing
16	Possible problems related to 2030 climate goal	Endogenous	Nature-	F15	-	Stavanger	2018 - Ongoing
17	Environmental challenges from oil production	Endogenous	Nature-	F15	F18	Offshore	1970 - Ongoing
18	The sinking of the Sleipner A concrete foundation	Endogenous	Other / Multiple	Possibly F09	-	Gands Fjord	1991 (over)

Sources: ENTRANCES Focus Group Discussion.

Note: The factors refer to the socio-cultural factors, dynamics and patterns identified by the ENTRANCES project in Deliverable 1.2. The symbol ❧ stands for strain situations.

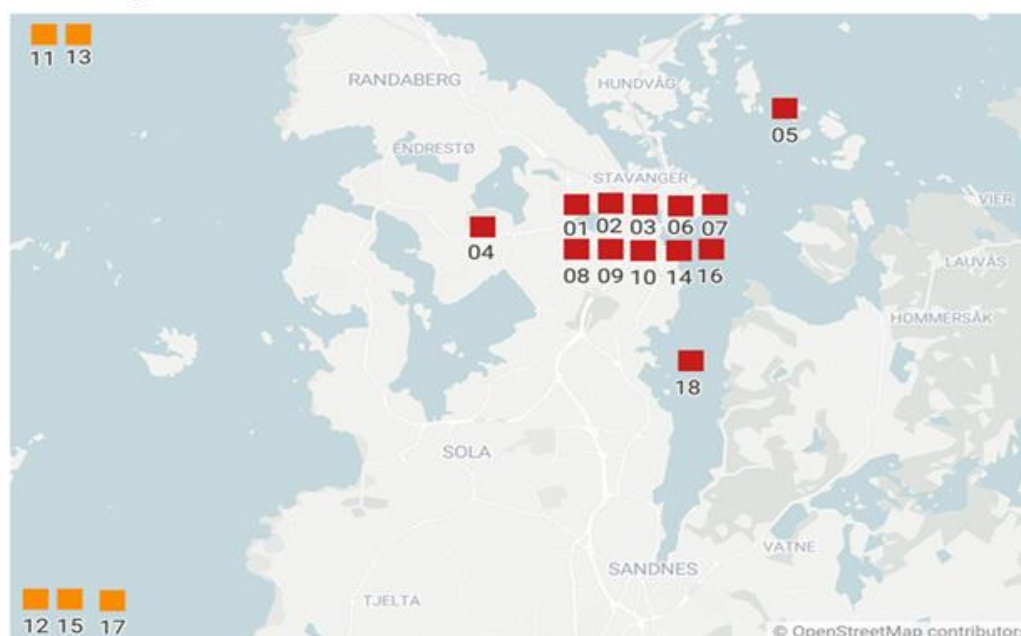
A total of 18 strain situations were mapped in the focus group. A list of the strain situations and related features is provided in the table below. Table 2 provides an overview of the strain situation mapped, classifying each strain situation in relation to (a) type of the strain situation; (b) areas of change and related stress factors; (c) position in space; (d) position in time.

Distribution of the strain situation in the geographical map

The following is a map of the identified strain situations in the Stavanger CCT (Figure 6). Red squares signal specific situations that are attributable to a specific geographical location within the region. The orange squares in the top left of the map represent strain situations that represent nationwide rather than regional issues but are affecting the region, nonetheless. The orange squares in the bottom left of the map represent offshore issues – that is, strain situations that primarily affect the industry that is located outside of the Stavanger CCT region's onshore installations.

Figure 65 – Distribution of the strain situations in the geographical map

Distribution of the strain situations in the Stavanger/Sandnes area



Created with Datawrapper

Sources: ENTRANCES Focus Group Discussion.

Distribution of the strain situations in the time map

Table 3 shows the starting year of the strain situations mapped, and the duration of the strain situation. It is a general historical overview of the strain situations identified during the focus group interview. However, it is worth mentioning that the vast majority of strain situations mentioned by the participants did not have appropriate time tags, and were generally considered to be relatively recent, ongoing situations. As such, they will not be listed in this table specifically, but rather discussed in-depth in the following sections of the report. Additionally, as the oil and gas industry in the Stavanger

CCT is an industry with a rich history of previously identified strain situations, these will be listed to offer a historical perspective on some of the major incidents and disasters that have occurred in the industry since the dawn of the golden age of oil in 1969.

Table 3 – List of strain situation

Years	Phase	Timeline / Strain Situation
1945-1953	1. Post-war period	No strain situation mapped started in this period
1958-1969	2. First oil searches – first oil discovery	<p>The 1950s: The Geological Survey of Norway (NGU) concluded that there was little chance of discovering oil, coal or sulphur off the Norwegian coast. Soon after, a massive gas field is discovered near Groningen in the Netherlands, increasing the interest in the North Sea area. No strain situation was mapped in this period.</p> <p>The 1960s: Small wells are drilled in the Svalbard region, but no oil quantities of note are made until the late 1960s, upon the discovery of the Ekofisk field.</p> <p>Pre-1969: ⚡11: Preventing youth/competence outmigration ⚡12: Wage differences created animosity</p> <p>1969: ⚡09: Replacement of the culture of old with a new wasteful one ⚡10: Foreigners living in separated communities</p>
1970s - 1980s	3. Going commercial	<p>In the 1970s: Phillips Petroleum notes that the Ekofisk field was to be developed, and a national oil policy is introduced alongside Statoil and the Norwegian Petroleum Directorate. Stavanger is also firmly established as the “oil capital”, or “Oljehovedstaden”, under the slogan “Stavanger er stedet” (Stavanger’s the spot). The industry is faced with helicopter accidents, fires, blowouts and wrecking as well as oil and shipping crises. The first concrete project is also arranged for the Norwegian continental shelf – which had taken two years to build at Jättåvågen in Stavanger. There are also gas pipes established between Norway and the UK.</p> <p>1970: ⚡17: Environmental challenges from oil production</p> <p>In the 1980s: 123 individuals are killed in the Alexander Kielland oil platform accident. Fears also exist that Statoil is growing too quickly, and the state, therefore, redirects the financial flow from Statoil’s holdings to “the state’s direct financial interest” in petroleum operations. Another oil crisis hits, and the price of oil drops. There is considerable political pressure exerted by US President Ronald Reagan on developing the huge gas reserves in Troll, due to concerns that Europe would become dependent on gas supplies from the Soviet Union. The world’s biggest energy contract is signed at a value of 800 billion NOK, and the Brundtland commission introduces the term “sustainable development” in their cornerstone report “Our Common Future” (NO: Vår Felles Fremtid). No strain situation is mentioned in this period.</p>
1990s - 2000s	4. Carbon taxation, merging of companies, a	1991: The concrete undercarriage of the Sleipner A platform breaks off and sinks in the Gands Fjord off of Stavanger (⚡18)

success story and new Statoil		
2010 - 2020	5. New discoveries and difficult times	The 2010s: Forced media exclusion of the elderly in transportation practices (≈06)
		2018: Possible problems related to 2030 climate goal (≈16)
2020 onwards	6. Pandemic and intensification of the green shift	2021: Conflicts around construction projects (≈04)
		2021: Bridge and tunnel projects (≈05)

3.2.2 Interpretation

This paragraph is dedicated to interpreting what the strain situations mapped tell us about our unit of analysis, i.e., the CCT. The interpretation is divided into three subparagraphs: (i) stress vectors, (ii) stress-strains, (iii) change, resistance to change and ambivalence. The three paragraphs describe all the key aspects considered in the socio-cultural component. Paragraph (i) deals with the vectors of change that are exercising pressure on the territorial organisation thus producing stress. Paragraph (ii) deals with the stress-strains itself, and it describes what the stress is and how it manifests itself (stress-strain). Finally, paragraph (iii) illustrates how under the pressure of the vectors, and in a context of stress-strain, the territorial organisation itself is changing, is resisting change and/or is in an ambivalent position between these two poles. While paragraphs (i) and (ii) consist of a descriptive interpretation, based on a list of stress vectors and stress-strains, paragraph (iii) uses all the data collected and elaborated for providing a synthetic interpretation of the position of the CCT concerning change/resistance and ambivalence.

Stress-strain

Conflict and disputes: The analysis of the strain situations allows us to single out two primary ongoing stressors within the Coal and Carbon Territory. The analysis of the strain situations allows us to single out a set of recurring conflicts within the Coal and Carbon Territory. To supply the growing needs of an increasing population and increased industry, power cables and large masts have been a point of contention among the population that lives in regions where cables and masts are planned. These masts are often called monster masts (NO: monsternaster) to denote their intrusion into Norwegian nature due to their size. Power cables can be built underground, but this is not financially viable according to social economists. This results in strain situations between the government and politicians, and the local populations residing in areas with planned masts and power cables. The national government makes financial decisions while simultaneously ignoring the local population and the environment. The construction of such masts requires deforestation, and as the local population realises this they might protest. This issue with power masts has been brought up in the media several times, and large groups have gathered to protest these masts. A power station is proposed to be situated in and around Sunde and Tingbø forest is at risk and will be cut down if the project is to be completed. Farmland around the Revheim area is also at risk as a population centre which is supposed to house approximately 40000 residents (in 4000-8000 housing units) is planned, called Madla-Revheim. This project has not been finalised, but the proposition will generate debate and will most likely result in a serious strain situation. This is also relevant to environmentally friendly windmills, but nobody wants to live near them.

There was also an ongoing discussion regarding the construction of tunnels, where only a limited amount of people benefits from very expensive projects. The dangers that possible earthquakes pose to underwater tunnels must also be considered. In Stavanger, there is an ongoing discussion about whether to allow funding for a road construction project that will properly link outer parts of the Stavanger municipality (Langøy, Vassøy, and Hellesøy) to Stavanger. The (expensive) needs of the smaller communities are weighed against the cost the population would have to pay. Not only are there financial worries regarding the construction of a coastal highway, but also environmental, as the bridges that must be built require intrusion into nature. The project was started before the problem with earthquakes was investigated, leading to a top-down decision-making process from the national government over the local municipality. Promises were made to initiate this project, but there are worries about the necessity of this project vis-à-vis the financial and environmental costs. People have invested in properties in the area that was supposed to be connected to the mainland, so people will be unhappy if this project is cancelled.

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*. During the focus group, a trio of influential decision-makers from Stavanger's past were mentioned, and how comparatively easy it was at the time to "get things done" back in the days when regulations were less strict and "over-governed" as they likely have grown to become. A core question arose in the debate around this time - who is supposed to make the decisions? Possibly unpopular decisions? It was furthermore mentioned that a general feeling of lack of support for such potential decisionmakers was at the forefront of the resulting inactivity. It would eventually boil down to a general feeling among these decisionmakers that "something has to happen - the emissions need to go down, but nobody knows how". It would furthermore appear that the region is missing good arenas where interactions between various stakeholders can meet and discuss topics of regional importance without some form of prejudice. There is also considerable confusion as to who is supposed to be the instigator of change – be it social, political, financial, or otherwise.

Dependence and uncertainties. Through the analysis of the strain situations, we have identified different forms of stress by dependence and uncertainty. Through the analysis of the strain situations, we have identified different forms of stress by dependence and uncertainty. First and foremost, the region relies very heavily on fish farming as a significant source of financial income, being a coastal region. Although this is highly lucrative for some actors, it is also an industry that is known to pollute and utilize an overabundance of substances such as delousing antibiotics that leak into the water and sink to the seabed where it does not belong. Secondly, the region – as with any city or region that has an industrial component to it – requires manpower and employment opportunities. As the dependence on oil and gas becomes more apparent to new workers, and the oil and gas industry experiences heavy fluctuations, the Stavanger region is experiencing an increase in people moving out of the city to seek employment and education elsewhere. Thirdly, as we are living in a heavily media-saturated society, there are many dependencies connected to the use of technology and apps that the local population does not necessarily desire. One example can be found in the public transport sector, where the COVID-19 pandemic caused a surge in contactless payment and ticket registration. Elderly inhabitants in the Stavanger region have noted that they struggle with the new system and that many of them do not have smartphones. As such, they felt like criminals when they got on the bus and were unable to pay for their tickets properly. Another concern about the overreliance on media was the large influx of misinformation and disinformation spread throughout social media apps that specifically target younger users, such as TikTok.

Members of the younger generations would use such social media apps for a variety of purposes but would also be subjected to content that would be considered harmful – ranging from dangerous trends such as the tide pod challenge to being subjected to extreme political views, dangerous conspiracy theories, or even snuff films.

Strategies for coping with territorial stress. Any existing initiatives in the region focusing on the reduction of regional stressors appear to be overshadowed by initiatives that are dedicated to maintaining the status quo - that is, the identified ongoing national identity crisis where Norway wishes to be both an oil nation as well as a primary innovator within pro-environmental practices simultaneously. Despite all the strain situations ongoing in the area, few, if any, initiatives and strategies have been found devoted to coping with the stress itself. The research has found the lack of appropriate participatory mechanisms devoted to defusing, reducing or solving conflicts; a lack of attempt 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 policymaking and by other actors. Furthermore, it was found that the region did not clearly benefit from arenas where such tensions and strain situations could be openly discussed and debated among local stakeholders. In fact, some of the primary arenas of discussion in the region primarily exist in the form of newspaper discussion boards, rather than physical arenas where local government can summon local stakeholders for discussions of matters of interest.

One local initiative to circumvent or counter the territorial stress and stigma came in the form of a changing moniker. While Stavanger has conventionally and traditionally been referred to as the “Oil Capital of Norway” (NO: *Oljehovedstaden*), there is now a traceable change in the narrative where the region itself tries to shed it in favour of the more general and all-encompassing “Energy Capital of Norway” (NO: *Energihovedstaden*).

Change, resistance to change, and ambivalence

The analysis of the strain situations and the complementary information collected about the Coal and Carbon Territory allowed us to describe some key dynamics of change, resistance to change and ambivalence in the territorial organisation of the CCT. Such dynamics are shortly described below.

a. Territorial Trajectory: between continuity and rupture

The first element concerns the ambivalence in the interpretation of territorial identity and visions of the territory in the future. It is clear that the city of Stavanger continues to have strong connections to the oil and gas industry, and that there is a certain degree of regional pride in being at the core of such an important industry for the nation. Despite this, some local initiatives focus more on green initiatives rather than oil and gas. The city historically benefits from a strong entrepreneurial spirit and has shown the ability to change itself in accordance with shifts in the times – such as how it went from primarily being a fishing city to becoming one of the most important industrial locations for pickling and canning in the past. Municipal initiatives such as the Triangulum project have also been established to steer Stavanger into the green shift, and previously oil-exclusive energy companies have changed their business profiles to match the changing times (the most famous example probably being the massive oil company Statoil, which rebranded into the energy company Equinor in 2018). The discrepancy between the amount of funding that is put into oil searching and production versus what is reserved for green energy development, however, remains very large – thus suggesting that the region is having significant difficulties with

transitioning from the historical golden age of oil into the green shift. While this is impacted significantly by the current military conflict between Russia and Ukraine, in the favour of Norwegian oil which is now considerably more costly than before the conflict started, it is unclear to what degree the territorial trajectory will be affected.

b. Territorial boundaries: between distinctiveness and alignment

A core element of the territorial trajectory concerns the ambivalence in the interpretation of territorial identity and visions of the territory in the future. Conventionally, the most visible sides of the territorial future envisioning are divided into two; pro-oil and anti-oil. Those who are pro-oil generally refer to how the region has historically benefitted from the oil and gas industry since the 1970s, how many everyday products are made using oil, how there are few – if any – good alternatives to oil in modern-day society, how certain types of renewable energy structures are destroying the environment through their demand for space, and how the activity and employment region depends on the upkeep of the oil and gas industry. Those who are anti-oil generally emphasize the negative effects of oil and gas on the environment, how renewable energy is making rapid developmental progress worldwide and that Norway is lagging on its renewable energy structures, how the oil and gas industry does not invest enough in renewable energy research, and which alternatives exist to oil and gas in the creation of everyday products. Overall, the region suffers from a sharp divide signified by little dialogue and large conflicts of interest in terms of how, where, when and why the region should develop.

The region does have a very strong identity connection with the oil and gas industry, however, which is emphasized strongly both by the size and scope of the Forus park (which houses over 45.000 employees from the industry and stretches across three municipalities) as well as the Norwegian Petroleum Museum, which details the entirety of the Norwegian oil history from the late 1950s until today. Despite this connection, there are symbolic actions taken to generate attempts at moving away from the understanding of Stavanger as the oil capital of Norway. The current mayor, for example, refuses to use the moniker *Oljehovedstaden* (EN: The Oil Capital) about the city of Stavanger, and the population has slowly begun to adopt the more all-encompassing nickname *Energihovedstaden* (EN: The Energy Capital) instead.

c. Territorial governance: between endogenous and exogenous

An important dynamic of territorial identity is related to the distribution of capacity to steer the territorial development by the key actors of the territory, as well as the relative lack of influence by stakeholders outside of typical governance-related positions and fields of expertise - i.e., civil society. An important dynamic of territorial identity is related to the decrease of the capacity to steer territorial development by the key actors of the territory. The Stavanger CCT technically sees governance from at least three governing factions; 1) local, 2) national, and 3) EU regulations. First and foremost, the municipalities themselves constitute the *local governance*. Municipalities elect a mayor (NO: ordfører) and their cabinets, and they are set to make decisions for their respective areas. Simultaneously, the local municipalities also need to adhere to *national* guidelines set by the central Norwegian government (NO: Stortinget), and – being part of Europe – a variety of *EU guidelines*. Depending on the situation in the CCT, there is a possibility that one form of governance can override another in terms of political decisions. This was seen especially well during the COVID-19 lockdowns where national guidelines were imparted, initially forcing people across the country to remain indoors and away from their workplaces – even in municipalities where no infections had demonstrably occurred. This would eventually give rise to the opportunity for local governments to establish their protocols for how local inhabitants should behave to cope with the COVID-19 situation. The oil is

also governed by different stakeholders. According to the Norwegian Petroleum Museum, from 1 January 1985, the State's participation in petroleum operations was reorganised. The State's participation was split in two, one linked to the company and the other becoming part of the State's Direct Financial Interest (SDFI) in petroleum operations. SDFI is an arrangement in which the State owns interests in several oil and gas fields, pipelines and onshore facilities. Each government take is decided when production licences are awarded, and the size varies from field to field. As one of several owners, the State pays its share of investments and costs and receives a corresponding share of the income from the production licence. The Storting resolved in the spring of 2001 that 21.5 per cent of the SDFI's assets could be sold. 15 per cent was sold to Statoil and 6.5 per cent was sold to other licensees.

d. Territorial Symbols: between myth and stigma

Throughout the work conducted in the Stavanger ENTRANCES case, a recurring narrative revolves around the “golden age” of oil. A “golden age” generally refers to a timeframe where a specific resource – in Stavanger’s case, oil – is seeing rapid and unprecedented growth in terms of its value and demand. Conventionally, the golden age of Norwegian oil began with the discovery of the Ekofisk field in 1969, but it is difficult to say when it ended, if at all. Regardless, the fluctuations in the Norwegian oil market are likely to contribute to a positive myth that the region of Stavanger will once again benefit from its close associations and ties with oil and gas, even when the region is faced with increasing difficulties keeping in line with the development of renewable energy structures that are occurring around the world. Currently, this myth is likely gaining traction because of the inflated gas prices that are happening due to the ongoing armed conflict between Russia and Ukraine, which has once again contributed to making Norwegian oil seem “green” and “ethical” by comparison to other sources of European energy – such as Russian gas.

Although the region benefits from a nostalgic relationship with the golden age of oil, there is also a dawning territorial stigma which was identified during the work on the Sociocultural Component Report of the Stavanger CCT. As a likely result of the green shift and the push towards renewable energy, the oil and gas industry is now commonly demonized and branded as “dirty” in the local media. What was once considered to be a profession that one could be proud of, has now become a profession that is associated with what Norwegians call “*oljeskam*” (EN: oil shame). Workers in the oil and gas industry have noted that they no longer feel as much pride and joy when going to work offshore, and the industry itself has become increasingly disinterested in providing media commentary on the situation due to what they perceive as skewed media reporting.

3.2.3 Gender Dimension

Although the questions asked during the focus group were general and open-ended, the respondents did not explicitly mention any gender-related issues that could be connected to the identified strain situations. Rather, it would appear that elderly individuals struggling with media applications and individuals with foreign backgrounds (primarily seasonal workers) that were not interested in integrating with the local population and culture were the main focal areas for the discussion. Despite this, it is known that the oil and gas industry – Stavanger's main industry – is largely male-dominated. In 2021, the oil and gas industry consisted of approx. 80% male workers – a number that grows to about 95% if one focuses only on the offshore part of the sector^[1]. By comparison, the total amount of women in the Norwegian oil and gas industry was approx. 10% in 2000^[2]. As such, any societal changes that would affect the offshore part of the oil and gas sector in any distinguishable way, would likely largely affect male members of Norwegian society (directly) unless otherwise specified.

In terms of onshore installations, where women make up approx. 45% of workers, the gender impact would likely be more even in the event of a sector-specific incident. The transformation of the energy system and the decarbonisation process are expected to have a noticeable impact on the socio-psychological wellbeing of the inhabitants of 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 the socio-psychological well-being of the people and the de/re-territorialisation of the affected regions. It can provide crucial support to policymakers and investors, helping them to 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 socio-psychological stress in the general population of the territories more directly challenged by the ongoing decarbonisation process, conventionally referred to in the project as the Coal and Carbon Territory (CCT). Through a quantitative survey, the project aims at creating new knowledge about the impact of 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

Sociodemographic characteristics of the respondents from the Stavanger case study survey are shown in Table 4. Among the total number of 483 respondents in the Stavanger case study survey, 54.87% were males and 45.13% were females, which are slightly different from the proportion of both genders in the total population of the region (i.e., 50.59% males and 49.41% females). Concerning the age distribution of the respondents, the majority came from the age group 45-64, meaning this particular group was sampled almost twice compared to the proportion of this age group in the total population of the region (i.e., 24.88%). It also seems the age group 65+ was also sampled almost twice as much compared to its actual size in the total population of the region (i.e., 14.23%).

People with higher education dominated the sample, i.e., 68.94% of the respondents indicated they have a university degree or higher. It is also clear that the overwhelming majority of the respondents (i.e., 83.85%) have been living in the Stavanger/Sandnes area for more than 20 years. 30.02% of the respondents were living with dependencies. The majority, i.e., 69.98%, however, indicated they had no dependencies or underaged minors that needed to be taken care of. Only 8.107% of the respondents were born abroad, indicating they moved to the area from outside Norway. The majority, i.e., 64.39%, were born in the area. Regarding occupation, i.e., professional profile, the largest chunk of the respondents was employed in the public sector (i.e., 22.57%), followed by the service sector (i.e., 18.22%) and industry sector (i.e., 15.11%). 24.22% of the respondents were retired, and 15.11% did not provide information about their occupations. Only 12.01% of the respondents were currently working in carbon industries, while 22.57% indicated they had previously been employed in carbon industries.

Table 4 – Respondent profile

506 Complete cases

Gender	Males (265, 54.87%)			Females (218, 45.13%)			
Age	18-29 (45, 9.32%)	30-44 (113, 23.4%)		45-64 (199, 41.2%)	65+ (126, 26.09%)		
Education	Primary (12, 2.48%)	Secondary (73, 15.11%)		University (333, 68.94%)	Professional (65, 13.46%)		
Occupation	Industry (73, 15.11%)	Agriculture (4, 0.83%)	Services (88, 18.22%)	Public Servants (109, 22.57%)	Unemployed (19, 3.93%)	Retired (117, 24.22%)	Inactive (73, 15.11%)
Work in Carbon Ind.	Yes (58, 12.01%)				No (425, 87.99%)		
Worked in Carbon Ind.	Yes (109, 22.57%)				No (374, 77.73%)		
Marital Status	Not Married (89, 18.43%)	With Partner (63, 13.04%)	Married (255, 52.8%)	Divorced/ Sep. (59, 12.22%)	Widowed (17, 3.52%)		
Living with dependents	Yes (145, 30.02%)				No (338, 69.98%)		
Nativity	Born in the Stavanger region (311, 64.39%)		Born in another region (133, 27.54%)		Born outside country (39, 8.07%)		
Duration of Stay	0-5 years (13, 2.69%)	6-10 years (16, 3.31%)		11-20 years (49, 10.14%)	20+ years (405, 83.85%)		

Sources: ENTRANCES survey data.

Note: Number and corresponding proportion are provided. Rounding ensures that the numbers per cent and up to 100% in each row.

3.3.2 Interpretation

Correlation among different factors related to the socio-psychological component

Figure below shows all the correlations between all sub-constructs. There was found a strong correlation between place attachment and place dependence (0.70), between, resilience and optimism (0.75), and between support and perceived fairness (0.77).

There was found a moderate correlation between place attachment and place rootedness (0.58), place rootedness and place dependence (0.54), nostalgia and perceived stress (0.44), life satisfaction and optimism (0.54), life satisfaction and economic hardship (0.47).

There was found a strong negative correlation between resistance and protest and perceived fairness and between resistance and protest and place dependence (-0.75). There was found a moderate negative correlation between perceived stress and optimism (-0.49), between economic

hardship and perceived stress (-0.50), between intention to relocate and place rootedness (-0.54), between life satisfaction and perceived stress (-0.56).

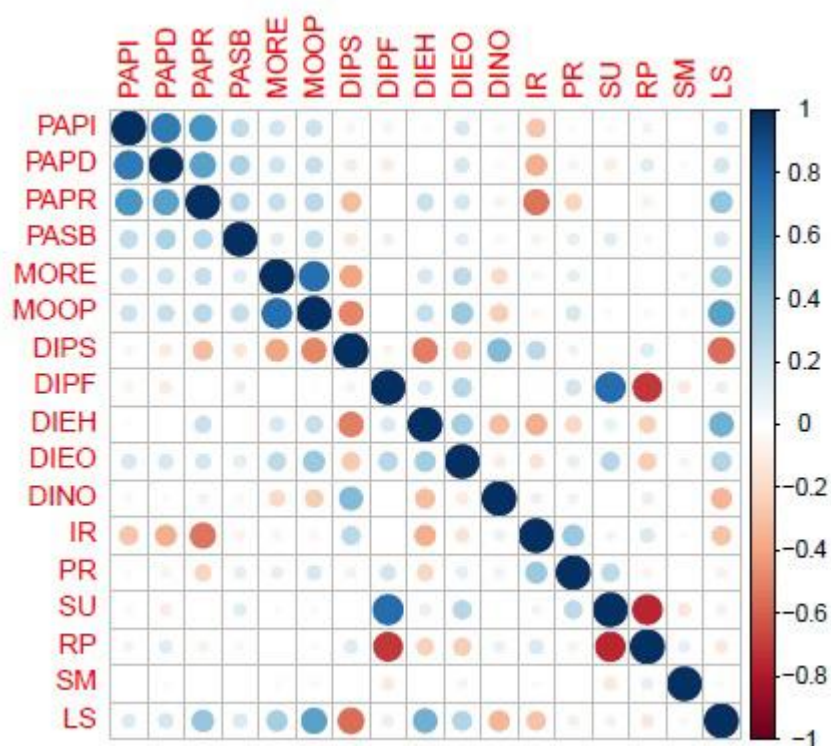


Figure 7 – Correlation among different factors related to the socio-psychological component

Sources: ENTRANCES survey data.

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.

Mean score with standard deviations for all constructs

According to the mean scores for the socio-psychological constructs shown in Table 5, the respondents of the ENTRANCES Stavanger case study survey had low intention to relocate (mean = 1.72) and scored

Table 5 – Mean score and standard deviations for all factors

Factors/ Latent constructs	Sub constructs	Mean score	Standard deviation	Cronbach's Alpha
Place Attachment	Place Identity	4.22	0.83	0.93
	Place Dependence	3.49	0.99	0.89
	Place Rootedness	3.97	0.61	0.68
	Social Bonding	3.15	1.11	0.87
Moderators	Resilience	4.06	0.58	0.82
	Optimism	3.95	0.64	0.88
Decarbonisation Impacts	Perceived Stress	2.32	0.59	0.83
	Perceived Fairness	2.94	0.96	0.80
	Economic Hardship	3.62	0.92	0.92
	Economic Optimism	3.33	0.75	0.83
	Nostalgia	2.60	0.76	0.85
Coping Strategies	Intention to relocate	1.72	0.89	0.87
	Personal reinvention	1.91	0.94	0.68
	Support	3.25	1.26	0.95
	Resistance and Protest	2.33	1.05	0.86
	Submission	3.39	0.81	0.34
Life Satisfaction		3.72	0.80	0.89

Sources: ENTRANCES survey data.

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. Cronbach's Alpha provides a measure of the internal consistency of a test or scale indicated (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.

low on personal reinvention (i.e., mean = 1.91). Meantime, they indicated a strong place identity (mean = 4.22), resilience (mean = 4.06), place rootedness (mean = 3.97) and optimism (mean = 3.95). They also seemed to be satisfied with their life (mean = 3.72) despite indicating some level of economic hardship challenging them (mean = 3.62).

Regional differences in mean scores for different factors

Table 6 displays Z-score and standard ten (STEN) for all 17 sub-constructs for the Stavanger region, and as can be seen there are some interesting findings where the participants in the Stavanger region scored higher compared to the other ENTRANCES case studies. Participants in the Stavanger regions scored higher on place identity (6.74) and place dependence (7.12), perceived

stress (6.26), economic hardship (6.06), and intention to relocate (6.28.) None of the sub-constructs show lower scores (under 4) compared to the other ENTRANCES case studies

Table 6 – Z score and STAN for all factors

Factors/Latent constructs	Sub constructs	Z-score	STEN
Place Attachment	Place Identity	-0.62	6.74
	Place Dependence	0.81	7.12
	Place Rootedness	-0.39	4.72
	Social Bonding	0.09	5.68
Moderators	Resilience	-0.53	4.44
	Optimism	-0.57	4.36
Decarbonisation Impacts	Perceived Stress	0.38	6.26
	Perceived Fairness	0.20	5.90
	Economic Hardship	0.28	6.06
	Economic Optimism	0.09	5.68
	Nostalgia	0.05	5.60
Coping Strategies	Intention to Relocate	0.39	6.28
	Personal Reinvention	-0.16	5.18
	Support	-0.43	4.64
	Resistance and Protest	-0.40	4.70
	Submission	0.05	5.60
Life Satisfaction		0.13	5.76

Sources: ENTRANCES survey data.

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

Gender Dimension

Gender is one of the important dimensions of our study. There were found five significant differences between men and women (Table 7). Women had significantly higher values in three sub-constructs within place attachment: place identity (men: 4.14, women: 4.32, $p < 0.01$), place dependence (men: 3.41, women: 3.59, $p < 0.05$), and place rootedness (men: 3.90, women: 4.04, $p < 0.01$). These results show that women have a stronger attachment to the Stavanger region compared to men. Women showed higher levels of support compared to men (men: 3.06, women: 3.49, $p < 0.001$) and men showed higher resistance and protest compared to women (men: 2.47, women: 3.32, $p < 0.01$).

Table 7 – Gender differences in mean score for all constructs

Factors/ constructs	Latent	Sub constructs	Mean score		T-test (df 504)	P- values
			Men	Women		
Place Attachment		Place Identity	4.14	4.32	-2.431	0.01
		Place Dependence	3.41	3.59	-1.925	0.05
		Place Rootedness	3.90	4.04	-2.540	0.01
		Social Bonding	3.07	3.26	-1.891	0.06
Moderators		Resilience	4.07	4.04	0.526	0.60
		Optimism	3.93	3.98	-0.959	0.34
Decarbonisation Impacts		Perceived Stress	3.7	3.65	1.001	0.32
		Perceived Fairness	3.24	2.85	4.538	7.19
		Economic Hardship	2.36	2.41	-0.598	0.55
		Economic Optimism	3.31	3.35	-0.546	0.23
		Nostalgia	3.44	3.36	1.208	0.17
Coping Strategies		Intention to Relocate	1.77	1.66	1.390	0.47
		Personal Reinvention	1.88	1.94	-0.799	0.43
		Support	3.06	3.49	-3.895	0.00
		Resistance and Protest	2.47	2.16	3.270	0.01
		Submission	3.45	3.32	1.794	0.07
Life Satisfaction		Life Satisfaction	3.68	3.77	-1.197	0.23

Sources: ENTRANCES survey data.

Note: Mean score indicates the mean score for all constructs for both sexes. 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. A p-value less than or equal to 0.05 is statistically significant.

3.4 Conclusion

In spring 2021, the ENTRANCES survey methodology group developed a questionnaire, which operationalised 17 constructs aimed to investigate socio-psychological consequences of the decarbonisation process in coal and carbon regions in Europe. As a part of the ENTRANCES case studies, the questionnaire was deployed in Stavanger/Sandnes area, Norway, in October 2021, through the contracted company, InFact AS. The company translated the questionnaire into Norwegian, recruited participants (through prerecruitment via a telephone survey and a web panel) from the Stavanger/Sandnes area, and conducted the survey.

A dataset containing responses of 483 survey participants was delivered to the ENTRANCES NTNU team. The dataset was undergone quality control and was later subjected to some preliminary analysis. It seems that some sample characteristics, for example in terms of age groups and gender, were different from the target population in the Stavanger/Sandnes area. The sample contained a fraction of people (i.e., 12.01%) who were working in carbon industries. People who had previously worked in carbon industries (i.e., 22.57%) were represented to a larger degree.

The socio-psychological profiles of the respondents showed some interesting findings. Results show that high correlation between place attachment and place dependence, resilience and optimism, and support and perceived fairness. And a moderate correlation between place attachment and place rootedness, and place rootedness and place dependence. None of these results can be considered surprising but expected. However, the correlations between life satisfaction and economic hardship were unexpected, and this probably reflects that the financial situation is not as important and there are likely other factors that affect life satisfaction. The correlation between nostalgia and perceived stress could reflect that reflection on old-time nostalgia could lead people to negatively assess their current situation. The negative correlation between resistance and protest and perceived fairness and between resistance and protest and place dependence is not surprising as it most likely reflects that those who feel their situation is unfair are more likely to speak out and intend to change their situation and if they are dependent on their home, they are also likely to do the same. There was found a moderate negative correlation between perceived stress and optimism, between life satisfaction and perceived stress and these results are also not surprising. The negative correlation between economic hardship and perceived stress.

The moderate negative correlation between intention to relocate and place rootedness is also expected as those who are more rooted in their place would not like to move away.

The intention to relocate was low, and the same went for personal reinvention. This indicates that the transition in Stavanger is more of a threat on the horizon than actually happening now. The strong place identity, resilience, place rootedness and optimism marked the respondents from the Stavanger/Sandnes area survey and indicate that the region might be well situated to tackle future changes, though. The high levels of place attachment can also stem from the self-definition of people from Stavanger as “siddis”, which is defined as a person that needs to abide by 6 historical qualities:

1. A “siddis” needs to be born in Stavanger.
2. He/she needs to have been staying in Stavanger for most of his/her life.
3. He/she can be found in all layers of society.
4. He/she needs to know the city dialect.
5. He/she must be un-snobbish and straightforward.
6. He/she needs to have a great heart.

In addition, Stavanger has been the “oil capital” of Norway for a little over 50 years now, and it is likely that during this time citizens of the Stavanger area have settled and gotten families, possibly decreasing their intention to move. The high levels of optimism might reflect preparedness although this optimism could also be explained by a lack of knowledge about the CET, and this concern has been brought up earlier. It was argued that citizens of the Stavanger area are unprepared and that the CET would come as a shock. So, even though the citizens are optimistic and show high scores on place attachment, steps should be taken to ensure everybody in the areas affected by changes is prepared.

The participants in the Stavanger region scored higher on place identity and place dependence, perceived stress, economic hardship, and intention to relocate compared to the other ENTRANCES case studies. Interestingly the Norwegian participants scored higher on economic hardship which is unexpected since Norway have generally high wages and a high standard of living. The results could reflect the high costs of living in Stavanger, where a high amount of people work in the oil and gas sector which could have resulted in increased cost of living and expensive housing, creating a gap between those who work in the oil and gas industry and those on the outside. The intention to relocate is higher for the Stavanger area compared to the other countries, but the average was low

so there seems to be no reason to say that participants are particularly prone to out-emigrate. Stavanger has had net immigration over the last few years.

Results show differences in coping strategies between men and women, where women report more support while men report showing more resistance and protest. These two differences show that men perhaps are more willing to act out in response to changes they deem unfair, unnecessary or changes that threaten their way of living. Women, on the other hand, seem to rely more on support to deal with negative influences in their lives, perhaps supporting each other or seeking out support in their environment. Women also show higher place attachment (on three of the four sub-constructs) compared to men, showing that they put a high value on the region and perhaps on their homes.

CHAPTER 4

SOCIO-ECONOMIC SITUATION

4 The socio-economic situation

4.1 Introduction to the socio-economic situation

This chapter provides an overview of the socio-economic situation of the region. Important factors for economic development are population dynamics, labour force, capital stock and technological progress.

We refer to the three different delineations of the region, namely the Coal Carbon Territory (CCT), Labour Market Area (LMA) and Political Administrative Region (PAR), as described in Section 3. The delineations correspond to the nomenclature units of territorial statistics (NUTS).

The socio-economic component focuses on structural change in the economy, i.e., the reallocation of economic activity across different economic sectors and regions. Structural change can lead to a change in a region's economic, financial, and demographic composition. This report provides a descriptive analysis of technological progress, demography, economic inequality, employment, and economic activity based on various data sources.

4.2 Determinants of economic development

An important indicator of economic development is real GDP per capita.⁴ Real GDP per capita (Y/N) can be decomposed into three components, i.e., labour productivity (Y/L), the employment rate (L/E) and the share of the population of working age (E/N):

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

where Y is the real GDP, N population, L employed persons and E working-age population.⁵ Labour productivity (Y/L) depends on technological progress and capital intensity (Solow, 1956; Solow, 1957). In addition to private investments, also investments in the public capital stock influence the development of labour productivity. The public capital stock is important for the growth trajectory of a region (Baxter & King, 1993). Technological progress depends on research and development (Romer, 1990; Jones, 2005; Lucas Jr, 2009). Further, technological progress also depends on human capital determined through individual qualifications (Uzawa, 1965; Lucas Jr, 1988; Mankiw, et al., 1992).

On a sub-national level, there is no data available to analyse the capital stock for the CCT and LMA delineations in the Stavanger case. Labour productivity information is only available for the PAR (2008 and afterwards) and country delineations. Although the PAR region exhibited slightly lower labour productivity compared to the country, it is much higher than the EU28 average (see Figure a). This is not surprising as the political and administrative region of Rogaland contains the centre of

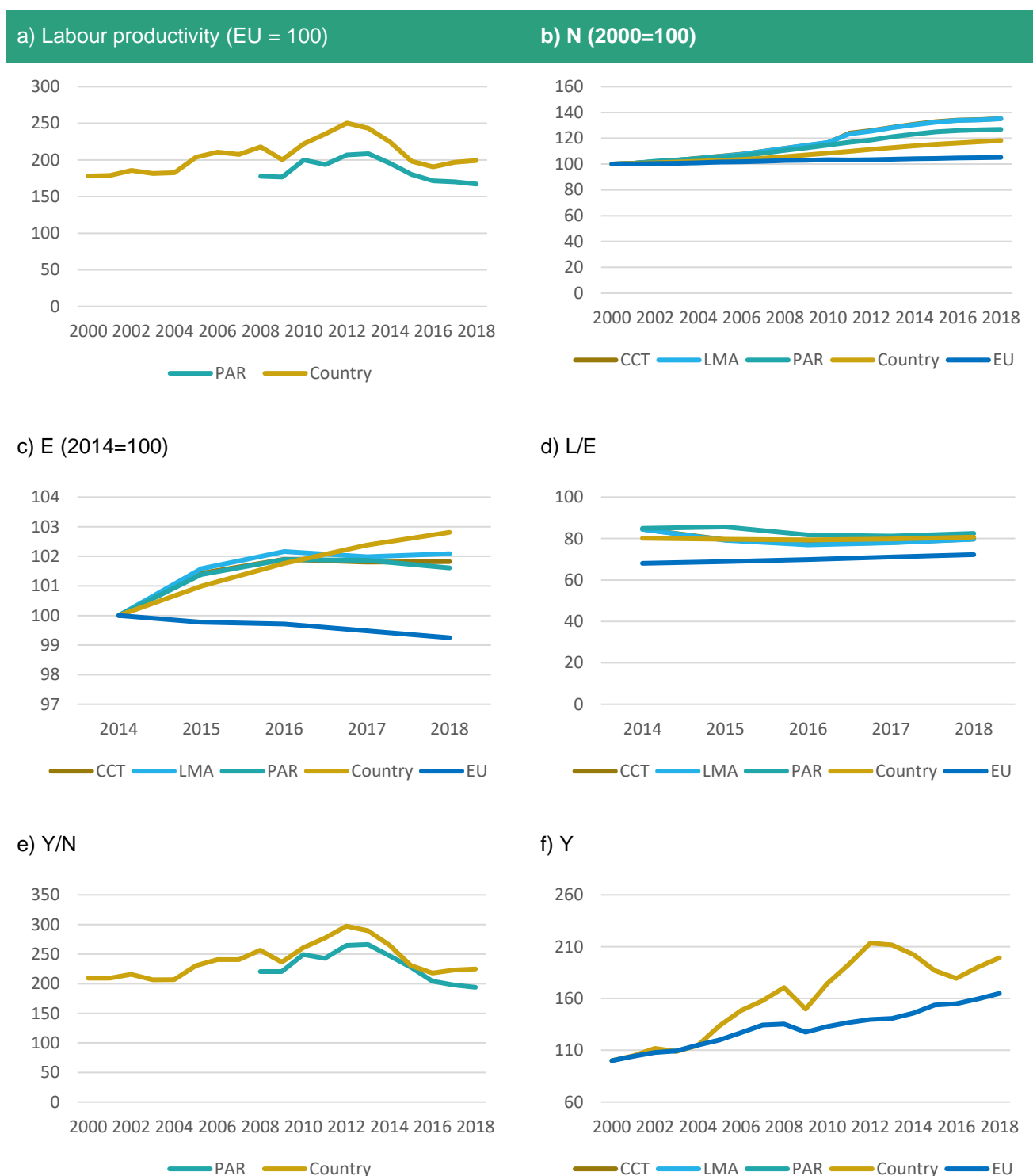
⁴ Gross domestic product is not created to measure welfare. It measures the transaction value of goods and services over a specific period (see Eurostat 2014, p. 146). Other measures such as mortality, leisure and inequality show a high cross-country correlation with GDP (see Jones and Klenow 2016). 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).

⁵ 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.

the Norwegian oil and gas industry, which has high productivity. The decline in labour productivity and GDP per capita after 2014 (Figure [a](#), and [8e](#)) can be explained as a result of fluctuation in global oil and gas markets. The price of oil decreased from around \$100 in 2014 to about \$44 in 2015, and this decline was one of the largest seen in modern history. The steep decline in oil prices has been attributed to a severe increase in oil production magnified by hydraulic fracturing in the US, and oil production in Canada. It was also argued that the increased sale of oil by Saudia Arabia also contributed (Yergin, 2014; Tully, 2020).

Population growth for CCT, LMA and PAR was well above the national and EU28 levels, with growth rates of 35% in the CCT (EU28: 5.2%) since 2000 (Figure [b](#)). The Norwegian population is expected to grow by 11 per cent from 2022 (about 5.4 million) until 2060 (about 6.1 million) (Statistics Norway, 2022a). However, the growth is projected for large cities and surrounding regions. Population in smaller and rural locations is expected to decline (Statistics Norway, 2022b). In contrast to the steady decline of the working-age population in the EU28, the working-age population in the CCT, LMA, PAR and country showed a strong increase from 2014 to 2016 (i.e., about 2%). Between 2016 and 2018, the working-age population in the country showed a further 1% increase while the share of the working-age population in the CCT and LMA remained stable. The working-age population is expected to decrease compared to labour force demands from around 2024/2025 until 2040 on the national level (Statistics Norway, 2022a). Although the share of employed persons in the CCT, LMA, PAR and country was about 10% higher than the EU28 average through 20014-2018, the share of employed persons in the CCT and LMA had been lower than the PAR and country average since 2015. Energy activities, both carbon and renewable, in the Stavanger region and Rogaland County have attracted the labour force to the region in recent years. With high labour productivity and active labour force, the PAR region and country show much higher GDP per capita compared to the EU28; the national value is twice as high as the EU28 average level. Statistics Norway expects oil and gas extractions to be halved by 2050 (Aune, Cappelen & Mæland, 2020), which entails a production decrease of about 3.5% yearly. With the expected decrease in extraction, employment is also expected to decrease in the same period (Cappelen, Dapi, Gjefsen, & Stølen, 2020).

Figure 8 – Economic Overview



Sources: Eurostat & Statistics Norway.

Note: Information on Labour productivity is only available at PAR and national levels. For PAR, it is available from 2008 and afterwards.

4.3 Sectoral structure

Among the sectors, the 'Other services' (i.e., NACE sectors O-U) has contributed the most (about 40-50%) to the gross value added in both 2010 and 2018 on the CCT, LMA, PAR, and national levels.⁶ This was substantially higher than the sector's contribution to the gross value added in EU28 (i.e., about 30% in both 2010 and 2018). The second important contributor to the gross value added was the 'Retail and IT' sector (i.e., NACE sectors G-J), with about 20% contribution on all levels. This was not different from the 'Retail and IT' sector's contribution to the gross value added in EU28. The 'Mining and Utilities' sector (i.e., NACE sectors B, D, E) contributed more than 10% of the gross value added to the CCT and LMA levels. This was about ten times higher than this sector's contribution to the gross value added on the PAR, national and EU28 levels. As the largest contributor to the gross value added (Figure), the 'Other services' stood for 45-50% of the total employment on both PAR and national levels. This was twice the EU28 level. While the employment in the 'Retail and IT' sector on the PAR and national levels was slightly lower than at the EU28 level both in 2010 and 2018, employment in the 'Mining and Utilities' sector was higher on the PAR level than on the national and EU28 levels in 2018. After recovery from the oil price plunge of 2014-2016, the share of employees in the carbon industry (at the country level) has been increasing on the national level.

All aggregate sectors exhibit positive labour productivity growth similar to the carbon industry from 2000 to 2018. **Błąd! Nie można odnaleźć źródła odwołania.** a shows that labour productivity, i.e., the ratio of sectoral output to employed persons, in the 'Mining and Utilities' sector grew more than in any other sector, except the 'Agriculture' sector' (i.e., NACE sectors A), on PAR level. On the national level, the growth of the labour productivity in the 'Mining and Utilities' sector was dwarfed also by the 'Finance, real estate and other professional services' (i.e., NACE sectors K-N) sector. On both the PAR and national levels, the 'Agriculture' and the 'Manufacturing' sectors employed fewer persons in 2018 compared to the year 2000. Regarding the growth decomposition, all sectors exhibited growth in the respective period on the PAR and national levels.

Figure 10b shows that the 'Mining and Utilities' sector contributed 2.4 percentage points to the overall growth of more than 25 per cent in the PAR. Therefore, the economic development in the PAR from 2000 to 2018 was not mainly driven by the development in the 'Mining and Utilities' sector, but the contribution of the sector was exceptionally higher compared to the EU and national levels (Figure 10c. 10 d).

⁶ All sectors follow the European Classification of Economic Activities (NACE), Eurostat (2008).

Figure 9 – Sectoral Structure

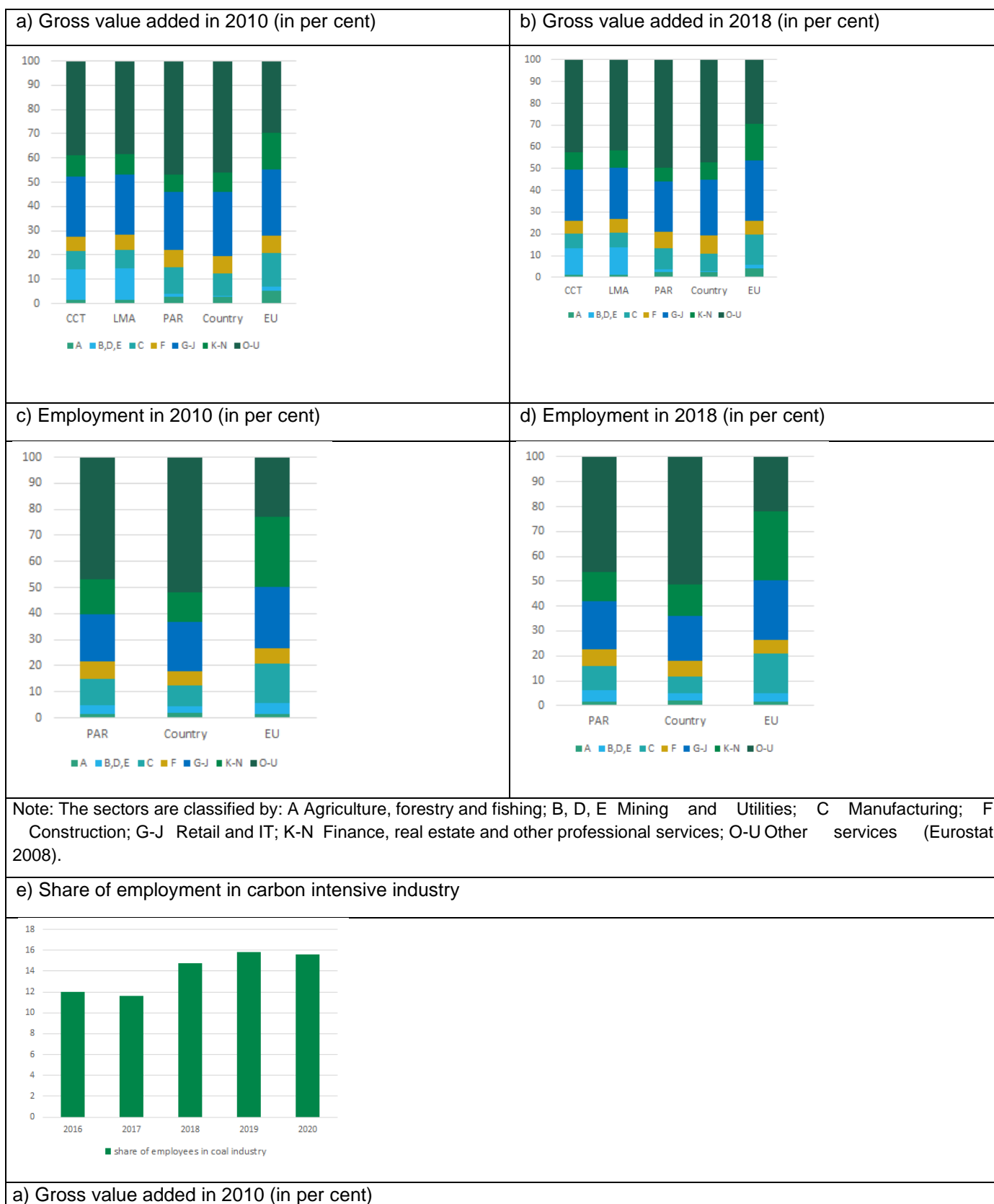


Figure 10 – Growth decomposition (2018-2000)



Sources: Eurostat & Statistics Norway.

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_i/Y_i). Abbreviations for the sectors are provided in Figure Błąd! Nie można odnaleźć źródła odwołania. and tabulated in Table 12.

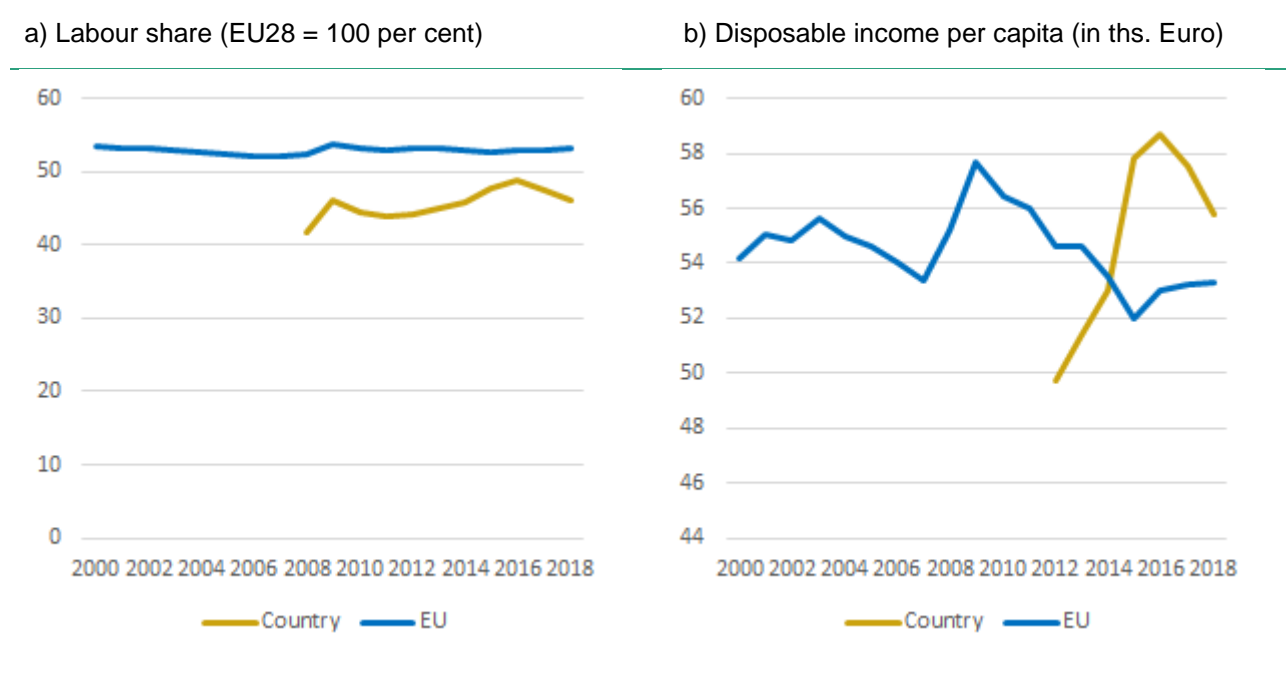
4.4. Income distribution

On the sub-national level, harmonized data for the income distribution on a household or individual level is not available for all European case studies. However, it is possible to analyse the development of the functional income distribution in the region. The income approach states that GDP in a region is the compensation of employees (labour income), the gross operating surplus, mixed-income (e.g., compensation of owners), taxes on production and imports minus subsidies on

production.⁷ Figure 6a depicts the labour share **Błąd! Nie można odnaleźć źródła odwołania.** as a key economic indicator for the distribution of income (between labour income and capital income).

The Norwegian disposable income / GDP per capita was about 5000 Euros less than the EU28 average in 2012. While the GDP per capita in the EU28 had decreased from about 55000 Euros in 2012 to 53000 Euros in 2016, the Norwegian disposable income sharply increased during this period (i.e., from less than 50000 Euros in 2012 to about 59000 Euros in 2016). Though the Norwegian GDP per capita had decreased since 2016, it was still 2000 Euros higher than the EU28 average in 2018 (Figure 6b). The decreasing GDP per capita in Norway between 2016 and 2018 might indicate stagnation in disposable income in the country compared to the steady increase of the average disposable income in the EU28.

Figure 6 – Income Distribution



Sources: Eurostat & Statistics Norway.

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

4.5 Gender dimension

In Norway, women mainly work in the *Education*, and *Human health and social work activities* sector here described as the *Other services (sectors P and Q, respectively, See Table 12)*, while men mainly work in *Construction* and various industries. In addition, about 70% of women work in the public sector, while about 60% of men work in the private sector. As can be seen in **Błąd! Nie można odnaleźć źródła odwołania.** the largest labour growth was seen in the *Other services* category where *Education*, *Human health and social work activities* in both CCT and LMA indicate that the sector where women are more represented had the highest growth. However, for PAR and country, sectors, where men are more represented, had higher growth. The Stavanger region has 50.6% men of a total population of 263,369, and there have not been any significant changes in the

⁷ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Income_approach

demographics in the Stavanger region in the time period 2000-2018 where the gender distribution has been stable.

4.6 Conclusion

After the discovery of oil in the North Sea in 1969, Stavanger and its three neighbouring municipalities (i.e., Sandnes, Randaberg and Sola) have experienced a period of hectic growth due to a business structure dominated by oil and gas-related activities. The region houses both national and international companies having a stake in oil and gas related activities, and host around 50% of all employees in petroleum-oriented activities in Norway. In addition, four out of five entities in the region are currently registered as providing various services to entities with the extraction of crude oil and natural gas business. The importance of oil and gas-related activities in the socio-economic structure has played a significant role in the population and demographic composition of the region. Although there has been a steady flow of immigration to the region, the fluctuation of the global oil and gas market has been felt in the region.

The sectorial structure of the region is, however, not entirely dependent on the oil and gas industry. About half of the PAR's gross value added is coming from the Other services, and Mining and utilities (including the oil and gas industry) only account for less than 10% of the PAR's gross value added. The region has started pursuing renewable energy production and technological developments in areas to decrease greenhouse gas emissions. This is set to diversify the sectorial structure of the region and to lead further economic development and fair income distribution.

The socio-economic analyses of the Stavanger region show that coal carbon territory (CCT), labour market area (LMA), and the political-administrative region (PAR) have higher labour productivity, higher GDP, and higher GDP per capita compared to the EU average. This is likely a result of income from the oil and gas industry and related areas.

CHAPTER 5

ANALYSIS OF THE ENERGY TRANSITION IN THE POLITICAL ADMINISTRATIVE REGION

5 Analysis of the Energy Transition in the Political Administrative Region

5.1 Overview of the Energy Transition Policies

5.1.1 Political system and context

The key administrative unit in the case of Stavanger is the Rogaland County (county municipality NUTS level 3) in the region of Western Norway (NUTS level 2), counting 475 thousand inhabitants, which comprises 23 municipalities grouped in 4 districts: Dalane, Jæren, Haugalandet and Ryfylke. The main cities are Stavanger, the administration centre with a population of 144,117, and Sandnes, with a population of 80,450 (SSB, 2021b).

Norway has a two tier-system of local government: the municipalities and the county authorities. The Local Government Act (Act of 25 September 1992) (Regjeringen.no, 2014) determines the ground rules for the organisation of the municipalities' and county authorities' work and proceedings, relationship with supervisory state bodies, etc. Overall, the regulations are the same for municipalities and county authorities. Both at the municipal level and the county level there are elections with popular representatives responsible to their constituents. Voters elect representatives to the municipal councils and county councils.

The municipalities and the county authorities have the same administrative status, whereas the central government has the overriding authority and supervision of municipal and county municipal administration. The central government retains the responsibility for several policy areas including overall environmental strategies at the national level. The counties and municipalities have, among others, responsibilities regarding regional planning and business development, together with some authority regarding environmental issues (Regjeringen.no, 2014). As mentioned above, the central government's national-level strategy overrides and guides local-level initiatives and strategies regarding various issues, including the environment.

5.1.2. Decarbonisation process

In Norway's Climate Strategy for 2030 (Norwegian Ministry of Climate and Environment, 2017), the national target was set to reduce global greenhouse gas emissions by the equivalent of 30 % of its own 1990 emissions by 2020. Norway's 2020 target was being followed up under the Kyoto Protocol, while the 40 % target for 2030 has been communicated to the UN as Norway's contribution under the Paris Agreement and has been made legally binding in the Climate Change Act. Norway's target of being a low-emission society by 2050 has also been made legally binding in the Climate Change Act. The Norwegian Government has chosen to enter a dialogue with the EU on joint fulfilment of the 2030 emission reduction commitment. The Norwegian Government has identified five priority areas for Norway's climate policy: reducing emissions from the transport sector, strengthening Norway's role as a supplier of renewable energy, developing of low-emission industrial technology and clean production technology, environmentally sound shipping and carbon capture and storage.

The Norwegian Ministry of Petroleum and Energy is responsible for facilitating a coordinated and comprehensive energy policy at the national level. The Ministry has a further responsibility to supervise the state-owned corporations (e.g., Petoro AS and Gassco AS), as well as the oil company Equinor in which the state holds a majority stake. The Norwegian Petroleum Directorate, which is

subordinate to the Norwegian Ministry of Petroleum and Energy, plays a key role in petroleum resource management (e.g., responsibilities relating to the exploration and production of petroleum on the Norwegian continental shelf). While the Norwegian Ministry of Climate and Environment has a particular responsibility to carry out the environmental policies of the government, the energy sector is mainly regulated by the Energy Act, which aims to ensure that production, transformation, transfer, turnover, distribution, and use of energy take place in a socially responsible manner (IEA, 2017).

Although energy policy and strategies are set by the state, local authorities may have a say on the opening of new areas and the granting of licenses for energy production, when their area of competence is affected. Further, it is stated that resource management of petroleum resources should “take due regard to regional and local policy considerations” (Norwegian Petroleum Directorate, 2018). As mentioned previously, local authorities (both counties and municipalities) can develop local-level initiatives and strategies regarding various issues, including regional planning, business development, energy, and the environment, under the national-level strategies (Regjeringen.no, 2014). The Rogaland County and the municipalities of the Stavanger/Sandnes area have therefore developed their strategic plan for climate, energy, and environment. Respective plans have been adopted in the county/municipality councils to contribute to issues relating to reducing emissions from transport, investment in renewable energy sources, clean technology, business development etc. in the territory (Randaberg kommune, 2019; Rogaland fylkeskommune, 2019; Sandnes kommune, 2020a; Sola kommune, 2021; Stavanger kommune, 2018).

5.1.3 Public participation

Development of the strategic plan at the county level and municipality level involves the main institutional and social actors (e.g., public authorities, research institutions, energy operators, industrial companies, labour unions, environmental associations and engaged citizens) in the region and local areas. In general, the county council and the municipality council, which are consisted of elected representatives of the local community and key stakeholders representing social and economic aspects in the local area or region, launch consultation matters and initiate a process of a public hearing.

Such involvement was enhanced by promoting public participation in the planning processes according to the Planning and Building Act of 2008 (Regjeringen.no., 2008). In Section 1-1. Purpose of the Act, it is stated that “Planning and administrative decisions shall ensure transparency, predictability and public participation for all affected interests and authorities. There shall be an emphasis on long-term solutions, and environmental and social impacts shall be described.” The Act further sets guidelines and processes for public participation in planning, e.g., “Anyone who presents a planning proposal shall facilitate public participation.” and “The municipality has a special responsibility for ensuring the active participation of groups who require special facilitation” (Section 5-1). In Section 5-2. Consultation and public scrutiny, it is stated that “a planning proposal shall be circulated for comment, ...” and “a proposal shall be presented for public scrutiny, at least one copy of the proposal must be easily accessible to everyone so that anyone can familiarise himself/herself with it.”

5.1.4 Clean energy transition (CET)

Stavanger has been known as the Oil Capital of Norway (NO: Oljehovedstaden), and because of this, a large part of Stavanger and its surrounding municipalities are characterised by an infrastructure that is intimately linked to the oil and gas industry. It is therefore clear that the

Stavanger CCT is highly dependent on the oil and gas industry, and that the economy of the region is intricately connected with it.

The perception of the oil, and the transition away from it to greener and more environmentally friendly alternatives, is fluctuating. One example of this can be found in the media portrayals of the oil workers, which range from them being framed as obstacles to the green shift to “the heroes of tomorrow” - capable of solving future problems with current knowledge obtained from the oil and gas industry itself (Ytterstad, Houeland, & Jordhus-Lier, 2022). Oil and gas industry workers have also been forced into requalification schemes in recent years following heavy downtime in the sector that, in the western parts of Norway (the Stavanger CCT is located in southwestern Norway), has resulted in an influx of students from the oil industry who wish to requalify as science teachers (Skarstein, 2020). This showcases how fluctuations in the industry can have ripple effects also in other fields, such as the R&D sector. In other fields, climate change is often considered to be “someone else’s problem”, and not necessarily subject to immediate concern or personal responsibility (e.g., Houeland & Jordhus-Lier, 2022). The green shift is, of course, a political concern as well, and a citation from the former Norwegian prime minister reflects a key issue that encompasses many of the worries and challenges that Norway is subjected to through the clean energy transition (CET).

Through fluctuations in the oil and gas market, varying media portrayals and political emphasis, there do appear to be significant changes with regard to the CET in various sectors – especially within technology. Another key driver of the CET is the municipal project Triangulum, which consists of 22 partners and collaborators focusing on creating smart cities and societies (Stavanger kommune, 2022). Partners involved in the Triangulum project include energy companies, the municipality of Stavanger, the county municipality of Rogaland, the University of Stavanger, and the Stavanger Region European Office (Greater Stavanger) - all involved in separate projects revolving around sustainability. Other local drivers behind the green shift include Framtiden i Våre Hender Stavanger (EN: Friends of the Earth Norway, Stavanger Department), Naturvernforbundet (EN: The Norwegian Society for the Conservation of Nature), the national recycling organization Grønt Punkt Norge (EN: Green Point Norway), and Grønn By Stavanger-Regionen (EN: Green City Stavanger Region). The region also benefits from specific projects such as Vindmøllebakken (EN: The Windmill Hill), a housing solution where a sharing economy is heavily promoted (<https://helenhard.no/work/vindmollebakken/>).

Three major regional CET policy agendas and strategies:

Decarbonisation phaseout strategy: The decarbonization phaseout strategy is described in political governing documents at the national (NOU 13, 2021) and municipal levels (Randaberg kommune, 2019; Sandnes kommune, 2020; Sola kommune, 2021; Stavanger kommune, 2018).

Smart specialization: Stavanger Smart City is a municipal initiative that represents a smart specialization arena, such as the use of drones in cities and suburban areas for emergency medical use, the involvement of a youth citizen panel for environmental community matters, agile piloting, various sensor projects, and co-creation of necessary services with involved citizens (<https://www.stavanger.kommune.no/en/samfunnsutvikling/stavanger-smart-city/smart-city-projects/>).

Foresight studies: Long-term development projects, such as the use of renewable sources of energy (e.g., hydrogen, wind, solar) and the development of new and greener technology (e.g., the electrification of marine vessels, carbon capture and storage), are delineated in the political government documents (e.g., NOU 13, 2021).

Stakeholder-specific decarbonisation strategies: A general finding in the Stavanger CCT (and Norway in general) is that most stakeholders and businesses have adopted environmental profiles as part of their corporate identity – albeit to varying degrees. Pro-environmental NGOs such as Naturvernforbundet (EN: The Norwegian Society for the Conservation of Nature) revolve entirely around environmental protection across a variety of fields. Their suggested decarbonization strategies are commonly listed on their websites and other informative content such as leaflets or other media channels. Comparatively, the decarbonization strategies for the biggest trade association in Stavanger (Næringsforeningen i Stavanger) are lacking – often just described loosely and unspecifically as the ‘promotion of growth in the region’ (<https://www.naeringsforeningen.no/om-oss/>).

5.2 Socio-political component

5.2.1 Summary of results

Issues, statements, and conflicts

The debate surrounding energy and climate, particularly the Norwegian production and export of petroleum and gas and the Norwegian government’s commitment to reducing global CO2 emissions, has been in the public eye for decades. As the 2021 Norwegian parliamentary election was held in September, the energy transition issue was one of the most debated across different platforms in the year 2021. The debates involve: whether to set a date for a full stop in all petroleum activities, which new energy resources need to be developed to replace fossil energy and how, if employment and economic growth opportunities are affected in the energy transition and to what extent. Although the voices of the groups promoting a green energy transition are getting heard, the oil and gas industry with its huge economic and political power as a coping constituency seems to be still able to dictate the discourse at both national and local levels.

A text mining analysis was conducted to outline the keywords that are characterising the phenomena. The result of the analysis is drawn in a Word Cloud, which shows how energy transition has been debated in local and national Norwegian newspapers in recent years. It confirms that some key terms are particularly relevant in the debate (debatt) about the energy transition process in Norway (norge) in general and local areas Stavanger and Rogaland in particular. Oil (olje), energy (energi), nature (naturen), car (bilen), renewables (fornybar), climate (klima), offshore wind (havvind), gas (gass), emissions (utslipp), green transition (grønne skiftet), oil employment (oljejobb), election (valget) etc. are the most frequent words in the debate. The oil industry Equinor / Statoil and the local areas (i.e., Stavanger and Rogaland) seem to be confirmed as important stakeholders in the debate.

Defining Constituencies

Constituency 1: Technological Regularisation (IMPOSE)

Imposing constituencies primarily frame the decarbonization process as a social and financial necessity, a process that is capable of generating new beneficial arenas for innovation and research, and increased employment opportunities in green jobs (e.g., Hovland, 2021; Norwegian Ministry of Climate and Environment, 2021; Skarsaune, 2018). Much of the imposing narrative revolves around the development and adoption of clean technologies and energy sources, ranging from oceanic wind (Blomgren & Haraldseid, 2021; Norwegian Ministry of Climate and Environment, 2021; Skarsaune, 2021) to hydrogen (Haraldseid, 2021; Ministry of Climate and Environment, 2020; Mullis, 2017;

Norwegian Ministry of Climate and Environment, 2021), solar power (Randaberg kommune, 2021), electrification – usually of the carbon industry itself (Blindheim, 2021; Norwegian Ministry of Climate and Environment, 2021), and carbon capture and storage (Norwegian Ministry of Climate and Environment, 2021).

The decarbonisation technologies in question appear to be framed positively, but the description of how they function and under which contexts appears to be relatively superficial. As an example, clean technologies are briefly and repeatedly summarized in certain public government documents, but aspects such as their competitiveness in relation to oil tend to be downplayed or otherwise not mentioned (Norwegian Ministry of Climate and Environment, 2021). Also, by contrast to the general debate surrounding the positive framing of the economical validity and reduced emissions of green energy and technology, the debate from the imposing constituencies tends to contain very few mentions of requalification opportunities among existing carbon workers in the oil industry, arguing that worker in the oil sector is unaware of what their new jobs will entail (e.g., Topdahl & Fossaskåret, 2021). It is therefore often unclear if the imposing constituencies are doing a sufficient job in communicating or researching opportunities with which carbon workers can make the transition from employment in oil and gas, to positions in renewable energy – the so-called ‘green jobs’ mentioned above. Political statements – even among conflicting political parties – provide examples of green jobs, but little to no platforms through which requalification opportunities exist, jobs within the circular economy, know-how and money from oil and gas, can be used in new green jobs, and foreign investments in renewables (Stokkebo, 2019a; Torgersen, 2020).

Constituency 2: Technological Adjustment (COPE)

Decarbonization appears to be understood among coping constituencies (individuals, groups, and organizations not directly connected to the carbon industry) as a series of benefits and losses – much in the same vein as imposing and resisting stakeholders – but often from a more hedonistic or individualized view. A core example of this tendency is illustrated through a news article detailing how foreign financial interests and investments in wind power have a detrimental effect on specifically the beauty of Norwegian nature and biodiversity (Øvrebekk, Andersson & Holstad, 2018). One of the primary flagships in the Norwegian decarbonization strategy, alongside *carbon capture strategies*, *hydrogen* and *oceanic wind parks* such as Hywind Tampen (Norwegian Ministry of Climate and Environment, 2021) comes in the form of windmills and wind parks. Certain municipalities in the Stavanger case are optimistic about the implementation and building of wind parks, both onshore (Sandnes kommune, 2020a) and offshore (Stavanger kommune, 2018). The overall attitude towards renewable energy in the form of wind – especially offshore – is generally positive in Norway, although the view on land-based wind parks has experienced a more negative framing in recent years (Andreassen, 2020) – such as the case of Frøya wind park which is primarily owned by the German company Stadtwerke München, which presents a rather inflated view of Norwegian positivity towards onshore wind farms (Moe, 2019). It appears, overall, that the coping constituencies are knowledgeable and aware of how wind farms can be used to generate renewable energy, but they are considerably more sceptical and negative towards the idea that large wind turbines are damaging nature and are aesthetically displeasing – as such, the view towards wind parks and renewable energy technology, in general, can be described as nuanced (Amundsen, 2019).

Core contributors towards innovation-based scepticism in coping constituencies can be summarized as 1) *necessary infrastructure and area use* (Andreassen, 2020), 2) *competing values* (Aslaksen, 2021), 3) *bio conservation concerns* (Daugstad & Prøsch-Danielsen, 2017) and 4) *techno-scepticism* (e.g., Blindheim, 2021). This list is not exhaustive but represents the majority view of the analyzed

documents in this report. The first contributor, necessary infrastructure and area use, simply revolves around how wind parks require large plots of land for their construction. Additionally, initial construction plans are often understated in terms of how much infrastructure is needed, which results in the wind parks generally becoming bigger than their initial blueprints would suggest. This leads to a public feeling of being misinformed and, consequentially, a growing scepticism among the coping constituencies (Andreassen, 2020). The second contributor, competing values, focuses on the tension between political priorities versus those of the coping constituencies. For example, in Norway, the construction of wind parks is often associated with a decline in the grazing areas of reindeer – a highly important animal for the Sapmi indigenous people (Aslaksen, 2021). In a similar vein, local inhabitants living in the close vicinity of the wind park experience that their neighbourhoods, lifestyles and local wildlife can be threatened (Øvrebekk et al., 2018). The threat posed upon local wildlife is also a core component of the third contributor to scepticism among the coping constituencies – bio-conservation concerns. Wind parks and windmills, often due to the infancy of the technology and the unfamiliarity of it with wild animals, have a history of damaging local wildlife populations and breeding habits (e.g., Chowdhury et al., 2022; Kumara et al., 2022), a finding that is often portrayed using affective language in Norwegian media (Daugstad & Prøsch-Danielsen, 2017). The fourth and final contributor identified among coping constituencies in this report is overall techno-scepticism. Much of the technology that is developed and utilized in the decarbonization process is – at least by comparison to older and more established technology – still in its infancy and suffering from malfunctions, unintended detrimental effects on nature (e.g., Chowdhury et al., 2022; Kumara et al., 2022), weak or insignificant pro-environmental effects and so on. In some cases, technology that is used for greening the carbon industry also falls under criticism and scepticism by the general population (Blindheim, 2021). Wind parks and electrification of the carbon industry remain some of the most hotly debated topics among coping constituencies, largely due to their need for space, location in beautiful natural landscapes, the threat to biodiversity, and rising popularity as an alternative to fossil fuels. By comparison and contrast, hydrogen and carbon capture appear to get less public and media attention, despite political interest in utilizing them (Norwegian Ministry of Climate and Environment, 2021). One possible explanation for this is that carbon capture facilities are, by and large, invisible entities to the public – literally since the storage units are deep below the ocean surface (Rubin et al., 2012). Wind parks, by comparison, are large and looming structures that appear clearly in the landscape (Andreassen, 2020).

Constituency 3: Technological Reconstitution (RESIST)

The overall framing of the carbon industry, as well as the decarbonization processes in the analysed documents, is generally characterized by strong polarization between imposing factions such as the oil industry itself as well as primarily right-wing political parties on one side and opposing factions such as various NGOs, interest organizations, and primarily left-wing political parties on the other (e.g., Huseby, 2017). Additionally, the decarbonization process tends to encounter resistance and protests from locals that fear nature and biodiversity loss as a result of increased amounts of wind farms (e.g., Øvrebekk, Andersson & Holstad, 2018). Among *workers in the carbon industry* there exists both a fear of a declining market (Sandberg, 2019), scepticism towards requalification into green energy industries (Skjelbred, 2021), and denial that a decline in the oil market is even happening (Øvrebekk, 2019), an identity crisis where continued extraction and production of oil is perceived as needing to happen while concurrently expanding renewable sources of energy (Norwegian Ministry of Climate and Environment, 2021) as well as a feeling of being demonized due to their connection with a “dirty” industry (Topdahl & Fossaskåret, 2021). *Media coverage of carbon workers*, especially media outlets such as local newspapers in the carbon intensive region itself, shows a tendency to portray them positively as strong-willed, proud, patriotic and nostalgic (e.g.,

Skarsaune, Våga & Haga, 2018; Topdahl & Fossaskåret, 2021), often as a reference to the Norwegian golden age of oil drilling that started in the late 1960s and early 1970s with the discovery of the Ekofisk oil field. It simultaneously reveals a general lack of faith in the industry surrounding decarbonization, usually in the form of inquiries into what Norway's primary industry should be, if not oil (e.g., Topdahl & Fossaskåret, 2021). Strong tensions appear to exist primarily in the dichotomy between the relative economic safety of oil and the perceived risk of investing in what is often framed as underdeveloped and unreliable forms of energy – such as the (previous) Norwegian government's commitment to hydrogen (Ministry of Climate and Environment, 2020) or the floating wind farm *Hywind Tampen* (Norwegian Ministry of Climate and Environment, 2021).

Perceived benefits and losses from the decarbonization process

In order to gain a more complete picture of the perceived **benefits** and **losses** of decarbonization, it is highly important to understand the perceived benefits and losses of the Norwegian carbon industry stakeholders that are the primary, recurring agents of the analysed documents as well.

Carbon workers and the media: Oil and gas have been, and continue to be, an economic adventure for the Norwegian industry. Since the discovery of the Ekofisk field in the late 1960s, the Norwegian economy has boomed to such an extent that it is common for Norwegians to coin specific phrases for it – ranging from *Oljeeventyret* (lit., “The Oil Adventure”) to simply *Oljå* (regional Stavanger area accent, simply meaning “The Oil”). As such, oil has become part of the national identity and – as such – the public debate surrounding decarbonization (oil to renewables) often tends to be based on a combination of effect (e.g., Sæbø, 2020), political and economic interests and lobbyism (Tollaksen, 2017), as well as vague and complex models of local emission rates (Vatne, 2013, p.43). One of the results of this combination of factors, likely combined with Norway's overall reliance on oil and carbon workers' fears of losing their employment as a direct consequence of globalized decarbonization processes (**loss**), is that much of the public debate on their side is characterized by *Whataboutism* or *whataboutery*. This is a common form of rhetorical strategy where, when confronted with an accusation or a statement that creates discomfort or cognitive dissonance, individuals will either respond with a different accusation or even change the subject entirely without responding directly to the initial accusation itself (Haupt & Shockley, 2020). Here, the focus is shifted from the issue of Norwegian oil to how supposedly other nations somehow produce “dirtier” oil – both without addressing the original issue under discussion and also without providing any clear examples of nations that – again supposedly – produce oil with fewer environmental considerations than Norway does. Additionally, the concept of “clean oil” is not explicitly operationalized in the text, neither by the speaker nor by any of the authors of the article. This tendency of describing Norwegian oil and gas as “clean”, or “cleaner” than those of other nations, can also be found in political rhetoric (e.g., Solberg, 2019b) and is not unique to carbon workers.

Political parties: As previously mentioned, and perhaps unsurprisingly due to how the Norwegian economy is heavily reliant on oil and gas, decarbonization and all of its involved processes is a hotly discussed and controversial political topic – both in the carbon intensive region of Stavanger and its surrounding municipalities as well as in the country as a whole. On one hand, for example, most Norwegian political parties – irrespective of left, right, or centre – acknowledge the importance and **benefits** of reducing emissions. However, there are significant disagreements surrounding how this needs to happen, as well as to what extent. Most political parties cite a goal to reduce a bare minimum of 40% of the current emissions by 2030, with a strongly varying degree of emphasis on domestic, international, and European emission rates (Huseby, 2017). It is also an overarching political goal for some parties to ensure that the oil industry is capable of entering a requalification

process, and that cleaner forms of energy are developed with government regulations and funding (Khorami & Randen, 2021).

Additionally, as a consequence of the consistent political and economic tension between acknowledging anthropogenic climate change as an impending reality and the overreliance on oil in the national economy, the result is *the Norwegian climate paradox or identity crisis* – the *concurrent desire to maintain the status quo of oil production while simultaneously wanting to appear as a pioneering country in clean and green technologies and solutions* (Gloppen & Rakner, 2015). One of the most consistent findings in the analysed documents surrounding the Stavanger case is the tendency to *display and portray oil production as sustainable*. This is often done by, for example, 1) supplying arguments for the *electrification of Norwegian oil and gas as a greening strategy* (Norwegian Ministry of Climate and Environment, 2021), 2) *portraying Norwegian oil production as “cleaner” than that of other nations or carbon industries* such as coal (Stokkebø, 2019b), or 3) *justifying the use of continued search for and extraction of oil in order to gain financial means and technological insight with which to aid in the research and development of green technology* (Oskarsen, 2019). Other strategies include 4) *belittling or negatively framing alternative, green energy sources*, 4) *justifying continued gathering and production of oil simply due to the industry stating a vaguely defined desire to reduce its emissions long-term*, and 5) *stating that cutting oil production in Norway will just lead to increased production elsewhere* (Ihlen, 2006).

As is the case with carbon workers and media outlets, imposing political parties are also frequently steering the carbon debate in a direction of Whataboutism or whataboutery. Here is an illustrative excerpt from a deputy leader of a right-wing Norwegian political party on the topic of Norwegian oil (Thonhaugen & Kalkenberg, 2021), citing her source as a controversial publication commissioned by the interest organization Norsk Olje og Gass (Rystad Energy, 2021). Here, it is also worth noting that the speaker has *cherry-picked* (Morse, 2010) selected data and used this limited finding to support her argument, while simultaneously presenting herself as well-acquainted with the industry as an insider.

Constituencies, the local field of power and outcomes

The socio-political report builds on the analysis of 56 newspaper articles, 5 core public documents detailing the climate plans for the Rogaland region and its municipalities of Stavanger, Sandnes, Sola, and Randaberg, 3 governmental white papers (NOUs), and 4 governmental documents that are otherwise connected to the political discourse and decision-making surrounding decarbonization. The documents were imported into-, coded, and analysed in the Nvivo software by the lead authors. The results of this analysis reveal a mixed framing and varying degrees of acceptance towards the decarbonization process. Because Norway has been built as an oil nation since the late 1960s, and the Stavanger region has been firmly established as the heart of this industry, it is not surprising that the local decarbonization narrative is characterized by strong polarization, political tensions, and controversy. While the narratives exist in several formats, these appear to be the primary benefits and losses illustrated in the public debate and the analysed documents.

Benefits: Enabling the decarbonization process would lead to a better climate, clean water and air, green jobs and employment opportunities, fewer carbon emissions, and new economic opportunities and competitiveness in the growing green market. The transition is perceived as a modern-day necessity and a safe future for life on the planet. Much of the pro-decarbonization narrative focuses on the problem of carbon, rather than potential solutions to how to reduce emissions.

Losses: Decarbonization means fewer jobs in the carbon industry as well as a perceived severe lack of requalification opportunities into green industries, severe economic downtime, and a loss of the nostalgic, proud 'golden age' of oil. Furthermore, the transition is considered a distant goal requiring unknown sacrifices on Norway's part, multiple layers of risk, and ignores evidence of how Norway's oil and gas industry is 'cleaner' than that of other nations. Lastly, there exists a general scepticism or bias against the use of oil-related technology in enabling the decarbonization process to occur.

It should be noted that this list of perceived benefits and losses due to decarbonization is far from exhaustive; it merely represents the general notions identified and analysed in the chosen documents. Furthermore, the list also draws upon views and perceptions from a very wide variety of stakeholders, individuals, groups, industry leaders, and so on – people with very different degrees of attachment to (and understanding of) how the industry works, and the level of revenue it generates for Norway.

Interestingly, due to the mixed framing of decarbonization – including the competitiveness of renewables in relation to oil and the impact that decarbonization is likely to have on the national economy and nature – a national identity crisis is shown to have formed both in the general population and among politicians and carbon workers. This identity crisis revolves around how Norway markets itself as an oil nation, while simultaneously also wanting to be perceived as a pioneer within renewables and sustainable technologies, and thus mirrors the findings on this made by other researchers (Gloppen & Rakner, 2015).

5.3.2 Interpretation

This report builds on the analysis of 56 newspaper articles, 5 core public documents detailing the climate plans for the Rogaland region and its municipalities of Stavanger, Sandnes, Sola, and Randaberg, 3 governmental white papers (NOUs), and 4 governmental documents that are otherwise connected to the political discourse and decision-making surrounding decarbonization. The documents were imported into-, coded, and analysed in the NVivo software by the lead authors. The results of this analysis reveal a mixed framing and varying degrees of acceptance towards the decarbonization process. Because Norway has been built as an oil nation since the late 1960s, and the Stavanger region has been firmly established as the heart of this industry, it is not surprising that the local decarbonization narrative is characterized by strong polarization, political tensions, and controversy. While the narratives exist in several formats, these appear to be the primary benefits and losses illustrated in the public debate and the analysed documents.

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5.3.3 Gender dimension

Key stakeholders in the Stavanger region are predominantly male, although there are some exceptions such as two stakeholders from the municipalities are women. Several other stakeholders are CEOs and business leaders which are, in Norway, predominantly men with a share of 63 % in Norwegian companies as of 2019 (SSB, 2021). It should be noted, however, that the number of female leaders has been increasing in Norway over the last years, but still, a majority are men. Since a majority of stakeholders are men, it seems likely that this could affect the framing, and that gender issues might have been more in the forefront had the gender balance had been different. However, there are several issues where gender is not likely to have any effect on the framing or narratives, and some issues where a female stakeholder responds similarly to a male stakeholder. There are gender quotas in place in Norway for business leaders, and in higher education, and some political parties have instituted gender quotas. Based on the main actors in the socio-political component there are indications of a male-dominated narrative. However, due to gender quotas in place, the gap between the relative representation of men and women is getting closer to an even 50-50 split. The results found in this report should be read with an understanding of this fact.

5.3 Socio-ecological and technical components

This section provides an overview of the transformative capacity of the 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 towards 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. Wolfram (2016) identifies ten interdependent components to assess the transformative capacity of a region. These components are selected based on a literature review. 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 multiformity 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.

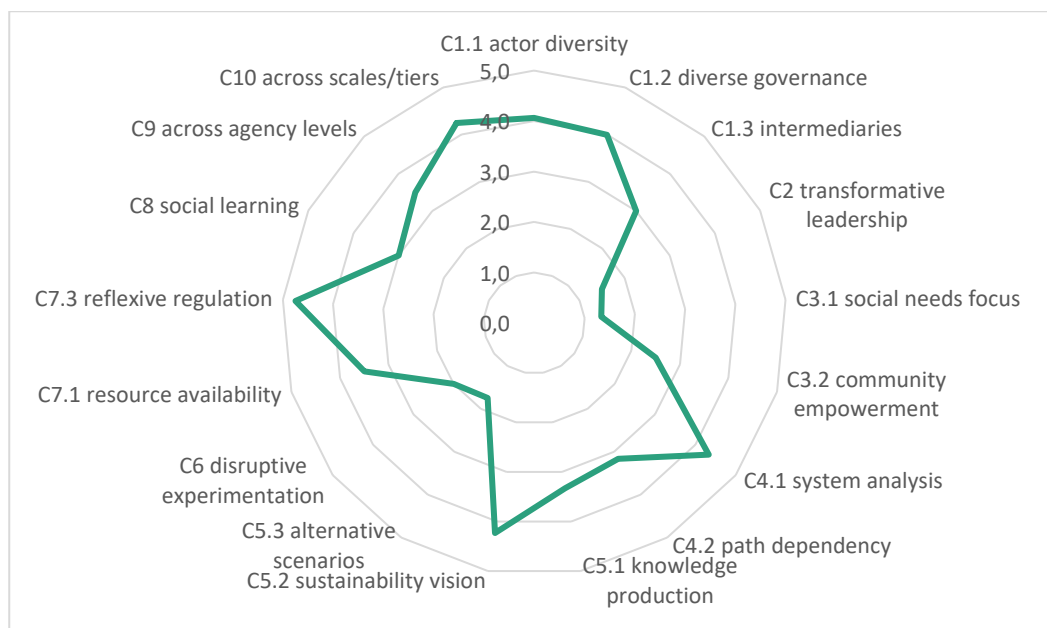
5.3.1 Summary of results

Overall Assessment

The below chart (Figure 7) summarises respondents' assessments of components of transformative capacity in the region. Due to the small sample (five) all participants share presented in one chart.⁸ The chart shows the stakeholder assessments of the different factors of the SETS component of the Stavanger CCT study. Categorical variables such as C5.1 (knowledge production) and C5.2 (sustainability vision) rated highest, whereas the category C7.1 (resource availability) rated lowest.

⁸ Some respondents answered Likert-scale questions with half units, e.g., "between 3 and 4". While means are unaffected by this, to produce accurate representations of the modes and medians, it was necessary to adjust these figures, with all results lower than 3 rounded down and all results higher than 3 rounded up, to indicate the direction of the respondent's estimation. This permits the data to be used as intended, for illustrative purposes (and as a visual stimulus and boundary object) rather than for statistical purposes.

Figure 7 – Stakeholder Assessment of Transformative Capacity



Note:

Possible responses are 0 – don't know; 1 – completely disagree; 2 – somewhat disagree; 3 – neither agree nor disagree; 4 – somewhat agree; 5 – fully agree.

Source: Based on ENTRANCES interviews conducted for the case study.

5.3.2 Interpretation

Governance and Agency

C1. Inclusive and multiform governance

The factors C1.1 (actor diversity) and C1.2 (diverse governance) were generally rated highly among the respondents, whereas factor C1.3 (intermediaries) ranked close to the middle of the rating scale. The respondents focused on the variation in the CET debate participation, noting aspects such as 1) a sector-based low will to participate in the CET, 2) the lack of participation among larger companies invested in oil, 3) universities benefitting from the CET, and 4) the near-complete lack of participation from the “average citizen”.

C2. Transformative leadership

The factor C2 (transformative leadership) was generally ranked as “medium” by the respondents, with reasoning such as 1) some leaders being more active and visible in various media channels than others, 2) external influence by the ongoing armed conflict between Russia and Ukraine, 3) failings in the public sector and framework conditions, and 4) the lack of participation from the average citizen. There were no particular mentions of specific leaders that drove the CET in the region, but due to the relatively small number of respondents involved in the workshop, it is difficult to conclude that this is indeed the case for the region as a whole. Most of the CET appears to be driven by smaller interest organizations; the main focal point of the Stavanger region is still the oil and gas industry.

The representative from civil society (Museum employee, M) noted a lack of media presence among CET leaders, while leaders from the oil and gas industries are more media savvy. There has also been a demonisation of oil works and an overweight of emphasis on the good and bad sides of the oil and gas industry, rather than emphasizing the potential positive effects of the green shift in the region.

The armed conflict between Ukraine and Russia was brought up and how Europe is trying to be less dependent on Russian gas, and that there seemed to be a lack of leadership and voiced opinions from pro-CET actors and stakeholders (University employee, M).

Participants from the business associations (Business association employee, M1 & 2.) argued that there was a lack of framework conditions and noted failings in the public sector. Delays in implementation were argued to slow down the process towards the CET by not acting fast enough and providing the business sector with opportunities for innovation. The cooperation between the private and public sectors was considered vital for a satisfactory transition, and the tension between these two sectors was brought up as a potentially serious obstacle.

The representative from the NGO (NGO employee, M) was again worried about the lack of representation for the “average citizen.” He claimed that decisions are made in the “corridors of power,” meaning that only a few selects are included and participation in certain networks is necessary.

C3. Empowered and autonomous communities of practice

The factors C3.1 (social needs-focus) and C3.2 (community empowerment) were generally rated as “medium” by the respondents, with special emphasis placed upon reasons such as 1) the competitiveness of bonuses and salaries among oil-intensive companies, 2) a perceived discrepancy between empty words and promises and genuine social action, 3) increased gentrification, 4) an increased need for education and 5) a lack of understanding of the oil sector’s employment-oriented importance by core political parties that are positive to the CET.

Beneficial environmental and possibly psychological effects were brought up as a positive effects of the CET. Class differences between those who work in the oil and gas industries and those who don’t were brought up as negative social effects (University employee, M). And the participant from the university also argued that the CET often just boils down to empty words and promises, under the guise of social action and addressing basic social needs rather than genuine, life-important changes. He notes that while there is a lot of talking and symbolic actions, he has yet to see actual, tangible results.

Employment was brought up as a worry, and the participant from the business association was worried that Stavanger could lose its legitimacy if they are unable to provide jobs for those in the oil sector that are faced with job loss due to the CET. The greatest worry was not just losing the technological knowledge base currently based in the Stavanger region, but possible social unrest as a result of high unemployment (Business Association Employee, M2). This worry was also brought up by the representative from the NGO (NGO employee, M) who considered solving the problem with employment after the CET vital.

Capacity Development Processes

C4. System(s) awareness and memory

The factors C4.1 (systems analysis) and C4.2 (path dependency) were generally rated as slightly low by the respondents, citing reasons such as 1) feigned ignorance in order to avoid facing the CET, 2) a lack of specific types of knowledge – such as technical understanding, 3) the tension between human needs for energy and the destruction of natural ecosystems, and 4) a lack of political will to act and expedience.

C4.1 Baseline analysis and system(s) awareness

The participants from the civil society the understanding of systemic interdependencies are weakest among so-called “*petroholics*” (people with blind connections to the oil and gas industry), strongest among nature conservationist organizations, and somewhere in-between for SMEs.

A lack of political will was considered a barrier by both participants from business associations and the NGO (Business Associations employee, M2, NGO employee, M.) They argued that the lack of regulations is a hindrance for private companies.

C4.2 Recognition of path dependencies

A respondent from civil society states that the most critical obstacle to change and the CET can be summarized as “the general mentality of people and businesses, a general lack of will to change, and greed” (Museum employee, M).

The current energy crisis was brought up as a significant contributing factor delaying the CET. Participants from business associations (Business association employee, M1 & 2) focused on the current war in Ukraine as a significant barrier to the CET. The argument was that Norway should be (partly) responsible for making Europe independent from Russian oil and gas.

C5. Sustainability foresight

Factor C5.1 (knowledge production) was generally rated as high by the respondents, whereas factor C5.2 (sustainability vision aggregate) was rated as medium, and factor C5.3 (alternative scenarios) was rated as medium-high. Factor C5.2 also had some of the consistently largest ranges (1-5), thus signalling a great degree of disagreement among the different stakeholders with regard to how explicit, radical, collectively produced, motivating, and clear the regional sustainability vision truly is. Reasons for these scores include 1) the presence of a broad and diverse range of regional stakeholders, 2) the lack of basic knowledge of ecological coexistence, and 3) the lack of knowledge about the economic viability of the CET going forward. It is possible that the wide range of responses could be due to a lack of clarity and transparency of the regional sustainability visions - i.e., a lack of arenas where the general population can be involved in establishing them. This (a lack of conversational arenas for public discussions of the CET) has remained a concurrent theme throughout the research into the Stavanger CCT. As such, while such transformative visions could be communicated in some arenas (e.g., research and development), they might be mostly absent from other arenas, such as the general population.

C5.1 Diversity and transdisciplinary co-production of knowledge

There was disagreement among the participants as to how much diversity and knowledge exists. The participants from the civil sector and university argued that there is a broad and diverse range of knowledge and insight. This was shared by the participants from the business associations who argued that politicians are not as well informed.

C5.2 Collective vision for radical sustainability changes

The civil society participant argued that nature is often destroyed or demolished in favour of, e.g., wind farms, reflecting his low score on all factors except the radicality factor. The university employee disagreed on all factors.

The business sector (the industry) and large companies such as Equinor were considered to be the main drivers of the CET according to a representative from the business association.

The participant from the NGO was not as positive towards the planning and preparation for the CET and he thought that similar to his previous answers, there are no clear goals or any overarching goals.

There seems to be disagreement between the participants about the state of the transition, or if there is a collective vision at all. Based on the participant responses there seems to be a lack of collective vision, as the stakeholders seem to be acting separately. This might also reflect the fact that the Stavanger region is in a predevelopment phase regarding the transition to cleaner energy, and there are few, if any, overarching strategies.

C5.3 Alternative scenarios and future pathways

Participants were not able to provide information or insight into this topic. It could be argued that they think that the current solutions and pathways are good enough, or they simply lack the information to properly answer this question.

C6. Disruptive experimentation

Although a significant amount of the respondents stated that they did not have much insight into disruptive experimentation practices in the region, this factor (C6) was rated as a medium by the majority of the respondents, with reasoning such as 1) specific developmental projects from largely smaller R&D institutions and companies, 2) the relative lack of interest in participating in such experimental solutions by larger and more established companies, and 3) a relative lack of involvement and drive from the government in motivating and incentivizing such experimental solutions.

Respondents from the civil society and the university were not able to provide much information about ongoing R&D, but NORCE a research institution that works on projects within the fields of energy, health, climate, environment, society and technology was brought up.

Industries such as construction, infrastructure, technology, and energy were argued to be at the forefront of technological solutions, and Equinor was pointed out as an actor where 2000 new jobs are planned (Business association). In addition, clusters were brought up. The participant from the NGO argued that smaller companies were more involved and that large companies have fewer

incentives. There was an agreement that incentives were important to promote investments in the CET.

C7. Innovation embedding and coupling

The factors in this category, C7.1 (resource availability) and C7.3 (reflexive regulation) were rated as medium and low, respectively. Reasons for this were 1) small and ineffective regulations for sustainability being introduced too late to the regional businesses, 2) a general lack of regulation foresight, 3) an overreliance on people locating resources actively and voluntarily rather than putting effort into advertising them, and 4) lack of governmental activity in promoting CET investments among regional businesses.

The participants from civil society and the university could not provide much information about access to resources for capacity development. However, the university employee argued that people have to do their own research to locate resources.

The participants from the business associations brought up industries such as construction, infrastructure, technology, and energy, and Equinor was pointed out as an actor where 2000 new jobs are planned. The participant from the NGO brought up clusters such as NES, Nordic Edge, and Smart Care which are the drivers of innovation.

Relational Factors

C8. Reflexivity and social learning

Factor C8 (social learning) was rated as medium-high by the respondents, who cited reasons such as 1) heavy university involvement in central processes related to reflexive monitoring, and 2) a wealth of knowledge and regulation of the oil and gas industry from the Norwegian Oil and Petroleum Directorate.

The university appears to be heavily involved in research on renewable energy, and it is specified that this is especially the case for monitoring practices. As the university employee notes, Stavanger is a region that is rich in wind and opportunities for establishing wind farms, and monitoring activities in this arena are therefore ample.

The Norwegian Petroleum Directorate (NO: Oljedirektoratet) is a civil service that has good knowledge about the business (oil sector and surrounding businesses) that regulate oil bases in the North Sea. The participant from the NGO brought up meetings between clusters and the contact between them and the government with the intent of gathering information about the state of affairs.

C9. Cooperation across human agency levels

Factor C9 (working across agency levels) was rated as high by the respondents, primarily citing the presence of multiple levels of agency in regional capacity development as a core factor. Simultaneously, some of the respondents noted that there still exists an unfortunate general lack of or underrepresentation of civil society in the CET debate and a notion that there are differences between urban and rural individuals in the degree of emphasis they place upon the CET. As such the high score of F9 should be considered in light of these findings, as the respondents might simply

consider them to be less relevant than other agencies that deal with regional capacity development more specifically.

There is a strong consensus among the respondents from the civil society (Museum employee, M) and the university sector (University employee, M) that multiple levels of the agency are addressed in capacity development. The difference between urban and rural citizens was noted (Business Association employee, M1.) Those who live in the countryside and drive a “diesel car” were considered to be least involved in the CET. “The common citizen” was also thought to be least involved (NGO employee, M), which followed from his earlier comments about how average inhabitants of the Stavanger are being left out of the discussion surrounding the CET.

C10. Cooperation across political-administrative levels

Factor C10 (working across scales) was rated as high by the respondents, but they did provide comments about the line of inquiry and felt that the question was framed in a way that undermined the topic’s complexity.

The participants from civil society and the university both agreed that there is strong dialogue and interaction between different layers of the world society (regional, national, international), but the question was too general to disagree with. The other participants considered cooperation between national and local governments and the importance of initiatives taken by them. Criticism was levelled, again, against the government and municipalities for being slow and creating obstacles for private businesses.

5.3.3 Gender Dimension

No women were represented amongst the stakeholders in the socio-economic and technical components. Several women were approached and asked to participate, but none had the time, and several said that they felt they did not have the necessary knowledge to satisfactorily answer the questions. This lack of female participants reflects the lower number of female stakeholders, and it likely impacted the response and shaped the discussion through-out. None of the participants was able to provide any insight into gender issues and this might represent a significant bias in the results and discussion. Several of the stakeholders hold high positions in their field and the lack of female representation shows that.

5.4 Conclusion

After interpreting and discussing the interviews four different themes were identified.

Theme 1 – Possible lack of perspective-taking and systems thinking

There appears to exist a general tendency among some of the respondents to acknowledge and describe the CET almost exclusively in terms of their own professions and interests – such as finances and energy development from the university, biodiversity and nature from the museum, and business development and interests from the business associations. This suggests that there is a general need for the promotion of more *systems thinking* practices in regional institutions – that is, increasing the understanding of how changes in one societal system (e.g., financescapes) can create changes, positive and/or negative, in other societal systems (e.g., naturescapes, landscapes, cityscapes). The analysis shows that there are significant tensions in the region that exists somewhere at the crossroads between infrastructural development on one side (e.g., wind farms for

the production of renewable energy), and the protection and conservation of nature and biodiversity on the other. These two issues are often opposed to one another, but that does not necessarily mean that there is no 'golden middle road' to potential interdisciplinary decision-making. Hypothetically speaking, there may be a variety of good solutions both in the developmental phase as well as in theory that could be improved upon and implemented safely if allowed to be scrutinized among interdisciplinary experts from a variety of academic fields and professions. However, whereas renewable energy production and biodiversity conservation are both highly important, there appears to exist relatively little dialogue and understanding between the stakeholders involved with them – possibly suggesting a need for better communication practices or shared social professional arenas in which such matters can be discussed properly, or – if any such arenas exist – they need to be advertised or brought to public attention more clearly.

Theme 2 - Our 'Common Future'? Worries about regular citizens and their lacking involvement in the Stavanger CET debate

A common worry was the lack of representation the “average citizen” in Stavanger has. By average citizen it is here meant; a resident of Stavanger that is in no way directly involved in the municipality, works in coal- or carbon intensive industries, is employed at the university, or is employed in an NGO or business association. These people have little to no contact with or information about the CET or the possible ramifications stemming from it. There are also no natural venues for the average citizen to appear, which is practically shutting them off. The CET is considered inevitable, but when it happens a large number of citizens may find themselves out of a job and lacking the necessary skills required for a new clean energy sector. The participants from the business associations were aware of this possible situation, and they were worried about the possible social unrest as a result of increased unemployment in Stavanger. They did not, however, suggest any solutions for this possible problem facing the Stavanger area. The need for education both for current and future employees in and around Stavanger should also be noted. This was something the participants focused on, and local businesses might be helped by focusing on further and continuing education for employees currently working in carbon intensive jobs.

Theme 3 - Nature - a pushover

Another core theme in the above discussions is the tension that exists between the human demand for more energy on one side, and the conservation of nature and biodiversity on the other. This issue was also brought up by the municipality employees in the ENTRANCES Stavanger CCT Sociocultural Component Report. A representative from Naturvernforbundet Rogaland (The Norwegian Society for the Conservation of Nature, Rogaland) was contacted but was unavailable for an interview. She claimed that Stavanger was lacking behind in regard to the CET and the effort to transition.

Theme 4 – The possible need for action in regulatory authority

A common theme throughout the interviews with the participants from the business associations (Business Association employee, M1 & 2) was the lack of foresight in regulations by the municipalities and government. Both members claimed that the government is aware of the challenges faced and what is necessary but is still too slow. This leaves both small and large companies willing to invest in the transition and future technologies unable to do so. This was considered a danger facing newly established and larger companies. This can be addressed by the regulatory authority in Norway, and should probably be cooperation and discussion between national

and local governments and Stavanger-based companies involved in the CET. As mentioned earlier there seems to be a lack of oversight and no clear goal for the Stavanger region.

CHAPTER 6

CHALLENGES, COPING STRATEGIES & GENDER

6 Challenges, Coping Strategies & Gender

This chapter is articulated in a paragraph for each of the territorial challenges identified by the case study team and by a final paragraph dedicated to a conclusion of the case study team. Each challenge is articulated as follows:

- (a) a presentation of the challenge itself
- (b) a presentation of the coping strategies adopted so far to deal with the challenge
- (c) a presentation of the gender-related aspects of the challenge and the coping strategies
- (d) a discussion of the challenge based on the research results obtained with the MAF application

Challenge. A challenge is composed of two elements: (i) a current situation (as the territory makes sense of it); (ii) the specific desired outcome(s) of a process intended to change that existing situation. Please note that a challenge is a social construct as the sense of the current situation only exists in a given social context (i) and that the outcome is desired by the territory itself. It is worth noting that we focus here on territorial challenges, i.e., challenges for the CCT from the perspective of the CCT. Depending on the state of awareness and compactness of the territory, the degree of clarity and definition of the challenges may vary a lot. In this respect, depending on the cases, the territorial challenge(s) may be rather vague or well structured (e.g., also including indicators to assess the success in achieving the challenge), may be several, few or just one.

Coping strategy. A coping strategy is defined as the strategy adopted to cope successfully with a (territorial) challenge. For each challenge, there can 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; (ii) actions undertaken.

6.1 Challenge 1: Regional Oil Identity Crisis

6.1.1 Challenge description

Current situation

A core issue for the region, and perhaps the country of Norway as a whole, is the increasingly divided view of oil as both a resource and a major pollutant. Whereas several individuals are either pro- or anti-oil, there is a greater amount of individuals who share a more ambivalent relationship with the resource. As such, Stavanger can be described as having a regional identity crisis, in that it both wants to 1) maintain and even intensify the search for and production of oil and gas, while simultaneously 2) wanting to increase its environmental profile and shift its identity away from being the “oil capital” to becoming the “energy capital” of Norway instead. In other cases, Norwegian oil is advertised as sustainable, often on the grounds that the industry claims to continuously be cutting its emissions, discrediting other energy sources as unviable, or simply labelling other producers as less sustainable than themselves^[1].

Desired outcome

As the situation stands, it is difficult to pinpoint exactly what the region desires in terms of the outcome of this challenge. Some would like the oil industry to keep developing and going forward (status quo, business-as-usual), others want a blend of oil, gas, and renewable energy structures, and others again want to radicalize Norwegian oil by phasing it out in favour of other, greener solutions exclusively.

6.1.2 Coping strategies

Coping strategy 1: Laissez-faire, business-as-usual, status quo

Some members of the region want to maintain the status quo of oil, citing reasons such as its overwhelming importance to the Norwegian economy and employment, few (if any) equally powerful and effective alternatives to oil and gas, a nostalgic view of the golden age of oil, and so on. This coping strategy involves social inaction, pro-oil lobbyism, and – in some cases – establishing social media profiles where pro-oil research and media commentary are provided to those who follow them (e.g., *Oljebrølet* (EN: The Oil Roar) - a counterweight to the pro-green energy *Klimabrølet* (EN: The Climate Roar)).

Coping strategy 1.2: One foot in each camp

Other members of the region adopt a “middle ground” between pro-oil and anti-oil, in the sense that they can see positives and negatives with both sides of the debate. Whereas they are capable of acknowledging that green alternatives to oil and gas sound attractive, they are also apt to emphasize that oil and gas are demonstrably more powerful energy resources with great historical and financial importance to the region. As such, this coping strategy is also characterized by wide-ranging social inactivity and is more likely to leave important decision-making processes to “those who are meant to deal with such matters”.

Coping strategy 1.3: Radical entrepreneurship

A third coping strategy is to actively get involved with the subject of regional oil activity and to proclaim and promote viable alternatives to oil and gas in the region. The Stavanger CCT does benefit from certain green start-up businesses and is also implementing the green shift in the region through the establishment of specific political-administrative working groups (e.g., the Triangulum project). These groups often tend to face obstacles, however, largely in the form of pro-oil lobbyism – which holds a very strong position in the political layers of the region.

6.1.3 Gender dimension

It is difficult to attribute the different coping strategies to specific genders, as this was never a subject of discussion during the interviews conducted. Research on gender differences in the support of environmental policy measures shows, however, that women are more positive than males on average – although, it should be noted, males are generally more motivated than women to act pro-environmentally if the action taken can demonstrably lead to a better environment^[2]. It is therefore possible to conclude that females are slightly more likely than males to adopt coping strategies 1.2

and 1.3. That said, gender differences in pro-environmentalism in Norway remain rather vague, and the authors of the abovementioned research state that the results are subject to scrutiny.

6.1.4 Discussion

The challenge of the regional oil identity crisis is perhaps one of the most well-known, deeply ingrained and complex issues facing Norwegian society today. As the country (and, by extension, the Stavanger CCT) has made itself almost completely reliant on oil and gas for financial and employment purposes, there is little to suggest that the region will see any immediate foreseeable change or transition towards greener alternatives in the near future. The oil and gas industry also enjoys the benefits of a strong, financially well-off lobby that, according to some of our interviewees, has strong personal connections to central regional politicians and admins – thus meaning that the proverbial other side of the debate is left with very little influence over how the region develops.

There is a likelihood that as green technology keeps being developed across the globe, and fully viable alternatives to oil and gas are starting to become mainstream, the Norwegian industry will eventually relent and adapt. This appears to be the case with one of Norway's biggest former oil companies – Statoil – which changed its name to Equinor as well as its branding from an oil company to an energy company in 2018. Although the company has been criticized for greenwashing practices when it did this^[3], it can still be argued that it is a step in the right direction – as well as an indication that things are slowly changing in terms of transitioning from oil and gas to greener alternatives. However, as the oil and gas industry is fundamentally technocratic - i.e., relying on technological development – it is highly likely that very little progress will be made in the transitional stages until fully viable and financially lucrative alternatives to oil and gas are found or developed.

6.2 Challenge 2: Funding Issues

6.2.1 Challenge description

Current situation

The region demonstrably struggles with subject-specific funding issues, primarily for environmental protection. The reasons for these finance-oriented difficulties are varied, but it seems that the difficulty of monetizing environmental costs is used as a justification or excuse for not maintaining or upkeeping it. Some of these funding issues are also related to differing views among the Stavanger CCT and national guidelines: Stavanger County is still expecting funding from the government for the green shift (NO: det grønne skiftet) to cover the costs of businesses that are involved in the oil industry. The government still expects that Stavanger will reach its goals and argues that due to the technological knowledge in Stavanger this should be possible. A core question that was brought up with our respondents here revolved around the cost of environmental degradation. The financial costs of e.g., building projects can be budgeted and are predictable, but environmental costs are not. In addition, adding the financial costs of environmental concerns would increase costs and make such projects unviable. The oil industry can also be discussed in relation to this. No outside pressure from the government is exerted to hold the oil industry responsible for environmental damages. This could be a result of the financial interests the governments, both national and locally, have, resulting in inaction from both sides. Furthermore, reasons such as foreign oil producers being more detrimental to the environment compared to Norwegian companies might result in national producers being given a pass. Historically the financial models that have been used in the private sector have

never reflected the above-mentioned issues. There are limited financial resources in the private sector and if the long-term costs are included in a project, then it will not be considered financially viable, and the proposed project will not survive global competition. This was said to reflect a common argument around the Norwegian oil industry; that if Norway were to stop producing then other companies/countries with possibly, more lax regulations would produce the oil/gas that Norway would not.

Desired outcome

Naturally, as the challenge is completely reliant on the overall lack of funding practices for environmental protection, a system that allows for such funding to occur needs to be implemented. It is also worth noting that the respondents themselves agreed that once nature had been sacrificed for a building project, it was gone – perhaps forever. As such, a theoretical funding system as suggested above needs to refrain from the conventional “carbon tax” approach that e.g., airlines use, where a higher cost of service justifies or exempts the invasive party from any responsibility resulting from emissions or the destruction that is caused by the project in question. It should furthermore emphasize restorative properties and promote strategies in which the project benefits nature rather than exclusively harming it. Such projects (often referred to as *økotun* (EN: eco-orchards) often make it a key priority to integrate nature protection in their planning – ranging from using exclusively sustainable building materials, utilizing smart technology to reduce energy consumption, installing insect hotels and promoting the growth of local flora for pollinating bee species, and so on.

6.2.2 Coping strategies

Because this is a challenge stemming from the lack rather than a presence of a proper financial system that allows for the restoration and maintenance of natural areas, it is difficult to describe coping mechanisms for it. However, the current situation likely means that local inhabitants are expected to cope simply by accepting what the local authorities decide to do.

6.2.3 Gender dimension

As this is an observed challenge for the entirety of the region, and perhaps even a national issue, the abovementioned situation affects both genders, likely equally.

6.2.4 Discussion

The challenge of lacking funding is not a new one, and generally remains a core challenge for any activity or sector that requires action to instigate positive change. There is no easy answer as to how such a funding arrangement can and should be introduced but emphasizing the sheer danger of natural destruction and a lack of environmental protection should become a much higher priority than it is today. Nature is inarguably the most important component of biological life on Earth, and wanton destruction of it without restorative practices will inevitably lead to disastrous consequences for mankind – not only in the Stavanger CCT but on a worldwide scale. It is therefore imperative for the region to introduce knowledge-building arenas where the importance of nature and a healthy relationship with it is highlighted. As mentioned previously, the Norwegian building industry is now experimenting with the construction of eco-orchards, where such practices are prioritized.

6.3 Challenge 3: Nature Comes Last

6.3.1 Challenge description

Current situation

A core, central recurring point in the focus group narrative revolves around the misuse of nature and natural resources. One of the main points of concern revolves around the impact of the increasingly large fish farming industry on coastal marine life such as seaweed and kelp. Being a coastal city, Stavanger has always had a close connection to the sea in terms of financial growth, but the respondents also note that the ocean is frequently abused by those who choose to utilize it for financial gain. Emissions and runoff from fish farms in Norway are well-documented and can have hazardous consequences for various forms of marine life – even outside the fish farm itself due to various forms of organic material and nutrients sinking to the seabed beneath the farm itself in the form of pollution. Additionally, farmed fish can escape their confines to breed with wild fish – which is especially the case for species such as salmon or trout. This in turn can cause the spread of unwanted or weaker genetic materials, which in turn might have detrimental consequences for future generations of salmon and trout in the region. The respondents furthermore pointed to an ongoing trend where nature and biodiversity would always be 'second-in-line' or less important than economic and financial growth – hereunder, exemplified through the expansion of infrastructure such as wind farms.

Desired outcome

As is the case in a modernized world, the need for more infrastructure and energy is paramount to human survival. However, expanding such infrastructure comes at a significant cost – natural areas are blown up, built down, tamed, and appropriated for human living and technology. Often, entire ecosystems and local biodiversity pay the heaviest cost for such anthropogenic activity. The respondents generally expressed pity that such practices were being made, and some additional resources from the previously conducted ENTRANCES Stavanger document analysis also suggested that many of the natural areas in Norway were utilized by energy companies that were established by foreign companies who did not give anything back to the local community that housed their constructions^[4] – primarily in the shape of wind farms. It is therefore likely that future acceptance of such practices relies on 1) a significant increase in the implementation and practice of nature conservation practices when considering future infrastructure projects, 2) additional technological development aimed towards making the infrastructure more nature-friendly (e.g., by developing solutions for wind farms to not decimate local bird and bat populations), 3) implementing financial solutions where foreign companies that wish to establish themselves in Norwegian natural areas take appropriate measures to support the local community fairly, and 4) continuously striving to adapt and develop in accordance with scientific findings on the effects of anthropogenic infrastructure on natural environments.

6.3.2 Coping strategies

This particular challenge appears to involve a great degree of frustration – both among the local population and the respondents from the focus group. The frustration appears to largely be twofold: on the one hand, people are frustrated that natural areas close to their homes are destroyed in favour of wind farm infrastructure. On the other hand, they are also frustrated that the wind farms that are built are made by foreign companies, that do not exhibit any interest in giving anything back to the

local population. As such, there appears to be a component of frustration related to the overall perceived value of keeping the such infrastructure of Norwegian nature. As such, it is possible to conclude that coping primarily involves accepting the situation as it is, albeit with a great degree of frustration.

6.3.3 Gender dimension

As this is an observed challenge for the entirety of the region, the abovementioned situation affects both genders, likely equally.

6.3.4 Discussion

As the current situation involves a great degree of frustration among the local population, and due to the fact, that building specific forms of invasive infrastructure is shown to lead to potentially unforeseen consequences for local biodiversity, the need for technological development is clear. Research on the improvement of wind turbines should be accelerated, and their damaging properties on biodiversity and natural areas should be ameliorated. Furthermore, as the infrastructure appears to solely benefit foreign interests, policies should be introduced in order for the local government and population to benefit equally. Altogether, these factors are likely to contribute to the acceptance of green energy infrastructure.

6.4 Challenge 4: Tensions Between Private Industry, National and Local Governance

6.4.1 Challenge description

Current situation

During the semi-structured interviews, several participants from business associations argued that the local municipality in the Stavanger region and the national government is too slow in enacting regulations and new framework conditions for both large and small companies willing to invest in green technology such as wind farms, solar panels, and similar technology. These delays were claimed to put companies in a situation where they are lagging behind companies based in other countries. Scotland was brought up as an example by a participant. Several participants worry that the lack of updated regulations and framework conditions would result in a loss of technological knowledge and that Norway would be surpassed by other countries. They argued that if the Norwegian government and local municipalities did not speed up the political decision-making businesses would potentially be forced to leave the Stavanger-region, and this would, in turn, lead to increased unemployment. Increased unemployment will then lead to social unrest and not only a loss of know-how. During the workshop and data gathering for the socio-cultural component the question.

Desired outcome

It seems clear that for companies the desired outcome is looser regulations and for companies to be able to act as quickly and efficiently and therefore, according to their perspective, be able to continue business as unhindered as possible. The problem, according to one participant, was that it is impossible to build anything or have anything done without applying it to the government or local municipality. The need for strict regulations was brought up by participants during the data-gathering for the socio-cultural component and municipality employees argued that lax regulations had resulted

in negative consequences for both work environments (i.e., work injuries) and irreparable damages to the environment. They argued that it was important for both local municipalities and the national government to have oversight so that private companies do not let financial gains override acceptable work environments and so that nature is not side-lined.

6.4.2 Coping strategies

This situation is at an impasse and representatives of business associations in the area argue that without framework conditions and regulations the situation is hard to resolve. It should be mentioned that none of the participants claimed that the politicians were ignorant of the problems and that nothing was being done. Participants did argue that politicians had information and that communication is taking place. The main concerns were the time it takes, and that the regulatory government needs to be faster.

6.4.3 Gender dimension

There are no known gender dimensions here as all framework conditions and regulations are independent of gender.

6.4.4 Discussion

It is understandable that companies that are interested in participating in the CET desire expedience and are keen on framework conditions and regulations to be provided. Arguments put forth by participants seem important and valid, such as the danger of losing the technological know-how to other companies and other countries. The risk is that investments in new and existing companies are reduced or stopped so that the necessary knowledge and competence are lost. This might result in a decrease in new work opportunities, an increase in unemployment, and a decrease in tax revenues for the Stavanger-region which it benefits from at the moment. Social unrest as a result of unemployment and the resulting strain on the welfare system that Norwegians count on and rely on should not be underestimated. However, it is also important that worker safety and nature preservation are not ignored so the importance of regulations should not be underestimated even though the time and potential cost can be a detriment to, maybe especially, smaller companies in a start-up phase. It is important for the national government and local municipalities to come together with the industry and have a close dialogue and exchange information. This would likely benefit both parties. For the government and municipalities, it ensures a focus on worker rights and the preservation of nature can be ensured a “place at the table” as it were. For companies willing to invest in CET it ensures that their needs are heard and that the decision-makers are provided with information as to what is most needed and what would benefit them most. In the end, this question relies on clear cooperation between the private industry and politicians.

CHAPTER 7

CONCLUSIONS

7 Conclusions

As mentioned in the previous section of the report, the Stavanger CCT is facing deeply engrained, systemic, complex issues that largely appear to exist at the crossroads between financial interests and conservation activities – largely fuelled by social and political inactivity and fundamental disagreements. Much of this appears to stem from 1) a regional identity crisis about the maintenance or cessation of oil and gas, and 2) an overall lack of communication between the regional inhabitants, who could and should all be considered relevant stakeholders in the public debate surrounding the region and its development. This, in turn, is likely a result of few –if any – arenas where such topics are discussed openly, and where public expertise and knowledge can be shared, as well as what appears to be a severely lacking degree of social involvement in matters concerning the green shift in the region. A complaint and concern have been the lack of inclusion of the “common people” and the workers involved in the oil and gas industry. The concern has been two-fold: 1) that the inhabitants of the Stavanger region are to a certain degree unaware of the changes happening in the region, and 2) that they have no platform from which to participate and receive information about the CET. This might result in a populace that is unprepared for a significantly different labour market. The following consequences are a possible increase in unemployment and the societal problems that entail. Several suggestions were made by regional stakeholders and focus was put on (further) education by businesses currently involved in the oil and gas industry and those that have an interest in the CET. The Norwegian Labour and Welfare Department was also mentioned as an actor who can help alleviate possible future problems and possibilities associated with the efforts to change the Stavanger region into a green city with a focus on clean energy.

While these issues are complex, they are not likely to be particularly unique to the region as the disconnect between finance and conservation is neither new nor exclusively an issue that solely exists in Stavanger. It is rather a possible illustration of what is commonly called a ‘*wicked problem*’ - persistent and insoluble issues that are symptomatic of deeper (societal) problems, possibly irreversible, unable to provide alternate solutions or scenarios, signified by contradictory certainties, and contain deeply entrenched interests. As an example, the region appears to overwhelmingly prioritize maintenance and upkeep of oil and gas as well as expansion of infrastructure and renewable energy at the cost of conservation efforts and invasive actions in natural areas. The municipality is aware that this is occurring but is powerless to stop it due to financial incentives, powerful lobbyism, conflicting interests, complex political guidelines, a lack of understanding of responsibility distribution, and so on - i.e., a wicked problem. The result is short-term financial gain and employment opportunities for the region, but also a possible long-term biodiversity extinction, irreversible natural damage, dissatisfied inhabitants in areas that become subject to industrialization, expansion, gentrification, and so on.

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APPENDIX

9 Appendix

9.1 Regional Delineation

Table 8 – Case Delineation

CCT	CCT (NUTS 3)	LMA	PAR
NOVRNJ4/3 Stavanger/ Sandnes area	NOVRNJ4 Stavanger NOVRNJ3 Sandnes NOVRNJ2 Sola NOVRNJ1 Randaberg	NOVRNJ4 Stavanger NOVRNJ3 Sandnes NOVRNJ2 Sola NOVRNJ1 Randaberg	NOVR Rogaland

Source: own delineation.

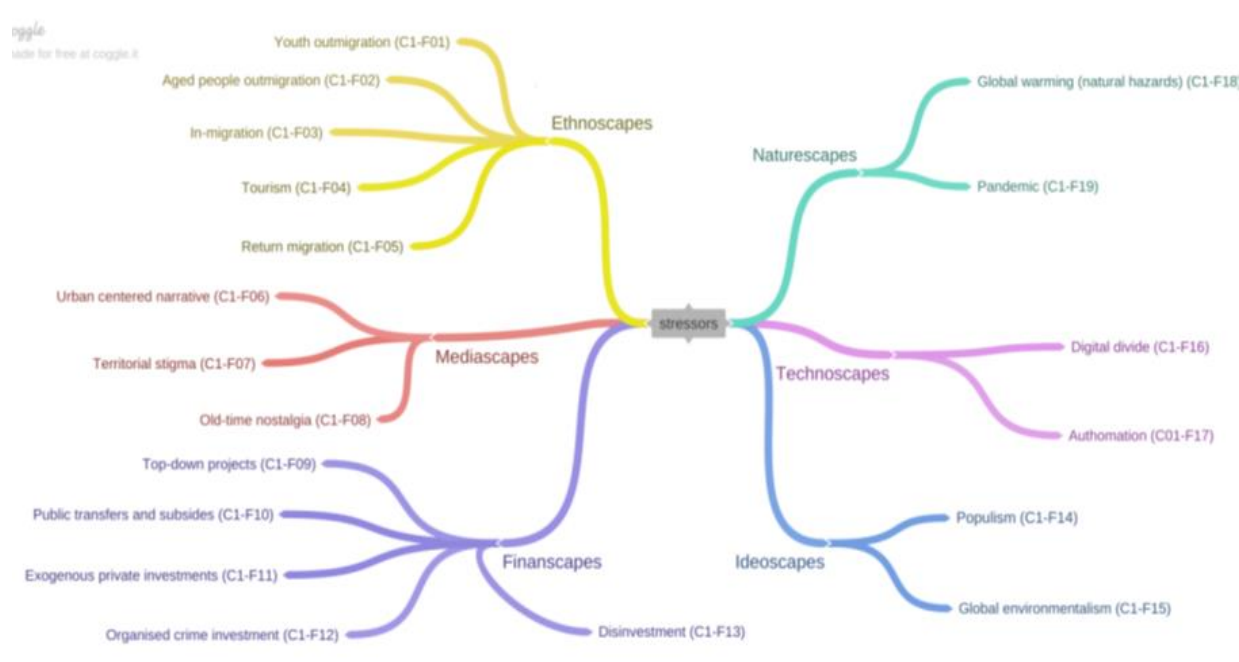
Table 9 – Municipalities in CCT

Community	National Identifier	Area in km ²	Population	Population Density	Average Age
Stavanger	NOVRNJ4	71	143 574	2022	38.8
Sandnes	NOVRNJ3	304	79 537	262	37.4
Sola	NOVRNJ2	250	26 582	106	37.6
Randaberg	NOVRNJ1	716	11 053	15	38.6

Source: Statistics Norway and own calculations

9.2 Socio-cultural factors

Figure 8 - Socio-cultural factors



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

9.3 Socio-psychological component

Table 10 - Survey questionnaire used in the Stavanger 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.
		MO_RE01	I can deal with whatever comes

Moderators	Resilience (Campbell-Sills and Stein 2007)	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 (less 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 11 – Economic Data Overview

	LMA	PAR	Norway	EU28
Labor Force Population				
total	132,303	241,587	2,726,000	245,797,412
Unemployment Rate (%) ^{a)}				
Total (ILO)	4.3	3.9	3.4	6.9
Employment Shares by Industries (%)				
Manufacturing	0.91	1.03	8.5	13.7
Services	1.7	4.7	47.5	74.1
Mining and utilities	0.29	0.7	8.7	1.5
Gross Value Added Total (Bn Euro real)	-	265	3,162	14,240
Gross Value Added Shares (%)				
Manufacturing	-	1.1	9.5	15.9
Services	-	3.6	51.5	73.7
Mining and utilities ^{b)}	-	0.5	6.4	3.3
GDP per capita (Euro)	-	109,925	69,925	31,084
in relation to country Ø	-	157%	-	-
in relation to EU Ø	-	354%	225%	-
Disposable Income per capita (Euro)	-	-	19,129	16,578
in relation to country Ø	-	-	-	-
in relation to EU Ø	-	-	107%	-

Notes: Data refers to 2018 because data on the NUTS 3 level is only available until 2018. The regional statistics refer to a different data vintage than the national/ EU data, which already incorporate data several revisions.

^{a)} sector covers NACE classification B, D, E (see Table 12).

Sources: Eurostat (nama_10_gdp, nama_10r_2hhinc, tps00203, lfisa_egan2, nama_10_a10) and own calculations.

Table 12 – 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 9 - The timeline of decarbonisation process in Stavanger case study.

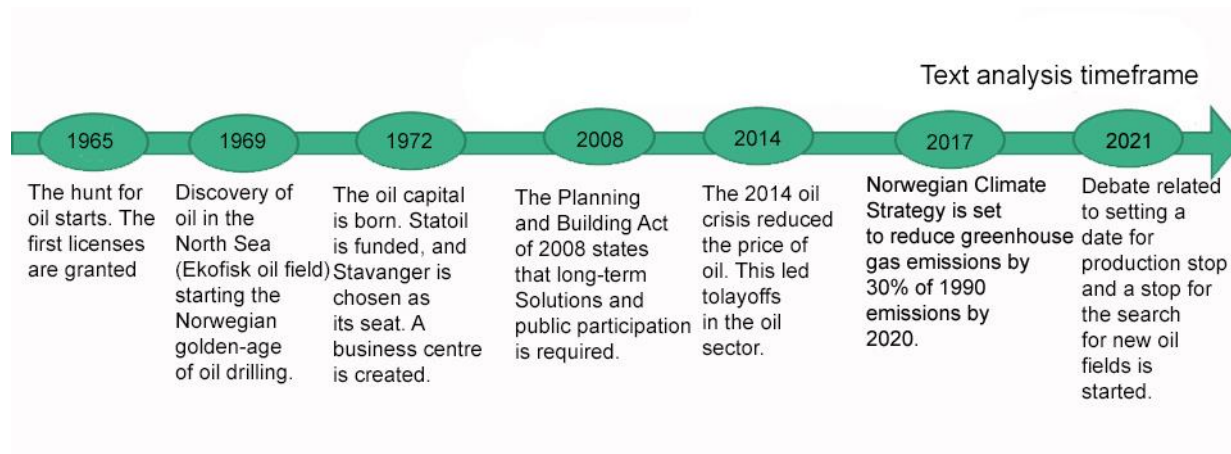


Table 13 - List of keywords used for text material search in Stavanger case study.

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"> -Rogaland County -Municipalities Randaberg, Sandnes, Sola and Stavanger -Haugaland Kraft -Lyse AS -Landsorganisasjonen i Norge -Norges Naturvernforbundet -University of Stavanger -Norwegian Research Centre AS -Equinor ASA -Aker Solutions ASA -Næringsforeningen i Stavanger-regionen -Framtiden i våre hender -Natur og Ungdom -Stavangerregionen Havn IKS 	<ul style="list-style-type: none"> -Oil Stavanger -Green shift Stavanger - Oil Rogaland - Climate Stavanger - Nature and Environment -Oil/gas energy supply -Greenhouse gas emissions -Green transition 	<ul style="list-style-type: none"> -Norway -Rogaland -Stavanger -Sola -Randaberg -Sandnes 	<ul style="list-style-type: none"> - Immigration and emigration -employment Stavanger -financial impact of oil Stavanger, -employment Forus -Stavanger oil business -environmental damage from oil -oil and environmental decline -oil and gas attitudes Stavanger -green shift attitudes Stavanger

Source: Own elaboration.

9.6 Socio-ecological and technological component

Table 14 - 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	Q14	"Transition planning/implementation makes use of future scenarios with alternative development options, based on stakeholder

	scenario s		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	organisa tional adjustm ent	– 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/ti ers	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	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

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	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

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	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

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
	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

Strongly Disagree	
-------------------	--

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 Strongly Disagree	2 Disagree	3 Neither agree nor disagree	4 Agree	5 Strongly Agree	Don't Know

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 Strongly Disagree	2 Disagree	3 Neither agree nor disagree	4 Agree	5 Strongly Agree	Don't Know

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 Disagree	3	4 Agree	5 Strongly Agree	

Strongly Disagree	Neither agree nor disagree	Don't Know
----------------------	-------------------------------	---------------

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	Don't Know
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	

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



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