

Energy and Environmental Justice in China: Literature Review and Research Agenda

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Abstract

Energy and environmental justice (EEJ) is an interdisciplinary field of study that examines the social, economic, and political dimensions of energy and environmental transitions. Studying EEJ in China is crucial as the country accelerates its transition towards environmental sustainability and carbon neutrality, highlighting the need for the development of more equitable energy and environmental policies. This paper offers a comprehensive review of academic research on EEJ in the Chinese context. Our review indicates that Chinese EEJ scholarship has identified instances of injustice in China's energy and ecological transitions and highlighted specific characteristics, including regional disparities, urban-rural inequality, and the disproportionate impact on migrant populations. However, the tendency to apply Western justice principles (e.g., distributive, recognition, and procedural justice) undermines the appreciation of the diverse and contextual interpretations of justice-related research in China. Furthermore, there is a lack of critical justice research that explores the root causes of injustice in China. The review suggests that future research can advance theoretical development by conducting cross-cultural studies, while also adopting a more critical approach that foregrounds the role of power in reproducing injustice. This review is useful for those interested in researching the social justice dimensions of energy and ecological transitions in China.

Keywords: energy justice, environmental justice, inequality, literature review, research agenda, China

1. INTRODUCTION

China is in the process of an unprecedented transformation towards environmental sustainability and carbon neutrality, as part of its commitment to ecological civilization [1–4]. To achieve these goals, the government has introduced a range of policy measures, including investing heavily in renewable energy sources, promoting energy conservation, closing down coal mines, and protecting natural ecosystems such as forests and grasslands [5–10]. Consequently, there is an urgent need to examine the social justice implications of environmental interventions and low-carbon transitions in China [11–13]. Understanding the impacts of this rapid eco-transition

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on marginal socio-economic groups is important in ensuring that the transition is equitable and inclusive [14].

Energy and environmental justice (EEJ) is an important area of scholarship that is concerned with the equitable access to energy and environmental resources, fair share of harms, and equitable treatment of all people by laws and policies [15–17]. This paper provides an overview of academic research on EEJ in the Chinese context. EEJ scholars have raised concerns about the prevalence of Western liberal discourse, which promotes a universal approach to justice [18,19]. These scholars have called into question the universality of the framings and concepts used to understand and define justice, specifically in relation to environmental and energy issues. In light of this, the critical review specifically focuses on how Chinese scholarship can contribute to the theoretical development and empirical research of non-Western energy and environmental justice. We also explore the future research agenda with suggestions to fertilize the theoretical achievements in this field.

The remainder of the paper is structured as follows: Section 2 presents a critical introduction to the literature on EEJ, providing readers with a comprehensive understanding of the diverse meanings of the concept. Section 3 focuses on the literature on EEJ in China, providing a summary of the findings and an analysis of the strengths and weaknesses of the existing scholarship. Finally, Section 4 concludes the review by presenting a research agenda for scholars interested in Chinese EEJ. The first suggestion is the adoption of a cross-cultural comparative approach to enable the plurality of the meaning of justice through “particular, competing, fragmented, and heterogeneous conceptions of discourses” [20]. The second suggestion is to assume a more critical stance, such as by integrating political ecology into EEJ, to identify the root causes of injustice.

2. THEORETICAL BACKDROP: EEJ

EEJ is a multidisciplinary field encompassing both environmental justice and energy justice. The term “environmental justice” was developed in the late 1970s during the environmental movement in the United States, which focused on low-income, colored, and indigenous communities struggling against disproportionate environmental health issues [21–24]. Advocates of environmental justice argue that disadvantaged communities must not shoulder an unequal burden of the damages caused by environmental issues [25], and all citizens must equally be involved in the development, implementation, and enforcement of environmentally-just policies [26]. First-generation environmental justice studies primarily documented injustices in the United States with increasing awareness of the unequal distribution of environmental degradation based on class and racial divides [19,27]. As the field grew, environmental justice scholarship evolved from an early focus on distributional justice to the multiple forms and dimensions of justice. Schlosberg’s radical environmental justice framework, with a focus on distributive, recognition, and procedural justice, together with the capabilities approach, rapidly evolved into a leading analytical framework [19,28]. Menton et al. [27] refer to this research approach as “mainstream” environmental justice.

With the development of globalization and increasingly critical climate crisis, the concept has spread worldwide, especially in the global South [29–33]. For instance, Martin, et al. [34] found that environmental conflicts arose from contested visions of justice among different actors in Rwanda’s payments for ecosystem services. They emphasized that the three commonly defined dimensions of the environmental justice framework are important analytical tools for research into global forest conservation efforts. Sikor et al. [29] recognized that a pluralistic understanding of justice could lead to multiple biodiversity conflicts because different actors varied in their perception of natural resources. They proposed to address justice by adopting an empirical approach to

investigate “how certain notions of justice find support in public discourse, how they may become dominant, and may lose support again” for a mutual understanding among the stakeholders. This empirical approach was further applied in conservation equity studies [32,35–37].

More recently, a critical environmental justice body of literature called for an expansion of environmental justice beyond the aforementioned justice dimensions with the critique that the environmental justice framework ignores the multi-scalar power structures of justice [38]. Some scholars suggest connecting political theories with environmental justice studies. For example, Svarstad and Benjaminsen [28] revisited the radical environmental justice framework through a political ecology lens and suggested that the radical environmental justice framework would benefit from engagements with various power theories. Le Billon and Duffy [39] point out that political ecology’s emphasis on uneven power relations is important for environmental justice research because the pursuit of environmental justice is the goal of political ecology, and its structural violence approaches are conducive to addressing environmental injustices. Drawing on the perspective of political ecology, Gonzalez [40] explored the accessibility of environmental justice for citizens who are adversely affected by pollution problems. Furthermore, scholars have criticized the lack of engagement of environmental justice studies with the decolonial theory [19]. In line with this critique, Menton et al. [27] claimed that the sustainable development goals failed to incorporate explicit justice. They point out that the transformation towards a sustainable future must pay more attention to power dynamics and complex interactions among injustices. As such, environmental justice frameworks need to move beyond a focus on the principles of mainstream environmental justice (e.g., distribution, procedure, and recognition justice) towards a more intersectional decolonial approach [27].

Energy justice is a newer concept. Rooted in environmental justice [23,41–48], the concept of energy justice has emerged within the last decade [49]. Energy justice scholarship has developed as a burgeoning research area with a focus on the ethical, philosophical, and moral aspects of contemporary energy challenges [50]. The widely adopted definition of the concept, provided by Sovacool and Dworkin, defined energy justice as “a global energy system that fairly disseminates both the benefits and costs of energy services and one that has representative and impartial energy decision-making.” [51]. This definition suggests that all people should have access to reliable and affordable energy services, without being disproportionately burdened by the negative impacts of energy production and consumption.

Similar to the evolution of the environmental justice concept, the concept of energy justice has evolved from the initial distributional problem of energy resources [52] to include the three justice principles (distribution, procedure, and recognition) as the “tenets”. Distributional justice is about the physical and spatial dimension of energy and possible unequal distribution of costs and benefits of energy supply and consumption [50,53]. Procedural justice requires transparent, inclusive, non-discriminatory participation in the decision-making process, especially of the most affected groups [54–57]. Justice as recognition focuses on how marginalized and deprived communities can achieve cultural and political respect with recognition of the local indigenous communal identity and traditional way of life [53,54,58]. Energy justice scholars have developed the three-tenet framework as the “conceptual, analytical, and policy-oriented decision-making tool” [59]. This framework has been applied in empirical studies to reveal and evaluate the source of injustices, their primary victims, and their impacts [60,61]. However, the three dimensions of justice privileged the universalist notion of justice within a western context [54,62], which raised concerns that the Western understanding shapes the background of the concept, making it less easily transferrable to other cultures [63]. Therefore, scholars like Sovacool et al. [62] call for the involvement of “non-Western justice theorists.” Moreover, scholars pointed out that, as a research field that focuses on justice concerns within the global energy system [61] there is further need for

energy justice-led attention for the developing world as there are new challenges in developing countries that require further exploration and theory development, which differ from those in developed countries [64].

In sum, the EEJ scholarship focuses on identifying and analyzing the unequal distribution of environmental and energy-related harms and benefits. However, the liberal conceptions of EEJ have enforced the assimilation of Western discourses and practices in the global South. Vermeylen [18] questioned how EEJ, as a field of study rooted in and characterized by universal values and norms, could respect divergent epistemologies and ontologies. The author pointed out that even though the EEJ concept could be adapted, to some extent, to local circumstances and reformulated as being adaptable to different geographical contexts, it eventually becomes entrenched or sedentary in particular interpretations, thereby, evolving as a form of hegemonic power, looking for unity, dispassion, and detachment, which reinforces the issue of misrecognition [18]. The application of the three-tenet framework, most problematically, leads to very predictable results and stifles other approaches to conceptualizing justice. This view was echoed by Álvarez and Coolsaet [19], who criticized the tendency to transpose Western concepts and frameworks to the global South and run the risk of being ineffective and producing additional injustices. Particularly, the West-centered justice framework, conceptualized by Western academics as the sole source of comprehending justice concerns, risks undermining its emancipatory power and deepens some of the injustices that it claims to address [19]. Likewise, Menton et al. [27] criticized that EEJ could promote domination and misrecognition because it was theorized under Western norms and failed to account for the perspectives and desires of majority-world groups. Therefore, they explicitly pointed out that the EEJ frameworks needed to move beyond the basic principles and pay attention to “the complexity of the intersectionality of marginalization and injustices”. In short, there have been consistent calls for the involvement of non-Western epistemologies and ontologies in EEJ scholarship to broaden the theoretical perspectives and develop new crosscutting social science agendas for exploring injustices [7, 61, 62, 64–69].

3. EEJ IN CHINA

The EEJ scholarship first emerged in China in the early 2000s with a focus on introducing its Western origins into Chinese analyses. The existing literature has indicated that Chinese environmental justice issues have certain common features with international studies. Vulnerable groups, such as low incomes earners, rural residents, and migrant workers, are the predominant focus of environmental justice research. Environmental injustice reflected in these groups ranges from exposure to environmental hazards [70–75], to the low accessibility to green spaces, such as urban parks and ecological attractions [76–79], to the unfair treatment of environmental and climate policies [7, 12]. For example, studies have shown that the distribution of polluting enterprises exemplifies environmental injustice, whereby low-income areas, including migrant residences, attract polluting firms to enter, whereas fewer firms are found in areas with highly educated groups and ethnic minorities [70, 71]. Moreover, environmental justice research in China has largely drawn on the disparity in the impact of air pollution. For example, in Beijing, studies indicated that PM_{2.5} exposure has a causal relation with housing prices [74]. Beijing commuters with low wealth levels are exposed to 13% more PM_{2.5} per hour than those with high wealth levels when staying at home. These findings are echoed by others who found that residents of public low-rent housing, who were characterized by low income, underemployment, and poor educational attainment, were the economically disadvantaged group and suffered higher static and air pollution exposure, especially in southern Beijing [72]. In addition, beyond the injustices of environmental risks, the disparity between socioeconomic strata reflects environmental benefits,

such as the accessibility of green spaces. For instance, Wang et al. [76] found that people with higher incomes had the best park accessibility in Shanghai. The same was reflected regarding socioeconomic disparities in terms of green space accessibility and its quality, including green infrastructure and ecological attractions [77–79].

The fact that socioeconomically disadvantaged groups are more likely to bear environmental costs has led to discussions regarding race-based models of environmental justice among scholars. Some pointed out that, similar to the racial minorities of the U.S., rural residents, as identified by China's household registry system, shoulder a disproportionate environmental burden. In contrast, Liu [80] argued that environmental justice in China is embedded primarily in occupational differences. The author stressed that since minority groups are not discriminated against during employment opportunities, as a result of the "racially neutral" national policy, the concept of environmental justice in China is "very different from its original racial and income-based meanings defined by the environmental justice history of the United States".

The debates remain primarily focus on the distributional aspect of environmental justice, with limited acknowledgment of procedural and recognitional justice. This understanding of environmental justice is not limited to academics. Empirical studies that investigate the notions of justice held by local stakeholders in diverse fields such as China's Sloping Land Conversion Program [32], tourism development in protected areas [35], and marine management [37] also find that distributive justice is the primary concern for villagers and local officials, despite differences in their specific notions. Similar outcomes were identified by other scholars, such as Li, et al. [81] who highlighted that compared with procedural and informational justice, distributive and interpersonal justice are more related to residents' trust in the government. However, He et al. [36] found that the combination of distributive, procedural, and recognitional justice was an important factor that contributed to successful community forestry. In addition, the capabilities approach was interpreted with regard to environmental justice, which referred to the diverse demands of concerned parties and the freedom to choose, a subject rarely discussed in the Chinese context [82]. To date, to the best of our knowledge, only one research has focused on the plural epistemologies of environmental justice from the capability dimension through a case study of a global e-waste salvaging hub – Guiyu in China [83]. The research found that, contrary to the common consensus that e-waste is an environmental hazard, the moral issue becomes complicated and contested when local salvagers treat e-waste as resources, livelihoods, and wealth such that they are willing to pollute their environment and take health risks for what they value as a "worthy life" [83].

Nevertheless, a number of pioneering studies have engaged with the procedural and recognitional aspects of environmental justice, paving ways to understand the authoritarian approach employed by China and the resultant injustices. Through an empirical study of the coal-to-gas heating projects in rural Northern China, Hu [84] explored the forms of injustice by applying the justice framework – procedural injustice caused by the low level of participation and lack of information disclosure between the decision-makers and the stakeholders, and distributional injustice related to the uneven distribution of the benefits and costs between the rural and urban areas. The author suggested that restorative justice was a more possible and feasible approach to remediate the injustices since the opportunities to seek procedural justice are limited in the Chinese context. Focusing on injustice in the hydropower resettlement process and its impacts on the resettled households, to three different tenets of environmental justice. Zhao, et al. [85] highlighted a lack of fairness, transparency, and accountability in decision-making caused recognition injustice. Furthermore, procedural injustice largely drew on the limited participatory rights in the decision-making process.

From a spatio-structural perspective, environmental justice research in China has primarily focused on issues related to regional disparities, urban-rural inequality, and certain groups of

the population such as migrant workers. Regional disparities refer to the uneven distribution of environmental benefits and burdens between the eastern regions (more developed regions despite limited natural resources) and the western regions (less developed regions with relatively rich natural resources). The western regions, historically, have made significant contributions towards the economic development of the eastern regions by transferring abundant mineral reserves to the east [86]. However, these regions are battling serious environmental destruction caused by resource extraction activities, along with a lower level of industrialization, urbanization, and modernization than their eastern counterparts [12,80]. Ling, et al. [87] indicated the unequal distribution of goods and services in China's West-East Energy Transmission program because a large amount of SO₂ emissions from Northwestern China was produced due to the virtual energy demand for the consumption of the well-developed regions of eastern and southern China. Fang, et al. [88] found that the national carbon emission rights allocation mechanism, based on regional population size, ecologically productive land, GDP, and fossil energy resources, is unfair to the coal-supplying provinces (e.g., Shanxi and Inner Mongolia), leaving behind degraded environment yet receiving few carbon emission quotas. Furthermore, as some scholars observed, the rapid low-carbon transition in China has imposed unfair burdens on extractive regions [89,90]. Lo [90] highlighted that low-carbon transition in extractive areas intensified the pre-existing regional disparity. Rather than benefiting, environmental objectives were achieved by sacrificing the interests of the extractive communities. Most of China's coal-rich provinces are located in inland regions, which have faced longstanding regional disparity due to the difficulty of attracting investment. As such, these areas are facing severe economic and social challenges, such as widespread unemployment and increasing local revenue reduction [89].

Urban-rural inequality is closely related to China's rapid urbanization, whereby rural residents have limited income sources, educational facilities, employment opportunities, and social security [80,91]. In addition, they bear higher environmental risks due to the uneven distribution of polluting enterprises that are more likely to be attracted to rural areas with lower land prices [70,92]. The vulnerable groups of various populations often have distinct socioeconomic determinants associated with the household registration system (*hukou*) [93]. The household registration system is one of the oldest and most prominent institutions of social governance in China, first established in the 1950s under the tutelage of the Soviet Union. Under this system, citizens are registered based on geographical locales and the rural-urban type and its effects on income, education, and life courses [93]. Studies have shown that China's household registration system has "led to the social exclusion of migrant workers in the urban environmental policy-making process, which ultimately translates into an unequal distribution of environmental benefits among cities" [93]. For instance, Hu [84] revealed that tremendous injustices have been faced by the rural, elderly residents in the coal-to-gas heating transition project. Shen, et al. [94] pointed out that China's imbalanced social-political structures, such as the prominent urban-rural divide, determine that people with lower socioeconomic status are more vulnerable to environmental policies. With a focus on the reallocation of laid-off coal miners in a coal-based city in the north of China, Wang and Lo [7] pointed out the disparate impact of coal mine closure on state-owned and private coal workers, where the former enjoyed a high level of job security within the state-owned system and the latter, who were mostly of rural origin and held a rural *hukou*, were laid-off without adequate compensation and job assistance, despite both groups doing the same work. Furthermore, migrant workers—rural people who leave their lands for urban areas, are regarded as "out-group" members with unfavorable social categorization and weak political power [93], being exposed to more pollution, which makes them particularly vulnerable to occupational diseases due to the worsening working conditions [80].

Conflicts and disputes associated with the environmental pollution in China have increased

over recent years. Yet, unlike the large-scale social movement of the early 1980s in the United States to fight the unfair distribution of environmental benefits and burdens [95], environmental injustice in China has not attracted the same level of attention [96]. Scholars observed that this may be due to the low socioeconomic status of certain groups who are disproportionately impacted by environmental degradation. Even if they express an awareness of the health risks of living and working with pollution, they tolerate the situation by seeking compensation for contaminated water and lost land from the industries [97,98]. In recent years, combining environmental conflicts with legal and regulatory innovations has developed a new pattern for accessing environmental justice for citizens through public participation [99]. For instance, one of the few studies incorporated environmental justice into local villagers' opposition to an incinerator in Hebei Province. The empirical study showed that the local campaigners successfully framed environmental justice claims in the language of procedural justice. This allowed their interests to merge with the interests of the professional anti-incineration campaigners by exposing fraudulent public consultation in the environmental impact assessment in terms of public participation in siting decisions [100].

Environmental justice is interpreted broadly in China to imply the need for better environmental governance and the enforcement of environmental laws [80]. This is evidenced in the existing literature where scholars frequently link environmental justice with legal scholarship [80,96,97,99]. Mah and Wang [97] highlighted that the concept of environmental justice resonated with the cultural ideas of justice and equity (*gongzheng*) within long-standing Chinese legal traditions. This idea was echoed by other legal scholars like Ke [96] who suggested that the legal recognition of environmental justice should be incorporated into China's environmental laws. Addressing the environmental injustices in China, it was pointed out that environmental public interest litigation is an important means to achieve improved environmental justice for the entire society [80], given the fact that a disproportionate impact of environmental degradation on certain groups of people could not capture the government's attention [96]. The use of the term in the Chinese context has been premised largely upon the utilitarian principles of achieving the greatest good for the greatest number [96]. Therefore, pursuing public interest, rather than the notion that all races should equitably share in the burdens and risks of hazardous waste facilities, is closer to the notion of justice in China. For example, in a Chinese empirical study, villagers who were suffering from tungsten mine pollution sought environmental justice through a petition [101]. The author indicated that rather than focusing on individual interests, seeking "public interests" was the key motivation of the local resistance. The organizer claimed that he would rather offend the powerful mining companies to ensure that future generations could enjoy a better natural environment [101].

Turning to energy justice, studies have pointed out that unlike the energy transition processes in liberal democracies that are characterized by voluntariness, participation, and gradualness, the formulation and implementation of China's energy policies featured strict command-and-control policies and a non-participatory policymaking process to quickly and effectively side-step the need of promoting "rapid" energy transition [102]. It is, thus, imperative and urgent to gain knowledge about the causes, patterns, and implications of social justice regarding the transitions caused by policy interventions in authoritarian regimes [11].

Energy justice scholars in China have applied the three-tenets-based analysis framework with a focus on revealing the injustices [84,85], as well as discussing how energy justice is associated with China's energy reform and the Chinese viewpoint of energy justice based on harmonious thought [103,104]. Hu's research paved the way to understand the authoritarian approach employed by China and the resultant energy injustices through an empirical study of the coal-to-gas heating projects in rural Northern China [84]. The research explored the forms of injustice by applying the energy justice framework – procedural injustice caused by the low level of participation and lack of information disclosure between the decision-makers and the

stakeholders, and distributional injustice related to the uneven distribution of the benefits and costs between the rural and urban areas. The author suggested that restorative justice was a more possible and feasible approach to remediate the injustices since the opportunities to seek procedural justice are limited in the Chinese context [84]. Focusing on energy injustice in the Chinese hydropower development-induced resettlement process and its impacts on the resettled households responded to three different tenets of energy justice. Zhao et al. [85] concluded that distributional injustice resulted from an unbalanced distribution of costs and benefits from hydropower development, and a lack of fairness, transparency, and accountability in energy decision-making caused recognition injustice. Procedural injustice largely drew on the limited participatory rights in the decision-making process [85].

In addition to the application of the energy justice framework, the literature on Chinese energy justice focuses on the uneven distribution of the benefits and burdens between the developed and undeveloped regions in China. This is similar to the environmental justice research being predominately associated with China's regional disparity. Ling et al. indicated the unequal distribution of goods and services in China's West-East Energy Transmission program because a large amount of SO₂ emissions from Northwestern China was produced due to the virtual energy demand for the consumption of the well-developed regions of eastern and southern China [87]. With a focus on carbon emission rights allocation, Fang et al. came to a similar conclusion that the carbon emission rights allocation mechanism, based on regional population size, ecologically productive land, GDP, and fossil energy resources, led to the coal-supplying provinces, such as Shanxi and Inner Mongolia, leaving behind destroyed ecological environment yet getting less carbon emission quotas [88].

Studies have also analyzed energy justice from a policy perspective. Wang and Yang posited that the theory of energy justice, especially distributive and intergenerational justice, has been gradually being integrated into China's energy reform practices through marketization, humanization, and ecologicalization [103]. Other policy scholars have attempted to theorize energy justice beyond the traditional individual rights theory and suggest that the concept of "harmony" in traditional Chinese philosophy and culture could shed light on the global issues of energy justice [104].

4. CONCLUSION AND RESEARCH AGENDA

This paper reviews the existing literature regarding EEJ in China. Overall, EEJ studies in the Chinese context has convincingly highlighted the social justice issues in China's energy and ecological transitions, including regional disparities, urban-rural inequality, and migrants and other lower socio-economic groups being disproportionately affected by the negative impacts of energy and environmental policies. The rich variety in EEJ scholarships has provided a solid starting point in the field. However, studies in this area are far from adequate, especially in critical justice research. This could be related to the fact that justice is a politically sensitive concept in China and empirical studies that reflects social and inequality problems could be considered by the party-state as threatening to stability [105,106]. Furthermore, in the existing literature, there is a tendency of applying the justice-principles-based analysis framework albeit studies are conducted against distinctive social backgrounds. Some scholars have pointed out the challenges of applying theories of Western origin to China [107], since the Western mainstream understanding of justice concepts is less easily transferrable to other cultures [63]. Therefore, rather than simply calling for an increase in related research in China, it is important to develop a more complex and culturally rich understanding of the plurality of the meanings of EEJ.

The most significant gap in the Chinese literature is the lack of critical engagement with the concept of power—studies that examine power relations as the underlying causes of environmental

and energy injustice. Concepts such as political economy and political ecology overlap with EEJ in the involvement of critical studies of environmental interventions; however, they are rarely discussed together in the Chinese context. Political ecology is a transdisciplinary research field that has become an important approach for understanding human-environment relations [108]. Political ecology is rooted in Marxist political economy and cultural ecology with recognition of uneven power relations and politics within environmental degradation processes and struggles over resources. Therefore, power asymmetries and social inequalities are critical to understanding the power relations between society and nature, embedded in social interests, institutions, knowledge, and imaginaries. In addition, political ecology is defined as the study of environmental conflicts [109, 110], whereby conflict is conceptualized as “a recurring, historically-driven, and multi-scalar socio-environmental process” [39]. Thus, a focus on conflicts through an analysis of the powers exercised by the implementors and resisters of environmental interventions would offer a conceptual starting point to elaborate on an understanding of justice associated with politics [111]. Hence, conflicts over environmental justice are a central concern in the field of political ecology [20].

Given the connections between the two fields, political ecology offers a distinctive approach to understanding the meaning of power and its utilization, thereby, enriching EEJ scholarship by refining and expanding its theoretical and political repertoire [111]. For example, focusing on the connection of political ecology with peace and conflict studies, Le Billon and Duffy [39] highlighted the uneven power relations in the struggles over resources and the environment, and in engaging with socio-environmental relations and materiality through discussions about the three domains of EEJ conflict – renewable resources, extractive sectors, and climate change [39]. From a global perspective, Hornborg [20] linked EEJ with the political ecology of the money-energy-technology complex to rethink the ontology of modern technologies. The author criticized that the distribution of given energy technology is inherently contingent on asymmetric global transfers of biophysical resources, and the accelerating production of entropy has become the new social instrument of displacing work and environmental loads to other parts of the world-system. Looking back at the national development of green industries, Brock, et al. [112] indicated how the supposed promotion of “energy democracy,” “greenness,” and “cleanliness” of industrial-scale renewable energy generation reinforces environmental injustices and degrees of environmental racism through a case study of “sacrifice zones” in Germany. The authors critically pointed out that the so-called green industry is nothing more than “a continuation of the old patterns of accumulation and degradation” to open new “green” markets in the accelerating climate crisis through state involvement.

In this regard, EEJ issues in China can be discussed from a broadly political-economic perspective and through the multi-scalar lens with the recognition of the linkages between local, regional, and global scales. This would offer the chain of explanation to understand the root causes of environmental injustices in China [113]. As such, scholars can move beyond the “universal” Western interpretation of justice and examine the understanding of justice rooted in China’s distinct socio-political contexts. Without a contextual understanding of the power relations of justice, injustices will hardly be distinguishable; thereby, the efforts to restore justice would never start.

Furthermore, analyzing EEJ from a cross-cultural perspective can gain a deeper appreciation of the variegated epistemologies and ontologies with regard to the conception of justice. For instance, concerning Confucian views of justice and Western justice theories, there is broad agreement among the existing literature about the difference in their “concept of rights” [114–117]. The Western culture stresses equality, individual rights, and freedom, while Chinese justice emphasizes morality, exemplarity, and duties [114, 115]. Therefore, questions arise about the notions of justice that are advocated in the environmental sector by the Chinese ruling elites. Is there any

difference between the Western-dominated understanding and the Chinese understanding of the environmental justice concept? If yes, the Chinese Confucian view of justice may provide an important perspective for facilitating the advancement of environmental justice theory. This is in line with the call to inject a wider ontological understanding of the philosophies of recognition that inform contemporary political discourses [18]. At the same time, it is important to recognize that China is inhabited by diverse ethnic groups, and studies on how different ethnic groups in China understand environmental justice remain inadequate [15].

EEJ discussions beyond Chinese academia remain rare, which suggests that the academic debates have limited power influencing policy thus far. The concept has rarely been used by environmental non-governmental organizations in China nor has it appeared in mainstream news reports or government discourses, even though severe pollution has become a crucial environmental issue due to the country's rapid industrialization. Recent research showed that rather than considering the structural problems, possible causes of environmental injustices, or voices of vulnerable groups affected by pollution, the notion of EEJ mentioned in China's state-sponsored media mainly emphasizes the governmental efforts to deal with pollution [118]. This means that academics have the duty to champion the cause of EEJ by critically examining the unfairness in environmental and energy transitions, as well as finding solutions to achieve the objective.

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