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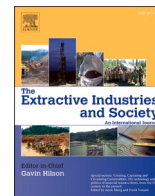
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Review article

Decarbonising industry: A places-of-work research agenda

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ABSTRACT

Deep decarbonisation of extractive and foundational industries will involve widespread social and economic change. Research on previous industrial restructuring has demonstrated that resultant changes will be geographically uneven, especially without countervailing state intervention. Such change has been shown to matter for both the nature and location of work in those industries as well as for the wider wellbeing of places. Concentrations of economic activity create place-based economic and sociocultural dependencies. As such industries and industrial work often become entwined with workers' and communities' cultural identities. It is important to understand implications of industrial change for work, for place, and – as we argue here – relations between work and place. Building from a semi-systematic review of existing literature on industrial decarbonisation, work and place, we extend prevailing political economic approaches to economic change, to also set out an original approach to decarbonising extractive and foundational industries, which we term 'places-of-work'. This approach is embedded in acknowledgement of the deep economic and cultural relations between work and place, which also plays out in processes of industrial decarbonisation. The approach builds from cultural and feminist approaches to economic change to emphasise sets of interrelations important to study of industrial decarbonisation as geographic phenomenon. Such an approach means extending the role of the state not as solely, or even primarily, focused on provision of training or employment opportunities, but as requiring adoption of a place-based approach to remaking economic and cultural characteristics of a location and its people. In setting out our alternative agenda, we seek to develop new insights that enable us to understand how industrial transitions potentially act within, and impact upon, places and their cultural identities, and the role of the state in reinforcing and disrupting these to support just transitions.

1. Introduction

Decarbonisation is impacting decision-making across extractive and foundational industries. Action has been catalysed by growing global recognition of climate emergency, underpinned by formal commitments like the 2016 Paris Agreement which seeks to ratchet up climate action. There are specific impacts for those industries – industrial processes, changing locational factors and so on – but economic restructuring also has impacts for the places where economic activity happens, and for work (While & Eadson, 2022). This includes interactions between work and place. Those changes, and the interactions between work and place involved, have implications for the state as a critical institution in guiding and shaping how decarbonisation processes unfold. Previous research on industrial change has emphasised its uneven geographic impacts, particularly affecting places with high concentrations of

particular industries (Massey, 1984). Such change impacts on availability of paid employment and has indirect impacts on local economies. When geographically concentrated, industries become entwined with the economic story of places, but also worker and community cultural identities (Mackenzie et al., 2006; High et al., 2017; McLachlan et al., 2019). As such, understanding implications of decarbonisation needs to not only focus on implications for work(ers) and for places, but how relations between work and place are also affected; and the role of the state in mediating those impacts.

In this article we set out a novel 'places-of-work' approach for investigating relationships between work and place in decarbonisation processes; and consider the role of the state in mediating these relationships. We root our approach in feminist readings of industrial change, place and work, which question 'masculinist' understandings of economic organisation and its spatial implications. In particular we

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build from the work of four scholars, whose work might each be loosely framed as post-Marxist: J.K. Gibson-Graham, Miriam Glucksmann, Doreen Massey and Kathi Weeks. These scholars each seek to examine how concepts and practices of work are politically constructed and deployed through time and space. Importantly for us, they each seek to uncover how dominant discourses and social constructions shape how we understand work, place and possibilities for change.

We begin with an overarching project of ‘reading for difference’ (Gibson-Graham, 2020) seeking to uncover difference and heterogeneity within our understanding of industrial futures. Specifically we highlight how industrial activity is enmeshed within people’s lives and the places where they live in a variety of ways in, beyond and against waged labour, or indeed beyond work in any form. This in turn has implications for how we think about industrial decarbonisation processes and their impacts. In this vein we also draw from Weeks (2012) who examines the political construction of work, its perceived value, and where it is seen to take place.

Places-of-work, then, is an attempt to conceptualise interrelations between industrial activity and the work involved in this activity; and places and the work that goes into making places. The aim is to trace these connections to support a different reading of industrial change, and by extension, industrial decarbonisation. We take this lens to consider how the production of spatial divisions of labour through Massey (1984) can be expanded through interaction with the work of Glucksmann (2005) on the ‘total social organisation of labour’, to understand work as spatially organised through time and as a set of interrelated activities in and beyond waged labour. In line with Weeks (2012) we use this conception to draw on ideas of ‘concrete utopianism’ to consider what industrial decarbonisation might then mean when configured as a set of utopian demands for future places-of-work. Our novel conception of places-of-work is therefore an attempt to inject understanding of industrial decarbonisation with a relational approach to place and work which hinges on a web of interrelations, between and within places, between modes of economic activity, and between past, present and future.

We develop our approach by first examining existing understanding of industrial decarbonisation, work and place. We interrogate literature on industrial decarbonisation through a semi-systematic review of scholarship in the field, focusing on how interrelations between work and place are conceptualised and operationalised. We find valuable continuation of political economic understandings of these relations – as utilised to understand other processes of economic change – as well as points of promise for more culturally and materially informed perspectives on transitions. We take this review and consider its implications for how we understand the role of the state in industrial decarbonisation processes. We then use this as a starting point to set out our alternative agenda that more explicitly infuses work-place relations with a material and cultural, feminist, sensibility without losing sight of the important role of geographic political economy in both understanding and addressing economic injustice. As with our initial review, we consider what implications this alternative framework has for how we understand the role of the state in industrial decarbonisation processes. We outline implications for four sets of interrelations that sit at the heart of our suggested approach: work beyond waged labour; place beyond place as container; action beyond the structure-lived experience divide; and temporalities beyond present-centrism.

The remainder of this article is structured as follows. First we outline our methods and broad thematic overview of industrial decarbonisation literature uncovered through our review, before conducting a deeper analysis of how this literature has attended to questions of place, work and the state. In the following section we build out from this review to set out our places-of-work framework.

2. Methods and thematic overview

Our argument derives from a review of industrial decarbonisation

literature, which sought to identify trends and gaps in existing scholarship on work, place and the state in relation to industrial decarbonisation. The literature review sought to answer the question of, *how are state, place and work defined and operationalised in existing understanding of industrial decarbonisation?*

The review employed a semi-systematic approach. The focus in such a review is to generate new qualitative insights based on capturing different – often interdisciplinary – perspectives which are less easily comparable and quantifiable than the kinds of questions often set for classic systematic reviews (Garvey et al., 2022). This allows for generation of thematic and content analysis of literature (King and Locock, 2022), in our case with specific interest in conceptualisation of key terms.

An initial literature search was conducted in March 2022, using Google Scholar, Scopus and Web of Science search engines. A search strategy was devised using combinations of terms across topics and themes relating to extractive and foundational industries, decarbonisation, place, work and time. The following overarching keyword search string was used as the initial search:

(Industry OR coal OR iron OR steel OR metals OR mining OR Glass OR cement OR oil OR chemicals OR paper OR ceramics) AND (decarboni* OR transition OR “just transition” OR phaseout OR “phase out”) AND (work OR labor OR labour OR jobs OR employment) AND (place OR community OR identity OR memory OR legacy)

In Scopus and Web of Science, search results were limited to outputs from relevant disciplines to screen out solely technical papers. For example, in Scopus results were limited to: arts and humanities; social sciences; business, management and accounting; economics, econometrics and finance; and ‘multidisciplinary’. Search validity was also tested by using shortened search strings using different combinations of the terms within the string.

These searches, combined with further snowballing from literature found in search results identified 70 articles that were initially viewed as relevant to our research questions.

An initial sift of search results removed nine articles focused solely on technical and policy aspects of industrial decarbonisation. A further 32 papers were deemed relevant to our wider research agenda but not sufficiently focused on industrial decarbonisation in relation to place and/or work for inclusion in our detailed review. We were stringent with our criteria: we only wanted to review papers with an explicit focus on place or work (ideally both) in relation to industrial decarbonisation and so, although there is a burgeoning literature on – for example – the concept of just transition, our focused criteria meant that a relatively small sample of articles made it through the initial sifting process.

This left us with 29 papers for review (see Appendix 1 for the full list). An initial topline analysis of these papers (via titles and abstracts) assessed:

- Date of publication
- Topic focus
- Geographic focus

Search results confirmed that academic interest in industrial decarbonisation and its relationship with place and/or work is very recent, reflecting that policy and market changes for fossil fuel phaseout and industrial decarbonisation have only recently begun to take shape (see Table 1).

Over half of outputs (17 out of 29) investigated coal transitions with other topics more evenly spread among the rest, again reflecting where much initial policy and investment was focused during early phases of energy transition (see Table 2).

Articles mostly focused on the Global North, with 21 studies centring on Europe (8), North America (8 – all USA) or Australia (3). This reflects other reviews on – for example – spatial justice implications of

Table 1

Date of publication.

Publication year	Number
2010–16	0
2017	1
2018	8
2019	1
2020	9
2021	10
Total	29

Table 2

Topic focus.

Topic focus	Number
Coal	17
Oil	2
Natural gas	1
Fossil fuels (general)	1
Renewables	3
Energy general	2
Transport	1
Technological transitions	1
General/unspecified	5
Total	33

Note: some papers focused on more than one topic area so total exceeds number of papers.

transitions (see Garvey et al., 2022) and is likely influenced by the fact that searches were conducted in English and only papers with an English-language abstract were included for further analysis. It also likely reflects that the countries/regions most represented in the literature are at broadly similar stages within both the long-durée of industrial development and more recent energy transition processes.

Papers included for detailed review were analysed according to:

- How they conceptualised work
- Who or what was seen to be important in shaping work implications of industrial decarbonisation
- How they conceptualised place
- Who or what was seen to be important in shaping place implications of industrial decarbonisation
- How the role of the state was understood in relation to place and work

Coding within each of these questions was inductive, and these inductive codes are reflected in the headings used in the analytical sections throughout Section 3 below.

In the next section we conduct a more detailed thematic analysis of the literature, presenting our interpretations of how work and place are conceptualised; and how work and places are seen to be shaped through transition processes. We also consider the broader intellectual standpoints of the literature, before reflecting on what this means for how the state is understood in existing scholarship on industrial decarbonisation.

3. How have work and place been explored within existing literature?

In this section we explore how work and place have been conceptualised in the literature to date, identifying key empirical and conceptual themes. We use this review to understand the dominant framings and points of difference within the literature, and then draw from the review to set out our place-of-work approach in Section 4.

3.1. Work

3.1.1. How is work conceptualised?

Work tends not to be explicitly conceptualised within the literature. In application it is almost exclusively used to mean waged labour or ‘jobs’ (e.g. Baran et al., 2020; Cha, 2020; Crowe and Li, 2020). Likewise, studies often discuss the loss of ‘good’ work resulting from fossil phaseout, and the lack of skilled replacement jobs, highlighting fears for affected workers that they will not find new, ‘decent’ work. But the nature and quality of work – either that which is lost or in new jobs – tends not to be unpacked.

The literature also primarily pays attention to ‘frontline’ labour: the work involved in extracting coal, oil and gas, power production, or manufacturing and installing new technologies. Sharma and Banerjee (2021) expand this to consider indirect (jobs in supporting processes) and induced (as a result of overall changes in economic activity flowing from energy investments) jobs created and lost through changes in energy generation processes.

Logically following focus on immediate implications of decarbonisation, most articles bound analysis to local labour processes. Some studies go further to consider labour relations across supply chains, opening the boundaries of site-specific implications to consider how changes in production/consumption in one site might lead to implications for labour elsewhere. Stevis and Felli (2020, p.8) highlight, for example, implications for work across Global Production Networks (GPNs) in analysis of just transition: “*research on planetary just transitions ... must pay attention to social relations across boundaries.*” (We also note here that other literature beyond this review has focused on justice in GPNs for products and technologies important for energy transitions: for instance, Sovacool et al. (2022) highlight ‘embodied injustices’ in the solar PV industry.)

But Littig (2018) critiques focus on waged labour, arguing that moving to a sustainable society potentially involves an overall reduction in paid labour. They consider the implications for potential reduction in need for paid work in places impacted by decarbonisation and highlight the requirement to pay attention to the role of unpaid work in maintaining civic functions: to do so, “*a fundamental sociocultural change and new forms of meaningfulness will be required. How this change should be set in motion and who should promote and carry it are aspects that are not addressed in the majority of studies*” (2018 p.573). Following from this they argue for greater focus on the “*psychosocial functions of paid work and its relevance for civic integration*” (ibid.), that is, the relationship between work and place.

In a similar vein, Sanz-Hernandez (2020) explains how coal phase-out affects the identities that people derive from work. They find that “*identification with coal tends to be continuous, even after the mine has closed or the employment relationship with the mining concern has ended*”, demonstrating that these identities can continue even after employment (ibid. 2020, p.7). These interventions from Littig (2018) and Sanz-Hernandez (2020) start to expand the boundaries of work within decarbonisation processes, asking scholars to think more deeply about the connections between decarbonisation and entanglement with different sets of activities, as well as the meaning of those activities to participants.

3.1.2. What shapes work in decarbonisation processes?

The literature highlights two sets of factors on relations between work and industrial decarbonisation: place as context for worker transitions; and actors-in-places with agency to shape work futures. The consideration of place-as-context does not always focus directly on work, but economic conditions more widely. As such we discuss that later, when considering treatments of place.

Here, following the literature, we focus on who shapes decarbonised work futures and how. Analysis centres on the role of formal institutions, especially state bodies and trade unions. These institutions are bound by diverse sets of relations and negotiations: industrial change “*involves*

struggle" (Snell, 2018). However, scholars differ in their emphasis on the importance of different actors within these struggles.

3.1.2.1. Government and policy. Much of the literature emphasises the role of state organisations in mitigating job losses and reskilling workers: "government needs to come up with a proactive set of interventions that will retrain and reskill workers from high-carbon sectors, so that they can move into emerging low-carbon sectors" (Johnstone and Hielscher, 2017 p.459). And, as Snell (2018, p. 560) argues, in liberal economies, "the general criticism is that governments ... have not done enough". Municipalities and regional governments have provided reactive support to mine or power station closures, for instance working with unions and employers to set up worker transfer programmes to related industries, and funding pension 'sweeteners' to encourage early retirement. But often this has taken place in response to firms' decisions rather than as proactive measures to support workers implicated in decarbonisation processes. In turn, Weller (2019) critiques state policies as relying on flawed assumptions about how 'the market' will determine labour outcomes of decarbonisation. In this framing, work futures rely on changing the nature of supply and demand within industries: individuals (as market actors) will respond to those signals to find work.

This market-led approach is not the only route even within the confines of growth-led capitalist ideologies, and places characterised by different 'worlds of welfare capitalism' (Esping-Anderson, 1990) show alternative possibilities. Oei et al. (2020) focus on more interventionist approaches in the German coal transition policy since 1950. They demonstrate how government at different levels can attract investment and support new industries to create jobs in different sectors, also retraining workers (and providing other forms of employment support) to move into different sectors. Importantly, Oei et al. (ibid.) also emphasise the importance of government investment beyond retraining programmes, to develop supportive scaffolding such as transport, digital and utilities infrastructure, education, research facilities and 'soft' location factors (like cultural and leisure facilities).

3.1.2.2. Trade unions. Calls for just transition originated in the Trade Union (TU) movement and so it is not surprising that where work is addressed as an important element of industrial decarbonisation, the role of TUs is a key focus of the literature (e.g. Stevis, 2018; Stevis and Felli, 2020; Clarke and Lipsig-Mummé, 2020). Similarly, worker agency is often considered as a function of TU activities and organisation.

Consideration of the role of unions is nuanced. For instance, Clarke and Lipsig-Mummé (2020, p. 363) highlight the different contexts that unions operate within and the differences this makes to union strategies:

First, union strategies depend very much on the sector, whether it is associated with greater or lesser carbon emissions and whether employment gains or losses are envisaged. They depend too on unions' histories, identities and position in society, whether embedded in social partnership models, defenders of member interests in the market or active representatives of working-class interests. Finally, they depend on the industrial relations system in place and on the role of the state and how far these provide opportunities or obstacles to union intervention.

As such, unions are also shown to sometimes have conflicted interests: a primary concern for workers' welfare can lead to opposition to environmental action.

Stevis (2018) also pinpoints TUs' spatially uneven support for retraining workers. In the United States, they found that local rather than national union organisation that was critical to activities to support workers through industrial change related to decarbonisation. More broadly, for Clarke and Lipsig-Mummé (2020) many calls for TU or government-led decarbonisation processes remain fixed to growth-centred economic models, which do not challenge the overall relations of production nor question the roots of environmental and

capitalist crisis. These approaches fit with a political economy of industrial decarbonisation that does not foresee more radical economic change or consider more expansive understandings of work within these processes: they follow the logic of what Clarke and Lipsig Mummé (ibid.) critique as 'Green Keynesianism'.

3.1.2.3. Industry. The role of firms or private sector interests feature less centrally, as a backdrop to studies. Firms and their representatives often appear as passive market actors only able to act in relation to market signals or regulatory pressures: "The role and responsibility of private sector actors ... is surprisingly absent from much of the current debate about JT [just transition]" (Snell 2018, p.554). In their case study of the Latrobe Valley in Australia, Snell points out that although there had been discussion locally about decarbonisation, "the first major change came about not as a result of government policy or environmental activism but due to the corporate business decisions made overseas." Owners of a power station in Latrobe with headquarters in Japan and France announced its closure with less than five months' notice, leaving workers, unions and local authorities initially in a state of shock.

Similarly, Pichler et al. (2021) highlight the nature of Global Production Networks (GPNs) for the automotive industry, which means that most workers are employed by subsidiaries of transnational corporations headquartered in other countries: as a result local worker agency is constrained. Relatedly, Oei et al. (2020) describe how ownership structure impacted on worker protection during coal phaseout in Germany: public ownership of coal mining in Saarland supported a faster transition than in the Ruhr where coal industry activities were privately operated.

Yet, less is known about the logics of investment and disinvestment and related worker or community-focused policies enacted by firms embroiled within decarbonisation processes; or how individual decision-makers within firms wrestle with the dilemmas they face in making decisions for the firm, and their impacts on workers.

3.1.2.4. Civil society, social movements, diverse economies. Focus on formal institutional relations might also explain lack of explicit focus on civil society beyond TUs. Exceptions are Mohr (2021) and Hess et al. (2021). From a work perspective, Mohr spotlights gendered divisions of labour, including the important role of women as community leaders. Mohr highlights that women are often important 'change agents' in places but face barriers to participating in formal decision-making procedures. These exceptions helpfully bring different voices into analysis of industrial change. They also remind us of the different forms of labour involved in decarbonisation processes, beyond waged labour at the 'frontline'. Another way to consider organisations and activities operating outside the market-state dialectic is as active participants of diverse economies (Gibson-Graham, 2008); that is considering different ways of organising economic activity including, within and beyond market or capitalist logics. Based on our review, literature taking a place-based focus on industrial transitions has only partly engaged with the cultural economy of work: we return to this in our alternative approach (Section 4).

3.2. Place

Previous research has demonstrated that decarbonisation impacts are often geographically concentrated (e.g. Spencer et al., 2018). Research into the link between decarbonisation and work therefore requires understanding how working lives affect, and are affected by, places where industries and workers are situated. Mimicking our approach to the literature on work we therefore specifically considered (1) how place is conceptualised in extant literature on industrial decarbonisation, and (2) who/what shapes places in industrial decarbonisation processes.

3.2.1. How is place conceptualised?

In answering the first question, nearly all the articles we reviewed consider place as a 'container' of transition and site of resistance to change. In other words, the geographical boundaries of places affected are largely treated unproblematically. One exception indicates why such an approach might be problematic: [Weller's \(2019\)](#) analysis of how the Australian government defines 'affected places/communities' in decarbonisation. Weller demonstrates that by seeing coal phaseout as a regional rather than local issue, phaseout and its associated challenges were downgraded institutionally and inhibited a larger-scale socio-economic reorientation than had been originally proposed. Furthermore, this impacted who was able to benefit from just transition programmes:

Federal policymakers defended this reterritorialization, arguing that the employment impacts of foreshadowed power station closures would reverberate over this wider area. Yet those power station workers who chose to live in the rural areas were mostly relatively affluent managers and professionals whose termination packages would secure a comfortable future. ([Weller 2019](#), p.306).

Through addressing the question of how place and scale are constructed, Weller thus effectively demonstrates how decisions around who and where is deemed to be affected are deeply political.

3.2.1.1. What shapes place(s) in decarbonisation processes?

Perhaps due to the more abstract nature of place, when analysing who or what shapes how places are impacted by transitions, the literature mostly pointed towards structural and material factors rather than specific stakeholders.

3.2.2.1. Economic structures

Returning to a theme identified above, the structures of regional economies, and especially the concentration of economic activity – that is, local economic dependency and a lack of economic diversity – is identified in the literature as a key influence shaping how places are impacted ([Olson-Hazboun, 2018](#)). For example, in their study of UK coal transitions [Johnstone and Hielscher \(2017\)](#) note that the spatial concentration of decarbonisation efforts often extends beyond a single employer. When one employer leaves this often has knock on effects on auxiliary services, significantly exacerbating the initial impact. This link is often conceptualised through the lens of workers: the concentration of economic activity limits options for local alternative employment for workers and this needs to be addressed ([Pape et al., 2016](#); [Snell, 2018](#)).

Local economic dependency is thus seen as one key feature that shapes how places are affected. But what does local economic dependency mean exactly? Which features make a place or community vulnerable to change? Here, historic industrial trends, the reliance on single industries, as well as specific geographic conditions are all considered key structural forces that inhibit emergence of alternatives. For example, [Hess et al. \(2021\)](#) note that some places lack political or workers' support for a just transition due to their historic ties to industry. Further, existing concentrations of economic activity might inhibit the availability of alternative job opportunities ([Snell, 2018](#); [Zervas et al., 2021](#)). Finally, [Mayer et al. \(2020\)](#); see also [Haggerty et al., 2018](#)) note how factors such as geographic isolation from larger population centres, isolation from transportation routes, lack of economic diversity, population loss and 'brain drain' can also contribute to local economic vulnerability.

Nonetheless, often agency is not examined in detail within these studies: who or what fosters these dependencies and how? One exception is [Hess et al. \(2021\)](#) who argue that historic ties to coal industry, which is also linked to political leadership unwilling to focus on transition from coal, affect places' ability to transition away from coal. In response, they find that in some places civil society actors are seeking to fill this void and create conditions for just transition.

3.2.2.2. Policy and procedures

Framing impact of deindustrialisation on places primarily in economic terms means that proposed solutions are also framed this way. If local economic dependency, and specifically one under threat from exogenous forces, is the problem, then for many, local/regional policies that shape economic opportunities are the answer. For example, [Stewis \(2018\)](#) argues that policies shape opportunity, but that regional variation as well as contradictions in multi-level governance arrangements can inhibit development of new industries in places:

The innovations of the IBEW [International Brotherhood of Electrical Workers] locals are not insignificant – they are the product of visionaries – but they are operating within a national union supportive of fossil fuels and nuclear energy. Moreover, the public policies of California enabled their visions, something that is not likely to be the case across the country. (Stewis, 2018 p.464).

However, while others agree on the role of policy, they point towards the need for such policies to take seriously concerns 'on the ground', as well as the more-than-economic ways places are affected. For example, [Johnstone and Hielscher \(2017\)](#) emphasise that decarbonisation not only has potential to affect livelihoods, but also community cohesion. Therefore, they argue it is key that local communities as well as workers or trade unions are included in discussions around coal phase-out and future energy trajectories.

What stands out here is that when we ask who or what shapes places in transition, some of the literature also points towards the importance of enabling workers and communities to play an active role in shaping their future, something considered to be largely absent in practice. For example, in addition to [Johnstone and Hielscher \(2017\)](#), [Olson-Hazboun \(2018\)](#) argues for the importance of including marginalised energy communities in decarbonisation decision-making processes. Thus, implicitly, these authors point towards the importance of recognition and procedural justice in shaping places in transition.

3.2.2.3. Lived experiences

A predominant political economy approach to industrial decarbonisation processes emphasises how local economic dependencies shape how places are impacted by decarbonisation. Another set of literature has focused on how such concentrations of economic activities become internalised as local economic identities, which in turn are also considered to play a role in re-configuring places and communities experiencing impacts of decarbonisation processes. What sets this literature apart is the focus on how change is anticipated, experienced and lived with 'on the ground'. In other words, how people make sense of potential change. Conceptually, scholars have used a variety of place-related concepts (such as place attachment, place identity and sense of place) as lenses to understand the collective experience of how social and economic dimensions of place are intertwined and affected by decarbonisation (e.g. [Olson-Hazboun, 2018](#); see also [Ceresola and Crowe, 2015](#); [Evans and Phelan, 2016](#)).

This literature also begins to show the complex ways people make sense of change. For example, while economic explanations have made the argument that policies should be enacted to help workers and communities find employment in a new, decarbonised economy, others have found that communities historically dependent upon fossil fuel extraction are not more likely to endorse policies to help their struggling workers than other communities ([Mayer, 2018](#)). In other words, anticipated economic impacts alone do not necessarily affect how people and places understand or respond to decarbonisation. Socio-cultural factors are likely to also shape how places are affected and how people anticipate the effects of decarbonisation. Indeed, these identities can also mediate other impacts. For example [Johnstone and Hielscher \(2017\)](#) note that technologies embed cultural traditions and social identities, with potential consequences for how community cohesion and social networks will be reconfigured as part of shifts away from fossil fuels. This set of literature also reminds us, however, that while these

experiences have a strong collective element, they are not experienced in a uniform way. [Brown & Spiegel \(2019\)](#), for example, note that identity-based narratives around the role of coal in economic prosperity and community solidarity is an exclusive narrative, which excludes many population groups. These approaches might hint towards a different place-centred role for the state in mediating decarbonisation processes, beyond reskilling and employment support, although this is not directly addressed in the literature. We pick this up in our alternative agenda, below.

Combined these literatures point towards the need to consider internal versus exogenous forces that impact places, and how to conceptualise the relations between these internalised dimensions around identity versus the perception that change is being imposed from ‘outside’

3.3. What does this imply for the role of the state?

Our review identified two dominant approaches to analysing how work and place shape, and are re-shaped through decarbonisation processes: a prevailing focus on economic geography and political economy; and a smaller but still significant body of literature taking more sociologically-informed views on place and work, in particular concerned with lived experience of change.

The more common political economy approach is often implicit rather than explicit but is evident through a combination of: (1) conceptualisation of work as waged labour, (2) emphasis on economic processes and outcomes, (3) foregrounding structural/exogenous factors as driving (undesirable) outcomes of decarbonisation, and (4) emphasis on institutional actors, in particular the state and trade unions, mitigating such outcomes, from labour markets to regional economies. Interestingly, it appears that the role of industry in this context has been little discussed, with instead more focus on the role of trade unions as well as government in shaping economic outcomes.

A smaller body of identified literature took a more ‘bottom-up’ approach to industrial decarbonisation processes, seeking to uncover individual and collective experiences, narratives and narrations of industrial change where work and place are almost always central.

This is of course not to say that there is no variation within these two broad approaches, or that we did not identify alternative perspectives. However, these perspectives comprised a small proportion of the literature, and, where relevant, will be discussed further in the next section. First we consider what these broad categorisations of political economic and sociological approaches mean for understanding the role of the state within places-of-work.

The role of state is most closely considered by those approaching transition from a political economy standing. Within this literature the state’s function is framed mostly in terms of economic policy, and enactment of specific strategies: worker training, employment programmes, inward investment strategies and so on. This is a view of the state as coordinator and enabler of economic growth, and welfare provider, supporting workers to access different opportunities and subsidising income to ameliorate negative effects. Insofar as the state is theorised through these visions, it is as a policy machine, pulling levers as a reaction to changing circumstances (such as decarbonisation processes).

The state is seen as a key institution that can shape change, but the state as a multifaceted, sometimes contradictory, complex system operating according to a range of institutional logics is not always explicitly acknowledged. ‘The state’ needs to act, but what is the state? Some literature is clearer on this and both [Oei et al. \(2020\)](#) and [Stevis \(2018\)](#) draw attention to both multi-level governance processes and sub-national variety in state institutional approaches.

Likewise, the state as entangled with complex systems including a variety of non-state actors was perhaps implicit within the literature but not always drawn out: this might include formal and informal relationships between different state and non-state organisations,

lobbying arrangements and so on (for example, does the manager of the coal plant also have a place in local economic development policy forums?). Standing apart in this regard, [Haggerty et al. \(2018\)](#) draws attention to how the configuration of energy systems and the complex stakeholder landscapes involved in managing these systems requires a more nuanced understanding of state action and relationship to other systems which also cross different territorial boundaries.

The focus on economic policy, as highlighted above, also means that the role of the state in its different guises in supporting or hindering broader place-based challenges such as community cohesion or even the material landscape (what happens to the landscape when the coal mine as economic venture closes, leaving its winding gear, slag heaps and so on behind?). This is not picked up in the more sociologically focused literature we reviewed, which, with its focus on lived experiences, has tended not to tie this into state strategies for place-making (or lack of). The effects of different political structures or ‘policy habitus’ ([Eadson and Foden, 2019](#)) on decarbonisation approaches has not been explored in detail.

If we consider the state as a relatively monolithic economic policy and welfare ‘machine’ rather than a culturally entangled set of institutions (and individuals within institutions) this inhibits potential to think through alternative decarbonised futures with positive impacts for people and places affected. In the next section we build from this point to set out an alternative agenda for understanding interrelations of place, work and state to help support more positive visions of post-carbon futures.

4. An alternative research agenda: places-of-work and the state

Our literature review uncovered important and diverse contributions to understanding how decarbonisation processes interact with work and place. The political economy literature is particularly helpful for highlighting institutional processes and the role of worker organisations in shaping change. It helps to situate decarbonisation within wider struggles about the future of work, and within broader economic trends and challenges. This literature does not tend to interrogate what we mean by work and how different ways of thinking about work might alter how we respond to industrial decarbonisation processes.

The sociological literature is richer in its consideration of how work and place entwine in the construction of identities and provide some hints towards a more diverse or cultural approach to understanding industrial change and implications for work, which provide some promising avenues for further research and analysis. Literature which seeks to open out our understanding of place and work tends to be less engaged with questions about the state, as well as agency more broadly. And it is less concerned with situating change within translocal engagements – be they economic or cultural – tending not to interrogate what we mean by place and how different ways of thinking about place might alter how we respond to industrial transition processes.

We see value in integrating some of the insights across these two sets of literature, and we build on these openings while drawing from wider theories of economic and social change to set out an alternative places-of-work research agenda. We do this by providing an explicitly feminist take on industrial decarbonisation, place and work.

Our approach to reviewing the industrial decarbonisation literature has been to ‘read for difference’, a key aspect of which is to unpick binary understanding of phenomena, and in doing so to break down the positive and negative connotations that come with such dualisms: [Gibson-Graham \(2020\)](#) highlights how many taken-for-granted terms are laden with positive and negative valuations which are also imbued with masculine or feminine tropes. This is seen to also pervade economic thinking. For instance, ‘production’ is seen as a site of value, of ‘growth’, and historically linked to male labour, while reproduction is amorphous, undervalued, even seen as negative: “soaking up wealth and taxes and putting a brake on growth” ([Gibson-Graham, ibid. p483](#)). It is not enough to revalue the subordinated term because terms remain defined

in relation to the dominant term. Instead it is important to unravel these dualisms to:

“...highlight the radical heterogeneity of economic identities and relationships and trajectories ... [A] world that is more differentiated is a world where more unexpected innovations and unforeseen developments might be fostered. Reading for economic difference thus becomes a first step in many new kinds of interventions and collective actions” (ibid. p483).

We take up this mantle in conversation with three other key feminist thinkers on different aspects of work and place.

First, we reach back to work by Massey on [Spatial Divisions of Labour](#) (1984) and her longer-term project to examine relations between gender, economy, work and place (see [Massey, 1994, 2005](#)). Massey consistently highlighted the spatial and gendered impacts of industrial change, for example outlining how structural changes to British industry from the 1960s onwards redrew the economic map of the UK, and highlighted its implications for the spatial organisation of work ([Massey, 1984](#)), as well as how industrial change was important for understanding place ([Massey, 2005](#)). [Massey \(1994\)](#) also drew attention to how the construction of ‘industry’ as a male, productive domain was also linked to regional policy solutions which reinforced a masculinist approach to managing industrial change. Arguably we can see similar visions in productivist policy prescriptions that valorise hi-tech growth-orientated solutions to industrial decarbonisation, as well as in dominant framings of ‘just transition’ for affected frontline workers.

Second, we draw on Weeks’ examination of ‘The Problem With Work’ (2011) to unravel how work is conceptualised and differently valued depending on who does it, where it takes place, and its relation to capitalist growth. Weeks deconstructs how notions and sites of waged labour are valorised and how ‘utopian demands’ for change can be a pragmatic approach to building alternative industrial futures. Like Massey, Weeks details how industrialisation was central to producing a vision of work which centres on reifying waged work, taking place in specific locations – most notably outside the domestic sphere. Weeks also highlights how work has become increasingly individualised and privatised, with the consequence that “*thinking about work as a system ... strangely becomes as difficult as it is for many to conceive marriage and family in structural terms*” (ibid. p4).

Third, [Glucksmann’s \(2005\)](#) ‘total social organisation of labour’ helps to construct a more concrete analytical approach to examining different forms of economic activity and work. Our places-of-work approach focuses on interconnected sets of relations which provide different entry points for understanding industrial change, work and place. Following [Glucksmann \(ibid.\)](#), this approach understands industrial decarbonisation as an instituted, historical economic process ([Polanyi, 1957](#)), whereby:

“*What is differentiated out as ‘economic’ or understood as ‘work’ may vary significantly between different societies and over time, depending on how economic processes are embedded and instituted in particular cases. Adopting this approach, the different parts or stages of an economic process may be seen as a relational complex of interdependent parts*” ([Glucksmann, op cit p.23](#))

[Glucksmann \(ibid.\)](#) sets out different dimensions to analyse interconnections in relation to work: across systems of provision; between different types of work (including non-waged) and different forms of economic organisation; relationship between work and non-work activities; and emphasis on different temporalities of work. From [Massey](#), we might also add the importance of spatial relations to understanding industrial change and its implications for work.

Each of our key influences therefore highlight that work is a relational, spatially and temporally contingent concept, shaped by different instituted entanglements, and politically constructed. These provide useful guidelines for our own interpretation of work and place interconnections in decarbonisation processes. As such, we set out the

following four key interrelated sets of interconnections for future study:

- **Beyond waged labour:** as set out above we need to consider work as multifaceted, not confined to waged labour. This means considering both how different forms of labour are related in existing processes and how they might be affected by decarbonisation processes. It also means explicit recognition of interconnectedness across boundaries between paid and unpaid work, market and non-market, formal and informal sectors. In our formulation below – following [Glucksmann and Weeks](#) – we use this to emphasise the need to move beyond waged labour in conceptualisation and analysis of decarbonisation processes.
- **Beyond place as container:** building from [Massey \(1984, 2005, 2009\)](#), here we focus on interrelation of economic and labour processes over space and across systems of provision. This also includes focus on how place or scalar geographies are constructed within processes of decarbonisation
- **Beyond the structure-lived experience divide:** instead seeing industrial change as a social, cultural and political phenomenon through focus on spatial relations and politics of industrial change, emphasising entanglement of what are often characterised as ‘on the ground’ interpretations and ‘top down’ processes. We also consider how attention to material geographies can help to disrupt these imaginaries.
- **Beyond present-centrism:** like [Glucksmann](#) we highlight importance of understanding work-place interactions as temporal as well as spatial processes. Like [Massey et al. \(2009\)](#) we are keen here to emphasise the dynamic relationship between present, past and future rather than – for example – linear notions of ‘path dependency’. This helps to avoid totalising and/or teleological visions of the future: [Weeks \(2011\)](#) suggests the use of ‘utopian demands’ to help produce fragments of possible futures.

Following this guiding set of interrelations helps us to focus on how industrial decarbonisation impacts work beyond the confines of the ‘frontline’, drawing particular attention to intersectional effects of such change, and how they are embedded in a range of place-based relations. Such an approach then has implications for our understanding of the state and its role in mediating decarbonisation processes. We expand on each of these interrelations now.

4.1. Beyond waged labour

To better understand how work is embedded within decarbonised futures, we must first enhance conceptualisation of what we understand as work. We start with the fact that all purposive activity involves work of some kind, and that changes to activities involve changes to work, both qualitative and quantitative. This work might be waged labour bound by contracts and provided with a notional exchange value. But to focus only on waged labour is – to use an analogy from [Gibson-Graham \(2005\)](#) – focusing on the tip of the iceberg. If we understand industrial decarbonisation processes as rooted in place then we need to consider the wide variety of informal, unpaid and unrecognised forms of work involved in maintaining (industrial) communities and shaping lived experiences of change. Such unpaid work often is critical to supporting cultural heritage, memory and commemoration in places affected by industrial change.

That is not to ignore the importance of waged labour within current economic constructs, but to situate waged labour as one set of relations within the total social organisation of labour. To bring about a decarbonised future that prioritises wellbeing we need to not only understand how work or industry-based social identities are constructed, but also bring this into conversation with feminist research on the role of work in enabling thriving lives and communities. This includes using a feminist perspective to re-evaluate what a good job is, and moreover, how such jobs enable people and communities to thrive (see also [Bell](#)

et al., 2020). Such a theorisation of work goes beyond an individualised ‘job counting’ or ‘gender in the workplace’ approach, but instead evaluates work as a social institution – and the central role that it plays in our lives (Weeks 2016). Rather than a preoccupation with the problems of individual jobs, or their absence, it enables a broader re-evaluation of work as a system, as a way of life (ibid.), and its position within a social contract, often “*treated as a basic obligation of citizenship*” (Weeks, 2011 p7).

While waged labour has been tightly connected to personal worth and identity, feminist perspectives can help us realise the many other activities, economic and otherwise, that could provide communities with the fuel they need to thrive and live well (Weeks 2011; Bell et al., 2020). One example of this from the literature we reviewed above is Mohr (2021) who highlights women’s central role in community organising in their case study of coal transition in Colombia. In doing so they spotlight gendered divisions of labour: women are often important change agents in places but face barriers to participating in formal decision-making procedures through workplaces or policy forums. It will not be easy to loosen the attachments that bind us to high-growth modernity (Bell et al., 2020), but a feminist perspective will help us to identify alternative ways to achieve thriving lives and communities and further openings for future change (see e.g. Gibson-Graham 2006).

4.2. Beyond place as container

Each of the sets of work relations above also have a spatial dimension. Considering industrial change, it is important to highlight that even if we begin from a focus on work-as-activity (rather than identity) industrial transitions spill out beyond the ‘coalface’ and into communities in a wide variety of ways. Industries are often deeply embedded or entangled in place. Yet, there is also a risk here in overstating territorial embeddedness (the extent to which such processes are purely ‘local’). Therefore, an alternative geographic approach would first pay heed to the importance of recognising actors and networks operating across local boundaries (e.g. High et al., 2017), and second, also question how scales of decarbonisation are produced, and to what effect.

Staying with the work perspective we can return to a concern with exploring change across translocal ‘systems of provision’. Earlier work by Massey (1984) provides detailed examination of how changing economic organisation also impacts on changing divisions of labour between places, for example. But it is important to combine these political economic insights with broader concerns for the social organisation of work: we should be interested in how places are connected in different ways beyond waged labour and how changes affect those connections; how flows of people are impacted (e.g. through economic migration); how identities are constructed through translocal industrial connections, and so on.

From a state perspective this sharpens attention on multifaceted state processes and actions. It makes thinking about state intervention more complicated than specific economic interventions in particular places. This is of course a simplification of what existing literature says. But the lesson here is that we must be acutely attuned to how different forms of state apparatus entwine with systems of provision across space: coordination across jurisdictions (policy and territorial) is essential. However, Weller (2019) also demonstrates the importance of not only considering trans-scalar networks, but also questioning the scalar politics of decarbonisation: at what scales are interventions targeted, why, and to what effect? Building on this, we suggest it would be valuable for research to consider the active role of the state in defining place: drawing political boundaries also impacts on who or what is seen to matter within transition processes.

4.3. Beyond the structure-lived experience divide

Through adopting a place-based perspective, some of the literature on industrial decarbonisation also begins to have more in common with

what Strangleman and Rhodes (2014) have referred to as a “new” sociology of deindustrialisation’ or what Berger and High (2019) refer to as a cross-disciplinary deindustrialisation field, which emerged in the crisis atmosphere of the 1970–90s. Disrupting the notion of top-down processes versus on the ground experiences, this new sociology seeks to understand the interaction between the two, seeing industrial change as a social, cultural and political phenomenon focusing on the spatial relations, regional socio-cultural characteristics and politics of industrial change (Strangleman and Rhodes, 2014). In a slightly different way, greater attention to material geographies can also serve to bridge the structure-lived experience divide. For example, Haggerty et al. (2018) explore the entanglement of physical and political geographies of the U. S. West’s energy systems, and how these strongly influence dynamics of the coal transition in the region. Elsewhere, Sanz-Hernandez (2020) uses the concept of ‘minescapes’, which are both physical and cultural, to explore how these feed collective imaginaries of prosperity, and which in turn give the mines symbolic and material power. In contrast to some of the literature focused on economic dependence we reviewed above, this perspective draws attention to how dependence becomes internalised through myriad factors, and also challenges the drawing of boundaries about what is deemed internal/external to places undergoing change. Such a perspective also opens up different conceptualisations of the role of the state beyond simply being an instigator/executor of policy. Instead it enables us to ask for example, the different ways infrastructures might act as material expressions of state power, and the implications of this for how we see the role of the state in challenging or reproducing social and spatial relations.

4.4. Beyond present-centrism

Connecting cultural approaches with theorisation of time, we can also seek to understand the temporal dimensions of industrial change more fully. There is a dominant perception across much of the social sciences and humanities of the future as being entrenched in the past (Heller 2016; Hunt, 2018). Here, we seek to uncover a more dynamic relationship between the past, the present, and the future, exploring how inhabitants live through cycles of industrial creation and destruction. We therefore suggest that bringing together relevant socio-cultural theorisations of industrial change (e.g. Gordillo 2014; Strangleman and Rhodes, 2014; High 2018; Emery, 2020) with analyses of the relationship between present and past, and how this creates different horizons of expectation (Koselleck, 2004) that can help uncover the complex and multifaceted ways in which temporal processes (e.g. cultural representations of the past vs representations of anticipated futures) mediate the interaction between decarbonisation, place and work. Both Massey and Weeks are insightful on the contingencies of time. Massey’s explorations of place are suffused with space and time as interactive rather than linear relations (e.g. Massey, 2005), using the adage from Althusser that ‘*there is no point of departure*’ (Massey et al., 2009 p404), while Weeks invokes the idea of the ‘not-yet become’ (from Bloch, 1970) to insist that to, “*grasp the present ... we must not only understand its emergences from and attachments to the past, but also attempt to grasp its leading edges and open possibilities; everything real has not only a history, but also a horizon*” (Weeks, 2011 p189).

Through focus on how change is understood some scholars have identified the importance of possible futures in shaping people’s perceptions of change. For example, Della Bosca and Gillespie (2018) note that for many people, making sense of change is “as much a matter of engaging with imagined futures as with current realities” (p736). Whereas in their study of coal phaseout in Germany, Oei et al. (2020) found that “cognitive lock-in” whereby decline in coal was seen as a cyclical rather than structural issue created resistance to the phaseout of coal. Such an approach can also help explore how the imagined futures put forward in economic scenarios and industrial pathways are negotiated by workers and communities on the ground (e.g. Mah, 2012; Walkerdine and Jiminiz, 2012; Strangleman and Rhodes, 2014; High

et al., 2017). Weeks (2011) also turns this view around to point to the need to inculcate new imaginative subjectivities which allow workers and communities to reach beyond what is currently seen to be realistically possible, and make 'utopian demands' which produce glimpses of what could be. Such demands are deliberately limited to avoid creating unrealisable totalising visions, but instead seek to create conditions for shifting imaginaries of the possible: Weeks uses the example of demands for Universal Basic Income which do not fit easily with current economic imaginaries but which also create the condition for debate about what alternative economic constructs might look like.

Of course, this has implications for how we seek to explore the role of the state. For example, we might ask what is the role of the state in enabling or foreclosing the emergence of alternative economic imaginaries and realities through – for example – utopian demands; or how do state-led imaginaries of either high-carbon pasts/presents or low-carbon futures reproduce or challenge high-carbon industries' material and symbolic power?

5. Conclusion: reimagining the work-place-state nexus in industrial change

The core implication of our alternative agenda is: to better understand possibilities for inclusive and just decarbonisation of extractive and foundational industries we need to move beyond analysis of place and work towards approaches that centre on relations between the two, that is to focus on places-of-work. In doing so this also recentres our understanding of how the state relates to place and work.

Existing research on industrial decarbonisation, work and place provide vital insights. We identified two broad schools of literature: a larger set of literature taking a broadly political economy approach, and a smaller set which draws on more sociological understandings of place. The political economic literature was more attendant to relational understanding of place and economic processes, and to questions relating to the state's role in industrial decarbonisation. The sociological literature provided important understanding of on the ground experiences of change, especially relating this to identity, culture and psycho-social implications.

Through our places-of-work approach we have sought to take these debates forward by producing a more diverse, relational framing of industrial change. We have engaged with feminist scholarship to argue for more open and dynamic conceptualisations of decarbonisation, work and place which explicitly seek to break away from dominant, hierarchical or masculinist readings of economic change. We sketched out four interrelated ways of achieving this, reaching beyond waged labour, place as container, structure versus lived experience, and present-centrism. Our approach has implications for how scholars of decarbonisation processes conceptualise and study those processes.

First, we see conceptual implications for understanding work and place implications of industrial decarbonisation. Our approach requires those researching industrial decarbonisation to engage beyond the frontline of job loss or change on the one hand, or social acceptance of change on the other. It requires a more holistic examination of change and its implications, with a more complex theory of change across different forms of economic and labour relations. More broadly, bringing a feminist sensibility to bear on this subject challenges scholars in the field to critically assess assumptions and categories of analysis: in particular taking an anti-essentialist stance to work, industry and the state.

Second, in developing our approach, we were also concerned with how applying a different lens on work and place affects how we think about the state. We felt it important to consider these implications as the state (in its different guises) remains critical to shaping how decarbonisation processes unfold, especially if we seek to utilise decarbonisation processes to also produce positive benefits to human welfare. Our approach means more attention needs to be given to the state as multi-faceted set of institutions and individuals, and consideration of state

intervention beyond specific policies to – for example – deliver training and employment opportunities to affected workers. Reading for difference is a powerful method to analysing state action: there is a need to interrogate how state bodies also open up or foreclose different possible decarbonised futures for industrial places. We might also seek points of possibility within existing institutions to make utopian demands for change.

Third – and related - wider understandings of places-of-work in industrial decarbonisation might engender more radical state policies (such as universal living incomes, for example) which decentre waged labour and the related power relations implied. Or it might at least force attention on how to support economically marginalised communities to access jobs in a decarbonised world, rather than solely support directly affected workers. As Weeks argues, the specific policy formulations perhaps matter less than their ability to create possibilities for new imaginaries: for instance precipitating a shift in governmental (and popular) discourse, away from masculinist valorisation of 'green' industrial development, which Massey also saw in the emergent high-tech industrial developments in the 1980s and 90s. Such discourses have implications not just for now but also the unfolding of "symbolic sectors and places of 'the future'" (Massey 1994, p178). Formulations for 'utopian hope' (Weeks, 2011) are dependent on how we think about the past and its relationship to the present: we must break from tendencies to feel trapped by the past and present in our understanding of what is possible, while also recognising that how we understand the past, and how we seek to produce new possible futures lie in the here and now: the present cannot be "jumped over" (ibid, p221). A relational perspective on temporality is therefore critical to our places-of-work approach if it is to produce hopeful imaginaries of possible industrial futures as we analyse change processes.

Fourth, following the focus of much of the extant research, our discussion tended to focus on application to processes of deindustrialisation. However, these approaches can also be fruitfully applied to places that are expected to (re)industrialise because of the industrial decarbonisation trends. There are new insights to be obtained by also exploring how social relations, culture and identity and industrial change are entwined in such places. A place-based approach will therefore also need to consider how culture and identity interconnect with desirable or dissuasive perspectives of the future, and the role of the state in enacting them.

Fourth, we have not delved into the methodological implications of our approach here, but clearly these matter and will need further examination in future studies. Places-of-work analysis involves an analysis of both what was, is, and what could be, or in other words it is about producing 'histories of the future'. Such an approach is methodologically challenging but we see promise in drawing together economic geographic methodologies which focus on tracing economic change over time and those which are more rooted in experience of place. Fundamentally such methodologies need to be rooted in workers and communities' experiences and provide opportunities of self-expression and production of hopeful demands for industrial futures and thriving places.

Places-of-work is an unashamedly ambitious agenda, and what we have set out in this article is not intended to be a closed or necessarily even complete theorisation; it is though intended to provoke an alternative sensibility for researching decarbonisation of industrial and foundational industries, and to stimulate new conceptual and empirical research in that vein. We believe that such an approach will not only help us to better understand the varied (geographic and temporal) ways that identity, working lives, and industrial change intersect, but also contribute to a renewed theorisation of these entanglements appropriate for wider application in the face of the oncoming 'green industrial revolution'. Combined with a feminist approach, this also has the potential to help identify already existing, and potential future, openings for more radical socio-economic change. We therefore suggest that our agenda is about a politics of hope for a just transition.

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Appendix 1: Papers on decarbonisation, work and place selected for in-depth review

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