



Review

When energy justice is contested: A systematic review of a decade of research on Sweden's conflicted energy landscape

Vasna Ramasar^{a,*}, Henner Busch^b, Eric Brandstedt^c, Krisjanis Rudus^d

^a Division of Human Ecology, Lund University, Sölvegatan 10, Lund 22100, Sweden

^b Lund University Centre for Sustainability Studies, Biskopsgatan 5, Lund 22100, Sweden

^c Division of Human Rights Studies, Helgonavägen 3, Lund 2210, Sweden

^d Norwegian Centre for Energy Transition Strategies, Department of Interdisciplinary Studies of Culture, Norwegian University of Science and Technology (NTNU)



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ABSTRACT

The way in which we produce and consume energy has profound implications for our societies. How we configure our energy systems determines not only our chances of successfully dealing with climate change but also, how benefits and burdens of these systems are distributed. In this paper, we set out to map the literature on conflicts related to the energy system in Sweden using a framework of energy justice. The purpose of this exercise is twofold: first, to identify and understand energy conflicts in Sweden through the research that is published; and second, to identify gaps in the literature on energy justice in Sweden. This systematic review builds upon 40 scholarly articles focusing on energy conflicts in Sweden. All articles were written in the time period from January 2010 to January 2021. All articles were published in English in peer-reviewed scientific journals. The papers were analysed using a framework for energy justice that focused on the elements of distributional and procedural justice and recognition justice. The findings of the review suggest that there has been little explicit focus on energy justice in the literature on Sweden's energy system. Issues of distributional justice are most raised and procedural and recognition justice are often conflated in research. While conflicts over hydropower and nuclear have dominated in the past, wind energy in Sami territory is most problematised in the reviewed literature. The understanding of justice in the Swedish energy system is currently missing two elements: a rigorous handling of ecologically unequal exchange and restorative justice.

1. Introduction

Energy systems often give rise to a wide array of justice issues, ranging from questions of access, via issues of resource depletion to the ongoing climate crisis [1]. While low-carbon energy technologies such as renewable energy (RE) can help address many of the justice issues, they are not free of negative side-effects and conflict: REs often require costly materials such as rare earths [2,3] which can lead to pollution from mining processes along with high prices for the final product. REs often require land which can cause big-scale land acquisition and lead to land-grabbing. The construction of RE power plants has led to the displacement of people [4] and the destruction of landscapes and ecosystems [5]. Similarly, nuclear energy remains a contested issue because of the problematic sourcing and disposal of fuel, the risk of accidents and the industry's entanglement with military questions [6].

In this context, Sweden is a particular case. As one of the Nordic

countries, its political culture focuses on consensus building. The country's electricity production is already mostly decarbonised, due to hydro and nuclear electricity generation and bioenergy covers the lion's share of energy needs [7]. However, a considerable expansion of wind power, especially in the North of the country, is well underway, leading to conflicts around the siting of new turbines and power lines. Nevertheless, these points highlight the challenges that even a country such as Sweden, which is blessed with ample hydro, wind and bio-energy potential, has to face when instigating a transition to a decarbonised, fossil-free energy system [8]. This makes Sweden a critical case as the "low hanging fruits" of decarbonisation in power and heat production have already been picked.

In this article, we set out to map the literature on conflicts related to power and heat production and distribution and use in Sweden. The purpose of this exercise is twofold: first, to identify and understand how energy conflicts are presented in Sweden through the research that is

* Corresponding author.

E-mail addresses: vasna.ramasar@hek.lu.se (V. Ramasar), henner.busch@lucsus.lu.se (H. Busch), eric.brandstedt@mrs.lu.se (E. Brandstedt).

published; and second, to identify gaps in the literature on energy conflicts in Sweden with reference to energy justice. By means of a systematic literature review, we aimed to answer the following research questions:

- 1) What conflicts related to the energy system in Sweden does the scientific literature describe?
- 2) How can these conflicts be characterised and categorised, according to the three dimensions of energy justice?
- 3) Which gaps in the literature does the review unveil?

In the context of Sweden's energy system, the findings of the review suggest that there has been little explicit focus on energy justice in the literature. Traditional environmental justice concerns with distributional justice are most present with less focus on procedural justice. The use of recognition justice is limited and often used in the context of procedural justice. The review reflects changes in the energy system over time so that where hydropower and nuclear were present in the literature in the previous decades, wind energy in Sapmi is most problematised in the recent scholarship. We see opportunities for more research on ecologically unequal exchange and restorative and compensatory justice.

With this systematic review, we have the goal to contribute to the literature on 'just transition' while going beyond traditional framings of the term that has largely focused on the phase-out of fossil fuels [e.g. [9,10]] and to a lesser (albeit increasing) degree, the justice implications of e.g. renewables. Instead, we take a broader approach to energy and include different forms of energy production, transmission and use to shed light on the conflicts related to the entire system of energy production, transmission and use. Thus, we hope to approach the Swedish energy system and its decarbonisation transition in a more holistic manner.

2. Theoretical framework

In situating this review of energy conflicts in Sweden, it is first necessary to articulate our understanding of energy conflicts as well as of energy justice – thereby setting an analytical framework to categorise said conflicts.

2.1. Energy conflicts

In understanding energy conflicts, inspiration can be taken from theories on environmental conflicts, where such conflicts can arise from either access to resource issues or from environmental degradation of the environment. In both cases, this leads to a negative impact on human society and quality of life, which can cause a conflict [11]. In the context of energy, such conflicts relate to disagreements relating to the energy system including energy resources; siting of facilities; decision-making on energy supplies as well as access and allocation, to name a few. One of the challenges of energy conflicts is that it is sometimes difficult to isolate an energy conflict from other conflicts in multi-dimensional contexts where for example a conflict over the siting of a wind farm is entangled with the conflict over colonisation of indigenous lands. Simon Caney [12] distinguishes between what he calls 'a method of isolation' (focusing only on the distribution of e.g. GHG emissions or the burdens and benefits of the energy system) and 'a method of integration' (taking into account the wider context, looking at all things creating advantages and disadvantages for people).

Conflict can take different forms from protests, to legal appeals to disagreement in a decision-making process as well as implicit unwillingness to accept energy plans, programmes and policies [13]. Turner [14], p.866 points out that moral and material motivations are often strongly intertwined in "resource conflicts". In this paper, we seek to engage both the material and the moral through a review of journal articles on energy conflicts in Sweden through the lens of energy justice.

2.2. Energy justice

In the last decades, there has been a wide range of academic research devoted to the implications of global energy system dependency on fossil fuels [15–18]. The current reliance on carbon-intensive resources raises issues in a wide range of fields. It not only contributes to the escalation of climate change effects but also is interlinked to various social issues, such as when the phasing out of fossil fuels risks leading to energy poverty and energy security matters [19]. In between tackling these challenges, the concept of energy justice has gained increased attention among social science researchers [20–22]. Energy justice provides a framework for advancing a global energy system that prioritizes sustainable, safe, and affordable use of energy resources in all regions worldwide [22]. However, the theory of energy justice is not only relevant in fossil fuel phase-out. The concept has gained increased attention in the energy transition towards less carbon-intensive systems [20]. To ensure fair and equitable access to energy in the shift towards low carbon alternatives, McCauley et al. [20] suggest incorporating energy justice as a guiding principle in decision-making and establishing various energy policies. Energy justice thus offers principles and an analytical framework for building a just transition to a decarbonised society or a fossil-free welfare state as has Sweden aimed for. As Heffron and McCauley [19]:75] argue, the benefit of a just transition is its aim is to reduce inequality in modern society, which it achieves by applying justice in the areas of climate, energy and environment.

In the case of this systematic review, we use the energy justice framework as a mapping tool for energy justice claims in Sweden [20]. Although there are numerous formulations of justice, in this review, we focus on the three most significant dimensions of justice in this context [19,20,22]: distributional, procedural, and recognition justice. Distributional justice focuses on how the benefits and costs generated by energy systems are distributed when it comes to, for example, the siting of energy infrastructure, who gains access to their outputs, and where externalities fall [20]. Distributional justice calls for a fair allocation of benefits and hardships for all relevant parties, irrespective of their socio-economic background [22]. This may concern issues such as the placement of polluting energy infrastructure in low-income areas, disproportionately affecting racial minorities, and overall marginalized groups of society [23,24].

Procedural justice seeks to address the processes of decision-making regarding energy projects such as who is included; how processes are inclusive and information shared. A call for procedural justice focuses on creating a more equitable decision-making process that "engages all stakeholders in a non-discriminatory way" [25], p.2]. Procedural justice also seeks to incorporate diverse local knowledge and contributions to the general issue.

Recognition justice seeks to understand who is made invisible and whose impacts are not acknowledged in energy system decision-making [20,26]. It asks to recognize the importance of diverse perspectives and continuous exploration of factors of influence in the specific contexts of envisioning future energy governance, avoiding reductive views on the issue prevailing [22]. All in all, these three tenets guide the systematic review process to discover justice claims and justified grievances among the involved parties in different energy transition cases in Sweden.

3. Methods

This systematic review builds upon forty scholarly articles focusing on energy conflicts in Sweden. All articles were written in the time period from January 2011 to January 2021. We chose this time frame to give an overview of the most recent research on energy transition conflicts in Sweden. At the same time, we acknowledge the importance of past energy conflicts for the current energy landscape in Sweden (Section 4). Apart from the investigated articles, there is also a number of graduate theses that focus on justice issues in the Swedish energy

transition.

In this systematic review, we have focused on what is available in the English peer reviewed scientific literature (Table 1 and Appendix 1 for more details). Given that the language of the context is Swedish, it stands to reason that the topic of energy conflicts will be addressed in Swedish peer-reviewed scientific literature as well. However, a systematic search with the Swedish translation of the search terms in Google scholar produced no peer-reviewed scientific articles even if a number of BA and MA theses came up. We excluded these for quality assurance, as they were not peer-reviewed.

We used two search engines to find the relevant articles: Web of Science (Clarivate Analytics) and Google Scholar (Google). To find the relevant articles, we used the following terms: energy justice, energy transition, energy conflicts, Sweden, wind energy Sweden, solar energy Sweden, hydroelectric Sweden, biomass Sweden, nuclear Sweden, shale gas Sweden, transport, distributional/procedural/recognition justice Sweden. Further, we also scanned the relevant articles' reference list and employed snowball sampling by consulting field experts on potential sources and aspects of energy conflicts in Sweden complementary to the study. We excluded the term energy poverty as the EU Energy Poverty Observatory notes that in Sweden no group is very susceptible to energy poverty [27]. von Platten et al. note that this may be owing to the strong social support system, covering costs for adequate warmth and other household- and energy-related demands, including accommodation, for low-income and other vulnerable groups [28]. We then developed the analytical framework for the review based on the three dimensions of energy justice. We tested the framework for internal consistency by having two of us analyse the same article and compare results. Based on these results, we fine-tuned the framework. Then we divided the articles from the literature search. We held regular meetings to discuss questions such as the inclusion or exclusion of specific articles and to ensure consistency in how we conducted the review. We gathered basic bibliometric data from the articles. Then we investigated the material deeper by extracting the information on potential energy conflicts and justice issues. Throughout, the three tenets of the energy justice framework were used in the review of the articles to examine if and how distributional, procedural and recognition justice were raised, either explicitly or implicitly. In addition, for each paper we highlighted the background to the author and article; context of the study; aim and purpose; methodology; scale and part of the energy system. In several workshops, we discussed the results from the review to write the article in a collaborative manner.

4. Swedish energy context

The modern history of large-scale energy production in Sweden can be described as three waves. The first of these should perhaps rather be described as a dammed-up wave, as it was the development of hydro power in the early 20th century. A large-scale industrialisation of the rivers of northern Sweden took off after World War 1 and continued until the 1970s [29,30]. In the latter part of this period, the development of hydro power plants accompanied more general industrial development in the northern parts of the country, having to do with forestry, mining and transport. This northward expansion of the Swedish territory led to land conflicts with the Sámi people as well as resistance to the ecological damage caused by changes to rivers, new access roads, corridors for power lines and the subsequent landscape changes.

In the 70s, the second wave came with the development of nuclear energy, which was a great success in the sense that it came to cover around 40 % of the total energy production and supplied a reliable base load [see e.g., [31]]. There were, however, plenty of protests over

nuclear energy and lots of political contestation, eventually leading up to a public referendum in 1980. As a result of the outcome of the referendum, Sweden started to slowly phase out its nuclear reactors. This decision is however currently being reconsidered.

From the 1990s, and in particular in the last two decades, wind power has taken more and more market shares. It has increased from almost nothing to over 10 % of the total energy production [see e.g., [32]]. In the visions of the Swedish energy transition created by the government, it is stated that all energy produced should be renewable (although this is not taken to exclude nuclear). As with hydro power, most wind power is produced in the sparsely populated North as it is there where the conditions are best for onshore wind parks.

According to the International Energy Agency [7], Sweden is one of the leading countries in the world when it comes to the transition towards a low-carbon economy. Sweden has the lowest share of fossil fuels in its primary sector, and it places second for CO₂ emissions per gross domestic product and per capita. Sweden has also set one of the most ambitious targets for energy transition in the future: the country government mandated a net zero-carbon economy by 2045 [33]. There are, however, some significant obstacles standing in the way of Sweden's ambitious climate goals. In particular, there are the transport and agricultural sectors of the economy which have substantial emissions and where there is still no clear path towards decarbonisation [34].

Another thing often highlighted as an obstacle to the low-carbon transition is the permit process for industrial development projects such as wind power [32,35–38]. Some argue that these processes create long lead times and prevent Sweden from taking advantage of its good conditions for developing renewable energy. At the same time, as we will further see below, Sweden has been criticised for failing to comply with the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and to protect the Sami land rights in these permit processes [39,40]. The process for resource development begins with the state designating certain areas as being of 'national interest', e.g. because they are suitable for developing wind power. This also includes land which is part of the original territory of the Sámi people. Thereafter the municipality develops a Comprehensive Plan, which outlines how the land is to be developed. The municipality here has a veto and can freely decide to ignore the suggestion from the state. If the decision is to develop e.g., a wind power park, an environmental impact assessment must be carried out. However, the state is not required to consult affected parties including indigenous people. Instead, the impact assessments can and often are outsourced to a developer and usually carried out as mere information meetings.

Finally, we should note that Swedish energy politics extends beyond its domestic borders. Firstly, Swedish energy agencies are engaged in biofuel production in foreign countries [41]. Secondly, the partly state owned energy company Vattenfall owns coal plants in Germany [42]. Thirdly, some energy production in Sweden feeds into connected grids for Norway and Denmark.

5. Mapping the justice landscape of articles published on energy conflicts in Sweden

5.1. Background

Forty peer-reviewed journal articles were included in the systematic review along with one doctoral thesis. Not only do these papers represent a thorough overview of the most recent social problems on the Swedish energy landscape, but they also point towards an important new research area, that is, the role of justice in the expansion of renewables mandated by the transition to a sustainable future, in Sweden

Table 1

List of references that were part of the systematic review.

[8,13,26,30,35,40,43,44,45,46,47,48,49,50,51,52,53,55,56,57,58,59,60,61,62,63,65,66,67,68,69,71,72,73,74,75,76,77,78,79]

and elsewhere [8,43]. Given the focus of this review on Sweden, it was not surprising to find that 35 of the papers were (co-)authored by researchers working at Swedish higher education institutions. Ten papers were authored by researchers in Europe and there was one Australian and one English lead author and one Australian and one Scottish co-author. In most of the cases with non-Swedish authors, the studies were comparative between Sweden and other countries or comparisons at a lower scale (e.g. comparing cities in Europe) [e.g. [44]]. This suggests that the Swedish energy justice conflicts resonate cross-nationally and relate to energy justice issues in other world regions. Comparative studies made up seven of the articles while national (Sweden) studies accounted for 12 of the documents. The majority of the studies focused on the sub-national scale with 21 studies engaging regional or city level dynamics of energy conflicts (Fig. 1). Interestingly, only three of the studies used the word justice as a keyword [34,45]. They focused on energy conflicts related to wind power in Sweden; mobility justice and low-carbon energy transition in general.

In terms of the content of the articles, most studies were regional or national and focused overwhelmingly on energy production. A great majority of the articles address development of wind energy. The ones about hydro energy are historically oriented. In addition, solar energy is the focus of wholly three articles, which is interesting considering how small this energy source is in Sweden. Urban planning and transport were two areas where energy use was the subject of study.

The vast majority of articles make no use of the concept of justice or justice theories. Energy justice and social justice are used explicitly in two of the paper titles. Another article relates to the idea of benefit sharing mechanisms and another speaks more directly to energy justice theory. Other concepts/ideas mentioned in passing are: conservation, environmental values, recognition, distribution, procedural, and rights. One should note that even if explicit 'justice language' is rarely employed, many of the articles implicitly analyse energy projects in terms of justice (e.g., how people are affected, who's consulted, accessibility, etc.)

Only one article took up the broad Nordic low-carbon energy transition as its main focus [8]. Most of the articles that address the development of wind energy in Sweden relate to the ongoing energy transition and the need to decarbonise the economy. The article about shale gas presents this technology as a bridge towards a green transition. These ideas are not related to in all articles though. Some articles mention neither. The more historically oriented articles mention 'transition' to refer to one stage of the development of hydro energy.

5.2. Methodologies used in the studies

The majority of the studies reviewed relied on qualitative analysis [18] while about half that number used quantitative methods [7]. It thus seems that in recent years, energy conflicts are studied more from the qualitative and policy/legal perspective in Sweden. Only two studies combined quantitative and qualitative methods [46,47]. Given the preference for qualitative analysis, we found that interviews were the primary method of collecting data with 17 studies using interviews. These were carried out with official government and industry representatives as well as citizens affected by projects. In some cases, the interviews were complemented with other methods. This usually included policy analysis with seven of the articles drawing on policy analysis. Surveys [3], socio-economic statistics [3] and technical data [1] were used in fewer papers as was legal jurisprudence which was used in two papers. Archival material was important to engage questions of colonisation of Sápmi as well as the historical trends with renewable energy, especially hydropower and environmental history methods were used in four papers [48].

5.3. Distributional justice

The first tenet of justice that we examined is distributional justice.

The focus here is on how the costs and benefits created by energy systems fall differently on parties affected by or somehow involved in them. This includes everything from the siting of energy technologies, to the construction and the operation of them, as well as the indirect socio-economic effects brought about by either of these steps (e.g. new roads built around the power station or related to the mining of raw material needed to construct or power an energy system even if this is done in another country). Most of the reviewed articles that address issues of distributional justice focus on the wind energy expansion with two papers considering mobility accessibility for rural dwellers. This is consistent with the energy developments of the last decade which have largely been in the area of wind. Within this category, the main attention is on the development of wind power in or around Sápmi [49–51]. A few articles addressed negative aesthetic values and perceptions created by wind turbines [52,53].

The main conflict in the reviewed articles thus concerned wind power development on Sámi lands. The articles by Ek and Matti [49], Lawrence [50], Szpak [51] put an emphasis on both the burden that the placement of wind power technologies has on Sámi livelihoods, as well as the lack of benefits in forms of retributions, that the wind power companies and the local counties have failed to provide. When it comes to Sámi livelihoods, wind power development portends the issue of landscape fragmentation that is used for reindeer husbandry, due to expansion of new roads and power lines [[50], p.1045–1046, [51]]. Such alterations of the land yield a high risk of endangering the traditional practice of reindeer herding in the long-term, possibly to a complete destruction [[50], p.1045–1046, [52]]. Not only that, but the execution of current developments on reindeer herding lands is a potential gateway for further wind power developer access to the indigenous lands through the benefitting county boards – specifically, in the mountain regions that are viewed by Sámi peoples as the sacred lands [50].

Another facet of distributional justice that the articles reveal is the lack of compensation that the Sámi receive through such developments [50] or what can be considered compensatory justice. Compensatory justice takes over where distributive justice fails. In terms of compensatory justice, Sami peoples should have received benefits (economic, for example) in return for the costs (land) incurred in the interest of the national community. Since for years these (just) benefits were denied, we can say, moving from the ideal to the non-ideal level (repeated violation of principles of distributive justice) that the Sami are entitled to compensation. Local communities have sought a compromise in the form of a benefit-sharing agreement with wind power developers as a reparation for the direct damages to their livelihoods [[50], p.1041]. Nevertheless, according to Ek and Matti [49], Lawrence [50] and Szpak [51] so far there are only few recorded cases, where such agreements have actually been achieved. In this sense, the overall impression of wind power developments in Northern Sweden is a grim picture of the various ways distributional justice is violated: not only is the indigenous land exploited, but it leaves the Sámi empty-handed, with little or no aim for a more levelled approach towards more balance in the assigned burdens and (lacking) benefits of the wind power development in the North.

Such examples of resource exploitation on Sápmi territory are not only found in modern day wind power expansion but also historically when Sweden began to colonize the indigenous lands [40,50]. Ever since the beginning of the 18th century, Sámi lands and wilderness areas were used by Swedish state to extract raw materials, such as precious metals, wood and other [50]. Later, by the end of the 19th century, it was also waterpower extraction from rivers that reduced the indigenous lands for herding [[50], p.1045]. During these times Sámi received only a small compensation for the damage made by the state through a general fund from the government. Nevertheless, it was not directly transferred to the communities affected by the herding land loss but to the general Sámi population [46]. The farmers of the given area, in turn, received compensation for the lost land. Around the same time, the Swedish state

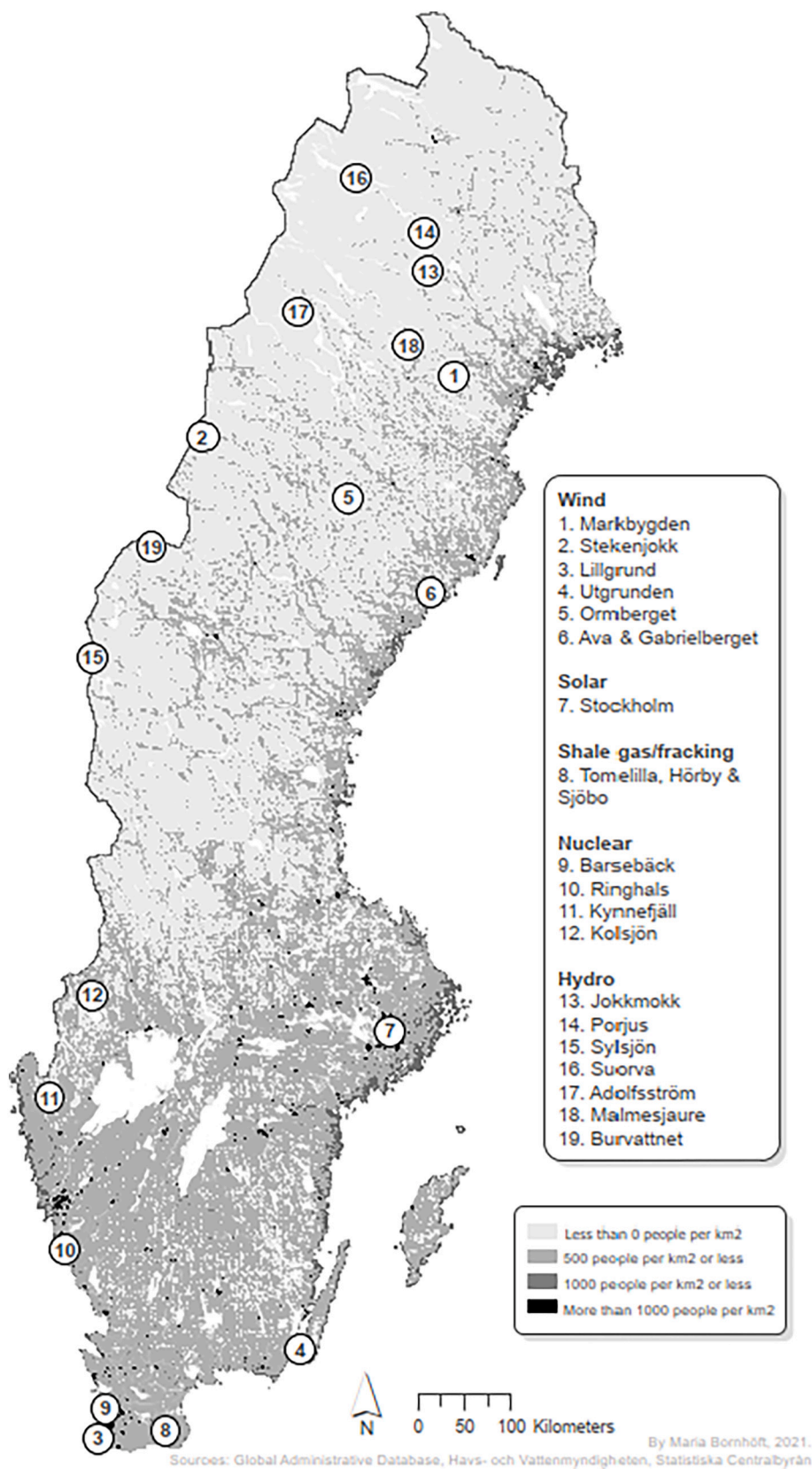


Fig. 1. Location of the sub-national studies reviewed in this article showing location and energy type.

enabled further expansion of cultivated lands and increased access for agricultural settlers in the North, undermining Sámi rights to their own land [50], p.1042–1043]. Finally, the Reindeer Grazing Act of 1886 reduced the historical recognition of special grazing lands and Sámi privileges for reindeer herding [50], p.1043]. In keeping with Caney's [12] method of integration, exploitation of Sápmi has deeper roots than just issues related to the current renewable energy agenda, which is an important factor to consider when evaluating the weight and the meaning of burdens potentially affecting the various communities around Sweden on a national level. We will come back to this discussion under the heading of "recognition justice" below.

Apart from issues with Sámi grazing lands and wind power development in Northern Sweden, there is also evidence of other issues of distributional justice, such as concerning aesthetic burdens and noise that residents and municipalities have struggled with in various regions of Sweden [52–54]. One of such cases is the burden of negative aesthetic 'distortions' related to wind power expansion, for example in the province of Östergötland [52]. While some of the residents and developers wanted to expand the wind power capacity that fulfilled national targets for wind power regional supply, many of the local municipalities were against this proposal. Further wind power expansion was seen as benefiting private companies and individuals, while placing an aesthetic burden on the cultural landscape of the region [52]. Such implications were seen as creating imbalance between the burdens and benefits that wind power development has initially created.

A similar case is Waldo's [53] article that focuses on the offshore wind power developments in Southern Sweden (Lillgrund wind farm). Here, the expansion was met with opposition from the local residents in Vellinge municipality due to negative aesthetic associations and the noise of wind turbines [53], p.698]. At the same time, representatives of the proponent city of Malmö saw it as the personal interest of the residents and that wind turbine placement is fair as it has limited impact on residents' view, while simultaneously contributing with its economic impact. Here again, wind power development with its national contributions to clean energy production was met with opposition where the aesthetic loss was used as a legitimate reason to resist further developments. According to Söderholm and Pettersson [37] the Swedish legal system ruled that certain negative impacts of offshore wind are acceptable as the projects contribute to attaining national environmental goals and can thus also justifiably receive subsidies.

Nuclear power has been a part of the Swedish energy mix for over half a century. During this time, it has always been subject to heated political debate [56]. The review produced surprisingly few results on nuclear. Two of the papers published within the timeframe of the review were pro-nuclear in their focus on distributional impacts. Qvist and Brook [57] offered a modeling analysis of emissions savings lost and air pollution deaths caused as a result of the phase out of nuclear energy in an article supporting nuclear power in Sweden's energy mix. In regards to distributional justice, Di Lucia and Ericsson [58] found that Vattenfall – the state-owned energy company – tried to defend the strong market position of nuclear by financial means. Åberga and Fjæstad [56] also note the political nature of nuclear energy in Sweden but do not discuss the issue in the context of distributional justice at all. Municipalities that were interested in setting up decentral cogeneration heat and thermal power (CHP) plants were offered long-term power purchasing contracts at preferential rates by the company. These contracts made decentral CHP solutions financially not attractive. Disposal of nuclear waste has often sparked protest as in the case of the German storage Gorleben. In Sweden, the process caused significantly fewer conflicts. Municipalities with strong and established links to the nuclear industry showed high levels of acceptance towards hosting nuclear waste disposal facilities [59]. The affected communities had a strong voice in the negotiations and received compensation through financial support for public projects and NGOs [59].

Despite the importance of the bioenergy sector for Sweden, conflicts in this part of the energy system do not surface much in our review.

Johansson and Ranius [60] state that the sector is currently in transition to meet a growing demand for bioenergy and that this development will lead to more conflicts between different purposes of and values connected to Swedish forests. Another article by Silveira and Johnson [61] highlights the national, regional and global inter-linkages in the bio-energy sector in Sweden and is one of the few articles to note the distributional justice issues outside of Sweden's borders as well as outside the energy sector when they note the potential opportunity cost of bio-energy to food security and affecting water and land resources.

In terms of energy use, distributional justice came up in the transport sector. Studies suggest that there is a distributional injustice in transport infrastructure, especially public transport between urban and rural dwellers in Sweden [62,63]. This was also related to access and accessibility and mobility justice between the urban and the rural parts of the country. As Sweden continues to decarbonise, the rural reliance on cars may become a greater issue of distributional justice worthy of further research.

Overall, we see various potential distributional injustices across Swedish energy politics. Some of these grievances concern disturbances caused by noise or negative visual effects of wind turbines and may be categorised as aesthetic reasons but also connect to health issues and life satisfaction such as mobility access. Another set of grievances are those expressed by the Sámi people who struggle to maintain their livelihoods against the wind power expansion which generally do not benefit them. The current energy transition will seriously affect reindeer herding, a staple practice in the indigenous lands up north. We believe that social burdens throughout these articles occur on different levels of importance. While for many people it is an issue of change in landscape, an aesthetic aspect that embodies negative feelings from municipalities and residents, in other areas it directly affects the future living conditions in the areas affected by wind power expansion.

5.4. Procedural justice

The second category of justice claims is procedural justice. It concerns decision-making processes used to design, develop, implement or maintain energy systems. There are various legally recognised norms relevant to this dimension which can be used to further unpack what is relevant to consider here. Sweden has ratified the Aarhus convention, which means that its rules have to be followed in decision-making concerned with the environment. It defines three pillars of procedural justice: access to information, access to participation and access to legal procedures [64]. We use this categorization to structure and analyse the findings related to procedural justice. In addition, considering that many of the energy decisions considered here concern the Sámi, it is also relevant to note the legislation that aims to protect indigenous people. Sweden has a minority law which specifies a state duty to provide opportunities for the Sámi to effectively participate in land and resource decisions. Then there are international norms stated in the UNDRIP (mentioned above) and ILO 169, which specify procedural rights for indigenous people, in particular the norm about Free, Prior and Informed Consent. Sweden has not ratified ILO 169 so far.

We found that most claims of violations of procedural justice mentioned in the literature concerned "access to **participation**". Most of the claims concerning access to participation refer to the development of energy resources in the North of the country. The permit processes used for industrial development standardly fail to protect basic procedural rights. Participation is often restricted to a kind of token consultation to silence critique, the permit process is fragmented, and wholly politicised [65,66]. One reason for this is that relevant authorities say they lack competence to know how to include Sámi people [66] another is that the duty to consult affected parties is outsourced to the often private developer.

There is a longer history of procedural injustice, e.g. when the rivers in the North were dammed for the expansion of hydroelectricity [30,48,67,68] which mainly took place between the 1910s and the

1980s [48]. In the last decade, the fast growing wind energy sector has caused a number of new conflicts related to energy projects [13,30,50–53,69]. All conflicts in the North of the country are intertwined with what some authors refer to as the colonisation of the North [30,48,50,51,68,70]. A notable exception is the case of Vellinge in Skåne (Southern tip of Sweden) where the local population protested against offshore wind turbines on the grounds of a perceived violation of the people's right to make their voice heard in the decision making process [53]. Here the conflict does not revolve around the loss of livelihoods but rather an unobstructed view of the Öresund.

Apart from production, the management of electricity transmission in the form of grid expansion has given rise to conflicts [70]. Despite this list of conflicts, some authors point out that participation in the management of the Swedish energy system is much more prevalent than in other countries like Norway or the UK [71,72]. Hansen and Nerhagen [73] note that the most common procedural form of decision making in Sweden is a consensus-based coordination.

Our review produced several references to a perceived lack of **information** in the decision-making process around energy infrastructure [74–77]. We can categorise these instances roughly into three kinds. First, one article [68] describes a case in which the flow of information to affected people was hampered by institutions belonging to the colonial regime in Northern Sweden. More concretely, the Swedish state had installed a system in which State-appointed bailiffs represented Sami communities in legal processes such as siting decisions of hydropower [68]. This system, which was in place in the first decades of the last century, turned the bailiffs into bottlenecks of the flow of information. This system led to violations of procedural justice in the early days of hydropower in Sweden because information was withheld from indigenous people who had traditionally used the land for reindeer herding [68].

Second, the review produced findings that show that citizens felt poorly informed about the technology used in different energy projects. In the case of the wind farm close to Vellinge municipality, local people complained that the project developer failed to provide them with information on some technical and financial aspects on the wind turbines, especially in comparison to other forms of energy production [53]. One article mentions the information problems that are inherent to shale gas extraction. The authors point out that shale gas extraction appears to people like a black box, as they do not feel that they understand the details of the extraction process and which implications this process might have [72]. However, shale gas never passed the stage of initial exploration in Sweden.

Third, people perceived that it was very difficult to find easily accessible information on how to get involved in small-scale energy production. The main issue in this context was the de-facto monopoly of big energy producers that led to an energy system that excluded small scale producers by an intricate legal framework [55]. This situation is echoed by Ruggiero et al. [78] who observe that community energy projects are often organised by local energy companies with much higher administrative capacity.

Finally, some of the injustices related to in the literature are best understood as having to do with 'access to justice', that is, can affected parties effectively appeal decisions that go against their interests. Here, it is important to not only investigate whether energy system decisions are aligned with legislation, but also to critically assess whether the law is implemented in a balanced way. The reviewed literature suggests that this may not be the case now. Cambou [43] points to a report by the Swedish Energy Agency which surveyed the application process for wind power between 2014 and 2018, according to which only 7 % of the permits rejected were due to protection of reindeer husbandry. This suggests that although the Sámi can voice their objections to proposed plans to develop wind power and even appeal such decisions (to the Swedish Land and Environment Court), in practice their claims are most often ignored. The real opportunities to influence the permit process are limited, also because most Sámi communities are small and lack the

resources to file lawsuits [43].

Despite the fact that nuclear energy is a very contested topic in Swedish public debate, the review did not indicate any violations of procedural justice. Åberg and Fjæstad [56] traced the history of nuclear energy in Sweden and note that the decision to phase out nuclear was highly political but also participatory in the decision going to a public referendum in 1980. Qvist and Brook [57] also note the political nature of decision making and argue that it is not based on science but public perception and politics. Decision making about final disposal of nuclear waste took place in a two-step process. First, in a top-down process technical issues were decided by experts. In a second step, local communities had an active voice and veto-right in the process of finding a location for the final waste storage [59]. Local groups and NGOs gained access early on in the decision-making process and received resources to manage their involvement. This reflects that $\frac{3}{4}$ of Swedish members of parliament agree that decisions on nuclear waste disposal should not be left to experts alone [79].

In terms of the bio-energy sector, a future issue for procedural justice may arise as a result of a lack of cross-sectoral coordination [61]. This is noted in the literature but as bio-energy production is still in the early stages, no explicit conflicts came out of the review.

5.5. Recognition justice

Justice is not only about how goods or burdens are distributed and decisions are made, it is also about respecting individual differences and allowing individuals to represent their interests on equal terms. The point is that a just system protects a 'difference-friendly world' [80], where different experiences, feelings, and perceptions are taken into account, and where rights are respected, for example in energy decision making. Recognition justice requires us to analyse how people are represented (e.g., in policy-documents, reports, decisions), how different points of views, claims and objections are interpreted, and how decisions and policies are communicated. Recognition justice connects individual decisions (e.g. about energy production) to a wider context, for example by arguing that individual decisions reproduce a history of status inequality. The remedies suggested by recognition justice range from merely symbolic changes in official communication to better representation of different perspectives and to wholesale cultural transformation.

In analysing the reviewed articles in terms of recognition justice, we were searching for patterns of domination, non-recognition and disrespect, also connected back to the longer history proceeding the particular energy conflicts now studied. We were interested in analysing whether the research on Swedish energy conflicts uncovered also this kind of deep-seated injustices concerning affected parties' abilities to participate in energy decision-making on equal terms. Although this is related to procedural justice, it is different in that the focus is on the bigger picture, on the cultural norms that are not necessarily seen in focusing only on a particular decision-making process. The articles reviewed show three issues which arguably are best understood in terms of recognition justice. These energy conflicts mostly concern contestations between the Swedish state, municipalities in Northern Sweden or energy companies and the Sámi but also relate to the recognition of the needs of rural citizens in terms of transport infrastructure. We have identified the following cases of recognition injustice: (1) who is invited to the mandatory consultation meetings and whose complaints that are taken into consideration in cost benefit analyses, (2) whose knowledge claims that are viewed as legitimate; and (3) how do ongoing energy conflicts relate to historical injustices.

When new wind power is developed in Sweden, the project is tested either against the Planning and Building Act or the Environmental Code [32]. This means that either the municipality or the developer is charged with organising consultation meetings with affected parties. In relation to these meetings two issues of recognition arise. First, some agents who have a stake in the decision about whether and how windmills are constructed are simply not invited to the consultation meetings. Their

claims to participation are not recognised. This is the case with Sámi people and communities who have traditionally used land for herding when these use rights (as opposed to ownership rights) are not officially recognised. They are not seen as the legitimate landowners and thus not invited to these meetings [50]. This misrecognition also means that their claims to compensation are not taken seriously, and they are not given a veto right over whether the projects should go ahead. Most fundamentally, they are not recognised as equal participants in a shared political community.

Another issue concerns whose knowledge claims are recognised in official high-stake negotiations. Several articles note that local knowledge claims have been dismissed or relativised. This dismissal may lead to or manifest recognition injustice. Some agents' views, perceptions, experiences, feelings, etc., are not taken seriously, which in turn means that the agents themselves are disrespected. In the case of Sámi people being represented by bailiffs discussed above under procedural justice, Åsa Össbo and Lantto [[68], p.336] also argues that this 'made the herders invisible in the process, as the bailiffs did not view their knowledge as a general asset, but chose to refer to it only on certain occasions when it was assumed to be of specific importance' [[68], p.337]. Jonas Anshelm and Haikola Simon [[13], p.1150] argue that in both historical conflicts around hydro power and in present-day conflicts around wind power, expert knowledge is pitted against lay knowledge, which leads to 'a conflict between universal, objectivist and abstract knowledge claims on the one hand and, on the other hand, specific claims connected to the actual place and based upon personal experience.'

In addition to the recognition disrespect, this may also lead to procedural and distributional unfairness in that some claims to compensation are just not taken seriously or denied. For example, some who claim to be negatively affected by wind power are not recognised as having standing to claim due to the way in which impact is measured [81]. There are conflicting views about how to limit the scope of consideration, e.g., about the extent to which wind power plants "uglify" an aesthetically appealing landscape and about what are acceptable levels of noise annoyance from wind turbines.

Finally, many of the energy conflicts reviewed play out against a longer history of colonialism, repression and disrespect [43,50,68,82]. The articles acknowledge that the Sámi have suffered from cultural exclusion and status inequality as long as the Swedish state has existed, for example through the so-called Lapp Administration and the Reindeer Grazing Act. Rebecca Lawrence [50] discusses the dispute over the development of wind power in Stekkenjokk in which the County Board's signing of a letter of intent 'has been interpreted by the community as the next step in a longer process of colonisation in which Sámi rights have been increasingly ignored' (pp. 1043–44). Lawrence also notes that the County Board's attempt to facilitate wind power development is 'based on the false claim to state ownership of those lands' (p. 1044). Similarly, Åsa Össbo and Patrik Lantto [68] notes how the handling of the wind power development perpetuates a longer process by which the Swedish state has not dismissed the customary rights of the Sámi, but fundamentally redefined and devalued them over the years, as well as disrespected important aspects of Sámi culture in official documentations. Dorothee Cambou [43] argues that 'the current governance system [of wind power in Sweden] is based on a discursive relationship of settler-colonial society that misrecognises Indigenous cultural status and rights'. This is, for example, expressed in court decisions which refer to reindeer herding as 'a business right' [43] and thus ignore the status of the Sámi as Indigenous people and disrespect their cultural rights.

6. Discussion

In this article we have sought to present a review of energy conflicts described in the literature on Sweden through the lens of the three tenets of energy justice.

6.1. Speaking back to theory

Unlike many systematic reviews which use an inductive approach starting from the reading of the literature, in this review, we have explicitly chosen to engage the literature through the tenets of energy justice. In doing so, the review serves also as an application of energy justice theory and reveals interesting challenges when relating energy conflicts to the concept of energy justice. The methodological choice to analyse the documents using the energy justice principles and framework has been helpful in the study of literature on energy conflicts. It has allowed the authors to explicitly draw out how and where justice is brought into the debate and highlighted many gaps. We believe this offers value to the existing literature in two ways: (1) Using a dual inductive-deductive approach in the systematic review (building on what we see in literature but also using it to say something about energy justice theory) and (2) offering an overview of how justice is dealt with in literature on Swedish energy conflicts and transitions.

We also suggest that the paper is theory testing, using the analysis of the existing literature to assess the relevance and applicability of general theories of energy justice. From our review, it would appear that restorative justice has not been sufficiently theorised in the energy justice literature and more intersections between these bodies of theory could be useful, especially in the context of indigenous energy conflicts. Hazrati and Heffron [[83]:2] suggest that the essence of restorative justice is that there is an obligation to return the victim to their original position and in the context of energy justice define it as "any injustice caused by the energy sector should be rectified and be part of preventive and forward-looking action". We suggest that an explicit justice framing could be helpful to apply to systematic reviews of other country research as well. Ultimately this can serve a policy agenda of promoting energy research that supports a just transition. Some findings of the systematic review include the fact that distributional justice is the most commonly used tenet and that recognition and procedural justice are often conflated in their presentation. Returning to Caney's [12] method, we suggest that whether one takes an approach of isolation or integration affects how different issues are viewed as either recognition or procedural concerns. Without understanding the underlying inequalities in a society, it is possible to treat society as uniform and mis-represent certain recognition justice issues as simple procedural failings. This can be highly problematic and reinforce inequalities in the energy transition. From this systematic review, we therefore advocate for a clearer application of different concepts of justice when studying energy conflicts. In connection with energy conflicts, it was also noted that energy justice was seldom explicitly mentioned. This may be a choice of the authors to use different language but could also be perceived as a potential depoliticization of energy conflicts. The proliferation of just transition policies and plans may bring greater attention to energy justice concepts for analysis that supports the transition and bring more convergence in justice scholarship within climate, energy and environmental fields [9].

6.2. Attention to the north

In our review, the conflicts related to wind energy in the North of Sweden and Sámi communities have been highlighted by several authors. This may partly be related to the third wave of energy production in Sweden which is currently focused on wind energy. According to Liljenfelt and Pettersson [45], more than a quarter of the wind energy proposals were rejected in the south of Sweden, but only slightly more than 1 % were rejected in the north during the same period. It would thus appear that this focus on the north is a natural result of more wind energy projects being undertaken in the north of Sweden. A further point worth noting from a justice perspective is that discussions of colonisation and decoloniality have received more attention in the scientific literature in recent years. In Sweden, this inevitably draws attention to the north and the Sámi as the indigenous peoples of the region. As a

result, we see that energy conflict studies are broadening to engage more actively with the broader socio-economic context of energy development. It is our opinion that this is a deepening of energy and climate justice theorising and welcome contributions to the literature.

6.3. Gaps in the scientific literature

Much of the literature on energy conflicts in Sweden relate to production and transport of energy. While there is a great deal of research on energy and transport planning and household energy use, this is not discussed in terms of energy justice. As such, there is no strong research field on energy poverty in Sweden as one finds in the UK for example. We suggest that energy poverty may not be a particular concern in Sweden but the discussion of energy use can be broadened to consider if there is energy inequality, especially in the housing and transport sectors. As an affluent country, Sweden has a large energy footprint and the discussion of consumption is minimal and could be developed further. Conflicts about the sourcing of bioenergy have made it into the academic debate about the Swedish energy system [41], however these debates have very much focused on North-South relations. A blind spot in the scientific debate so far is the trade of biomass from the Baltic States to Sweden to meet bioenergy needs. Another finding of the systematic review is that when analysing energy conflicts, the focus is most often on the negative aspects such as who complains, who loses, what fails, etc. In many cases, there is less visibility of the benefits and who gains them. We find that there is little substantial discussion of the benefits such as who is benefiting financially and how projects lead to carbon emissions savings. In thinking about a just transition, it is important that both costs and benefits as well as procedural advantages and disadvantages are understood.

6.4. Justice beyond Sweden's borders

In reviewing the articles using an energy justice framework, we perceived that the focus of articles tends to be on regional and national distribution of impacts and does not consider the global burdens of embodied land and labour of technologies as well as the global benefits that exist. Only one of the articles took up the issue of global offshoring of carbon emissions [8]. In addition, the temporal issues regarding the needs of future generations are hardly touched upon in the articles. In keeping with our approach of using a theoretical lens for the review, the spatial and temporal impacts must thus be acknowledged.

In this paper, we acknowledge that even solutions that are alternatives to fossil fuels may perpetuate ecologically unequal exchange [84]. Many authors, such as Mulvaney [85] and Mathews [86] have provided examples of ecologically unequal exchange that is created by renewable energy production. Renewable energy technologies rely on metals and other materials that are extracted in polluting conditions that often rely on labour working in unsafe conditions as well as child labour. Biofuel production for use in Sweden has been associated with land deals in Africa for example that have been flagged for concerns over land dispossession and causing food insecurity [87]. The construction of wind turbines used in Sweden creates externalities in faraway countries [8,88]. The disposal of renewable technologies in landfills and other sites may take place in Sweden but could potentially be carried out in the Global South causing pollution at distant sites.

In order to be rigorous in examining energy justice, one must consider the distributional, procedural and recognition aspects of

Swedish energy conflicts from an international and futures perspective. As Goodman and Marshall [189]:4] argue, method necessarily privileges and excludes various social actors, and needs to be self-conscious of this problem. The allocation of renewable energies and social burdens that it carries, the future dispossession of waste and the ethical conditions for their production in a world-system context are currently gaps in the energy conflicts literature in Sweden.

7. A future research agenda

There is a wealth of research on energy systems in Sweden and at a policy level, high ambitions for decarbonisation. However, the review of literature in the last ten years reveals that there is a weakness in engaging these analytically from the perspective of energy justice. Expanding the study of energy justice and just energy transitions is necessary, even in a country like Sweden where renewables make up a substantial part of the energy mix.

The review revealed that an area where Sweden has been most criticised in the literature is on indigenous rights and how they are integrated in energy decision making. While the critique is present in the literature, a constructive model for reconciling respect for indigenous rights with climate ambitions is not well established. Bio-energy and transport are current and future areas of energy conflicts in Sweden but are not yet appearing in the scientific peer-reviewed literature suggesting the lag between research and publication. There are also new horizons for both research and for extending the justice analysis of these sectors. Similarly, questions of consumption are imperative for development in a sustainable way and therefore should be theorised in energy justice terms. As we write this paper, the energy landscape of Europe is changing with current events such as the war in Ukraine, the destruction of the Nordstream pipelines and increasing energy prices. We expect that the horizons of energy security and energy poverty in Sweden may change in the coming years and warrant more investigation.

Some further questions that science, society and policy makers struggle with include: How do we weigh up the different justice concerns? How do we handle the differences when they do not weigh equally? This suggests to us that there is also room to extend the study of energy justice to consider more carefully the moral grounds for addressing grievances and justice claims in the low-carbon transition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix 1: List of Reviewed Articles

Citation	Journal	Year	Author(s)	Authors' location	Title	Keywords
[8]	Energy Policy	2017	Benjamin Sovacool	Aarhus University and University of Sussex	Contestation, contingency, and justice in the Nordic low-carbon energy transition	Decarbonization; Energy transitions; Low-carbon energy; Climate policy; Nordic decarbonization pathways
[13]	Renewable and Sustainable Energy Reviews	2016	Jonas Anshelm, Haikola Simon	Linköping University	Power production and environmental opinions – environmentally motivated resistance to wind power in Sweden	Environmental protest Wind power in Sweden Environmental opinion formation
[26]	Ecological Economics	2019	Benjamin K. Sovacool, Johannes Kester, Lance Noel, Gerardo Zarazua de Rubens	Sussex University, UK and Aarhus University, Denmark	Energy injustice and Nordic electric mobility: inequality, elitism, and externalities in the electrification of vehicle-to-grid (V2G) transport	Electric vehicles Energy justice Energy transitions Low-carbon transport
[30]	Energy Research and Social Science	2016	Dean B. Carson, Doris A. Carson, Gabriella Nordin, Peter Sköld	Charles Darwin University, Australia; and Umeå, Sweden	Lessons from the arctic past: the resource cycle, hydro energy development, and the human geography of Jokkmokk, Sweden	Hydropower; Resource cycle; Staples thesis; Human Geography; Arctic
[35]	Energy Policy	2010	Patrik Söderholm, Maria Pettersson	Luleå University, Sweden	Offshore wind power policy and planning in Sweden	Offshore windpower, Planning, Policy
[40]	Environmental Impact Assessment Review	2017	Rasmus Kløcker Larsen, Kaisa Raitio, Marita Stinnerbom, Jenny Wik-Karlsson	SEI, SLU, Vilhelmina norra reindeer herding community, Swedish Sami Association	Sami-state collaboration in the governance of cumulative effects assessment: a critical action research approach	Cumulative effects; Impact assessment; Reindeer herding; Sami; Action research; Collaboration
[43]	Arctic review of law and politics	2020	Dorothee Cambou	University of Helsinki, Finland	Uncovering injustices in the green transition: sami rights in the development of wind energy in Sweden	Sámi rights, wind energy, just transition, social justice, Indigenous peoples, Swedish law
[44]	Urban Studies	2014	Cyria Emelianoff	Le Mans Universite, France	local energy transition and multilevel climate governance: the contrasted experiences of two pioneer cities (Hanover, Germany, and Växjö, Sweden)	Hanover, local climate governance, low carbon city, multilevel climate governance, urban energy transition, Växjö
[45]	Energy Policy	2017	Liljenfeldt, J. and Pettersson, O.	Umeå University, Sweden	Distributional justice in Swedish wind power development – an odds ratio analysis of windmill localization and local residents' socio-economic characteristics	Wind power, energy justice, distributional justice, planning process, odds ration
[46]	Urban, Planning and Transport Research	2018	Jouri Kanters & Maria Wall	Lund University, Sweden	Experiences from the urban planning process of a solar neighbourhood in Malmö, Sweden	Solar energy; energy planning; urban planning; PV; IEA SHC Task 51
[47]	Local Environment	2016	Paul Fenton, Sara Gustafsson, Jenny Ivner and Jenny Palm	Linköping University, Sweden	Stakeholder participation in municipal energy and climate planning – experiences from Sweden	energy and climate strategies; municipalities; participation; stakeholders
[48]	Journal of Northern Studies	2018	Åsa Össbo	Umeå University, Sweden	Recurring colonial ignorance: a genealogy of the Swedish energy system	Sami History, Indigenous People, Swedish Hydropower, Industrial Colonialism, Genealogy
[49]	Journal of environmental planning and management	2015	Kristina Ek and Simon Matti	Luleå University, Sweden	Valuing the local impacts of a large scale wind power establishment in northern Sweden: public and private preferences towards economic, environmental and sociocultural values	Wind power, choice experiment, WTP, indigenous people, public, private
[50]	Environmental and Planning D: Society and space	2014	Rebecca Lawrence	Stockholm Environment Institute, Sweden	Internal colonisation and indigenous resource sovereignty: wind power developments on traditional Saami lands	internal colonisation, resource sovereignty, Saami, wind power, Sweden
[51]	Polar Science	2019	Agnieszka Szpak	University of Torun, Poland	Relocation of Kiruna and construction of the Markbygden wind farm and the Saami rights	The Saami Indigenous peoples, Kiruna, Markbygden, Free, prior and informed consent
[52]	Energy Policy	2009	Anna Berggek	Linköping University, Sweden	Levelling the playing field? The influence of national wind power planning instruments on conflicts of interests in a Swedish county	Wind power, planning instruments, policy
[53]	Energy Policy	2011	Åsa Waldo	Lund University, Sweden	Offshore wind power in Sweden—a qualitative analysis of attitudes with particular focus on opponents	Wind power, Attitude, Qualitative case study
[55]	Sustainability: Science, Practice and Policy	2011	Jenny Palm	Linköping University, Sweden	Motives for and barriers to household adoption of small-scale production of electricity: examples from Sweden	electric power generation, solar cells, wind energy, electrical equipment, energy consumption, attitude measures, environmental awareness, renewable energy resources
[56]		2020	Anna Åberg, Maja Fjæstad			Sweden Uranium

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Citation	Journal	Year	Author(s)	Authors' location	Title	Keywords
	The Extractive Industries and Society			Chalmers University and KTH Royal Institute of Technology, Sweden	Chasing uranium: Securing nuclear fuel on a transnational arena in Sweden 1971–1984	Nuclear fuel cycle Nuclear history SKBF
[57]	Energy Policy	2015	Staffan A. Qvist, Barry W. Brook	Uppsala University, Sweden and University of Tasmania, Australia	Environmental and health impacts of a policy to phase out nuclear power in Sweden	Resource import Climate change Nuclear power Health impact Electricity production CO ₂ emissions
[58]	Energy Research and Social Science	2014	Lorenzo Di Lucia, Karin Ericsson	Lund University, Sweden and Imperial College London, UK	Low-carbon district heating in Sweden – examining a successful energy transition	District heating Sweden Energy transition Multi-level perspective Systems of innovations
[59]	European Policy Analysis	2017	Maria Rosaria Di Nucci, Achim Brunnengräber	Free University Berlin, Germany	In whose backyard? The wicked problem of siting nuclear waste repositories	Nuclear waste, NIMBYsm, voluntarism, siting, community benefits, wicked problem
[60]	Scandinavian Journal of Forest Research	2019	Johanna Johansson & Thomas Ranius	Södertörn University and Uppsala University, Sweden	Biomass outtake and bioenergy development in Sweden: the role of policy and economic presumptions	Bioenergy; bioeconomy; forest policy; residue extraction; woody biomass
[61]	Energy Research and Social Science	2016	Semida Silveira, Francis X. Johnson	KTH Royal Institute of Technology, Sweden and SEI-Africa, Kenya	Navigating the transition to sustainable bioenergy in Sweden and Brazil: lessons learned in a European and International context	Sustainable bioenergy Energy transitions Sweden Brazil
[62]	Sustainability	2019	Tom Rye and Anders Wretstrand	Transport research institute Edinburgh Napier University, Scotland and Lund University, Sweden	Swedish and Scottish National Transport policy and spend: a social equity analysis	Social, equity, national, transport policy, funding
[63]	Social Sciences	2019	Jessica Berg and Jonas Ihlström	The Swedish National Road and Transport Research Institute, Sweden	The importance of public transport for mobility and everyday activities among rural residents	public transport use, mobility, rural areas, mode choice, time geography
[65]	Third World Quarterly	2017	Rebecca Lawrence and Rasmus Kløcker Larsen	Stockholm University and Stockholm Environment Institute, Sweden	The politics of planning: assessing the impacts of mining on Sami Lands	Planning; Impact assessment; Resistance; Indigeneous; Sami; Sweden
[66]	Arctic Review	2019	Rasmus Kløcker Larsen and Kaisa Raitio	SEI and Swedish University of Agricultural Sciences, Sweden	Implementing the state duty to consult in land and resource decisions: perspectives from Sami Communities and Swedish State Officials	consultation; participation; natural resources; indigenous rights; Sami rights; Swedish law; minority law
[67]	Sustainability	2017	Andreas Lindström, Audun Ruud	Stockholm Environment Institute, Sweden and Norwegian Institute for Nature Research, Norway	Whose hydropower? From conflictual management into an era of reconciling environmental concerns; a retake of hydropower governance towards win-win solutions?	integrated water resources management; the role of hydropower and reservoirs in climate change mitigation and adaptation; governance of water resources in regulated river basins
[68]	Scandinavian Journal of History	2011	Åsa Össo & Patrik Lantto	Umeå University, Sweden	Colonial Tutelage and Industrial Colonialism: reindeer husbandry and early 20th-century hydroelectric development in Sweden	Sami people, reindeer husbandry, hydropower, colonialism
[69]	Renewable and Sustainable Energy Reviews	2015	Thomas Ejdemo, Patrik Söderholm	Luleå University, Sweden	Wind power, regional development and benefit-sharing: the case of Northern Sweden	Wind power, Regional development, Community benefits, Sweden
[71]	Energy Research and Social Science	2014	Øystein Aas, Patrick Devine-Wright, Torvald Tangeland, Susana Batel, Audun Ruud	Norwegian Institute for Nature Research, National Institute for Consumer Research, and SINTEF Energy Research Norway, and University of Exeter, UK	Public beliefs about high-voltage powerlines in Norway, Sweden and the United Kingdom: a comparative survey	Electricity grids, Networks, Public beliefs, Public acceptance, National comparisons
[72]	Journal of European Management & Public Affairs Studies	2014	Vanessa Becker and Anne Werner	Technical University of Applied Sciences, Germany	One step forward, one step back: shale gas in Denmark and Sweden	Denmark, energy, energy policy, fracking, hydraulic fracturing, mining, protest, public acceptance, regulatory politics, Scandinavia, shale gas, Sweden, unconventional gas
[73]	Sustainability	2019	Lisa Hansson, and Lena Nerhagen	Molde Univ Norway and Linköping Sweden + Swedish National Road and Transport Research Institute	Regulatory measurements in policy coordinated practices: the case of promoting renewable energy and cleaner transport in Sweden	Regulatory Impact Assessment; CBA; policy coordination; renewable energy; transport; Sweden
[74]	Energy, Sustainability and Society	2018	Jenny Palm and Elina Eriksson	Lund University and KTH Royal Institute of Technology, Sweden	Residential solar electricity adoption: how households in Sweden search for and use information	Photovoltaics, Adopter, Households, Prosumers, Ideal type, Adoption process, Information, Peer effect
[75]	International Journal of Sustainable Water	2012	Karel Mulder, Olga Petrik, Alireza	Delft University of Technology, Netherlands	Scenario based learning regarding contested articulations of	

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Citation	Journal	Year	Author(s)	Authors' location	Title	Keywords
	and Environmental Systems		Parandian, Fredrik Gröndahl	and KTH Royal Institute of Technology, Sweden	sustainability: the example of hydropower and Sweden's Energy Future	Learning, scenario workshops, hydropower, climate change, biodiversity
[76]	International journal of urban and regional research	2011	Ulrika Gunnarsson-Östling and Mattias Höjer	KTH Royal Institute of Technology, Sweden	Scenario planning for sustainability Stockholm, Sweden: environmental justice considerations	No keywords given
[77]	Journal of Cleaner Production	2015	Sara Gustafsson, Jenny Ivner, Jenny Palm	Linköping University, Sweden	Management and stakeholder participation in local strategic energy planning: Examples from Sweden	Energy strategy Planning Municipality Participation Management
[78]	Energy Policy	2021	S. Ruggiero, H. Busch, T. Hansen, A. Isakovic	Aalto University, Finland, Lund University, Sweden, SINTEF Energy Research, Norway and Kiel University, Germany	Context and agency in urban community energy initiatives: an analysis of six case studies from the Baltic Sea Region	Energy communities Sustainability transition Renewable energy Citizens Urban energy systems
[79]	Energies	2020	Jenny Palm	Lund University, Sweden	Knowledge about the final disposal of nuclear fuel in Sweden: surveys to members of parliament and citizens	Nuclear waste; survey; final repository; Sweden; politician; citizens

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