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The methodologies, geographies, and technologies of energy justice: A systematic and comprehensive review

Kirsten Jenkins1*, Benjamin K. Sovacool2,3, Niek Mouter4, Nick Hacking5, Mary-Kate Burns6 and Darren McCauley6

1*Corresponding author, Science, Technology and Innovation Studies, University of Edinburgh, 2.05 Old Surgeon’s Hall, High School Yards, Edinburgh, UK, EH1 1LZ. Kirsten.jenkins@ed.ac.uk
2Science and Policy Research Unit, University of Sussex, UK
3Centre for Energy Technologies, Aarhus University, DK
4Transport and Logistics Group, Technical University of Delft, The Netherlands
5School of Geography and Planning, University of Cardiff, UK
6Global Social Challenges Research Group, Erasmus University of Rotterdam, The Netherlands

Abstract
The energy justice literature has seen a rapid surge in both academic and practical popularity. However, there has been less systematic reflection on the research conducted so far, its scope or contribution, nor what it might mean for the future of the concept. To provide insights, this paper presents the results of a systematic and comprehensive review of 155 peer-reviewed articles published across eight databases between January 2008 and December 2019. The aim is firstly to review the current state of the art in the energy justice literature and, secondly, to present findings that support novel recommendations with the potential to enhance the impact of energy justice research, including applications in the economic and planning policy sectors. Critically, our study demonstrates that the literature lacks diversity in its author basis and research design. By contrast, conceptual frameworks and the geographies and technologies of global energy injustice are proliferating. These results illustrate that energy justice has power and agency as a tool. It can act as a protagonist in energy research, provoking researchers to remain reflexively normative and active in identifying injustices and vulnerabilities, and it can act as a promising progenitor, creating new research methods and themes.

Key Words: Energy justice; energy ethics; systematic review; energy policy; research impact

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Highlights
• Offers a twelve-year systematic review of energy justice literature covering 155 articles
• Emphasises the importance of the energy justice concept in neglected policy contexts
• Reveals critical trends in author demographics and methodologies
• Illustrates the geographies, technologies, and marginalized peoples of injustice
1. Introduction

Over the past decade, the energy justice literature has seen a rapid growth in application and use, with increasing numbers of volumes, books and even university courses dedicated to the issue (e.g. McCauley 2018, Bickerstaff et al. 2013, Sovacool et al. 2013, University of Michigan 2020). An early definition by Jenkins et al. (2016) suggests that energy justice represents: (a) concerns for evaluating where injustices emerge (distributional justice), (b) which affected sections of society are ignored (justice as recognition), and (c) which processes exist for their remediation (procedural justice) in order to (i) reveal and (ii) reduce such injustices. But numerous other interpretations have been developed utilizing other concepts and approaches, including prohibitive and affirmative principles (Sovacool et al. 2013), notions of restorative justice (Heffron and McCauley 2017), spatial justice (Bouzarovski and Simcock 2017), and even calls to combine climate, environmental and energy justice under the banner of “just transitions” (McCauley and Heffron 2018). These variations demonstrate a significant degree of conceptual growth of the term (as also discussed by Jenkins et al. 2020).

Energy justice investigations have also appeared with more practical applications to fossil fuel labour transitions (Healy and Barry 2017), ethical consumption (Hall 2013), post-war conflict (Lappe-Ostthege and Andreas 2017) and social movements and issue framing (Fuller and McCauley 2016), for instance, demonstrating growth in the topic of concern. These contributions have been encouraged, in part, by three special issues with “energy justice” in their title; one in Energy Policy (Jenkins et al. 2017), one in Energy Research and Social Science (Simcock and Mullen 2016), and one in Applied Energy (McCauley et al. 2019) that represent a generally growing trend in this endeavour.

However, this impressive expansion of energy justice literature has been myopic, is still fairly young, and remains scattered. Efforts are generally more multidisciplinary than interdisciplinary, and it is a potentially ‘corruptible concept’, highly vulnerable to a range of political agendas. While appropriate for a literature that transcends so many issues and is being produced from scholars from many disciplines around the world, it makes a more systematic assessment of key trends in the literature elusive. This paper has two aims. First, it seeks to systematically and comprehensively analyse 12 years of energy justice contributions to review the current state of the art. By systematically, we mean according to explicit and transparent methodologies that are replicable and updateable (Sorrell 2007). By comprehensively, we mean by considering contributions across different databases, publications and case studies, amongst other criteria. Second, this paper seeks to further explore the links between future energy justice research and its practical implementation. It does so by systematically reviewing the academic
literature from January 2008 to December 2019 including 155 peer-reviewed articles spanning eight databases. We then present findings that support novel recommendations with the potential to enhance the impact of energy justice research, including an exploration of the importance of the energy justice concept to the often neglected economic and planning policy sectors.

2. Research design and limitations
To begin, our methodology for the systematic and comprehensive content analysis of energy justice research literature is presented throughout this section.

2.1. Data Collection
Academic papers—including full-length articles and review papers—were sampled between the 1st January 2008 and the 31st of December 2019. The 12-year range was chosen in order to achieve the “state of the art” focus the article aims for. Data was sampled from eight major peer-reviewed academic article databases (Table 1) with acknowledgement that this may exclude contributions from those without ready access to major journals and that this does not capture books published on the subject (e.g. McCauley 2018, Sovacool et al. 2013, Bickerstaff et al. 2013 or Bombaerts et al. 2020). This mirrors more qualitative review approaches used by Lacey-Barnacle et al. (2020) and Sovacool (2014) and many others before them.

To identify relevant articles, we searched for the term “energy justice” within three fields, the article title, abstract, and keywords. Papers that did not use the term “energy justice” exactly were excluded. This included the decision not to broaden out the search to include the related terms “energy ethics” and “due process”, for example. This also excludes the wider body of established justice literature that covers energy issues connecting with equity or power relations, including that using the environmental justice lens as well as approaches from political economy or political ecology. Although this and the decision to search only in three article fields reduces the sample—i.e. it excludes those that use “energy justice” in the main text but not in the sample fields and those which refer to energy ethics, for example,—this was deemed to be the most appropriate approach as it removed subjectivity in determining the sample (mirroring the approach of Sovacool 2014) and aided our desire to track the evolution of the energy justice literature in particular, in keeping with the aims and scope of this investigation. Only full-length, peer-reviewed, English-language research submissions and review papers were taken forward. We utilized an approach in line with Sovacool (2014) because it was well suited to a fragmented discipline (the nexus of energy and climate social
and also captured a diversity of outputs, including books, commentaries, book reviews, notes, opinion-editorials, letters, forums, viewpoints, corrigendum and similar items were excluded. The resultant sample across the eight databases is shown in Table 1. The full list of coded articles is given in Appendix 1.

**Table 1:** Overview of articles included by database and search term “Energy Justice” (2008-2019)

| Database                        | Search Term Tally |
|---------------------------------|-------------------|
| Science Direct                  | 119               |
| Project Muse                    | 0                 |
| Hein Online                     | 7                 |
| SpringerLink                    | 4                 |
| Taylor & Francis Online         | 14                |
| Wiley Online                    | 7                 |
| Sage Journals                   | 3                 |
| Annual Reviews                  | 1                 |
| **Total:**                      | **155**           |

Duplicates of papers were removed so that those remaining were only analysed once even if they appeared multiple times across the search terms and databases.

**2.2. Analytical protocol**

Our approach to categorization was both inductive and deductive. That is to say that in some instances, we started with a pre-established list of categories inferred from the literature and later amended this during the process of analysis. In other instances, such as for the coding of policy recommendations, we used a more grounded approach, developing the coding criteria as we read. This activity mirrors and extends a similar approach to that used by Sovacool (2014) and Mouter et al. (2018).

During the content analysis, data was collected on a variety of aspects present in each article (Table 2). To collate this data, the lead author read the title, abstract, and article keywords (when available), before searching the rest of the article for key terms and phases. This data was then analyzed using descriptive statistics as well as thematic analysis, allowing
the creation of a series of percentages, figures, summary tables and discussions presented in section 3 of the paper.

**Table 2:** Content analysis coding framework for the systematic review

| Distributive Coding – Author Demographics |  |
|------------------------------------------|----------------------------------|
| **Author Discipline**                   | Engineering & Technology; Life Science & Medicine; Social Science & Management; Arts & Humanities; Natural Science; Non-academic; Not Listed/Indeterminate; Interdisciplinary |
| **Author Region**                       | Africa; Asia-Pacific (including Australia and New Zealand); Europe (including Russia and Turkey); Latin America and Caribbean; Middle East; North America |
| **Author Gender**                       | Male; Female; Indeterminate |
| **Publishing Journal**                  | Geoforum; Energy; Applied Energy; Energy Research & Social Science; Energy Policy; Environmental Science and Policy; Environmental Studies and Sciences; Journal of Environment and Resources; Science as Culture; Local Environment; Environmental Politics; Energy and Buildings; Energy, Sustainability and Society; Journal of Rural Studies; Colorado Journal of International Environmental Law and Policy; Natural Resources; Renewable and Sustainable Energy Reviews; Energy for Sustainable Development; American Association of Geographers; Post-communist Economies; Journal of Energy and Natural Resources Law; Environment and Planning C; The Geographical Journal; Asia and Pacific Policy Studies; Antipode; Transactions of the Institute of British Geographers; Energy Law Journal; Politics and Space; Environment and Planning E; The Extractive Industries and Society; Journal of Cleaner Production; Environmental Innovation and Societal Transitions; Ecological Economics; Global Environmental Change; Energy Strategy Review; Climatic Change; Risks, Hazards and Crisis in Public Policy; Energy Efficiency; Cultural Studies; Harvard Civil Rights – Civil Liberties Law Review; Harvard Environmental Law Review |

| Analytical Coding |  |
|-------------------|----------------------------------|
| **Article methodologies and research designs** | Experimental; Surveys; Modelling; Qualitative; Secondary Data; None; Mixed method |
| **Philosophical and conceptual approaches** | Distribution; Distribution and Procedure; Distribution, Procedure and Recognition; Universal and Particular Justice; Six Energy Justice Principles; Eight Energy Justice Principles; Prohibitive and Affirmative Principles; Cosmopolitan; Other; Not Explicit/None |
| **Geographic and institutional approaches** | The Arctic; Australia; Bangladesh; Belgium; Brazil; Bulgaria; Canada; Chile; China; Colombia; Cuba; Czech Republic; Denmark; Ecuador; England; the European Union; France; Finland; Germany; Ghana; Guatemala; Hungary; Iceland; India; Indonesia; Iran; Ireland; Italy; Japan; Kenya; Kosovo; Latvia; Malaysia; Mexico; Mozambique; Nepal; Netherlands; Nigeria; Norway; Panama; Papa New Guinea; Peru; Poland; Portugal; Russia; São Tomé and Príncipe; Sierra Leone; South Africa; |
Spain; Sri Lanka; Sweden; Switzerland; Turkey; United Kingdom; United States of America; Ukraine; Vietnam, and Wales.

**Technologies, infrastructures and material systems**

- Fracking; Wind; Biomass and biogas; Nuclear: Lighting; Coal; Solar; Smart/energy meters; Hydropower; Gas; Thermal power plants; Heating/cooling; Oil; Cooking; Geothermal; Tidal; Wave; Electricity supply/grids; Smart grids; CO$_2$ storage; Vehicles or vehicle components; Energy Pipelines; Energy from waste; Cryptocurrency

**The marginalized peoples and victims of injustice**

- Unemployed (including fossil fuel workers); Biomass users; Women/gender; Ill or unhealthy; Disabled; Indigenous; Conservatives; Children, youth or young families; Elderly; Households; Racial and ethnic minorities; Land and resource owners (including farmers); Renters/tenure type (including social housing); Resisters; Poverty and economically marginalized; Limited access/disconnections; Domestic mobility; Cyber insecure; Displaced; Local populations/host communities; Procedurally disenfranchised; Politically powerless; Socially marginalised; Climate change victims/refugees; Rural; City inhabitants; Future generations

**Policy recommendations**

- Present/absent
- Then inductive codes of what they said, including Energy-based education; Support for translational intermediaries; Supportive financial structures; Attention to local contexts; Widening recognition; Collaborative procedure and decision-making; Diversifying ownership and beneficiaries; Transparency; Allocation of regulation and responsibility; Pro-justice policy monitoring frameworks; Anticipatory, inclusive policy visions; Targeted technological investments; Application of modelling or matrices; Defining need versus choice; Fostering cross-boundary discussion; Learning from other contexts; System wide policy applications; Flexible regulatory frameworks; Supporting jobs, technological expertise trade; Soft policy instrumentation; Requirements for Environmental and Social Impact Assessments; Clarified organisational roles

2.1.1 Author Demographics

We began the content analysis by looking at four categories relating to the most identifiable attributes of authors: author disciplinary affiliation at the time of publication, global region, gender and publishing journal. In all categories, we coded for each individual author, not just the lead author. This meant that the paper could receive numerous counts for the same category e.g. two “female” and one “male”; an approach that more accurately represented the demographic variables of all authors. All categories were pre-determined.

For disciplinary affiliation, we coded the affiliation listed at the beginning of the paper for all paper authors and classified those based on the five broad categories of “arts and humanities,” “engineering and technology,” “life sciences and medicine,” “natural sciences,”
and “social sciences and management,” along with the categories of “not listed” or “other” (Table 3). This follows the approach used by the QS World University Rankings. We coded for only the first affiliation listed by an author. Where multiple authors on the paper recorded the same affiliation, it was only coded once. A paper was coded as “interdisciplinary”—bringing together the distinctive components of two or more disciplines. (Nissani, 1995)—if two or more of the authors listed affiliations falling across two or more of the five categories listed above, if the affiliation itself mentioned more than one, or if it said “interdisciplinary” or “multidisciplinary” in its title.

### Table 3 Discipline Categorisation Framework

| Arts and Humanities                                      |
|----------------------------------------------------------|
| American studies; archaeology; architecture/build environment; area studies; art & design; classics; drama; dance & performing arts; English language & literature; history; language and logistics; music; philosophy; theology; divinity and religious studies |
| Engineering and Technology                               |
| Chemical engineering; civil engineering; computer science; electric and electronic engineering; general engineering; mechanical; aeronautical & manufacturing engineering; mineral & mining engineering; nanotechnology |
| Life Sciences and Medicine                               |
| Agriculture; biological sciences; clinical psychology; dentistry; food science & technology; health sciences; medicine and medical-related studies; neuroscience; nursing; pharmacy & pharmacology; psychiatry; public health; veterinary science |
| Natural Sciences                                         |
| Applied mathematics; astronomy; chemistry; earth sciences; environmental science; geography; metallurgy & materials; physics; pure mathematics |
| Social Sciences and Management                           |
| Accounting and finance; anthropology; business & management studies; communication; cultural and media studies; development studies; economics and econometrics; education; law; library & information management; politics & international studies; sociology; social policy & administration; social psychology; social work; sports-related subjects; statistics & operational research; town & country planning; innovation studies |

For author region, we coded each global region listed on the paper, determining whether the authors were writing from Africa, Asia-Pacific, Europe, Latin America and the Caribbean, the Middle East or North America. Then, to achieve more granularity in our data, we also took notes of the country listed by each author. We note, of course, that although the paper may have originated from the Netherlands this does not mean the authors were Dutch. So, our analysis only demonstrates where energy justice is being discussed. If there were three
authors from the Netherlands and one from the UK, the Netherlands would get 3 ticks and the UK 1. Where authors listed multiple country affiliations, each one was scored.

For **author gender**, authors were coded into “male”, “female”, and “indeterminate” as some authors only used initials or had names common to both genders. Where hyperlinks were given, or where clear affiliations were listed that enabled a search of the authors, these were double-checked to increase the validity of our coding.

Finally, for **publishing journal**, we recorded the journal each article was published in, the majority of which were associated with the Science Direct platform.

### 2.1.2 Article methodologies and research designs

For paper **article methodologies** and **research designs**, we coded for seven categories: “experimental”, “surveys”, “modelling”, “qualitative”, “secondary data”, “none” and “mixed method”. Articles were only coded once based on their stated methodology. Where more than one method was present, they were determined to be “mixed method” and further notes were taken. This follows the framing of “mixed methods” used by Mason (2006), who considers them not only to be those that span the qualitative versus quantitative divide, but also those that use a diversity of approaches within those respective categories. Examples include the use of participatory action research, interviews and secondary documentary analysis in Finley-Brook et al.’s (2018) work.

### 2.1.3 Philosophical and conceptual approaches

We also coded for which **type of energy justice framework** was used as recognition that a range of tenet frameworks have emerged. This left us with 10 categories: distribution only; distribution and procedure; distribution, procedure and recognition; universal and particular justice; six energy justice principles; eight energy justice principles; prohibitive and affirmative principles; cosmopolitan; other (then with qualitative details of what “other” stood for); and not Explicit/none.

### 2.1.4 Geographic and institutional approaches

Jenkins et al. (2016), Mullen and Marsden (2016), and latterly Sovacool et al. (2017) identify that some aspects of justice transcend spatial scales, requiring scholarship at both the front and back-end of energy production lifecycles and consciousness of international energy transfer and use. To test whether such a focus was present in the literature, we coded for the presence of geographical and/or institutional case studies (where the latter refers political and
economic consortia, such as the European Union). This resulted in 48 different codes, given in Table 2. We also coded for whether the geographic and institutional case studies were comparative i.e. whether more than one was used in each paper. If so, 1 tick was given and further notes were taken.

2.1.5 Technologies, infrastructure and material systems

Our analysis was also interested in what we were researching so that we could demonstrate new fields of research and discuss the potential methods that make them more accessible. Our purpose was to discern the general topic of research, rather than to determine the exact nuances of their writings. Thus, the coding for technologies, infrastructure and material system took an inductive, high-level approach. Notes were initially derived from the title, keywords and abstract, where possible, before a more systematic search. From these notes, 22 codes emerged (Table 2). Each paper was then allocated to all appropriate categories. Papers could be coded in multiple categories i.e. if they referred to both “biogas” and “nuclear” each category would receive a tick. As above, we considered whether cases were comparative i.e. they compared two or more energy production technologies.

2.1.6 The marginalized peoples and victims of injustice

There is some contention in the energy justice literature around whether “ justice as recognition” should exist as a separate concern – or tenet – from “procedural justice”. In this paper, and in keeping with Jenkins et al. (2016) and others, we consider that it is separate, and contend that by explicitly asking who is of concern, we can better represent and attend to marginalised peoples and victims of injustice. Therefore, we searched all article’s title, keywords and conclusions to initially determine the dominant focus before reading the articles in more depth. Each paper could be coded across multiple categories, including “indigenous”, “biomass users” and “landowners”, for instance. The category of “not clear” was used when no specific group social groups were mentioned. The emergent codes use the author’s definitions rather than our own, giving code titles such as “cyber insecure” or “procedurally disenfranchised”.

2.1.7 Policy recommendations

Finally, and given that we were concerned with the practical implementation of energy justice research in the policy sector, we coded each article for its policy recommendations. This allows us both to summarise the recommendations made to date, and then to the critically
synthesises these in order to develop our own agenda. As above, we began by coding whether they were present or absent, and following this, by inductively coding the energy justice-based recommendations where present.

2.3 Limitations

Of course, we acknowledge limitations to our study, as would be the case with any such systematic review, and we reflect on the most prominent issues. First, to keep the total number of articles read and coded manageable, we search for only academic literature, meaning we do not include insights from non-academic contributions such as reports, policy briefings and white papers. Nonetheless, we find merit in studying the academic literature and in the finding (below), that it does not often connect with issues of practical implementation. Similarly, our sample is composed only of full-length, peer-reviewed, English-language research submissions and review papers, so we did not capture other forms of contribution.

Second, we searched only for publications in English-language, which neglects contributions made in indigenous and European languages used throughout Africa and Asia, for example.

Third, a team of two authors were responsible for the coding, to improve the reliability of our inferences.

Lastly, though non-exhaustively, we appreciate that there may be texts that although they did not use the term “energy justice” in the title, keywords or abstract – or indeed elsewhere in the text –, may still have discussed its core approach and complementary issues. This may particularly relate to publications from non-Western contexts, where notions of “justice” do not necessarily directly translate or carry the same meaning. It is also a similar challenge to that faced by the environmental justice literature, which is dominated by literature from the United States (Reed and George 2011).

3. Results and Discussion

This section of the paper presents the results of the systematic and comprehensive review and its content analysis, and discusses what some of these findings mean, following the same structure outlined above: author discipline; author region; author gender; publishing journal, article methodologies and research designs; philosophical and conceptual approaches; geographic and institutional approaches; technological, infrastructures and material systems; the marginalised peoples and victims of injustice, and policy recommendations. Where quotes
are given, they have been selected as indicative representations of the discussions within the themes. To begin, Table 4 presents general statistics on the collected papers.
Table 4: General statistics for energy justice articles, 2008-2019 (n=155)

| Year | Number of Articles | Number of disciplinary affiliations | Number of author regions | Number of mixed method papers | Number of geographical case studies | Number of technological case studies | Number of technologically comparative case studies | Number of geographically comparative case studies |
|------|-------------------|-----------------------------------|--------------------------|-------------------------------|-----------------------------------|-------------------------------------|---------------------------------------------|-----------------------------------------------|
| 2008 | 0                 | 0                                 | 0                        | 0                             | 0                                 | 0                                   | 0                                           | 0                                             |
| 2009 | 1                 | 1                                 | 1                        | 0                             | 1                                 | 1                                   | 0                                           | 0                                             |
| 2010 | 3                 | 3                                 | 3                        | 0                             | 2                                 | 2                                   | 1                                           | 0                                             |
| 2011 | 1                 | 1                                 | 1                        | 0                             | 0                                 | 0                                   | 0                                           | 0                                             |
| 2012 | 1                 | 2                                 | 2                        | 0                             | 0                                 | 0                                   | 0                                           | 0                                             |
| 2013 | 5                 | 8                                 | 8                        | 0                             | 1                                 | 2                                   | 0                                           | 0                                             |
| 2014 | 1                 | 2                                 | 2                        | 0                             | 1                                 | 1                                   | 0                                           | 0                                             |
| 2015 | 5                 | 10                                | 10                       | 0                             | 6                                 | 4                                   | 1                                           | 1                                             |
| 2016 | 17                | 44                                | 43                       | 1                             | 16                                | 16                                  | 1                                           | 4                                             |
| 2017 | 24                | 71                                | 64                       | 12                            | 24                                | 19                                  | 3                                           | 4                                             |
| 2018 | 53                | 151                               | 142                      | 21                            | 69                                | 52                                  | 11                                          | 9                                             |
| 2019 | 44                | 101                               | 115                      | 14                            | 61                                | 83                                  | 8                                           | 8                                             |
| Total: | 155           | 394                               | 391                      | 48                            | 181                               | 180                                 | 25                                          | 26                                           |
3.1. Author Demographics

Across all articles analysed in the sample, a total of 378 author affiliations were listed, covering all five of the major academic families mentioned above. In total, 76% of authors listed themselves as being associated with social sciences and management disciplines, with 10% appearing as not listed/indeterminate, 4% engineering and technology, 2% life sciences and medicine, 4% natural sciences, and 2% arts and humanities Figure 2(A). The arts and humanities affiliations included contributions from a Professor of Theatre and Consecrated Layman, illustrating the full diversity of energy justice scholarship. Of these affiliations, only 3% could clearly be considered as “non-academic”. Whilst Sovacool (2014) identified an underrepresentation of social science and humanities perspectives on energy research, the energy justice research therefore seems far more balanced in this area.

Yet of the papers analysed, only 16 papers were explicitly identifiable as having interdisciplinary authorship, meaning that despite an increasing shift in academic pedagogy towards interdisciplinary approaches, many authors continue to work in the confines of one of the five listed categories – arts and humanities, engineering and technology, life sciences and medicine, natural science, and social science and management - even when working across different institutions and countries.

Authors reported affiliations with all six global regions used for the analysis. This implies positive global representation, although Figure 2(B) shows that there was a heavy bias towards European contributions, which amounted to 60% of the sample, whilst authors in universities from the Asia-Pacific region (including Australia and New Zealand) totalled 16%. Of those from Europe, 41% were from the UK. Particularly underrepresented global regions include universities from Africa (2%), Middle East (1%) and Latin American and the Caribbean (1%), although we do note that our sample only selected papers written in English from major databases, which may not be readily accessible in some global regions.

For author gender, shown in Figure 2(C), whilst male contributions did dominate (59%), female authors were represented at 38% of the total sample leaving 3% of the research sample as unidentifiable. Sovacool (2014) recognizes in his content analysis of social science research in the energy field, that of 9549 papers analysed, only 15.7% could be identified as female. Although our sample is smaller, our analysis shows that the energy justice literature is currently more gender progressive than the general energy studies literature.

In terms of publishing journal, and despite a wide range of publishing outlets (with 41 journals represented overall), 98 of the articles in the sample of 155 came from just three journals; Applied Energy, Energy Research & Social Science and Energy Policy (Figure 3).
This corresponds partly with journals publishing special issues on the topic but given that these contained between 14-20 papers a time, it also suggests these are enduring targets for this area of scholarship.

**Figure 2: Energy justice author demographics (n=155)**

(A) Author Affiliation

(B) Author Region

(C) Author Gender

| Gender          | Total | % share |
|-----------------|-------|---------|
| Male            | 234   | 59      |
| Female          | 153   | 38      |
| Indeterminate   | 12    | 3       |
Figure 3: Journals publishing energy justice papers from 2008 to 2019 (n=155)
3.2. Article methodologies and research designs

Examining the methodological approach of published articles allowed an assessment of the most dominant research approaches. In total, 39% of articles contained no stated methodology, where subjectively, most of these appeared as conceptual advancements based largely on non-replicable reviews (e.g. Jenkins et al. 2016) or in-depth case studies with no openly-recorded method for data collection or analysis (Sovacool 2016) (Figure 4). In contrast, 45% used qualitative primary data and 35% secondary data. 48 papers also included one or more methods, such as Sareen and Haarstad (2018) who employ field observations during site visits to solar energy projects, expert interviews and documentary analysis of media reports and policy documents. Likewise, Lacey-Barnacle and Bird (2018) use participatory action research methods, focusing on interviews and focusing groups, whereas Liljenfeldt and Pettersson (2018) develop models on the basis of secondary data. As a particularly novel case, Osnes (2010) reports the findings of participatory theatre exercises used to engage women in energy development projects, such as the rollout of fuel-efficient cook stoves.

Figure 4: Data collection methods within the energy justice literature (n=155)

![Data collection methods within the energy justice literature](image)

One caveat must be stated. Although the research field has a mix of conceptual and empirical studies, these findings may not suggest a lack of attention to methods from all researchers, and instead it could be that the type of papers produced may not have needed a specific methods section. Nevertheless, even in disciplines with divergent codes of practice and norms about research design, we find the dearth of detailed methods sections troubling on
grounds of both transparency (fully accounting for techniques and assumptions in research design) and replication (giving the community the ability to try to replicate findings and methods if they so desire).

### 3.3. Philosophical and conceptual approaches

Within the field of energy justice, a range of tenet frameworks have emerged. Our analysis showed that the dominant framework in the sample papers was that of distributional justice, justice as recognition and procedural justice (38%), a finding that corroborates the results of a recent review from Lacey-Barnacle et al. (2020). In our results, this was followed by mentions of cosmopolitan justice (9%), distributional justice and procedural justice on their own (8%) and the eight principles approach (7%). A cumulative category of “other” (8%) captured papers using “energy systems justice”, “spatial justice”, “energy sufficiency”, “assemblage” and “energy mobility”, “restorative justice” and “capabilities approaches” alongside a 10 principles approach. Table 5 gives an overview of the different approaches and the frequency of their appearance.

As particular observations, in 7 papers, the approach of distributional justice, justice as recognition, and procedural justice was used alongside the “8 principles” decision-making framework approach, which calls for attention to (1) availability, (2) affordability, (3) due process, (4) intra-generational equity, (5) sustainability, (6) transparency and accountability, (7) equity and (8) responsibility (Sovacool et al. 2016). This may be considered a particularly profitable avenue that blends a key conceptual approach to energy justice within one intended to have more of a decision-making and practical influence. Moreover, it is worth noting too that some authors switched between approaches either through time or across different papers over the same timescale. Tentatively, this suggests that the literature may still be evolving in shape or critically, that new authors are joining and seeking to contribute their own perspectives and agendas. In this regard, there is a tension between simultaneously “opening up” to new authors, disciplinary perspectives and conceptual and decision-making approaches, whilst “closing down” through the continued dominance of distribution, procedure and recognition.
Table 5: Theoretical approaches undertaken within the energy justice literature (n=155)

| Approach                                        | Frequency (%) |
|------------------------------------------------|---------------|
| Distribution                                   | 6             |
| Distribution and procedure                     | 8             |
| Distribution, procedure and recognition        | 38            |
| Universal and particular justice               | 1             |
| Six principles                                 | 2             |
| Eight principles                               | 7             |
| Prohibitive and affirmative                    | 1             |
| Cosmopolitanism                                | 9             |
| Other                                          | 8             |
| Not explicit/none                              | 20            |

3.4. Geographic and institutional approaches

Out of the total sample of 155 papers, 125 drew on what we would classify as geographical case studies. Though it should be noted that this does not mean that the others contained no geographical or institutional approaches at all, only that the references were very passing without exploring them in significant depth. Comparative case studies of countries appeared in just 24 papers (15%). As an indicative example, Siciliano et al. (2018) look at large dam construction in the global South using case studies in Cambodia, Malaysia, Ghana and Nigeria.

Compared to the comparatively limited geographical scope of the universities where contributing authors are, this geographical scope of application shows real breadth in the reach of energy justice scholarship, mentioning 61 different countries across the world (Figure 5). Although a subjective claim, one of the most novel case study was from the African Island nation of São Tomé and Príncipe, where Sovacool (2016) explores the notion of “prudence” in fossil fuel use where energy resources out to be maximised for future use, and utilized to better the communities living near them. However, in keeping with Lacey-Barnacle et al. (2020) we also demonstrate a neglect of case studies in particular regions of the world, including Sub-Saharan Africa, South American and Asian contexts. There is also a notable lack of research

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1 The following countries were included: the Arctic; Australia; Bangladesh; Belgium; Brazil; Bulgaria; Canada; Chile; China; Colombia; Cuba; Czech Republic; Denmark; Ecuador; England; the European Union; France; Finland; Germany; Ghana; Guatemala; Hungary; Iceland; India; Indonesia; Iran; Ireland; Italy; Japan; Kenya; Kosovo; Latvia; Malaysia; Mexico; Mozambique; Nepal; Netherlands; Nigeria; Norway; Panama; Papa New Guinea; Peru; Poland; Portugal; Russia; São Tomé and Príncipe; Sierra Leone; South Africa; Spain; Sri Lanka; Sweden; Switzerland; Turkey; United Kingdom; United States of America; Ukraine; Vietnam, and Wales.
in Arctic countries, even though these countries face some daunting energy justice concerns (McCauley et al. 2016).
Figure 5: Global map showing the current coverage of energy justice case studies by country (São Tomé and Príncipe, the “European Union” and “the Arctic” are omitted)
3.5. Technologies, infrastructures and material systems

Whilst technological cases were less prevalent than those relating to different geographical and institutional approaches, they were similarly diverse, considering both production and consumption technologies such as shale gas, solar, thermal power plants, smart meters and domestic lighting. Out of the total sample of 155 papers, 102 drew on technological case studies (Appendix 2). 54 of the total number had no discernible technological focus, though again it should be noted that this does not mean that they contained no examples at all, only that they were either very broad (e.g. “fossil fuels” and “renewables”) or contained only very passing reference to particular technologies without exploring them in significant depth. A total of 17% of the sample could be considered ‘technologically comparative’, meaning it compared energy justice manifestations for more than one technology. Roddis et al. (2018) consider community acceptance for onshore wind and solar in the UK, for example, and Rudolph et al. (2018) which considers wind, wave and tidal energy.

Of the technologies, infrastructures and material systems mentioned, solar (33 papers), wind (18 papers) and heating/cooling technologies (17 papers) were the most common (Figure 6), a surprising finding given that fossil fuels and nuclear power are known to have more severe externalities and social and economic costs than low-carbon or renewable energy systems (Sundqvist 2004; Roth and Ambs 2004; Kalkuhl et al. 2019; Healy et al. 2019). For heating/cooling technologies in particular, the instances were almost entirely in the context of fuel poverty concerns. We also note the comparative neglect of emerging technologies such as hydrogen (although they have been noted in more recent publications, e.g. Scott and Powells 2020), which although it was discussed in passing in 9 papers was not explored in any real depth. Despite from the fact that “the energy justice concept can expose exclusionary and/or inclusionary technological and social niches before they develop, leading to potentially new and socially just innovation” (Jenkins et al. 2018: 67) this demonstrates that energy justice scholars may not yet be proactively exploring upcoming justice issues of concern (with the exception, perhaps, of studies on smart metering and smart grids (e.g. Milchram et al. 2018, Hielscher and Sovacool 2018 and Xu and Chen 2019).

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2 Though we do note that there is significant, closely related work on these topics in the wider environmental justice literature (e.g. Evans and Phelan, 2016; Shiva, 2008).
Figure 6: Mentioned technologies, infrastructures and material systems within the energy justice literature
3.6. The marginalized peoples and victims of injustice

Out of the total sample of 155 papers, 136 contained reference to at least one social group of concern or enhanced vulnerability to energy injustice; a reference to the marginalized peoples and victims of injustice. In total, 34 different coding categories emerged (Table 2). These categories included demographic characteristics, such as individual’s health, disability status, age and care responsibilities around children, as well as a wider set of material conditions (e.g. inhabitants of particular building types), social performances (e.g. whether groups were procedurally disenfranchised or “resisters” to a form of socio-technical change) and wider contextual changes (e.g. victims of war, conflict and corruption or the unemployed in the context fossil fuel production closures). In some cases, the categories shown in Figure 7 and Appendix 3 represent a grouping of concerns; “poor and economically marginalized” includes those suffering from financial poverty, energy poverty and fuel poverty for example, and “socially marginalized” captures a range of stakeholders facing restrictions in their social mobility through class, caste status, illiteracy or the use of English as a second language, for instance. On the whole, almost all papers carried statements of who we should be concerned about in achieving energy justice outcomes, illustrating a complex web of different social, material and socio-structural vulnerabilities.

Although at times the identification of some social groups was only briefly stated – e.g. in a list or as a series of short sentences –, a number of papers engaged with their articulation in more depth. By example, Finley-Brook et al. (2018: 182) include overview tables of the “victims of injustice”, showcasing concern for “climate change hard to future generations”, “harm to wetlands and biodiversity”, those affected by the “forced buy-out of homes”, and “harassment of threats to protestors and opponents”. Likewise, Bartiaux et al. (2018) illustrate the complexity of households affected by affordable warmth, including whether inhabitants were urban or rural, tenants or owners, single or multiple occupants or even their educational status. Taking a notably different approach, Chatterton et al. (2016: 85) focus on the highest consuming members of society, arguing that, “Energy justice work in the context of energy consumption has tended to focus on ensuring that certain sectors of society identified as fuel poor receive support in order to allow them to meet their fundamental energy needs at a cost that is affordable by them. However, here we argue that in terms of both the just targeting of climate policies to reduce energy consumption, and strategies to create a more equitable use of national energy systems, there is a need to broaden the justice lens to consider not just the lower end of the consumption spectrum, but also the higher end too”. This perspective raises ongoing questions about notions of “justice by whom”, in addition to “justice for whom” concerns.
It is worth noting that considerations of “poverty and the economically marginalized”, “racial and ethnic minorities” and “climate change victims/refugees” shows some overlap with groups that would typically be recognised with the environmental and climate justice literatures, albeit in an energy-systems context.

**Figure 7**: Marginalized peoples, vulnerable groups and victims of injustice mentioned in the literature
3.7. Policy recommendations

In total, 43% of the sample of papers contained policy recommendations, spanning a total of 21 categories derived from inductive coding. For the 57% of studies that did not include policy recommendations, this is a fairly common trend in the literature. Marsden and Reardon (2017) examined the field of transportation governance and found that many studies were one-step removed from policymaking and that research did not contribute to understanding options and opportunities to intervene and improve policy processes.

Where recommendations were present, they were largely in publications from the journal *Energy Policy* (Figure 3), a trend largely explained by the journal’s author guidelines that require it to integrate a “Conclusions and Policy Implications” section in every manuscript. Across all papers in our sample, the recommendations ranged from context-specific suggestions for particular organizations or countries to broader, systematic statements spanning technological development and improvements for policy practice and monitoring. The most frequently mentioned categories were (1) attention to local contexts, (2) supportive financial structured, (3) widening recognition, (4) collaborative procedure and decision making, and (5) targeted technological investments (Figure 8). This speaks to the scalar applicability of the energy justice concept, with intended applications in local, national and international settings.

In keeping with Lacey-Barnacle et al. (2020), our findings showcase a policy emphasis on increasing participation, with less explicit discussion on how to reduce the power of elites (except, perhaps, through the work of Chatterton et al., 2016). It should be noted too, that some recommendations were provided for social groups beyond traditional policy “elites”, including recommendations for utilities, activists and developers. By way of illustration, Rudolph et al. (2018: 106) suggest that “developers should therefore be urged to consider, reveal, discuss, and justify openly what is achievable and expectable in terms of community benefits when engaging local communities” and Liévanos and Horne (2017: 209) recommend “that utilities be particularly clear in their information-sharing efforts with disadvantaged communities”. For the policy recommendations in particular, indicative quotes for each coding category are given in Table 6.
**Figure 8:** Policy recommendations offered by the energy justice literature

- Energy-based education
- Support for translational intermediaries
- Supportive financial structures
- Attention to local contexts
- Widen recognition
- Collaborative procedure and decision-making
- Diversifying ownership and beneficiaries
- Transparency
- Allocation and regulation of responsibility
- Pro-justice policy monitoring frameworks
- Anticipatory, inclusive policy visions
- Targeted technological investments
- Application of modelling or matrices
- Defining need versus choice
- Fostering cross-boundary discussions
- Learning from other contexts
- Systems wide policy applications
- Flexible regulatory frameworks
- Supporting jobs, technological and expertise trade
- Soft policy instruments
- Requirement for Environmental and Social Impact...
- Clarified organisational roles
Table 6: Indicative examples of policy recommendations in the energy justice literature

| Category                          | Authors                          | Quote                                                                                                                                 |
|-----------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Energy-based education            | Heffron and McCauley (2017)      | “Policy-makers and educators need to ensure energy justice is part of the energy curricula”.                                           |
| Support for translational         | Labelle (2017)                   | “Policy makers need to act as mediators between global business and regulatory structures while also asserting local norms with acceptable business models and profit levels”. |
| intermediaries                    |                                  |                                                                                                                                 |
| Supportive financial              | Capaccioli et al. (2017)         | “For instance, these initiatives could be allowed to use the incentive schemes that already exist for renewables to feed the creation of the energy bonus in connection to improvements of energy consumption”. |
| structures                         |                                  |                                                                                                                                 |
| Attention to local contexts       | Munro et al. (2017)              | “This includes the understanding of actual, rather than presumed, political economic forces that shape energy access, as well as the kinds of energy futures that particular communities desire …; a form of ‘recognition justice’ that helps to articulate voices and knowledges from people experiencing energy poverty”. |
| Widening recognition              | Bouzarovski and Herrero (2017)   | “…also of importance is the nature of policy recognition afforded to groups who are susceptible to the condition but remain outside the focus of present policy measures, due to the state’s failure to detect the specific age, gender and locational profiles of energy-poor households.” |
| Collaborative procedure           | Baker (2016)                     | “Substantively, the consultation process must offer opportunities for meaningful exchanges among community members, and also among community members, government officials, and developers”. |
| and decision-making               |                                  |                                                                                                                                 |
| Diversifying ownership            | Forman (2017)                    | “As recent policy approaches in the United Kingdom under Electricity Market Reform have tended to prioritise affordability over ownership as a means to enhance equity, the analysis suggests that there is much scope to capitalise on a wider equity dividend through a more diverse approach to ownership in UK energy policy”. |
| and beneficiaries                 |                                  |                                                                                                                                 |
| Transparency                      | Jenkins et al. (2017)            | “As this is the study, we highlight the necessity of using policy tools oriented towards the regular reassessments of who is responsible, and of how successfully transparency is being achieved”. |
| Allocation and regulation         | Jenkins et al. (2017)            | “Policy frameworks that allocate and uphold responsibility are required”.                                                                 |
| of responsibility                 |                                  |                                                                                                                                 |
| Pro-justice policy                | Bouzarovski and Simocock (2017)  | “… correcting end-use energy injustice requires improved energy poverty detection and monitoring frameworks”.                         |
| monitoring frameworks             |                                  |                                                                                                                                 |
| Topic                                                                 | Author(s)                  | Quote                                                                                                                                 |
|----------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Anticipatory, inclusive policy visions                              | Poruschi et al. (2018)    | “If policymakers are to avoid unintended outcomes, moving forward, federal and state governments need to also define a vision of how the future grid will operate and steer technological development in that direction, before technological advances can dictate the evolution of grid system with unintended, unjust consequences for its users”. |
| Targeted technological investments                                  | Islar et al. (2017)       | “Thus, Nepalese policy-makers may choose to strengthen the local technological capacity, by supporting local grid-extension movements in NACEUN, but they may also cultivate geopolitical relations to China and India by agreeing to technological transfers through development aid or trade”. |
| Application of modelling or matrices                               | Bednar et al. (2017)      | “Modelling both heating consumption and efficiency provides a useful tool that may assist policymakers, energy conservation and efficiency program administrators and retrofit installers develop more effective targeting strategies”. |
| Defining need versus choice                                        | Chatterton et al. (2016)  | “In moving forward to establishing a just set of policies for achieving ambitious climate change and energy targets it will be necessary to much better identify the boundaries between choice and need, particularly in the context of high energy consumption where action is needed the most”. |
| Fostering cross-boundary discussions                               | Pesch et al. (2017)       | “…have to reflect on the way in which decisionmakers can involve the different territorial levels that are affected by an energy project in a productive way”. |
| Learning from other contexts                                       | Gillard et al. (2017)     | “Similarly, with regards to energy efficiency policy, there is certainly scope for collecting best-practice examples from multiple country case studies, as well as from complementary areas of social policy, and on-the ground perspectives from vulnerable households”. |
| Systems wide policy applications                                   | Urban et al. (2017)       | “It would be useful for the government of Vietnam to develop more coordinated, integrated approaches, policies, and plans that span across the three areas that address green transformations: green growth, sustainable development, and climate change”. |
| Flexible regulatory frameworks                                      | Hiteva and Sovacool (2017)| “This means that policymakers (at national and even supranational levels) should introduce sufficient flexibility within existing regulatory frameworks to make use of such local conditions and to turn them into local deals”. |
Now, when considering the prevalence of policy recommendations in the energy justice literature, one important caveat merits mentioning. Our review paints a useful picture as to the frequency by which policy recommendations appear in the literature, but it does not speak to the quality by which those recommendations are crafted, grounded in data, or presented in actionable ways to policymakers. It could be that few of the policy recommendations in Table 6 are sufficiently contextually specific to be useful, or feasible enough to be meaningful. However, it does still tell us the intent of the authors to take policy implications into serious consideration. Moreover, past trends may not be predictive of future ones: overall, the energy justice scholarship may now be at a phase where policy outcomes are perhaps more likely.

As a final observation, it is also worth considering the potential role of currently under-explored or under-emphasised policy mechanisms, including the role of Cost Benefit Analyses as a particular facet of supportive financial structures and impact assessments, for example, which were infrequently mentioned across our sample but widely used in non-academic circles. Other options include impact benefit agreements, truth commissions, and the use of prohibitive or punitive environmental bonds as ways to enforce energy justice principles (Sovacool and Dworkin, 2004). This is necessary both so that we can deploy a broader array of policy tools,

| Supporting jobs, technological and expertise trade | Islar et al. (2017) | “Thus, Nepalese policy-makers may choose to strengthen the local technological capacity, by supporting local grid-extension movements in NACEUN, but they may also cultivate geopolitical relations to China and India by agreeing to technological transfers through development aid or trade”. |
| Soft policy instrumentation | David (2018) | “The comparative case study approach pursued in this article shows that soft policy instruments, like the means of contention used by the two organizations analyzed here, help the move toward intra- and intergenerational energy justice by aiming for the exnovation of carbon intensive infrastructures”. |
| Requirements for Environmental and Social Impact Assessments | Xalzadilla and Mauger (2018) | “…, public, private or community-led renewable energy projects should be submitted to a compulsory environmental and social impact assessment (ESIA), but this does not always happen”. |
| Clarified organisational roles | Fleming (2019) | “This leads to the third and final policy recommendation of this article. It is crucial for the EU to clarify the role and function it has vis-à-vis EU Member States in gas supply security.” |
as well as better understand their potential and to develop impact beyond silos, given that these mechanisms are frequently applied beyond the ivory tower. To that end, and as indicative examples of areas in which more research is required, we further reflect on the potential role of Cost Benefit Analyses and some forms of impact assessments in sections 4.1.1 and 4.2.2.

4. Reflections: Recommendations for practice and policy

Our analysis has given a 12-year systematic assessment of energy justice scholarship, including both a descriptive consideration of who is writing, from where and through which outlets, and an analytical consideration of which methods we are using, which conceptual frames are being applied, in relation to which case studies and topics and to what end. Various, and in considering why these findings matter on a broader scale, our analysis therefore points towards potential areas of growth and refinement in the energy justice literature in its next wave of development, including the possibility of increasing interdisciplinarity and the geographical breadth of contributors, exploring currently underutilized methods as part of interdisciplinary outlooks and impact beyond silos, exploring new case studies and geographical peculiarities and even questioning not only which groups are marginalized, but which groups receive disproportionate benefit and therefore might reallocate these. We highlight these areas not with a view to suggesting that continued growth is always inherently positive but as a process of ongoing systematic reflection. Indeed, researcher reflexivity is certainly necessary to refine and direct the concept of energy justice beyond the analysis here of what the literature is doing and where the gaps may be for future scholarship (Jenkins et al. 2020; Sovacool et al. 2020). This first proposition therefore suggests that energy justice researchers should further focus on what frameworks, approaches and methods are being used in the context of both energy storage, demand and supply, before assessments of what can or should be used.

Nonetheless, we do see merit in capturing new perspectives, ensure representation and as ever, move towards practical impact. In this regard, our analysis lends itself to both introverted and extroverted reflection. It allows us as an authoring team to take stock on what has been achieved through our collective experience as energy justice researchers as well as the results given above, and to collectively look forward, considering which further research gaps have been highlighted and which practical recommendations have been made for a range of energy systems stakeholders including NGOs, educators and policy-makers. In this Reflections section that follows, we therefore seek to synthesize and extend a select few of these potential avenues into a series of recommendations for both academia and “practice”
(which we loosely define as being the implementation of energy justice principles outside of academia), all of which are oriented towards securing a more impactful energy justice agenda. In so doing, we highlight potential directions for the next wave of energy justice scholarship. But we also want to avoid our recommendations as being seen as dogmatic or hegemonic; we believe the field as a whole should avoid privileging a particular type of energy justice scholarship over other types and to more carefully consider the importance of diversity and pluralism as guiding principles. We thus present our reflections with the idea of germinating and opening up future discussion, not closing it down.

4.1. Looking in: Recommendations for academic practice

Here, we explore three key areas which, in light of our experience and the findings discussed above, highlight critical areas of refinement for academic practice. As noted above, almost about two-fifths of articles (40%) had no research design or no methods section at all. This lack of attention to methods and empirical reinforcement may limit the insight gained from and the applicability of energy justice research, particularly as energy justice remains, to some degree, conceptual and not applied. It also would preclude any sort of replication study or a study seeking to confirm initial results. Therefore, it seems important to push professional researchers, and even the next generation of students, to strengthen their ability to offer more methodologically transparent and at times rigorous assessments. Universities may also recommend continuous training for energy justice researchers, similar to what the legal profession does with its Continuing Legal Education (CLE) requirements (Overland and Sovacool 2020). CLE requirements ensure that all practicing lawyers remain professionally certified on a continuing basis well after they pass the bar or become a law professor. Implementing a similar approach for energy justice or even broader social science work could be fairly easily done via a multitude of options and permutations. At the institutional level, university departments, faculty congresses or senates, or university colleges could all make this training as a requirement for employment. At the level of research councils, it could be made a condition of funding (one must show they have been certified) by particular initiatives, or across entire programs. It could lastly supported or implemented by various professional bodies and associations, even those with a disciplinary focus, i.e. the International Studies Association for international relations, or the Royal Geographical Society for geographers in the United Kingdom, or the Society for the History of Technology or Society for the Social Studies of Science for those in technology studies.
Furthermore, we call on researchers to consider more intersectional forms of energy justice analysis that go beyond many of the simple binaries implicit within current research, e.g. gender (male and female), income (rich and poor), or race (black and white), categories which frequently appeared across our sample, but often not in intersection. Groundbreaking work in this regard from the energy justice community includes that of Mulvaney (2013) (examining justice and solar commodity chains), Adams et al. (2012) (examining justice and whole systems analysis of microgeneration technologies), and Healey at al. (2019) (embodied energy injustices). Groundbreaking work from the energy studies community includes Lennon (2017) (intersections of race, ethnicity, and gender), Ryder (2018) (intersections of feminism, class, and power), Johnston et al. (2020) (gender and class/equity), Lieu et al. (2020) (intersections of indigenousness and gender), and Newell (2021) (race and class).

In reality, many people suffer energy injustices due to a confluence of these factors; they live the experiences of injustice due to their gender, income and race but also their age, religion, and even location. Sovacool et al. (2020: 14) documented this extensively in their assessment of the injustices facing cobalt miners in the Congo, who often dig up cobalt to provide materials for low-carbon energy systems such as solar panels or electric vehicle batteries. As their research indicated, “there are ethnic dimensions to vulnerability, also, as the system is predicated on displaced persons working for artisanal mining bosses trying to stay rich and keep others, less experienced miners or different ethnic groups, poor as a result. So socioeconomic class mixes with ethnicity for vulnerability” and “inequalities in terms of work conditions map onto and reinforce existing inequalities of ethnicity, race, class, and social status.” These intersectional injustices demand more robust conceptual frameworks that account for the complexity of lived experiences across space and time.

Finally, many of the cosmopolitan concerns identified in the literature remind us that justice impacts are multi-scalar and do not occur only in a single country (see Figure 9) and yet our sample shows that geographically and technologically comparative studies were not common. This may include nuclear reactor designs being exported, cheap electricity trade, uranium mining, and nuclear waste for nuclear energy; low-wage manufacturing in China and material inputs for solar energy; copper and cobalt (DRC), e-waste (Ghana) for smart meters; and extractive industries (cobalt, lithium) for EVs, e-waste, cheaper/dirtier cars flooding other markets (Sovacool et al. 2019). Cleaner and lower carbon energy may be a human right, but securing it currently forces trade-offs with other human rights, leading to “green on green” and even “poor on poor” conflict. We must avoid conceptual approaches or research designs that obscure or mask this emerging spatial divide to energy justice.
4.2. Looking out: Minimizing injustices

Looking outward, we offer suggestions about better incorporation energy justice into assessments of costs and benefits, as well as how it can improve energy planning and policymaking. Here, we recognize the work on increasing participation and information sharing captured above, but point towards less common but potentially very beneficial and complementary mechanisms.

4.2.1. Improving real-world (economic) policy assessment through energy justice

Energy justice needs to be more formally incorporated into mechanisms of assessing costs and benefits. One of the main criticisms is that Cost Benefit Analyses (CBAs) have difficulty incorporating ethical considerations (van Wee 2012), such as procedural and distributive aspects, which are important for the social acceptance of sustainable energy policies (Sovacool et al. 2016; Sovacool and Dworkin 2015). This is problematic, in part, because lack of local social acceptance increases the risks of failures and delays of sustainable...
energy policies (Enevoldsen and Sovacool 2016). Acknowledging this line of argumentation, as well as the generalized need for strengthening of policy contributions within the energy justice literature, we position Participatory Value Evaluation (PVE) as a promising avenue for future operationalisation.

PVE is a novel web-based evaluation approach that holds the promise to integrate the three tenets of energy justice into economic assessment methodology. PVE has been used in the context of the assessment of a transport investment plan (Mouter et al. 2019a) and a flood protection scheme (Dekker et al. 2019; Mouter et al. 2019b) and the energy transition of the city of Utrecht, the Netherlands (Mouter et al., 2020). The most important difference with conventional CBA is that individuals are conceptualized in a PVE as co-owners of the government instead of consumers of public goods. In a PVE, citizens are basically put in the shoes of a policy maker. They are confronted with the choice situation of the policy maker. Citizens receive information about the personal and collective impacts of each of the options they can choose from and the limitations that exist (e.g. limited budget or a sustainability target). They are then asked to provide a recommendation to the policy maker. Finally, citizens explain their choices, which provides a clear picture of their preferences and considerations. For instance, in the case of the energy transition PVE in Utrecht over 600 citizens were asked which neighborhoods need to get rid of natural gas before 2030 to achieve sustainability targets (Mouter et al., 2020). Citizens could make their own selection, but they also had the opportunity to select predefined strategies such as ‘cheapest option which starts in the poor neighborhoods’, ‘freedom of choice for citizens’, ‘maximum reduction CO2’ and ‘start in the wealthy neighborhoods’.

The use of PVE might contribute to citizens’ acceptance of government decisions by recognizing three justice dimensions that play an important role in acceptance of government policies: distributive, procedural justice and justice as recognition (Jenkins et al. 2016; McCauley et al. 2013; Sovacool et al. 2016; Sovacool and Dworkin 2015). As a more precise example, the use of PVE might secure or enhance distributional justice as citizens are explicitly asked to consider the distribution of burdens and benefits of government projects. The procedural justice benefits are clear as, when incorporated in the policy process, a large group of citizens is directly involved in decision-making about these government projects. Moreover, justice as recognition is fostered through the inclusion of the option in a PVE to provide qualitative motivations as this might be a vehicle for citizens to express their (local) concerns and values. Table 7 shows how the three tenets of energy justice are neglected in a conventional CBA and recognized in a PVE.
Table 7: The three tenets of energy justice versus conventional Cost-Benefit Analysis and Participatory Value Evaluation

|                             | Conventional CBA                                                                 | Participatory Value Evaluation                                                                 |
|-----------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| **Procedural justice**      | Procedural justice is not deliberately fostered in a CBA as citizens are not involved in compiling the study. | Procedural justice is deliberately fostered as it empowers citizens to participate in decision-making in a serious way. Moreover, PVE might increase transparency in public spending. |
| (Fairness/quality decision-making process) |                                                                                  |                                                                                                                                                 |
| **Justice of recognition**  | Justice as recognition is not fostered as a CBA uses standardized models and generic price tags to determine policy impacts and transform impacts into monetary terms. | Justice as recognition is fostered as local knowledge is mobilized and local preferences are respected.                                               |
| (Recognising the specific characteristics/needs of a community) |                                                                                  |                                                                                                                                                 |
| **Distributional justice**  | The fairness or desirability of the distribution of burdens and benefits is not studied. | Citizens are explicitly consulted in the distribution of burdens and benefits.                                                                     |
| (Fair distribution of burdens and benefits) |                                                                                  |                                                                                                                                                 |

Although PVE holds promise as a practical energy justice tool, it is worth mentioning that participatory evaluation processes will in fact represent an advance in energy justice of policies and programs provided that participation becomes a part of the political and governmental decision-making processes. However, explicitly asking citizens about the distribution of costs and benefits is no guarantee that the final decision will incorporate greater doses of energy justice. To this end, regulatory frameworks must contemplate the mechanics of distribution alongside procedure, and consider for example issues of community participation or ownership, the reallocation of profits via bonds, restrictions placed on environmental degradation, and more explicit disbursement of funds or support to socially marginalized groups (to name a few).

4.2.2. Improving energy planning policy assessment through energy justice

The forward planning of energy infrastructure – or ‘energy planning’ – involves developing long-range policies to help “guide the future of a local, national, regional or even the global energy system.” (Kaya and Kahraman 2011: 6577). Energy planning is typically a top-down bureaucratic activity involving centralised policy decision-making at the national level. To determine the likely impact of a technology in a certain place and for a certain time means weighing up conflicting quantitative and qualitative evaluation criteria covering technical, economic, environmental and social attributes. In this respect, energy planning
practice initially involves going beyond techniques such as CBA. Instead, energy planning currently includes a range of multi-criteria decision-making (MCDM) tools to help with analysis of the likely impacts of new energy infrastructure (see the far left-hand column of Table 8) (Glasson et al. 2008; Kaya and Kahraman 2011).

New infrastructure and monitoring are delivered via local governmental actors and a range of associated stakeholders. As plans and projects are evaluated via national and regional planning systems, other assessment tools further to the right in Table 8 help to estimate the likely impacts of a particular energy technology at a range of scales. Environmental Impact Assessment (EIA) is the most widely known assessment tool for energy infrastructure. Developed in the 1960s, EIA is a statutory requirement for projects above a certain scale (Cornero, 2010). However, EIA is narrowly focused in terms of social indicators and lacks appraisal of cumulative impacts. These shortcomings led to the development of Social Impact Assessment (SIA) in the 1970s, Strategic Environmental Assessment (SEA) in the 1980s (which are statutory in the UK for Local Development Plans and spatial development strategies), and Health Impact Assessment (HIA) in the 1990s.
Table 8: Matrix of energy justice criteria versus decision-making and impact assessment tools

| Selection Tools | Technology | Project | Plans, Policies and Programmes |
|-----------------|------------|---------|---------------------------------|
| **Sufficient Energy Resources for Daily Needs** | Multi-criteria Decision Making (MCDM) | Environmental Impact Assessment (EIA) | Strategic Environmental Assessment (SEA) | Health Impact Assessment (HIA) | Social Impact Assessment (SIA) |
| Non-statutory | Statutory | Non-statutory | Non-statutory | Non-statutory |
| Can be covered under ‘Technical’, ‘Economic’ and ‘Social Aspects’. | A mitigation measure for ‘Socio-economic Environment’. | Can be a mitigation measure for ‘human health’. | Can be a socio-economic mitigation measure. | Can be a mitigation measure regarding ‘poverty’. |
| **Avoiding Energy Poverty** | Can be covered under ‘Technical’, ‘Economic’ and ‘Social Aspects’. | A mitigation measure for ‘Socio-economic Environment’. | Can be a mitigation measure for ‘human health’. | Can be a socio-economic mitigation measure. | Can be a mitigation measure regarding ‘poverty’. |
| **Due Process and Human Rights** | None. Rights’ efforts are better supported where the UN Guiding Principles on Business and Human Rights (UNGPs) (Ruggie, 2011) are upheld. | | Fully applicable. |
| **Open and Accountable Energy Decision-making** | Produce a non-technical summary. Include a description of how the assessment was done. Democratic efforts are better supported where the Aarhus Convention (UNECE, 1998) is upheld. | | Fully applicable. |
| **Energy Resource Savings** | Can be covered under ‘Economic Aspects’. | A mitigation measure for ‘Socio-economic Environment’. | Can be a mitigation measure for ‘material assets’. | Can be a socio-economic mitigation measure. | An ‘economic and fiscal impacts’ mitigation measure. |
| **Community Development** | Can be covered under ‘Economic’ and ‘Social Aspects’. | A mitigation measure for ‘Socio-economic Environment’. | A mitigation measure for ‘population’ or ‘protected community status’. | Can be a socio-economic mitigation measure. | A ‘community impacts’ mitigation measure. |
| **The Precautionary Principle** | Can be incorporated for environmental weighting. | Can be invoked where mitigation measures are perceived to fail. | | Fully applicable. |
| **Fair Access to Energy Services** | Covered by ‘Economic’ and ‘Social Aspects’. | A ‘Socio-economic Environment’ mitigation measure. | Can be a mitigation measure for ‘population’. | A socio-economic mitigation measure. | A ‘poverty’ mitigation measure. |
| **Protect Natural Environment** | Can be covered under ‘Environmental Aspects’. | Covered by a wide range of mitigation measures. | Covers determinants of (human) health. | Balanced with the social realm. |
| **Resist Unjust Energy Projects** | Little or no provision for ‘Public Participation’. | Some encouragement for ‘Public Participation’. | | Fully applicable (supports action research). |

1 Based on Kaya and Kahraman (2011), Glasson et al. (2008), Kemm et al. (2008), and Vanclay (2006); 2 from Sovacool et al. (2017)
Table 8 shows that, when these assessment tools – MCDM, EIA, SEA, HIA and SIA – are compared alongside Sovacool et al.’s (2017) criteria for energy justice, only SIA has the potential to satisfy all the criteria. This is, in part, because SIA is designed for this purpose, with, according to Vanclav (2003), the role of SIA going far beyond the ex-ante prediction of adverse impacts and the determination of who wins and who loses. This extends to claims that SIA practitioners believe that there should be an emphasis on enhancing the lives of vulnerable and disadvantaged people, and in particular, that there should be a specific focus on improving the lives of the worst-off members of society (Esteves et al. 2012). This suggests two energy planning policy improvements: 1) to further support the development of MCDM analytical tools in line with the SIA approach (where the human and natural realms are more equally weighted), and 2) to further support and enforce the pragmatic screening of projects, plans and policies for a range of assessments (whether SIA, SEA, HIA or other impact assessment types). Where SIA is undertaken, it appears likely that practitioners and policymakers working within national planning systems at least have the potential to begin to help achieve many of the normative outcomes sought by energy justice advocates.

5. Conclusions

Energy justice has emerged at a critical moment in academic and contemporary history, guided by many researchers and practitioners who want to make a difference in tackling many of the inequalities, unfair practices, unaccountable institutions, and mounting negative costs of the current energy system, including the consequences of climate change alongside many other ills. It reminds us that energy systems and material infrastructures, even clean or low-carbon ones such as wind energy and solar power, can be reframed not only as matters of national security, economic competitiveness, or environmental degradation, but as matters of social injustice. Many ethicists would question the underlying morality of forcing people to abandon their homes for energy projects, imposing the burden of pollution on the young and vulnerable, violating basic civil liberties and human rights, misappropriating energy funds, and creating an energy system with unequal access. This demands that contemporary analysts and professional researchers in the academy begin to reconsider their energy decisions not only as technical and economic or even environmental concerns, but as moral ones. It also suggests that energy justice become a lever for action and community mobilization, so that new transformations to global energy systems can be intently debated, evaluated according to justice principles, and enacted.
Our study, documenting 12 years of energy justice scholarship, offers insight into the rich variety of methodologies, case studies, technological focus, and findings from a state of the art sample of the literature. This literature has some problems - chiefly in terms of diversity - it is still dominated by men and by a focus on Western or Northern countries, and in terms of research design, many studies are still weak on rigour and have no comparative research designs. Nevertheless, we see a diversification of conceptual frameworks that cut across the usual tenants of social justice research, moving beyond only distribution or procedure. We have shown that methods and knowledge from a range of disciplines are being used to answer similar research questions. The questions that many academic researchers feel are most important in the field of energy justice are focused on equity, policy and planning, and the risks of new energy systems, but this picture is continually being contested as contributions from these different disciplines to this emerging knowledge space open up new territory. We see 85 specific case studies documenting various forms of injustice, with almost every continent on the planet represented by at least one study, and more than 70 distinct analyses of energy technologies and systems, revealing the emerging geography and technology of global energy injustice. We lastly exhibit an inventory of 34 distinct groups of people, including indigenous communities, the poor, and women, who are continually at risk to energy injustices.

Alongside reflections on where some of the research effort for energy justice may focus next, including recommendations for academic practice, the role of PVE, EIA and SEA mechanisms, for example, these findings remind us that energy justice has the potential agency to serve as the unceasing protagonist in energy research and beyond, provoking researchers and practitioners to remain reflexively normative and active in identifying injustices and vulnerabilities. But it can also serve as a promising progenitor, creating new research methods and themes about the unfolding and often accelerating risks that emerge alongside conventional and low-carbon energy systems, and the intersectional, multi-scalar and even unintended repercussions those may have on the most vulnerable.
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Appendix 1: Alphabetical list of all sampled papers

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### Appendix 2: Specific technologies, infrastructures and material systems mentioned in the literature

| Broto et al. (2018) | Fracking | Wind | Biomass and biogas | Nuclear | Lighting | Coal | Solar | Smart/energy meters | Hydropower | Natural gas | Thermal power plants | Heating/cooling | Oil | Cooking | Geothermal | Tidal | Wave | Electricity supply | Smart grids | CO\(_2\) storage | Vehicles and components | Energy pipelines | Energy from waste | Cryptocurrency |
|---------------------|---------|------|--------------------|--------|----------|------|-------|---------------------|------------|-------------|---------------------|----------------|-----|---------|------------|------|------|------------------|----------|---------------|----------------------|---------------|----------------|------------------|
| Heffron and McCauley (2014) |         | X    |                    |        |          |      |       |                     |            |             |                     |                |     |         |            |      |      |                   |          |               |                      |               |                |                  |
| Rasch and Kohne (2017) | X       | X    |                    |        |          |      |       |                     |            |             |                     |                |     |         |            |      |      |                   |          |               |                      |               |                |                  |
| Jenkins et al. (2017)  |         |      |                    |        |          |      |       |                     |            |             |                     |                |     |         |            |      |      | X                 |          |               |                      |               |                |                  |
| Jenkins et al. (2016)  | X       | X    |                    |        |          |      |       |                     |            |             |                     |                |     |         |            |      |      |                   |          |               |                      |               |                |                  |
| Bouzarovski and Simcock (2017) | X     |      |                    |        |          |      |       |                     |            |             |                     |                |     |         |            |      |      |                   |          |               |                      |               |                |                  |
| Poruschi et al. (2018) |         |      |                    |        |          |      |       |                     |            |             |                     |                |     |         |            |      |      | X                 |          |               |                      |               |                |                  |
| Fraser and Chapman (2018) |         |      |                    |        |          |      |       |                     |            |             |                     |                |     |         |            |      |      |                   |          |               |                      |               |                |                  |
| Monyeyi et al. (2018)  |         |      |                    |        |          |      |       |                     |            |             |                     |                |     |         |            |      |      |                   |          |               |                      |               |                |                  |
| Evensen (2018)         |         |      |                    |        |          |      |       |                     |            |             |                     |                |     |         |            |      |      |                   |          |               |                      |               |                |                  |
| Ontiveros et al. (2018) |         |      |                    |        |          |      |       |                     |            |             |                     |                |     |         |            |      |      |                   |          |               |                      |               |                |                  |
| Milchram et al. (2018)  |         |      |                    |        |          |      |       |                     |            |             |                     |                |     |         |            |      |      |                   |          |               |                      |               |                |                  |
| Resource Type         | McCauley et al. (2018) | Sareen and Haarstad (2018) | Bednar et al. (2017) | Yenetti and Day (2016) | Sovacool (2015) | Lacey-Barnacle and Bird (2018) | Liévanos and Horne (2017) | Yenetti et al. (2016) | Sovacool (2016) | Kotikalapudi (2016) | Sovacool and Scarpaci (2016) | Yenetti and Day (2015) |
|----------------------|------------------------|-----------------------------|----------------------|------------------------|-----------------|-------------------------------|--------------------------|----------------------|-----------------|---------------------|--------------------------|---------------------|
| Fracking             |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Wind                 |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Biomass and biogas   |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Nuclear              |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Lighting             |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Coal                 |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Solar                | X                      |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Smart/energy meters  |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Hydropower           |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Natural gas          |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Thermal power plants |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Heating/cooling      |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Oil                  |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Cooking              |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Geothermal           |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Tidal                |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Wave                 |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Electricity supply   |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Smart grids          |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| CO₂ storage          |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Vehicles and components |                    |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Energy from waste    |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Cryptocurrency       |                        |                             |                      |                        |                 |                               |                          |                      |                 |                     |                          |                     |
| Source                           | Fracking | Wind | Biomass and biogas | Nuclear | Lighting | Coal | Solar | Smart/energy meters | Hydropower | Natural gas | Thermal power plants | Heating/cooling | Oil | Cooking | Geothermal | Tidal | Wave | Electricity supply | Smart grids | CO2 storage | Vehicles and components | Energy pipelines | Energy from waste | Cryptocurrency |
|---------------------------------|----------|------|--------------------|---------|----------|------|-------|--------------------|------------|-------------|----------------------|----------------|-----|---------|------------|-------|------|----------------------|---------|-------------|----------------------|-----------------|-----------------|---------------------|
| Liljenfeldt and Pettersson (2017) | X        |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            |       |      |                      |        |             |                      |                |                |                     |
| Reames (2016)                   |          |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            |       |      |                      |        |             |                      |                |                |                     |
| McCauley et al. (2016)          |          |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            | X     |      |                      |        |             |                      |                |                |                     |
| Chatterton et al. (2016)        |          |      |                    |         |          |      |       | X                  |            |             |                      |                |     |         |            |       |      |                      |        |             |                      |                |                |                     |
| Pesch et al. (2017)             | X        |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            |       |      |                      |        |             |                      |                |                |                     |
| Lappe-Osthege and Andreas (2017)|          |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            |       |      |                      |        |             |                      |                |                |                     |
| Finley-Brook et al. (2018)      |          |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            | X     |      |                      |        |             |                      |                |                |                     |
| Bedi (2018)                     |          |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            |       |      |                      |        |             |                      |                |                |                     |
| Siciliano et al. (2018)         |          |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            |       |      |                      |        |             |                      |                |                |                     |
| Sareen and Kale (2018)          |          |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            | X     |      |                      |        |             |                      |                |                |                     |
| Partridge et al. (2018)         | X        |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            |       |      |                      |        |             |                      |                |                |                     |
| Andreas et al. (2018)           | X        |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            |       |      |                      |        |             |                      |                |                |                     |
| Groves et al. (2017)            |          |      |                    |         |          |      |       |                    |            |             |                      |                |     |         |            |       |      |                      |        |             |                      |                |                |                     |
| Resource Type | Fracking | Wind | Biomass and biogas | Nuclear | Lighting | Coal | Solar | Smart energy meters | Hydropower | Natural gas | Thermal power plants | Heating/cooling | Oil | Cooking | Geothermal | Tidal | Wave | Electricity supply | Smart grids | CO₂ storage | Vehicles and components | Energy pipelines | Energy from waste | Cryptocurrency |
|---------------|----------|------|--------------------|---------|----------|------|------|---------------------|------------|-------------|---------------------|--------------|-----|---------|-------------|-------|------|---------------------|-----------|-------------|----------------------|----------------|-----------------|----------------------|
| Mayer (2018)  |          |      |                    |         |          |      |      |                      |            |             |                     |              | X   |         |             |       |      |                     |           |             |                      |               |                 |                      |
| Hielscher and Sovacool (2018) |          |      |                    |         |          |      |      |                      |            |             |                     |              | X   |         |             |       |      |                     |           |             |                      |               |                 |                      |
| David (2018)  |          |      |                    |         |          |      |      |                      |            |             |                     |              |     |         |             |       |      |                     |           |             |                      |               |                 |                      |
| Hurlbert and Rayner (2018) |          |      |                    |         |          |      |      |                      |            |             |                     |              |     |         |             |       |      |                     |           |             |                      |               |                 | X                    |
| Monyedi et al. (2018) |          |      |                    |         |          |      |      |                      |            |             |                     |              | X   |         |             |       |      |                     |           |             |                      |               |                 |                      |
| Roddis et al. (2018) |          |      |                    |         |          |      |      |                      |            |             |                     |              | X   |         |             |       |      |                     |           |             |                      |               |                 |                      |
| Willand and Horne (2018) |          |      |                    |         |          |      |      |                      |            |             |                     |              | X   |         |             |       |      |                     |           |             |                      |               |                 |                      |
| Goddard and Farrelly (2018) |          |      |                    |         |          |      |      |                      |            |             |                     |              |     |         |             |       |      |                     |           |             |                      |               |                 |                      |
| Bartiaux et al. (2018) |          |      |                    |         |          |      |      |                      |            |             |                     |              | X   |         |             |       |      |                     |           |             |                      |               |                 |                      |
| Cardoso and Turham (2018) |          |      |                    |         |          |      |      |                      |            |             |                     |              |     |         |             |       |      |                     |           |             |                      |               |                 |                      |
| Dolter and Boucher (2018) |          |      |                    |         |          |      |      |                      |            |             |                     |              |     |         |             |       |      |                     |           |             |                      |               |                 |                      |
| Chapman et al. (2018) |          |      |                    |         |          |      |      |                      |            |             |                     |              |     |         |             |       |      |                     |           |             |                      |               |                 |                      |
| Mundaca et al. (2018) |          |      |                    |         |          |      |      |                      |            |             |                     |              | X   |         |             |       |      |                     |           |             |                      |               |                 | X                    |
| Source                                | Fracking | Wind | Biomass and biogas | Nuclear | Lighting | Coal | Solar | Smart energy meters | Hydropower | Natural gas | Thermal power plants | Heating/cooling | Oil | Cooking | Geothermal | Tidal | Wave | Electricity supply | Smart grids | CO₂ storage | Vehicles and components | Energy from waste | Cryptocurrency |
|--------------------------------------|----------|------|---------------------|---------|----------|------|-------|---------------------|------------|-------------|----------------------|-----------------|-----|---------|------------|--------|------|-------------------|----------|--------------|----------------------|-----------------|-------------|
| Reames et al. (2018)                 |          |      |                      |         |          |      |       | X                   |            |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Sidortsov and Sovacool (2015)        |          |      |                      |         |          |      |       | X       | X          |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Damgaard et al. (2017)               |          |      |                      |         |          |      |       | X                   |            |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Emelianoff and Wernert (2018)        | X        |      |                      |         |          |      |       | X       | X          | X                  |                      |     |         |            |        |      |                   |         |             |                      |                 |             |
| Calzadilla and Mauger (2018)         | X        |      |                      |         |          |      |       | X                   |            |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Bouzarovski and Herrero (2017)       |          |      |                      |         |          |      |       |                      |            |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Harrison (2013)                      |          |      |                      |         |          |      |       | X                   |            |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Moore (2013)                         |          |      |                      |         |          |      |       | X                   |            |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Park and Sovacool (2018)             |          |      |                      |         |          |      |       | X                   |            |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Bouzarovski and Thomson (2018)       |          |      |                      |         |          |      |       |                      |            |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Chezel and Nadai (2018)              |          |      |                      |         |          |      |       | X                   |            |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Endres (2009)                        |          |      |                      |         |          |      |       | X                   |            |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Pearse (2016)                        |          |      |                      |         |          |      |       | X                   |            |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
| Rudolph et al. (2018)                | X        |      |                      |         |          |      |       | X                   | X          |             |                      |                 |     |         |            |        |      |                   |         |             |                      |                 |             |
|                        | Fracking | Wind | Biomass and biogas | Nuclear | Lighting | Coal | Solar | Smart energy meters | Hydropower | Natural gas | Thermal power plants | Heating/cooling | Oil | Cooking | Geothermal | Tidal | Wave | Electricity supply | Smart grids | CO₂ storage | Vehicles and components | Energy from waste | Cryptocurrency |
|------------------------|----------|------|-------------------|---------|----------|------|-------|---------------------|------------|--------------|----------------------|----------------|-----|---------|------------|-------|------|------------------|-----------|------------|----------------------|-----------------|---------------|
| Guomundsdottir et al. (2018) |          |      |                   |         |          |      |       |         | X          |             |                      |                |     |         | X          |       |      |                   |          |            |                      |                 |               |
| Guruswamy (2010)        | X        |      |                   |         |          |      |       |         |            |             |                      |                |     |         |            |       |      |                   |          |            |                      |                 |               |
| Osnes (2010)            |          |      |                   |         |          |      |       |         |            |             |                      |                |     |         | X          |       |      |                   |          |            |                      |                 |               |
| Baker (2016)            | X        |      |                   |         |          |      |       |         |            |             |                      |                |     |         |            |       |      |                   |          |            |                      |                 |               |
| Urban et al. (2017)     | X        |      |                   |         |          |      |       |         |            |             |                      |                |     |         | X          |       |      |                   |          |            |                      |                 |               |
| Rudolph and Kirkegaard (2018) | X   |      |                   |         |          |      |       |         |            |             |                      |                |     |         |            |       |      |                   |          |            |                      |                 |               |
| Rice and Burke (2018)   | X        |      |                   |         |          |      |       |         |            |             |                      |                |     |         |            |       |      |                   |          |            |                      |                 |               |
| Demski et al. (2019)    |          |      |                   |         |          |      |       |         |            |             |                      |                |     |         | X          |       |      |                   |          |            |                      |                 |               |
| Fleming (2019)          |          |      |                   |         |          |      |       |         |            |             |                      |                |     |         |            |       |      |                   |          |            |                      |                 |               |
| Ling et al. (2019)      |          |      |                   |         |          |      |       |         |            |             |                      |                |     |         |            |       |      |                   |          |            |                      |                 |               |
| Sovacool et al. (2019)  |          |      |                   |         |          |      |       |         |            |             |                      |                |     |         | X          |       |      |                   |          |            |                      |                 |               |
| Xu et al. (2019)        | X        |      |                   |         |          |      |       |         |            |             |                      |                |     |         | X          |       |      |                   |          |            |                      |                 |               |
| Jayapalan et al. (2019) |          |      |                   |         |          |      |       |         |            |             |                      |                |     |         | X          |       |      |                   |          |            |                      |                 |               |
| Sayan (2019)            |          |      |                   |         |          |      |       |         |            |             |                      |                |     |         |            |       |      |                   |          |            |                      |                 |               |
| Fetnat et al. (2019)    |          |      |                   |         |          |      |       |         |            |             |                      |                |     |         | X          |       |      |                   |          |            |                      |                 |               |
| Maher and Stefan (2019)  |          |      |                   |         |          |      |       |         |            |             |                      |                |     |         |            |       |      |                   |          |            |                      |                 |               |
| Sovacool and Marie (2019)|          |      |                   |         |          |      |       |         |            |             |                      |                |     |         |            |       |      |                   |          |            |                      |                 |               |
| Source                                      | Fracking | Wind | Biomass and biogas | Nuclear | Lighting | Coal | Solar | Smart energy meters | Hydropower | Natural gas | Thermal power plants | Heating/cooling | Oil | Cooking | Geothermal | Tidal | Wave | Electricity supply | Smart grids | CO₂ storage | Vehicles and components | Energy from waste | Cryptocurrency |
|---------------------------------------------|----------|------|---------------------|---------|----------|------|-------|---------------------|------------|-------------|----------------------|----------------|-----|---------|------------|-------|------|---------------------|-----------|-------------|----------------------|-----------------|-------------|
| Kraal (2019)                                |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Fortiera et al. (2019)                      | X        |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Saxe et al. (2019)                          |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Allen et al. (2019)                         |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Thombs (2019)                               |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Kim et al. (2019)                           | X        |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Lukanov and Krieger (2019)                  |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Wood and Roelich (2019)                      |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Kumar et al. (2019)                         |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Williams and Doyon (2019)                    |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Dwyer and Bidwell (2019)                     | X        |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Lim and Goh (2019)                           |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Malakar et al. (2019)                        |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Galvin (2019)                                |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Samarakoon (2019)                            |          |      |                     |         |          |      |       |                     |            |             |                      |                |     |         | X          |       |      |                     |           |             |                      |                 |             |
| Offshore Energy Types | Fracking | Wind | Biomass and biogas | Nuclear | Lighting | Coal | Solar | Smart energy meters | Hydropower | Natural gas | Thermal power plants | Heating/cooling | Oil | Cooking | Geothermal | Tidal | Wave | Electricity supply | Smart grids | CO₂ storage | Vehicles and components | Energy from waste | Cryptocurrency |
|-----------------------|----------|------|-------------------|---------|----------|------|------|---------------------|-----------|-------------|----------------------|---------------|-----|---------|-------------|-------|------|--------------------|-----------|----------|---------------------|---------------|--------------|
| Sovacool et al. (2019) |          | X    |                   | X       | X        |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Sassea and Trutnevyte (2019) |          | X    |                   | X       | X        |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Israela and Jehling (2019) |          |      |                   |         |          | X    |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Viviana and Castillo (2019) |          |      |                   |         |          |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Greenberg and Bugden (2019) |          |      |                   |         |          |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Sovacool et al. (2019) |          |      |                   |         |          |      |      |                     |           |             |                      |                | X  |         |             |       |      |                     |           |          |                     |               |              |
| Yadav et al. (2019) |          |      |                   |         |          |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Okushima (2019) |          |      |                   |         |          |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Poruschi and Ambrey (2019) |          |      |                   |         |          |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Van Zyl-Bulitta et al. (2019) |          |      |                   |         |          |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Sanz-Hernandez (2019) |          |      |                   |         |          |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Sovacool et al. (2019) | X        |      |                   |         |          |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Lewis et al. (2019) |          |      |                   |         |          |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Mookerjea (2019) |          |      |                   |         |          |      |      |                     |           |             |                      |                |     |         |             |       |      |                     |           |          |                     |               |              |
| Hornborg (2019) | X | Wind | Biomass and biogas | Nuclear | Lighting | Coal | Solar | Smart meters | Hydropower | Natural gas | Thermal power plants | Heating/cooling | Oil | Cooking | Geothermal | Tidal | Wave | Electricity supply | Smart grids | CO₂ storage | Vehicles and components | Energy from waste | Cryptocurrency |
|-----------------|----|-----|--------------------|---------|----------|------|-------|-------------|------------|-------------|---------------------|----------------|-----|---------|-------------|-------|------|-------------------|------------|-------------|----------------------|----------------|---------------|
| Waitt and Harada (2019) |   |     |                    |         |          |      |       |             |            |             |                     |                |     |         |              |       |      |                    |             |             |                       |               |               |
| Jenkins and Taebi (2019) | X |   |                    |         |          |      |       |             |            |             |                     |                |     |         |              |       |      |                    |             |             |                       |               |               |
| Baker (2019) |   |   |                    |         |          |      |       |             |            |             |                     |                |     |         |              |       |      |                    |             |             |                       |               |               |
| Welton and Eisen (2019) | X | X |                    |         |          |      |       |             |            |             |                     |                |     |         |              |       |      |                    |             |             |                       |               |               |
### Appendix 3: Overview of papers using examples of marginalized peoples and victims of injustice

| Broto et al. (2018) | Poverty and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystem/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Renters/tenure type (inc. social housing) | Conservatives | Developing countries/Global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Households | Elderly | Procedurally disenfranchised | Not clear | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic mobility | Cyber insecure |
|---------------------|--------------------------------------|-----------------------------|---------------------------------------|-----------------------------------|----------------------------------|----------------|-----------------|----------------|-------------------|--------------------------|--------------------------|----------------|----------------------------|----------------|----------------|---------|----------------|---------|-------------|---------------------|------------|--------|-----------------|------------|------------------|----------------|-------------------|----------------------|----------|----------------|------------------|-----------------|------------------|----------------|----------------|---------------------|
| X                   | X                                    | X                           | X                                     | X                                 | X                                 | X             | X               | X               | X                 | X                       | X                       | X             | X                           | X               | X               | X                   | X             | X                 | X                       | X               | X                 | X                     | X                 | X          | X                     | X                 | X                    | X                      | X                   | X                    | X                  | X                  | X                  | X                  | X                  |
| Heffron and McCaul ey (2014) | X                                    | X                           | X                                     | X                                 | X                                 | X             | X               | X               | X                 | X                       | X                       | X             | X                           | X               | X               | X                   | X             | X                 | X                       | X               | X                 | X                     | X                 | X          | X                     | X                 | X                    | X                      | X                   | X                    | X                  | X                  | X                  | X                  | X                  |
| Labelle (2017) | X                                    | X                           | X                                     | X                                 | X                                 | X             | X               | X               | X                 | X                       | X                       | X             | X                           | X               | X               | X                   | X             | X                 | X                       | X               | X                 | X                     | X                 | X          | X                     | X                 | X                    | X                      | X                   | X                    | X                  | X                  | X                  | X                  | X                  |
| Heffron and McCaul ey (2014) | X                                    | X                           | X                                     | X                                 | X                                 | X             | X               | X               | X                 | X                       | X                       | X             | X                           | X               | X               | X                   | X             | X                 | X                       | X               | X                 | X                     | X                 | X          | X                     | X                 | X                    | X                      | X                   | X                    | X                  | X                  | X                  | X                  | X                  |
| Heffron et al. (2018) | X                                    | X                           | X                                     | X                                 | X                                 | X             | X               | X               | X                 | X                       | X                       | X             | X                           | X               | X               | X                   | X             | X                 | X                       | X               | X                 | X                     | X                 | X          | X                     | X                 | X                    | X                      | X                   | X                    | X                  | X                  | X                  | X                  | X                  |
| Forman (2017) | X                                    | X                           | X                                     | X                                 | X                                 | X             | X               | X               | X                 | X                       | X                       | X             | X                           | X               | X               | X                   | X             | X                 | X                       | X               | X                 | X                     | X                 | X          | X                     | X                 | X                    | X                      | X                   | X                    | X                  | X                  | X                  | X                  | X                  |
| Fuller and McCaul  | Rasch and Kohne | Sovacool and Dworkin | Healy and Barry | Jenkins et al. | Sovacool et al. | Jenkins |
|-------------------|-----------------|----------------------|-----------------|----------------|----------------|---------|
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |

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Sovacool and Dworkin (2015) X X X X X X X X
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Sovacool et al. (2017) X X X X X X X X
Jenkins (2018) X X X X X X X X

| Fuller and McCaul  | Rasch and Kohne | Sovacool and Dworkin | Healy and Barry | Jenkins et al. | Sovacool et al. | Jenkins |
|-------------------|-----------------|----------------------|-----------------|----------------|----------------|---------|
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |
| Poverty and economi | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Rural and peripheral | Local populations/host communities | Future generations |
| Ically marginalized | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | Limited access/disconnections | Unemployed (inc. fossil fuel workers) |

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Jenkins (2018) X X X X X X X X

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| Jenkins et al. (2016) | Povery and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Conservatives | Developing countries/Global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Household | Elderly | Procedurally disenfranchised | Not clear | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic mobility | Cyber insecure |
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| Bouzrovski and Simcock (2017) | X                                 |                                 |                                      |                                   |                                 |                |                |                |                                 |                               |                |                                 |                 |                | X                | X                | X                | X                | X                | X                | X                | X                | X                | X                | X                | X                | X                | X                | X                | X                | X                | X                | X                |
| Heffron and McCaulley (2018) |                                 |                                 |                                      |                                   |                                 |                |                |                |                                 |                               |                |                                 |                 |                | X                |                | X                |                | X                |                | X                |                | X                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |
| Poruschi et al. (2018) | X                                 |                                 |                                      |                                   |                                 |                |                |                |                                 |                               |                |                                 |                 |                | X                |                | X                |                | X                |                | X                |                | X                |                | X                |                |                |                |                |                |                |                |                |                |                |
| Fraser and Chapman (2018) | X                                 | X                               | X                                   |                                   |                                 |                |                |                |                                 |                               |                |                                 |                 |                | X                |                | X                |                | X                |                | X                |                | X                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |
| Goldthau and Sovacoo (2012) |                                 |                                 |                                      |                                   |                                 |                |                |                |                                 |                               |                |                                 |                 |                | X                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |
| Monyei et al. (2018) | X                                 | X                               | X                                   |                                   |                                 |                |                |                |                                 |                               |                |                                 |                 |                | X                |                | X                |                | X                |                | X                |                | X                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |
| Poverty and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Renters/tenure type (inc. social housing) | Conservatives | Developing countries/Global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Households | Elderly | Procedurally disenfranchised | Not clear | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic mobility | Cyber insecure |
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| Van Veelen and van der Horst (2018) | X                           | X                                    | X                                 |                   |                    |                   |                      |                           |                               |                |                           |            |               |        |                 |        |                 |                             |              |       |                       |          |                        |                |                        |                |     |                     |          |                        |                |     |
| Evensen (2018)                     |                             |                                      | X                                 |                   |                    |                   |                      |                           |                               |                |                           |            |               |        |                 |        |                 |                             |              |       |                       |          |                        |                |     |                     |          |                        |                |     |
| Ontiveros et al. (2018)            | X                           | X X                                 | X                                 | X                 |                    |                   |                      |                           |                               |                |                           |            |               |        |                 |        |                 |                             |              |       |                       |          |                        |                |     |                     |          |                        |                |     |
| Fang et al. (2018)                 |                             |                                      |                                   |                   |                    |                   |                      |                           |                               |                |                           |            |               |        |                 |        |                 |                             |              |       |                       |          |                        |                |     |                     |          |                        |                |     |
| Michman et al. (2018)              | X                           | X                                    | X                                 |                   |                    |                   |                      |                           |                               |                |                           |            |               |        |                 |        |                 |                             |              |       |                       |          |                        |                |     |                     |          |                        |                |     |
| McCaul et al. (2018)               |                             |                                      |                                   |                   |                    |                   |                      |                           |                               |                |                           |            |               |        |                 |        |                 |                             |              |       |                       |          |                        |                |     |                     |          |                        |                |     |
| Sareen and Haarstad (2018)         | X                           | X                                    |                                   |                   |                    |                   |                      |                           |                               |                |                           |            |               |        |                 |        |                 |                             |              |       |                       |          |                        |                |     |                     |          |                        |                |     |
| Heffron et al. (2018)              | X                           |                                      |                                   |                   |                    |                   |                      |                           |                               |                |                           |            |               |        |                 |        |                 |                             |              |       |                       |          |                        |                |     |                     |          |                        |                |     |
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| Bednar et al. (2017)               | X                             | X                                     |                                      |                                   |                             |                   |                   |                     |                             |                               |                |                          |              |               |            |               |              |                |                               |            |         |                         |          |                      |          |                   |             |                         |          |
| Yenetti and Day (2016)             | X                             |                                       |                                       |                                   |                             |                   |                   |                     |                             |                               |                |                          |              |               |            |               |              |                |                               |            |         |                         |          |                      |          |                   |             |                         |          |
| Sovacool (2015)                    | X                             | X                                     |                                      |                                   |                             |                   |                   |                     |                             |                               |                |                          |              |               |            |               |              |                |                               |            |         |                         |          |                      |          |                   |             |                         |          |
| Lacey-Barnacle and Bird (2018)     | X                             | X                                     |                                      |                                   |                             |                   |                   |                     |                             |                               |                |                          |              |               |            |               |              |                |                               |            |         |                         |          |                      |          |                   |             |                         |          |
| Heffron and Talus (2016)           | X                             | X                                     |                                      |                                   |                             |                   |                   |                     |                             |                               |                |                          |              |               |            |               |              |                |                               |            |         |                         |          |                      |          |                   |             |                         |          |
| Liévano and Horne (2017)           | X                             |                                       |                                       |                                   |                             |                   |                   |                     |                             |                               |                |                          |              |               |            |               |              |                |                               |            |         |                         |          |                      |          |                   |             |                         |          |
| Yenetti et al. (2016)              | X                             | X                                     | X                                    |                                   |                             |                   |                   |                     |                             |                               |                |                          |              |               |            |               |              |                |                               |            |         |                         |          |                      |          |                   |             |                         |          |
| Sovacool (2016)                    | X                             | X                                     |                                      |                                   |                             |                   |                   |                     |                             |                               |                |                          |              |               |            |               |              |                |                               |            |         |                         |          |                      |          |                   |             |                         |          |
| Topic                                                                 | 2016     | 2015     | 2017     | 2016     | 2016     | 2016     | 2016     | 2016     | 2016     | 2016     |
|----------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Poverty and economically marginalized                               | X        | X        | X        | X        |          | X        |          |          |          |          |
| Limited access/disconnections                                        |          |          |          | X        | X        |          | X        |          |          |          |
| Unemployed (inc. fossil fuel workers)                                |          |          |          |          |          | X        | X        |          |          |          |
| Ecosystems/environmentally degraded                                  |          |          |          |          |          |          | X        |          |          |          |
| Local populations/host communities                                  |          |          |          |          |          |          |          |          |          |          |
| Future generations                                                   |          |          |          | X        | X        |          |          |          |          |          |
| Rural and peripheral                                                 |          |          |          |          |          |          |          |          |          |          |
| City inhabitants                                                     |          |          |          |          |          |          |          | X        |          |          |
| Landowner and resource owners                                        |          |          |          |          |          |          |          |          |          |          |
| Children, youth and young families                                  |          |          |          |          |          |          |          |          | X        |          |
| Renters/tenure type (inc. social housing)                            |          |          |          |          |          |          |          |          |          | X        |
| Conservatives                                                       |          |          |          |          |          |          |          |          |          |          |
| Developing countries/Global South                                    |          |          |          |          |          |          |          |          |          |          |
| Biomass users                                                       |          |          |          |          |          |          |          |          |          |          |
| Women/gender                                                        |          |          |          |          |          |          |          |          |          |          |
| Disabled                                                            |          |          |          |          |          |          |          |          |          |          |
| Displaced                                                            |          |          |          |          |          |          |          |          |          |          |
| Ill or unhealthy                                                     |          |          |          |          |          |          |          |          | X        |          |
| Indigenous                                                          |          |          |          |          |          |          |          |          |          |          |
| Climate change victims/refugees                                      |          |          |          |          |          |          |          |          | X        |          |
| Households                                                           |          |          |          |          |          |          |          | X        |          |          |
| Elderly                                                             |          |          |          |          |          |          |          |          |          |          |
| Procedurally disenfranchised                                         |          |          |          |          |          |          |          |          | X        |          |
| Not clear                                                           |          |          |          |          |          |          |          |          |          |          |
| War, conflict and corruption                                         |          |          |          |          |          |          |          |          |          |          |
| Energy accidents                                                     |          |          |          |          |          |          |          |          |          |          |
| Racial and ethnic minorities                                         |          |          |          |          |          |          |          |          |          |          |
| Politically powerless                                               |          |          |          |          |          |          |          |          |          |          |
| Resisters                                                           |          |          |          |          |          |          |          |          |          |          |
| Socially marginalized                                               |          |          |          |          |          |          |          |          |          |          |
| Waste streams and externalities                                     |          |          |          |          |          |          |          |          |          |          |
| Building type and age                                               |          |          |          |          |          |          |          |          |          |          |
| Domestic insecurity                                                 |          |          |          |          |          |          |          |          |          |          |
| Kotikala pudi (2016)                                                 | X        |          |          |          |          |          |          |          |          |          |
| Sovacoo and Scarpa (2016)                                            | X        | X        | X        |          |          |          |          |          |          |          |
| Yenetti and Duy (2015)                                               |          | X        | X        | X        | X        | X        | X        | X        |          |          |
| Liljefeldt and Pettersson (2017)                                     | X        | X        | X        |          |          |          |          |          |          | X        |
| Reames (2016)                                                       | X        | X        |          |          |          |          | X        | X        |          | X        |
| Chapman et al. (2016)                                               | X        | X        | X        |          |          |          |          |          | X        |          |
| McCaulley et al. (2016)                                             | X        | X        | X        |          |          |          |          |          | X        |          |
| Simcock and Mullen (2016)                                            | X        |          |          |          |          |          | X        |          |          |          |

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| Hall et al. (2018)             |                                      |                              |                                      |                                     |                    |                    |                   |                        |                               |                                |               |                          |                 |                |          |                        |         |               | X                           |             |                |                        |             |                        |                |                      |                |                |                |                |                |                |                |
| Chatterton et al. (2016)       |                                      |                              |                                      |                                     |                    |                    |                   |                        |                               |                                |               |                          |                 |                |          |                        |         |               | X                           |             |                |                        |             |                        |                |                      |                |                |                |                |                |                |                |
| Liddell et al. (2016)          |                                      |                              |                                      |                                     |                    |                    |                   |                        |                               |                                |               |                          |                 |                |          |                        |         |               | X                           |             |                |                        |             |                        |                |                      |                |                |                |                |                |                |                |
| Pesch et al. (2017)            |                                      |                              |                                      |                                     |                    |                    |                   |                        |                               |                                |               |                          |                 |                |          |                        |         |               | X                           |             |                |                        |             |                        |                |                      |                |                |                |                |                |                |                |
| Capaccioli et al. (2017)       |                                      | X                            |                                      |                                     |                    |                    |                   |                        |                               |                                |               |                          |                 |                |          |                        |         |               | X                           |             |                |                        |             |                        |                |                      |                |                |                |                |                |                |                |
| Gillard et al. (2017)          | X                                    | X                            | X                                    | X                     |                    |                    |                   |                        |                               |                                |               |                          |                 |                |          |                        |         |               | X                           |             |                |                        |             |                        |                |                      |                |                |                |                |                |                |                |
| Alvial-Palaviciu and Ureta (2017)| X                               |                              |                                      |                                     |                    |                    |                   |                        |                               |                                |               |                          |                 |                |          |                        |         |               | X                           |             |                |                        |             |                        |                |                      |                |                |                |                |                |                |                |
| Walker et al. (2016)           | X                                    | X                            |                                      |                                     |                    |                    |                   |                        |                               |                                |               |                          |                 |                |          |                        |         |               | X                           |             |                |                        |             |                        |                |                      |                |                |                |                |                |                |                |
| Poverty and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Renters/tenure type (inc. social housing) | Conservatives | Developing countries/Global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Households | Elderly | Politically disenfranchised | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic insecurity | Cyber insecure |
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| Hiteva and Sovacool (2017)          | X                           | X                                     | X                                   |                    |                    |                   |                      |                         |                                   |                |                               |               |             |        |                  |         |                 |                           | X          |        |                       |                      |                  |                       |                     |           |                   |                       |                  |          |
| Islar et al. (2017)                | X                           | X                                     | X                                   |                    |                    |                   |                      |                         |                                   |                |                               |               |             |        |                  |         |                 |                           | X          |        |                       |                      |                  |                       |                     |           |                   |                       |                  |          |
| Munro et al. (2017)                | X                           | X                                     | X                                   |                    |                    |                   |                      |                         |                                   |                |                               |               |             |        |                  |         |                 |                           | X          |        |                       |                      |                  |                       |                     |           |                   |                       |                  |          |
| Lappe-Osthege and Andreas (2017)   | X                           | X                                     | X                                   |                    |                    |                   |                      |                         |                                   |                |                               |               |             |        |                  |         |                 |                           | X          |        |                       |                      |                  |                       |                     |           |                   |                       |                  |          |
| Finley-Brook et al. (2018)         | X                           | X                                     | X                                   |                    |                    |                   |                      |                         |                                   |                |                               |               |             |        |                  |         |                 |                           | X          |        |                       |                      |                  |                       |                     |           |                   |                       |                  |          |
| Bedi (2018)                        | X                           | X                                     | X                                   |                    |                    |                   |                      |                         |                                   |                |                               |               |             |        |                  |         |                 |                           | X          |        |                       |                      |                  |                       |                     |           |                   |                       |                  |          |
| Siciliano et al. (2018)            | X                           | X                                     | X                                   |                    |                    |                   |                      |                         |                                   |                |                               |               |             |        |                  |         |                 |                           | X          |        |                       |                      |                  |                       |                     |           |                   |                       |                  |          |
| Sareen and Kale (2018)             | X                           | X                                     | X                                   |                    |                    |                   |                      |                         |                                   |                |                               |               |             |        |                  |         |                 |                           | X          |        |                       |                      |                  |                       |                     |           |                   |                       |                  |          |
| Partridge et al. (2018) | Poverty and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Local populations/host communities | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Renters/tenure type (inc. social housing) | Conservatives | Developing countries/Global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Households | Elderly | Procedurally disenfranchised | War/conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic mobility | Cyber insecure |
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| X                     |                                     |                             |                                      |                                  |                  |                   |                 |                        |                                 |                                                            |                 |                               | X                 |               | X                   | X                |                |                             |               |         | X                     |                             |                |                   |                 |               |                   |
| Andreas et al. (2018) |                                     |                             |                                      |                                  |                  |                   |                 |                        |                                 |                                                            |                 |                               | X                 |               | X                   | X                |                |                             |               |         | X                     |                             |                |                   |                 |               |                   |
| Groves et al. (2017) |                                     |                             |                                      |                                  |                  |                   |                 |                        |                                 |                                                            |                 |                               | X                 |               | X                   | X                |                |                             |               |         | X                     |                             |                |                   |                 |               |                   |
| Bulter et al. (2018) |                                     |                             |                                      |                                  |                  |                   |                 |                        |                                 |                                                            |                 |                               | X                 |               | X                   | X                |                |                             |               |         | X                     |                             |                |                   |                 |               |                   |
| Mayer (2018)          |                                     |                             |                                      |                                  |                  |                   |                 |                        |                                 |                                                            |                 |                               | X                 |               | X                   | X                |                |                             |               |         | X                     |                             |                |                   |                 |               |                   |
| Hielscher and Sovacoo (2018) |                     |                             |                                      |                                  |                  |                   |                 |                        |                                 |                                                            |                 |                               | X                 |               | X                   | X                |                |                             |               |         | X                     |                             |                |                   |                 |               |                   |
| David (2018)          |                                     |                             |                                      |                                  |                  |                   |                 |                        |                                 |                                                            |                 |                               | X                 |               | X                   | X                |                |                             |               |         | X                     |                             |                |                   |                 |               |                   |
| Huribert and Rayner (2018) |                     |                             |                                      |                                  |                  |                   |                 |                        |                                 |                                                            |                 |                               | X                 |               | X                   | X                |                |                             |               |         | X                     |                             |                |                   |                 |               |                   |
| Moniye et al. (2018)  |                                     |                             |                                      |                                  |                  |                   |                 |                        |                                 |                                                            |                 |                               | X                 |               | X                   | X                |                |                             |               |         | X                     |                             |                |                   |                 |               |                   |

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| Poverty and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Renters/housing type (inc. social housing) | Conservatives | Developing countries/global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Households | Elderly | Procurementally disenfranchised | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic insecurity | Cyber insecure |
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| Roddis et al. (2018)              | X                              | X                                    | X                                   | X                 | X                 | X               | X                    | X                        | X                 | X               | X                       | X                     | X                   | X                     | X               | X                     | X                   | X                     | X                     | X                     | X                     | X                    | X                     | X                     | X                      |
| Munday et al. (2018) | Poverty and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Renters/tenure type (inc. social housing) | Conservatives | Developing countries/Global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Household | Elderly | Procedurally disenfranchised | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic mobility | Cyber insecure |
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| Reames et al. (2018) | X                                    |                              |                                      |                                   |                                   |                          |                     |               |                        |                                    |                                 |                |                            |                |                |           |                     |           |               |                             |               |              |                        |                         |                |                         |                |               |
| Heffron and McCaul ey (2018) | X                                    |                              |                                      |                                   |                                   |                          |                     |               |                        |                                    |                                 |                |                            |                |                |           |                     |           |               |                             |               |              |                        |                         |                |                         |                |               |
| Poreusch and Ambrey (2018) | X                                    |                              |                                      |                                   |                                   |                          |                     |               |                        |                                    |                                 |                |                            |                |                |           |                     |           |               |                             |               |              |                        |                         |                |                         |                |               |
| Jenkins et al. (2018) | X                                    |                              |                                      |                                   |                                   |                          |                     |               |                        |                                    |                                 |                |                            |                |                |           |                     |           |               |                             |               |              |                        |                         |                |                         |                |               |
| Wildt et al. (2018) | X                                    |                              |                                      |                                   |                                   |                          |                     |               |                        |                                    |                                 |                |                            |                |                |           |                     |           |               |                             |               |              |                        |                         |                |                         |                |               |
| Sidortso v and Sovacoo l (2015) | X                                    |                              |                                      |                                   |                                   |                          |                     |               |                        |                                    |                                 |                |                            |                |                |           |                     |           |               |                             |               |              |                        |                         |                |                         |                |               |
| Damgaard et al. (2017) | X                                    |                              |                                      |                                   |                                   |                          |                     |               |                        |                                    |                                 |                |                            |                |                |           |                     |           |               |                             |               |              |                        |                         |                |                         |                |               |
| Poverty and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Conservatives | Renters/tenure type (inc. social housing) | Developing countries/Global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Households | Elderly | Procedurally disenfranchised | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic mobility | Cyber insecure |
|--------------------------------------|------------------------------|--------------------------------------|-------------------------------------|---------------------------------|-----------------|------------------|-----------------|-------------------|-----------------------------|--------------|-----------------------------|-----------------------------|-----------------|--------------|---------|----------------|---------|----------------|-----------------------------|-------------|--------|-----------------|-------------------|----------|-----------------|----------------|----------------------|-------------------|
| Szulecki (2018)                      |                              |                                      |                                     |                                 |                 |                  |                 |                   |                             |             |                             |                             |                 |              |         |                 |         |               |                             |             |         |                 |                 |          |                 |               |                      |                   |
| Hall (2013)                          |                              |                                      |                                     |                                 |                 |                  |                 |                   |                             |             |                             |                             |                 |              |         |                 |         |               |                             |             |         |                 |                 |          |                 |               |                      |                   |
| Emelianoff and Wernert (2018)        |                              |                                      |                                     |                                 |                 |                  |                 |                   |                             |             |                             |                             |                 |              |         |                 |         |               |                             |             |         |                 |                 |          |                 |               |                      |                   |
| Calzadilla and Mauger (2018)         | X                            | X                                    | X                                   |                                 |                 |                  |                 |                   |                             |             |                             |                             |                 |              |         |                 |         |               |                             |             |         |                 |                 |          |                 |               |                      |                   |
| Bouzrovski and Herrero (2017)        | X                            | X                                    | X                                   | X                               |                 |                  |                 |                   | X                             |             |                             |                             |                 |              |         |                 |         |               |                             |             |         |                 |                 |          |                 |               |                      |                   |
| Harrison (2013)                      | X                            |                                      |                                      |                                 |                 |                  |                 |                   | X                             |             |                             |                             |                 |              |         |                 |         |               |                             |             |         |                 |                 |          |                 |               |                      |                   |
| Miller et al. (2013)                 | X                            | X                                    |                                      |                                 |                 |                  |                 |                   | X                             |             |                             |                             |                 |              |         |                 |         |               |                             |             |         |                 |                 |          |                 |               |                      |                   |
| Moore (2013)                         | X                            | X                                    |                                      |                                 |                 |                  |                 |                   | X                             |             |                             |                             |                 |              |         |                 |         |               |                             |             |         |                 |                 |          |                 |               |                      |                   |
| Poverty and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Renters/tenure type (inc. social housing) | Conservatives | Developing countries/Global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Household | Elderly | Procedurally disenfranchised | Not clear | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic mobility | Cyber insecure |
|----------------------------------------|-----------------------------|---------------------------------------|-------------------------------------|--------------------|--------------------|-------------------|-------------------|--------------------------|-----------------------------------|---------------|--------------------------|-------------|---------------|---------|----------------|---------|----------------|----------------------------|------------|---------|--------------------------|-----------|---------------------|----------------|--------------------------|----------------|-----------|----------------|------------------------|----------------|-----------------|-----------------|
| Park and Sovacool (2018)               | X                           | X                                     | X                                  |                |                   |                   |                   |                          |                                   |               |                          |             |               |         |                |         |                  |                        |           |         | X                          |             |                     |                |                        |           |                  |                 |
| Bouzavoiski and Thompson (2018)       | X                           | X                                     | X                                  |                |                   |                   |                   |                          |                                   |               |                          |             |               |         |                |         |                  |                        |           |         | X                          |             |                     |                |                        |           |                  |                 |
| Chezel and Nadai (2018)               |                             |                                       | X                                  |                |                   |                   |                   |                          |                                   |               |                          |             |               |         |                |         |                  |                        |           |         | X                          |             |                     |                |                        |           |                  |                 |
| Endres (2009)                         |                             |                                       | X                                  |                |                   |                   |                   |                          |                                   |               |                          |             |               |         |                |         |                  |                        |           |         | X                          |             |                     |                |                        |           |                  |                 |
| Rudolph et al. (2018)                 |                             |                                       | X                                  |                |                   |                   |                   |                          |                                   |               |                          |             |               |         |                |         |                  |                        |           |         | X                          |             |                     |                |                        |           |                  |                 |
| Guruswamy (2010)                      | X                           | X                                     | X                                  | X               | X                  | X                  | X                  | X                         |                                   |               |                          |             |               |         |                |         |                  |                        |           |         | X                          |             |                     |                |                        |           |                  |                 |
| Osnes (2010)                          | X                           |                                       | X                                  |                |                   |                   |                   |                          |                                   |               |                          |             |               |         |                |         |                  |                        |           |         | X                          |             |                     |                |                        |           |                  |                 |
| Ambrozic (2010)                       | X                           |                                       | X                                  |                |                   |                   |                   |                          |                                   |               |                          |             |               |         |                |         |                  |                        |           |         | X                          |             |                     |                |                        |           |                  |                 |
| Baker (2016)                          |                             |                                       | X                                  |                |                   |                   |                   |                          |                                   |               |                          |             |               |         |                |         |                  |                        |           |         | X                          |             |                     |                |                        |           |                  |                 |
| Mastor et al. (2018) | Poverty and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Renters/tenure type (inc. social housing) | Conservatives | Developing countries/Global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Households | Elderly | Procedurally disenfranchised | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams/externalities | Building type and age | Domestic mobility | Cyber insecure |
|---------------------|--------------------------------------|-----------------------------|-------------------------------------|---------------------------------|-----------------------------------|-----------------|-------------------|-----------------|-----------------------|--------------------------|-----------------------------------|----------------|---------------------------------|-----------|----------------|---------|-----------------|-------------|----------------|-----------------------------|------------|----------|------------------------|-----------------|-----------------|-----------------|----------------|----------------|-----------------|----------------|----------------|-----------------|
|                     |                                      |                             |                                     |                                 |                                   |                 |                   |                 |                       |                          |                                   |               |                                 |                  |                     |          |                 |               |                |              |                 |                          |            |          |                        |                 |                 |                 |                 |                 |                 |
| Guruswamy (2011)    | X                                    | X                           |                        X            |                                  |                                   |                 |                   |                 |                       |                          |                                   |               |                                 |                  |                     |          |                 |               |                |              |                 |                          |            |          |                        |                 |                 |                 |                 |                 |                 |
| Newell and Mulvany (2013) | X                                  | X                           | X                                 | X                                |                                   |                 |                   |                 |                       |                          |                                   |               |                                 |                  |                     |          |                 |               |                |              |                 |                          |            |          |                        |                 |                 |                 |                 |                 |                 |
| Urban et al. (2017) | X                                    | X                           | X                                 | X                                | X                                 |                 |                   |                 |                       |                          |                                   |               |                                 |                  |                     |          |                 |               |                |              |                 |                          |            |          |                        |                 |                 |                 |                 |                 |                 |
| Rudolph and Kirkegaard (2018) |                                  |                              |                                     |                                 |                                   |                 |                   |                 |                       |                          |                                   |               |                                 |                  |                     |          |                 |               |                |              |                 |                          |            |          |                        |                 |                 |                 |                 |                 |                 |
| Petrova (2017)      | X                                    |                              |                                     |                                 |                                   |                 |                   |                 |                       |                          |                                   |               |                                 |                  |                     |          |                 |               |                |              |                 |                          |            |          |                        |                 |                 |                 |                 |                 |                 |
| Rice and Burke (2018) | X                                  |                              |                                     |                                 |                                   |                 |                   |                 |                       |                          |                                   |               |                                 |                  |                     |          |                 |               |                |              |                 |                          |            |          |                        |                 |                 |                 |                 |                 |                 |
| Demski et al. (2019) | X                                    | X                           | X                                 | X                                | X                                 |                 |                   |                 |                       |                          |                                   |               |                                 |                  |                     |          |                 |               |                |              |                 |                          |            |          |                        |                 |                 |                 |                 |                 |                 |
| Category                                                                 | Fleming (2019) | Ling et al. (2019) | Sovacool et al. (2019) | Xu et al. (2019) | Jayapalan et al. (2019) | Sayan (2019) | Fetnat et al. (2019) | Maher and Stefan (2019) | Sovacool and Marie (2019) |
|--------------------------------------------------------------------------|----------------|-------------------|------------------------|----------------|------------------------|--------------|---------------------|-------------------------|--------------------------|
| Poverty and economically marginalized                                   |                |                   |                        |                |                        |              |                     |                         |                          |
| Limited access/disconnections                                            |                |                   |                        |                |                        |              |                     |                         |                          |
| Unemployed (inc. fossil fuel workers)                                     |                |                   |                        |                |                        |              |                     |                         |                          |
| Ecosystems/environmentally degraded                                      |                |                   |                        |                |                        |              |                     |                         |                          |
| Local populations/host communities                                       |                |                   |                        |                |                        |              |                     |                         |                          |
| Future generations                                                       |                |                   |                        |                |                        |              |                     |                         |                          |
| Rural and peripheral                                                     |                |                   |                        |                |                        |              |                     |                         |                          |
| City inhabitants                                                        |                |                   |                        |                |                        |              |                     |                         |                          |
| Landowner and resource owners                                            |                |                   |                        |                |                        |              |                     |                         |                          |
| Children, youth and young families                                      |                |                   |                        |                |                        |              |                     |                         |                          |
| Renters/tenure type (inc. social housing)                                |                |                   |                        |                |                        |              |                     |                         |                          |
| Conservatives                                                           |                |                   |                        |                |                        |              |                     |                         |                          |
| Developing countries/Global South                                       |                |                   |                        |                |                        |              |                     |                         |                          |
| Biomass users                                                            |                |                   |                        |                |                        |              |                     |                         |                          |
| Women/gender                                                            |                |                   |                        |                |                        |              |                     |                         |                          |
| Disabled                                                                 |                |                   |                        |                |                        |              |                     |                         |                          |
| Ill or unhealthy                                                         |                |                   |                        |                |                        |              |                     |                         |                          |
| Displaced                                                                |                |                   |                        |                |                        |              |                     |                         |                          |
| Indigenous                                                              |                |                   |                        |                |                        |              |                     |                         |                          |
| Climate change victims/refugees                                          |                |                   |                        |                |                        |              |                     |                         |                          |
| Household                                                               |                |                   |                        |                |                        |              |                     |                         |                          |
| Elderly                                                                 |                |                   |                        |                |                        |              |                     |                         |                          |
| Procedurally disenfranchised                                             |                |                   |                        |                |                        |              |                     |                         |                          |
| Not clear                                                                |                |                   |                        |                |                        |              |                     |                         |                          |
| War, conflict and corruption                                             |                |                   |                        |                |                        |              |                     |                         |                          |
| Energy accidents                                                         |                |                   |                        |                |                        |              |                     |                         |                          |
| Racial and ethnic minorities                                             |                |                   |                        |                |                        |              |                     |                         |                          |
| Politically powerless                                                   |                |                   |                        |                |                        |              |                     |                         |                          |
| Resisters                                                               |                |                   |                        |                |                        |              |                     |                         |                          |
| Socially marginalized                                                   |                |                   |                        |                |                        |              |                     |                         |                          |
| Waste streams and externalities                                          |                |                   |                        |                |                        |              |                     |                         |                          |
| Building type and age                                                    |                |                   |                        |                |                        |              |                     |                         |                          |
| Domestic insecurity                                                     |                |                   |                        |                |                        |              |                     |                         |                          |
|                                | Poverty and economically marginalized | Limited access/disconnections | Unemployed (incl. fossil fuel workers) | Ecosystems/environmentally degraded | Local populations/host communities | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Conservatives | Renters/tenure type (incl. social housing) | Developing countries/Global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Household | Elderly | Procedurally disenfranchised | Not clear | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic mobility | Cyber insecure |
|--------------------------------|--------------------------------------|-------------------------------|----------------------------------------|--------------------------------------|-----------------------------------|-----------------|-------------------|------------------|-----------------------|-----------------------------------|-----------------|--------------------------------|-----------------------------------|----------------|----------------|---------|-------------------|----------|------------|--------------------------|----------|----------------|---------------------|------------------|------------------|-------------------|----------------|-------------------|-------------------|----------------|----------------|----------------|
| Kraal et al. (2019)            |                                     | X                             | X                                      |                                      |                                   |                 |                   |                 |                       |                                   |                 |                               |                                    |                |                |         |                   |          |            |                           |        |                |                    |                  |                 |                  |                |               |
| Fortiera et al. (2019)         | X                                    | X                             | X                                      | X                                    | X                                 | X               |                   |                 |                       |                                   |                 |                               |                                    |                |                |         |                   |          |            |                           |        |                |                    |                  |                 |                  |                |               |
| Saxe et al. (2019)             | X                                    |                               |                                        |                                      |                                   |                 |                   |                 |                       |                                   |                 |                               |                                    |                |                |         |                   |          |            |                           |        |                |                    |                  |                 |                  |                |               |
| Allen et al. (2019)            |                                      |                               |                                        |                                      |                                   |                 |                   |                 |                       |                                   |                 |                               |                                    |                |                |         |                   |          |            |                           |        |                |                    |                  |                 |                  |                |               |
| Thombs et al. (2019)           |                                      |                               |                                        |                                      |                                   |                 |                   |                 |                       |                                   |                 |                               |                                    |                |                |         |                   |          |            |                           |        |                |                    |                  |                 |                  |                |               |
| Kim et al. (2019)              | X                                    | X                             | X                                      | X                                    | X                                 |                 |                   |                 |                       |                                   |                 |                               |                                    |                |                |         |                   |          |            |                           |        |                |                    |                  |                 |                  |                |               |
| Lukanov and Krieger (2019)     | X                                    |                               |                                        |                                      |                                   |                 |                   |                 |                       |                                   |                 |                               |                                    |                |                |         |                   |          |            |                           |        |                |                    |                  |                 |                  |                |               |
| Wood and Roelich (2019)        | X                                    |                               |                                        |                                      |                                   |                 |                   |                 |                       |                                   |                 |                               |                                    |                |                |         |                   |          |            |                           |        |                |                    |                  |                 |                  |                |               |
| Kumar et al. (2019)            | X                                    |                               |                                        |                                      |                                   |                 |                   |                 |                       |                                   |                 |                               |                                    |                |                |         |                   |          |            |                           |        |                |                    |                  |                 |                  |                |               |
|                                | Poverty and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Renters/tenure type (inc. social housing) | Conservatives | Developing countries/Global South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Households | Elderly | Procedurally disenfranchised | Not clear | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic mobility | Cyber insecure |
|--------------------------------|--------------------------------------|------------------------------|--------------------------------------|-------------------------------------|-------------------|---------------------|------------------|----------------------|--------------------------|-----------------------------------|----------------|--------------------------|----------------|----------------|----------|------------------------|----------|----------------|----------------------------|------------|---------|------------------------|-----------|----------------------|---------------|------------------------|-----------------|-----------|------------------------|-----------|----------------------|---------------|------------------------|
| Williams and Doyon (2019)      | X                                    | X                            | X                                    | X                                   | X                 | X                   | X                | X                    | X                        | X                   | X                                      |              |                      |           |                       |          |            |                             |            |          |                        |            |                      |               |                        |                 |          |                        |            |                      |               |                        |
| Dwyer and Bidwell (2019)       |                                       |                              |                                       |                                      |                   | X                   |                  |                      |                          |                     | X                                      |              |                      |           |                       |          |            |                             |            |          |                        |            |                      |               |                        |                 |          |                        |            |                      |               |                        |
| Lim and Goh (2019)             |                                       |                              |                                       |                                      |                   |                      | X                 |                      |                          |                     |                          |              |                      |           |                       |          |            |                             |            |          |                        |            |                      |               |                        |                 |          |                        |            |                      |               |                        |
| Malakar et al. (2019)          | X                                     | X                            | X                                    | X                                    | X                 | X                   | X                | X                    | X                        | X                   | X                                      |              |                      |           |                       |          |            |                             |            |          |                        |            |                      |               |                        |                 |          |                        |            |                      |               |                        |
| Galvin (2019)                  | X                                     |                              |                                       |                                      |                   |                     |                  |                      |                          |                     |                          |              |                      |           |                       |          |            |                             |            |          |                        |            |                      |               |                        |                 |          |                        |            |                      |               |                        |
| Samarakoon (2019)              | X                                     | X                            | X                                    |                                       |                   |                     |                  |                      |                          |                     |                          |              |                      |           |                       |          |            |                             |            |          |                        |            |                      |               |                        |                 |          |                        |            |                      |               |                        |
| Sovacool et al. (2019)         | X                                     | X                            | X                                    | X                                    | X                 | X                   | X                | X                    | X                        | X                   | X                                      |              |                      |           |                       |          |            |                             |            |          |                        |            |                      |               |                        |                 |          |                        |            |                      |               |                        |
| Sassea and Trutnev (2019)      | X                                     | X                            |                                       |                                      |                   |                     |                  |                      |                          |                     |                          |              |                      |           |                       |          |            |                             |            |          |                        |            |                      |               |                        |                 |          |                        |            |                      |               |                        |
|                           | Poverty and economically marginalized | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Ecosystems/environmentally degraded | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Renters/tenure type (inc. social housing) | Conservatives | Developing countries/Global South | Biomass users | Women/gender | Disabled | Displaced | Indigenous | Climate change victims/refugees | Households | Elderly | Procedurally disenfranchised | Not clear | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic mobility | Cyber insecure |
|--------------------------|--------------------------------------|-------------------------------|---------------------------------------|-------------------------------------|---------------------|---------------------|----------------|------------------------|-----------------------------|------------------------------------------|----------------|-----------------------------|----------------|----------------|----------|----------|-----------|--------------------------|-----------|--------|------------------------|----------|------------------------|----------------|------------------------|--------------------------|-----------|------------------------|-------------------|----------------|-------------------|
| Israela and Jehling (2019) |                                      |                               |                                       |                                     |                     |                     |               |                        |                                            |                                          |                  |                             |                |                |           |           |           |                          |           |        |                        |          |                       |                 |                        |                           |          |                       |                    |                |
| Viviana and Castillo (2019) | X X X X                               |                               |                                       |                                     |                     |                     |               |                        |                                            |                                          |                  |                             |                |                |           |           |           |                          |           |        |                        |          |                       |                 |                        |                           |          |                       |                    |                |
| Greenberg and Bugden (2019) |                                      |                               |                                       |                                     |                     |                     |               |                        |                                            |                                          |                  |                             |                |                |           |           |           |                          |           |        |                        |          |                       |                 |                        |                           |          |                       |                    |                |
| Sovacoo et al. (2019)       | X X X X                               |                               |                                       |                                     |                     |                     |               |                        |                                            |                                          |                  |                             |                |                |           |           |           |                          |           |        |                        |          |                       |                 |                        |                           |          |                       |                    |                |
| Yadav et al. (2019)         | X X X X                               |                               |                                       |                                     |                     |                     |               |                        |                                            |                                          |                  |                             |                |                |           |           |           |                          |           |        |                        |          |                       |                 |                        |                           |          |                       |                    |                |
| Okushima (2019)             | X X                                   |                               |                                       |                                     |                     |                     |               |                        |                                            |                                          |                  |                             |                |                |           |           |           |                          |           |        |                        |          |                       |                 |                        |                           |          |                       |                    |                |
| Potuschi and Ambrey (2019)  | X X                                   |                               |                                       |                                     |                     |                     |               |                        |                                            |                                          |                  |                             |                |                |           |           |           |                          |           |        |                        |          |                       |                 |                        |                           |          |                       |                    |                |
| Van Zyl-Bulitta et al. (2019)| X X X X                               |                               |                                       |                                     |                     |                     |               |                        |                                            |                                          |                  |                             |                |                |           |           |           |                          |           |        |                        |          |                       |                 |                        |                           |          |                       |                    |                |
### Poverty and economically marginalized
- Limited access/disconnections
- Unemployed (inc. fossil fuel workers)
- Local populations/host communities
- Future generations
- Rural and peripheral
- City inhabitants
- Landowner and resource owners
- Children, youth and young families
- Renters/tenure type (inc. social housing)
- Landowners and resource owners
- Conservative
- Developing countries/Glbal South
- Biomass users
- Women/gender
- Disabled
- Ill or unhealthy
- Displaced
- Indigenous
- Climate change victims/refugees
- Households
- Elderly
- Procedurally disenfranchised
- Not clear
- War, conflict and corruption
- Energy accidents
- Racial and ethnic minorities
- Politically powerless
- Resisters
- Socially marginalized
- Waste streams and externalities
- Building type and age
- Domestic insecurity

| Source | Poverty | Limited access/disconnections | Unemployed (inc. fossil fuel workers) | Local populations/host communities | Future generations | Rural and peripheral | City inhabitants | Landowner and resource owners | Children, youth and young families | Renters/tenure type (inc. social housing) | Developing countries/Glbal South | Biomass users | Women/gender | Disabled | Ill or unhealthy | Displaced | Indigenous | Climate change victims/refugees | Households | Elderly | Procedurally disenfranchised | Not clear | War, conflict and corruption | Energy accidents | Racial and ethnic minorities | Politically powerless | Resisters | Socially marginalized | Waste streams and externalities | Building type and age | Domestic insecurity | Cyber insecure |
|--------|---------|-------------------------------|---------------------------------------|------------------------------------|--------------------|---------------------|-------------------|-----------------------------|---------------------------------------|----------------------------------------|---------------------------------|---------------|----------------|---------|----------------|--------|-------------|--------------------------------|-------------|-------|-----------------------------|----------|-----------------------------|------------------|---------------------------|----------------------|-------------|--------------------------|----------------|------------------------|------------------|-------------------|
