



Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss



Original research article

Energy demand for everyday mobility and domestic life: Exploring the justice implications

Neil Simcock^{a,*}, Caroline Mullen^b

^a DEMAND Centre, Lancaster University, LA1 4YD, United Kingdom

^b DEMAND Centre and Institute for Transport Studies, 1-3 Lifford Place, University of Leeds, LS2 9JT, United Kingdom

ARTICLE INFO

Article history:

Received 4 April 2016

Received in revised form 26 May 2016

Accepted 31 May 2016

Available online xxx

Keywords:

Justice

Equity

Energy

Energy demand

Consumption

Mobility

ABSTRACT

The consumption of energy services for everyday mobility and domestic life is a fundamental precondition for participating in many contemporary societies, but it can also impact upon current and future generations in ways that raise questions of equity and fairness. Whilst the field of ‘energy justice’ has become more established in recent years, much work remains to be done to further this area of study. In this lead article for a Special Issue on ‘Energy demand for mobility and domestic life: new insights from energy justice’, we begin by outlining the many interlocking issues of (in)justice raised by energy consumption for mobility and domestic services, identifying gaps in the current literature. We then describe the articles within the Special Issue, discussing these in relation to three themes: uneven access to energy and transport services; the unequal burdens of low-carbon policies; and reducing energy demand and the good society. We conclude by highlighting potential directions for future research; for example, conceptualising ‘excessive’ consumption as an issue of (in)justice, and identifying low-energy social practices and arrangements that simultaneously contribute to human well-being.

© 2016 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

1. Justice and energy demand: setting the context

Justice and fairness are amongst our most central human concerns [54], reaching to some of the deepest and most fundamental questions about the type of society we wish to live in Ref. [49]. As a vital ingredient for the fulfilment of much contemporary human activity and the very functioning of modern societies [66], it is perhaps unsurprising that in recent years energy has become embroiled in such debates. ‘Energy justice’ has emerged as a new framing for social-science research focussed on issues of justice arising across the energy system [28,39]. The research falling under this banner is broad, and includes a focus on the distributive impacts of energy production [9,75] and the lack of access to democratic decision-making processes for those affected by the installation and operation of energy systems [40,58,77]. However, it is justice in terms of energy consumption – or, more accurately, consumption of the many domestic and mobility services made possible by energy [62] – that is the focus of this Special Issue. Specifically, the Issue centres upon two broad categories of energy consumption that are both fundamental to contemporary ways of life – energy

used for domestic tasks, and energy used for everyday forms of mobility and transport.

In the domestic space, being able to access and use energy services is often a pre-requisite for securing basic needs and engaging in customary and expected patterns of everyday activity [63]. When people are unable attain sufficient levels of ‘essential’ energy services – a problem commonly termed ‘fuel poverty’ or ‘energy poverty’ [11] – this can have serious impacts on their physical health [31], well-being, and ability to lead a flourishing life [19]. Given the centrality of energy services to human development and quality of life, some energy justice literature has focussed on examining distributive inequities in the availability and affordability of such services in different parts of the world [8], underpinned by the principle that all people are entitled to the basic goods necessary for well-being and the ability to participate in their society [63]. Alongside this distributive injustice, Walker and Day [71] argue that fuel poverty is also indicative of a lack of respect and recognition for the needs of vulnerable groups in society, and inadequate procedural justice in terms of limited information and a lack of opportunity for the fuel poor to participate in policy-making.

Beyond the domestic space, energy is also a crucial precondition for much everyday mobility, as it typically enables the functioning of various transport systems. Such mobility is itself often an essential part of participating in many economic, social, political and personal activities. Research literature on ‘transport poverty’

* Corresponding author.

E-mail addresses: n.simcock@outlook.com (N. Simcock), c.a.mullen@leeds.ac.uk (C. Mullen).

<http://dx.doi.org/10.1016/j.erss.2016.05.019>

2214-6296/© 2016 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

illustrates how there can be deep inequalities in people's ability to access and/or afford the means to be mobile [7,32,33,43,47], with some communities unfairly disadvantaged due to an environment in which important services (work, education, shopping, amenities, and so on) are not easily or affordably accessible by means other than a private motorcar. Infrastructural design, perceptions of safety and risk, and cultural norms can all contribute to the creation of such environments [10,46]. In such cases, those without a car can face social exclusion, whilst conversely some of those who do have a car can face economic stress due to the cost of insurance, fuel and maintenance [38].

Whilst inequalities in accessing and using energy services for mobility and domestic purposes can raise justice concerns, current energy-intensive societies and systems pose their own significant problems. As long as ways of life involve high levels of energy consumption, and energy production remains dominated by fossil fuel combustion, then CO₂ and other pollutants create pressing issues of global injustice – principally, climate change and its accompanying ecological degradation and impact upon human well-being. Work in the field of 'climate justice' [45] has highlighted the uneven impacts of climate change, with future generations bearing costs imposed on them by the actions of preceding generations [69]. Impacts are also socially and spatially differentiated at various geographic scales, with low-income individuals, communities and nations often most vulnerable and least able to adapt, whilst contributing proportionately little to global carbon emissions [26,69]. The ways people experience and adapt to climate change are highly gendered, with women frequently suffering the worst impacts both because they are more likely to be in poverty¹ and due to traditional gendered divisions of labour in which women are primarily responsible for everyday household management and family care [35]. Beyond climate change, pollution from energy combustion is also responsible for more localised and immediate health risks, with the World Health Organisation (WHO) estimating that 3.7 million deaths were attributable to ambient air pollution in 2012 [76]. Such aggregate figures masks numerous social and spatial inequalities in exposure and risks of harm, with those on low-incomes or living in deprived neighbourhoods often exposed to higher levels of air pollution [21,25,34,41]. High energy activities and systems, especially in transport, also lead to inequality and exclusion by physically endangering people in collisions and by creating and supporting development in which undertaking everyday activities require long or complicated journeys [32,43,68,74].

The need to act to mitigate these harmful effects through deep changes to energy and transport systems is now widely recognised. This will require not only a significant increase in renewable and low-carbon forms of energy generation, but also profound reductions in the amount of energy consumed globally – particularly by 'developed' countries [60]. We concur with the argument that achieving such reductions is not only a matter of improving levels of energy efficiency. Instead, the scale of the challenge means that deep and fundamental changes to how many people live, work and play are also likely to be necessary, especially in the richer societies of the West [56,57].

Yet, although often presented as purely technocratic and scientific endeavours devoid of any political consequences [65], 'sustainability' and associated policies to decarbonise energy systems have their own justice implications [8]. Attempts to alter patterns and levels of energy consumption are likely to have benefits and burdens that are unevenly shared socially and spatially, potentially unfairly disadvantaging some groups or localities and possibly exacerbating existing inequalities or creating new areas of

deprivation. In the UK [27] and many other countries [53], those on higher incomes tend to also have the highest levels of energy consumption and largest carbon footprints, raising questions of which citizens in a society should bear the responsibility of reducing their consumption. There are also questions of democracy and procedural fairness in how policies to reduce energy demand are designed and implemented [29], and whether all groups have been treated with appropriate recognition and respect. However, such intriguing but challenging issues have only recently begun to be explored in the academic literature [8]. Instead, much of the theory, rhetoric and practice on sustainability displays a distinct 'equity deficit' [2], [p. 44], focussing almost exclusively on environmental protection whilst being blind to questions of social and spatial difference and justice [1,53]. Agyeman et al. [3] utilise the concept of 'just sustainabilities' to capture the need to fully integrate fairness and equity issues alongside environmental concerns in sustainability discourse and research. In line with this, there is a need for more academic work that explores, both conceptually and empirically, the justice implications of policies to reduce energy demand.

2. This Special Issue

Clearly, there is a complex web of justice issues related to energy consumption for mobility and domestic activities, and this Special Issue makes a contribution at the nexus of these concerns. Some of the articles extend research on the distribution, causes and consequences of fuel and transport poverty, whilst others help to develop a clearer understanding, both conceptually and empirically, of some of the potential injustices associated with energy demand reduction policies. The final group of articles examine how societies might reduce energy demand whilst also enabling people to live well and meet 'basic needs'. The primary emphasis of the articles in the Issue is on issues of distributive injustice rather than justice in recognition or procedure, although some of the essays also touch upon these latter two concerns.

The research presented in this Issue includes authors from across the globe and articles focussed on contexts as diverse as Gambia, Mexico, the United States, Taiwan, New Zealand, France and the United Kingdom. This is perhaps a testament to the wide-ranging power and relevance of the energy justice framing. The Issue is also significant in that it begins to bring together research on domestic energy and mobility services, two areas which are typically treated as distinct. As we demonstrate in this introductory article, there are many cross-cutting issues of justice that apply to both, and we hope that this Special Issue can mark the beginning of a more widespread and fruitful dialogue between the two fields. Overall, the issues raised by the papers in this Special Issue can be broadly categorised into three themes, and we now summarize the papers under these banners.

2.1. Uneven access to energy and transport services

The first theme relates to patterns of inequality in people's ability to access and use essential transport and energy services, highlighting the unjust disadvantages faced by some sections of society. This is one of the more established areas within the wider energy and transport justice literature, but the papers in this Issue help to further this agenda by exploring new issues and expanding into geographical contexts that have previously received little attention.

In the first article of the Issue, Berry et al. [6] explore methods of defining, identifying and measuring what they term 'transport fuel poverty' – the transport equivalent of the better known domestic counterpart. They suggest that traditional indicators of domestic energy deprivation are not readily transferable to the transport sec-

¹ Approximately 70% of the world's poor are women [35].

tor. Instead, they develop and test a new transport poverty indicator that incorporates budget constraints but also other vulnerabilities and wider conditions of mobility, whilst remaining sensitive to variations in travel need and people's ability to alter mobility practices. Testing their indicator on French data, they find that 7.8% of households are 'transport fuel poor,' having both a low income and either high transport costs or restricted mobility, a further 7.4% 'fuel vulnerable' with low incomes and difficulties in adapting to change in circumstances due to their location or available transport modes, and 3.7% 'fuel dependent' with high fuel costs and no alternative means of transport.

The next article considers energy services within the domestic sphere. Dubois and Meier [20] analyse the diversity of energy poverty situations faced by European countries. To do this, they make a useful distinction between 'energy service deprivation' and 'energy deprivation inequality', with the former referring to a nation's aggregate level of energy poverty, and the latter referring to the extent that different population groups *within* a country are affected by the condition. Their results show that rates of energy poverty are particularly severe in countries of the Eastern and Southern parts of Europe, and that different inequality profiles exist across the continent – in some countries (for example, Lithuania and Bulgaria), energy poverty affects different socio-demographic groups relatively equally; in others (such as Denmark and the Netherlands) it is particularly prevalent amongst certain sections of the population. They then discuss the policy implications of their findings, arguing that rates of energy service deprivation and inequality will impact upon the feasibility and targeting of different energy poverty mitigation policies. They conclude by suggesting that current rates of fuel poverty represent a major challenge for achieving socially just energy transitions in Europe.

García Ochoa and Graizbord [23] examine domestic energy poverty in Mexico. Rather than focus upon indicators of the affordability of energy services in the home, the authors argue that a lack of *access* to key energy services is a significant issue for many households in the Mexican context. They develop a framework for characterising households according to the extent of their deprivation of key energy services. Drawing on secondary data from the Household Income and Expenditure Survey, they find four categories of household in terms of the presence and severity of energy service deprivation: one which lacks energy services for food refrigeration; a second which lacks facilities for cooking food; a third (which they term 'strong energy poverty') that lacks facilities for water heating, cooking, refrigeration, and entertainment; and a finally a group which lacks all of these services and also adequate space cooling. The authors conclude by exploring some of the public policy implications of their findings, arguing that targeted strategies may be developed to meet the specific needs of different household groups. Further research is required to help explain the underlying causes and drivers of the patterns of deprivation they identify, as well as the relative merits and challenges associated with different methods of measuring and conceptualising 'energy poverty.'

Schiffer [55] evaluates a series of measures designed to provide access to domestic energy and transport services for people living in Kartong, Gambia. The services involved connection to a regional electricity grid, and provision of a new bus service connecting Kartong to Banjul. Her study found significant benefits for residents able to make use of the new services, but that there were inequalities in people's ability to access them, with those living at the edge of town beyond the electricity grid excluded. Such issues were further complicated as the provision of new services reduced the viability of the previous forms of transport and domestic energy provision, thus increasing the town's dependence on resources from outside the local area. This issue also appears to echo concerns in other areas of development studies, especially in relation to

land appropriation for infrastructure or other projects which might bring broad social benefits but which can create hardship for those who previously occupied the land [52].

Finally, Chard and Walker [13] examine experiences of fuel poverty amongst older people in England. Utilising in-depth qualitative interviews, they explore how householders cope with, and adapt to, difficulties in affording space heating. They find that all participants recognised the importance of maintaining a healthy bodily temperature, and identify four distinct forms of 'coping strategies' used by participants to ensure they remained warm even if they were restricted in their use of space heating. However, although such coping measures are typically interpreted as a sign of deprivation amongst fuel poverty research (for example, Refs. [4,12,61]), in Chard and Walker's study the participants themselves did not consider their actions to be problematic – instead they simply believed them to be sensible. The authors conclude by pointing out that this raises difficult questions for energy justice research regarding what constitutes 'acceptable' living conditions and 'essential' energy services, how and by whom such judgements can and should be made, and how assistance can be provided to households who do not problematize their own situation.

2.2. *The unequal burdens of low carbon policies*

As we noted earlier in this article, efforts to alter patterns and levels of energy demand and decarbonise energy systems are very likely to impact upon some groups more than others, with potential justice implications [8]. However, this remains a relatively new area for research, and several papers in this Special Issue further our critical understanding of this important issue.

Chatterton et al. [14] provide an exploratory analysis of large UK datasets of energy consumed for domestic purposes and car travel, drawing on readings from over 70 million domestic energy meters and vehicle odometers. They find that energy consumption varies greatly across the UK and correlates with levels of household wealth or deprivation within geographic locations, with a minority of relatively wealthy areas consuming greater amounts of energy for both car travel and domestic uses. They argue that this prompts concerns about the equity of existing patterns of energy consumption, with consequent implications for the fairness of policies that focus on lowering aggregate energy consumption regardless of questions of responsibility and *who* should be required to make reductions. The authors suggest that more equitable policies would place a higher priority on targeting wealthier and high-consuming areas, especially as these households have greater resources (financial and others) that would allow them to more easily take measures to reduce their consumption.

Focussing on gender, Wang [73] draws on insights from social practice theory to examine the impacts of sustainable consumption policies in Taiwan that aimed to alter household behaviours and individual choices. She argues that although the policies are well intentioned, they fail to fully account for the complexity of daily life and the structural impediments on householder's consumption. As such, they exacerbate gender inequalities and asymmetric power relations between men and women, for example by increasing women's workload and creating feelings of guilt and shame when the idealised recommendations of the national government cannot be achieved. As well as these distributive injustices, she also argues that women in Taiwan suffer from a lack of 'recognition' and respect [22]. She concludes by suggesting that greater procedural justice [78], in the form of women's participation in the design of sustainability policies, is necessary to avoid their discrimination.

Oppenheim [44] examines of low-carbon policies in the United States (US), and their impact on energy prices and energy poverty. He begins by outlining the long history of regulation around energy prices in the country, arguing that in numerous US states energy has

long been considered not merely a commodity but a 'public good', thus justifying price regulation and policies to support low-income consumers. However, he notes that in the current regulatory environment 'distributed' forms of renewable energy generation (such as domestic solar PV) produce higher bills for low-income consumers by reducing utility sales but not utility fixed costs, and through subsidies applied as levies on energy bills. He argues that this is unjust, both because it contributes to energy poverty, and also because those who are left reliant on increasingly expensive utility electricity are those on low-incomes who are least able to afford distributed generation technologies – potentially leading to the development of what Walker [70] terms an 'energy underclass'. To avoid such injustices, Oppenheim argues that new forms of regulatory protection are required and concludes by suggesting what such measures might involve.

2.3. Reducing energy demand and the good society

The final set of articles in the Special Issue all approach a difficult tension within energy justice. On the one hand, many would argue that there is an urgent need to dramatically reduce energy demand as part of combating the many severe injustices associated with climate change; on the other hand, energy for mobility and domestic services is widely seen as a crucial part of any good and just society, enabling people to escape deprivation, meet basic needs, and lead flourishing and fulfilling lives. Is it possible for societies to reduce energy demand on the scale required without sacrificing human well-being? The final five papers in the Special Issue take on different theoretical and practical dimensions of this question, and begin to propose how the tension might be resolved.

Mullen and Marsden [42] identify potential issues for mobility justice created by measures designed to deal with the injustice of pollution from transport. Using a case study of policy on electric vehicles, they find that attempts to reduce emissions through the use of such vehicles can perpetuate other forms of injustice associated with high levels of car use. They argue that a more just approach to reducing pollution would be to reduce the overall use of private automobiles. Significantly, they further suggest that the changes required would impact not just on the transport choices available to people, but on the sorts of activities that transport and mobility policies would support and enable. Pursuing such an agenda, the authors suggest, would require a reconsideration of the liberal 'choice-based' conceptualisations of justice that are prominent in much of the mobility and energy justice literature. Drawing on 'communitarian' justice theorists such as Sandel [50] and MacIntyre [36], they conclude by suggesting a need to think beyond choice and consider what sort of social arrangements and activities should be supported in a just society.

Mattioli [37] approaches the difficult problem of how to ensure all households can access the transport necessary for them to meet their 'basic needs', whilst simultaneously reducing energy consumption and emissions from transport – particularly when in many contexts much travel (including for the satisfaction of basic needs) has become dependent on carbon-intensive modes such as the motor-car and air travel. To reconcile this tension, he develops a sophisticated and novel conceptual framework that makes an important distinction between 'fundamental needs' and 'need satisfiers' – whilst the former refer to abstract 'states of being' and are anthropological invariants, the latter are the material goods and services through which fundamental needs are met and are historically and contextually contingent. Drawing on the work of Giddens [24], he suggests that need satisfiers have become more carbon intensive through progressive structuration processes. Although some degree of mobility will always be required for humans to secure basic means of living the forms and amounts that are necessary are contingent, and modes of travel should be understood

as the *means* to satisfy fundamental needs rather than reified as normative ends in themselves. In this way, Mattioli argues, justice tensions might be reconciled. He concludes by calling for further research to examine how need satisfaction has changed over time, and how it might be transformed in more sustainable directions in the future.

Following a similar theme but with a more empirical approach, Walker et al. [72] examine which domestic energy-uses should be considered 'basic necessities' within the context of the United Kingdom (UK). Drawing on a set of longitudinal secondary data [18], they find that a diverse range of energy-consuming items and technologies are considered by members of the public to be basic necessities for participation in contemporary UK society. To some degree the profile of these necessities has evolved since 2008, with information and communication technologies in particular becoming progressively more 'essential' over this period. They argue that whilst these findings suggest that UK government policy should support people's ability to access and afford these energy services as part of mitigating fuel poverty, escalating norms of energy dependency may be problematic when the UK needs to radically reduce its energy demand on climate justice grounds. Along similar lines to Mattioli, they argue that one way to overcome this 'tension', at least at a conceptual level, is to emphasise that energy services are only instrumental means to satisfy the more fundamentally valuable end of human flourishing. Through structural change, 'basic necessities' may evolve to become less carbon intensive without producing injustice as long as everyone is able to achieve a reasonable level of well-being and participate in society. The authors conclude by recognising the complexities and political challenges involved in such reconciliation, and by calling for similar research in other cultural contexts.

Cheyne and Imran [15] then examine the potential for shared transport to act as a means of reducing the overall use of motorised transport whilst also contributing to social justice goals such as inclusion in economic and educational activity. They do this through an empirical study in New Zealand, using both qualitative and quantitative methods to explore travel practices, transport need, and affordability, as well as attitudes to public transport. Their data comes from places where there is a paucity of public transport, resulting in multiple forms of social exclusion or 'forced car ownership' which in turn has created financial hardship (see also Ref. [38]). They argue that shared transport could provide an affordable and low-emission alternative means for people to fulfil basic social needs. Whilst shared transport has gained attention in policy discourse, the authors describe how it remains marginal in policy implementation and practice, suggesting that there is a lack of the political will necessary for it to become more widespread.

Finally, and also focussing on the New Zealand context, Smith [59] utilises a discourse analysis approach to examine the extent to which social justice issues are incorporated into 'sustainable' transport policies. She begins by arguing that cycling is a transport mode that can contribute to addressing many of the justice concerns raised in the transport and social exclusion literature. However, policy attempts to increase the uptake in cycling often fail, with cycling making up only a small proportion of journeys in New Zealand. The paper then examines the reasons for this disjuncture. Smith argues that, despite ambitious rhetoric, cycling has been generally marginalised in New Zealand transport policy. Instead, the use and meaning of the term 'sustainable' has become focussed on a neo-liberalised agenda of ensuring economic growth over and above other objectives, therefore narrowing the aims of transport policy and systematically privileging motor vehicles which are portrayed as contributing to growth. Overall, Smith's findings provide empirical support for Cook and Swyngedouw's [16] suggestion that whilst social justice is nominally included as the 'third pillar' of

sustainability, in practice the economic pillar takes precedent and social issues are either an afterthought or disregarded completely.

3. Future research directions

The papers in this Special Issue help extend the literature on energy justice in relation to domestic consumption and everyday mobility. They also prompt new questions across a range of areas, and we here conclude by proposing some directions for future research.

The first relates to the identification and study of low-energy practices and arrangements that nonetheless achieve high-levels of human well-being and contribute to social justice. Several of the papers in this Special Issue have suggested that it is theoretically possible to have a society in which all people can 'flourish' and participate without high levels of energy consumption. Previous studies at the scale of nation-states demonstrate empirically that countries can, on aggregate, to have high-levels of Human Development with relatively low carbon emissions [30,64]. However, such arguments remain somewhat abstracted from everyday life, and more work is required to identify the specific *practices*, and material, social and political arrangements, that contribute to equitable, low-carbon well-being. In this respect, mobility research is perhaps ahead of that centred on domestic energy, with modes such as flexible shared transport and cycling (both discussed in this issue) identified as means to both reduce emissions and improve social justice, but more remains to be done. In-depth, ethnographic studies of social practices in countries that have low-levels of energy consumption but high-levels of equality and well-being is one example of the valuable research that could be undertaken.

Second, there is a need to consider issues of excess consumption in energy and transport justice debates. Much research in these fields currently focuses on poverty and deprivation, i.e. whether households are able to meet their 'basic needs' of energy consumption, and the impact on people's well-being if they fail to do so. However, it is also occasionally implied that 'excessive' consumption of energy (and other resources [5,48]), or the use of 'excessive' forms of energy service, are unjust and should be curtailed [17,53,67]. But can and should 'excess' be understood as an issue of (in)justice, and, if so, what theories do we need to draw on to conceptualise this phenomenon? The very notion is potentially problematic for many liberal theories of justice, which attempt to remain neutral on the substantive value of different goods or activities and instead argue that justice involves allowing all people the freedom to choose their own vision of the 'good life' [49,51]. Moreover, how do we define what constitutes 'excessive' consumption? Should this be based on some notion of a 'finite planet' or ecological limits, or some other measure? In this issue, Mattioli's framework goes some way to making assessments of excess, but there is plenty of scope for further consideration and we believe this should mark the beginning of a wider debate within the energy justice literature.

Third and finally, a theme emerging across the papers in this Special Issue is the importance of considering elements of energy inequalities in their wider social, economic, and political context. Attempting to tackle single issues, such as access to domestic energy or transport, without reference to the potential for wider impacts runs the risk of exacerbating other injustices. The complexity involved in thinking about how to mitigate injustices without creating others raises pressing questions of how society and politicians might be able to respond. Addressing these questions will require means of tracking inequalities and making assessments of interventions (such as that developed by Berry et al., Chatterton et al. and Mattioli). It may also involve more consideration of methods of collecting knowledge about the impacts of energy consuming activities and a lack of access to energy. Coupled with this, there are

many possible 'just' ways of living and of consuming energy. For democratic societies, these are questions that need to be negotiated through debate – how might democratic structures and practices develop to accommodate inclusive decision-making about energy systems?

To conclude, this article began by outlining some of the multiple justice implications of the consumption of energy for both mobility and domestic use. We then summarised the many interesting papers that make up the Special Issue, before highlighting some directions for future research. As guest editors, we hope that readers of the Issue find it to be a useful contribution to the expanding energy and transport justice debates, and that the papers stimulate new research that tackles some of the unanswered questions we highlight here.

Acknowledgements

We would like to thank Benjamin Sovacool and Pascale Blyth, and the team at Elsevier, for their help and guidance during the development of this Special Issue. Many thanks also to the reviewers of this and other articles within the issue, and to all of the authors for their time and dedication in putting together their papers. This article, and the Special Issue as a whole, arises from work for the DEMAND Centre (www.demand.ac.uk), which receives funding from UK Research Councils (EPSRC EP/K011723/1), ECLEER (EDF R&D), Transport for London and the International Energy Agency.

References

- [1] J. Agyeman, *Introducing Just Sustainabilities: Policy, Planning, and Practice*, Zed Books Ltd., London, 2013.
- [2] J. Agyeman, *Sustainable Communities and the Challenge of Environmental Justice*, New York University Press, New York, 2005.
- [3] *Just Sustainabilities: Development in an Unequal World*, in: J. Agyeman, B. Bullard, B. Evans (Eds.), MIT Press, Cambridge, MA, 2003.
- [4] W. Anderson, V. White, A. Finney, Coping with low incomes and cold homes, *Energy Policy* 49 (2012) 40–52, <http://dx.doi.org/10.1016/j.enpol.2012.01.002>, Special Section: Fuel Poverty Comes of Age: Commemorating 21 Years of Research and Policy.
- [5] K. Arrow, P. Dasgupta, L. Goulder, G. Daily, P. Ehrlich, G. Heal, S. Levin, K.-G. Mäler, S. Schneider, D. Starrett, B. Walker, Are we consuming too much? *J. Econ. Perspect.* 18 (2004) 147–172.
- [6] A. Berry, Y. Jouffe, N. Coulombel, C. Guivarch, Investigating fuel poverty in the transport sector: toward a composite indicator of vulnerability, *Energy Res. Soc. Sci.* 18 (2016), <http://dx.doi.org/10.1016/j.erss.2016.02.001>.
- [7] E. Beyazit, Evaluating social justice in transport: lessons to be learned from the capability approach, *Transp. Rev.* 31 (2011) 117–134, <http://dx.doi.org/10.1080/01441647.2010.504900>.
- [8] K. Bickerstaff, G. Walker, H. Bulkeley, Introduction: making sense of energy justice, in: K. Bickerstaff, G. Walker, H. Bulkeley (Eds.), *Energy Justice in a Changing Climate*, Zed Books Ltd., London, 2013, pp. 1–13.
- [9] A. Blowers, Why Fukushima is a moral issue? The need for an ethic for the future in the debate about the future of nuclear energy, *J. Integr. Environ. Sci.* 8 (2011) 73–80, <http://dx.doi.org/10.1080/1943815X.2011.585760>.
- [10] L. Bostock, Pathways of disadvantage? Walking as a mode of transport among low income mothers, *Health Soc. Care Community* 9 (2001) 11–18.
- [11] S. Bouzarovski, S. Petrova, A global perspective on domestic energy deprivation: overcoming the energy poverty–fuel poverty binary, *Energy Res. Soc. Sci.* 10 (2015) 31–40, <http://dx.doi.org/10.1016/j.erss.2015.06.007>.
- [12] S. Buzar, *Energy Poverty in Eastern Europe: Hidden Geographies of Deprivation*, Ashgate, Aldershot, 2007.
- [13] R. Chard, G. Walker, Living with fuel poverty in older age: coping strategies and their problematic implications, *Energy Res. Soc. Sci.* 18 (2016), <http://dx.doi.org/10.1016/j.erss.2016.03.004>.
- [14] T. Chatterton, J. Barnes, J. Anable, G. Yeboah, Mapping household direct energy consumption in the United Kingdom to provide a new perspective on energy justice, *Energy Res. Soc. Sci.* 18 (2016).
- [15] C. Cheyne, M. Imran, Shared transport: reducing energy demand and enhancing transport options for residents of small towns, *Energy Res. Soc. Sci.* 18 (2016), <http://dx.doi.org/10.1016/j.erss.2016.04.012>.
- [16] I.R. Cook, E. Swyngedouw, Cities, social cohesion and the environment: towards a future research agenda, *Urban Stud.* 49 (2012) 1959–1979, <http://dx.doi.org/10.1177/0042098012444887>.
- [17] G. D'Alisa, F. Demaria, G. Kallis, *Degrowth: A Vocabulary for a New Era*, Routledge, London, 2014.

- [18] A. Davis, D. Hirsch, M. Padley, A Minimum Income Standard for the UK in 2014, Joseph Rowntree Foundation, York, 2014.
- [19] R. Day, G. Walker, N. Simcock, Conceptualising energy use and energy poverty using a capabilities framework, *Energy Policy* (2016) 255–264.
- [20] U. Dubois, H. Meier, Energy affordability and energy inequality in Europe: implications for policymaking, *Energy Res. Soc. Sci.* 18 (2016), <http://dx.doi.org/10.1016/j.erss.2016.04.015>.
- [21] J. Fairburn, G. Walker, G. Smith, Investigating Environmental Justice in Scotland: Links Between Measures of Environmental Quality and Social Deprivation (No. UE4(03)01), Scottish and Northern Ireland Forum of Environmental Research, Edinburgh, 2005.
- [22] N. Fraser, *Justice Interruptus: Critical Reflections on the Postsocialist Condition*, Routledge, London, 1997.
- [23] R. García Ochoa, B. Graizbord, Privation of energy services in Mexican households: an alternative measure of energy poverty, *Energy Res. Soc. Sci.* 18 (2016), <http://dx.doi.org/10.1016/j.erss.2016.04.014>.
- [24] A. Giddens, *The Constitution of Society*, University of California Press, Los Angeles, 1984.
- [25] S. Grineski, B. Bolin, C. Boone, Criteria air pollution and marginalized populations: environmental inequity in metropolitan Phoenix, Arizona, *Soc. Sci. Q.* 88 (2007) 535–554, <http://dx.doi.org/10.1111/j.1540-6237.2007.00470.x>.
- [26] J.W. Handmer, S. Dovers, T.E. Downing, Societal vulnerability to climate change and variability, *Mitig. Adapt. Strateg. Global Change* 4 (1999) 267–281, <http://dx.doi.org/10.1023/A:1009611621048>.
- [27] K. Hargreaves, I. Preston, V. White, J. Thumim, *The Distribution of Household CO2 Emissions in Great Britain*, Joseph Rowntree Foundation, York, 2013.
- [28] K. Jenkins, D. McCauley, R. Heffron, H. Stephan, R. Rehner, Energy justice: a conceptual review, *Energy Res. Soc. Sci.* 11 (2016) 174–182, <http://dx.doi.org/10.1016/j.erss.2015.10.004>.
- [29] R. Jones, J. Pykett, M. Whitehead, Governing temptation: changing behaviour in an age of libertarian paternalism, *Prog. Hum. Geogr.* 35 (2011) 483–501, <http://dx.doi.org/10.1177/0309132510385741>.
- [30] W.F. Lamb, N.D. Rao, Human development in a climate-constrained world: what the past says about the future, *Global Environ. Change* 33 (2015) 14–22, <http://dx.doi.org/10.1016/j.gloenvcha.2015.03.010>.
- [31] C. Liddell, C. Morris, Fuel poverty and human health: a review of recent evidence, *Energy Policy* 38 (2010) 2987–2997, <http://dx.doi.org/10.1016/j.enpol.2010.01.037>, The Role of Trust in Managing Uncertainties in the Transition to a Sustainable Energy Economy, Special Section with Regular Papers.
- [32] K. Lucas, Transport and social exclusion: where are we now? *Transport Policy* 20 (2012) 105–113, <http://dx.doi.org/10.1016/j.tranpol.2012.01.013>, URBAN TRANSPORT INITIATIVES.
- [33] K. Lucas, Providing for social inclusion within a framework for environmental justice in the UK, *Transp. Res. A: Policy Pract.* 40 (2006) 801–809.
- [34] K. Lucas, G. Walker, M. Eames, H. Fay, M. Poustie, *Environmental and Social Justice: Rapid Research and Evidence Review*, Sustainable Development Research Network and Policy Studies Institute, London, 2004.
- [35] S. MacGregor, A stranger silence still: the need for feminist social research on climate change, *Sociol. Res.* 57 (2009) 124–140, <http://dx.doi.org/10.1111/j.1467-954X.2010.01889.x>.
- [36] A. MacIntyre, *After Virtue: A Study in Moral Theory*, University of Notre Dame Press, Paris, 1982.
- [37] G. Mattioli, Transport needs in a climate-constrained world. A novel framework to reconcile social and environmental sustainability in transport, *Energy Res. Soc. Sci.* 18 (2016), <http://dx.doi.org/10.1016/j.erss.2016.03.025>.
- [38] G. Mattioli, M. Colleoni, Transport disadvantage, car dependence and urban form, in: P. Pucci, M. Colleoni (Eds.), *Understanding Mobilities for Designing Contemporary Cities*, Springer, London, 2016, pp. 171–190.
- [39] D.A. McCauley, R.J. Heffron, H. Stephan, K. Jenkins, Advancing energy justice: the triumvirate of tenets, *Int. Energy Law Rev.* 32 (2013) 107–110.
- [40] D. McLaren, K. Krieger, K. Bickerstaff, Justice in energy system transformations: the case of carbon capture and storage, in: K. Bickerstaff, G. Walker, H. Bulkeley (Eds.), *Energy Justice in a Changing Climate*, Zed Books Ltd., London, 2013, pp. 158–181.
- [41] G. Mitchell, D. Dorling, An environmental justice analysis of British air quality, *Environ. Plan. A* 35 (2003) 909–929, <http://dx.doi.org/10.1068/a35240>.
- [42] C. Mullen, G. Marsden, Mobility justice in low carbon energy transitions, *Energy Res. Soc. Sci.* 18 (2016), <http://dx.doi.org/10.1016/j.erss.2016.03.026>.
- [43] C. Mullen, M. Tight, A. Whiteing, A. Jopson, Knowing their place on the roads: what would equality mean for walking and cycling? *Transp. Res. A: Policy Pract.* 61 (2014) 238–248, <http://dx.doi.org/10.1016/j.tra.2014.01.009>.
- [44] J. Oppenheim, The United States regulatory compact and energy poverty, *Energy Res. Soc. Sci.* 18 (2016).
- [45] J. Pettit, Climate justice: a new social movement for atmospheric rights, *IDS Bull.* 35 (2004) 102–106, <http://dx.doi.org/10.1111/j.1759-5436.2004.tb00142.x>.
- [46] C.G. Pooley, D. Horton, G. Scheldeman, C.A. Mullen, T. Jones, M. Tight, A. Jopson, E. Strano, A. Chisholm, Policies for promoting walking and cycling in England: a view from the street, *Transp. Policy* 27 (2013) 66–72.
- [47] J. Preston, F. Raje, Accessibility, mobility and transport related social exclusion, *J. Transp. Geogr.* 15 (2007) 151–160.
- [48] T. Pricen, *The Logic of Sufficiency*, MIT Press, Cambridge, 2005.
- [49] M.J. Sandel, *Justice: What's the Right Thing to Do?* Penguin Books, London, 2009.
- [50] M.J. Sandel, America's search for a new public philosophy *Atl. Mon.* 277 (1996) 57–88.
- [51] M.J. Sandel, Political liberalism, *Harv. Law Rev.* 107 (1993) 1765–1794.
- [52] A. Sarkar, Development and displacement: land acquisition in West Bengal, *Econ. Political Wkly.* 42 (2007) 1435–1442.
- [53] A. Sayer, *Why We Can't Afford the Rich*, Policy Press, Bristol, 2015.
- [54] A. Sayer, Why things matter to people: social science, in: *Values and Ethical Life*, Cambridge University Press, Cambridge, 2011.
- [55] A. Schiffer, Empowered, excited, or disenfranchised? Unveiling issues of energy access inequality and resource dependency in The Gambia, *Energy Res. Soc. Sci.* 18 (2016), <http://dx.doi.org/10.1016/j.erss.2016.04.011>.
- [56] E. Shove, Beyond the ABC: climate change policy and theories of social change, *Environ. Plan. A* 42 (2010) 1273–1285, <http://dx.doi.org/10.1068/a42282>.
- [57] E. Shove, G. Walker, What is energy for? Social practice and energy demand, *Theory Cult. Soc.* 31 (2014) 41–58, <http://dx.doi.org/10.1177/0263276414536746>.
- [58] N. Simcock, Exploring how stakeholders in two community wind projects use a those affected principle to evaluate the fairness of each project's spatial boundary, *Local Environ.* 19 (2014) 241–258, <http://dx.doi.org/10.1080/13549839.2013.788482>.
- [59] M. Smith, Cycling on the verge: the discursive marginalisation of cycling in contemporary New Zealand transport policy, *Energy Res. Soc. Sci.* 18 (2016), <http://dx.doi.org/10.1016/j.erss.2016.02.002>.
- [60] S. Sorrell, Reducing energy demand: a review of issues, challenges and approaches, *Renew. Sustain. Energy Rev.* 47 (2015) 74–82, <http://dx.doi.org/10.1016/j.rser.2015.03.002>.
- [61] B.K. Sovacool, Fuel poverty, affordability, and energy justice in England: policy insights from the Warm Front Program, *Energy* 93 (Part 1) (2015) 361–371, <http://dx.doi.org/10.1016/j.energy.2015.09.016>.
- [62] B.K. Sovacool, Conceptualizing urban household energy use: climbing the energy services ladder, *Energy Policy* 39 (2011) 1659–1668, <http://dx.doi.org/10.1016/j.enpol.2010.12.041>.
- [63] B.K. Sovacool, R.V. Sidortsov, B.R. Jones, *Energy Security, Equality and Justice*, Routledge, London, 2014.
- [64] J.K. Steinberger, J.T. Roberts, From constraint to sufficiency: the decoupling of energy and carbon from human needs 1975–2005, *Ecol. Econ.* 70 (2010) 425–433, <http://dx.doi.org/10.1016/j.ecolecon.2010.09.014>, Special Section: Ecological Distribution Conflicts.
- [65] E. Swyngedouw, Apocalypse forever? Post-political populism and the spectre of climate change, *Theory Cult. Soc.* 27 (2010) 213–232, <http://dx.doi.org/10.1177/0263276409358728>.
- [66] J. Urry, The problem of energy, *Theory Cult. Soc.* 31 (2014) 3–20, <http://dx.doi.org/10.1177/0263276414536747>.
- [67] J. Urry, Consuming the planet to excess, *Theory Cult. Soc.* 27 (2010) 191–212, <http://dx.doi.org/10.1177/0263276409355999>.
- [68] J. Urry, The system of automobility, *Theory Cult. Soc.* 21 (2004) 25–39, <http://dx.doi.org/10.1177/0263276404046059>.
- [69] G. Walker, *Environmental justice: concepts, in: Evidence and Politics*, Routledge, London, 2012.
- [70] G. Walker, Decentralised systems and fuel poverty: are there any links or risks? *Energy Policy* 36 (2008) 4514–4517, <http://dx.doi.org/10.1016/j.enpol.2008.09.020>, Foresight Sustainable Energy Management and the Built Environment Project.
- [71] G. Walker, R. Day, Fuel poverty as injustice: integrating distribution, recognition and procedure in the struggle for affordable warmth, *Energy Policy* 49 (2012) 69–75, <http://dx.doi.org/10.1016/j.enpol.2012.01.044>, Special Section: Fuel Poverty Comes of Age: Commemorating 21 Years of Research and Policy.
- [72] G. Walker, N. Simcock, R. Day, Necessary energy uses and a minimum standard of living in the United Kingdom: energy justice or escalating expectations? *Energy Res. Soc. Sci.* 18 (2016), <http://dx.doi.org/10.1016/j.erss.2016.02.007>.
- [73] S. Wang, Green practices are gendered: exploring gender inequality caused by sustainable consumption policies in Taiwan, *Energy Res. Soc. Sci.* 18 (2016), <http://dx.doi.org/10.1016/j.erss.2016.03.005>.
- [74] J. Whitelegg, *Critical Mass: Transport Environment and Equity in the Twenty-First Century*, Pluto Press, London, 1997.
- [75] M. Wolsink, Fair distribution of power-generating capacity: justice, micro-grids and utilizing the common-pool of renewable energy, in: K. Bickerstaff, G. Walker, H. Bulkeley (Eds.), *Energy Justice in a Changing Climate*, Zed Books Ltd., London, 2013, pp. 116–138.
- [76] World Health Organisation, *Burden of Disease from Ambient Air Pollution in 2012*, World Health Organisation, Geneva, Switzerland, 2014.
- [77] K. Yenneti, R. Day, Procedural (in)justice in the implementation of solar energy: the case of Charanaka solar park Gujarat, India, *Energy Policy* 86 (2015) 664–673.
- [78] I.M. Young, *Justice and the Politics of Difference*, Princeton University Press, Princeton, 1990.