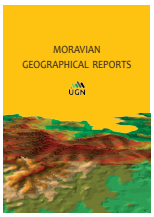

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The evolving energy landscapes of coal: Windows on the past and influences on the future

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Abstract

Coal energy landscapes have changed dramatically over the last decades, including geographic shifts in production and consumption, technological changes that have reduced labour demand and led to relatively new mining practices (e.g. invasive mountain-top approaches), changed economic footprints, a shutdown of capacities or a complete end of mining in many regions with massive impacts on regional and local economies, community well-being, social capital, et cetera. Then the Covid-19 pandemic and Russia´s invasion of Ukraine have fundamentally affected the global economy, disrupted energy markets, and shattered existing estimates about development trends, challenging the progress and speed of the low-carbon energy transition and coal phase-out. This article provides a brief reflection on the changing landscapes of coal and their possible futures, and serves as an introduction to the Special Issue of Moravian Geographical Reports on "The death of coal in the energy transition? Regional perspectives".

Keywords: *coal mining; energy landscapes; energy transitions; coal phase-out; energy crisis*

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1. Introduction

Energy dominates not only the lives we live but the land we use. For most of history, we assumed all rearrangement and damage to the landscape that energy development might cause were unavoidable ancillaries to the benefits that energy development provided. Despite our recent awareness that such attitudes are unsustainable, we still have legacy energy landscapes to address, old habits to break, and new sensitivities to establish. In concert with our more modern awareness, we have also realized the value of energy landscapes as windows on the past and influences on the future. They are all around us. We see them in the contaminated oil fields near Baku (Azerbaijan), the 'dead zones' around the Chernobyl and Fukushima nuclear power plants, the spectacular wind farms in Germany, the cleared forest lands above the oil sands in Canada, and the vast reservoirs along the Yangtze, the Paraná, and the Volta Rivers. Our need and use of coal, however, has produced the most profound and widespread record of reshaping the landscape. Coal energy development has most clearly revealed our cavalier brashness toward maintaining any semblance of landscape integrity.

The coal energy landscapes have changed dramatically over the last decades, including geographic shifts in production and consumption, technological changes that have reduced labour demand and led to relatively new mining practices (e.g. invasive mountain-top approaches), changed economic footprints, a shutdown of capacities or a complete end of mining in many regions with massive impacts on regional and local economies and a population's well-being and social capital (Betz et al., 2015; Ruppert Bulmer et al., 2021; Svobodová et al., 2022). While global coal consumption grew between 2010 and 2020 by roughly 6%, coal's share in the world's primary energy supply declined from 30% to nearly 26% over the same period, and its share in global electricity generation fell from 40% almost to 35% (Global Change Data Lab, 2022). The shale gas revolution in the United States, changes in China's economic structure and growth, the widespread adoption of climate change mitigation policies, and the immense development of renewables, resulted in changing the global coal industry and its "shift" from the USA and Europe to Asia (Alvarez and Arnold, 2020; Jewell et al., 2019). In the European Union, coal consumption decreased by almost 50%

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between 2010 and 2020, and the share of coal in electricity generation decreased from 25% to 13% in the same period (Global Change Data Lab, 2022). Similar reductions in the development and use of coal have also occurred in the USA. It might seem, at least in these two traditionally large markets that the bell is tolling for coal.

And then came two phenomena that fundamentally affected the global economy and disrupted existing energy markets and development trends: the Covid-19 pandemic and Russia's invasion of Ukraine. The pandemic caused drastic fluctuations in energy demand, oil price shocks, disruptions in energy supply chains, and hindered energy investments, while the war in Ukraine brought energy price hikes and unprecedented challenges for energy security, with great uncertainties regarding the future of energy transitions and climate change mitigation (see Zakari et al., 2022).

In autumn 2021, we started mapping the energy transition and fossil fuel phase-out processes in Europe and its effects on the development of regions and the lives of their inhabitants, and we announced a call for Special Issue of Moravian Geographical Reports (MGR) on "The death of coal in the energy transition? Regional perspectives". This was before the war in Ukraine, which has had huge impacts on the political, economic and energy situation around the world, and transformed the discursive space of the energy transition and introduced new aspects into it. This article provides a brief reflection on the changing landscapes of coal and their possible futures and serves as an introduction to this Special Issue.

2. Coal transforming lives and landscapes

Coal came to meaningful use relatively late in human history. While early energy landscapes were being produced as soon as we started reshaping the land for food, until the Industrial Revolution these impacts were of little concern. Once fossil fuels became more available and valuable, the human capacity to alter the land multiplied without restraint. While the use of fire and cultivated crops of the organic economy helped change where and how people could live on Earth, the use of fossil fuels of the mineral economy more fundamentally changed Earth itself. It was an uncompromising shift: instead of relying on the flow of renewable resources like water and wind that could be immediately available, people started depending on the stocks of mineral resources that had accumulated over vast periods. These were the 'fossil' fuels. Their greater energy density allowed them to be economically marketed over great distances. Such a shift in energy density broadened the geographic area of demand and the scale of production (see e.g. Fine, 1990; Clark and Jacks, 2007). At the time of this shift, the energy landscapes of coal began to take shape.

Greater demand for energy led to increased coal mining, first from the places where it was easily accessible at the surface and, later, from underground. Early mining near Ličge, Belgium and Ironbridge, England, was followed by mining in Poland, Germany, Russia, China, the U.S., Australia, and other countries. In most places, even when coal came from underground, the related mining activities created notorious energy landscapes on the surface. Much of England's gracious Midlands was turned inside out, and the bucolic scenes that once characterised the state of Pennsylvania in the U.S. lay littered with the detritus of noncombustible shale and slate (see Fig. 1).

But these activities were only partially responsible for the landscape changes that resulted. In addition to the direct impacts of the mines, workers by the thousands moved to where the jobs were and built houses, churches, shops, and factories. It was a sequence replicated everywhere coal was developed, and settlement patterns created during this period are still largely in place, even when coal reserves have been exhausted. Coal mining and environmental quality became a classic binary that set a pattern for what we continue to see today. With little understanding of how to soften the impacts of the coal, damaged landscapes that coal mining created were tolerated as a sign of progress. For those who lived amid the coal measures, there was no escaping the energy landscapes that mining coal produced. Central England, South Wales, eastern Belgium, the Ruhr and Saar regions of Germany, Appalachia in North America, the Donets Basin of Ukraine, and many other places became sordid, unsafe, and pathetic energy landscapes that included scars, pits, shafts, piles of waste, hulking machinery, and miserable assemblages of squalid housing. So notorious did coal landscapes become in Britain

Fig. 1: Noncombustible piles, called 'culm,' litter the old anthracite city of Wilkes-Barre, Pennsylvania, USA Photo: M. Pasqualetti

and France that they were used as the dismal backdrop for novelists such as Charles Dickens, George Orwell, Richard Llewellyn, Émile Zola, and many others.

Ironically, while early coal mining tarnished the natural landscape, it stimulated new inventions that were to intensify the form and scale of landscape damage even more. First, diggings had been in the form of shallow bell mines, named after their distinctive profile. Later, when improved equipment became available and water pumping more effective, mines became deeper, more elaborate, and more extensive. Even for underground mines, surface landscapes were changed due to the winding gear, ventilation shafts, spoils, and – in some places – surface subsidence (see Fig. 2). Our speeding desire for more and more coal was rapidly transforming the remaining natural landscapes into energy landscapes of coal. Yet, even then, it was only the beginning.

Technology continued to improve, and energy landscapes took on an even greater extent and impact. Massive and powerful machines eventually allowed the removal of extensive areas of overburden, exposing the coal seams beneath, heralding the era of open-cast mines that have, in several places, devoured towns as mining companies sought to reach the coal just under the surface (Montrie, 2003). For example, over a hundred of villages and parts of some larger cities have been destroyed and nearly 100,000 people were forcibly relocated due to the sprawling surface mines, construction of large thermal power plants and related infrastructural projects during the communist regime (1948–1989) in what was then Czechoslovakia (Říha et al., 2010). Infamously, the entire historic centre of the medieval city of Most was obliterated as a "decaying capitalist relic" to expose over 85 million tons of coal under the city (Glassheim, 2007) (see Figs. 3, 4a and 4b).

Most recently, especially in the Appalachian Mountains of the U.S., entire mountains are being demolished with nonchalant detachment (see e.g. Scott, 2010). Mountains in places like West Virginia are simply disappearing (see

Fig. 2: Abandoned house damaged by subsidence from underground coal mines in Wilkes Barre, Pennsylavia, USA. Photo: M. Pasqualetti

Fig. 3: One of the extensive open-cast coal mines that have reshaped the landscape near city of Most, Czech Republic in 2012. Photo: B. Frantál

Fig. 4: Historic Most in 1940s (left) and the same perspective in 2012, showing reclaimed land after coal mining (right). Source: The Archive of Regional Museum in Most; M. Pasqualetti

Fig. 5); up to 500 mountains in Appalachia have been lost so far. In the roughly 12-million-acre region of eastern Kentucky, southern West Virginia, western Virginia, and eastern Tennessee where mountaintop removal mining is concentrated, nearly 7% of all the land was disturbed between 1992 and 2012. For further information on mountaintop removal see Mary Anne Hitt (2007). One of many organisations that is attempting to slow the creation of energy landscapes from mountaintop removal is the National Memorial for the Mountains (www.ilovemountains.org).

Fig. 5: Mountain-top removal in Hobert 21 mine, West Virginia, USA. Photo: M. Farlow

The landscape impact does not stop with mountain top removal; the discarded overlying rocks, soil and vegetation must be dumped somewhere. Usually, it is tossed into nearby valleys. This practice can double the extent of the coal landscape produced, just as it also changes the watershed's hydrology and increases the risk of disastrous flooding and land slippage. While mountain top removal allows the retrieval of virtually all the coal underneath, it produces an especially vicious and lasting landscape insult. Even where reclamation of a sort can be practiced, landscapes are altered to an extent never witnessed in the long account of coal mining. Although public outcries have accompanied the use of this technique, they have failed so far to halt its practice (Fig. 6).

Cataloging coal landscapes can go on and on. It could consider much more than just the extraction phase. We could also include landscapes that are altered by railroads and conveyor belts, storage silos, washing apparatus, power plants, fly ash disposal, and even the indirect impacts of acid rain on forest cover. Our use of coal has transformed landscapes near and far in more ways than we usually imagine, and there seems no way to predict how long into the future they will persist or what new forms they may take.

Fig. 6: Protest placards against mountain-top removal in July 2005, Whitesville, West Virginia, USA Photo: M. Pasqualetti

3. Recycling, upcycling and rebranding coal energy landscapes

Over the centuries, energy development has largely been a linear enterprise, ending in landscapes disrupted, abandoned, poisoned, and forgotten. This "use, abandon, forget" approach is slowly being abandoned in favour of the more sustainable notion of "use, repurpose, reuse" (*cf.* Pasqualetti and Stremke, 2018). The ongoing low carbon transition – a transition from fossil fuels that underpinned the industrial age to a post-industrial era – is characterised by increasing competition between the land used for energy development and the land needed for cities, farms, recreation, and contemplation. In many countries, there is increasing pressure to regenerate, reclaim, and redevelop the abandoned, derelict and contaminated areas left behind – so called brownfields (see e.g. Martinát et al., 2018; Navrátil et al., 2018). These include abandoned mines, processing equipment, waste heaps, disused oil and gas wells, and other traditional energy landscapes.

The repurposing of these landscapes – and often disused buildings that rest on them – has become increasingly imperative and economically sensible as competition for land has increased and as emerging policies and economic instruments have grown to support the regeneration processes (e.g. the Re-powering America's land Initiative, see EPA, 2010). We have now reached a period when recycling energy landscapes is occurring with increasing frequency. While many energy landscapes are being recycled, we also witness the upcycling of energy landscapes, when the environmental integrity and performance of the present stage exceed those of the previous stage (Pasqualetti and Stremke, 2018). Examples of this new stage in land use development include converting opencast mines to recreational lakes, power plant buildings into museums, sites of mountain-top removal into golf courses, ash disposal piles into solar farms, canal paths into bike paths, and a wide assortment of energy infrastructure into destinations for the "energy tourism" (Frantál and Urbánková, 2017) (see Figs. 7 and 8).

The historical development of energy in a landscape, like other land uses, is an expression of changing relations between people and their living environment. Public perceptions of and attitudes to energy landscapes are prone to change with time, with some energy landscapes that induced opposition and social conflicts during construction and/or operation being now listed as UNESCO world heritage sites (this is also the case of coal mining landscapes, such as, for example, the utopian architecture from the early periods of the industrial era in Wallonia (Belgium), Sorachi coal-mining landscape in Hokkaido (Japan), the Ombilin mines in the mountains of West Sumatra (Indonesia), or recently listed sites in Erzgebirge/Ore Mountains region on the borders of Germany and the Czech Republic.

Various forms and materialisations of energy from fossils fuels to nuclear power and renewables have been perceived as being, among other things, dirty, clean, environmentally harmful, uncontrollable, dangerous, friendly, expensive, fascinating, or ghastly (see e.g. Truelove, 2012). Accordingly, new public relations and branding strategies (including various forms of energy tourism attractions and activities)

Fig. 7: Partially recycled coal energy landscape in Oslavany town (Czech Republic). An abandoned complex of coal-fired power plant (in the middle of the background), a big slag heap accumulated over decades of burning coal, and solar (PV) plant constructed on mining dump (left) – photographed from the Kukla mining tower, which is part of the former mining buildings regenerated into an amusement park for children (in the foreground). Photo: B. Frantál

have been introduced by energy companies and various interest groups in order to influence policy makers, energy policies and their support among the general public, social acceptance of energy projects, and even customer loyalty in liberalised residential energy markets (Frantál and Urbánková, 2017). For example, the Czech Coal Group company has been organising since 2009 so called "Coal Safari" guided off-road truck tours in an area of active open-pit mine near the city of Most, which has been already attended by tens of thousands of visitors. The aim of the tours, which include several stops introducing different types of minescapes, mining technologies and machines in regular operation, with examples of post-mining environmental restoration (including the Most Hippodrome (Fig. 9), the Matylda recreational lake created from a flooded quarry, vineyards and forests planted on coal dumps), was to improve the public image of coal mining in favour of lifting the current territorial limits on mining in the area (see also Frantál, 2016). How are global discourses concerning energy sustainability locally reproduced through specific energy tourism products and how are different narratives used by companies and operators to promote their products and to shape public opinion about energy are among the key questions in the energy tourism research.

Energy has been largely "invisible" in the consumption choices made in our daily lives, and people living outside energy landscapes were rarely aware of the spatial and environmental costs of the energy they consume (Pasqualetti, 2000). As Frantál and Urbánková (2017) suggest, the energy tourism can play a more important role than as just a kind of consumer experience-oriented industrial tourism (Mitchel and Orwig, 2002). By witnessing the real impacts of energy production on landscapes, energy tourism has the potential to improve people's energy literacy by raising awareness about the environmental cost of the energy we all use, and to motivate people to think about appropriate energy-related choices to tackle current energy challenges. While industrial heritage sites represent rather landscapes of history and nostalgia, new energy tourism sites with wind and solar farms represent authentic contemporaneity, or even the landscapes of a possible future, as we can assume further spatial diffusion of renewables. Energy landscapes

Fig. 8: Zollverein coal mine industrial complex (Essen, Germany) converted to museum and tourist attraction Photo: M Pasqualetti

exist over a wide temporal range in various forms. There are those that existed in the past but have disappeared due to reclamation or natural succession, there are those that exist at present and have an uncertain life expectancy, and there are those that will exist in the future, either created afresh or recycled from pre-existing energy landscapes (Pasqualetti and Stremke, 2018).

4. The death of coal in the energy transition?

In 2014, the Special Issue of Moravian Geographical Reports on "New Trends and Challenges for Energy Geographies" was published (see Frantál, Pasqualetti and Van der Horst, 2014) to contribute to the debates about the spatial scales and social dynamics of ongoing energy transition processes in the European context. The continued expansion of the renewable energy sector with wind farms, solar power plants and other energy facilities growing in number and size, has significantly altered landscapes and land use dynamics, and brought about new land use conflicts, socioeconomic disparities, and disconnections between policymakers and stakeholders (see e.g. Warren, 2014; Carley and Konisky, 2020; Frantál et al., 2023).

Fig. 9: Most Hippodrome – the racecourse with trail for in-line skating which was built on a recultivated coal dump, city of Most, Czech Republic. Photo: B. Frantál

Geographers contribute to understanding energy transitions by paying attention to settings (places), spatial configurations and the dynamics of the networks within which the transitions are embedded (Hansen and Coenen, 2015; Bridge and Gailing, 2020; Coenen et al., 2021). Since the capacity to take up different renewable energy technologies is related to geographical conditions, the locations, landscapes and territorialisations associated with energy transition can generate new patterns of uneven development (cf. Bridge et al., 2013). It is also important to understand how systems of places shape the reproduction of dominant socio-technical systems for energy (based on fossil fuels), by mediating the extent and efficacy of public engagement in decision-making and problematising political challenges to the social order (Cowell, 2020).

The energy transition posed challenges for regions that are still heavily dependent on the extraction of fossil fuels and related industries – the so-called coal and carbon-intensive regions (European Commission, 2017). Despite their centrality in energy provision chains during the 19th and 20th centuries, carbon-intensive regions are now considered peripheries – synonymous with landscape degradation, air pollution, and health and social deprivation. The phasing out of coal and the decline of related industries have resulted in stagnating local economies, declining populations, an overall sense of loss of identity and prospects, and the rise of populism rhetoric with nostalgia for the 'good old days' (Kojola, 2019; Mayer, 2022). On the other hand, the energy transition could be perceived as an opportunity for developing new lines of economy, rebranding identities, and for increasing the competitiveness of structurally depressed regions (Alves Dias et al., 2018; Stognief et al., 2019).

In 2017, the European Commission established the "Initiative for Coal Regions in Transition", to promote knowledge-sharing and exchanges of experiences between European coal regions. The aim of contributing to the sharing of experiences with energy transitions in different European regions and to highlight the role of geography in addressing current energy dilemmas, was the background of this Special Issue. The current energy crisis with disrupted energy markets, increasing prices of fossil fuels and electricity related to the post-Covid economic recovery and the war in Ukraine, have challenged the progress and speed of energy transition and brought another dimension to the coal-phase out debate: it is no longer just a binary "jobs versus the environment" discourse, but issues of national energy security and peoples' rights to affordable energy and heat that are being highlighted.

Zakeri et al. (2022) have suggested that both crises (i.e. the Covid-19 pandemic and the Russia-Ukraine war) initially appeared as opportunities for the energy transition, by showing the extent of lifestyle and behavioural change in a short period and the role of science-based policy advice on the one hand, and by highlighting the need for greater energy diversification and reliance on local renewable sources on the other hand. They, however, provide evidence that policymakers worldwide more likely focus on quicker and short-term solutions (such as supporting incumbent energy industries and searching for new fossil fuels supply routes) to save national economies and enhancing energy security. In this respect, they argue, the fossil fuel industry may emerge even stronger after this energy crisis, creating new lock-ins (Zakeri et al., 2022). Politicians' plans to extend coal mining (previously announced to end) are already echoing from many European countries. Recently, a plan to dismantle the Keyenberg wind farm in the western state of North Rhine-Westphalia (Germany), to expand the area of surface coal mining, has stirred up wider public opinion (Oltermann, 2022). The opening of a new deep coal mine after decades as announced at the beginning of December in Great Britain drew huge criticism from opponents (Reuters, 2022). The Woodhouse Colliery, to be developed by West Cumbria Mining in northwest England, should extract coking coal to be used in the steel industry and is expected to create up to 500 new jobs. This summer, the government in the Czech Republic decided to extend coal mining in the last open underground hard coal mine in the country, which was supposed to be completed in 2022, at least until the end of 2023. The Czech politicians, however, assume that coal mining will continue here even in the following years if it will be at least "economically neutral" (i.e. neither profitable nor unprofitable) (Czech Television, 2022).

The aim of the Special Issue was to address some of the following issues: What are the patterns of energy transition and renewable energy development in coal regions with different geographical development contexts and different

resource availabilities? How does geographical (spatial) proximity, remoteness or peripherality play a role in the socioeconomic and demographic changes of coal regions? How do people in carbon intensive regions perceive the energy transition processes and policies? Are people living in coal mining regions affected by energy poverty and how do they deal with it? To what extent are coal regions populist, anti-democratic, xenophobic? …and how do different regions reshape their image and collective identity based on coal mining traditions or alternative narratives? Our collection of articles includes European countries with a strong and long-standing tradition of coal mining and related industries: the Czech Republic, Germany, Poland, Romania, Spain, and Scotland. While the first three articles focus on the economic and social impacts of the energy transition in traditional coal mining regions, the next three articles examine public perceptions and attitudes towards the decarbonisation and development of specific forms of renewable energy systems at the community and individual level.

In the first paper, Bohumil Frantál, Jindřich Frajer, Stanislav Martinát and Lucia Brisudová provide new empirical evidence regarding the theories of the resource curse and regional resilience in the context of a coal phase-out, using statistical data for districts in the Czech Republic. They found that Czech coal mining and post-mining districts (in aggregate) show significantly worse indicators in terms of air quality, population vitality, labour market issues and social capital than non-mining districts. The authors, however, revealed significant intra-group differences in most indicators, and they conclude that coal mining itself and its decline is not a significant determinant of population decline, unemployment, and support for populism (which are determined by the geographical peripherality, rate of urbanisation, population density, education level and business activity in districts). The study demonstrates that it is problematic with respect to policy implications to consider coal mining regions as homogenous categories and that it is necessary to investigate and reflect differences in demographic and socioeconomic indicators at a sub-regional level.

Despite the political promises that the just transition will bring more democracy and prosperity, there are legitimate fears that, in some regions, the pre-existing inequalities will be reinforced rather than rectified. Focusing on Jiu Valley, a traditional coal-mining region in Romania, Sanda Nicola and Serge Schmitz question how community resilience can be stimulated prior to and during coal mining closures. Their study reveals shortcomings in implementing the just transition, including the issues of governance and mistrust towards local and national authorities, difficulties in orchestrating individual agendas to launch a collective action for the future of the region, and poor information and delays of the mine closures. Furthermore, they point out some of the mechanisms that explain the scarce preparedness of key actors for the coal phase-out and why the closure of mines and the socioeconomic transition were repeatedly postponed.

Oei et al. (2020) emphasised that, besides the economic reorientation, the change of regional identities is the most difficult aspect of the transition of coal mining regions. In the third paper, using a critical narrative analysis, Franziska Görmar and Nadir Kinossian explore how identity-forming discourses and local development activities co-constitute each other in the case of Zeitz, an industrial town located at the fringes of the Central German lignite exploitation area. As local actors try to make sense of a place's past and future, they select, contribute to, and mobilise various local narratives, which are part of a place's identity that defines a frame for possible development options. The authors suggest that the development of local narratives is a dynamic policy arena where collective and individual experiences influence each other and create structuring frames for options and local actors, and the narratives help to construct a coherent imaginary of a place linking the past, present, and the future.

Suburban neighbourhoods (not only in the UK) are characterised by high car-dependency and relatively large and energy inefficient homes, which pose challenges regarding their decarbonisation. Charlotte Bucke, Connor Smith and Dan van der Horst surveyed households in Perth (Scotland) about their perspectives on the adoption of measures for decarbonising homes and transportation in suburbia. While they found high levels of concern about climate change, energy costs, and growing engagement with cleaner technologies, most residents perceived their individual options for decarbonisation as limited, and they seem locked into high-carbon suburban lifestyles. The views that the state should take a stronger role in coordinating and implementing systemic changes required for energy transition and applying measures affecting residents directly (such as e.g. reducing car traffic into the city centre) have been also shared.

Quite similar findings about a wide awareness about renewable energies in general, but a rather shallow, imbalanced, and outdated knowledge on potentials, advantages and disadvantages of individual locally available sources are reported in the next paper from Poland, by Justyna Chodkowska-Miszczuk, Sylwia Kuziemkowska, Pramit Verma, Stanislav Martinát and Agata Lewandowska. The authors argue that to break deeply rooted carbon dependency and lock-in and to trigger mechanisms of change leading to more sustainable futures, practical, contextual, and place-based knowledge is essentially needed to shape responsive attitudes of people living in rural areas. They claim that personal experience of the effects of renewable energy facilities (together with distributional justice) can be a proxy for the change and scaling up. This is a key because it proves the leading role of an inclusive approach to developing renewable energy in rural areas.

Spain is among the world's leaders in wind energy implementation. Despite having one of the fastest rates of onshore wind power growth, the offshore development so far lags significantly behind – mainly because of strong local opposition. Marina Frolova, Belén Pérez-Pérez and Daniel Herrero-Luque in their paper explore factors affecting public perceptions of offshore wind farms in the coastal regions of Southern Spain. Their study shows that the conflicts surrounding offshore wind farms are linked to the perception of the sea and the wind as important local resources, and the perceived right of the coastal region to use these resources to generate wealth for their communities. They suggest that providing socioeconomic benefits for local communities and guaranteeing a joint use of marine resources can significantly increase the local acceptance of projects.

The few articles in this Special Issue present a width of geographical perspectives on the ongoing energy transition and a diversity of empirical research endeavours applying various methods and techniques, from participatory observation, interviews, focus groups and questionnaire

surveys to the content analysis of historical documents, critical narrative analysis and rigorous analysis of statistical data using multivariate statistics. Our articles do not give a clear answer to the question of whether and when will the death of coal occur in the energy transition, but they help to understand the complexities of this process, its driving forces, barriers, and consequences.

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