



Beyond oil:
Refuelling transformation
Bergen, October 17 & 18

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In order of parallel sessions



Centre for Climate
and Energy Transformation



UNIVERSITY OF BERGEN

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Tuesday 17th of October

Parallel session 1

1a Networks of energy

Unravelling the UK Oil Complex: Evolution and durability of territory-network relations over time

Gavin Bridge & James Marriott, University of Durham

Determining the scope and reach of the oil sector is an increasingly important analytical problem in the context of efforts to decarbonise, as is unravelling the political-economic mechanisms that reproduce oil's social power. We explore these problems in the context of UK oil and gas. In popular imagination and government policy, the 'UK oil sector' refers almost exclusively to upstream activities of exploration and production, producing a geography of oil centred on the North Sea, and an historical narrative of oil's significance that begins (and ends) with offshore production. We provide an expanded account of UK oil and gas via the concept of an 'oil complex', offering an analytical approach for investigating oil's territorial embeddedness and socio-political incumbency. Understanding the oil sector's scope, and the geographies of the body politic through which it is reproduced, is vital to moving rapidly beyond fossil fuels. Applied to the UK, our approach involves decentering offshore production to place it alongside four other territorial assets - markets, state capacity, finance, and trade – that reproduce global oil networks as part of a territorial oil complex. We show how assets underlying this territorial complex have been constructed over time, embedding the UK in wider geographies of trade, investment and political power that are historically and geographically dynamic. Our expanded account suggests a more durable oil complex than revealed by examining offshore extraction alone. It also shows the UK oil complex's broad role in reproducing contemporary global oil networks, and how efforts to decarbonise the UK oil sector need to extend well beyond domestic extraction.

Mapping the Oil Elite Complex: Unpacking the embeddedness of institutional and elite social networks of lead oil and gas firms in the UK

Alexander Dodge; Nana De Graaff; Thomas Janssen & Tiago Teixeira, Norwegian University of Science and Technology

This study focuses on how lead oil firms are embedded in the UK oil sector over time (2000-2020). Throughout this period the UK oil sector has witnessed the entry and exit of different players ranging from international oil companies, upstream independents, national oil companies, and private equity. Rather than analyzing at a institutional level how the exit and

entry of different firms shapes firm-territory relations, as the current literature traditionally does, this study proposes to additionally look at the ways in which corporate elites mediate firm-territory relationships over time, through social networks that span both within and across different firm and non-firm institutions and are embedded within and across different territories. To do so, this paper employs the BoardEx database and Social Network Analysis (SNA) mapping techniques to reveal how oil firms via the personal ties of their directors have been historically tied to wider networks of a) global and national corporations b) financial actors (banks, equity funds, etc.), c) state and public agencies, and d) societal networks (from think tanks and research institutes to non-profits) and how the composition and geography of these ties has changed over time. With this approach our study generates important insights into how the changing composition and geography of elite social networks shapes firm-territory relationships over time.

Critical raw materials in the 'age of decarbonisation': How local dynamics affect the trajectories of oil, natural gas and mining sectors in select African countries

Mohammed Adil Sait, London School of Economics and Political Science

Much of the literature on natural resources management (including from the perspective of human, environmental and resource geography) conflates the experiences of oil and gas producing with mineral rich countries, especially across the diverse African continent. Particularly in relation to the 'resource curse' hypothesis. Yet, there are distinctions that require closer examination. In the context of the global shift towards decarbonisation, a common claim in the literature is that 'critical raw materials' (CRMs) can replace oil and gas markets in the medium term. CRMs include minerals such as lithium, cobalt, nickel, bauxite, alumina, and tin, tungsten, tantalum and gold ('the 3TG') that arguably form the 'material basis of modern technology'. However, although oil and gas supply and demand patterns are uncertain and volatile, CRM demand is evolving, less well-understood, and insufficiently regulated. Compared to well-developed existing oil and gas markets, supply chains, and policies, there is still a need to demystify the definitions, classification, market structure, and regulation of CRM supply chains. The relationship between multinationals (MNEs), the state, and local actors and stakeholders (including local communities) also varies significantly between oil and gas and CRM-mining, with implications for policy implementation and the quest for sustainable, inclusive development in African countries. Drawing on LSE doctoral research, including fieldwork in Windhoek, Namibia, this paper seeks to explore how multi-stakeholder relations impact on the perceptions of and prospects for the shift from oil and gas to low-carbon futures. The paper's focus is specifically on how local stakeholders make choices and contribute to national and local economic development discourse and practice. Thus, the contribution of this comparative research is to offer a reappraisal of the main assumptions underpinning the shift away from oil and gas dependence (towards CRMs) and examine how top-down economic investments and interventions are being challenged at the local level.

1b Between policy and practice

Perceptions of decision criteria in climate policy: What is important to whom?

Mari Helliesen; Gisle Andersen; Thea Gregersen & Endre Tvinnereim, NORCE

In this study, we analyse (in)congruence in perceptions of key criteria for policymaking between three groups with different societal functions. We elicit the prioritization of decision criteria for choosing climate mitigation measures to assess whether respondents support incremental or radical climate policy making. We use survey data from the Norwegian Citizen Panel, the Norwegian Panel of Elected Representatives, and The Norwegian Panel of Public Administrators. Citizens, elected officials, and bureaucrats were asked to rate the importance of ten different aspects of climate mitigation measures. The ten considerations range from cost-effective, economy, and employment to public support, inequality, and nature as well as emission reduction, global responsibility, technology, and experts.

Preliminary results indicate significance differences between the three panels. In general, citizens and elected officials are more congruent with each other than they are with bureaucrats. Among the three groups, elected officials generally rate the different criteria as more important aspects of decision making than citizens and bureaucrats do.

Bureaucrats consider the effect on the Norwegian economy as the least important decision criteria. Elected officials and citizens, on the other hand, rate the display of Norway's global responsibility as the least important consideration. Bureaucrats, elected officials, and citizens alike assign most importance to whether the measure develops technology that can lead to large-scale emission reductions. This latter finding aligns with previous research showing comparatively high levels of technology optimism in Norway, i.e., that Norwegians have a strong belief that new technology will solve climate challenges.

Beyond Sprawl? A critical interrogation of current suburban sustainability strategies

Per Gunnar Røe, University of Oslo

This paper deals with ongoing urbanization and suburbanization processes, and the challenges and opportunities for developing sustainability strategies for city regions. Based on findings in a newly finished research project, the paper focus on the transformation of suburban areas and suburbanization processes, that are fueled both by sustainability policies and private developer led initiatives and strategies, and that have substantial implications of a variety of social groups in an increasingly diverse suburban landscape. contrast to urban cores which regularly are used to showcase sustainability strategies (i.e. car-free initiatives, public transport investments, micro-mobilities and energy efficient office

buildings), the suburbs have until recently received little attention, although substantial parts of cities are suburban and the spatial structure of suburbs and social practices of suburbanites have profound effects on travel patterns and energy use for urban regions. This is about to change, but mainstream and current sustainability strategies for cities as well as suburbs, tend to focus on technology, built environments, generic design models and top-down planning, leaving out important societal and social implications. The paper interrogates such strategies, focusing on the case of regional planning in greater Oslo, and propose alternative or additional theoretical perspectives or knowledges that may inform strategies for developing sustainable and socially just suburbs.

Composite Leanings. A critical reflection on the policy implementation for the decarbonisation of the UK's industrial clusters

Guy Finkill, University of Manchester

Rapid decarbonisation is required across every element of society. However, some sectors are proving harder-to-abate than others. High-emitting processes are often concentrated in industrial clusters that share common infrastructure for process and cost-efficiency reasons. Carbon capture and storage (CCS) across its various iterations has been touted as an effective means of drastically reducing emissions from hard-to-abate sectors such as industrial processes.

Discourse has long played a role in setting policy agenda; the emergence of the net-zero discourse looks set to impact the policies implemented as nations pursue net-zero commitments through a portfolio of decarbonisation efforts. Using an Overton Window, we display a heuristic visualisation of the overlapping and contesting discourses emergent in how policymakers consider methods of engineered CCS, including GGR, as a mitigatory tool in the UK government's Cluster Sequencing Process. By using a variance of framings based on the body of literature on the governance of decarbonisation, it has been possible to lay out a spectrum of engineered carbon capture implementation while assessing the contesting motivations and discourses that underlie each framing. Our findings point towards UK policy and management of decarbonisation in the early 2020s aligning with tech-optimist 'Scenario 3 – High innovation' as outlined in the UK's 2021 Net-Zero Strategy. However, early policy decisions have indicated that there is an underwhelming level of state support or incentivisation for facilities that could carry the potential for delivering large quantities of GGR such as the Drax bioenergy plant, adjacent to the Humber Cluster. Identifiable disparities between bold government rhetoric and near-term policy action heightens the potential for delay in emissions reductions and thus contributing to an overshoot scenario. Our discussion draws out dangers of mitigation deterrence and climate delay implicit in the implementation of the CSP and the associated business models.

Make a u-turn if possible: The GPS and its three advisory comrades in climate policymaking

Bror Kristian Raanaas Tandberg, Norwegian University of Life Sciences

Climate Advisory Bodies have been established in more than 40 countries as an instrument to transition to low-carbon societies. This study compares the highly institutionalised climate advisory body in Denmark with the more loosely structured climate advisory commissions in Norway, using a structured focused comparison. By doing so, key stakeholder perceptions have been investigated. Nine semi-structured interviews were conducted with stakeholders with insight into the climate policymaking process, four in Denmark and five in Norway. The study applies three lenses to study the influence of advisory bodies, namely the legitimiser, knowledge broker, policy entrepreneur. In addition, novel insight is added by applying a fourth lens; the GPS. The results indicate that the Danish Council on Climate Change (DCCC) is perceived to be a pronounced GPS both through publicly guiding the government and in providing independent advice to a broad range of actors who use this to push climate politics. The DCCC also functions as a broker of knowledge, as well as an entrepreneur on the policy ambitiousness level. The Norwegian loosely organised advisory structure seems suited to providing specific innovative advice to the policy process but lacks the structure to function as a GPS or a knowledge broker, limiting its potential to contribute to decarbonisation. This finding strengthens previous studies in that purpose-built climate institutions facilitate for transitioning away from fossil fuel dependence.

1c Local transformations

Place-making, geopolitics and a local energy transition: A qualitative case study of the energy transition process in Longyearbyen, Svalbard

Birgitte Nygaard; Tomas Moe Skjølvold & Robert Næss, Norwegian University of Science and Technology

For more than a century, the circumpolar archipelago of Svalbard has been of geopolitical interest. Historically, coal has been the central resource for all human activity in the area. Today, coal remains the prerequisite source of energy that sustains the Norwegian community of Longyearbyen, Svalbard. However, plans are currently made by the Norwegian government and the local municipal body to decarbonise the community. Located at 78°N, Svalbard is a place that is simultaneously remote yet hyper-connected due to its geopolitical relevance. The community of Longyearbyen is characterised by an increasing annual turnover of residents, however, it is also a place where residents live their everyday life challenging traditional notions of place. In light of such complexity, how will an energy transition process be carried out? Building on 1.5 months of fieldwork, 22 interviews with

central local actors, analysis of policy documents, and news media coverage, we study how the process of local energy transition is carried out in a landscape of various stakeholders with differing priorities and competing interests. Such interests include energy pricing, institutional or business development, socio-political stability, job security, and energy security. To examine this, we employ the concept of place-making to outline how different territorial strategies and understandings of place influence the socio-technical energy transition. We find that local obligations to ensure affordable energy for residents are complicated by ambitions for utilising the transition as a show case for Arctic energy transitions. Further, we find that these are tightly tied to national ambitions for cementing Norwegian sovereignty over Svalbard. The paper's contribution is twofold: empirically, it adds a novel offgrid case study to transitions research, and theoretically, it illuminates the multidimensionality of socio-spatial relations in energy transitions.

The role(s) of universities in sustainable smart specialisation: The case of Grøn Region Vestland, Norway

Lars Coenen; Ridvan Cinar; Stig-Erik Jakobsen; Øystein Stavø Høvig & Julia Winslow, Western Norway University of Applied Sciences

Smart Specialisation is a place-based approach to innovation strategies that found large-scale practical application in European regional policymaking. Because of the overall strategic direction given by EU policy (e.g. the European Green Deal) but equally due to a growing understanding of the necessity and urgency to act to address sustainability challenges at regional and local levels, many regions are trialling and testing their Smart Specialisation strategies to enhance sustainability transitions (Grillitsch et al., 2023). In this paper, we focus on the strategic involvement and engagement of universities and high education organisations in Smart Specialisation strategies geared to sustainability and consider whether and how their roles extend beyond knowledge transfer activities such as spin-off creation, licensing, and patenting. In a recent paper, Thomas et al. (2023) argue that many prevailing concepts in the literature on universities and regional development focus on enforcing universities' roles in a single domain such as entrepreneurship, innovation, or civic engagement at the expense of a more comprehensive and integrated perspective across teaching, research, and engagement. At the same time, such heterogeneity opens up for a highly complex and difficult-to-navigate institutional environment for universities (but equally for regional policy-makers) due to risks of policy layering and challenges around competing demands and potentially conflicting priorities (Cinar et al., 2023). Empirically, we focus on the Vestland Region in Norway, host to three HEIs, namely UiB, NHH and HVL, and a region that is in the midst of a green transition beyond its historical industrial specialisation in oil and gas. The latter is endorsed in the Smart Specialisation strategy of the region 'Grøn Region Vestland' which is scoped around building "green hubs" and industrial symbiosis to create and scale up new green value chains in the region. Our analysis is grounded in interviews with policy-makers, HEIs and industry representatives.

Reframing the sustainability of urban logistics: Beyond zero-emissions

Subina Shrestha, University of Bergen

Sustainable urban logistics is increasingly being recognized as pivotal for achieving cities' sustainability and climate-neutrality agenda. As a result, cities are engaging more with urban logistics, albeit more so to meet their climate goals. As a result, sustainability in the sector is being conflated with zero-emissions, and techno-infrastructure solutions that favor fleet electrification and operation optimization are on the rise. Such 'in the box' approach implies that other aspects of sustainability tend to be overlooked and could have other (un)intended consequences. In this paper, we contend there is a fundamental need to reframe the sustainability of urban logistics beyond the zero-emissions rhetoric. This entails repoliticizing the sector and opening up questions about justice (spatial and social), circularity (sustainable consumption and production) and urban vitalism (quality of life, see Nederhand et al., 2023). Bringing these aspects of sustainability to the fore of urban logistics implies critically reflecting on if and to what extent current dominant framings of sustainability run the risk of reinforcing unsustainable practices of business-as-usual (Blythe et al., 2018), or critiques of sustainability as an "empty signifier" (Brown, 2016).

Beyond harmony: Unraveling the role of conflict and competition in the path to electrification

Sophie-Marie Ertelt & Johan Kask, Örebro University, Inland Norway University of Applied Sciences

The pursuit of net-zero targets has pushed for the electrification of societal sectors like transportation, fostering the development of system reconfiguration approaches. These perspectives pay more attention to the potential changes within existing socio-technical systems (Geels, 2018; McMeekin et al., 2019; Geels & Turnheim, 2022). While current research acknowledges the importance of incumbents' reorientation processes toward niche innovations (Kump, 2023; Geels & Turnheim, 2022), it lacks insight into the types of relationships and interactions that can foster such shifts. Indeed, the dominant view in transition research emphasizes harmonious relationships as key to successful innovation (Heiberg and Truffer, 2022), highlighting mutually beneficial partnerships (Cuilli et al., 2022; Mousavi & Bossink, 2020). This perspective tends to overlook the impact of competition and conflict. These elements primarily come into focus in niche-regime interactions, where conflict typically arises as competitive tensions between new and incumbent actors (Altunay & Bergek, 2023), or between niches (Lin and Sovacool, 2020). This focus on harmonious relationships and collaboration leaves out the intricate negotiation processes between actors and organisations with differing interests and visions for the future. As industry sectors strive to decarbonise, we argue that conflict, co-dependencies, and competition play pivotal roles in shaping low-carbon transitions and can sometimes impede the reorientation processes (Ertelt & Kask, 2023). To enrich our understanding of these intricate actor relationships, we introduce five conceptualisations of non-harmonic relationships in low-carbon transitions. We use the electrification of the Swedish road freight sector to illustrate these concepts. We

conclude the paper by discussing how these relationships affect transition speed and direction, thus direction of transitions, thus contributing to a richer understanding of the dynamic relationships steering low-carbon transitions. This work opens new transition research avenues by encouraging exploration into these special relationships and their unique challenges. The findings also help managers and policymakers make informed, strategic transition decisions.

1d Media & imaginaries: Technological solutions

Harmful excitement? Technology as rhetorical resource

Bård Torvetjønn Haugland, Norwegian University of Science and Technology

Got a problem? There's a technology for solving that; or so it is often claimed. Clearly, the visions accompanying new technologies are attractive: While the technologies may not yet have proven useful, they are claimed to offer solutions to persistent societal problems, while simultaneously opening a host of new economic opportunities. The promissory nature of these claims is an obvious strength for proponents of new technologies, who tend to list a series of seemingly self-evident benefits associated with the technology in question. Such claims are enabled by the rhetorical flexibility that accompanies new technologies: aspects such as costs, technological limitations, and regulations have yet to be ascertained. Hence, proponents of new technologies have an advantage over those who propose – technological and non-technological – concepts that can already be realised. The narrative surrounding new technologies is (yet) unburdened by real-world limitations and further propped up by stubborn belief in the inevitability of technological progress. The resounding prevalence of this narrative begs the question: Beyond the technology itself, what are being promised when we are being promised exciting new technologies? The presentation draws upon data from two disparate – though, in their own ways, technology-heavy – fields: transport automation and carbon capture and storage. Building upon qualitative interview data, the presentation explores questions such as the following: What happens – and what does not happen – when claims about technologies are taken for granted, and what remains unspoken when new technologies are promoted as the solution to societal problems? Does the excitement surrounding new technologies preclude or postpone the implementation of already possible – though often politically contested – concepts?

Good bye Oil, hello Nuclear! It is so good to see you again. A qualitative media content analysis of Norwegian media coverage of nuclear energy and climate

Silje Kristiansen, University of Bergen

With the need for energy comes the intense search for energy sources. When we turn our back to fossil fuels, which are the energy sources we invite to join us to the future? The deliberation of this question twists and turns as benefits and potential detriments of energy

technologies get dragged in and out of the limelight. Sometimes attention is directed back to technologies we previously turned our back to. Hello nuclear energy. Google Insights since January in the national election year 2021 until today shows that Norwegian searches for “kjernekraft” [nuclear power] compared to “vindkraft” [wind power] follow each other much closer now than before July 2022. Are we turning to face nuclear energy in Norway? Nuclear energy as a low CO₂-emitting technology is interesting in a climate change perspective. However, just like other energy technologies, it comes with potential detriments. Kristiansen (2017) showed that media attention to the benefits and the potential detriments fluctuates depending on how long ago the last severe nuclear energy plant accident was and the political climate. Given Norway’s goals of cutting greenhouse gas emissions in half by 2030 compared to 1990, and being a low-emission-society by 2050, and the trade-offs with other energy sources (e.g., conflicts over wind power) nuclear energy seems to be gaining interest, again. And the mass media is on the case, and an important information source for people. This presentation turns to look at what information is presented by Norwegian media. Preliminary results show that media direct more attention to nuclear energy and climate. Since January 2021 there are three noticeable peaks in January 2022, October 2022, and March 2023. I will dive into the results of a qualitative content analysis of the presentation of nuclear’s benefits and potential detriments using Kristiansen’s (2017) framework focusing on the Norwegian media coverage of nuclear energy and climate during these attention peaks.

Capturing visions from diverse actors: A study on vision-making in the construction of a CCS market

Amber Nordholm, Norwegian University of Science and Technology

In response to navigating uncertainties and risks in the energy transition, regime actors create visions of what our future should look like to provide directionality for how the transition should unfold. A generalized dominating vision emerges often propelled by these well-positioned stakeholders. However, there can be a number of alternative visions of varying scales which contribute to systemic change in less visible ways. Carbon, capture, and storage (CCS) is a technology which, despite a high technology readiness level, has yet to diffuse at scale to be on track for fulfilling its significant role in many net-zero by 2050 schemes. As a result, CCS societal embedding is presently undergoing a live process of institutional and market-building work by various actors. This presents an opportunity to observe and capture vision-making in action. This work builds on existing knowledge of the role of multi-scalar visions in transitions by showing how diverse actors envision economic opportunities for themselves in the context of a CCS market which has yet to materialize. In terms of market-building, the dominant vision is usually too broad to be a business case in and of itself. Rather, this vision is scaled down and translated into a series of micro-visions. Understanding the workings of this novel socio-technical ecosystem illustrates how diverse actors develop and upscale difficult-to-implement technologies and contribute to the construction of the ensuing new market. The analysis builds on participant observation, interviews, and document analysis. Findings show that under the active institutional work

facilitated by regime actors, a set of visions from non-regime actors (e.g. municipalities, small businesses, students) are formulating in response to the potentialities within a future CCS market. These include visions on themes as diverse as climate accountability, career directionality for young people, and new revenue streams for municipalities.

Assessing the sustainability of the digital transition: A novel investigation

Joseph Doolen, University of Stavanger

This project addresses the alignment of the so-called ‘twin transitions’ – the green transition and the digital transition. On its face, the digital transition is broadly assumed to be part of the green transition. This sustainable path to a digitalized society is hailed as an answer to the problems of environmental sustainability and economic growth. Digital technologies and platforms allow for more people to work remotely as well as transmit, store, and process their digital data in ever more efficient ways. What does this mean for the future? Such research is relevant for all of the ‘three pillars’ of sustainability: economic, environmental, and social. The implications of this research involve the socially sustainable aims of the Montreal Statement on Sustainability in the Digital Age (access, equity, digital rights, and environmental sustainability). In this work, however I specifically look at the environmental sustainability of the digital transition under current economic practices of growth in digital technology. The drive behind the research is the ‘Jevons paradox’, wherein increased productivity from increased efficiency effectively reduces price and thus, demand. The increasing efficiency of our digital lives is increasing demand for data storage, transmission, and processing. I argue that the ease of massive data storage by billions of people, the replication of such data on digital platforms and across content delivery networks, the frivolous use of artificial intelligence applications, and the proliferation of hyperscale data centers are all acting to counter-align the green and digital transitions. Empirical material includes digital technology company documents, trade press, media articles, and expert interviews. To delimit the scope of this paper, I zoom in on the Power Utilization Effectiveness (PUE) value. I hypothesize that energy use correlates with PUE, as represented in the best available data. This would support Jevons paradox and the ‘unsustainability’ of the digital transition.

Parallel session 2

2a The voiceless: Public voices and vulnerable groups

The paradoxes of participating in a just transition

Robert Edward Gilmore, University of Durham

The rise of environmental concerns up urban policy agendas is shifting the rules, norms, and practices by which urban areas are governed. This change, or transition, presents the opportunity to make urban life more equitable, inclusive, and just. But a growing body demonstrates that this transition is proceeding along, and deepening, already existing inequities, injustices, and exclusions, rather than displacing them. Broadening and deepening public participation in decision-making regarding this transition is frequently posited as one way of ensuring that it is 'just'. But for public participation to effectively deliver justice, the outcomes participatory processes deliver must not be determined in advance. There is a risk that, as the urgency of taking environmental action becomes more apparent, the range of 'acceptable' outcomes from participatory processes narrows. This risks turning participation into means of justifying pre-made decisions, rather than a means of delivering justice. Ultimately, this is a problem for both social justice and environmental action. As social ecologists have long argued, an unjust transition is not merely unjust; it is also likely to be ineffective. This presentation will explore these themes using a case study from Belfast, Northern Ireland, where these tensions have played out across the fabric of the city.

Limits to urban climate governance: Institutional responses to climate protests in four Scandinavian cities

Håvard Haarstad; Trond Vedeld; Hege Hofstad; Lukas Smas; Einar Braathen & Marianne Millstein, University of Bergen

This paper explores contradictions in democratic governance approaches to climate protests in cities. We argue that limits to democratic governance is an underappreciated problem in the literature on urban sustainability transformations. The past few years have seen a growing political backlash against core dimensions of more ambitious climate policies in Scandinavian cities and elsewhere in Europe – both from actors that seek to roll back climate-related measures and actors that seek to strengthen them. Empirically, the article examines how city leadership and governance structures in four Scandinavian cities (Oslo, Bergen, Stockholm and Gothenburg) respond to the conflicting demands of these protests. Based on interviews and fieldwork in the case cities, we examine the claims and strategies of the protest groups, as well as the experiences, approaches and governance solutions political and administrative leaders as they seek to overcome the conflicts and contradictions of equity, citizen demands and emission reductions. We find that city leaders in the case cities are well aware of the complexity of the challenges, and have developed some managerial and procedural approaches for dealing with them. Nevertheless, they struggle to

cope with and accommodate the underlying socio-spatial conflicts that maintain the more fundamental contradictions of just climate transformations. There are clear limits to how current governance models manage to integrate challenges to the legitimacy of the climate policy agenda. Exploring the ways both pro- and counterprotests mobilize and seek influence, we find differences in how different groups manoeuvre governance processes and achieve influence. Those protest actions that succeed in influencing the authorities rely on a particular social-cultural competence and networks, as well as competence in maneuvering local bureaucratic processes. In our case studies, it is pro-climate groups that tend to maneuver these processes most successfully, while counterprotests are less successful.

Confronting fossil fuel governance cultures with 'sociotechnical resisting'

Saurabh Biswas; Faheem Hussain; Greg Poelzer & Bram Noble, University of Saskatchewan

Governance and institutional cultures that create and sustain forgotten places are often extensions of fossil fuel cultures in more than one way (e.g., Carbon democracy and Petro-Hegemonies). Transforming energy systems to reflect principles of social justice, economic equity and cultural inclusivity alongside environmental restoration requires greater sensitivity and understanding of the feedback from marginalized corners of societal systems. However, green energy transitions that continue and co-opt the governance and institutional fundamentals of fossil fuel cultures, are not the energy systems transformations capable of processing such feedback. Disempowerment, marginalization, and disenfranchisement of vulnerable social and economic groups of people continue to be replicated. Assuming actors in control of sociotechnical transformations possess the intention of facilitating just and equitable energy systems, what therefore are some feedback signals from vulnerable people and places include and learn from? In this paper, we scrutinize emergent sociotechnical structures and actors leveraging mundane technologies and technological artefacts to resist dominant regimes. These examples of 'sociotechnical resisting', in response to energy regimes as well as other governance meta-structures, represent struggles for renegotiating value with much more powerful actors to achieve social and environmental justice. Combining social purpose, identity struggles and frugal innovation, we explore sociotechnical resisting as a bottom-up indicator and stimulus for transformative change. Stimulating social movements and grassroots activism, as well as communicating the need for further devolution of institutional resistance are the feedback pathways explored. Examples are drawn from indigenous and native communities, displaced population groups and mass movements.

2b The mineral flow (of transformation)

The deep-sea mining policy process in Norway: Mitigation and losing opportunities for innovation?

Aiste Klimasauskaite & Laura E. Drivdal, University of Bergen

Moving beyond oil, the search for new industrial adventures is essential in Norwegian policymaking. It is framed as knowledge-based and sustainable. One such venture is deep-sea mining. The Ministry of Petroleum and Energy is leading the process of potential opening of areas for mineral exploration and exploitation. We follow this opening process with attention to the policy context. We do so through document analysis, focusing on the Environmental Impact Assessment and the associated hearing replies. We find that the grand narrative of the energy transition is disconnected from the knowledge base used in the Assessment. We suggest that such disconnect is an example of dealing with uncomfortable knowledge by deeming it irrelevant. Next, we analyze how the tension between various uncertainties and the need for certainty is dealt with through tension-releasing tools such as mitigation. Finally, we find contradictions in the assessment of future conflicts between deep-sea mining and other Ocean industries such as seabed genetic diversity for biotechnology innovation. In sum, mineral extraction allows operating in a comfortable known offshore space, moving from oil to minerals, where knowledge is merely used as an enabling tool.

Socio-ecologically responsible seabed governance through systems thinking, degrowth and environmental justice

Claudiu Eduard Nedelciu; Birgit Kopainsky; Aiste Klimasauskaite; Neftali Villanueva Fernandez & Nathalie Spittler, University of Bergen

Deep-sea mining is framed as the solution for the energy "transition", to boost the renewables sector. This message is embedded in "green" growth aspirations. We are told, economic growth is compatible with environmental protection and decoupled from the negative impacts, by means of modern technology, market dynamics, state interventions, and increases in efficiency. This extractivist, techno-managerial approach is applied to the seabed by an increasing number of global actors, from the International Seabed Authority to the Norwegian government. In parallel, the reactive response grows as well, most often through calls for a precautionary pause or moratoriums on deep-sea mining. In this research, we suggest a systems thinking framework rooted in degrowth theory to redesign alternative choices for seabed governance that go beyond the commodification of nature. We first highlight the necessity to allow a plurality of voices to shape deep-sea governance for the realities of the Anthropocene. This includes not only addressing the climate and ecological tipping points but also the distributional and justice aspects of the energy "transition". We then analyze case studies on renewable energy projects from the Environmental Justice Atlas to explore what types of non-monetary valuations of nature, and decision-making processes can guide a redesign of the international seabed governance, that is attentive to socio-ecological wellbeing.

Material limits to the energy transition

Simon Davidsson Kurland, Uppsala University

An important part of a sustainable transformation of society is a successful energy transition. Growth rates of technologies required for a sustainable energy transition can stagnate for many different reasons, including technological, regulatory, policy, social, economic, and environmental barriers. How do we know which is actually the limiting factor and how fast can this transformation happen if all these barriers are surpassed? Is there in fact some real physical or material limit to such a transformation?

Different types models are commonly used to analyse potential energy transition pathways, but socio-technical and techno-economic models which dominate energy transition research often have a quite poor foundation in the material world, including the need for physical infrastructure and material resources. Others overemphasize the requirements of so called critical raw materials creating an overly pessimistic view of what is possible. This tend to lead to an overly polarized discussion between pessimists and optimists.

Raw materials will inevitably be one of the things required to refuel a sustainable transformation, but deciding on how to include such constraints when imagining the future is difficult. By using the case of the global wind industry as an example, I investigate how historical and potential future technology trends affect the material flows in the energy transition and analyse the implications this can have for a successful energy transition.

2c Refuelling public discourses

Added value! The normative institutional component for transformational decision-making

Simon Neby, University of Bergen

As the urgency of climate transformation and real progress towards sustainability is becoming more and more pronounced, our political-administrative institutions are in many ways stuck in yesterday's realities. On the one hand, this creates barriers for needed change: the rules and guidelines, practices and logics shaping action are geared towards a normatively constrained past where neo-liberal concerns for financial and economic efficiency interact with rigid ideas of what the public sector should look like, how it should work, and what it should take into consideration. The administrative policies of yesterday continue to shape tomorrow, and our ideas of democratic governance were not built on – or for – today's transformative challenges. On the other hand, existing research creates a display of what the challenges are: typically, we call for more holistic approaches to governance, more collaboration and coordination, more cross-disciplinary science and more calculation of decision effects. But what if the solution lies elsewhere, in the construction of less formal constraints for public institutions – in the ideas of what the public ethos is, in the logics that constitute our sense of appropriateness?

The impact of ethnocentrism on dietary carbon footprint

Anna Birgitte Milford & Sarah Muiruri, NIBIO

A sustainable dietary transition requires knowledge on drivers and barriers for dietary choices. We investigate the role of ethnocentrism, meaning preference for domestically produced products, as well as environmental and health concerns, as drivers for the frequency of consumption of red and white meat, fish and plant-based food products. A survey with 1000 consumers was conducted in Norway, with questions about food attitudes, beliefs and preferences regarding health, environment and ethnocentrism, as well as diets. Results show that ethnocentric attitudes are correlated with a higher consumption of red meat and a lower consumption of plant-based food, whereas environmental concern has the opposite effect. The results confirm results of previous studies that beliefs regarding the health and environmental impact of meat correlates with food choices, but in addition we show that beliefs regarding domestic food production opportunities also have a strong impact on dietary sustainability.

Populist far right discursive tactics in European regional decarbonization

Mahir Yazar & Håvard Haarstad, University of Bergen

What rhetorical strategies are populist far-right parties using to delay regional decarbonization? This paper focuses on three populist far-right parties—the Conservative People’s Party of Estonia (EKRE), Alternative for Germany (AfD), and Poland’s Law and Justice (PiS)—and the discursive tactics each used from 2014 to 2021 to delay decarbonization of their carbon-intensive regions. We identify three discursive-institutional tactics used by populist far-right actors to delay decarbonization: (1) politicizing decarbonization, (2) reframing cultural values to form alliances with anti-decarbonization movements, and (3) dismantling key decarbonization institutions. We show that the populist far-right discursive tactics in European regional decarbonization are prevalent and vary widely. The politics of backlash against the EU-driven progressive public policies and anti-democratic rhetoric, including xenophobia and national sovereignty discourses are commonly used by these three populist right parties to mobilize counternarratives against climate change and regional decarbonization. Furthermore, these parties employ such strategies with an aim to dismantle democratic checks and balances in their respective countries. EKRE and PiS typically portray themselves as the protectors of social insurance and safety for vulnerable groups affected by regional decarbonization. PiS and AfD harness regional identity to mobilize civic engagement against decarbonization. All three parties work to empty and dismantle key decarbonization institutions. Overall, our findings suggest that carbon-intensive regions are particularly susceptible to the discursive tactics and institutional work of populist far-right parties, and may therefore provide opportunities for these parties to constrain decarbonization more broadly.

Should we talk about 'climate anxiety'?

Thea Gregersen; Rouven Doran; Charles Ogunbode & Gisela Böhm, NORCE

In recent years, the term 'climate anxiety' has increasingly appeared in the media and research publications, particularly when discussing young people's climate concerns. But what is 'climate anxiety'? While 'climate anxiety' is sometimes discussed in relation to clinically-relevant symptoms, it is most often used as an umbrella term for all types of negative emotions and worries related to climate change. Due to the indiscriminate use of the term, one relevant question is how the general public understands and reacts to it. In this talk, I will present preliminary results from data collected during the summer of 2023. First, a representative sample of the Norwegian public is asked an open-ended question about what they think about when hearing or reading the words 'climate anxiety'. The goal is to categorize recurring themes in the responses. Secondly, a survey experiment is used to investigate whether people react differently to descriptions of young people as having 'climate anxiety' compared to young people being concerned or worried about the climate issue. We will explore potential differences in how distinct socio-demographic groups understand and react to the use of the term, both in their response to the open-ended question and as part of the survey experiment. The results contribute important insights into the effect of using specific terms when reporting on climate concerns.

2d Refuelling policies for fuel and transport

Farewell to fossil-based aviation: Exploring policy and techno-economic conditions to substitute fossil jet fuels

Nicoletta Brazzola; Amir Meskaldji; Tim Tröndle; Anthony Patt & Christian Moretti, ETH Zürich

To move beyond fossil fuels while avoiding the sustainability threats posed by biofuels, the aviation sector needs to move towards synthetic fuels made from CO₂ captured from the air. If produced using renewable energy, these fuels have the potential to virtually eliminate CO₂ emissions while mitigating some of the non-CO₂ impacts of aviation. However, making these fuels is expensive and needs a lot of energy. Some studies suggest it's cheaper and more efficient to keep using fossil fuels and just offset their climate impacts, namely capturing CO₂ from the air. In this study, we assess the conditions - both in terms of policy targets, growth of the aviation sector and various techno-economic variables - that could lead to a reversal of this situation and thus allow the substitution of fossil fuels by synthetic fuels. We find that simply extending aviation climate policy targets from carbon neutrality to climate neutrality, i.e. internalising the economic benefits of mitigating non-CO₂ impacts via synthetic fuels, leads to lower costs of synthetic fuels relative to an emit-and-offset pathway. In addition, we find that electricity costs, capital cost reductions for Direct Air Capture and electrolysis, and uncertainties in the climate impacts of non-CO₂ aviation can significantly affect the final price of synthetic fuels relative to an emit-and-offset pathway. We conclude that more stringent climate targets for the aviation sector as well as policies enabling cheap renewable energy and initial deployment of synthetic fuels are needed to substitute fossil jet fuels.

Green technocrats and global libertarians: The transnational power struggle over the making of net zero policies

Cristina Parau, NTNU, Oxford University

The policy trilemma between decarbonization, energy security, and fuel affordability is being resolved in the West by the priority of decarbonization (a.k.a Net Zero), trickling down to poorer countries dependent on coal, and even to producers of gas and oil like Norway. The stakes of Net Zero are high; if mishandled, it may ignite an extreme political reaction. My current research found that the 2015 Climate Paris Agreement catalysed the forging of the informal, transnational policy Decarbonization Template intended by its entrepreneurs to be “downloaded” across as many national legal systems and governing institutions as possible. Using the methodology of Grounded Theory, abductive inference and elite interviews, I have inferred that the Template reflects the vision of an elite transnational policy network. This policy network can be conceived as a “Green Technocrat” one. Technocracy is an all-pervasive dirigisme in which the command and control is by a corps of presumed scientific and technical experts who programme economies in ways that may go way beyond going green. Its members include individual and collective actors spanning formal and informal organizations and ranging from norm entrepreneurs to functionaries at all levels of governance (e.g. UN, International Energy Agency, national ministries of climate and/or energy), informally meeting in transnational fora (e.g. World Economic Forum, Energy Transition Commission). Multinational corporations, media empires, philanthropic foundations, epistemic communities of scientists are also involved, networking themselves in across borders and across institutions to achieve their common goal of self-empowerment qua decarbonisation. The hypothesis to be refuted is that the Green Technocrat Network is treating climate change and energy transition as an opportunity for self-empowerment regardless of the merits or demerits of the climate change debate.

Refuelling old gas debates? The politics of assembling blue hydrogen on the UK Continental Shelf

Naima Kraushaar-Friesen, Uppsala University

In the UK, the development and deployment of hydrogen is becoming a centrepiece of national climate policy, and in particular a core component for the transition of the UK Continental Shelf to a net zero basin by 2050. The UK’s hydrogen strategy is premised on developing both green hydrogen, produced from offshore wind power, and blue hydrogen, produced from steam reforming natural gas from the North Sea, capturing the carbon and subsequently returning it to the North Sea for storage. The deployment of blue hydrogen, then, is closely connected to the infrastructures and geographies of hydrocarbon flows on the UK Continental Shelf. Policy-makers and several industry actors are currently forging visions of hydrogen-fuelled futures that coalesce around a number of material properties of hydrogen as well as its multiple possible modes of production, transportation, storage and end use. Drawing on the concept of sociotechnical imaginaries, this paper probes the

imaginaries of blue hydrogen futures in the UK across three distinct scales: the national scale of the UK Government's energy policy; the regional scale of forging a blue hydrogen future for the Tees Valley; and at the level of specific projects on Teesside. In particular, it illuminates the material qualities of hydrogen around which imaginaries of blue hydrogen energy futures on the UK Continental Shelf coalesce and how in turn these visions aim to spatially reconfigure the current infrastructural assemblage of gas extraction, transmission and consumption. I deploy an ethnographic research design, drawing on participation at industry conferences, document analysis and interviews with policy-makers and industry representatives, and place my findings within broader geographical debates on the disassembly of fossil energy systems and the political economy of delay in addressing climate change.

Mining the Amazon in the name of the planet? On the politics surrounding a copper mine project in the Colombian Andean-Amazon

Juan Antonio Samper, Lund University

Few topics have raised the kind of consensus that climate change has reached in the scientific world. While the physical science basis of climate change is nigh undisputable, when it comes to mitigation and adaptation debates dispute is notorious. Though large doubts can be cast towards the affirmation that society is inevitably moving beyond oil, there is widespread agreement about the necessity to prioritize downsizing fossil fuel extraction at a large enough scale as quickly as possible. How to go about this, however, is highly ideological. Large-scale extractivists, such as states and multinational companies, favor a hegemonic notion of displacing fossil fuels with alternative sources of energy. From other sectors of society, chiefly socio-environmental movements and academia, there is a growing recognition that such displacement involves structural political economic transformations that challenge deeply held paradigms such as capitalist forms of production, extractivism, and the necessity for economic growth. In the Andean-Amazonic region of Putumayo, Colombia an iconic clash arose with a copper mining project. In this study I offer an ethnographic account of the politics around a mine that has not yet been opened but whose exploratory operations have been underway since 2019. I highlight the strategies that are used both by those who favor and oppose the project in a way that contributes to understanding how buzzwords such as sustainability, just transition, or energy transformation are used to (de)legitimize certain political agendas. This study contributes to a wider body of scientific studies focusing on the way that the politics of sustainability play out in locations of high socio-ecological value.

Wednesday 18th of October

Parallel session 3

3a Spatial tension

For the love of land: Energy infrastructure, wind power and justice in Finnmark

Ranghild Freng Dale, Vestlandsforskning

The term 'just transition' is commonly used in both academic literature and public debate, yet understanding precisely what should be considered just and for whom is a highly contextual issue. In Finnmark, Norway's northernmost county, tensions over the potential development of wind power plants, industry, and transmission lines have been high in recent years. With governmental plans for electrification of the petroleum sector in West Finnmark, and lack of governmental action after a landmark verdict on wind power in the southern part of Sápmi, these controversies have been set on fire in the past year. Whilst plans for industrial development bring hope for local employment, municipal income and population growth, they also create worry and outrage for impacts on indigenous Sámi reindeer herding, electricity prices, nature, and ways of life among indigenous and non-indigenous locals in Finnmark. Zooming in on a potential wind power project and its enabling infrastructure, this paper looks at the background for the controversies, and how past and present injustices are nested within each other. As motivation for opposing (and supporting) industrial development often relates to care for and belonging to land and its inhabitants, this has implications for the meaning of justice and just development in the region.

How to meet Norway's growing electricity demand in 2030? A methodology for integrating social and environmental factors into energy system modelling

Paola Velasco Herrejón; Maximilian Roithner; Oskar Vågerö; Eline Maninno; James Price; Tobias Verheugen Hvidsten; Aleksander Grochowicz; Koen van Greevenbroek & Marianne Zeyringer, University of Oslo

The scale and buildout rate of renewable energy projects needs to increase dramatically over the next decade to meet the Paris Agreement as well as for Europe to reduce dependency on fossil fuels. However, the location of Variable renewable energy technologies (VREs) such as wind and solar photovoltaics (PV) affects the technical feasibility and their impact on the environment and the communities they are located. Thus, socio-environmental constraints can have a large impact on the overall capacity potential which will affect the technology choices, resulting costs and political feasibility of reaching decarbonisation

targets. These constraints may also have an impact on electricity prices and ensuring a reliable electricity supply that meets current and future energy demand. The conflict and potential trade-offs and competing interests between technology, nature protection, social acceptance, energy prices and future demand will need to be evident in policies aimed at promoting VREs.

This presentation aims to inform wind energy deployment policies in Norway so that these reflect the benefits and drawbacks of the instalment of different onshore wind and solar power scenarios when integrating environmental and social variables into systems modelling. The resulting three scenarios (technical, low and high restrictions) were built into a GIS model and integrated into a 'socially informed' highRES of Norway. These scenarios might prove a useful starting point to decide which projects and locations can be considered and the costs incurred for the development of the wind and solar power sector that meets future demand and decarbonisation goals.

Just transitions to green Industries? Tensions and imaginaries of the Tesla gigafactory Berlin-Brandenburg

Lea Marie Sasse, University of Stavanger

The global electric vehicle (EV) market is developing dynamically, with rapid growth in EV penetration and concomitant ethical and geopolitical supply chain concerns. Within the European Union, efforts to strategically build up regional battery production aim to create new jobs, increase supply chain resilience, and address human rights and environmental issues. In the German context, the rapidly shifting automotive industry has raised particular concerns for many businesses, workers, and politicians, given national reliance on this largest industrial sector for employment and economic prosperity.

In 2019, Tesla billionaire Elon Musk's prominent announcement of the first European Tesla Gigafactory in Germany caused a national and supra-national stir. Yet, research on the production site remains scarce. The project launch revealed various interests and conflicts, including hopes for regional development with green job creation and an innovation cluster at the periphery of the capital region of Berlin. Simultaneously, Gigafactory opponents including environmental groups and residents raised concerns against the potential environmental and social impacts and criticised the expedited approval process. In particular, the deforestation of 90 hectares for the Gigafactory prior to the final building permit, and the high water consumption associated with operations – comparable to a town of 40,000 inhabitants – in one of Germany's driest regions triggered protests. Additionally, discourse featuring Tesla, politicians, administrators, and civil society is indicative of conflicts linked to this largest German industrial project of recent decades. Based on original field research during summer 2023, the talk unpacks the tensions and imaginaries related to the approval process and establishment of the Tesla Gigafactory 4 in Grünheide, featuring perspectives informed by just transition and political ecology scholarship. The study sheds light on the power dynamics, conflicts, and environmental justice issues at stake, and seeks to inform pathways for more equitable and sustainable approaches to green industrial development.

Solar transitions seen through anti-colonialism: What solar India's developmentalist material discursive practices say about the contemporary model of social life

Shayan Shokrgozar, University of Bergen

The amalgam of contemporary socioecological crises, brought about through dominant onto-epistemologies, has resulted in growing fears about planetary conditions and their implications for socioecological justice and habitat. As observed by critical scholars, indigenous peoples, and environmental activists, amongst others, the rejection of natureculture—through incumbent ideas (i.e., carbonscapes) and institutions (i.e., fossil fuel corporations and their enablers)—is central to the survival of these dominant onto-epistemologies. Despite early warning signs dating back at least to the mid-19th century, collective efforts to displace fossil fuels were late to begin with, and their use as an energy source continues to grow at an alarming rate. Non-conventional energy sources—in stark contrast to their capacity to bring about alternative (and better) futures—are following the same history as fossil fuels, leading to a renewed assault on convivial socioecological relations. This paper interrogates the case of solar energy rollout in Rajasthan, India, to explicate what it indicates about the contemporary model of social life. We conclude that capitalism and coloniality are (structurally) linked to the necropolitics of Solar India.

3b Traveling through the transformation

Responsive organising for low emission societies

Siddharth Sareen, University of Stavanger, University of Bergen

Three years ago, we commenced a project entitled Responsive Organising for Low Emission Societies (ROLES), funded through the Joint Programming Initiative Climate by three national research councils in Norway, Italy and the UK. In response to a call on societal transformation in the face of climate change, over a dozen of us researched socially inclusive digitalisation and decarbonisation processes in three mid-sized cities in these European countries, namely in Bergen, Brighton and Trento. We focused on three sectors where these twin transitions are taking place: electric mobility, smart local energy systems featuring solar, and smart electric meters. This led to dozens of articles published in leading journals, Master theses and new doctoral projects, an edited volume, keynotes at major conferences, and even some policy impact. In this talk, the principal investigator reflects upon an ambition that the ROLES project had to be engaged, and to contribute to 'responsive organising'. How well has this worked, and what reflections can we feed back to academia from this? As a no-fly project, where the only in-person consortium meeting involved many days of surface travel for ten team members, what learning can ROLES offer for future projects and ways of organising? And finally, having worked to identify pathways to digitalise for deep decarbonisation, what prospects do we as engaged environmental social scientists see to enable such pathways?

Mapping public opinion on negative emissions using online deliberative polling

Gisle Andersen & Endre Tvinnereim, University of Bergen

Negative emission technologies (NETs) are given a small but significant role in mainstream emission projections leading to politically agreed greenhouse gas (GHG) concentration targets. Yet many NETs are still at the experimental stage and require further development and deployment, which in turn require public-sector financing and acceptance. How do people think about using NETs to remove carbon dioxide from the atmosphere? We present research from the Ocean NETs project, an EU-funded interdisciplinary project combining climate modelling, biology, economics, political science, and ethics research. We report results from two online deliberative polls, where participants were gathered in small groups to discuss aspects of negative emission technologies, generate their own questions, and pose questions to experts.

Preliminary analysis indicates that participants emphasize the importance of reducing emissions and changing consumption patterns. They hardly discuss the need to remove CO₂ from the atmosphere to reach the Paris climate goal, and the concept of negative emissions seems difficult for them to engage with. Among the methods, participants prefer “nature-based” approaches over more technical methods. Participants are concerned about the feasibility of deployment at a relevant removal scale and for a more extended period. Connected to this are concerns about the controllability of the deployment and the methods’ impact, like difficulties to control adverse environmental effects from biomass sinking at the seafloor. They also question the buildup of additional infrastructure or interventions into nature on top of existing human interference. The opportunity to deliberate the methods increases participants’ certainty about their assessment but only slightly changes the direction of the assessment.

Does the UK public feel ashamed or embarrassed about flying?

Rouven Doran; Charles A. Ogunbode & Gisela Böhm, University of Bergen

The flight shame movement has drawn attention to questions regarding the role of flying in the face of climate change. Demands from the movement have been vocalized in various media outlets, which according to some commentators, exemplified a shift in the public discourse on carbon-intensive lifestyle choices. Nevertheless, and even though there have been numerous anecdotal reports in the media, few attempts have been made to systematically assess the incidence of flight shame in the public at large. This presentation reports on a study that set out to explore the extent to which flight shame becomes reported by members of the UK public. The data was collected as part of an online survey distributed to a nationally representative sample of the UK population in 2022. Results showed that

there was only a small percentage who felt extremely ashamed or embarrassed in reference to their flying, and that this varied somewhat based on the reason for which people may choose to travel by plane. Other results indicated that the extent to which people reported being ashamed or embarrassed about their flying was linked to individual perceptions about social norms. This presentation discusses these results against the background of the available literature on the subject, including studies that have investigated the incidence of flight shame in Norway.

Green washing: The paradoxes of automation and technological innovation in the maritime sector

Marianna Betti, University of Bergen

In 2014 Naomi Klein called out to stop the calamities of capitalism and save humanity from collapse. Really, since the financial crisis of 2008, and despite the wide/scientific agreement on the Anthropocene, the world is polarized into pessimist and optimist views for the future and the solutions to climate crisis. People like Klein claim climate crisis is not for all, does not unite all nations but that the powerful agents pick and choose “green” solutions to sustain rather than dilapidated, deregulated capitalism. De facto, drastic solutions for the global climate crisis, go intrinsically against capitalism. Contrarily, people like Fücks (2015) believe the crisis a period of transition and opportunities where industries and institutions can “experiment” with new solutions. Here narratives of green technology and innovation play central role in constructing an “illusion” of smooth transition into new energy sources which sustain accelerated capitalistic economy. Technological advancement makes growth possible. Democracy and social equality have rarely thrived in nations whose development is due to fossil fuel, with few arguable exceptions like Norway, Canada and the UK during coal mining boasting workers’ rights. Many nations blessed by fossil fuel have rather experienced variations of the “resource curse” or a complex entanglement of events fueled by greed, corruption and existing structural problems which have led to conflicts, wars, economic collapse and enormous social inequalities. What ensures us that democracy is better accommodated in societies whose future is planned and depend on transitional or renewable energy when these forms of energy cannot disentangle from fossil fuel? This paper looks at the paradoxes of green washing from the perspective of the maritime sector of the oil and gas industry, namely from the digitalization and automation of machines and systems on board oil and gas tankers.

3c Perspectives on a Just Transition

A critical review of emergent research on community-based energy initiatives

Mathias Lindkvist & Siddharth Sareen, University of Stavanger

To speed up just energy transitions to low-carbon societies, policies encourage community-based energy production, use, and sharing, especially in European countries with the region's high climate ambitions. Policymakers and measures envision that energy communities (ECs) will increase the renewable energy share of the energy mix, balance supply and demand, and provide social benefit through inclusion of citizens in provision and usage of energy flexibility services. Such ECs are a relatively new phenomenon and warrant critical examination. We conducted a review and synthesis of emergent research on ECs, with a qualitative social science focus, drawing on over 40 articles published during 2020-2023. Results reveal a range of challenges and opportunities, spanning a lack of consideration of impacts in and beyond ECs, conflicting interests, and the importance of social capital to participate in ECs. Challenges identified are considerable in scope and number. Nascent scholarship typically features conclusions that highlight challenges and opportunities, yet offer limited guidance on how, when, and where to handle these aspects. Thus, we identify a range of issues in this rapidly evolving domain that are unresolved. Our analysis suggests a need for careful reflection on the situated roles of ECs, in order not to produce significant unintended adverse effects that may consequently weaken the support for environmental sustainability measures down the line.

Just Transition in an oil city: Place-based approach to decarbonisation governance

Daria Shapovalova, University of Aberdeen

In order to meet the Paris Agreement target of keeping global warming below 2°C, globally a third of oil and half of gas reserves should remain unused from 2010 to 2050. In 2021, the International Energy Agency estimated that in the net-zero emissions scenario there is no need for fossil fuel exploration, new oil and natural gas fields beyond those already been approved for development, or new coal mines or mine extensions. Climate emergency cannot be solved without a complete transformation of our energy systems. While the any urban centre is dealing with challenges of decarbonisation, in cities hosting the oil and gas production there added struggles caused by intrinsic connections with the energy industry. From the energy industry hubs perspective, the switch from fossil fuel production to renewables is not a simple replacement. Labour markets in "oil cities" are often bifurcated with oil and gas industry being the main employer in the region. There are further close cultural ties between the industry and the community through identity and sense of belonging. This paper is part of an interdisciplinary project studying energy transition in

“oil cities”. It uses rapid evidence review and key informant interviews to assess the common challenges of a just transition in petro-regions. It focuses on Aberdeen in Scotland with a comparative element to Stavanger, Texas, and Calgary to consider the meaning of “just transition” from a place-based perspective and to critical analyse of the wider regulatory framework in light of these principles.

Who gets to imagine a just transformation towards a fossil-free future? Co-production of power, knowledge and governance in policy-relevant research

Tatiana Sokolova, Södertörn University

‘Just green transitions’ focusing on technological aspects have been criticised for being insufficiently ‘green’ or ‘just’. Effective climate governance which is perceived as just by a variety of actors demands structural transformations affecting the entire fabric of modern societies. This paper argues that such transformations necessitate democratic interfaces between knowledge and governance, informed by ontological and epistemological pluralism. The paper uses two distinct approaches to power (Arendtian and Foucauldian) to analyse how researchers at one such knowledge-governance interface attempt to bridge two opposing political ontologies of ‘green modernity’ and ‘resistance’ through a third – that of ‘planetary boundaries’. Both approaches reveal knowledge production as a political process in a broad sense: engaging multiple actors in ontological politics and navigating specific power-knowledge configurations. The paper shows how interactions between political ontologies, understandings of justice and transformation, climate governance strategies and knowledge-action models inform a constitution of a knowledge-governance interface created with the aim to advance democratically legitimate policy of ‘green transitions’. Keywords: climate policy, Sweden, trade unions, transitions justice, civil society, political ontology

Ambition and tension on the pathway to Just Transition in the Pacific

Miriam Ladstein, University of Bergen

In March of 2023, in the wake of two consecutive Category 4 cyclones, leaders from across the Pacific Island region convened in Port Vila, Vanuatu, to follow up a Ministerial Dialogue opened at COP27 on global pathways towards fossil fuel phaseout. The Dialogue culminated in an outcome document titled the Port Vila Call for a Just Transition to a Fossil Fuel Free Pacific. In this document, 6 Pacific Island governments supported by experts and civil society call for recognition of the historical ties between the global fossil fuel industry and climate induced loss and damage in the Pacific. It further makes clear that in lieu of accountability on the part of large-scale fossil fuel producers, the Pacific Islands will take leadership towards decarbonization, despite their somewhat precarious economic situations at the frontline of a climate crisis they did little to cause.

In this paper I would like to shed light on some of the key elements of the Port Vila Call, the role that government and civil society alliances have played in defining its level of ambition, and what it can tell us about the meaning of Just Transition in a Pacific Islands context. This paper builds on my recent one-year ethnographic fieldwork among civil society organizations in Fiji and the wider Pacific. Drawing especially on discussions that took place during the 5th Pacific Regional Energy and Transport Ministers' Meeting in May of 2023, this paper will explore some of the complex and somewhat contentious elements to the drive towards 'just, fair and equitable' energy transition in a maritime region that has been placed in a position of dependency on both climate aid and fossil fuels.

3d Reflections on a Just Transition

Reflections on a Just Transition (two short films and a conversation)

Camilla Houeland & David Jordhus-Lier in conversation with Jorunn Birkeland and Mari Skåra Helliesen, Fafo Institute for Labour and Social Research, University of Oslo, The Norwegian Society of Engineers and Technologists (NITO), NORCE Norwegian Research Centre

Transforming ourselves into a low-carbon society requires many people to reconsider their own jobs. Hundreds of thousands of Norwegian workers, and many times more globally, rely on petroleum and other fossil fuels for income and job security. Anyone who calls for the phasing out other people's work enters an intensely contentious political terrain, yet this is regularly what is implied by green politicians, environmental activists and sustainability researchers.

In a newly completed research project, Camilla Houeland (Fafo), David Jordhus-Lier (UiO) and colleagues have studied how oil and gas workers in Norway, Nigeria and USA respond to the prospect of a petroleum phase-out. The concept "just transition" is gaining traction as a way to frame the demands of workers and communities whose jobs and livelihoods are at risk.

By using visual and qualitative methods, including focus groups and on-camera interviews, their research allows workers in different parts of the world to connect with each other, and with environmental activists, around these issues. The films also allow other audiences to engage with the faces and voices behind the research process.

In this session, we will show excerpts from two of the films produced in the project: "The global phase-out dilemma" and "Worker agency in a just transition". In addition, we have invited two panelists to conversations about the films, about connecting voices and on questions on just transitions.

The first guest is one of the faces from the screen that we welcome onto the stage. Jorunn Birkeland can look back at a long career in the petroleum sector and in the labour movement, and will share her views on the issues as well as reflect on how she has experienced being part of an interactive research project.

The other guest in the panel is senior researcher Mari Skåra Helliesen, who will reflect upon the films and talk about her research on people's attitude to oil and gas production and Norway's global responsibilities with us. We also invite the audience to engage in conversations with the panel.

The session will be in both English and Norwegian.

Parallel session 4

4a Measuring transformation

Emissions targets are not what we need from fossil fuel companies

Yann Robiou du Pont; Joeri Rogelj & Angel Hsu, Utrecht University

The need to decarbonize is accepted and the necessity to reduce oil consumption is understood. Yet, no moratorium on fossil fuels agreed upon. Instead, oil companies adopt net-zero emissions targets that often rely on unrealistic claims to plant forests. Our 2022 Land Gap report showed that land-based carbon removal claims already overshoot the planetary limits. Beyond, the implementation challenges of such net-zero claim, offsets are criticized as a way to avoid transformation of a company's activities, thereby jeopardizing the 1.5C goal. Emerging initiatives (e.g. Science Based Targets) are seeking to review the ambition of companies on the basis of their emissions targets. Here, we argue that emissions targets are not an adequate mean to align companies' activities with the Paris Agreement (coal activities should cease, not pursue net-zero emissions). Even a wide-spread adoption of net-zero pledges would not guarantee collective alignment and should replace market regulations.

Our previous publications derived emissions targets and ambition metrics to review the ambition of national and subnational governments on the basis of equity-based emissions allocation frameworks. However, unlike countries and their populations, companies are not recipients of fairness considerations. Allocating them emissions targets (and thus emissions space) contradicts the nature of the competitive market where companies can emerge, bankrupt or gain market shares. Instead, companies should compete, including through innovation to develop and enable the 1.5C decarbonization, within a market with regulations informed by science and best-practices.

The absence of purely emissions-based ambition metric highlights and clarifies that emissions targets (including net-zero) cannot be seen as a guarantee of alignment of companies with the Paris Agreement. Our contribution informs court cases against companies ruling on the adequacy of their emissions targets (e.g. Shell, or the case TotalEnergie that I informed as third party expert) or on greenwashing practices (e.g. Shell board of directors, TotalEnergie).

Scotland's net zero by 2045: Modeling societal metabolic potentials and scenarios toward emissions reductions

Jean Boucher & Keith Matthews, The James Hutton Institute

As humanity faces the complexities of ecological, material, and economic crises, the need to integrate multilevel political, institutional, and industrial ecologies into trajectories of sustainability become ever more urgent. Though discourses of net zero, just transition, green recovery, and ‘socio-ecological transformation’ have emerged, scholars are challenged to measure and monitor these developments in both integrative and multilevel ways. To this end, societal metabolic analyses (SMA) offer a multidimensional and cross-scale method of understanding and examining sectoral and regional developments through material flows, energetic, and social accounts (Giampietro et al. 2014; Giampietro, Mayumi, and Sorman 2011). SMA define and integrate views of: industrial sectors; workforce capacities; land use patterns; energy use; economic value, and other flows. Such metabolic analyses can provide useful insights into relations between political discourse and practical action, multi-level actors and biophysical flows, policy tools, and coherence toward the ‘greening’ of economies, ‘green recoveries’, net zero, and a more ecologically just world.

Scotland—and other nations—has expressed great ambitions for not only a post-covid ‘green recovery’ (SG 2020) but also a ‘net zero by 2045’ with interim targets for 2030 and 2040 with, respectively, 75% and 90% lower emissions than a baseline net zero (SP 2019). Besides noting that these targets must be ensured by Scottish Ministers, there is also little material detail on how these targets will be met (SP 2019).

Using this policy case of Scotland’s ‘net zero by 2045’, we operationalize metabolic analyses to assess the challenge and possible tradeoffs of maintaining stable household and paid-work sectors while transitioning to electricity and other low-carbon energy carriers, while trying to activate greener activities in land use and other industrial sectors. This analysis aims to model a number of different scenarios that include: status quo, net zero, progress to net zero, and degrowth.

Setting local Paris-aligned climate goals: Moving away from CO2 emission goals to energy system indicator goals

Martin Wetterstedt & Mikael Kilter, Uppsala University

Cities and municipalities have since long set climate goals aiming for a relative emission reduction or net-zero emissions by a certain year, e.g. 2045. Recently, some have changed this into, or added, an accumulated carbon emission goal. Even with this addition however, we argue that current goal setting is too vague to effectively guide municipalities in their everyday climate efforts, and that it makes it difficult to distribute climate actions between actors. In a project funded by the Swedish Innovation Agency we examined current climate goal setting from the perspective of SMART* goals and outlined a new method. The method involved developing quantitative national roadmaps, detailing the change in the energy system needed to stay within a certain national carbon budget. These roadmaps were then broken down into regional and municipal roadmaps while making sure that the sum of the changes described in the local roadmaps add up to the national roadmap. Based on these roadmaps, effectively functioning as detailed goals, the municipalities developed actions that described what different actors need to do and when. With this approach, the effects of actions are evaluated as changes in the production and use of energy, as opposed to changes in CO2-emissions directly. The project also included developing and testing a multi-stakeholder process to collectively design the quantitative national roadmaps. At the end of the project it will be assessed whether this approach makes it easier for municipalities to set Paris aligned climate goals that are more effective and are more easily co-operated upon together with other actors. * SMART stand for Specific, Measurable, Assignable, Realistic and Time-related.

4b Transforming freight logistics

Meta-governance of green shipping networks

Agnete Hessevik, University of Bergen

Decarbonization of shipping is a goal that is shared by governments, many powerful shipping industry associations and individual and collective bodies within the maritime sector. As collaboration is increasingly seen as a precondition for transforming the maritime sector, new collaborative arrangements are emerging around the globe. Governance networks have long been acclaimed as a good way of governing public issues that requires the resources of multiple actors from the public and the private sectors, but the concept is new to the case of green shipping. This paper explores the conditions for governance network formation and how public and private actors cooperate within the networks, with a particular focus on government organizations. The research questions are: Which roles do governments take in governance networks for green shipping? How do the public institutions exercise governance through participation in networks, and how does this shape the formation and development of green shipping governance networks in Washington state in the US and Norway?

It is a comparative case study of the Green Shipping Programme in Norway and Washington Maritime Blue in Washington state, US, which both seek to implement public policy on green shipping. Preliminary analysis shows that government organizations are essential in designing and forming the governance network, but later retire to a less active, but still important, network participant, serving the functions of providing funding and information about funding and policy development. In the Washington state case, government actors have to a larger degree practiced hands-on meta-governance in the establishment of the network, because the governance network model was less known in the US than in Norway within the maritime sector.

Battles for space: Transforming urban freight transport in Norway

Rafael Rosales, University of Bergen

Urban freight transport consumes energy, produces greenhouse gas emissions, and takes up space in cities. Urban authorities have in recent years faced an increase in urban freight transport due to changing consumption patterns, and many have responded by streamlining urban freight planning within their governance structures. This project describes how urban authorities have addressed a battle for space in urban planning as they promote active or collective transport, whilst having to account for increased freight transport. Norwegian cities have assigned new responsibilities to planners, experimented with new measures, and approved new policies aimed at long-term plans. Through interviews with key stakeholders, a collaborative workshop, and a qualitative survey, this project analyses the goals and measures that urban authorities consider in the transformation of urban freight. Norway's four largest cities are all experiencing a shift from the implementation of short-term or concrete measures, to applying more strategic and long-term approaches to urban freight planning. The transformation of urban freight is moving beyond technical solutions that reduce greenhouse gas emissions and parking spaces, to more fundamental questions of space allocation and the consequences of consumption and construction. This change follows trends elsewhere in Europe, where the idea is for freight transport to be considered in tandem with personal mobility when cities plan for a low-carbon future. This project contributes to social science research on urban freight transport and considers these changes particularly in smaller cities, which in Norway excludes the city of Oslo, which have less resources and administrative capacity to implement the changes.

Circular charging systems: Harnessing multi-system interface solutions for freight transport electrification

Vojtech Klezl; Zeinab Rezvani & Sophie-Marie Ertelt, Örebro University, Inland Norway University of Applied Sciences

The electrification of freight transport as a strategy to mitigate CO₂ emissions, noise, and pollution is increasingly seen as a viable route (Klitkou et al., 2015). Yet, this shift involves more than a mere fuel change to electricity. It necessitates comprehensive alterations in business models (Tongur & Engwall, 2014) and industry relationships, along with the integration of various innovations and technologies (Sovacool et al., 2020; Andersen & Markard, 2020). Such transformations pose significant uncertainties, particularly to freight hauliers, slowing the adoption of electric vehicles outside funded initiatives, especially in the heavy commercial vehicle segment (Melander & Nyquist-Magnusson, 2022). Recent work on low-carbon electrification has highlighted the crucial role of multi-system interface solutions in expediting low-carbon electrification (Nykamp et al., 2023) however how this new phenomenon may help accelerate ongoing transitions remains underresearched. To increase our understanding of the role of such solutions, we present a case study that explores the development of Circular Charging Systems (CCS) at regional logistics depots. The proposed CCS, incorporating energy hubs with photovoltaics and repurposed battery storage, plus autonomous static charging platforms, offers transport operators a chance to independently charge their electric trucks using their own climate-neutral electricity, bypassing price fluctuations. Our analysis of the CCS provides an in-depth perspective on the processes involved in the establishment and operation of multi-system interface solutions. It highlights how such innovations necessitate new collaborations between different industry stakeholders. In this context, CCS acts as a focal point, enabling shared technology investments among freight hauliers and fostering an environment of joint efforts and shared responsibilities. Furthermore, our study brings into sharp focus the need for regulatory adaptations to support such transitions. It underscores the importance of policy changes that can create a favourable environment for the adoption and scaling of solutions like CCS. In this sense, our research positions CCS not just as a technological tool but as a transformative solution capable of driving systemic change in the road freight industry. Therefore, by offering detailed insights into CCS, our study charts a path for leveraging multi-system interface solutions for an efficient and effective transition towards low-carbon electrification.

4d Digital presentation: Justice and policies in transformation

Chains of leverage as way to identify and foster transformative potential: The example of the EU energy transition

Tamara Schaal-Lagodzinski & Maraja Richers, Federal Institute for Research on Building, Urban Affairs and Spatial Development

There is an urgent need for sustainability transformations in order to avert the current unsustainable trajectory which is threatening, inter alia, the ecological integrity of the planet. However, such transformations are complex and require systemic changes that are difficult to implement. The concept of leverage points, developed by Donella Meadows, highlights where and how different interventions in a social-ecological system can bring about transformative change. We propose the concept of ‘chains of leverage’ which considers interactions how one type of change in a system might precipitate further changes across different systemic depths. We aim to operationalise this concept by providing a step-by-step process to identify transformative potential and leverage points to foster sustainability transformation. We thus draw attention to different levels of system depth and to aligning system characteristics across these levels. Using the example of the EU energy transition, we highlight how leverage points at different levels (supranational, national, sub-national/local) and systemic depths (parameters, feedbacks, design, intent) interact to form dominant and alternative chains of leverage. We highlight how mismatches and conflicting elements can be identified and discuss three possible avenues for changing system dynamics. These encompass strengthening alternative chains, weakening dominant chains and eliminating disruptive elements. We conclude by highlighting the value of chains of leverage for empirical research and the adaptability of the approach to different systems.

Navigating the razor’s edge: Public acceptance of climate policies and the case of transport pricing

Gail Hochachka, University of British Columbia Canada

Going ‘beyond oil’ will require both sufficient public and political support within the existing paradigm, as well as sufficient support to move beyond it into a new low-carbon culture and system. This presents a tension for climate and energy policy design. Drawing on a case study of transport pricing in Vancouver, Canada, this presentation will explore this tension in practice. Transport pricing (TP) has long been viewed as reasonable economic measure to pay for the roads and the transportation system; more recently, it has been held up as a helpful policy instrument for climate action to reduce greenhouse gas emissions and foster sustainable mobility. Yet few cities have implemented TP. The main barriers include a lack of

public and political acceptance, which is especially the case in regions with entrenched socio-technical systems and cultures of automobility. The dominance of automobility can be a reason for TP to be unacceptable to the public and politicians. Yet, policies for low-carbon mobility ultimately fail if they are designed within automobility and do not move beyond it. This presents policymakers with a 'razor's edge' which they have to navigate to establish effective climate and energy policies 'beyond oil.' How can public acceptance be secured for climate and energy policy, such as transport pricing, both navigating within automobility to gain sufficient public uptake but also beyond automobility towards more transformative climate action? In this presentation, I share a study on the proposed TP policy for Vancouver, Canada which found that climate policy-design that parts with a fossil-fuel based regime—and rather is carried out within a low-carbon paradigm—may confront greater short-term challenges with public acceptance, but will better position such an innovative policy for success on the long-term.

Climate justice considerations on the role of CCS in IPCC mitigation scenarios: A comparative analysis of Brazil and Norway

Lina Lefstad & Natalia Rubiano Rivadeneira, Lund University

Carbon Capture and Storage (CCS) has gained traction in recent years as most IPCC mitigation scenarios rely on large-scale carbon dioxide removal (CDR) to keep warming below 2C. CCS is a critical component of many CDR technologies, since it can enable permanent carbon storage. We explore the role of CCS in IPCC mitigation scenarios and global climate mitigation policy debates, and its implications for climate justice. First, we examine how CCS became integrated into global climate change policy through IPCC mitigation scenarios. We focus on Brazil and Norway, two countries historically active in global climate negotiations, to demonstrate how global climate knowledge can be harnessed to serve incumbent interests at a national/local level. We do this by looking at how imaginaries/ideas of CCS are instrumentalized and justified through the use of narratives of equity and justice. We draw data from interviews and policy documents to analyse the ways in which IPCC mitigation scenarios with CCS are instrumentalized to shape perceptions of feasibility and desirability in response to climate change, and how these relate to narratives of justice and equity. For instance, Norway stated during COP26 that continued fossil fuel extraction, with CCS, is necessary if Norway is to continue to be able to afford to send climate finance to the Global South. While in Brazil CCS has begun to be considered to enhance the country's role as a key player in the global carbon market, while allowing for continued fossil fuel extraction. As calls for climate justice continue to grow, justice considerations in practices of policy relevant knowledge production reckon more attention. This examination serves as an entry point and an invitation to reflect upon the hegemonic assumptions and practices in policy-relevant climate knowledge production that might be tacitly contributing to maintain and justify fossil fuel infrastructure.

Integration of carbon budgets into regional climate policy:

Finding agency to accelerate mitigation

Paula Lenninger; Magdalena Kuchler & Martin Wetterstedt, Uppsala University

The inclusion of the global carbon budget in the Paris climate regime indicates a paradigm shift emphasizing the urgency to accelerate climate mitigation efforts. In Sweden, there has been an emerging bottom-up interest in estimating carbon budgets on the local and regional levels to understand what is necessary to meet the objectives of the Paris Agreement. However, when attempting to integrate the carbon budgets into broader policy frameworks to speed up climate action, the Swedish counties face the challenge of agency location and allocation, namely, who has the mandate to accelerate mitigation efforts. This paper aims to identify political and institutional agency in Sweden's multi-sectorial regional governance context concerning the Paris-compliant mitigation pathway. To do so, we conduct workshops with energy- and climate planners, strategists from local and regional governments as well as representatives of the industry, transport and energy sectors from three distinct Swedish counties of Västerbotten, Västra Götaland and Östergötland. Drawing primarily upon findings from the literature on climate governance, we then examine different forms of agency through the conceptual lens of the modes of governance that help concretize the otherwise inexplicit division between direct and indirect agency. The paper illustrates that in-direct agency is high in regard to technical solutions on a smaller scale where technological maturity is high but lower in regard to large-scale infrastructural interventions necessary to electrify heavy transports or renewable energy production and storage. The paper confirms earlier findings in the literature that there is little direct mandate i.e. governance by authority and points to novel observations concerning governance through agenda-setting and experiment. Finally, our results spur further discussions on what sectors must engage in specific interventions and what forms of governance are required. They also visualize the limits to the agency local and regional actors possess to govern the accelerated transition.

Who is vulnerable to energy poverty in China?

Lin Zhang; Lucie Middlemiss & Ian Philips, University of Leeds

Energy poverty has been identified as a problem in China, but research to date does not discuss who experiences it, unlike in other countries. Here, we compared sociodemographic characteristics known to be linked to energy vulnerability in other nations between energy poor (EP) households and non-EP households, using the 2018 survey data from China Family Panel Studies (CFPS). We found that a range of sociodemographic characteristics associated with transport, education and employment, health, household structure, and social security, are disproportionately distributed among five provinces (Gansu, Liaoning, Henan, Shanghai, Guangdong) in our study. EP households are more likely to have low housing quality, low education, old people, poor mental/physical health, be mainly female, be rural-Hukou, be without pension, and lack clean cooking fuels. In addition, the logistic regression results further evidenced the increased likelihood of experiencing energy poverty given vulnerability related socio-demographic predictors in the full sample, in rural-urban areas, and in each single province. These results suggest that vulnerable groups should be considered specifically when formulating targeted policies for energy poverty alleviation to avoid exacerbating existing energy injustice or creating new ones.