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# China and Climate Change: Towards a Socially Inclusive and Just Transition

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EDITORIAL

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# China and Climate Change: Just Transition and Social Inclusion

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## Abstract

China aims to transition from a carbon-intensive economy to carbon neutrality before 2060. Although climate change policies commenced in 2007, this goal remains extremely challenging. Reporting on China's progress, the articles in this issue refer to three concepts. Ecological civilization is a political construct framing China's policy response to climate change and environmental degradation; its "thin" version refers to sustainable development and modernisation, but it also describes a higher form of civilization to replace industrial society. Environmental authoritarianism describes a top-down system of governance or policy implementation that engages in minimal public participation; several of the articles report China's green policies to be of this type. Just transition is a multifaceted evaluative concept employed in most of the articles to comment on the process or outcome of China's climate change policies. The policy context is explained, before reviewing results from authors' application of these concepts and offering a summary conclusion.

## Keywords

China; climate change; ecological civilization; environmental authoritarianism; just transition

## 1. Introduction

China, with the world's second-largest economy, is the world's largest polluter (Lin & Zhang, 2023; Yuming Zhang et al., 2022). It is also the world's largest producer of renewable energy and is engaged in an ambitious pollution control and decarbonisation strategy, commenced in 2007, the scale of which overshadows all others. Moreover, the success in reducing pollution is demonstrable with the Chicago-based Energy Policy Institute concluding, in 2023, that "the Chinese government's air pollution reduction strategies have largely allowed the country to win its war against pollution" (EPIC, 2023a). The articles assembled in this issue of *Social Inclusion*

collectively consider who is bearing the costs of this economic transformation to a cleaner, greener future, and whether the distribution of costs can be considered just.

The intention here is to situate the articles by briefly describing the scale of the pollution and climate threat that China must address and outlining some of the policies that it has put in place that appear to have proved remarkably effective. Turning to the social costs of China's policies elucidated in the subsequent articles, attention is drawn to concepts and themes that unite the authors' approaches before drawing some broad conclusions.

## 2. China: The Great Polluter

Since China opened its economy in 1978, the government has prioritised economic growth with remarkable results. Its economy has grown 120-fold with average annual growth rates exceeding nine percent, the urban population has almost quadrupled (to 64 percent in 2022), and over 800 million individuals have been lifted out of poverty (Climate Change Knowledge Portal, 2023; see also www.macrotrends.net).

However, the environmental and social costs have been considerable. Its total carbon dioxide emissions exceed those of the US, the European Union, and India combined (Friedlingstein et al., 2023). It consumes and produces more energy than any other country, having overtaken the US in 2010 and 2006 respectively (BP. (2011). Moreover, its energy use is less efficient than that of the US with the heavy reliance on coal as a source of energy helping to explain high carbon dioxide emissions. These continued to increase in 2023 whereas those in the US and Europe declined. China is the thirteenth most polluted country in the world, with an average life expectancy reduced by 2.5 years according to WHO guidelines on particulates (EPIC, 2023b).

Coal production in China has grown year on year since 2016, its use for electricity generation compensating for the recent fall in demand for cement and steel manufacture associated with the restructuring of the construction industry. New coal power production permits granted in 2022—increasing capacity by 106 GW—were 60 percent higher than in 2021 (EIA, 2023). While China's production and consumption of oil fell in 2022, this was the first decrease since 2001 and was largely attributable to the 48 percent decline in the demand for jet fuel following the Covid-19 pandemic. Natural gas production has increased each year since 1989, and the target for gas storage set for 2025 is double that available at the beginning of 2023.

With the world faced with the existential threat of climate change, China has come under enormous international pressure to reduce emissions. Although active in the United Nations Conference of the Parties (COP) on climate change, its proposal to achieve carbon neutrality before 2060—a decade behind the norm—has been heavily criticised. Likewise, China was widely blamed (alongside India) for the failure of the COP26 meeting in Glasgow to agree to phase out coal production (Harvey & Mason, 2023). It was similarly accused of preventing agreement to phase out fossil fuels at the COP28 meeting in Dubai in 2023 where it was agreed merely to "transition away" from them (Williams et al., 2023). The US and its allies have also argued that China should contribute to meeting the costs of loss and damage suffered due to climate change (Colman & Mathiesen, 2022; Woodroofe, 2023). Indeed, some have argued that climate change has been weaponised against China in its global competition with the US (Freymann, 2022). One reason given for the increase in coal production since 2016 (after a period of decline) is fear of fuel insecurity following much talk

of the US imposing a naval oil embargo on China (Collins, 2018). Another reason is China's exposure to the negative effects of climate change—most notably, record-breaking temperatures boosting energy use for air conditioning. Separately, China has a high exposure to cyclone damage (ranked sixth in the world), flooding (ranked 13th), and drought (ranked 55th), and is investing heavily in adaptation and mitigation (Climate Change Knowledge Portal, 2023; MEE, 2022).

## 3. China: The Great Reformer

When account is taken of China's population size, the level of its emissions ceases to look exceptional; in 2023, China ranked 22nd—one place ahead of the United Kingdom—while the US ranked third behind the United Arab Emirates and Australia (CGDev, 2023). Furthermore, as LIU Zhe and ZHANG Ying explain in this issue, China's late industrialisation means that its historic emissions are low, not justifying inclusion in Annex II of the UN Framework Convention on Climate Change listing governments that have a special obligation to provide financial resources for developing countries (Z. Liu & Zhang, 2024).

China's solar and wind energy capacity in 2020 was greater than that of the other top six countries combined and it is ahead of schedule to more than double this capacity by 2025 (Myllyvirta & Zhang, 2023). Moreover, installed capacity for renewables (including nuclear) exceeded that of fossil fuels energy for the first time in 2023 although coal still supplied some 60 percent of China's energy consumption. This apparent discrepancy is because the maximum output of renewables used to assess capacity is conditional on optimal climatic conditions but also due to the challenges of long-distance energy transmission. Much of the production of wind and solar energy is concentrated in vast "energy bases" in the desert areas in Gansu and Inner Mongolia whereas consumption is concentrated in China's eastern provinces.

While coal production continues to increase, as ZHANG Ying, MIAO Dan, HOU Xiangding, and JIA Mingjie (Ying Zhang et al., 2024) note in this issue, direct employment in China's coal industry declined from approximately 4.3 million in 2012 to 2.6 million in 2022. More efficient coal production, combined with newly commissioned coal-fired power stations substituting for older ones, serves to enhance the average productivity of the entire system of coal-fired electricity generation. Moreover, the expectation is that coal-fired plants will primarily be used to flexibly complement—rather than compete with—green energy production and that therefore total emissions will peak in 2024 rather than in 2030 as originally envisaged. The turn to greener energy is also witnessed by the fact that China leads the global production of electric vehicles with some 300 companies producing 6.3 million units in the first nine months of 2023, an increase of 34 percent in a single year (Fastmarkets team et al., 2023; Reid, 2023). Moreover, although pollution remains high, it has reduced the volume of $PM_{2.5}$ particulates by 70 percent since 2007, when it was the world's second most polluted country. Still, particulate pollution in Beijing remains 40 percent higher than in the most polluted county in the US, and 30 percent of China's population lives in areas that fail to comply with national standards on air pollution.

China, then, is amid a major structural transition. In 2014, a few months after the publication of the National Air Quality Action Plan, Premier Li Keqiang announced a war on pollution focused on three areas, Beijing–Tianjin–Hebei, the Pearl River Delta, and the Yangtze River Delta, with quantitative targets for reducing $PM_{2.5}$ particulates by 2017. Strategies included career incentives for relevant public officials, prohibition of new coal-fired power stations, promotion of renewables, and controls on vehicle emissions.

The targets were all met with reductions equivalent to those the US achieved only three decades after the passage of the 1963 Clean Air Act (EPIC, 2023a).

As YAN Chunhua and LUO Yajuan explain in this issue, President Xi Jinping, speaking at the 75th United Nations General Assembly in 2020, surprised many commentators with the announcement that China would achieve peak emissions before 2030 and carbon neutrality before 2060. The surprise might have been less had commentators recalled that, in June 2007, China had been the first developing country to implement a national programme to combat climate change and that, in 2009, it set targets to reduce greenhouse gas emissions (PMPRCUN, 2007; B. Wang & Gopal, 2023). Whereas these emissions had increased by 230 percent in the decade to 2010, they rose by only 18 percent during the following ten years.

Later in 2007, the term "ecological civilization" (subsequently variously translated as "conservation culture," "ecological progress," and "ecological conservation") was introduced into the Chinese policy pantheon by the *Report of the 17th National Congress* of the CPC (Xue et al., 2023). By 2012, ecological civilization had been incorporated into the Constitution and President Xi Jinping's "Chinese Dream" (Harrell, 2023). The term serves as a meta-goal to plan development from the perspective of the harmonious coexistence of human beings and nature, as when discussed by the 20th National Congress of the CPC. It also functions as a policy descriptor when referring to the six batches of "demonstration zones" intended to evolve, test, and demonstrate the benefits of a circular economy and ecological protection and which now involve 468 counties, districts, and cities (Xue et al., 2023).

By 2016, China had already announced its intent to peak emissions around 2030 when it also determined to increase the share of non-fossil fuels to 20 percent by 2030 (B. Wang & Gopal, 2023). The 13th five-year plan (2016–2020) capped total energy consumption and included targets for reducing carbon intensity and for cutting the share of coal-based energy consumption, targets that were updated in the 14th five-year plan (2021–2025) that referred to reducing coal consumption during the 15th five-year plan period (2026–2030). In 2021, President Xi announced a 1+N policy framework which has subsequently spawned multiple policy documents and quantitative targets appertaining to renewable energy production, phasing down of fossil fuels, reduced consumption and more efficient energy usage, recycling and reusable resources (De Boer & Fan, 2022).

## 4. Approaching China's Ecological Civilization

The eight articles in this thematic issue are organised in pairs. The first two, the first by LIU Zhe and ZHANG Ying, the other by ZHOU Ronghui, are contextual—the former locating China internationally, the latter problematising the concept of ecological civilization (see Z. Liu & Zhang, 2024; Zhou, 2024). The next two articles, one by ZHANG Guanli and ZHANG Bingyi (G. Zhang & Zhang), the other by ZHANG Ying, MIAO Dan, HOU Xiangding, and JIA Mingjie (Ying Zhang et al., 2024), both address the challenge of decommissioning China's coal industry—the first reviewing progress to date, the second perusing the future. The article by LIU Yijun, CHEN Ajiang, and LIU Zhuxiang (Y. Liu et al., 2024), as well as that by JIA Wenjuan and YOU Siyu (Jia & You, 2024), focus on green electricity—its production in the former, some employment implications in the latter. The final two articles examine difficult choices arising from prioritising the environment when pursuing economic development and the consequences of not listening to local voices. YAN Chunhua and LUO Yajuan report on a carbon sequestration scheme in rural Zhejiang province (Yan &

Luo, 2024), while HU Xiaohui, TANG Wu, ZHANG Xuliang, and JIE Dongzheng (Hu et al., 2024) explore the spatial distribution of social costs associated with ensuring clean water supplies.

### *4.1. Ecological Civilization*

Zhou (2024) approaches the concept of ecological civilization obliquely through the lens of education. The United Nations has been advocating that schools globally include education about environmental issues since 1975 and on sustainable development since the Rio Summit in 1992. With the 2015 global agreement on the sustainable development goals (SDGs), the scope of sustainable development was expanded to embrace content relevant to almost all of the 17 goals including sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and culture's contribution to sustainable development. China's primary and secondary school syllabi have included elements on sustainable development since 2003 but revisions implemented in 2017 under the banner "Enhancing Ecological Civilization Competence," though broader than before, remained exclusively environmental. Educationally the new syllabus promoted responsible consumption, politically it legitimated continued economic development albeit of a greener hue.

In their articles, Hu et al. (2024), G. Zhang and Zhang (2024), and Yan and Luo (2024) all follow Zhou's narrow interpretation of ecological civilization, namely as a policy descriptor rather than as a meta-goal. This interpretation focuses on both development and Chinese modernisation, acknowledges past mistakes in creating pollution and land degradation, and recognises that, for economic growth to continue unabated, it must be kinder to nature, even reparative. Sometimes, in Chinese academic literature and the interpretation of Xi Jinping's speeches, the concept of ecological civilization is seen as being more expansive and transformative (X. Liu, 1999; "Speech at a ceremony," 2021; Y. Wang, 2020). This perspective is one of cultural succession in which primitive, agricultural, and industrial civilizations that have become increasingly exploitative are to be replaced by a higher form of civilization. Ecological civilization will reflect socialist principles of fairness and justice and Chinese concepts of harmony between man and nature with a different ontology and ideology and, therefore, new values and practices.

In practice, the pursuit of ecological civilization has, as Ying Zhang et al. (2024) explain, evolved into both a government-led top-down initiative and a growing number of grassroots greening projects. The top-down strategy tends to take the form of national proclamations of government intent, largely consistent with China's stated intentions under the United Nations' COP system on climate change. The proclamations are then interpreted by lower levels of government and policies implemented that are intended to be consistent with the concept of ecological civilization by demanding changes in the behaviour of industries and individuals. This process is arguably deeply rooted in Chinese socialist ideology and cultural philosophy, emphasizing social justice although the results are not immune to criticism (Huang et al., 2021).

### *4.2. Environmental Authoritarianism*

Many authors, perhaps most notably Gilley (2012) and Lo (2021), have characterised China's approach to environmental issues as "environmental authoritarianism," which Gilley (2012, p. 287) succinctly defines as "a non-participatory approach to public policymaking and implementation in the face of severe environmental challenges." Zhou (2024) recognises that a centralised, hierarchical system can, "albeit restraining social justice,"

enable "fast and rigorous responses to environmental crises compared to democratic environmentalism." In the educational sphere, this permitted a rapid change in policy priorities but left front-line educators as "receivers of change," finding interpretation exceedingly difficult since they lacked adequate training and resources.

G. Zhang and Zhang (2024), researching coalmine closures in Liupanshui, document the negative consequences of driving a top-down policy at speed. Reacting to national directives, 55 mines were to be closed within five years. Targets and timetables were set far from the metaphorical and actual coalface leaving local officials and coal producers with as little as three months to close plants down. The necessity to hit targets meant little local consultation, limited strategic planning, short time horizons, and cost minimalization with the result that the social costs of closure were carried principally by the least powerful, those without voice. Private mines rather than state-owned pits were closed, staff without redundancy rights were laid off, and the consequences for local communities were ignored, while both up- and downstream enterprises were left to their own devices.

Y. Liu et al. (2024) introduce a second example where ecological and climate priorities appeared paramount in the eyes of policymakers. Largely unregulated aquaculture on a large lake had led to ecological damage but the unilateral removal of access rights destroyed the livelihoods of over 650 net cage fishermen, all but one percent of whom received no compensation because their fishing was a part-time occupation. About a sixth of the water previously given over to aquaculture was subsequently covered by photovoltaic panels and locals received one-off compensation for loss of amenity. While aquaculture can take place under the panels, the power generation company preferred to employ their own staff rather than local fishermen who, with limited transferrable skills, found new employment difficult to obtain. Those who secured employment often did so by migrating to urban areas thereby denuding the local area of working-age residents.

Yan and Luo (2024) document two similar examples of prioritizing environmental concerns albeit, on the second occasion, with an attempt to respond to the presumed needs of local farmers. In the late 1990s, pollution from bamboo processing in the northwest of Zhejiang province was found to be polluting a lake supplying water to Hangzhou, the provincial capital. Many bamboo processing enterprises were rapidly closed, forest farmers lost their livelihoods, and bamboo forests were abandoned. Then, in 2022, following national guidance on carbon neutrality and bamboo industry innovation, the county—its officials encouraged by career incentives to act—established 119 village cooperatives. These transferred their forest land to a county-owned company that used the land as collateral to raise loans to establish the necessary infrastructure to engage in carbon sequestration trading. With the company paying a fixed dividend to the cooperatives and subcontracting the forests back to the cooperatives, villagers derive an income. This example of a benevolent form of environmental authoritarianism provided villagers employment and potentially additional income. However, they had little alternative but to participate—99 percent contributed their land to cooperatives—and there was no local consultation about the reforms. Moreover, villagers were generally unaware of the financial risks involved; although early days, none had yet to receive any income, a surprise to many villagers. Environmental authoritarianism seems inevitably to exacerbate social exclusion.

### *4.3. Transitional Justice*

The third concept of importance, one linking all the articles, is that of just transition. Y. Zhang et al. (2024) trace the origins of the concept to the North American labour movement in the 1970s and the largely

unsuccessful attempts to protect the welfare and rights of workers in industries needing to restructure due to growing environmental concerns relating to pollution and land degradation. While finding little purchase in America, the concept has been broadened, as Zhou (2024) observes, "to encompass a more inclusive and holistic approach to societal transformation in response to climate challenges." Indeed, just transition has become a fundamental pillar of the United Nations-led climate governance process included, for example, in the landmark 2015 Paris Agreement (Johansson, 2023).

The fact that just transition is, as Hu et al. (2024) opine, "multi-dimensional, multi-scalar, multi-actor, and context-sensitive" is both a weakness and a strength. The weakness is that the term is over-identified, meaning different things to different people which often leads to confusion. The term is also grounded on Western concepts including democratic ideology and political legitimacy that, being normative and aspirational, do not necessarily resonate in the developing world or, indeed, in China with its unique political and cultural traditions. This is evident in the articles by Hu et al. (2024), Jia and You (2024), and Yan and Luo (2024).

The strength of just transition is evident from the breadth of perspectives offered by the eight articles in this issue. Taking "just" to mean fair and equitable treatment, Z. Liu and Zhang (2024) apply the concept across global and historical domains. They argue that it is fairer to calculate emissions from 1850, the beginning of the industrial age, than from when the world became conscious of their global consequences in the 1970s and 1990s. Doing so demonstrates that the responsibility for contributing to climate change, and for meeting the cost of damage and mitigation, lies with already-developed countries rather than with newly industrialised ones including China.

Y. Zhang et al. (2024) employ the concept of transitional justice at a national level and focus on the future. They move beyond G. Zhang and Zhang (2024), which suggests that the costs of Chinese coalmine closures have primarily fallen on the least powerful, to develop principles for managing future closures. They advocate early planning, transparent and inclusive decision-making and implementation addressing both employment and social impacts, and international cooperation and innovative finance mechanisms to build resilience and to reduce transition risks for vulnerable groups.

Like G. Zhang and Zhang (2024), Yan and Luo (2024) and Y. Liu et al. (2024) explore issues of transitional justice exclusively within local areas, but Hu et al. (2024) provide additional insights by viewing the local in the context of multi-level government. For over 20 years, Chun'an County in China's prosperous Zhejiang province has been designated as an ecologically sensitive site with an emphasis on maintaining the water quality of Lake Qiandao, a source of drinking water for Hangzhou, the provincial capital. The local perspective is that Chun'an made great sacrifices for the cause of a greener economy, largely missing out on Zhejiang's growing prosperity. The provincial perspective is that this was a cost necessary to "deliver wider well-being and greater social justice at a larger scale" (Hu et al., 2024).

Zhou (2024) follows Newell et al. (2021) in identifying three pathways or aspects of just transition, namely inclusivity, "deepening" (that is, the sensitivity to not worsen inequalities during policy implementation), and good governance. It is also possible to distinguish between just transition as a process and as an outcome. Yan and Luo (2024), in their study of bamboo sequestration in Zhejiang province, focus on the process and draw attention to the benefits that flow from the public being fully engaged in matters relevant to their own lives. This social inclusivity was largely lost sight of by officials in their bid to fulfil political environmental objectives.

Jia and You (2024) also focus on the process of securing justice which, in the context of workers in China's new energy industry, depends exclusively on individual participation in negotiations over employment terms and conditions. While most literature tends to address injustices when phasing out dirty industries, Jia and You draw attention to injustice occurring in replacement industries. Employers, keen to keep down costs, adopt strategies to weaken the bargaining position of software engineers who, sharing relevant information between themselves, seek to maximise promotions and pay raises (independent trade unions are illegal in China). In terms of outcomes, individual negotiations leave those in weak bargaining positions, the inexperienced and those aged over 35, disadvantaged.

The ease with which disadvantage is reproduced as an outcome of the transition to greener energy—deepening—is demonstrated in articles by G. Zhang and Zhang (2024), Yan and Luo (2024), and by Hu et al. (2024). Sometimes, as with the coalmine closures in Liupanshui, the result was a consequence of specific actions—quickly closing private mines that were least able to mount resistance and employed workers without social protection. On other occasions, it was a product of oversight—officials simply assuming that theirs was the right course of action, or the banning of aquaculture, for example, to prevent pollution, as Y. Liu et al. (2024) report. Sometimes the greater good was prioritised above individual well-being as when protecting Hangzhou's water supply.

Therefore, while good governance is likely to challenge rather than exacerbate pre-existing inequality, it is more difficult to conclude that governance that does not do so is always poor. Hu et al. (2024) explain that the deprivations experienced by Chun'an County to ensure Hangzhou's water supply were counted as "small-scale sacrifice, injustice, and compromises." This was so because, within "the Chinese-specific mindset associated with the socialist thinking and collectivist cultural norms," they were transcended by policies that were targeted to deliver greater justice at a large scale.

This Chinese mindset may also help explain why, except for software engineers who proactively sought better employment conditions, those negatively affected by the transition away from dirty industries did not protest more. Chinese tradition pays less attention to material-based inequalities, individual equality, and positive political rights than in the West (Jiang et al., 2023). Instead, Chinese political philosophy prioritises the relationship between people and society and between people. Confucian teaching saw "good governance" as "benevolent" with rulers required, like parents and children, to "nurture the people" to enable them to escape poverty and seek happiness. These ideas translate directly into the rhetoric of the CPC such as "the heart is for the people, the power is for the people, and the interests are for the people" (Jiang et al., 2023, p. 12). Confucian ideology was formally adopted as the basis of policymaking during the Han dynasty (202 BCE–9 CE and 25–220 CE) establishing the concept of justice based on *li*—the hierarchical, orderly but harmonious distribution of power and wealth—as the foundation of social virtue. People accepted their social position, recognising governance to be undertaken for the people as a whole, and adopting their role as passive and obedient recipients of benevolent government. The resident cited by Y. Zhang et al. (2024) is a descendant of this cultural tradition and typical of many of those negatively affected by green policies:

> Our green transition generates greater benefits to the whole Xin'an river basin region, whose development and growth is more important than us. I think our sacrifice is worthy and strategic for the greater good.

## 5. Conclusion

A late industrialiser, China has grown its economy at unprecedented speed since the 1980s in ways now considered unsustainable. It is currently rapidly implementing policies to combat resultant pollution and climate change, often by means that might be designated as environmental authoritarianism. Its policy implementation devoid of public participation is described by several authors as reflecting a lack of inclusivity in policymaking and resulting in social exclusion and the reinforcement or exacerbation of existing inequalities. In the case of software engineers, reported by Jia and You (2024), new forms of inequality—even exploitation—are emerging among greener replacement industries. Therefore, there is very little evidence of much attention being paid to either procedural or distributional justice, at least as defined at the individual level.

Some qualification of the term "environmental authoritarianism" is warranted. While strategic policymaking has taken place at the central level as illustrated by the five-year plans, much of the detailed implementation is designed at the provincial and county levels. Even when national policies are accompanied by targets, these are reinterpreted at the local level. This happens for several reasons. China is so vast and diverse that it is impossible for the central government to prescribe policies in detail. Equally important, local policymakers are evaluated and promoted on the basis of the success of policies, resulting in policy competition that can encourage the sometimes-unrealistic ambition noted by G. Zhang and Zhang (2024) and by Yan and Luo (2024). Focussed on policy outcomes, procedural justice appears quite often to be neglected.

In terms of policy achievement on climate change, China is emerging as a world leader with dramatic reductions in pollution and massive expansion of renewable energy. This is being achieved through policy exhortation, government investment, incentives for local government and commerce, and possibly the policy competition noted above. The critical rhetoric of China's reluctance to engage in global efforts to combat climate change appears to be misplaced. Liu and Zhang demonstrate, as have others done (e.g., McNamara & Jackson, 2019; Vanderheiden, 2023), that China's historic emissions do not warrant it being held liable for loss and damage payments to countries negatively affected by climate change.

This success, when interpreted in terms of Chinese political philosophy, also calls into question hasty conclusions about whether all the individual hurt arising from China's rapid transition to a greener economy demonstrates an absence of transitional justice. If the political rhetoric of China moving towards an ecological civilization in which development is in harmony with nature is taken literally, a case could be made that the benefits accruing for future generations, especially if considered globally, far exceed the loss in livelihoods currently being experienced during the transition. This is essentially the argument presented by Hu et al. (2024), as captured by the title of their article: "Small Sacrifice for the Greater Good." It is an argument which is similarly consistent with Confucian thought even if the concept of ecological civilization is reduced to the minimum formulation discussed by Zhou (2024), namely being environmental, referring merely to greener growth rather than the full complement of the 17 SDGs.

Hu et al. (2024) do not define "small sacrifice" and, to misquote Neil Armstrong setting foot on the moon, a small sacrifice for mankind could be a great loss for man. Those negatively affected by policy reform may be willing to make the sacrifice, to accept distributional injustice as their desert, or to see it as their contribution to society's future. However, the evidence from the articles assembled in this issue is that their contribution

goes unrecognised by those in power and, perhaps, by the Chinese population. Fraser (2009) and Jiang et al. (2023) have argued that recognition is a necessary complement to distributional and procedural justice. Taken seriously, it would point to the need for social inclusivity throughout the implementation of green policies. It would also call into question the justice of decisions taken by local policymakers. G. Zhang and Zhang (2024), for example, describe mines being selected for closure primarily because miners lacked the social protection afforded to miners elsewhere.

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## Conflict of Interests

The authors declare no conflict of interests.

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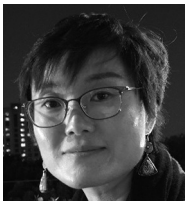

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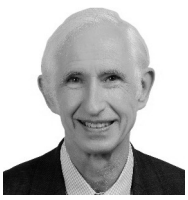

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# The Start Matters: A Comparative Analysis of Climate Equity Among UNFCCC Country Parties and Country Groups

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## Abstract

Incorrect indicators and starting years for emission cumulation can lead to confusion regarding the concepts of climate equity and climate responsibility. This article examines the variations in the results obtained by using different indicators and starting years to calculate climate equity and climate responsibilities among country parties and country groups of the UNFCCC. The article utilizes historical greenhouse gas (GHG) emissions data from 193 countries spanning the period 1850 to 2021. The data is aggregated from various sources including EDGAR, Climate Watch, and Global Carbon Budget (GCB). The article calculates cumulative GHG emissions and cumulative GHG emissions per capita, with starting years 1850, 1970, and 1990. By highlighting differences in various indicators, the article aims to provide a better understanding of climate responsibilities, climate beneficiaries, and climate equity. The results demonstrate that cumulative emissions and cumulative emissions per capita are scientific indicators that reveal a country's level of climate responsibility and climate equity. Negotiators can achieve consensus more easily in the complex system if they have a comprehensive and scientific understanding of climate equity. It is suggested that country groups under the UNFCCC use scientific indicators and methodologies to reveal climate responsibilities and climate equity.

## Keywords

climate equity; climate governance; cumulative GHG emissions; cumulative GHG emissions per capita; UNFCCC

## 1. Introduction

China and other emerging economies are often accused of being the world's largest emitters (Friedrich et al., 2023; Ritchie, 2019; Tiseo, 2023). From a scientific perspective, this is a critical issue that is relevant to major disputes in global climate talks: Who should reduce greenhouse gas (GHG) emissions and who should bear the cost of climate mitigation and adaptation? This issue concerns climate responsibility and equity. Developed countries are attempting to persuade emerging economies, such as China, to take responsibility for the loss and damage caused by climate change (Lo, 2022). However, they are doing so by reclassifying country groups as "wealthy" and "poor" instead of "developed" and "developing," which may mislead some developing countries.

### *1.1. What Is Historical Responsibility and Why Is It Relevant to Climate Equity?*

Cumulative anthropogenic GHG emissions, which are notably concentrated in earth's atmosphere, provide fundamental scientific evidence of global climate change. To address equity issues, it is important to clarify the indicators used to convey facts and stories. When discussing climate ethics and equity, it is important to consider the concept of sustainable development. This is defined as ensuring that the development of the current generation does not hinder future generations from developing. The issue of climate equity is closely linked to historical responsibilities. GHGs, such as CO2, N2O, and some F gases have a long-life expectancy in the atmosphere. As a result, their concentration will persist for centuries and continue to have an impact until the end of the 21st century. It is important to note that current emissions will inevitably be considered historical emissions in future discussions. Therefore, historical responsibility encompasses both past actions and future consequences. Several scholars argue that developed nations have emitted four times more than their fair share, which limits the developmental space available to developing countries (BASIC experts, 2011; Pan & Chen, 2010). If historical responsibilities continue to be ignored, developing nations may be compelled to follow the precedents set by developed countries, which could result in irreversible climate catastrophes. Therefore, it is crucial to tackle these inequalities within the wider context of global climate policy.

The parties to the United Nations Framework Convention on Climate Change (UNFCCC) have not yet reached a consensus on fundamental concepts such as climate responsibility and climate equity (Bogojević, 2015; Toivanen, 2023). Climate change has become a complex regime with low governance efficiency. Divergent perceptions of climate equity between developed and developing nations are a principal obstacle to effective climate governance.

Discourse on climate equity involves multiple legal and moral standards. The key disputes about how to interpret "common but differentiated responsibilities" arise from different understandings of historical responsibilities. The principle that "polluters pay" means that those who cause pollution should bear the cost of externalities. This principle is often used to impose sanctions on environmental laws (Barthakur, 2021). In climate talks, those who emit GHGs should take responsibility for mitigating the impact of climate change and provide financial support to others in their mitigation and adaptation efforts. The UNFCCC identifies developed countries as the primary polluters and requires them to take the lead in mitigation efforts and provide financial, technical, and institutional support to developing countries. The emissions have been accumulating in the atmosphere since the beginning of the Industrial Revolution in the 1840s.

On the other hand, the "beneficiaries pay" principle is based on a belief in autonomy (Lindstad, 2021). It states that if a third party benefits from the wrongful behavior of another, they are responsible for compensating the victims of the wrongdoing. In the context of the nationally determined contributions under the Paris Agreement, this principle could be considered as a supplementary principle of climate equity.

The "grandfathering principle" allocates carbon credits based on past emissions, thereby increasing entitlements to future emissions (Knight, 2013). Developed countries may evoke this principle to excuse themselves from the historical responsibility of the UNFCCC. This may involve their responsibilities of reducing GHG emissions and providing financial and technological support to developing countries. Critics argue that it allows countries with the highest historical GHG emissions to continue emitting the most (Cripps, 2023). Critics also suggest that developed countries neglect their historical responsibilities and that the grandfathering principle removes incentives for them to mitigate climate change (Damon et al., 2019). In the 1990s, once a country signed and ratified the UNFCCC, it had no excuse not to take responsibility for its emissions. However, if responsibility only began to be assigned from the 1990s onward, there is a gap between the start of industrialization and the 1990s. In relation to the UNFCCC, the grandfathering principle should be considered with specific limitations, taking into account national circumstances, and a specific time frame.

### *1.2. Country Parties, Country Groups, and Their Perspectives on Climate Equity*

According to the UNFCCC (1992), country parties to that convention are typically classified into Annex I and non-Annex I countries. This is meant to differentiate the common responsibilities of global climate change between developed and developing countries, where "the developed country parties should take the lead in combating climate change and the adverse effects thereof" (3.1), "with the aim of returning individually or jointly to their 1990 levels these anthropogenic emissions of carbon dioxide and other greenhouse gases" (4.2(b)). According to the Kyoto Protocol (1997), Annex I countries shall "reduce their overall emissions of such gases by at least 5 percent below 1990 levels in the commitment period 2008 to 2012."

Developing country parties typically collaborate through the "Group of 77 plus China" (G77) to establish common negotiating positions. However, since the 15th Conference of Parties to the UNFCCC was held in Copenhagen in 2009, a spectrum of country groups has been formed to intervene in debates jointly or individually due to identified diversified vulnerabilities among developing countries (Pan et al., 2016). The developing countries are divided into several major groups, including the African Group of Negotiators (AGNs), the BASIC countries (BASIC), the small island developing states (AOSIS), the group of least developed countries (LDCs), the Bolivarian Alliance for the Peoples of our America (ALBA), the Arab Group, and others.

It is important to note that these groups represent different regions and interests (see Table 1). BASIC comprises Brazil, South Africa, India, and China. They insist on the principle of "common but differentiated responsibilities," emphasizing the historical responsibilities and obligations of the developed countries (Hallding et al., 2013; Qi, 2011). The group calls for balance between mitigation and adaptation.

The AOSIS and LDCs are both vulnerable to extreme climate events. LDCs face additional challenges due to extreme poverty, which leaves many people without access to basic provisions. As a result of their vulnerable situation, both AOSIS and LDCs are actively advocating for financial support for adaptation, as

well as compensation for loss and damage (Ashe et al., 1999; Klöck et al., 2012). ALBA opposes neoliberal economic policies and rejects market-based carbon trading schemes under UNFCCC. ALBA advocates for social equity and a balance between human development and nature conservation. The Arab Group consists of most of the member states of the Organization of the Petroleum Exporting Countries (OPEC), who are calling for a just transition and response measures to climate mitigation (Aarts & Janssen, 2003; Alao et al., 2021; Barnett, 2002).

The Paris Agreement brought all parties together with the National Determined Contributions. New country groups have emerged as a result. From these, the Independent Alliance of Latin America and the Caribbean (AILAC) calls for comprehensive climate actions that reduce the differentiation between developed and developing countries. Meanwhile, the Like-Minded Developing Countries (LMDCs) adhere to "common but differentiated responsibilities" (Castro, 2020).

**Table 1.** Major country groups of parties to the UNFCCC.

| | |
|---|---|
| AOSIS (39) | Antigua and Barbuda, Bahamas, Barbados, Belize, Cuba, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of the Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Cabo Verde, Comoros, Guinea Bissau, Maldives, Mauritius, Sao Tome and Principe, Seychelles, Singapore, Timor Leste |
| AILAC (8) | Chile, Colombia, Costa Rica, Guatemala, Honduras, Panama, Paraguay, Peru |
| AGN (54) | Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cape Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte D'Ivoire, DR Congo, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Eswatini, Gabon, Gambia (Republic of The), Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Togo, Tunisia, Uganda, United Republic of Tanzania, Zambia, Zimbabwe |
| LDCs (46) | Angola, Benin, Burkina-Faso, Burundi, Central African Republic, Chad, Comoros, D.R.Congo, Djibouti, Eritrea, Ethiopia, Guinea, Guinea-Bissau, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, SãoTomé and Príncipe, Senegal, Sierra Leone, Somalia, South Sudan, Sudan, Tanzania, The Gambia, Togo, Uganda, Zambia, Haiti, Afghanistan, Bangladesh, Bhutan, Cambodia, EastTimor, Laos, Myanmar, Nepal, Yemen, Kiribati, SolomonIslands, Tuvalu |
| ABU (3) | Argentina, Brazil, Uruguay |
| ALBA (10) | Antigua and Barbuda, Bolivia, Cuba, Dominica, Grenada, Nicaragua, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Venezuela |
| BASIC (4) | Brazil, South Africa, India, China |
| UMBRELLA (11) | Kazakhstan, Ukraine, Australia, Canada, Iceland, Japan, New Zealand, Norway, United States, Israel, UK (UK joined UMBRELLA in 2023) |
| LMDCs (24) | Algeria, Bangladesh, Bolivia, China, Cuba, Ecuador, Egypt, El Salvador, India, Indonesia, Iran, Iraq, Jordan, Kuwait, Malaysia, Mali, Nicaragua, Pakistan, Saudi Arabia, Sri Lanka, Sudan, Syrian Arab Republic, Venezuela, Vietnam |
| EU (27) | Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden |
| OPEC (13) | Algeria, Angola, Republic of the Congo, Equatorial Guinea, Gabon, Iran, Iraq, Kuwait, Libya, Nigeria, Saudi Arabia, United Arab Emirates, Venezuela |

Developed country parties usually present their positions through the EU and the Umbrella group. The EU is taking a leading role in advocating for equal mitigation ambitions for 1.5-degree targets (Holz et al., 2018, 2023; Torney, 2015). Additionally, the EU is also using an internal effort-sharing approach to ensure fairness in both process and distribution (Kulovesi & van Asselt, 2020). The EU is also advocating for a just transition as a new working stream on climate equity. This approach neglects historical responsibilities and shifts the focus of equity issues to the present burden of mitigating fossil fuel emissions. Umbrella emphasizes the importance of equality of climate ambitions, actions, and support among all countries, particularly with the condition of full participation of the emerging countries. Additionally, Umbrella considers domestic federal-state balance a crucial aspect of climate equity. The EU and Umbrella argue for a competitive environment for domestic industries, disregarding the ethical necessity of addressing global climate change.

### *1.3. How do People Measure Climate Responsibility and Equity?*

According to UNFCCC, the term "emissions" lacks specificity regarding its indicators. There are three main indicators: annual emissions, which represent carbon flow; cumulative emissions, which represent carbon stock; and cumulative emissions per capita, which represent carbon benefits. Annual emissions are the most commonly used indicator. Social media and prominent data tools sometimes use indicators to show carbon flow in a certain year to identify the top emitters.

However, it is important to note that different indicators can lead to contradictory implicit meanings, and therefore, it is crucial to consider all perspectives. It is also important to use precise language and avoid ambiguous terms. For instance, using the indicator of annual carbon flow, China and India are often identified as the biggest polluters (Vazhayil et al., 2011). However, it is a misinterpretation of climate science to suggest that annual emissions alone are responsible for the historical impact of global climate change. Annual emissions only contribute to a very small fraction of the GHG concentration in the atmosphere. The US and EU are among the top polluters when considering historical cumulative emissions, which better represents historical responsibilities (BASIC experts, 2011).

Emissions can be accounted for by country groups, country parties, and subnational regions. They can also be accounted for by multiple stakeholders, such as corporations, families, and individuals. Country groups are commonly used in international multilateral negotiations. During the negotiation of the Kyoto Protocol of the UNFCCC, country parties were required to join country groups to reach a consensus on global targets and other climate actions. Environmental organizations often monitor a country's annual emissions to assess its progress in climate governance. Similarly, corporations measure, report, and verify their emissions to facilitate cap-and-trade schemes. Emissions of individuals are often used to discuss disparities and vulnerabilities among different groups of people.

Consumption side emissions indicate the welfare increase resulting from the consumption of products with carbon embodied and transmitted through international trade (Grubb et al., 2022). People argue that importing countries should take responsibility for the emissions they consume. People also argue that exporting countries should take responsibility for carbon reduction from the supply side. Some countries are implementing cross-border measures to make unilateral carbon adjustments (Meng et al., 2023).

Methods for calculating the relationship between carbon emissions and social identities include assumptions about the emission elasticity of incomes of people, which can result in a significant disparity in carbon

footprints among different income groups (Golley & Meng, 2012; Ivanova et al., 2020; Oxfam, 2015). Given that the cost of climate loss and damage may be significantly underestimated (Newman & Noy, 2023), it is increasingly important to identify vulnerable populations in order to make appropriate arrangements for climate financing.

### 1.4. Research Questions and Scope of Analysis

What are the differences in weighing historical responsibility for global climate change using different indicators among country parties and country groups? Based on these differences, which countries should reduce GHG emissions, and which should provide all kinds of support? Additionally, what is the total amount of emissions by countries since the UNFCCC was put in force? Finally, how would the cumulative emissions differ if different starting years were used? This article aims to study the cumulative emissions and cumulative emissions per capita of 193 countries from 1850 to 2021. This article considers both country parties and country groups.

## 2. Methodology and Data

### 2.1. Cumulative Emissions of Country Parties

Cumulative emissions indicate a country's historical responsibilities (Meyer, 2013). This is calculated by adding up all of the country's annual emissions over time:

$$E_{ct} = \sum_{t_0}^{t_n} E_t$$

$E_{ct}$ represents cumulative emissions of a country party at time t. It is calculated as the sum of the country's emissions of the country from year $t_0$ to year $t_n$. The length of time over which emissions are accumulated significantly affects the ranking of countries (Yu et al., 2020). In this article, the cumulative emissions are calculated using three sets of starting years: 1990, 1970, and 1850. This article aims to demonstrate the importance of the starting year of emission cumulation in discussions of climate equity. The most commonly used starting year for emission cumulation is 1990, which aligns with the starting year of the UNFCCC. However, a time series with all Kyoto gases is available from 1970, which serves as a medium-level reference to identify the differences using various lengths of time series for emissions cumulation. The best available time series of emissions starts in 1850, which is relevant to the beginning of industrialization in the 1840s. Historical emissions of 193 countries and the EU from 1850–2021 are sourced from Global Carbon Budget (GCB), EDGARv7.0 (1970–2021), and Climate Watch (1990–2020). The emissions data from EDGARv7.0 and Climate Watch include all Kyoto GHGs but exclude land use, land-use change, and forestry (LULUCF). On the other hand, the data from GCB only includes CO2 emissions from fossil fuel combustion.

Previous studies have acknowledged the significance of cumulative emissions. However, many of these studies only calculate emissions of a limited number of selected countries (BASIC experts, 2011; Pan & Chen, 2010; Yu et al., 2020), or they only calculate cumulative emissions starting from a single year in 1990 (Lamb et al., 2021). Research on GHG emission inventories shows historical annual emissions for all countries and country groups starting from 1850, without calculating cumulative emissions (Jones et al., 2023). Some popular data-driven climate action trackers only present annual emissions instead of

cumulative emissions starting from 1990, such as Climate Action Tracker, and Climate Watch. It is noticeable that some media blog articles have already pointed out the importance of historical responsibility of countries (Evans, 2021). This article calculates the cumulative emissions of all 193 countries, over three different periods, which enlarges the country coverage and time coverage of the climate equity studies and provides a comprehensive dataset on cumulative emissions accordingly.

### 2.2. Cumulative Emissions Per Capita of Country Parities

The cumulative emissions per capita are the cumulative emissions divided by the annual population of a country. Cumulative emissions per capita are calculated from 1990 to 2021 due to the grandfathering principle:

$$e_t = \frac{E_{at}}{P_{tn}} = \sum_{t_0}^{t_n} \frac{E_t}{P_{tn}}$$

$P_{tn}$ represents the population of country $n$ in year $t$. Cumulative emissions per capita represent the humanitarian development level of a country where carbon emissions have not been decoupled from economic growth. It represents an equal share of the carbon budget on an individual basis, regardless of location or time. Some scholars use cumulative emissions per capita to study global carbon budgets (Pan, 2022; Pan & Chen, 2010; Yu et al., 2020). Most of the studies have found an unfair allocation of carbon budget between developed and developing countries. Equitable access to sustainable development is crucial, and everyone should have a fair share of carbon emission rights to survive and develop from birth. In the end, global climate governance should ensure fairness for all. This article tries to demonstrate the disparity in carbon benefit increases among country parties by comparing the differences in cumulative emissions per capita. The historical population data for 193 countries from 1960 to 2050 is sourced from the World Bank Population Estimates and Projections. Population data of Niue and Cook Islands are sourced from an alternative database as they are not included in the World Bank dataset. Previous studies have used either the number of populations in a certain year (Pan & Chen, 2010), which lacks a comparison in time, or a sum of the population over a time range (Yu et al., 2020), which may not be physically addable. This article uses the number of population in a range of time from 1990 to 2021 for 193 countries, which provides a comprehensive time series of cumulative emissions per capita.

### 2.3. Cumulative Emissions of Country Groups

This article uses the country groups listed on UNFCCC webpages, which have submitted documents as a country group. These country groups include EU, Umbrella, AOSIS, BASIC, LMDCs, AG(N), LDCs, AILAC, ABU, OPEC, and ALBA. Emissions of G77 are not provided in this article as G77 is divided into many smaller-scale country groups. It is worth noting the UK recently joined the Umbrella in 2023, and therefore we provide the results of Umbrella both with and without the UK. The detailed country lists of the country groups are provided in the Appendix. Some of the countries appear in more than one country group, and therefore this article does not compare any aggregations of the emissions of country groups to the world total emissions:

$$E_{cgt} = \sum_{i}^{j} E_{ct}$$

$E_{cgt}$ represents the cumulative emissions of a country group in year $t$, which equals the sum of the cumulative emissions of countries from $i$ to $j$ in that country group. Due to calculation capacity limitation, this article uses the average value of each value of the cumulative emissions per capita of the country group to represent the cumulative emissions per capita of the country group.

## 3. Results and Discussion

### *3.1. Results and Implications for Country Parties*

Annual emissions are not a reliable indicator for determining who should take the historical responsibility for global climate change. The contributions of emerging countries are overestimated with annual emissions. And the contributions of developed countries are increasingly underestimated. It is evident that the ranking of the top 10 emitters varies significantly. Table 2 displays that the emerging large economies, such as China, India, Brazil and Indonesia are seemingly taking on more and more responsibilities. It also shows that the developed economies, like US, EU, Germany, and UK are taking less and less responsibilities.

**Table 2.** Top 10 emitters with annual emissions in 1990, 2000, 2010, and 2020, using total emissions of GHGs, excluding LULUCF form Climate Watch (unit: MtCO2e).

| No. | TOP 10 emitters in 1990 | | TOP 10 emitters in 2000 | | TOP 10 emitters in 2010 | | TOP 10 emitters in 2020 | |
|---|---|---|---|---|---|---|---|---|
| 1 | US | 5855.54 | US | 6810.66 | China↑ | 10211.64 | China | 12942.87 |
| 2 | EU | 4423.62 | China↑ | 4567.27 | US↓ | 6454.24 | US | 5505.18 |
| 3 | China | 3238.86 | EU↓ | 4094.39 | EU | 3882.53 | India↑ | 3200.82 |
| 4 | Russia | 2969.78 | Russia | 2137.89 | India↑ | 2569.05 | EU↓ | 3061.69 |
| 5 | India | 1237.96 | India | 1719.66 | Russia↓ | 2249.52 | Russia | 2331.48 |
| 6 | Japan | 1181.86 | Japan | 1278.17 | Japan | 1234.82 | Japan | 1094.56 |
| 7 | Germany | 1129.74 | Germany | 959.12 | Brazil↑ | 999.92 | Brazil | 1064.71 |
| 8 | Ukraine | 825.87 | Brazil↑ | 772.34 | Germany↓ | 881.69 | Indonesia↑ | 976.49 |
| 9 | UK | 749.51 | UK | 690.36 | Indonesia↑ | 788.13 | Iran↑ | 844.65 |
| 10 | Brazil | 592.50 | Indonesia↑ | 666.12 | Iran↑ | 756.07 | Saudi↑ | 712.59 |

The cumulative emissions of a country provide insights into its historical responsibility for climate change. However, it is important to avoid tricks such as manipulating the length of the time series of emissions for accumulation. To some extent, this can correct the underestimation of the results obtained with annual emissions. When using 1990 as the starting year, the ranking of the countries varies compared to the results in Table 2. Table 3 displays the top 10 emitters with cumulative emissions since 1990, which is the starting year for the grandfathering principle. Although it is not a correct starting point for accumulating emissions, changes indicate that the developed countries, like Russia, Japan, Germany, and Canada, are taking a higher ranking compared to their performance in Table 2. China is still growing fast, but not as much as indicated in Table 2.

With the starting year 1970, it is more apparent that, in Table 4, large emerging economies like India and Brazil are ranking lower and later comparing to Table 3.

**Table 3.** Top 10 emitters with cumulative emissions in 1990, 2000, 2010, and 2020, using total emissions of GHGs accumulated since 1990, excluding LULUCF from Climate Watch (unit: MtCO2e).

| No. | TOP 10 emitters in 1990 | | TOP 10 emitters in 2000 | | TOP 10 emitters in 2010 | | TOP 10 emitters in 2020 | |
|---|---|---|---|---|---|---|---|---|
| 1 | US | 5855.54 | US | 68881.03 | US | 135153.30 | China↑ | 238376.40 |
| 2 | EU | 4423.62 | EU | 46288.48 | China↑ | 118317.50 | US↓ | 195609.30 |
| 3 | China | 3238.86 | China | 44135.71 | EU↓ | 87270.77 | EU | 122429.20 |
| 4 | Russia | 2969.78 | Russia | 26274.07 | Russia | 48538.24 | Russia | 71640.83 |
| 5 | India | 1237.96 | India | 16149.11 | India | 36926.97 | India | 67996.43 |
| 6 | Japan | 1181.86 | Japan | 13677.88 | Japan | 26305.88 | Japan | 38811.47 |
| 7 | Germany | 1129.74 | Germany | 11433.71 | Germany | 20686.30 | Germany | 28897.80 |
| 8 | Ukraine | 825.87 | UK↑ | 7941.27 | Brazil↑ | 16367.92 | Brazil | 27112.47 |
| 9 | UK | 749.51 | Brazil↑ | 7449.25 | UK↓ | 14520.30 | Indonesia↑ | 22666.63 |
| 10 | Brazil | 592.50 | Canada↑ | 6450.16 | Indonesia↑ | 13604.91 | Canada↑ | 20313.47 |

**Table 4.** Top 10 emitters with cumulative emissions in 1990, 2000, 2010, and 2020, using total emissions of GHGs accumulated since 1970, excluding LULUCF from EDGAR 7.0(unit: MtCO2e).

| No. | TOP 10 emitters in 1990 | | TOP 10 emitters in 2000 | | TOP 10 emitters in 2010 | | TOP 10 emitters in 2020 | |
|---|---|---|---|---|---|---|---|---|
| 1 | US | 123627.85 | US | 188700.62 | US | 256243.95 | China↑ | 348950.63 |
| 2 | EU | 104109.42 | EU | 148978.33 | China↑ | 199113.56 | US↓ | 322077.81 |
| 3 | China | 62399.339 | China | 112372.94 | EU↓ | 192669.65 | EU | 233891.7 |
| 4 | Russia | 52395.497 | Russia | 75065.581 | Russia | 96439.207 | Russia | 121436.28 |
| 5 | Germany | 27598.618 | Germany | 38516.332 | India↑ | 59171.983 | India | 95685.813 |
| 6 | Japan | 23480.615 | India↑ | 36992.214 | Japan↑ | 50106.439 | Japan | 64283.049 |
| 7 | India | 20814.241 | Japan↓ | 36737.318 | Germany↓ | 48201.638 | Germany | 57656.146 |
| 8 | Ukraine | 18247.196 | Ukraine | 24137.709 | UK↑ | 30583.954 | Brazil↑ | 43282.633 |
| 9 | UK | 16906.581 | UK | 24109.373 | Brazil↑ | 29527.926 | UK↓ | 35862.362 |
| 10 | France | 12939.335 | Brazil↑ | 19167.255 | Ukraine↓ | 28485.906 | Canada↑ | 32328.992 |

Starting in 1850, the results indicate that developed countries are the largest contributors to global climate change. Table 5 displays the top 10 emitters with the cumulative CO2 emissions since 1850. The majority of the Annex I countries dominate the list, while large emerging economies rank far behind. China remains a fast-growing emitter but with a significant gap in total cumulative emissions compared to the US. This highlights the difference in industrialization history over the past centuries.

Cumulative emissions per capita indicate who benefits from carbon emissions. However, it can be misleading if the calculation is based on a shorter time series. A shorter time series of emissions for accumulation makes the actual emitters underestimated. Cumulative emissions per capita are meant to show how much benefits a country take on an individually average level. Figure 1 and Tables 6 and 7 present different information. Starting in 1850, the cumulative emissions per capita of a country could decrease as shown in Figure 1. This contradicts the assumption that longer accumulation leads to larger cumulative emissions per capita. The top 10 smallest emitters have a cumulative emission per capita of less than 3 metric tonnes of CO2 in 2021. This

**Table 5.** Top 10 emitters with cumulative emissions in 1990, 2000, 2010, and 2020, using emissions of CO2 accumulated since 1850 from GCB (unit: MtCO2).

| No. | 1990 | | 2000 | | 2010 | | 2020 | |
|---|---|---|---|---|---|---|---|---|
| 1 | USA | 249044.87 | USA | 304224.93 | USA | 363636.67 | USA | 416729.34 |
| 2 | EU | 185005.53 | EU | 221178.16 | EU | 257156.13 | EU | 287514.61 |
| 3 | Germany | 66552.07 | Russia | 83522.49 | China↑ | 136923.60 | China | 237880.45 |
| 4 | Russia | 66515.84 | Germany↓ | 75972.45 | Russia↓ | 99228.14 | Russia | 115792.04 |
| 5 | UK | 59123.88 | China↑ | 75692.22 | Germany↓ | 84647.72 | Germany | 92376.24 |
| 6 | China | 43404.61 | UK↓ | 64895.62 | UK | 70427.61 | UK | 74581.22 |
| 7 | Japan | 28813.90 | Japan | 41012.36 | Japan | 53584.98 | Japan | 65643.68 |
| 8 | France | 27146.62 | France | 31155.85 | France | 35159.33 | India↑ | 54395.70 |
| 9 | Ukraine | 20834.44 | Ukraine | 24979.09 | India↑ | 31668.51 | France↓ | 38479.00 |
| 10 | Poland | 17775.25 | Canada↑ | 22183.91 | Ukraine↓ | 28074.57 | Canada↑ | 33569.39 |

is exemplified by the performance of the US in Table 7. The per capita cumulative emissions of the US are 1257 metric tonnes of CO2 in 2020.

Starting in 1990, Table 6 shows the top 10 emitters; EU as one economy is not on the list, and neither is China, India, and other emerging large countries. Oil producing and exporting countries rank high on the list. USA ranks in the middle among the top 10 emissions, and lower than Australia in 2020. With starting year 1850, Table 7 shows a list of the top 10 emitters where US ranks first in 2020. EU as one economy is still not

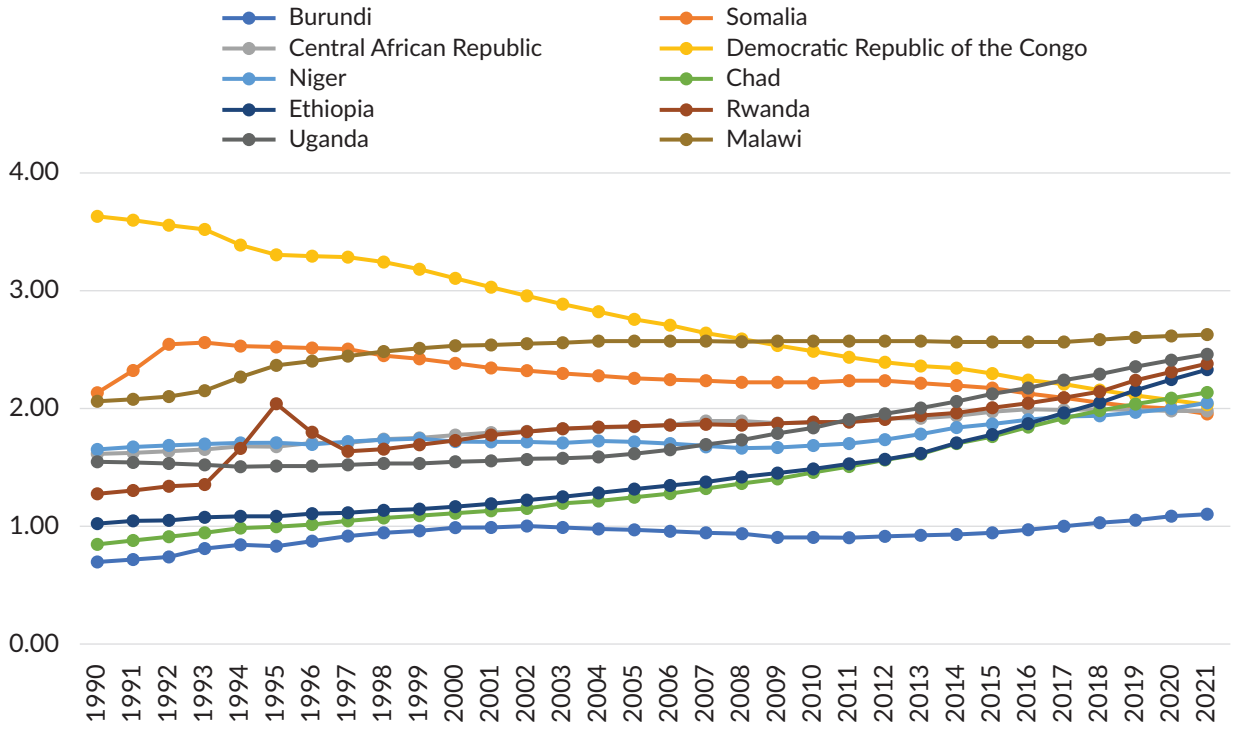


**Figure 1.** Top 10 smallest emitters in 2021 and the cumulative emissions per capita from 1990 to 2021, using emissions of CO2 accumulated since 1850 from GCB (unit: MtCO2/person).

**Table 6.** Top 10 emitters with cumulative emissions per capita in 1990, 2000, 2010, and 2020, using total emissions of GHGs accumulated since 1990, excluding LULUCF from Climate Watch (unit: tCO2e/person).

| No. | 1990 | | 2000 | | 2010 | | 2020 | |
|---|---|---|---|---|---|---|---|---|
| 1 | UAE | 41.37 | Qatar | 472.80 | Australia | 533.17 | Qatar | 742.59 |
| 2 | Turkmenistan | 41.25 | UAE | 335.92 | Qatar | 529.83 | Turkmenistan | 736.98 |
| 3 | Qatar | 36.77 | Bahrain | 316.01 | Turkmenistan | 498.86 | Bahrain | 707.24 |
| 4 | Belize | 35.71 | Australia | 301.34 | Kuwait | 496.90 | Australia | 703.59 |
| 5 | Luxembourg | 31.92 | Kuwait | 281.64 | Luxembourg | 463.10 | Kuwait | 626.77 |
| 6 | Bahrain | 30.83 | Luxembourg | 267.91 | Bahrain | 459.55 | USA | 590.05 |
| 7 | Australia | 28.74 | Turkmenistan | 247.69 | USA | 436.93 | Brunei | 556.64 |
| 8 | Estonia | 24.94 | USA | 244.12 | Canada | 389.03 | UAE | 556.13 |
| 9 | Kuwait | 23.49 | Belize | 224.66 | Brunei | 378.71 | Luxembourg | 538.86 |
| 10 | USA | 23.46 | Canada | 210.20 | Grenada | 377.24 | Grenada | 535.49 |

on the list, and neither is China, India, and other emerging large countries. However, European industrialized countries rank very high among the top 10. Oil producing and exporting countries rank much lower.

A shorter time series for cumulations hides the real carbon beneficiaries. Table 6 suggests that the fossil fuel export-dependent countries are cumulating carbon benefits together with the Annex I industrialized countries. Countries like UAE, Qatar, and Kuwait are among the top 10 emitters. However, Table 7 indicates that, the top 10 countries does not include any OPEC countries, and the developed countries once again dominate the list.

**Table 7.** Top 10 emitters with cumulative emissions per capita in 1990, 2000, 2010, and 2020, using emissions of CO2 accumulated since 1850 from GCB (unit: tCO2/person).

| No. | 1990 | | 2000 | | 2010 | | 2020 | |
|---|---|---|---|---|---|---|---|---|
| 1 | Luxembourg | 1169.47 | Luxembourg | 1252.65 | Luxembourg | 1294.72 | USA↑ | 1257.06 |
| 2 | UK | 1032.78 | UK | 1101.93 | UK | 1122.06 | Estonia↑ | 1226.01 |
| 3 | USA | 997.68 | USA | 1078.19 | USA | 1175.57 | Luxembourg↓ | 1195.39 |
| 4 | Belgium | 896.46 | Belgium | 993.88 | Belgium | 1047.29 | Czech ↑ | 1119.84 |
| 5 | Germany | 837.84 | Czech ↑ | 944.03 | Czech | 1042.91 | UK↓ | 1111.80 |
| 6 | Czech | 807.78 | Estonia↑ | 924.90 | Estonia | 1098.67 | Germany↑ | 1110.81 |
| 7 | Estonia | 694.53 | Germany | 924.11 | Germany | 1035.11 | Belgium↓ | 1075.28 |
| 8 | Qatar | 663.84 | Qatar | 920.52 | Qatar | 666.52 | Trinidad ↑ | 1035.77 |
| 9 | Canada | 619.91 | Canada | 722.94 | Canada | 819.92 | Canada | 883.24 |
| 10 | Brunei | 619.03 | Kuwait↑ | 645.68 | Kuwait | 667.77 | Brunei↑ | 816.77 |

### *3.2. Implications for Country Groups*

With the emissions accumulation starting in 1990, results indicate that the emerging country groups contribute more emissions to the world. However, this misleads the media and the public in their understanding of climate responsibilities. Figure 2 shows that LMDCs have taken a leading role in cumulative emissions for over a decade. It exceeded Umbrella around 2007. BASIC has ranked second since

2015. The EU has not ranked high since the beginning of the 1990s. The EU has a flatter curve compared to the top 3 groups of countries above. All other country groups are positioned much lower near the horizontal axis.

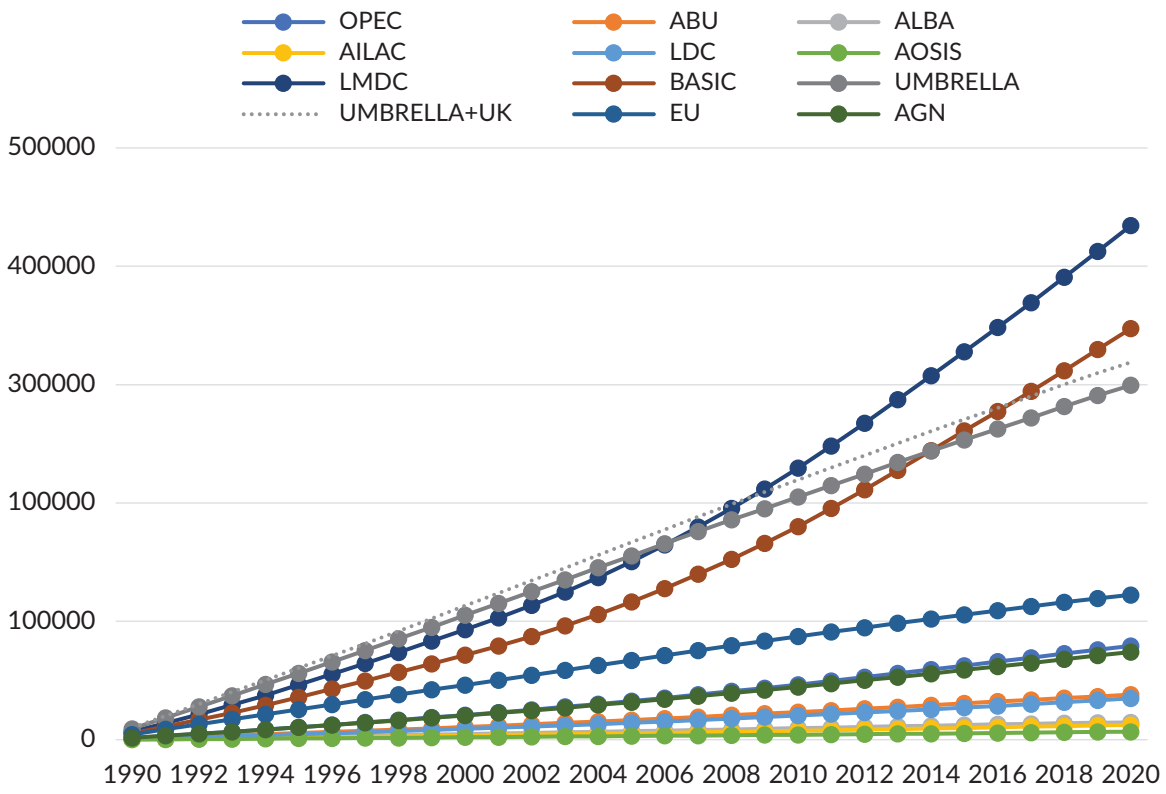


**Figure 2.** Historical cumulative emissions of major country groups of UNFCCC from 1990 to 2020, using total emissions of GHGs accumulated since 1990, excluding LULUCF from Climate Watch (unit: MtCO2e).

Starting in 1970, the contribution of emerging country groups decreased while the EU became more prominent. As shown in Figure 3, LMDCs still rank high in 2020, but the time when it exceeded the Umbrella is 2013, which is about six years later than in Figure 2. BASIC did not surpass Umbrella until 2021, which is about seven years later than in Figure 2. The EU is much closer to the top 3 country groups in Figure 3, with a steeper curve of increase, and it also drifted away from the lower-ranking country groups. It is still difficult to distinguish between the country groups that are close to the horizontal line.

Starting in 1850, emerging country groups fell from the top positions. Figure 4 shows that the Umbrella group ranks much higher than other country groups, emitting more than twice than the EU in 2021. The emission curve of the EU in Figure 4 is flatter but still shows a slight increase, while Umbrella's emissions are on the rise. The increase rate of the emission accumulation of Umbrella is significant, and the increase rate of emission accumulation of LMDCs and BASIC are exponential. This indicates that Umbrella is not only the biggest emitting country group, but it is also still contributing its emissions to the atmosphere. Meanwhile, LMDC and BASIC will probably surpass Umbrella very quickly. LMDCs and BASIC rank second and the third in 2021, where LMDC exceeds EU in 2013 and BASIC exceeds EU in 2017. The EU emits much more than the other country groups. Other country groups appear to be flattened near the horizontal line, indicating more inequality. Figure 4 illustrates the disparity of climate historical responsibility more

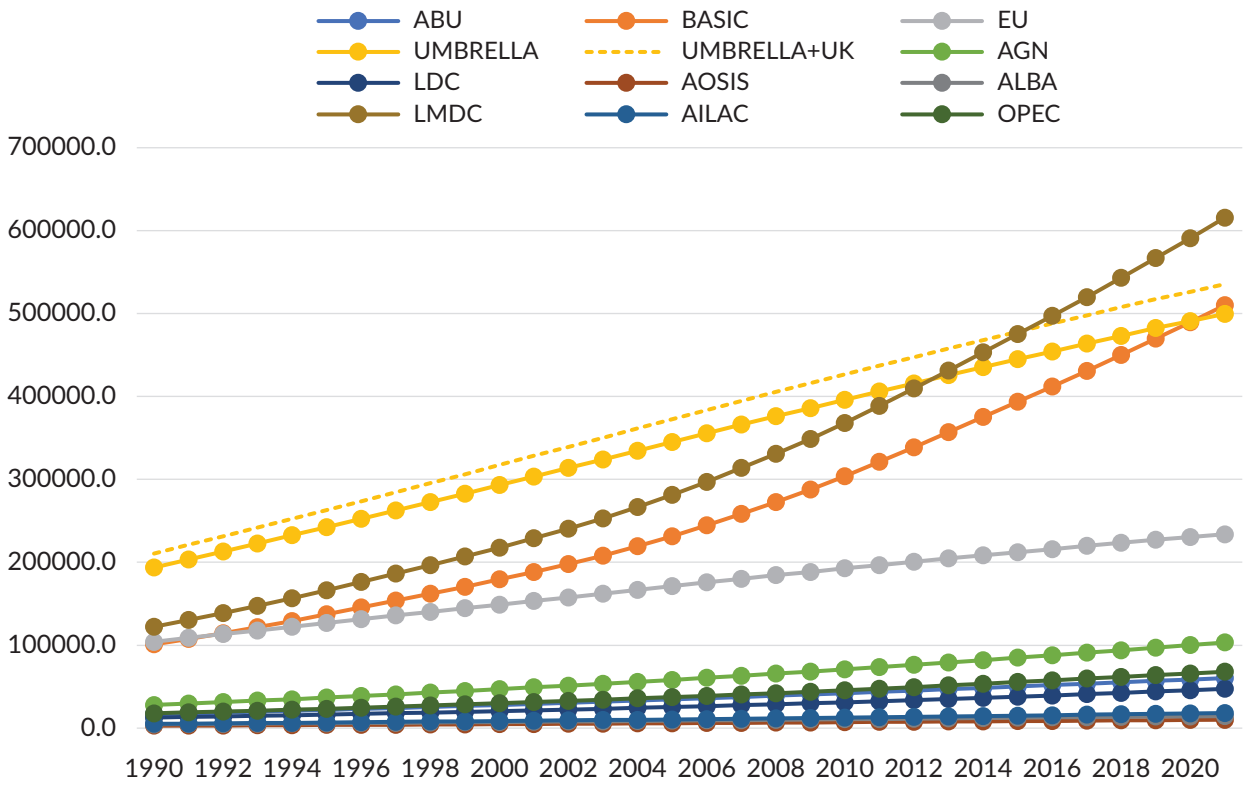


**Figure 3.** Historical cumulative emissions of major country groups of UNFCCC from 1990 to 2020, using total emissions of GHGs accumulated since 1970, excluding LULUCF from EDGAR 7.0(unit: MtCO2e).

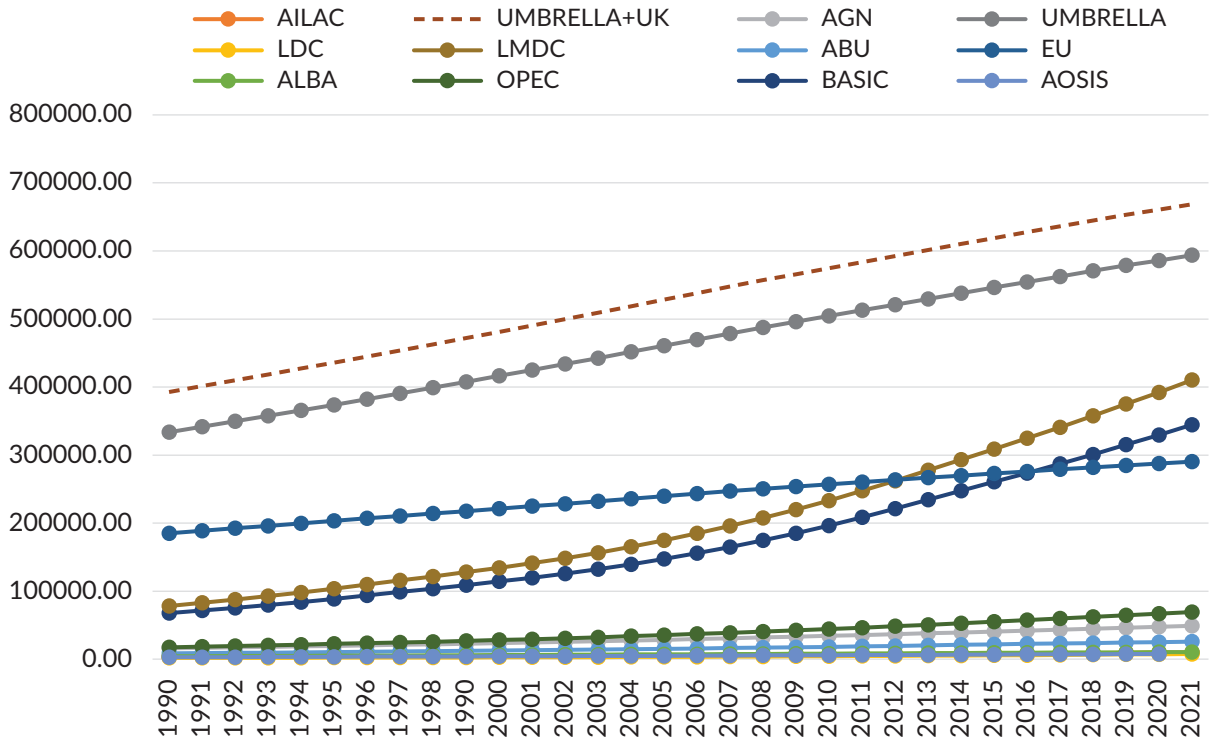


**Figure 4.** Historical cumulative emissions of major country groups of UNFCCC from 1990 to 2021, using emissions of CO2 accumulated since 1850 from GCB (unit: MtCO2).

clearly and may be the closest representation to reality. If LMDCs and BASIC are required to reduce emissions without financial and technological support from Umbrella and EU, all the us will lose the opportunity to achieve a fair and equitable share of sustainable development.

Meanwhile, if the world continues to accumulate emissions in the atmosphere at the current rate, emerging economies will eventually surpass the emission levels of the industrialized countries. It is crucial to establish a reasonable pathway for these economies to transition from the traditional industrialization pattern. Failure to do so would perpetuate the historical trend of industrialized countries colonizing the rest of the world.

Figures 5 and 6 identify the true beneficiaries of carbon emissions. Even with starting year 1990, as shown in Figure 5, Umbrella is leading in taking the most benefits from global carbon emissions. Umbrella has over 10 times the cumulative emissions per capita on average than LDCs and AGN. EU, OPEC, ABU, and ALBA, have cumulative emissions per capita higher than the world average. AOSIS, LMDCs, and BASIC are close to or below the world average. AOSIS may benefit from its small-scale population, while LMDCs and BASIC have large populations that lower their average emissions. Figure 5 shows that LMDCs and BASIC do not truly benefit the most from carbon emissions.

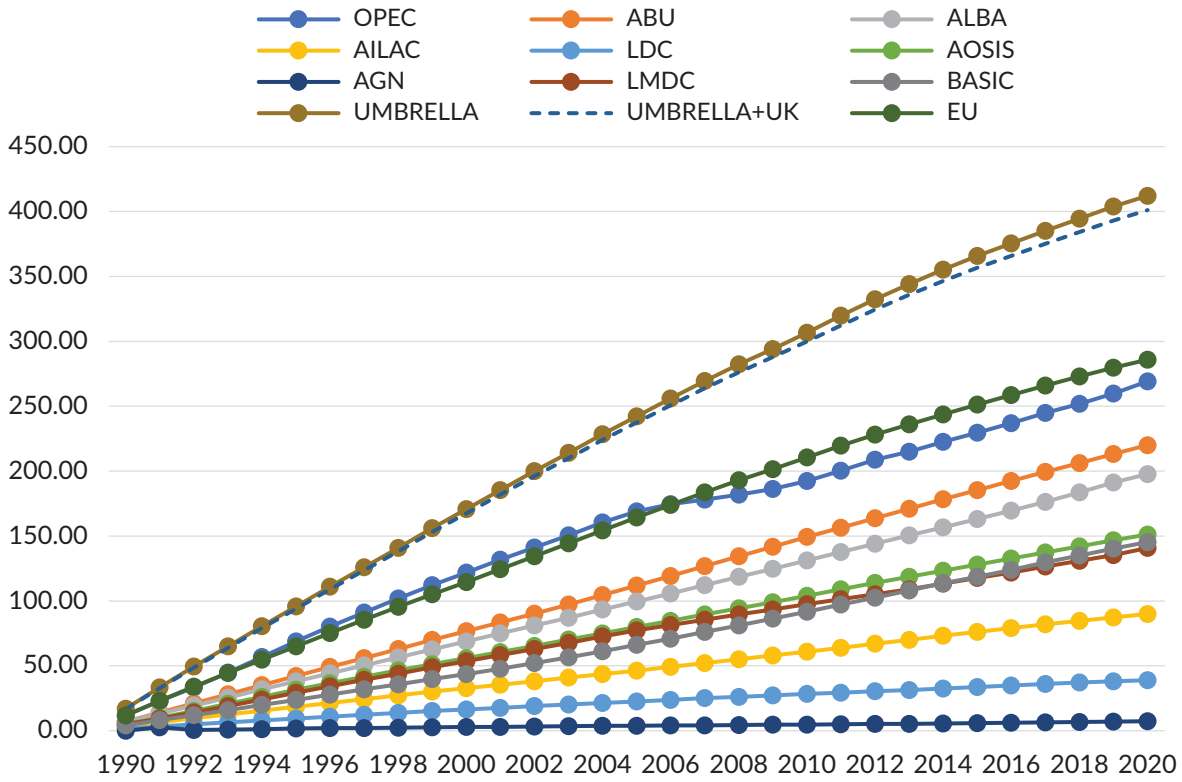


**Figure 5.** Average historical cumulative emissions per capita of major country groups of UNFCCC from 1990 to 2020, using total emissions of GHGs accumulated since 1990, excluding LULUCF from Climate Watch (unit: tCO2e/person).

With starting year 1850, Umbrella benefits the most from carbon. Umbrella countries are still cumulating their carbon benefits with a rise in the curve of their cumulative carbon emissions per capita. They emit five times more than developing country groups like ALBA, AOSIS and OPEC, and more than 100 times more than LDCs.

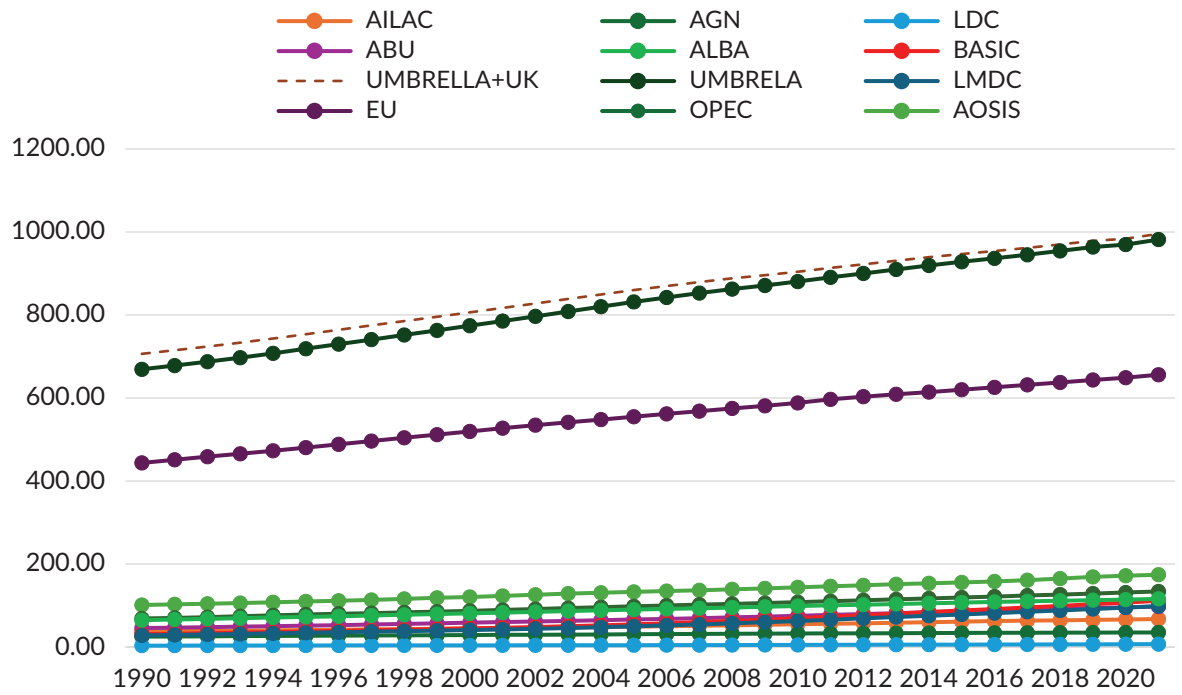


**Figure 6.** Average historical cumulative emissions per capita of major country groups of UNFCCC from 1990 to 2021, using emissions of CO2 accumulated since 1850 from GCB (unit: tCO2/person).

The EU comes after the Umbrella and ranks much higher than the other country groups. EU also emits nearly 100 times more than LDCs. All the developing country groups do not benefit much from carbon emissions. LMDC and BASIC do not rank high even within the developing countries.

## 4. Conclusion and Implications

### *4.1. Available Emission Data Justify Climate Responsibility and Equity*

Cumulative emissions and per capita emissions, with a baseline year as early as the start of the Industrial Revolution, should serve as pivotal scientific indicators in assessing climate responsibilities. Different methodologies yield varying results for the top 10 emitters. While annual emissions provide a snapshot of a country's current emission levels, cumulative emissions offer a more comprehensive view of historical responsibilities. It is thus inaccurate to rely solely on annual emissions for assessing climate responsibilities. The selection of the starting year for accumulation significantly influences the portrayal of historical responsibilities.

If emissions have cumulated since 1850, it is evident that Annex I countries are responsible for climate change. The developed countries rank high on the cumulative emissions. They should reduce emissions. According to the principle of "polluters pay," they should also compensate non-Annex I country parties for losses and damages already incurred.

Developed countries also benefit most according to the results on per capita cumulative emissions with a starting year in 1850. Moreover, their emissions per capita are still rising. Other countries are left far behind

and crowded out of sustainable development. The most vulnerable and the poorest countries are being locked in the under-development stage. According to the principle of "beneficiaries pay," developed countries should pay for the loss and damages of the developing country parties and help them adapt to climate change.

Meanwhile, China and other emerging countries will soon become largely responsible for cumulative emissions. However, their cumulative emissions per capita are not guaranteed to grow. Other non-Annex I countries are neither accumulating their emissions nor increasing their climate benefits. They should further identify and diversify their vulnerabilities and bring their calculated loss and damage cost to the negotiations under UNFCCC.

### *4.2. Revisiting Position to Achieve a Consensus on Climate Equity*

Developing countries should recognize their collective similarity that is in contrast with the developed countries, fostering unity in negotiations. EU countries should distinguish their positions from the Umbrella group, understanding that unilateral mitigation efforts are insufficient without addressing the Umbrella group's contributions to global emissions. The Umbrella group must acknowledge their high cumulative emissions and substantial carbon benefits, prompting substantial reductions in emissions, innovations in support of non-Annex I countries for mitigation and adaptation of climate change, and compensation for the most vulnerable countries in line with the Polluter Pays and Beneficiary Pays principles.

### *4.3. Limitations, Uncertainties, and Future Directions*

This analysis acknowledges several limitations and uncertainties. Firstly, the lack of official ratification by developing country governments of existing GHG emissions data may lead to discrepancies with national GHG inventories. Secondly, variance in data sources could introduce bias, although this is considered negligible for this study. Thirdly, cumulative GHG emissions do not perfectly correlate with atmospheric concentrations, but this bias is deemed irrelevant for the comparative analysis conducted.

Due to time limitations, this article does not provide the future scenario analysis of various indicators for climate equity of country parties and country groups. Therefore, future research could extend to projections of emissions and population, utilizing resources like the IPCC-AR6 socioeconomic scenarios and IIASA POP 2.0. Methodologies for calculating individual carbon emissions, including bottom-up consumption pattern analyses and assumptions of emission elasticities relative to socio-economic indicators (such as income level, gender identities, rural-urban identities, and aging disparity), offer potential for exploring the intersection of emissions and social issues, particularly for vulnerable groups.

Interestingly, OPEC countries lead in historical cumulative emissions per capita in Table 6. Distinguishing production-side from consumption-side emissions could further clarify the beneficiaries of carbon emissions.

It is also notable that the UK joining the Umbrella group makes this country group more responsible for historical emissions, but less beneficial on emission stocks in Figure 5. Hopefully, the UK's recent back-pedaling on climate change policies will be temporary, and the British government will be able to stimulate a positive response among members of the Umbrella group.

## Acknowledgments

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## Data Availability

1. Global Carbon Budget: https://www.icos-cp.eu/science-and-impact/global-carbon-budget/2022; https://www.icos-cp.eu/science-and-impact/global-carbon-budget/2022
2. EDGARv7.0: https://edgar.jrc.ec.europa.eu/dataset_ghg70
3. Climate Watch: https://www.wri.org/initiatives/climate-watch
4. World Bank Population Estimates and Projections: https://databank.worldbank.org/source/population-estimates-and-projections
5. Population data of Niue and Cook Islands are sourced from an alternative database: https://database.earth/population
6. Climate Action Tracker: https://climateactiontracker.org/global/cat-emissions-gaps
7. Climate Watch: https://www.climatewatchdata.org/ghg-emissions

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# From Education for a Sustainable Development to Ecological Civilization in China: A Just Transition?

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## Abstract

This article uses just transition to understand the education for sustainable development (ESD) transition in China. The latter has shifted from an internationally recognized response to support sustainable development to an "ecological civilization," that is, a policy agenda combining domestic environmental and political interests. Using a climate justice framework, this article interprets the ESD transition on three levels: stakeholder engagement, education scope, and environmental governance. The findings reveal that (a) the concept of ecological civilization is heavily political, (b) its scope is limited to environmental sustainability, and (c) stakeholders from the education sector who participated in the new agenda as policy recipients are underrepresented in decision-making processes. Most importantly, despite the heavy political endorsement of the agenda, many previous challenges associated with ESD, such as lack of policy support, inadequate professional training, and exam pressures, continue at the institutional level. This article recommends establishing an overarching ESD or ecological civilization framework in the education sector to sustain the growing attention given to ecological civilization in the Chinese education sector and calls for further research on the roles of education in just transition in the global context.

## Keywords

China; ecological civilization; education for sustainable development; environmental governance; just transition

## 1. Introduction

Just transition, originally focused on ensuring fairness and equity in the labor sector during environmental policy shifts in the 1980s, has been broadened to encompass a more inclusive and holistic approach to societal

transformation in response to climate challenges (McCauley & Heffron, 2018). This is particularly pertinent in the context of a global sustainability agenda, where there have been rapid policy reorientations in economic, environmental, and social sectors to address the urgency of climate change.

Concurrent with these developments, the emergence of education for sustainable development (ESD) offers a pathway to prepare learners to build and live in a sustainable future. Initiated in the 1992 Rio Summit and further developed during the so-called decade of education for sustainable development (2005–2014), ESD has inspired the development of educational pedagogies, policies, and theories to better connect education with sustainable development (SD; Rieckmann, 2018). Following the establishment of 17 SDGs in 2015, ESD has further developed as an integral part of the global sustainability agenda and has been granted key roles in promoting the SDGs. While there has been constant debate over the key function, approach, scope, and implementation of ESD, the interplay between ESD as an educational strategy and other sustainability policy frameworks, such as just transition, is becoming increasingly significant. This research delves into this intersection using China's paradigm shift towards ecological civilization as a case study to explore the dynamics between ESD and just transition.

In China, the transition to an "ecological civilization" marks a significant shift in ESD, moving from a phase of international recognition that aligns with global sustainability goals to a more localized and politicized framework. This transition raises critical questions about the nature as well as the transition process of ESD, including aspects such as the scope of education, public and stakeholder engagement, and the implications for China's environmental governance mode. This article aims to uncover how China's domestic political interests are influenced by the ESD transition and its outcome. This exploration contributes to the broader discourse on the role of education in supporting SD, introducing a novel perspective by revealing the drastic education transformation through the lens of a just transition framework.

This investigation is important because current studies, whether they illustrate the conceptual development of ESD or provide empirical evidence for ESD implementation in China, have largely overlooked the political significance of ESD. To bridge this gap, this article will first explore the key concept of just transition and then provide an overview of ESD in China. This is followed by the methodology and analysis sections, which will present the analytical framework and detail the study's findings. The discussion will synthesize the findings. The article concludes with a call for future research, underlining areas that warrant further exploration in the context of ESD and just transition.

## 2. Literature Review

### *2.1. The Global Development of ESD*

The term ESD stands for has continuously developed since the UN unveiled its plan at the Rio Summit of 1992. Before ESD was recognized in the global agenda, environment education (EE) emerged in the 1970s due to increasing awareness of environmental degradation and development issues. Gaining insight from *The Limits to Growth* (1972) and other books, conferences, and social activities, the UN quickly proposed an EE framework in the 1975 Belgrade Charter. The goal of the proposed EE framework was to inform the public of the existing state of the environment and its associated problems, and to develop "knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions to current problems and the prevention

of new ones" (UN, 1975, p. 3). The framework was extended two years later in the Tbilisi Declaration of 1977, which proposed bringing "biological, ethical, social, cultural, and economic aspects of environmental issues" into the scope of EE, building the foundation for EE and, later, ESD in a global context (Hume & Barry, 2015, p. 734).

The Rio Summit of 1992 helped transform EE into ESD. The non-binding action plan of the summit—Agenda 21—reoriented education goals toward SD. Chapter 36 of Agenda 21 proposed four education goals: "promote and improve the quality of education, reorient the curricula [toward sustainability], raise public awareness of the concept of sustainable development, [and] train the workforce" (Wals, 2009, p. 7). As a result, the newly proposed education missions were far beyond the scope of EE, as aspects of social justice, economic development, culture, equality, and sustainability were added to the agenda. The concept of ESD was hence created to respond to the increasing concerns regarding climate change and fulfill the needs of the education and development sectors (Hume & Barry, 2015). After nearly three decades of development in the global sustainability agendas, ESD has evolved from being an educational approach focused on promoting environmental protection to a globalized complex with practical and significant functions and roles in support of SD (Leicht et al., 2018; Sinakou et al., 2018). With the establishment of 17 SDGs in 2015, ESD has become part of the SDGs and is seen as a key enabler for all SDGs. According to SDG goal 4.7, ESD now incorporates human rights, gender equality, cultural diversity, and other related issues in constructing a sustainable future (UN, 2015). ESD was given a fundamental role as a tool for spreading values and knowledge related to SD and as a practical approach to training learners in skills and competencies that can contribute to SD.

### *2.2. Current Landscape of ESD in China*

There is still no official national-level ESD policy and framework in China even though it has been nearly three decades since its introduction (Han, 2015; J. Li, 2023; G. Li et al., 2022). Yet, ESD is commonly referenced in the national SD agenda and EE policies to demonstrate the fulfillment of its responsibilities by the Chinese government (Cheng & Yu, 2022). For example, China's sustainable development action outline in the early 21st century was issued to provide overarching SD goals in 2003. The policy was introduced to ensure the infiltration of SD values in all levels of education in China (China State Council, 2003). Following the action outline, and in the same year, the Ministry of Education issued two policies to support it. The first policy, regarding an environmental education curriculum outline for primary and secondary schools (dated 2003), targeted K-12 students and provided curriculum and extracurricular activity guidelines (Chinese Ministry of Education, 2003a). The second policy, concerning implementation guidelines for environmental education in primary and secondary schools (also in 2003), encompassed more details of curriculum development and included EE ideas and concepts in teaching (Chinese Ministry of Education, 2003b). These two policies aimed to promote environmental protection and ecological conservation knowledge in primary education to encourage environmentally friendly values in students.

Aside from the policy level, there were also multiple programs to develop ESD in the education sector. For example, the Chinese Ministry of Education, the World Wildlife Fund (WWF), and BP (British Petroleum) co-established the Environmental Educator Initiative (EEI) that existed from 1997 to 2007. The overall purpose of the project was to cooperate with educational institutions and provide EE opportunities for teachers and students to build an EE foundation for the next generation (Lee & Huang, 2009; Tsang & Lee,

2014). The project fostered school-based curriculum development, stimulated research on EE and ESD in higher education, and elevated EE and ESD implementation by providing training opportunities for education stakeholders (Tsang & Lee, 2014). Eighty-six primary and middle schools piloted the EE/ESD curricula, and more than 5000 teachers had been trained by the end of 2007 (Lee & Huang, 2009). Around the same time, UNESCO also helped China develop ESD opportunities through the project Educating for a Sustainable Future: Environment, Population and Sustainable Development (the EPD project). The objectives of the EPD project were aligned to increase instructors' capacities for understanding the environment, population, and SD, as well as students' overall knowledge and skills thereon, generate the next generation's awareness about these topics, and work with social institutions to provide better living conditions for all (Lee & Huang, 2009). More than 1000 schools from 14 provinces became ESD pilot schools, and EPD frameworks were implemented across China (Lee & Huang, 2009).

Indeed, ESD generated a positive impact on the education system in the past three decades (J. Li, 2023; R. Zhou, 2020). For example, the PuTuo District of Shanghai integrated ESD concepts into regional education plans that were implemented by all primary schools in the district. These new plans include focusing on students' innovative literacy, supplying education resources, school culture, infrastructure, etc. (Wang, 2019). However, there are also multiple challenges in current ESD practices in China. Interview results demonstrated that the Jingshan Primary School, the first ESD pilot school, was unable to fulfill the duties and accomplish the expected responsibilities of ESD practices due to a lack of ESD guidelines and local policy support (Witoszek, 2018). ESD was viewed as a tool to increase the school's reputation, rather than as an illustrative and constructive instrument to improve the quality of education: "Many schools have created fake websites for the ESD program….They don't lead to any actual implementation of the professed objectives" (Witoszek, 2018, p. 836). Other ESD pilot schools in Guangzhou encountered similar issues and showed that the lack of an interdisciplinary approach of ESD practices and the increasing pressure on exam scores shifted teachers' and students' attention away from ESD (Witoszek, 2018). Teacher training, textbook design, and curriculum innovation, as argued by Guo et al. (2018), were insufficient to promote ESD practices in geography education in China. Guo et al. (2018) gathered data from 237 geography teachers and found a lack of basic infrastructure for geography activities, which ultimately reduced students' opportunities to participate in geography education and further restricted efforts to promote ESD in schools. This situation underscores a crucial gap between the intended objectives of ESD and the practical realities within educational settings in China.

## 3. Just Transition

Just transition was originally used to describe energy transition in the 1970s. The term was first used by Tony Mazzochi, who postulated that workers and families whose livelihoods are affected by an energy transition should receive financial and educational support from the state during this transition (Eisenberg, 2019). When the Occupational Safety and Health Act in the United States was successfully passed in 1973, just transition became a concept that highlighted the dilemma of significant job losses due to increasing environmental regulations in contemporary society (Eisenberg, 2019). Given the global sustainability agenda since the 1990s, just transition invokes and incorporates divergent meanings and visions and engages multiple disciplines. Just transition has become an internationally recognized concept used to explore and resolve tensions around jobs, health, and the environment, and highlight justice and equality issues in SD (UNRISD, 2018).

Two prevalent viewpoints underpin the current development of just transition (Eisenberg, 2019). The "narrow lens" examines the theoretical implications in the contemporary world: Aside from being a labor-oriented concept targeting workers and communities in the transitioning energy industry, just transition is often defined as an integrated framework for climate, energy, and environmental justice (McCauley & Heffron, 2018). Just transition, hence, interconnects these aspects of justice through considerations of distributional, procedural, and restorative justice to assess and evaluate the transition process and outcomes (McCauley & Heffron, 2018). The second approach, or the "broader lens," investigates the extensive use and plain-language interpretations of justice (Eisenberg, 2019). The core concept of this approach "emphasises the importance of not continuing to sacrifice the well-being of vulnerable groups for the sake of advantaging others" (Eisenberg, 2019, p. 286). This idea of balance from the broader view of just transition aligns with the SD agenda, including the UN's SDGs, which promote a balanced mode of economic, environmental, and social development for a sustainable future (Delina & Sovacool, 2018).

Instead of focusing on the education inequality and injustice of the marginalized group in the energy transition, it is urgent to reconsider the roles of education in fulfilling the needs of learners to foster and live in a world with renewable energy (Trott et al., 2023). Under the global sustainability agenda, current and future generations need certain knowledge and skills to tackle the intricate complexities and profound challenges in reforming the education sector (Droubi et al., 2023). Derived from Heffron and McCauley's (2018) just transition framework, which highlights distributional, procedural, and restorative justice, climate justice is closely linked to education under just transition (Byrnes et al., 2022; Routledge et al., 2018; Schlosberg & Collins, 2014). Newell et al. (2021) suggested three dimensions for transformative climate justice that engage with the pathways for just transition: an inclusive one, a deepening one, and one of governance. Inclusive climate justice refers to the participation of stakeholders from different levels concerning the broader social mobilizations beyond the limits of regions, class, race, and gender (Newell et al., 2021). This is done through cognitive justice, stressing the importance of recognizing the value of experiential and lived knowledge from the forefront of climate justice struggles, such as marginalized stakeholders. Inclusive climate justice calls for integrating diverse knowledge systems, which challenges the traditional power dynamics in knowledge production and dissemination.

Deepening climate justice addresses the fundamental cause of climate injustice by reviewing the meaning-making and implementation stages (Newell et al., 2021). Newell et al. (2021) called for attention to the justice dimension, including equitable distribution of transition costs and attention to marginalized workers and communities affected by the transition. The key is to not worsen existing social inequalities while addressing the need for the transition. Governance for climate justice highlights the governance mode for accessing and sustaining climate justice (Newell et al., 2021). Governance focuses on access to justice, law, democracy, and climate justice within and beyond state boundaries. Newell et al. (2021) emphasize the critical role of deepening democracy to challenge existing power structures to enhance the representation of vulnerable groups in climate decision-making. It is also essential to understand the international impacts of climate justice governance and draw implications for the broader global community. Newell et al. (2021) argue that effective climate justice governance transcends national borders and requires a concerted effort in international forums to ensure equitable and just outcomes.

Overall, just transition provides a perspective for investigating justice issues (economic, energy, environmental, social, etc.) in the transition to a sustainable future and questioning the balance between different forms of

justice. Given these considerations of just transition, the three-dimensional approach offers a constructive lens to evaluate the ESD transition in China. By reviewing the recent change of ESD from an internationally recognized scheme to an education agenda that synthesizes domestic environmental and political interests, this article intends to explore the following research questions:

1. How do political factors shape the ESD development and transition within China's education sector?
2. To what extent is this transition considered as a "just transition" and what are the implications?

## 4. Methodology

This article mainly used documentary analysis and semi-structured interviews to address the proposed research questions. Documentary analysis was conducted to analyze the political significance of ESD, or ecological civilization, in this article. Key policies and documents were selected from keyword searches (e.g., ESD; ecological civilization; environmental education) on the Chinese Ministry of Education website (http://en.moe.gov.cn). Preliminary experience from the pilot study showed that these words were effective in identifying key information. These keywords are particularly pertinent to identifying policy documents and are in line with the objectives of this study. The empirical data is based on part of the study conducted in three primary schools in China. Semi-structured interviews were conducted with 28 school stakeholders, including teachers and school principals, to collect their perspectives regarding ESD. All interview data were recorded and transcribed verbatim through professional software. The author conducted a second round of transcription to validate the authenticity of the data. The author then used NVivo to code and analyze the data. This article also integrated secondary data from existing literature and synthesized various data sources in the analysis section. This combination constituted a comprehensive approach to addressing the research questions holistically.

## 5. From ESD to Ecological Civilization: The ESD Transition in China

The ESD transition in China emerged along with the development of an environmental agenda in late 2000. Hu Jintao, the president of China at the time, introduced the concept of "ecological civilization" (*sheng tai wen ming*). Ecological civilization, according to Hu's speech at the 17th National Congress of the Chinese Communist Party in 2007, was "to be a resource-efficient and environmentally friendly society that is based on resource and environmental capacity, following natural laws and targeted at sustainable development" (Pan, 2014, p. 48). "Ecological civilization" is also a political slogan created in response to the imbalanced and unsustainable domestic development pattern concentrating on industrialisation and economic growth (Gare, 2012). The ecological civilization concept was designed to alleviate the conflict between economic development and environmental sustainability that had been growing since the 1990s (Gu et al., 2020). Ecological civilization is, thus, an approach that signals an economic, environmental, and social transition to achieve SD in China (Geall & Ely, 2018).

Xi Jinping, the current president of China, has further developed and promoted the concept of ecological civilization since the 2010s. In fact, Xi coined the term "green development" in China when he was the governor of Zhejiang Province in 2005 (Geall & Ely, 2018). Political agenda items such as "clear waters and lush mountains are invaluable assets like mountains of gold and silver," "greenisation," and the "war on air, water, and soil pollution" were embedded in his governance and later became an image that China presented

in multiple international forums, such as the B20 Business Summit (2016) and the APEC Leaders Forum (2017) (Geall & Ely, 2018).

At the policy level, however, ecological civilization refers to environmental protection and ecological conservation that could reduce the burdens caused by economic activities (Yang et al., 2021). In short, ecological civilization aims to coordinate ecological protection and economic development and establish a new form of SD adapted for China (Meng et al., 2021). Ecological civilization endorses the idea of harmonious coexistence between humans and nature and theoretically promotes "environmentally friendly technology and green economic indicators, good government decision-making, environmental nomocracy, and social welfare, as well as extensive public participation, and green culture" (X. Zhou, 2021, p. 86). Overall, ecological civilization indicates China's SD path (Gare, 2012) and the increase in ecological considerations in the political agenda has contextually influenced ESD transition.

ESD has continued to feature in Chinese domestic policies since the 2000s. In 2010, the Chinese Ministry of Education issued the *Outline of China's National Plan for Medium- and Long-Term Education Reform and Development 2010–2020*. The outline was a ten-year plan for the education system, demonstrating the education priorities and interests for the decade. In the document, ESD appeared as an education priority along with safety education, life education, and national defense education (People's Republic of China, 2010). All of these were listed under the goal of promoting all-round development education and the policy further outlined the importance of ESD in China's education system.

Two years after the establishment of the SDGs, the Chinese Ministry of Education issued the *Outline of the 13th Five-Year Plan for the National Cause of Education* (2017). In this policy, ESD was listed and redefined under the heading "enhancing ecological civilization competence" and its goals were described as follows:

> To extensively carry out education for sustainable development; deepen water, electricity, and food saving education; guide students to practice strict economy and combat waste; establish an ecological civilization consciousness of respecting, conforming to, and protecting nature and, therefore, form sustainable development concepts, knowledge, and competences; practice a thrifty, green, and low-carbon, civilised, and healthy lifestyle; and lead the green trend in society. (People's Republic of China, 2017, translation by the author)

In this policy, the scope of ESD was expanded beyond the EE approach from previous policies. ESD now turned to an education approach to inspire diligence and thriftiness, environmental awareness, and the formation of SD values. Compared to the UNESCO framework of ESD, including the 17 SDGs and the key function of ESD in promoting quality education, the new approaches of ESD in China remained environmental. However, the absence of topics such as education equity and cultural diversity in UNESCO's ESD framework did not necessarily mean they were excluded from China's education system altogether. In the same policy, education equality, gender equality education, cultural education, and other targets that UNESCO proposed at the international level were listed independently and mentioned as priorities for the sector (People's Republic of China, 2017). Thus, ESD concepts and scopes were moderated in the context of China but not necessarily under the UNESCO ESD umbrella (R. Zhou & Lee, 2022).

As a result, independent educational targets and intentions, such as life-long learning, were not considered within the category of ESD in China. In 2019, the Ministry of Education aligned with three other ministries to

issue a policy on implementing Xi Jinping's ecological civilization thought in primary and secondary schools and enhancing ecological environmental awareness to further catalyze the concept of ecological civilization in schools. Besides establishing a new monitoring scheme to oversee progress and provide support for the development of ecological civilization in primary schools, the policy also emphasizes the importance of EE in the curriculum. The policy aimed to provide an environmentally friendly atmosphere in schools to promote values of diligence and thriftiness, encourage a low-carbon lifestyle, and foster green development. Although this trend of merging ecological civilization is often seen as political, ESD was inevitably transformed to satisfy the domestic agenda of ecological civilization in the education sector in China (G. Li et al., 2022).

The ESD transition in China was both educational and political. From the perspective of the education sector, the establishment of "an ecological civilization" in ESD indicated environmental significance in the promotion of social transformations (Kuhn, 2016). That is, EE continued to hold a prominent position in the educational aspect of ESD. The re-emphasis on ecological protection gave education an important role because part of the goal of ESD is to enhance civil awareness for respecting, conforming to, and protecting the environment. The political aspects of ecological civilization, in contrast, brought the possibility of reconnecting SD and ESD within China's development agenda (Zeng, 2019). Ecological civilization "promises…[the enhancement of] environmental consciousness of all citizens, a turn towards green need, not reduced economic growth" (M. Hansen & Liu, 2018, p. 323). As a political discourse, ecological civilization was an eco-environmental strategy that fostered ecological protection and continued generating economic development concurrently (Meng et al., 2021). Over the past three decades, China has focused extensively on development—especially economic growth—rather than sustainability in its SD agenda. The creation of the environmental agenda that Xi proposed provided political support for the ecological civilization that underpinned the seriousness of consistently promoting ecological development in development objectives (H. M. Hansen et al., 2018). This agenda reconciled the conflict between the orientations of SD and ESD (R. Zhou & Lee, 2022), given the increasing role of ecological civilization in the political agenda in China.

In short, the ESD transition expanded the educational and political aspects of ESD in China. The content and scope of ESD became responsible for promoting consumption patterns and values of diligence and thriftiness concerning environmental protection and ecological conservation. Politically, the rise of ecological civilization has emphasized the importance of environmental sustainability in development and education agendas, illustrating political support for ESD after two decades of development in China. ESD was, thus, internalized as a complex educational and political agenda after the ESD transition in China.

## 6. Interpreting ESD Transition Through the Lens of Climate Justice

The transition history of ESD over the past decade reflects the development of ESD in China from an internationally recognized concept to a domestically synthesized education agenda. This section interprets this ESD "internalization" through Newell et al.'s (2021) transformative climate justice dimension (inclusive, deepening, and one of governance). This section discusses the inclusive and governance dimensions through China's environmental governance and then addresses the deepening dimension.

Environmental governance has played an important role in understanding the political aspect of the ESD transition in China. Sometimes characterized as "public ignorance, free-riding, and a lack of available heuristics to motivate social action and multiple stakeholders' engagement," environmental governance in

China has provided an interpretive lens for climate justice (Gilley, 2012, p. 292). This mode of environmental governance is often referred to as "authoritarian environmentalism," a centralized system formed in a hierarchical structure that can allow for uniformly enacting order, policy, or instructions related to environmental development (Y. Li & Shapiro, 2020; Lo, 2015). In China, where an authoritarian government emphasizes top-down and non-participatory decision-making, public inclusion and participation are suppressed (Lo, 2020).

The introduction of ESD in China in the early 1990s and the transformation of ESD into ecological civilization in the 2010s conformed to the authoritarian environmentalist approach. The ESD transition was led by the political interests of China—a response to the urgent demand to connect development with environmental sustainability at the international level (Stimpson & Kwan, 2001). Environmental policies and initiatives were implemented command-and-control through a top-down administrative structure. As a result, the voice of education stakeholders, such as local school principals, teachers, and even bureaus at the lower level in the government, is underrepresented in authoritarian environmentalist governance. This is particularly reflected in teachers' and principals' interviews, of which this is an example:

> We only form school implementation plans according to the orders or policies made above…it's normally the administrative department that talks about policies. I mean, it is the district education department, yes, they may, I mean, based on the requests from the National Ministry of Education or the Ministry of Environment, you know. They will formulate a policy, a document, a document similar to a notice, and then send it down to school. Our school will make our implementation plans, based on the needs and principles of the document. (Teacher O)

Teacher O used the words "above" and "down" to describe the policy flow within the education system. Such governance structure is also confirmed by both teachers and school principals. In this regard, frontline educators' procedural justice in terms of participation in the decision-making for the ESD transition is limited. They act as receivers of the change, and their participation is highlighted during the implementation stage (Lee & Tilbury, 1998) to carry out the prescribed ecological civilization orientation, promote environmental responsibility, and encourage such transformation at local institutions.

Although often criticized for restraining social justice, authoritarian environmentalism can provide fast and rigorous responses to environmental crises compared to democratic environmentalism (Shahar, 2015). The strong advocacy for the ecological civilization agenda at the national level has immediate positive contributions in that ecological civilization has become one of the policy priorities in the education sector. In Tianjin, the sixth-largest city in China, for example, the municipal government followed up with an EE agenda for compulsory education stipulating that "half of the primary and middle schools in the city…qualify for green-school certificates" (Luova, 2020, p. 497). The project Green School was established in 1996 with the Ministry of Education and aimed to promote EE in primary and secondary schools (Wu, 2002). To receive the certificate, schools were asked to maintain a low-carbon campus, increase greenness on campus, provide extracurricular environmental conservation lectures and activities to students, and maintain the existing EE practices in the curriculum and teaching (Luova, 2020). Another example of the ecological civilization agenda is the waste classification policy endorsed by the Ministry of Education in 2018. Following its distribution to the district level, all school principals in this study reported implementing related activities, such as lecturing students about recycling, within a week of receiving the policy. The implementation of ecological civilization

under such an authoritarian scheme has proven to be highly efficient. The increased presence of ecological civilization in the education system indicated that the local government considered environmental sustainability a policy priority in response to the national directive. In other words, promoting ESD or ecological civilization has become politically correct in China (Luova, 2020).

However, the transition to ecological civilization has had limited improvement to the curriculum at the implementation stage. Previously, ESD in China has been criticized for being symbolic at the policy level for a long time (G. Li et al., 2022). Detailed follow-up ESD guidelines and implementation plans at the municipal level for education stakeholders were scarce (Witoszek, 2018). The implementation of ESD is often disjointed and lacks direction due to the absence of an overarching framework in the education sector (G. Li et al., 2022). At the institutional level, studies have found a lack of policy endorsement and supportive guidelines at the municipal level (Guo et al., 2018; Tian & Wang, 2016). These phenomena continued after the establishment of ecological civilization. Using the local waste classification policy as an example, although the policy was widely practiced in all primary schools at the municipal level, some of the issues identified in the literature still exist. Teacher H described the current status of the policy in their school:

> You just talk about it [the policy] to students. The actual implementation is not—not very strong, not mandatory….Lots of these things are done to meet the inspection from the superiors, so I think the environmental protection, the waste classification, I think it's still very [smiles], you know, right?

Additionally, several teachers reported a lack of professional training necessary for educating students about waste classification and other initiatives under the ecological civilization agenda, raising further concerns about its overall implementation. Without sufficient training and resources, educators often find themselves unprepared to effectively teach knowledge and develop competence in students, thereby failing to meet the intended policy and activity goals. This deficiency limits students' engagement with and understanding of vital environmental issues, thereby undermining the overarching goals of ecological civilization.

Witoszek (2018) also found that the extensive teaching and exam pressures in schools suppressed efforts to accommodate EE at schools. Such findings are also found in interviews with teachers, where many participants highlighted the significance of academic pressures in daily teaching. According to Teacher A, "the traditional exam-oriented education is still strong, emphasizing knowledge over values…because the superior leaders consider test results as large parts of our performance—yes, just test results." Teacher G agreed and added: "The graduating class always takes a district-wide exam. Therefore, you know, we [teachers] will definitely compare our performance, you know, so the pressure of performance is still relatively high." These challenges continue confronting the roles of ecological civilization in the curriculum, raising questions about the effectiveness and integration of such an agenda in China's education system. As the implementation has largely followed a "business as usual" trajectory, this ESD transition, while it made efforts to raise awareness about environmental sustainability through political motivation, has failed to reshape the ESD landscape at the practical level within China's education system.

Overall, the discrepancy between the government's advocacy for ecological civilization and its practical application in educational settings underscores a broader and systemic misalignment. This gap between policy and practice not only impedes the successful implementation of ecological civilization but also reflects

a more pervasive challenge within the educational paradigm—even policies characterized by authoritarian environmentalism can struggle under the prevailing and conventional educational system in China.

## 7. Conclusion

This article used just transition to explore the transition of ESD in China. Using the transformative climate justice framework, this article revealed the intentions, processes, and impacts of the ESD transition in China, from a well-established international convention to a political discourse that extensively focuses on EE. Overall, the transition to ecological civilization demonstrates the Chinese government's commitment to integrating sustainability within its governance structures, particularly in the education sector. This approach aligns well with the original concept of just transition, especially in its emphasis on environmental sustainability. Through the climate justice lens proposed by Newell et al. (2021), ecological civilization currently leads to a systematic endorsement of EE in the Chinese education system but offers limited changes to the existing status quo of the EE landscape, as many of the issues identified in previous experiences and case studies continue. This is presumably due to the underrepresentation of frontline stakeholders in steering the transition, coupled with the heavily political nature of the concept, which may not align with the broader educational objectives of ecological civilization.

To further progress the ESD transition, an overarching ESD, or an educational framework for ecological civilization is required in China. This new framework will allow the configuration of new strategies and initiatives to further embed ecological civilization in the education system under political support. The framework will also allow the Chinese government to systematically develop ecological civilization at all levels of educational institutions—moving beyond mere rhetoric in the political agenda. The proposed framework could also facilitate broader participation from stakeholders at all levels, not necessarily in direct decision-making, but in contributing to progress monitoring, evaluation, and recommendation within the existing governance model. The insights and feedback from students, teachers, principals, and municipal bureaus are crucial for providing perspectives on educational outcomes, implementation challenges, and innovative teaching methods. Their voices and opinions are important for continuing the development of ESD, or ecological civilization, in the Chinese education system.

Overall, this article provides new perspectives on just transition and ESD advances in China. However, this study has several limitations. Access to some documents listed on the Ministry of Education's website required special permissions, leading to potential gaps in the policy documents gathered for analysis. The empirical data used in this study are from 2020, and most secondary data originate from research conducted in the late 2010s. Considering the growing momentum of the ecological civilization in China's political arena over the past three years, the findings of this study may only reflect the situation as it was at the time of data collection. Therefore, future research is encouraged to provide updated insights and to continue exploring the political and educational dynamics of this agenda.

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## Conflict of Interests

The author declares no conflict of interests.

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ARTICLE

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# Hidden Dimensions of Injustice in the Green Transition of China's Coal Mining Industry

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## Abstract

The social impact of China's policy of phasing out excess coal production since the 2010s is examined through the lens of "just transition." Qualitative fieldwork undertaken in Liupanshui, Guizhou province, focussed on seven mines, among which three were decommissioned. Against the backdrop of top-down policy imperatives aimed at rapidly reducing coal production capacity, more powerful stakeholders took action to safeguard their own perceived interests, thereby transferring the costs of transition to the least powerful actors while exacerbating existing injustices. At the same time, Confucian traditions and modern civic education in China—which prioritise endurance and compliance—limited individual voice and agency. By adopting just transition as a policy tool, China could avoid errors made by countries that transitioned earlier.

## Keywords

China; coal mining industry; green transition; just transition; social injustice

## 1. Introduction: Just Transition and China's Accelerated Pace of Decarbonization

The concept of just transition bridges the fields of climate, energy, and environmental justice studies (McCauley & Heffron, 2018). It was initially proposed against the backdrop of global decarbonisation, with an emphasis on the equal distribution of the benefits and costs of green transition among different socio-economic groups (Carley & Konisky, 2020; Healy & Barry, 2017; Rissman et al., 2020). Although views about "transition" and "justice" differ (Heffron, 2021, pp. 9–19), the concept of just transition has gradually been integrated into governance strategy, public perceptions, and theories of socio-technical transition through extensive theoretical debates and empirical explorations (Wang & Lo, 2021). Threats to just

transition have been identified relating to energy poverty, the livelihoods of employees in the energy industry, and the management of potential conflicts between energy policy and the pursuit of climate justice (Newell & Mulvaney, 2013).

Just transition, while being a matter of public concern and an ethical principle, is necessarily achieved through political and economic processes. Just transition, therefore, may take different forms in societies with varying political economies and give rise to the need for empirical literature rooted in practice (Wang & Lo, 2021). However, the existing literature is disproportionately informed by the experience of just transition in the Global North, whereas that from developing countries (Swilling et al., 2016; Wang & Lo, 2022), as well as voices from indigenous or marginalised communities (Zografos & Robbins, 2020), are largely missing.

China, as the world's largest coal producer and consumer, plays a pivotal role in the global campaign of decarbonisation, with its transition commencing in the 2010s. In 2020, the pace of decarbonisation accelerated with the country's "political mission" to promote a green transition and facilitate the construction of an ecological civilisation, as well as with President Xi Jinping's announcement of the "30–60" decarbonisation target, with emissions peaking in 2030 and carbon neutrality to be achieved before 2060 (H. Dong et al., 2022). Achieving this target requires a dramatic reduction in coal-fired power production, an industry employing some four million workers (Zhang et al., 2022), and a major source of government revenues (Clark & Zhang, 2022). With limited alternative employment opportunities, frontline workers could bear much of the social cost of the transition which will be concentrated in China's major "coal provinces," i.e., Shanxi, Inner Mongolia, Shaanxi, and Xinjiang (Hamilton et al., 2022; Luo et al., 2023; Pai et al., 2020; Sharma et al., 2023). Against this backdrop, Chinese scholars and policymakers must engage with the idea of just transition, seeking ways of minimising and fairly allocating the social impact of the energy structure adjustment following the principles of social justice. In making the transition out of coal later than many developed countries, there is plenty of room for cross-national learning.

British coal production peaked in 1913 but the industry still employed 237,000 workers in 1980. Thereafter, mines closed rapidly but the former mining districts, once economic leaders, now lag the rest of the country in terms of economic development, with high levels of economic and social disadvantage and especially health problems and disability affecting the entire community, not just the dwindling number of former miners (Beatty et al., 2019). Mine closures on a large scale in the Appalachian region of the United States began in 2011 and current poverty rates in the once-high coal-producing areas are twice those in adjacent areas with high disease and mortality rates (Zipper & Skousen, 2021). In Poland, two-thirds of mines have closed in the last 30 years with pockets of high poverty remaining in many coal-mining districts. Leaders of mine workers unions complain of rapid closures, lack of unions, workers' benefits in the private sector, and, until recently, no commitment to two pillars of just transition: participation and re-training (Jarzabek, 2022).

In apparent contrast, the Ruhr region of Germany has pursued a holistic policy of just transition since 2007 (World Resources Institute, 2021). Policy elements include a slow, gradual phasing out of subsidised coal based on a strong social partnership model and large-scale investment by all levels of government. In addition, there has been a leverage of local assets and workforce skills with public support for regional revitalisation and diversification beyond a simple focus on job substitution and retraining. The policy "turn" towards just transition reflected earlier failures. Top-down policies first adopted in 1968 resulted in economic stagnation leading, in the 1990s, to a more decentralised, inclusive engagement strategy and partnership following the

Future Initiative for Coal and Steel Regions launched in 1987. While the commitment to just transition is deemed to have been largely successful, policies have primarily benefited large companies while casual and short-term workers have missed out on the protection afforded to long-term employees. Northern Ruhr has been underserved and has above-average unemployment rates, lower incomes, and high levels of child poverty (Arora & Schroeder, 2022).

Based on ethnographic research in a major coalfield in China's Guizhou province that has recently experienced a wave of closures, this research aims to better understand the distribution of the associated costs and the reasons for them. It is apparent that China has pursued strategies similar to those employed by other countries in the early stages of the transition away from coal and that a greater focus on just transition could yield social and economic benefits.

## 2. Fieldwork Methods

Guizhou province accounted for 3% of China's coal production capacity in 2022 (CEIC, 2022). Widely known as "the coal capital of Southwest China," Liupanshui, one of the nine prefecture-level cities in Guizhou, has a history of production dating back to the 1960s Third Front Construction Scheme (Guiyang Poverty Alleviation Office, 2021). It boasts 40% of the province's total coal reserves and, in 2022, over 10% of the city's population was still employed in coal mining and preparation, which accounted for 55.2% of its GDP (C. Chen, 2022). Since 2010, Liupanshui has proactively taken measures to align with the central government's directive to phase out inefficient coal production capacity (hereafter referred to as the "phase-out policy"). It closed 55 coalmines during the 13th Five Year Plan (2016–2020), reducing production capacity by 13.12 million tons (D. Liu & Qi, 2021), and announced plans to limit the number of coal mines to 120 by the end of the 14th Five Year Plan (2021–2025; Government of Liupanshui, 2023). Despite green development, the social consequences of closures have been described as "painful" by local media (Z. Liu, 2016; Long et al., 2021).

Fieldwork was undertaken in the summer of 2021 by a team of eight researchers from Beijing Normal University and Duke Kunshan University, including the authors. It concentrated on seven coal mines and their nearby communities chosen to provide a meaningful account of the ecology of the Liupanshui coal transition during the past decade. The mines differed in ownership, size, and location; three had closed while four remained open, as shown in Table 1.

**Table 1.** Background information of the seven selected coal mines.

| Name | Ownership | Location | Production capacity | Employees | Status |
|---|---|---|---|---|---|
| M Mine | State | 44 km NW to the city centre | 900 kiloton/y | 1231 | Shut down (2016) |
| D Mine | State | 38 km NW to the city centre | 3000 kiloton/y | 3005 | In operation |
| W Mine | State | 21 km NW to the city centre | 2700 kiloton/y | 3179 | In operation |
| Bh Mine | State | 32 km NE to the city centre | 400 kiloton/y | 240 | Shut down (2013) |
| Bx Mine | Private | 38 km NE to the city centre | 1500 kiloton/y | 1700 | In operation |
| H Mine | Private | 52 km SW to the city centre | 600 kiloton/y | 684 | In operation |
| X Mine | Private | 66km SW to the city centre | 200 kiloton/y | c. 200 | Shut down (2012) |

Some employees of closed mines were redeployed under "internal resettlement" schemes. The S Mining Company, for example, upon the closure of M Mine, moved some miners to mines D and W where the research team was able to interview them in depth. Similarly, some miners transferred from X Mine to H Mine and Bh Mine to Bx Mine at the time of closures in 2012 and 2013 respectively. Interviews and on-site observation of working mines added to the understanding of the challenges ahead and after closure. Ethical approval for the research was obtained from Beijing Normal University, with respondents consenting to recorded interviews and offered anonymity.

Semi-structured interviews were adopted as the main approach to data collection, accompanied by on-site observations and archival work. Sixty semi-structured individual interviews were conducted with six government officials, 13 high and mid-level managers, 21 first-line miners, 11 ground crew, and nine villagers living close by the mines identified through purposive sampling. Separate topic guides were designed for each set of stakeholders with respondents invited to reflect on the transition of coal mining and its influence on their lives during the past 10 years. The interviews yielded rich and comprehensive accounts of life stories and first-person observations which were later collated for summarisation and comparison. Paul Colaizzi's descriptive phenomenological method helped the authors reveal an "essential structure" of the investigation through a 7-step inductive data process (Morrow et al., 2015). Following this approach, the authors identified over 1,100 significant statements appertaining to the concept of just transition which, when aggregated, underpin the seven features of the transition discussed below.

## 3. Enterprises

### *3.1. Closures*

Coal mining enterprises nominally bore the primary responsibility for phasing out outdated and inefficient production (State Council of China, 2016). However, when, in February 2016, the State Council issued a decree to cut annual coal production capacity enterprises had no alternative but to act. In late May 2016, the Liupanshui government translated the decree into measurable targets, allowing only three months for companies to react. The implications were similar to those observed in Poland about which trade unions complained.

Although S Mining Company only had three months in which to act, being one of the largest state-owned coal mining enterprises in Guizhou, with over 10 coal mines, it had scope to mitigate direct losses through internal adjustments. It responded to the "political mission" by downscaling its annual production capacity by 1,000 kilotons in 2016, despite raw coal prices trending up at the time and a recent investment of 70 million RMB to increase productivity. It decided to close M Mine, even though it was still profitable, announcing the decision on 10 August 2016. Within five weeks, the portals of M Mine were sealed with strips of paper marking the closure date (12 September 2016), which remain fixed to the gate. L, former party secretary of M Mine, complained about the haste and the consequential tough situations faced by the management team:

> Everyone knew it would be a huge loss, but we had to shut down the mine instantly because it was a political mission from the above. We are a state-owned coal company and we serve primarily for the national strategy of development. This was our political responsibility and there was no room for bargaining…but all I hoped for was that we could have been given more time to evaluate what option

> would cause the least loss to the enterprise, and to find ways to minimise the harm to the workers. After all, we are a company. We need to care about profit too, as we have tens of thousands of employees to feed. (L, 45, male)

Many private coal mining companies in Liupanshui—typically smaller with less production capacity—had no room to mobilise for survival however. In 2016, the provincial government determined that enterprises with an annual production capacity equivalent to below 300 kilotons were to close. The three-month window for action was insufficient for companies to merge or purchase production quotas to exceed the closure threshold, a cause of many complaints, as reflected by Y, a former midlevel manager of X Mine, closed in 2013:

> Back at the time when the redline was announced, my boss barely slept for many days. He met other mining business owners, but they could not come up with any solutions on time, despite smoking packs of cigarettes together day and night. Even if they had agreed to merge, the paperwork and administrative procedures would have taken more than half a year. It was just a matter of the government not wanting private coal mines to survive. (Y, 39, male)

### *3.2. Compensation*

The central government established a special fund to assist mining companies in compensating employees who were to be dismissed because of the phase-out policy (Cong et al., 2019; S. Dong et al., 2007). D, a high-ranking manager of S Company responsible for the disbursement of the special fund, explained the challenges: The company received 480 million RMB to facilitate the closure of M Mine which, according to D, was insufficient. 340 million RMB, 70% of the total, was used to fund displaced workers' social insurance and redundancy payments, which left too little to guarantee retired employees' welfare, to support the families of mining accident victims, to maintain state-owned assets, and to undertake environmental restoration:

> Even though M Mine was shut down merely 32 days after the decision, many problems were left unsolved due to insufficient funds. This has caused the management of our enterprise much distress. (D, 56, male)

The situation was even tougher for the small-scale private enterprises. The Guizhou Provincial Government Planning Document explicitly prioritised state-owned companies when allocating the central government's special fund (Government of Guizhou Province, 2017). The reason, according to X, a government official in the energy sector, was that the state-owned companies' employees had a statutory right to redundancy and compensation, whereas workers from the private mines did not:

> The compensation for shutting down private coal mines with an annual production of 150 kilotons and 300 kilotons is 2.7 million and 4.6 million RMB respectively, whereas in my records, a state-owned mine can get 12 million to phase out 150 kiloton production capacity and another one 30 million for 420 kilotons. State-owned companies also receive additional stipends to resettle their employees, whereas private companies get nothing for that. After all, it is a common practice here that private companies do not have to compensate the miners when they get dismissed. (X, 37, female)

## 4. Employees

### *4.1. Participation*

The speed of closure meant no or very limited consultation with employees, who typically complained that they were "the first to be laid off and the last to be notified." M Mine serves as an example. Y, a frontline mineworker, recalled the last day in M Mine:

> My team was probably the last to know the news. It was right before we finished the day's work that the chief of the division told us that the portal would be sealed that night. All the machines and tools were left in the tunnel. Someone even forgot to bring out their hi-vis vest from the last blasting hole we were working on. (Y, 43, male)

Two of the three closed mines had been state-owned with a history of over 50 years. Many employees were *kuangerdai* or *kuangsandai* (the second or third generation of the descendants of workers who first developed the coal mines) and would have worked in the mines all of their lives. They criticised the company for the arbitrary decision and the unfair treatment in which they saw no compassion or respect.

Dissatisfaction was further compounded by S Company's decision to transfer all those displaced by the closure of M Mine to other positions within the company (internal settlement) rather than offering employees a choice of internal retirement or economic compensation as stated in the Guizhou Provincial Government Planning Document. Management explained that it was impossible to tailor plans for the 1,345 workers given the speed of closure.

### *4.2. Silence*

To legally launch the worker placement scheme, S Company was required to consult with representatives. Eighty percent of representatives voted against the proposal to redeploy all staff affected after which the company dispatched a special team to M Mine to undertake "ideological" work among the representatives. In a second vote, the revised plan received 100% approval but the legitimacy of the outcome was widely contested by miners including Z, a frontline miner who was transferred to D Mine:

> The assembly meeting was nonsense. I do not know those people. We do not have a representative to speak for us. Everyone focuses on his own business down under the mine. It is impossible that the representatives know me, nor do I get the chance to know them. (Z, 46, male)

Despite widespread discontent, few workers sought to challenge the result or seek a different outcome for themselves. Both the Confucian tradition and modern civic education in China set the stage for the deliberate choice of silence. The cost of transition transferred to the workers was considered to be a collective sacrifice equally distributed among the group and their unavoidable fate. As H, a forklift driver who transferred to D Mine from M Mine in 2016, reflected:

> No one wanted to stick his head out. The scheme was not fair, but everyone sacrificed without exception….The farthest we could go was the headquarters of S Company in the city. M Mine was too

> remote. It was hard to organise people and go tens of miles to protest. We seldom brought it up to the city authority. Back in the past when the wage was too low to live on, we just endured it by ourselves and did not bring it up for a single time either. (H, 44, male)

In the autumn of 2017, over 100 former employees of M Mine lobbied the Liupanshui Municipal Government to alter the basis for calculating compensation from the annual average income of S Company (30,000 yuan RMB) to the average of M Mine (56,000 yuan RMB). Their failure, reputedly even to receive a "proper" reply, frustrated workers and further dampened their willingness openly to express their opinions. Former miners from W Mine and Bh Mine were equally frustrated by the discontinued welfare. However, it was typical that frontline workers, being the bottom of the social and political pyramid, had no choice but to accept the loss as their destiny. W, a former miner from Bh Mine, explained why he chose to keep silent:

> It was only after the mine was shut down that we were told that we did not have medical insurance. We found it absurd and unacceptable—back then it was all free to see a doctor on the mine….What is the solution? The solution is [to pay] all from my own pocket. The officials cover for the entrepreneurs. As a commoner, I dare not defy the government. (W, 49, male)

### *4.3. Financial Support*

While the Guizhou Provincial Government Planning Document stipulated that state-owned, though not private, enterprises were obligated to reach an agreement on placement and to provide training and support for re-employment, this seldom occurred. Laid-off employees, perhaps especially those aged over 50, found it extremely hard to find another job, as they were "the least wanted in the job market." Miners complained that welfare benefits were insufficient to cover daily expenses meaning—as L, a former worker at Bh Mine, explained—that they had to "go back home growing some short season crops and live on a monthly stipend of less than 100 yuan RMB from the mine."

Worse still, as Bh Mine was later taken over by another company and resumed production for a short period of time, the new employer refused to recognise prior length of service, depriving workers of the retirement benefits they had accrued through working in a state-owned company for over 15 years.

## 5. Impact on Communities

### *5.1. Local Livelihoods*

All that remained of M Mine in 2021, five years after its closure, were the dilapidated grand hall, an abandoned hospital, and a deserted shopping street. Once a large community with more than 2,000 residents, only about 40 semi-retired employees remained to safeguard state-owned assets. The impact of mine closures on nearby villages was marked by small businesses offering services to mine employees abruptly losing their *raison d'être*. Mine managers, as explained by L, the former party secretary of M Mine, considered that their sole responsibility was the placement of their workers, not the livelihood of local villagers, many of whom had to migrate in search of alternative employment, leaving villages "hollow" of a prime-age workforce.

The mine closures in Liupanshui deliriously affected villagers in other respects. Often villagers had rented out their land to the mining company on long-term leases. Bh Mine, for example, had signed a 25-year land acquisition agreement with the adjacent villages but rents had not kept up with living costs. When Bh Mine closed in 2013, with 5-years tenure remaining, villagers expected that they would be able to take the land back into cultivation. However, S, a villager, explained that the local government requisitioned the land for other purposes:

> Back in the 1990s, Bh Mine contracted our arable land for 25 years in one go. We got money year by year as compensation, but the agreed rate was so low by today's standards….When Bh Mine was shut down, we all thought that we could finally get the land back. However, to our surprise, the district government took over the land and auctioned the right of use to another party. (S, 47, female, 47)

### *5.2. Environmental Degradation*

Much of the land near the mining sites was no longer suitable for cultivation due to the consequences of the mining operations. Land subsidence was reported by residents living close to both Bh and X mines; as H, a male villager living next to Bh Mine. memorably stated: "[The land] was too unstable to walk on, let alone grow things."

Ironically, the mines in Liupanshui had originally been sunk in areas of considerable natural beauty. M Mine, for example, named in the local Yi dialect, means "the valley with abundant flower bloom," while X Mine is located next to a famous grassland, the home of millions of camphor trees and spectacular karst landscape. The tourism potential was now compromised by severe land subsidence and ecological degradation. As a further irony, a factor influencing the closure of X mine, situated at the bottom of a valley, was the prospect of flooding the valley to create a reservoir that may "wash away the stains of the past." This was something locals welcomed, an unanticipated ending to their campaign against pollution:

> X Mine piled up the coal gangues here and there without any treatment at all. Our land has all been contaminated. We filed a complaint about pollution to the Environmental Bureau, but they never cared about our health….They would not have shut down the coal mine if the reservoir water were not pumped to the downtown of Liupanshui for the city residents to drink. (M, 55, male, villager living next to X Mine)

## 6. Discussion and Conclusion

Viewing the coalmine closures in Liupanshui through the lens of just transition is informative albeit that just transition was not a stated goal of Chinese environmental policy at the time. What is apparent is that the same threats to just transition were at play in Liupanshui as had been observed elsewhere: energy poverty, employee livelihoods, and management of conflicts between energy policy and the pursuit of climate justice (Newell & Mulvaney, 2013). Likewise, under similar pressures, policy actors pursued many of the same strategies as their counterparts dealing with mine closures in earlier periods in Europe and North America.

For the most part, social injustice went unrecognised. Collateral damage resulting from a narrow environmental policy might have been identified and avoided had the pillars of proactive just transition been in place such

as participation and re-training. The reality is that it is difficult to identify injustices in daily settings as they are usually expressed in the form of hidden transcripts, in the sense that James Scott originally used to term to describe the invisible criticism of power among peasants in Southeast East Asia (Scott, 1990). It may take anthropological approaches to reveal them (Tilt, 2023).

China's approach to environmental and energy governance has been termed "authoritarian environmentalism," a multi-tier command-style campaign of energy transition with top-down delegation of tasks (G. Chen & Lees, 2018). With the environment integrated into the performance appraisal system (Guan et al., 2022), local government officials felt obliged to reduce coal production capacity as instructed by the central government edict, constraining enterprises to act accordingly. Large state-owned coal mining companies, S Company, for example, exhibited greater resilience than smaller private enterprises and were able to protect employees to some extent through redeployment ("internal resettlement"). They also benefitted from receiving a disproportionate share of the special fund, rational in administrative terms since public sector employees were due social security payments whereas private sector employees were not. However, the strategy served to exacerbate existing inequalities between public and private sector employees.

The speed of closures imposed on enterprises created—or excused—forms of injustice. Managers in the state-owned S Company argued that they had insufficient time to offer employees a choice of redundancy packages as required by the Guizhou Provincial Government Planning Document. Instead, they opted to require all staff to accept "internal resettlement," a strategy resented by many employees. Likewise, the earlier rapid imposition of a capacity threshold on mining enterprises precluded small private sector firms from merging to meet the arbitrary threshold. This caused many producers to cease trading but it remains unclear whether this was the policy intent or an unanticipated consequence of imposing a short period of transition.

Ordinary people dependent for their livelihoods on the mining industry lie at the end of a chain of delegation and they experience the consequences of decisions taken primarily for the benefit of government and public or private sector enterprises. Their interests, insofar as they were accounted for in Guizhou's "phase-out" policy, were interpreted by others largely without consultation. Ordinary people were perhaps too often seen either as resources, labour, or liabilities. With limited voice or power, they bore most of the costs and few of the benefits of the green transition. The average per capita income in Liupanshui fell behind the Guizhou average in 2013 and has not recovered. Similarly, registered unemployment was much higher until the impact of the Covid-19 pandemic in 2021.

Consistent with the findings from Liupanshui, Lo (2020, 2021) concludes that China's "authoritarian environmentalism" excludes public engagement and, hence, denies policymakers access to local knowledge. China is not alone in this as will be realised from the failure of the concept of just transition to have traction in the United States where it was originally developed. Trade unions sought to ensure that environmental concerns did not prevail over the well-being of workers and communities (Wang & Lo, 2021). However, the passivity of those negatively affected by the phase-out policies in Liupanshui is possibly a product of Chinese social culture where both Confucian traditions and modern civic education merit endurance and compliance in everyday political life.

The German experience of gradually phasing out coal production and co-opting just transition as a policy template or tool stands as an exemplar against the generic failure of governments satisfactorily to manage the transition from coal. At its most successful, it has focused large-scale investment by all levels of government on future development investing in, rather than disposing of, human capital and strategic infrastructure. Little of either was yet apparent in Liupanshui risking the possibility of it repeating the experience of Britain, where former coalmining districts remain deeply disadvantaged and distrusting of the government 40 years after the mines were decommissioned (Abreu & Jones, 2021; Beatty et al., 2019).

The successful regeneration of Germany's Ruhr former coalmining district draws attention to the potential of just transition as a policy tool. By listening to different stakeholders, recognising various forms of injustice, and identifying the demands of people, this research sheds light on how to increase the "practicability" of the concept. It requires a bottom-up case-based approach in which anthropology and qualitative sociological methods play a key role in collecting data from the grassroots level, listening to subaltern groups in particular, and contextualising the findings in specific regimes and cultures.

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## Conflict of Interests

The authors declare no conflict of interests.

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# Just Transition for China's Coal Regions Towards Carbon Neutrality Targets

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## Abstract

China has pledged to peak its carbon emissions before 2030 and achieve carbon neutrality by 2060. A crucial aspect of this commitment involves transitioning from coal-dependent activities primarily concentrated in certain regions pivotal to local economies, employment, and livelihoods. High-quality development necessitates identifying just transition strategies for these coal-intensive regions, ensuring inclusive benefits from the energy transition. These regions exhibit disparities in economic and industrial growth, with many low-income mining communities and inadequate public services. This calls for comprehensive policy interventions in economic, energy, societal, and environmental domains. This study aims to delineate just transition strategies for China's coal regions, considering their unique challenges and circumstances. Initially, this article reviews the evolution of "just transition" as a concept and its policy implications. Subsequently, it explores China's approach to achieving carbon neutrality through the lens of just transition, delving into the local economy's reliance on coal-related industries and the impact on employment. Following a clear delineation of the vision for just transition in China, the analysis focuses on identifying principles and pathways for transition. The goal is to propose nuanced and effective policies to ensure just outcomes in the context of China's energy transition.

## Keywords

carbon neutrality; China; climate change; coal regions; just transition; social justice

## 1. Introduction

Climate change presents a formidable challenge globally, necessitating urgent scientific and political attention. The Paris Agreement, concluded in 2015 and entered into force in 2016, proposes to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels" (UNFCCC, 2015). The IPCC Special Report on the impacts of global warming of 1.5°C indicated that achieving global carbon neutrality by the mid-21st century is imperative to restrain global warming within 1.5°C, to avoid irreversible negative impacts of climate change on human society and ecosystems (IPCC, 2018). Against this backdrop, the call for carbon neutrality is becoming increasingly urgent worldwide. By the end of May 2023, more than 130 countries or regions have proposed their carbon neutrality targets. Pivotal in this context is China's commitment, declared at the 75th United Nations General Assembly in September 2020, stating "China will enhance its nationally determined contributions and take more vigorous policies and measures, striving to peak carbon dioxide emissions before 2030 and achieve carbon neutrality before 2060" (China SCIO, 2021). This extremely ambitious goal underscores the necessity for China to undertake extensive and profound systemic reforms in its economic and social systems, propelling a just energy transition (Lu et al., 2023).

China's energy profile is notably characterised by abundant coal reserves, limited oil, and scarce natural gas, positioning coal as a historically predominant energy source (Zhang et al., 2019). This has led to coal's substantial contribution to China's energy production and consumption. Despite energy security concerns prompting a gradual and somewhat disorganised coal phase-out in China (P. Wang et al., 2021), the imperative carbon neutrality objectives necessitate an orderly withdrawal from coal and other fossil fuels (Gonzalez-Salazar et al., 2020; Pan et al., 2022). For a long time, China's coal regions have made significant contributions to the country's economic and social development. However, these regions are highly dependent on coal resources and related industries. Under the "carbon peak and carbon neutrality" targets, the gradual phase-out of coal will bring significant social and economic shocks to these regions, leading to job losses, income reduction, and welfare losses. With the world's largest coal workforce, approximately 2.6 million strong in the coal mining and washing sector as of 2022, the phase-out of coal is poised to profoundly impact employment and socio-economic stability in these areas.

The rest of this article is structured as follows: Section 2 delves into a comprehensive review of the evolution of the "just transition" concept and related policies globally over the past decades. Sections 3 and 4 shift the focus to China, discussing the current landscape and expected future outlook for coal transition in specific regions. Section 5, finally, synthesises the insights gained and articulates a set of recommendations aimed at equipping China to adeptly navigate the impending challenges associated with the coal phase-out.

## 2. Development of the "Just Transition" Concept and Policies

### *2.1. Conceptual Evolution of Just Transition*

The concept of just transition originated from North American labour movements approximately half a century ago, initially focusing on urging policymakers to take measures to protect, support, and compensate workers adversely affected by environmental regulations and policies. It emphasised the importance of safeguarding the welfare and rights of workers in industries facing decline due to environmental actions

(Mazzochi, 1993). Over time, the efforts from some international organisations such as the International Trade Union Confederation (ITUC) and the International Labour Organization (ILO) have propelled the just transition issue into the realm of international climate negotiations, positioning it as a crucial social mechanism for addressing the challenges of climate change (Krawchenko & Gordon, 2021). The concept has gradually become a fundamental component of the UN-led climate governance process and was included in the Cancún Agreements, the Paris Agreement, and subsequent decisions (Johansson, 2023). Notably, the Silesia Declaration on Solidarity and Just Transition adopted at COP24 in 2018 underscored the elevation of this issue to a significant position on the global climate agenda.

The concept was initially focused on addressing employment equity and labour market challenges during economic transitions, and the preamble of the Paris Agreement also explicitly advocated for a "just transition of the workforce and the creation of decent work and quality jobs in accordance with nationally defined development priorities" (UNFCCC, 2015). Recent scholarly and political discourse has broadened the scope of just transition (X. Wang & Lo, 2021), centring on countries, industries, and communities adversely impacted by energy transitions (Heffron & McCauley, 2022; Morena et al., 2020). Evolving from its initial labour market orientation, just transition now encompasses a wider systemic socio-economic transformation, integrating principles of environmental justice, energy justice, and climate justice (Tavares, 2022). The commonly accepted concept of "equity" refers to fair inclusion or allocating resources such that people of different backgrounds and life experiences may reach an equal outcome (Polk & Diver, 2020). While "justice" goes beyond distribution to also include consideration of process and recognition (Fraser, 2009), it is the principle of upholding what is right and just, regardless of personal or societal biases (Goldman & Cropanzano, 2015). In terms of the goal of achieving social justice or ensuring equity, the original transition strategy emphasised the support offered to disadvantaged groups and regions affected by ambitious climate targets or transition, helping them to find new development opportunities. The concept has also evolved into using social justice as a guiding principle to promote economic and social transition fairly and inclusively towards a sustainable net-zero future. This comprehensive approach to a just transition advocates for a profound social and economic restructuring to eliminate the root causes of inequality.

Although the term "just transition" is not explicitly used in China's major policy documents, the underlying principles of this concept are mirrored in the country's policy orientations. China's commitment to carbon neutrality aims to foster a development space that is of higher quality, more efficient, fairer, more sustainable, and more secure. It also promises to explore synergies between environmental protection, economic development, job creation, and poverty alleviation during the green transition. These policy objectives align closely with the essence of just transition, emphasising social justice and equity in the process of environmental and economic transformation. However, in reality, the current green transition policy framework in China sidesteps clear consideration of the social impacts of coal phase-out and lacks guidance and institutional arrangements on just transition.

### *2.2. Policy Framework of Just Transition*

While the importance of a just transition has gained advocacy internationally, there is no universally accepted definition and understanding of the concept. Developing countries focus on international justice from a recognitional justice perspective, recognising that not all members of society are equally valued in current socio-cultural, economic, and political arrangements and that climate change and transitional policies

threaten to exacerbate existing inequalities along gender, class, and ethnic/racial lines (Lewis & Hernández, 2020). Thus, they aim to seek greater international aid and cooperation in their transition. Developed countries, however, prioritise distributive justice and procedural justice, stressing the fair distribution of transition benefits and burdens among different groups and ensuring policy formulation procedures are just, equitable, and inclusive. This results in a fragmented and diversified landscape of just transition policies worldwide, reflecting the diverse priorities and perspectives of different nations and stakeholders.

Globally, various international institutions and national bodies have provided frameworks and guidance for just transition. The guidelines released by ILO in 2015 have emerged as a foundational element, significantly influencing the development of subsequent just transition policy frameworks. Regionally, the European Green Deal approved in 2019 included an innovative just transition mechanism offering targeted support for fossil fuel-dependent regions and sectors during the energy transition to ensure that no one is left behind due to the green transition. In 2021, the Fit for 55 package released by the EU introduced the Social Climate Fund (SCF) plan, aiming to help vulnerable households, small and medium-sized enterprises, and transportation users with the increased costs during the green energy transition and avoid energy poverty. Nationally, Germany established the Commission on Growth, Structural Change and Employment (WSB) to introduce compensation and assistance measures for affected groups and regions according to the comprehensive phase-out plan for coal-fired power plants by 2038. Similarly, France introduced the Energy Transition for Green Growth Act, which includes measures such as energy price shields and providing energy vouchers for low-income households to address the issue of rising energy costs for low-income households. Countries like the United States, the United Kingdom, Japan, South Korea, Australia, Spain, Italy, Greece, and South Africa have also developed strategic policies and specific measures to ensure a just energy transition (Tavares, 2022).

Just transition policies, as shown in Figure 1, aim to balance environmental objectives with economic and social challenges. These policies span a variety of domains, including national economic, environmental, energy, industrial, regional, fiscal, financial, employment, and social security policies, as well as sector-specific and regional policies (ILO, 2015; Sharpe & Martinez-Fernandez, 2021). The comprehensive approach indicates that just transition is not the sole responsibility of any single department but rather demands the establishment of an inter-agency coordination mechanism and active participation of all stakeholders in policy development and implementation.

Given the evident differences in development stages and actual circumstances of various countries, a universal one-size-fits-all policy approach for just transition is impractical. Countries or regions need to devise targeted policies that address their unique challenges. These policies should be tailored to fit the specific economic structures and local specifications, ensuring the identification of suitable and equitable transition pathways.

## 3. Just Transition Towards Carbon Neutrality Targets in China

### *3.1. Overview of China's Coal Industry and Regions*

Coal, the most prevalent and vital fossil fuel in China, plays a pivotal role in the nation's landscape. Recent statistics, as of 2020, indicate that China's verified coal reserves reached 1,431.97 billion metric tons, accounting for 13.3% of global coal reserves, ranking fourth among all countries, trailing only the United States, Russia, and Australia (BP, 2021). China's vast economic size and rich coal resources make it the

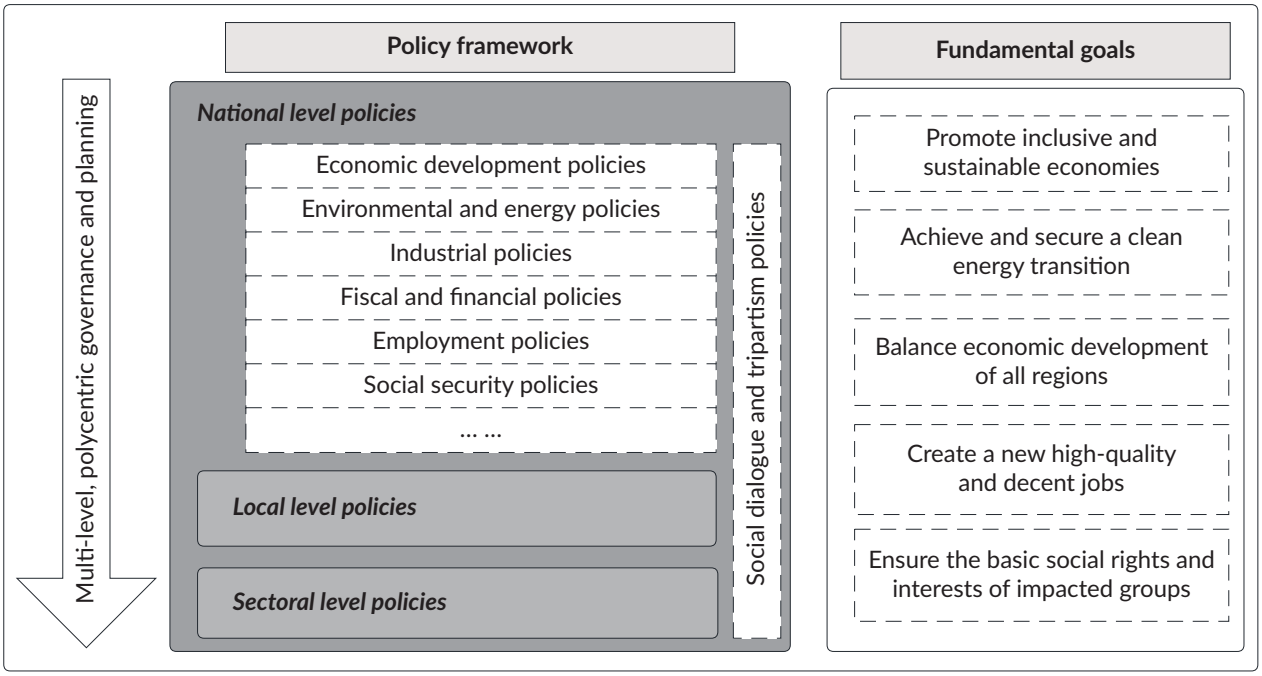


**Figure 1.** The just transition policy framework.

world's foremost consumer of coal. In 2021, China's coal consumption reached 86.17 exajoules, which accounts for a significant 53.82% of the total global coal consumption. Despite this heavy reliance on coal, there has been a discernible shift in China's energy consumption portfolio over recent decades, attributed to the accelerated development of renewable energy sources such as solar and wind power. This transition is indicative of a gradual decline in the proportion of coal in China's overall energy mix. Nevertheless, as of 2022, coal still represents 56.2% of China's energy consumption. This enduring reliance underscores the critical role of coal in China's energy strategy, despite the growing momentum towards cleaner energy sources.

The trajectory of coal production and processing in China is a critical determinant of the country's socio-economic development. Coal production has increased from 622 million tonnes in 1981 to 4.07 billion tons in 2021, thereby establishing China as the preeminent coal producer globally. The decade spanning from 2002 to 2012 is often characterised as the "golden decade" for China's coal industry, coinciding with periods of heightened economic growth. With high economic growth, the surging demand for social fixed investment and infrastructure construction catalysed a continuous expansion of China's coal production capacity. During this period, China's coal production was augmented by 154.52%, with an average annual growth rate exceeding 10%. However, the unchecked influx of capital led to the accumulation of obsolete production capacity within the industry. The subsequent deceleration of economic growth exposed the problem of overcapacity. In response to declining coal demand and emerging environmental concerns, China initiated supply-side reforms aimed at optimising coal production structure and enhancing the proportion of high-quality coal. The announcement of China's ambitions for achieving carbon peak and carbon neutrality has exerted substantial pressure on the sustainable development of the coal industry. Amidst the complex international geopolitical situation, the Chinese government has accorded unprecedented priority to energy security, thereby navigating the intricate balance between an orderly coal phase-out and the assurance of a

stable energy supply. This complicated backdrop renders China's approach to a just coal transition distinctively challenging compared to other nations.

China's coal resources, while abundant and extensively distributed, exhibit a notable spatial imbalance in their geographical distribution. The bulk of these resources are concentrated in the North China and Northwest China regions. Specifically, four provinces (or autonomous regions), namely Shanxi, Xinjiang Uyghur Autonomous Region, Inner Mongolia Autonomous Region, and Shaanxi, collectively account for over 70% of the nation's proven coal reserves, making them the primary coal resource-rich regions in China. Although China's coal production continues to concentrate in regions with superior resource endowments and more favourable development conditions, the coal industry's employment is primarily concentrated in the central, northwest, northeast, and Yunnan–Guizhou–Sichuan regions, as seen in Figure 2. Historically, these coal regions have relied heavily on carbon-intensive or heavy industries for their economic sustenance, leading to an overproduction of coal and the accumulation of a substantial volume of disordered and low-quality production capacity. Furthermore, these regions exhibit limited economic development, characterised by a monolithic industrial structure and a lack of economic diversification, resulting in excessive dependence on the coal industry for regional economic development.

### *3.2. Challenges of Coal Phase-Out in China*

China's predominantly coal-based energy structure poses a notable paradox when juxtaposed against its carbon neutrality ambitions, diverging from the global inclination towards a clean energy transition.

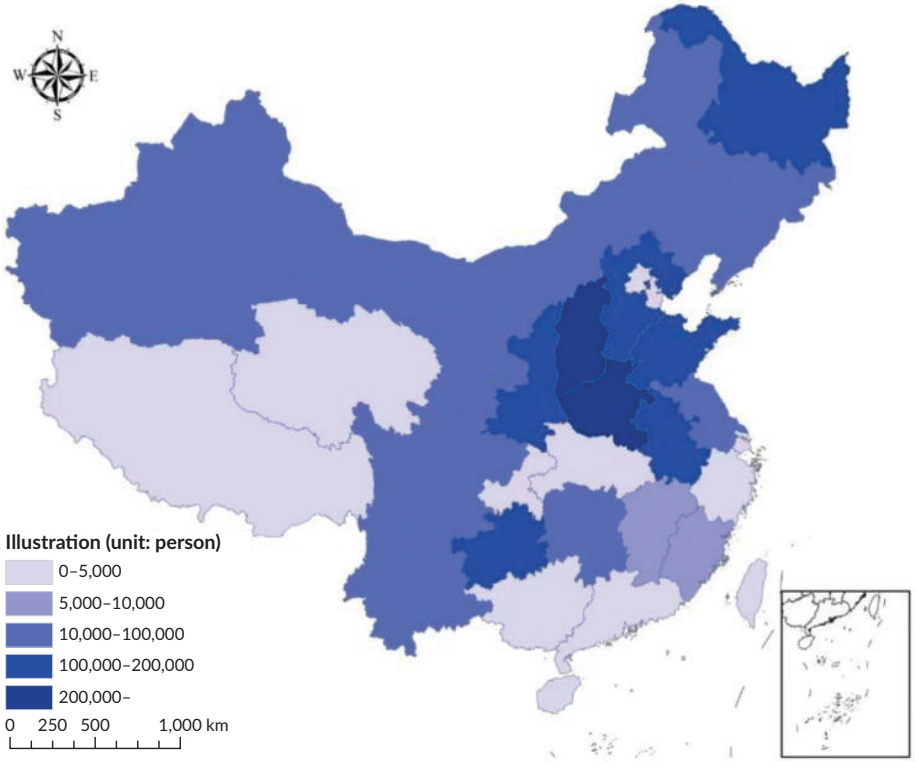


**Figure 2.** Geographical distribution of coal employment in China.

However, the abundance of coal resources and lower operational costs associated with its usage mean that an immediate disengagement from coal is not viable for China. Instead, the phase-out of coal is anticipated to be a gradual and lengthy process. The transformation is expected to have a profound impact on China's energy structure and regional economies, encompassing aspects of energy security, economic development, and social well-being. The intricacies of structural change in coal-dependent regions are multifaceted and region-specific, involving technical, political, economic, social, and cultural dimensions. Ineffective management may influence public perception of energy transition and climate change policies, potentially leading to issues concerning social stability.

China faces more formidable challenges in scaling down coal production compared to other countries worldwide. The most significant challenge in the coal transition is undoubtedly the direct impact on employment opportunities within coal-related industries. Notably, China maintains the highest employment coefficient for unit coal production globally, indicative of relatively low mechanisation and labour productivity (UNDP, 2023). The coal transition will necessitate a comprehensive adjustment of employment structure, predominantly affecting low-skilled jobs and leading to a shrinking labour demand industry-wide. Statistical data shows that direct employment in China's coal industry declined from approximately 4.30 million in 2012 to 2.60 million in 2022. Over the long term, the shrinking demand for labour in the coal production sector will persist. Projections indicate that under a 2°C scenario, China's coal mining industry's employment is expected to decrease to 1.2 million by 2030 and to around 200,000 by 2050. In a 1.5°C scenario, direct coal employment will reduce to about 150,000 by 2050 (NRDC, 2019). This trend highlights the increasing challenges in reallocating laid-off workers, who typically exhibit lower educational and skill levels and limited adaptability to industry transitions. Research also indicates that as China's coal industry gradually contracts, female and informal workers are often more vulnerable, facing higher risks of unemployment (UNDP, 2023).

Another significant aspect is the capital-intensive nature of China's coal industry. The rigidity of the carbon neutrality goal could lead to the early depreciation of coal-related assets or their conversion into liabilities, exerting substantial pressure on coal-dependent regions during the transition. The recent emphasis on energy security and supply has led to a continued expansion in coal-fired power and coal chemical production. In 2022, there were 82 newly approved coal-fired power plants with a total approved capacity of 90.716 gigawatts, a nearly fivefold increase from 2021. As a consequence, most of China's coal-fired power plants are among the youngest and most efficient globally, with an average age of only 12 years. A rapid shift away from coal in the short term could heighten the risk of stranded assets, adversely affecting the asset quality of enterprises and financial institutions, and even leading to credit default risks in the financial sector.

The ongoing transition and gradual phase-out of coal will present significant economic challenges for coal enterprises, characterised by rising operational costs and diminishing revenues. In 2021, the debt-to-asset ratio of China's enterprises above the designated size was reported at 64.9%. This financial strain was further evidenced by the recorded losses of 5.69 billion Yuan for loss-making companies. Looking ahead, the medium to long-term prognosis suggests that many coal enterprises, particularly smaller entities, may face bankruptcy or consolidation. Notably, the structure of China's coal industry is dominated by state-owned enterprises, accounting for over 90% of the market value of listed coal companies. This predominance of SOEs in the coal sector carries specific implications, particularly in some resource-based cities, where these large state-owned coal enterprises form the backbone of local fiscal revenue, employment, and social stability. Local governments

tend to provide extensive support to these enterprises, which can lead to the risk of "too big to fail" and even hinder coal transition.

The gradual decline of the coal industry in China is poised to engender a spectrum of social challenges, including large-scale unemployment, labour relocation, health issues for coal workers, population loss, disparities in talent supply, etc. Compounding these issues, many coal-dependent regions in China are also contending with some unresolved, deep-rooted challenges. Notably, these areas often suffer from significant deficits in urban infrastructure and public services. The exacerbation of these social challenges, stemming from the decline of the coal industry, could potentially impede economic development and reduce urban competitiveness in these regions.

Most of China's coal industry is geographically situated in regions adjacent to coal deposits, which are predominantly located in remote areas. These coal-abundant cities or regions have historically functioned as crucial bases for national energy production. This situation has led to a concentration of various factors, particularly economic and industrial activities, around coal resources, resulting in a pronounced dependency on the coal sector. Taking Shanxi and Inner Mongolia as examples, the economic vitality of these major coal-producing regions is intrinsically linked to the flourishing state of the coal industry. The cessation of coal production in these areas poses a substantial risk to their economic stability, potentially leading to the collapse of their primary economic pillars and adversely affecting their prospects for sustainable development. Additionally, the geographical distribution of these coal regions, generally distant from major urban centres, presents additional challenges in attracting high-quality talents and emerging industries during the transition phases. These regions frequently suffer from underdeveloped public services and infrastructure. In the absence of a just and equitable transition strategy, these inherent challenges risk exacerbating the problem of regional development imbalances. In the historical context of China's coal regions, large coal enterprises have traditionally assumed key roles in providing public social services, encompassing basic education and medical care. As the country embarks on a phase-out of coal and pursues industrial transformation, these entrenched social responsibilities need to be addressed. The process of divesting these coal enterprises from their long-held social responsibilities demands careful attention, particularly concerning the health of coal workers. Pneumoconiosis poses the most significant threat to coal workers' health and is the most prevalent occupational disease in China. According to data from the Chinese Centre for Disease Control and Prevention, as of the end of 2021, China reported a total of 915,000 cases of occupational pneumoconiosis, with an estimated 450,000 individuals currently affected, mainly among coal workers in the southwest and central-south regions of China. In the context of the coal industry downsising, the mental health issues of coal workers are gaining prominence. The decline of the coal sector has not only affected the careers of these workers but also their social status. This aspect underscores the need for comprehensive strategies that address both the physical and psychological well-being of workers in the coal regions.

## 4. Enabling Just Transition in China's Coal Regions

### *4.1. Vision and Objectives of a Just Transition in China*

China's ambition to achieve carbon neutrality necessitates a comprehensive and just transition in its coal regions, encompassing economic, social, energy, and ecological dimensions. This transition is characterised

by its proactive and regulation-driven nature, distinguishing it from transitions driven by technological innovations or economic development, such as the advent of the internal combustion engine or structural economic adjustments.

Coal has long been a pivotal component in China's energy structure, making its phase-out a challenging task. Despite China's clear commitment to achieving carbon neutrality, its approach to transitioning away from coal differs from that of other countries. This entails a dual strategy: a long-term gradual reduction in coal production and consumption, coupled with a short-term focus on enhancing the cleaner utilisation of coal resources. Government documents reaffirm coal's role as an essential stabiliser in energy security. The conspicuous absence of a definitive roadmap for coal phase-out in China results in a fragmented approach and a lack of unified vision for a just transition.

At the same time, China has defined the pursuit of "Chinese-style modernisation" as its medium- to long-term national vision, prioritising a people-centred approach. This strategy aims to ensure that modernisation addresses the diverse and layered needs of the people, advocating for an equitable distribution of its benefits. Chinese-style modernisation is envisioned to foster a harmonious relationship between humans and nature and to achieve collective prosperity. This suggests that the Chinese government is strategically positioned to take an active role in addressing climate change, integrating the realisation of carbon neutrality into its political agenda. Concurrently, the pursuit of collective prosperity demands a targeted governmental focus on regions heavily reliant on coal. This is critical to ensure their transformation and to pre-empt the onset of economic and social challenges in these areas. These aspirations impart unique implications and characteristics to the just transition of China's coal industry, setting it apart from its global counterparts.

Under these grand narratives, unjust treatment of coal-dependent regions during the transition could impede their positive response to energy transition and climate change policies, potentially leading to social stability issues. Therefore, effectively addressing the challenges and assisting coal regions in adapting to the changes induced by coal phase-out is crucial for the achievement of carbon neutrality. As depicted in Figure 3, the process of coal transition in China must concurrently consider multiple facets of justice: economic, social, environmental, climate, and energy. The critical question then becomes how to appropriately manage this situation and support these regions in adapting to the impacts of coal phase-out. The objectives are multifaceted: enabling coal regions to achieve high-quality economic development; improving people's livelihoods; restoring ecological environments; reducing carbon emissions; ensuring energy security and price stability, among others. The overarching goal is to facilitate a net-zero transition that allows all individuals to share its benefits and minimises any negative impacts on coal resource regions and their communities.

### *4.2. Practice-Oriented Just Transition in China*

Although China has not yet formally established a policy framework specifically titled "just transition," the country has developed a robust background in policy practices rooted in social justice across various stages of social and economic transition. The transition from a planned economy to a market economy, the urbanisation of rural populations, and the industrial restructuring associated with environmental protection are all complex systemic projects. They are confronted with the challenges of worker redistribution and urban transformation pressures, necessitating the reconstruction of the social security system. In China's

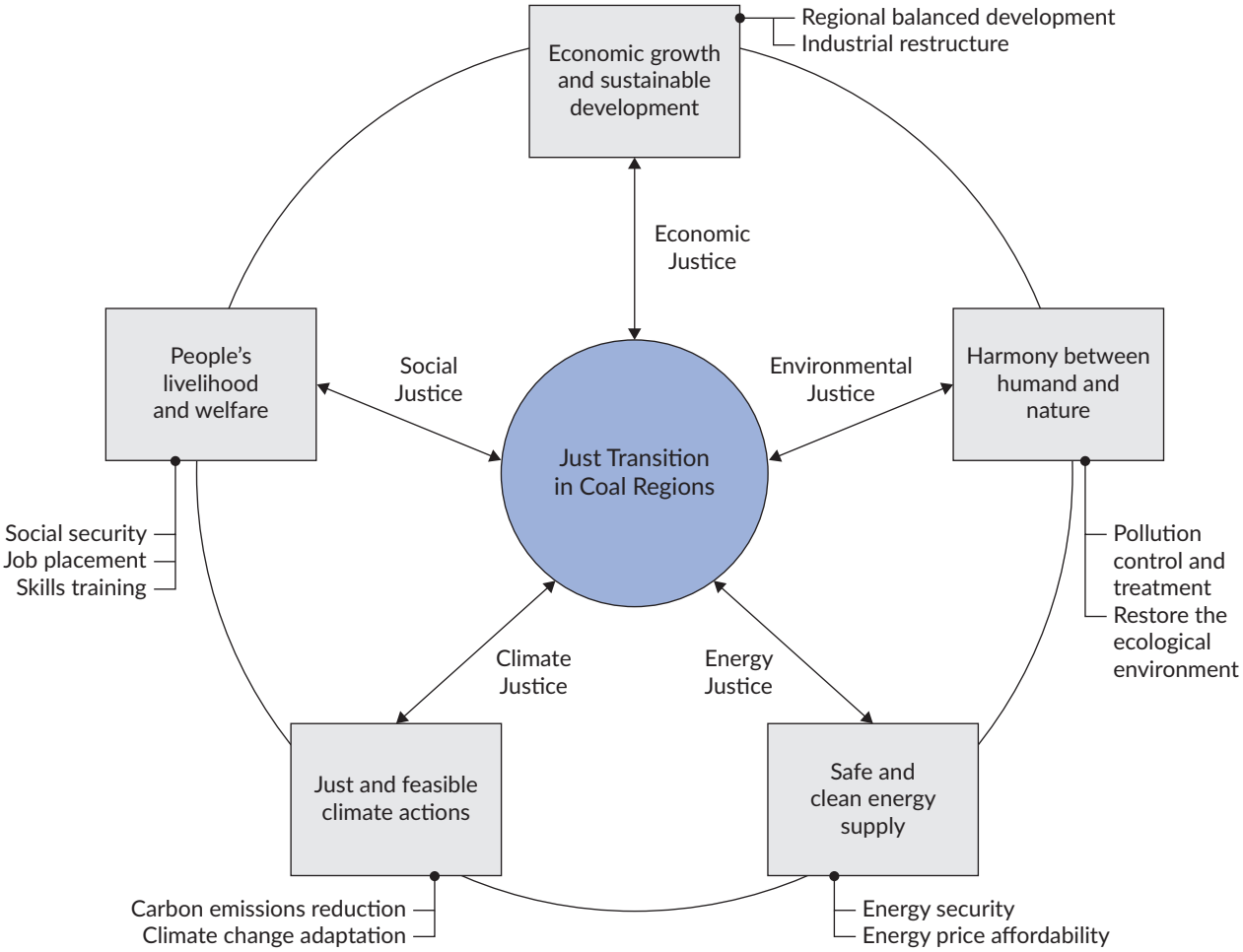


**Figure 3.** Just transition in coal regions.

context, a pragmatic approach for achieving a just transition in coal regions would involve leveraging existing policy frameworks and drawing on past experiences.

China's economic development has been marked by regional disparities due to differences in resource endowments, energy infrastructure, development conditions, and technological capabilities. These disparities necessitate a focus on "climate justice" within the country, as different regions and populations are differently affected by the impacts of climate change. The central government has underscored the need for regional customisation in the pursuit of the carbon neutrality goal, advocating for tailored tasks, objectives, and pathways based on local conditions, within the framework of nationwide coordination. Accordingly, coal transition policies should be regionalised to ensure the justice of the transition across different regions. For coal-dependent regions, it is imperative to foster the coordinated and sustainable development of the coal industry and alternative sectors. This approach can be actualised through strategic policies, fiscal support, and financial assistance, gradually reducing the economic dependence on coal and bolstering regional economic resilience.

The social impacts of coal phase-out necessitate the establishment of a comprehensive social security and employment support system aligned with China's national circumstances. This system should involve

collaborative efforts from the government, enterprises, and workers, effectively addressing job losses and poverty issues encountered by affected or vulnerable groups during the low-carbon transition in coal regions. China's existing mandatory social security system encompasses social insurance, assistance, welfare, and support for retired state-owned enterprises and laid-off workers. The Employment Promotion Law of 2007 advocates policies supporting voluntary, market-regulated, and government-promoted employment, mandating local governments to incorporate employment expansion into their national economic and social development plans. To support a just transition in coal regions, special emphasis should be placed on improving public services, basic living security, and stable employment. These regions should receive more policy support and funding for the development of public services, social security and welfare policies, vocational training, and skill enhancement initiatives in areas like education, healthcare, culture, transportation infrastructure, and environmental facilities.

In the context of a just transition with coal-dependent regions for China, securing energy stability emerges as a paramount task. While most of these regions serve as national powerhouses in energy production, they must acknowledge the anticipated decline in coal demand and pre-emptively strategise to mitigate potential negative ramifications for both the local coal sector and the broader regional economy. To ensure the fulfilment of national energy demand, these areas are advised to refine and incrementally diminish their existing advanced coal production capacities. This approach entails a coordinated diminishment plan, taking into account the specific resource capacities and coal reserves of each region. Establishing dynamic adjustment frameworks, underpinned by state-of-the-art coal mining facilities, is crucial. These frameworks should allow for flexible scaling of coal production, contingent upon actual productive capacities, transport feasibility, and fluctuating demands for coal consumption. Additionally, these regions must devise overarching strategies for an orderly exit of coal mining activities. This includes the creation and refinement of compensation mechanisms for exiting the industry, steering industrial diversification, and circumventing precipitous downturns in both regional economies and coal sectors. Exploiting local resources to foster the collaborative development of diverse energy sources, including coalbed methane and shale gas, along with renewable energies like wind, solar, hydro, and biomass, can facilitate the transformation of these regions from monolithic coal suppliers to multifaceted and complementary energy hubs.

Moreover, ecological conservation and rehabilitation in mining locales constitute a critical focus during the just transition process. With escalating demands for a better ecological environment and the national directives for spatial ecological restoration, coal-dependent regions should prioritise environmental governance and ecological restoration in mining areas. Utilising resources such as abandoned coal mines and subsidence land for ecological restoration projects is pivotal. Additionally, the establishment and enhancement of legal and regulatory frameworks for geological environmental protection, coupled with the implementation of unified and effective environmental monitoring systems across the provincial, municipal, county, and enterprise levels are essential steps in this endeavour.

## 5. Conclusion and Policy Recommendations

China's comprehensive coal phase-out, spanning various sectors, stands to exert distinctly profound social impacts diverging significantly from experiences in other nations. A systematic approach is vital to facilitate a just transition in its key coal regions, harmonising the overarching climate goals with pivotal socio-economic factors, such as economic transition, energy security, job creation, and social stability.

To achieve carbon neutrality, China has instituted a plethora of policy documents at both central and local levels, covering areas like energy, resource utilisation, technology, and financing, progressively constructing a "1+N" policy architecture. Nonetheless, this existing framework for green transition inadequately addresses the social consequences of coal phase-out and lacks guidance and institutional structures for a just transition. To mitigate this challenge and enhance the facilitation of a just transition in coal-dependent areas, China needs to integrate principles that ensure livelihood protection and promote social equity into its climate policy strategies. We offer the following recommendations:

1. Planning for orderly coal phase-out as soon as possible: Acknowledging the deep entrenchment of coal industry interests in China, the process of coal phase-out shadowed by concerns for energy security is anticipated to encounter challenges. Coal interest groups may leverage social justice impacts to influence policy decisions. However, implementing justice and fairness does not mean ensuring that everyone benefits during the energy transition. To achieve carbon neutrality, new vulnerable groups will emerge in society, encompassing not only the existing economically impoverished groups but also the workers and residents of the affected areas and industries. It is necessary to identify a feasible path to mitigate adverse impacts, rather than inappropriately delaying or hesitating in promoting the energy transition. Otherwise, the committed climate targets will not be achieved on schedule. Effective planning and future arrangements for coal phase-out are imperative, with phase-out procedures adhering to explicit criteria, such as prioritising the exit of technologically obsolete and inefficient coal production capacities. Market-oriented measures like carbon markets and energy credit trading should also be employed to optimise the overall cost of energy transition.
2. Establishing a transparent and inclusive decision-making and implementation mechanism: Public participation is crucial for a successful energy transition. Involving all stakeholders in the decision-making process enhances comprehension of the challenges associated with energy transition. China must identify coal transition pathways suitable for its unique national context. At a macro level, the government should lead, acknowledging the significance, comprehensiveness, and strategic nature of energy transition, and designing clear plans and transparent adjustment procedures. A wider array of perspectives from associations, scholars, and environmental organisations should be incorporated to build consensus and minimise decision-making errors. Regionally, policies should engage directly impacted groups, listening to the opinions of local governments, industries, and workers. All the relevant actors should be allowed to participate in decision-making through appropriate means. In China's context, the government could rely on think tanks affiliated with relevant ministries to convene relevant stakeholders to ensure voices from different parties are heard and considered.
3. Addressing employment and the social impacts of the coal transition. The severe impacts of coal phase-out on certain regions and groups should be fully and deliberately considered, aiming to prevent disproportionate bearing of transition costs. Specific plans for affected coal enterprises and coal regions should be crafted to eliminate poverty and prevent its recurrence, adhering to the principle of leaving no one behind. The government should support displaced workers with employment assistance, reemployment guidance, skills training, and entrepreneurship training, facilitating workers to find new jobs. Job creation in replacement industries should be encouraged through economic diversification plans.
4. Encouraging innovative financing mechanisms for just transition: Public finance plays a crucial role in building resilience and reducing transition risk for vulnerable groups. Fiscal policies through incentive mechanisms can guide behavioural changes, offering tax incentives and subsidies to enterprises hiring

former coal industry workers. Fiscal transfers should account for regional disparities and the uneven impact of coal phase-out, particularly favouring the provinces that face greater challenges in phasing out coal, like Shanxi and Inner Mongolia. Additionally, mobilising private finance is essential to supplement government budgets for employment and social security initiatives during just transitions.

5. Engaging actively in the global just transition process: In current international climate governance, there is more consensus than differences on the issue of just transition, and numerous countries are actively engaged in international cooperation in this area. China's participation in the declaration at the BRICS countries' Labour and Employment Ministers' Meeting in July 2022, advocating for efforts towards a just transition for all, exemplifies this engagement. In the future, China should continue to exchange knowledge and collaborate with the international community, actively contributing to the development of relevant international governance mechanisms.

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## Conflict of Interests

The authors declare no conflict of interest.

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# Social Exclusion in the Development of Photovoltaics: The Perspective of Fishers in the HU Township

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## Abstract

This article critically examines the consequences of the application of a photovoltaic (PV) project on the social exclusion of local fishers, through an environmental justice lens. The project was undertaken to develop a mechanism to increase local government revenue while mitigating climate change. However, the findings reveal that the entry of the PV industry displaced traditional fishery production, causing damage to the livelihood of local fishers and encroaching on their living space. At the same time, the authorities did not pay special attention to the interests of fishers in the distribution of PV revenue. These findings draw attention to the need to address the social exclusion of fishers and take decisive steps to institutionalize more structured and transparent co-creation processes to ensure that the voices of marginalized groups are heard and effectively considered in the process. The research this article draws on is qualitative, comprised of data gathered through document analysis, as well as in-depth interviews with the fishers, representatives of the local government, and the PV companies.

## Keywords

environment justice; fishers' livelihood; industrial expansion; photovoltaics; social exclusion

## 1. Introduction

Since the 75th United Nations General Assembly committed to reaching carbon neutrality by 2060 and peak carbon emissions before 2030, China has made the photovoltaic (PV) industry a key element of its energy strategy. PV technology expansion brings various benefits, such as lower electricity and system costs, reduced carbon dioxide emissions, decreased water usage, improved renewable energy integration, and increased

storage capacity (Cole et al., 2018). Especially in sun-rich nations, the spread of PV projects aids sustainable development goals by boosting the economy and reducing emissions (Han et al., 2020). Driven by national policies and financial incentives such as benchmark electricity price subsidies, the PV industry has seen rapid growth in China's affluent eastern provinces. Despite land scarcity and dense populations, the abundant water bodies in these regions offer ideal opportunities for PV systems. These efficient and eco-friendly systems allow arable land to be preserved and receive active promotion from government policies.

Although the PV industry's growth includes some public participation, it perpetuates China's government-led environmental governance, which frequently overlooks the concerns of local communities. Despite their environmental and economic benefits, these initiatives can cause social disruption. The rise of the PV industry has led to the substantial social marginalization of fishers, encroaching on aquatic ecosystems and jeopardizing their livelihoods and lifestyles. This article broadly defines "fishers" to include anyone involved in fishing or aquaculture in lake areas, be they full-time professionals or part-time workers.

This study, grounded in qualitative research, investigates the phenomenon of social exclusion experienced by local fishers following the implementation of the Hu Township PV project. Covering 29.3 square kilometers, waters in Hu Township were chosen for the "fishery-solar complementarity" project (total capacity: 500,000 kilowatts) following the establishment of the Hong County National Leading Photovoltaic Power Generation Application Base in late 2017. The Hu Township government banned aquaculture in these waters to facilitate the PV project and mitigate ecological damage from intensive and disorganized aquaculture. The government reclaimed the fishers' previously free water resource usage rights and removed fish cages and other aquaculture facilities from the lake. By early 2018, around 1,245.02 hectares of water surface rights had been reclaimed, with about 214.80 hectares allocated for the PV and fisheries project.

Having paid the government a water area rental fee of 7500 yuan per hectare per year, PV companies acquired the rights to use the water surface to install PV panels for electricity generation. Additionally, the PV companies rented a few fish ponds near the lake from village committees at the same rate to install PV panels. Upon receiving local government approval, PV companies invested in and constructed the project, delegating design and construction to scientific research institutions. The PV enterprises managed electricity generation and operations, settling electricity fees with the State Grid Corporation. Aquaculture companies acquired the rights to use and manage the water under the panels for breeding fish such as silver carp, retaining all profits. The PV enterprises' presence generated significant tax revenue for the local government, which offered tax concessions to the PV enterprises to foster development, creating a "win-win" situation. Furthermore, under government advocacy, enterprises allocated part of their revenue to a PV development fund, mainly supporting local welfare initiatives. However, this part of the fund was given to the government for distribution and did not directly benefit the local populace (see Figure 1). Overall, the fishing community was neglected in the decision-making and profit distribution associated with the PV industry's entry. Consequently, due to the loss of their primary source of income and homes without proper compensation, the regional fishing community encountered substantial socioeconomic difficulties.

This research comprehensively examines social inclusivity issues associated with the PV industry's entry into Hu District. We recognize the PV industry's positive impact on local economies and the environment, driven by local governments and enterprises amidst efforts to combat climate change and energy crises. Conversely, we critically analyze the conflict between the PV industry and the livelihoods and living spaces of fishers in

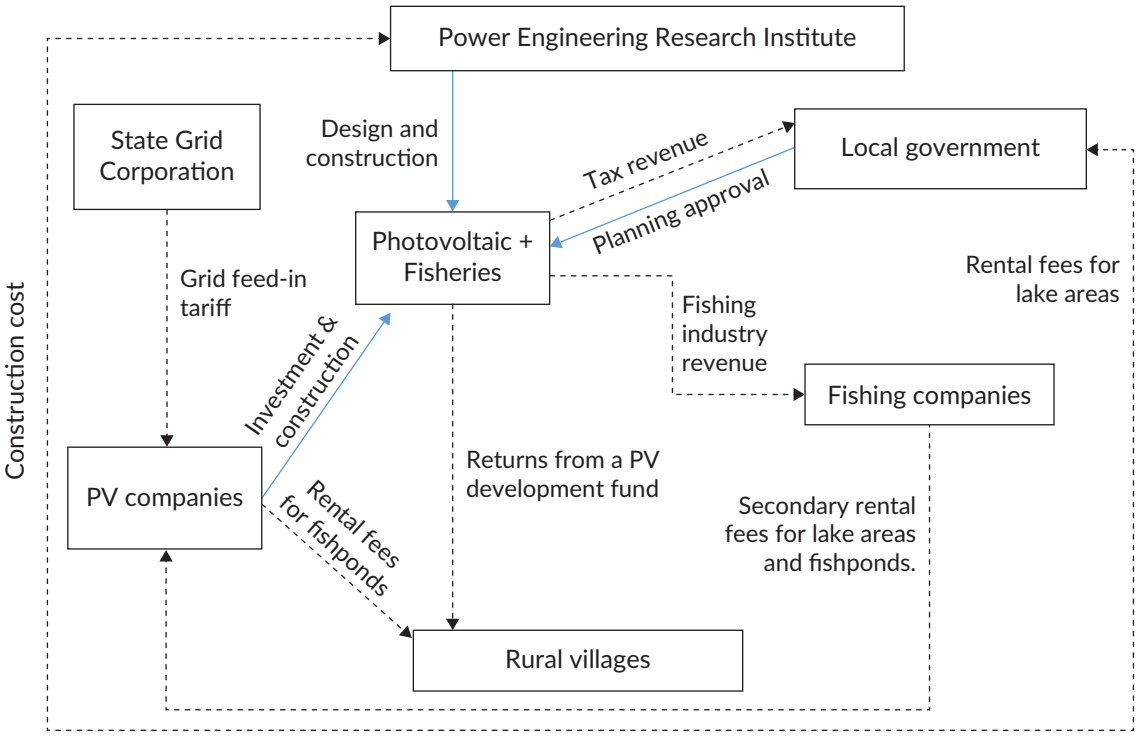


**Figure 1.** Fishery-PV complementary project operation mode.

Hu District's climate governance with caution. The article begins by introducing environmental justice, exploring how fishers disproportionately endure the negative impacts of strategies against climate change. Subsequently, it analyzes social exclusion scenarios, including fishers being deprived of their livelihoods and overlooked regarding the distribution of benefits. Finally, we examine the impact of the fishers' exclusion from living spaces in their lives and communities. This research aims to deepen understanding of the social impacts of industrial substitution in the fishing sector and sheds light on the experiences of fishers in Hu Township, highlighting the need to address social exclusion in rural industrialization.

## 2. Theoretical Background

Environmental justice and social exclusion are closely linked and extensively analyzed in scholarly literature. Environmental justice calls for equal distribution of environmental privileges and responsibilities, regardless of race, ethnicity, socioeconomic status, or gender (Pulido, 2000). This academically explored principle addresses concerns such as access to clean air, water, green spaces, and the uneven risk of environmental dangers to marginalized groups (Perlin et al., 1999). Advocates and researchers push for eradicating environmental disparities and integrating social justice in environmental decisions (Egert, 2023), including addressing unequal environmental damage and involving impacted communities in policymaking (Habuda, 2019). Environmental justice seeks to address and rectify these inequalities through activism, advocacy, research, and legislation.

This research identifies two primary dimensions of environmental justice. Firstly, access to environmental resources is critical. Urban growth strains landscapes and can degrade environmental quality. Considering the disproportionate effects of land-use changes on specific communities, understanding their

environmental justice repercussions is crucial. Studies highlight the link between access to urban green spaces and environmental justice (Bauer, 2023; Jennings et al., 2012). Moreover, there are contradictions between large-scale spatial change and community-scale social justice (da Silva & Correia, 2022; Goh, 2020). For example, PV projects have transformed HU Lake's landscape, altering the functionality of its wetlands and restricting local access, contradicting principles of environmental justice.

Secondly, environmental justice aims to correct the uneven distribution of environmental benefits and burdens, advocating for everyone's access to a healthy, sustainable environment. Many factors, including historical precedents of unfair policies and intersectional factors such as gender and race, contribute to environmental injustice (Bell, 2016; Egert, 2023). The movement has evolved from grassroots beginnings to include equitable climate change adaptation strategies (Schlosberg & Collins, 2014). Local energy initiatives have been linked to a range of advantages for the community, including enhanced social cohesion, economic prosperity, the acquisition of new skills, and heightened environmental awareness. In this study, while PV projects have restructured local energy use, reducing coal reliance and aiding climate mitigation, they have encroached on the fishers' livelihoods. Climate mitigation benefits are enjoyed globally, yet fishers bear the negative impacts alone, without fair compensation. This implies that the success of a local renewable energy project should be evaluated based on the local population's perceptions and the project's initial ambitions (Tsagkari et al., 2022).

## 3. Methods

This study used qualitative research methods to understand the fishers' experiences and perspectives deeply. Qualitative research, offering in-depth comprehension and interpretation from participants' perspectives, is uniquely advantageous in uncovering the fishers' social exclusion issues. Data collection included in-depth interviews and document analysis. In-depth interviews enabled one-on-one interactions with the fishers, yielding rich personal experiences and insights. In-depth interviews were held with diverse HU Township stakeholders, including government officials, leaders of PV and fishery companies, community leaders, and retired fishers, providing corroborating information. Interviews with local government officials involved three key figures from Lake Township's Rural Work Bureau, the Fishery Management Committee, and the Industrial Bureau, and five staff members overseeing the PV industry, fish farming, and fishers. Interviews also included management from two major PV companies, TW and GDT, and a fish farming company, WT. Community leaders and fishers were key interviewees. Investigations were carried out in three rural areas with dense populations of fishers. We interviewed three community leaders, six village officials, and 18 retired fishers, ensuring diverse perspectives across ages, genders, and economic backgrounds. We created semi-structured interview outlines tailored to the interviewees' social characteristics, each lasting two hours.

Document analysis and in-depth interviews serve as triangulation, employing various methodologies to study the issue. We reviewed local statistical yearbooks and literature to grasp the history of fisheries development and fishery culture. Additionally, we analyzed policy documents on fisheries and PV industries issued by the local government to understand its industrial orientation. This analysis will explore how fisheries' industrialization, an exogenous development, impacts fishers' social life. The study aims to highlight the challenges fishers face, including resource access, changes in community dynamics, and the loss of traditional practices.

## 4. Overlooked in Profit Distribution

In modern legal and property rights frameworks, property rights are fundamental to establishing relationships between entities. Legally, HU's water resources are state-owned, and the state holds the water rights. However, fishers, relying on traditional livelihoods and cultural heritage, possess legally recognized water surface usage rights. During the transfer of the rights, 661 net-cage aquaculture fishers, the original water users, seemingly vanished without being provided rental fees or government compensation. This raises questions about the fairness of establishing property rights, sparking debates over conflict and coordination between fishers' usage rights and state ownership, which will be further explored in a traditional context.

Property rights and boundary practices emerge from state interventions and community actions in resource competition, evolving into local customs. Historically, there has been a shift from communal to private ownership. Traditionally, fishers collectively owned or used water surfaces, gradually establishing fishing boundaries. These boundaries, reflecting lake spatial differentiation, encompass historical fishing practices, including specific rights to fishing locations, boats, tools, and fish types. The Kunshan fishing village study shows diverse fishers catching different fish with varied tools, leading to autonomous livelihood distinctions and a "shared water without centralized control" state (A. J. Chen, 2023).

By the early 20th century, increased external commerce and fish trade demand resulted in private ownership of water areas. Lake area property rights, unlike land, are complicated by human mobility on water, seasonal water level changes, and seasonal ambiguity of water surface rights, making boundary demarcation challenging. Consequently, cultural and official texts often reference a "lack of hard boundaries." However, rights allocation boundaries emerged in lake areas, with rivers divided by settlements and fishers marking "contracting areas" using natural signifiers that are respected in daily practice (Sugawara, 2020). However, such boundaries are not definitive due to the high costs of defining property rights (Bazel, 2017), leaving many rights public, such as aquatic crop cultivation and water activities.

Recent market economy influences have resulted in disorganized water area privatizations. After the 1983 implementation of the household responsibility system, village collective agricultural land and ponds were distributed to individual households. However, there was no consensus on the usage rights of public areas such as a lake's surface. HU District's population ranges from 20,000 to 30,000. On average, each person has 0.05 hectares of land and each household has 0.13–0.20 hectares. The scarcity of land resources forces residents to depend on natural aquatic resources for livelihood. Locals without ownership rights traditionally have usage rights to public lake areas, sustaining their livelihoods through fishing and aquaculture. These rights are legally recognized and protected. Continuing the tradition of public water surface use, local production activities included fishing and aquatic plant cultivation. Village elders recall that, in 1988, some farmers experimented with netting lake portions for intensive fish farming, yielding significant profits. Dozens of nearby households followed, claiming water areas for intensive aquaculture. Legally, public areas such as these water bodies, state-owned, should not be privately owned; however, government management and oversight were lax. In the market-driven development's early stages, the government was equally eager to profit as the locals. Water surfaces alone do not generate income; however, local authorities welcomed renting them out to locals for production activities and collecting part of the rent. The local government and community agreed to rent the lake surface to villagers at 750 yuan per hectare. However, in

practice, this policy was not fully implemented, and some villagers occupied and used the water surface for aquaculture without payment:

> Water surface contracting is basically first-come, first-served. During the trial phase, most villagers were watchful, with only a few proactive ones taking contracts. Once others saw the profits, they wanted in, but there were no more water surface quotas, and they couldn't complain. After all, the opportunities were equal; some people just seized them first. (Retired fisherman Wang)

> It's about capability. I only contracted 0.33 hectare because I couldn't manage more, leaving the rest for others. Some capable ones contracted three to five hectares. (Retired fisherman Li)

Around 2000, local crab farming surged in popularity, with 200 hectares of coastal water densely packed with cages at its peak. Motivated by profits, some farmers expanded into water surfaces for large-scale farming. The government, typically hands-off in water rights allocation, intervened to mediate disputes. Unregulated and seeking quick profits, some engaged in intensive aquaculture, causing environmental issues such as eutrophication. This "tragedy of the commons" prompted government regulation, including licensing. However, environmental issues from widespread intensive farming persisted. Driven by profit and lack of oversight, disorderly farming practices led to severe local environmental pollution, impacting waterway traffic and flood control.

As previously noted, traditional livelihood regulations define rights in fishery resource utilization. However, delineating spatial boundaries is crucial for establishing property rights. The longstanding framework, where the state owns water bodies, but local fishers have spatial usage rights, represents a delicate balance between governance and traditional livelihoods. This arrangement acknowledges the state's role in managing natural resources and recognizes the fishers' reliance on these waters for sustenance and cultural identity. Although unregulated practices among fishers have led to environmental concerns, addressing these issues should ideally involve targeted interventions, education, and sustainable fishing alternatives rather than revoking usage rights outright. Problematic production behaviors, while concerning, do not justify directly depriving fishers of their rights, especially without viable alternatives or compensation.

Currently, neither the government nor enterprise provides economic compensation or aid for water area acquisitions, offering only about 13,500 yuan per hectare for fencing removal. Fishers forced to give up water areas believe the compensation does not cover their property losses or secure their future livelihoods. The government's average total output from water area PV conversions greatly exceeds the average household compensation, making the fishers' sense of relative deprivation palpable. Legally, enterprises must pay government fees for the resources they use, reflecting the transactional aspect of their commercial activities. From a spatial perspective, introducing PV enterprises has effectively nullified fishers' production activities, depriving them of their traditional livelihoods. If not managed inclusively, this transition risks marginalizing fishers, eroding community structures, and worsening socio-economic disparities.

From a social inclusivity and justice standpoint, offering adequate livelihood compensation to affected fishers or integrating them into emerging PV production activities is crucial. Considering the compatibility of aquaculture operations with PV installations, as seen in PV-aquaculture systems, involving original fishing communities in these ventures is compelling. Including fishers would secure their livelihoods and utilize their

expertise in aquatic management, potentially improving the productivity and sustainability of aquaculture operations under PV panels. Allowing fishers to participate in PV-aquaculture systems could create communal ownership and involvement, easing transitions and enhancing social harmony. Although beneficial for renewable energy, the shift to PV enterprises should be approached with empathy, fairness, and a commitment to social inclusivity. Integrating fishers into PV-aquaculture systems or offering suitable compensation is a balanced approach, respecting tradition and embracing progress.

## 5. Fishers' Lives and Social Exclusion

### *5.1. The Social Exclusion of Fishers' Livelihoods*

In history, the economy of the HU Lake area was primarily based on the exploitation of water resources, encompassing fishing and aquaculture, known as "living off the water." Before the entry of the PV industry, each fisherman typically had access to a specific water surface area, averaging about 2.5 hectares, which was not just a source of livelihood but also a testament to their ancestral ties and cultural heritage. There was a competitive demand for limited water resources, resulting in the encroachment on the livelihood resources of fishers and posing a threat to their livelihoods.

Fishers in the HU Lake township could be divided into two main types. One type is the legally recognized professional fishers with fishing-related household registrations. Professional fishers are restricted to certain water areas for fishing or aquaculture activities and do not have land onshore. Fisheries are their sole source of livelihood. The other type is part-time fishers, referring to ordinary onshore farmers who engage in agriculture and aquaculture or work outside while also participating part-time in aquaculture and fishing activities in the water. For them, fisheries are important but not their sole source of income. Considering the extent of the impact of the fishing cessation program on fishers' livelihoods, the government has implemented targeted support measures and comprehensive compensation for professional fishers during the process of fishing cessation, including assisting them in continuing fisheries-related activities locally or in neighboring provinces or cities, providing entrepreneurship loans, and offering social security funds. However, professional fishers only account for 1% of all fishers—the majority are part-time. When PV enterprises entered the expropriated water areas, the government only provided non-targeted measures, such as an average compensation of 13500 yuan per hectare for fence removal, without specific measures for employment assistance or social security for these part-time fishers. Overall, the policies and systems are not sufficiently refined, and effective support and protection measures have not been provided for part-time fishers. Hence, the concept of livelihood presented in this article is mainly focused on these part-time fishers.

In the local context, aquaculture operates on a household basis. As of 2017, when the government mandated the cessation of aquaculture, 633 households were still engaged in these activities. A distinct generational divide characterizes these practitioners: While individuals over 50 tended to stay and engage in aquaculture, the younger generation, aged 20–49, often sought higher-paying jobs elsewhere. This divergence is not merely a matter of choice but reflects broader socio-economic shifts.

The reform and opening-up policies, coupled with over four decades of rural-urban migration, have profoundly altered China's employment landscape, pushing an increasing number of rural residents into

non-agricultural sectors (Gustafsson & Zhang, 2022). The regional economic disparities create "cores" of resource concentration, attracting investment, population, and technology, while less prosperous areas become "peripheries," experiencing outflows of these same resources and a consequent "hollowing-out" effect (Li, 2023). Hong County, situated in northern Jiangsu, exemplifies this periphery. Economic vitality has long been low, especially in its southwestern hilly region, with nearly 60% of villages classified as economically weak and a significant portion of the population earning a meager annual net income. To circumvent these constraints, laborers have historically migrated to southern Jiangsu's more prosperous locales, such as Suzhou, Wuxi, and Changzhou, seeking better employment opportunities.

Thus, the impact of industrial transition is most acutely felt among the over-50 demographic of the 633 aquaculture households. In the academic sphere, different perspectives exist regarding the impact of resource loss on farmers' livelihoods. For instance, in the discussion of the impact of enclosure movements on displaced farmers, traditional views represented by the Hammond couple argue that enclosures led to the loss of land for farmers, exacerbating poverty and inequality in rural areas (T. Chen et al., 2022). On the other hand, some scholars believe that enclosures provided new development opportunities and additional employment opportunities for displaced farmers. However, a generally accepted viewpoint is that due to changes in the external environment and livelihood capital after the displacement of fishers, their original livelihood activities became difficult to sustain, forcing them to choose new livelihood strategies. Overall, the post-displacement livelihood strategies of fishers exhibit a trend toward non-agricultural diversification and multifaceted development (Zhang et al., 2012). A critical socio-economic issue is the exclusion of local fishers from the burgeoning PV industry due to technological and managerial thresholds they cannot easily surmount. This exclusion underscores a broader, systemic problem often witnessed in periods of rapid industrial transition.

The displaced fishers face difficulties in acquiring new skills when seeking re-employment. Fishers's vocational skills are primarily concentrated in the field of fisheries. Traditionally reliant on aquaculture, fishers have honed skills and knowledge tailored to their trade over generations. Their expertise, while invaluable within the context of aquaculture, does not readily transfer to industries such as the technologically advanced PV sector. This industry, with its emphasis on technological acumen, specialized knowledge, and often higher educational requirements, presents barriers that most fishers find insurmountable, primarily due to their limited formal education and lack of exposure to relevant technical training. Moreover, the PV industry's management practices and operational scale necessitate a form of corporate governance and bureaucracy alien to traditional, small-scale, family-run fishing operations. Consequently, these fishers find themselves in a precarious position. Their traditional livelihoods are undercut by the new industry, yet they cannot participate in the very sector that's replacing their traditional jobs. This dilemma forces them to seek employment elsewhere, often in sectors or positions that do not recognize or compensate for the depth of their experience in aquaculture, leading to underemployment or even unemployment. Rural women with lower levels of education, in particular, are in a disadvantaged position when it comes to choosing employment opportunities, thereby putting their basic livelihoods at risk. At the same time, retired or displaced fishers with better skills also face various degrees of restriction, discrimination, and exclusion when migrating to urban areas. Most of the agricultural transfer population can only engage in temporary and migratory movements between rural and urban areas, lacking stable employment locations. This can result in significant psychological pressure:

> We fishers are the poorest. Most of us in this generation are illiterate and have never received formal education. Without education, it becomes difficult to find employment. Nowadays, the only option for us is to do labor-intensive work in factories. (Retired fisherman Ma)

> It's difficult for illiterate women to find jobs in factories. We are already in our forties and fifties, so we can only stay home and care for our children. Occasionally, we can find temporary work nearby. (Retired fisherman Gu)

From a social inclusion perspective, the ideal scenario would be for the PV industry to absorb this workforce, capitalizing on their intimate knowledge of the local aquatic environment and providing them with roles that, while different from their traditional work, offer continuity in terms of income and social identity. However, the older fishers in the HU District, typically over 50 years of age, face two primary forms of exclusion, each with its own set of socio-economic implications.

On the one hand, they suffer exclusion from the PV industry. The entry of the PV industry not only brings a company and an industrial chain to the local area but also objectively provides employment opportunities for the local population. Some residents have been absorbed into the PV industry. Despite offering employment opportunities and training, the PV sector inherently demands a workforce that meets specific criteria, including age, physical robustness, learning agility, and technical expertise in electricity-related areas. These requirements create a barrier for older fishers, whose lifelong skills and expertise lie predominantly in traditional fishing practices, not high-tech industries. This mismatch in skill sets, coupled with the physical demands of the new jobs, effectively excludes these seasoned fishers from the emerging job market within the PV industry.

On the other hand, the fishers are excluded from "aquaculture under the panels," a characteristic of fishery-PV complementary projects. The water area under the PV panels can be utilized by enterprises with usage rights for ecological aquaculture. The innovative approach of integrating aquaculture with PV panels (known as the fishery-PV complementary model) should, in theory, provide a seamless transition for displaced fishers. This model allows for ecological aquaculture practices under the PV panels, an area that seems naturally suited to the skills and experience of the local fishers. However, in practice, this is not the case. Concerns over management costs, operational control, and the safety of PV equipment lead enterprises to favor formally trained internal employees over local fishers. Even when these companies engage local help, it is often for menial, short-term tasks, offering little in terms of sustainable income or job security. Take TW PV company as an example; they only hire local part-time workers for labor-intensive tasks such as releasing fish fry and fishing, with a daily average of 10 person-days over 20 days, resulting in limited employment opportunities.

While policies often neglect the re-employment support for fishers, this oversight occurs within complex temporal and spatial contexts. Even before the 2017 retirement policy, young and middle-aged laborers frequently sought work beyond their hometowns. This trend has led to a distinct intergenerational shift in fishing households' production structures. Older couples typically engage in local aquaculture, whereas their younger counterparts pursue diverse employment opportunities elsewhere. Consequently, most fishing families maintain a diversified income portfolio, enhancing their per capita earnings and reducing their reliance on fishing. Local governments and policymakers often view this labor migration trend as a natural transition towards non-resource-dependent livelihoods, requiring no intentional guidance. Recognizing that

fishing households are not monolithically dependent on aquaculture is crucial. Many of these families have diversified income sources, which can be a form of resilience. Policies should, therefore, avoid one-size-fits-all solutions and instead consider the varied economic landscapes of these communities. This laissez-faire approach overlooks the small, often unnoticed community of fishers, encompassing merely 633 households, resulting in insufficient public concern and support for their development. Addressing this issue demands policies informed by social justice, focusing beyond economic considerations to acknowledge the social and generational complexities of communities facing industrial and environmental change. Effective strategies may encompass retraining and new skills for older individuals, comprehensive social security measures, and promoting unique cultural and natural legacies to forge sustainable livelihoods.

### *5.2. The Social Exclusion of Fishers' Living Space*

Living spaces are essential to fishers' livelihoods and well-being. This study examines the impact of fishers' exclusion from their living spaces on their lives and communities.

Fishers' habitats are more than residences; they are deeply intertwined with their economic and cultural well-being. Urban sprawl and industrial advancement threaten these traditional spaces, often reducing resource access and causing involuntary community displacement. Traditionally, fishing communities are located near water surfaces and tidal flats near lakes. PV developments invade traditional fishing territories, reduce resource availability, and displace communities, undermining socio-economic stability. The rise of PV enterprises forces relocation, leading to community depletion, marked by the absence of the younger generation who leave the elderly and children behind. Compounding these challenges is inadequate social security and inefficient fishing cooperatives.

Furthermore, the industrial repurposing of environmental assets such as lakes and wetlands erodes natural habitats and reduces the quality of living space. Beyond functionality, these water bodies contribute to scenic beauty, offering recreational and tourism potential (Wu et al., 2019). Their aesthetic value enhances visual appeal and fosters a connection with nature (Rava et al., 2015; Wu et al., 2019). In traditional rural societies, landscape aesthetic appreciation is seen as natural ecological beauty. The landscape of PV panels, a modern industry product, clashes with the traditional ecological landscape, and the introduction of PV enterprises has altered local natural vistas, unsettling residents. Field interviews with locals reveal deep-seated discontent; many see the once-pristine scenery as "destroyed." Numerous adverse claims have been made, including observations of fish deformities in the lake and reduced rainfall patterns after PV panel installation. One interviewee, a lifelong resident, lamented:

> After the photovoltaic panels arrived, we noticed the fish in our lake started looking different, not like before, and it just doesn't rain as it used to. (Village group leader Hu)

While these assertions await scientific confirmation, they underscore the residents' substantial resistance to the perceived environmental repercussions of PVs.

Besides, for local fishers, natural water bodies are not just ecological spaces; they serve as versatile social arenas for various uses. Apart from livelihood activities, these aquatic environments are crucial for leisure, acting as communal hubs for swimming and other recreational activities. However, the PV industry's entry into

areas like Tian Gang Lake has limited these waters' use to a single purpose. PV and aquaculture companies have erected barriers at the water's edge, restricting access to formerly communal spaces. This monopolization has squeezed locals' living and leisure spaces, confining their activities to village dwellings and land. The project development process has overlooked the water bodies' natural expansiveness, which provided relaxation and served as travel thoroughfares. This oversight highlights the need for an inclusive approach that considers the ecological and social dimensions of industrial expansion. Interviews with local villagers reveal that their opinions were not effectively considered during the project approval and construction phases. This revelation underscores a key principle: incorporating local input into decision-making enhances project adaptability and acceptance and fosters initiative sustainability and success. Residents have a deep understanding of their environment and community needs. Their insights can help project planners avoid issues and leverage the community's unique strengths. Ensuring locals have a voice in critical decision-making is essential for achieving project objectives and promoting community well-being.

Last but not least, the cultural significance of water bodies is profound. However, with the industrialization of these spaces, a growing disconnect emerges, leading to the gradual erosion of water-centric cultural practices. In traditional fishing livelihoods, locals naturally revere water bodies, and the worship of water deities is integral to their activities. This cultural detachment highlights the need for a nuanced development approach that considers the socio-cultural dimensions of affected communities. Policies that advocate for inclusive development, respect for indigenous knowledge, and sustainable alternative livelihoods are essential. These initiatives could mitigate displacement's adverse effects, enhance community resilience, and preserve the rich cultural tapestry of fishing communities.

## 6. Conclusion

This article explores the social exclusion of fishers in Hu Township due to PV construction on water surfaces. The qualitative research method has given us a comprehensive understanding of the complex and far-reaching impacts of social exclusion from the fishers' perspective. Through data collection and analysis, we have uncovered significant findings and themes.

Firstly, the evident disregard for resource allocation stands out. Historically, fishers' right to use natural water surfaces was recognized, but the requisition for PV development has deprived them of this vital livelihood source. While they received some compensation for livelihood tools and property rights, they were denied water area rents and other economic compensation. Ignoring their deep psychological attachment to this natural resource has intensified their sense of deprivation.

Secondly, industrial substitution has led to significant livelihood exclusion for Hu Township's fishers. The entry of PV enterprises has occupied water spaces used for fishing, causing the loss of traditional fishing activities and societal marginalization. Most fishers, with low education and limited skills outside fishing, face restricted non-fishing employment options. Particularly, older fishers and rural women with limited education face job market disadvantages, causing instability and financial difficulties.

Furthermore, industrial substitution's social exclusion has destructively impacted fishers' living spaces and cultural heritage. The water served as both their livelihood and living space. Repurposing environmental resources such as lake surfaces and wetlands for industry has led to the loss of natural areas, affecting the

quality of their living space. Industrial substitution has disrupted Hu Township's deeply rooted fishing traditions and gradually distanced fishers from their close-knit communities.

This study's findings illuminate the social exclusion experienced by Hu Township's fishers due to PV development. Government industrial decisions are often conceived and implemented from a regional perspective, prioritizing overall interests and departmental policies. However, the survival methods of special occupational groups such as fishers and the resources they rely on are often overlooked. Recognizing fishers' unique spatial needs and promoting social justice in spatial planning and policymaking is crucial to addressing their exclusion from their living space. This necessitates establishing an organizational mechanism and effective policy system for coordination and communication at all levels.

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## Conflict of Interests

The authors declare no conflict of interests.

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# Power Games and Wage Negotiations in China's New Energy Vehicle Industry

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## Abstract

China has launched a comprehensive low-carbon transition strategy at the same time as the concept of just transition is receiving extensive international attention from the academic community. A just transition needs to embrace the interests of workers in the new energy industry as well as those of miners and others facing job losses in traditional industries. Accordingly, this article focuses on how programmers at a new energy vehicle company in Shanghai negotiate wages with their employers. Employers trying to curtail the salaries of programmers find fault with their biographies, qualifications, and experiences to undermine their confidence and create an incentive-driven competitive work environment. Programmers, in turn, try to improve their bargaining power by demonstrating their professional competence, job hopping, and informally investigating conditions at employing enterprises to take advantage of the competitive relationship between them. The interests of programmers in China's new energy vehicle industry are found to differ from those of Chinese state-owned enterprise workers and migrant workers. Although individual negotiations can improve the wage levels of specific programmers in the short run, they are not conducive to the emergence of labor solidarity. Moreover, they exacerbate income inequality among workers and fail to bring justice to workers in the new energy industry.

## Keywords

China; job hopping; just transition; labor relations; new energy vehicle industry; wage negotiations

## 1. Introduction

On 22 September 2020, during the 75th session of the United Nations General Assembly, Chinese President Xi Jinping announced that China would aim to achieve a carbon peak before 2030 and carbon neutrality

before 2060. In 2021, the 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of Long-Range Goals for 2035 proposed "the construction of an ecological civilization system and the promotion of comprehensive low-carbon transition in economic and social development" ("14th Five-Year Plan," 2021). Consequently, China has embarked on a comprehensive low-carbon transition. However, global studies have shown that although a low-carbon transition is believed to create diverse economic opportunities and a range of benefits (Karlsson et al., 2020), the distribution of its benefits and costs is not equitable (Gambhir et al., 2018; Green & Gambhir, 2020). For example, fossil fuel workers and communities often bear the costs of low-carbon transition and face issues such as unemployment and community decline (Piggot et al., 2019). Therefore, numerous unions, social activists, labor lawyers, social scientists, and policy researchers worldwide have called for attention and resources to be focused on helping fossil fuel workers and communities adapt to clean energy in a way that is fair and just, also known as a just transition (Cha, 2017). A just transition thus means "greening" the economy in a way that is as fair and inclusive as possible for everyone concerned, creating decent jobs and leaving no one behind. According to Newell and Mulvaney (2013), a just transition includes two aspects: climate justice and energy justice. Doorey and Eisenberg (2022, p. 14) broke the constraints of the narrow concept of just transition:

> There is no longer a shared, unified theory of justice that defines just transition. Instead, the contemporary "just transition movement" is inhabited by multiple, sometimes complementary, but sometimes conflicting justice movements and justice narratives.

Scholars use the term "rustbelt" to refer to regions where traditional industries are located and shut down during the process of industrial transformation, while "sunbelt" refers to regions where new high-profit industries are developing. For example, when Lee (2007) researched the labor movement of Chinese workers during the brunt of market reform and globalization, she found a "protest of desperation" among laid-off workers, who worked at Chinese state-owned enterprises in the rustbelt, such as Liaoning province, and a "protest against discrimination" towards migrant workers, who worked at private-owned enterprises in the sunbelt, such as Shenzhen city. Like industrial upgrading, a low-carbon transition also includes the rustbelt and sunbelt regions. In China, the rustbelt of the low-carbon transition includes coal-producing regions, such as Shanxi province and Hebei province, as well as carbon-intensive industrial areas. The sunbelt regions of low-carbon transition are places like Shanghai, Shenzhen, and other new energy and high-tech industry clusters. When coal production, iron and steel metallurgy, and other related industries in places like Shanxi and Hebei are required to reduce production or forcibly shut down under national energy-saving and emission-reduction policies, new energy vehicles combined with artificial intelligence (AI) technology have become key industries for development in China. At the same time, substantial supportive industrial policies, large investments from the capital market, and high-tech labor forces have poured into the new energy vehicle industry in the eastern coastal areas of China. It is evident that the low-carbon transition, while dismantling coal and mining industries in the western regions of China, has also fostered economically viable green industries in the eastern coastal areas.

In social practice, a low-carbon transition not only harms the interests of the most vulnerable groups but also damages the interests of different groups of workers in different ways. However, current research on the justice of transitions mainly focuses on fossil fuel workers and communities without addressing the injustices occurring in the sunbelt. Moreover, when scholars study transitional justice, they often pay more attention

to how unions, non-profit organizations, and local governments jointly promote the formulation of relevant policies for protection of the interests of fossil fuel workers during the transition than to workers' interests in the sunbelt. This article focuses on the practical actions of workers in the sunbelt to promote transitional justice. On the basis that the green economy should not only be environmentally friendly but also socially friendly and equitable, this means that "new jobs created in low-carbon sectors provide 'decent' jobs" (Newell & Mulvaney, 2013, p. 134). According to the agenda of the International Labor Organization (ILO), this includes a fair income and better prospects for personal development and social integration, as well as organization and participation in decisions that affect workers' lives.

In China, the low-carbon transition, like technological upgrading, is conducted within the framework of developmentalism (Lei, 2022). This means that the low-carbon transition revolves around the central goal of economic development. In this process, the state and capital collaborate to formulate low-carbon transition policies that facilitate economic growth, while trade unions, workers, and environmental NGOs are not regarded as main stakeholders and therefore have limited involvement in the policymaking process. Furthermore, due to the prioritization of speed over equality in the low-carbon transition, workers are merely treated as resources to be integrated into this grand modernity project, and the government remains silent on issues of work-related harm and inequality in the transition. In such circumstances, transitional justice is no longer the responsibility of policymakers but becomes a goal that workers need to pursue through their proactive actions. How do sunbelt workers perceive transitional justice during the low-carbon transition? What strategies do sunbelt employers use to minimize labor costs? How do software engineers negotiate their wages with new energy vehicle companies? This study examines the wage negotiations and labor–management game actions between programmers and employers in the process of market mobility. It analyzes the actions taken by these core workers in the sunbelt to address issues of unfairness in the low-carbon transition.

## 2. Methodology and the W Company Case

This study utilizes a case-study approach, with the primary case being the global headquarters of the W Company (pseudonym). It includes 30 interviews with software engineers and four interviews with human resources (HR) managers. The 30 IT engineers were all grassroots-level engineers, ranging from junior engineers with no working experience (Professional Level 1) to mid-level engineers (Professional Level 4), including 13 master's degree holders and 17 bachelor's degree holders; 23 were male and seven were female.

The W Company was selected as a case study because it is a typical high-end new energy automobile enterprise registered in Shanghai. It has a global market presence and has received strong support from the city government for its development. Currently, W Company has more than 9,500 highly educated employees worldwide and has established research and production institutions in 12 global locations, including Shanghai, Beijing, and London. A nationwide user service system has also been established in the Chinese market. In recent years, W has focused on the research and development of AI autonomous driving technology and has expanded into six core technologies, including intelligent gateways, advanced driver-assistance systems, smart cockpits, battery packs, and motor and electronic control systems. During this process, software engineers responsible for autonomous driving research and development, smart cockpit design, engine simulation research, sensors, and other related tasks have become the core labor

force. By examining this company, we can gain insights into the general conditions of labor relations in China's new energy vehicle industry.

From November 2021 to March 2022, the researcher conducted an 8-month fieldwork at W. During the fieldwork, the researcher participated in the recruitment process as an HR intern in the autonomous driving algorithm and systems department, helped with hiring programmers, including algorithm engineers, software development engineers, testing engineers, simulation development experts, and front-end and back-end engineers. Through this fieldwork, the study was able to explore the perspectives and actions of IT programmers in the new energy vehicle industry regarding their understanding of justice and their pursuit of it.

Rawls (1971, p. 10) argued, following Aristotle, that justice means refraining from gaining some advantage for oneself by seizing what belongs to another, or by denying a person that which is due to them, the repayment of a debt, the showing of proper respect, and so on. According to Amartya Sen's critique of Rawls (Sen, 2009), there are two approaches and theoretical orientations toward the concept of justice: transcendental institutionalism and realistic comparative theory. The former focuses on the rational design of institutions that promote justice, whereas the latter emphasizes how people can define what is justice and actively address injustice through their actions. In the context of just-transition issues, this article contends that it is important not only to consider the planning and implementation of institutional frameworks for low-carbon transitions but also to examine the perspective of specific labor groups on justice from a practical justice perspective. It is crucial to understand what these groups perceive as "justice" and the efforts they make to pursue justice in situations where institutional frameworks may be inadequate. Therefore, the following discussion explores the perception of justice held by software engineers in the new energy vehicle industry and the negotiations they engage in with corporate management in their pursuit of justice.

## 3. IT Programmers' Perception of Justice

### *3.1. The Development of China's New Energy Vehicle Industry*

Since 2020, the new energy vehicle industry has been strongly promoted by the Chinese government because of its ability to reduce carbon emissions effectively. In the sunbelt region, the government implemented extremely cautious and highly efficient industrial policies to develop the new energy vehicle industry. Starting in 2013, both the central and local governments began providing consumption subsidies to new energy vehicle manufacturers. The Ministry of Finance announced on 16 April 2020 that new energy vehicles would be exempt from vehicle purchase tax, while local governments introduced corresponding supportive policies. For example, in Shanghai, purchasing a new energy vehicle allowed direct registration, whereas the auction price for license plates of fuel-powered vehicles reached $1.37 thousand. The introduction of these industrial policies led to a rapid increase in capital investment in the industry. For 2021, 239 financing events were shown for China's new energy industry, with a total of $49.84 billion ("In 2021, new energy vehicle sales," 2022). Simultaneously, the sales of energy vehicles reached $3.521 million and, in 2022, it increased further to $6.887 million ("New energy vehicle sales," 2023). W Corporation has accumulated financing of $7.49 billion from 2015 to the present; however, its losses are substantial, considering a loss of $60 million in the first quarter of 2023. On the one hand, it has been

widely recognized in Chinese society that new energy vehicles are the future trend. On the other hand, the competition in the technical routes for the production of new energy vehicles is fierce, with major companies making massive investments. Once W Corporation fails in this competition, the earlier investments cannot be recovered. Therefore, while new energy vehicle companies are facing a talent shortage and are diligently searching for talent that can help them succeed, they are also attempting to reduce labor cost expenditures.

### *3.2. Labor Relations in the New Energy Vehicle Industry in China*

Researchers generally believe that low-carbon transitions can create new employment opportunities and increase workers' compensation in the sunbelt regions. Workers in new industries in sunbelt regions have experienced a significant increase in compensation (ILO, 2018). However, this has not been the case in China. Friedman (2022, p. 37) has pointed out that in Chinese megacities, under the institutional logic of "just-in-time urbanization," many workers are devalued as "temporary labor" for specific industries, without full welfare protection, to maximize the utilization of the population and minimize the economic and political cost of "warehousing people." Jia (2022) reports that, despite earning higher compensation than traditional industry migrant workers, most grassroots programmers in Shanghai are also treated as temporary laborers, living in precarious conditions. At the same time, many new energy vehicle companies are also attempting various methods to reduce labor costs, including by increasing the working hours of programmers. Management is not actively improving the wage levels and job grades of programmers but reducing the stock of basic-level programmers over the age of 35 through department downsizing, eliminating underperformers, and applying for the use of "flexible working hours" from the local "human resource and social security bureau" to increase the working hours of programmers. Due to the relaxation of restrictions on corporate behavior in the 2018 revision of the People's Republic of China Labor Law, the above practices by companies, although detrimental to the workers, are difficult to determine as illegal. It is well known that Chinese programmers previously initiated the 996.ICU movement on GitHub to protest about poor working conditions, but the effects of this online labor movement have been limited, and their working environment has not substantially improved.

While Chinese programmers have complained about their working conditions, the All-China Federation of Trade Unions (ACFTU) has not responded actively. This is because, overall, working-class organizations in China have accepted the goals of promoting ethnonational autonomy and increasing productive forces since the 1920s. The Trade Union Law of the People's Republic of China (2022) stipulates:

> The trade union is a mass organization of the working class under the leadership of the CPC [Communist Party of China], and it is the bridge and link between the CPC and the masses of workers.

The CPC maintains sharp vigilance against syndicalism, which involves promoting union independence from party leadership, and economism, which refers to paying excessive attention to workers' economic concerns over larger economic and development goals (Andreas, 2019, p. 38). "The ACFTU does not see increasing the material and political standing of its membership as an end in itself, and in this sense it challenges commonly held notions of what constitutes a union" (Friedman, 2014, p. 30). The establishment of all unions requires approval from higher-level unions, whereas all independent unions are illegal. Furthermore, the Trade Union Law also specifies that trade unions are centered around economic development. In this context, Chinese

unions consider themselves and behave like subordinates of the CPC and government agencies, rather than representatives of workers' interests (Friedman & Lee, 2010, p. 522).

For the programmers at W Company, labor unions are virtually non-existent. When asked about whether W Company has a union, most respondents stated that they had never heard of it. One programmer even conducted a search within the company's system and found the listing of a union contact, but had never heard or seen this person within the company. This implies that, despite the numerous grievances among programmers, they do not consider organizing collective action through a labor union as a means to seek improvement.

### *3.3. The Sense of Justice and Action Orientation of Software Engineers*

Software engineers have developed a sense of practical justice centered around their pursuit of income growth and career development, as well as the practical challenges of collective action, leading them to focus on "market self-interest." This concept of justice encompasses two aspects. First, from the perspective of distributive justice, software engineers believe they should receive compensation commensurate with their position in the market. They compare themselves with colleagues who work in similar technologies at similar companies to understand their position in the market and confirm their anticipated income. Second, from the perspective of freedom of development, software engineers believe they should have opportunities for career advancement that facilitate their professional growth. For example, one interviewee explained that:

> Our performance was evaluated by the superior and promotions were based on that. I hoped my efforts and dedication were recognized, that my good work was acknowledged and that my superior could promote me and increase my salary. At the very least, there should be some fairness….But at A Company [the respondent's previous company], the leadership was really terrible. After this new superior was brought in by the higher-ups, he marginalized the original employees in the team, including me. Every time there was an opportunity for promotion, it would be given to the superior's "lackeys," not me. It doesn't matter how well I perform. (L26, 2021-11-05)

The W Company's software engineers' compensation includes a salary, stock options, and year-end bonuses. The salary primarily refers to pre-tax annual income, and the company generally provides a 13-month salary. Stock options serve as an important incentive upon hiring, with all employees being eligible to receive them. The year-end bonus varies according to the company's performance, team dynamics, and individual achievements. For software engineers, career development involves continual promotions. Promotion and salary increases comprise the core interests pursued by software engineers since they believe that fairness lies in obtaining opportunities for advancement and salary increases commensurate with their market position and job performance. However, through the interviews, we found that unfair practices occurred relating to the distribution of salaries and promotions. Under such circumstances, maximizing one's interests becomes an action goal for software engineers.

Silver (2003, p. 19) argues that we should pay attention not just to how the struggles of newly emerging working classes are successively made and strengthened as an unintended outcome of the development of historical capitalism but also to how the old working classes are unmade. As noted by Polanyi (1944), the most powerful challenges to employers come not from the declining profit rates of workers in traditional

industries but from technical workers in dominant industries who are proud of their occupations and seek privileged treatment. Faced with the inactive official labor union, programmers in the new energy industry have adopted a strategy reminiscent of China's manufacturing migrant workers voting with their feet. However, what sets them apart from their predecessors is that during this mobility, programmers maximize their technical advantages and engage in power struggles with employers over their basic salaries, equity stakes, and benefit packages, in pursuit of their own vision of justice.

Wright (2000, p. 962) classifies the negotiating power of the working class into associational power and structural power. Structural power results from workers' positions within the economic system. It is distinct from associational power, which arises from the formation of collective worker organizations:

> The power of workers as individuals resulting directly from tight labor markets or from the strategic location of a particular group of workers within a key industrial sector would constitute instances of structural power. (Wright, 2000, p. 962)

Importantly, the structural power of workers can enhance both their collective associational power and individual bargaining power in the labor market. Under China's existing political system, programmers cannot establish independent unions with the support from official labor unions, or gain associational power to improve their conditions. However, the need for software engineers in new energy vehicle enterprises, as well as the programming technology possessed by software engineers, gives many people some structural power. In this context, many individual workers are leveraging their structural power and resorting to individualized actions, engaging in direct power games with employers during job transitions. In the case of W Company, software engineers engage in power games with employers through market mobility, negotiating their base salaries, equity shares, and benefits to strive for what they perceive as justice. How do these wage negotiations take place? What are the interests and demands of the two sides? How do they engage in power games during wage negotiations to maximize their interests? This study addresses these questions in the following analysis.

## 4. The Employer's Bargaining Goals and Strategies

Even highly skilled IT software engineers are today members of a precarious workforce. In China, companies build a public reservoir of labor by frequently conducting layoffs. These companies prioritize young and strong workers, while constantly eliminating older and less healthy employees. Scholars refer to the strategy of selecting younger and more productive migrant workers to accomplish more production tasks as "pinching at the top" (Shi et al., 2022, p. 98). Similarly, companies prefer to hire young programmers with higher productivity but aim to keep labor costs as low as possible, achieving the goal of low-cost pinching. This creates obstacles to promotion and salary increases and undermines the eager expectations of software engineers for justice.

When dealing with desirable candidates, the W Company's HR managers often employ three strategies to lower their expectations, bargaining power, and wages.

First, they find fault with the software engineers' biographies to undermine their confidence in the labor market. Employers mainly criticize experienced software engineers for their age, lack of innovation and

learning abilities, and inability to handle high-intensity work. Employers deliberately emphasize age anxiety because hiring a senior software engineer is much more expensive than hiring a junior engineer. One interviewee recalled his interview process:

> From the initial phone call and subsequent two rounds of technical interviews, I felt that the communication with HR went smoothly. However, during the discussion of the salary package, when I proposed an additional monthly salary amount of $400, HR noted that I was on the older side and suggested that my creativity might not be as strong as younger people's. They stated that the current salary offer was already the maximum, which made me feel very uncomfortable. (L15, 2022-03-14)

On the other hand, employers criticize young and productive software engineers for their lack of experience. For example, one interviewee said:

> There are several salary levels for fresh graduates: "cabbage price," "spinach price," and "guru price." I got the "cabbage price," which made me unhappy. I tried to negotiate, but the HR manager gave me no opportunity. She told me that I could learn from the gurus, and then I would receive a higher salary. (L18, 2022-04-01)

Age discrimination is widespread in the Chinese labor market, and employers use the resulting age anxiety to lower employees' wages. Regardless of a candidate's age, their resumés are subjected to criticism and scrutiny by employers.

Second, by concealing core information, the company shifts the focus to the software engineers. Although the W Company is listed on the stock market, its stock price is low, and its potential for growth remains uncertain. Given this situation, the company does not adjust the salaries of all employees universally based on inflation levels, changes in national policies, or business performance. Moreover, unlike other companies, it does not provide material benefits, such as holiday gifts. Furthermore, W Company lacks a clear salary payment standard, resulting in varying salaries for software engineers in the same project team. For example, within the same team, while performing similar job tasks, the monthly salary for one interviewee is $1600, whereas another's monthly salary is $2000. In such a scenario, the management regards salary as the confidential red line of the company, a principle that enables the employer to have a greater bargaining advantage. When software engineers are dissatisfied with the salary package offered by the company, HR managers deliberately shift their focus from existing salary arrangements to career development prospects. One interviewee said:

> My request was to increase the monthly salary by $550 based on the existing salary package. However, HR told me that as a young professional, I should consider not only the current salary but also the company's platform advantages and the prospects of the autonomous driving industry. They said I should take a long-term perspective considering the growth opportunities of the position and the platform. Ultimately, they only raised my salary by $274. (L16, 2022-03-25)

It is thus clear that to divert attention from the issue of unequal pay for equal work and lower the expectations of soft engineers regarding salary discrepancies, the company deliberately emphasizes the rank that might be achieved to shift the candidate's perspective and focus.

Third, by fabricating false information, HR suppresses software engineers' bargaining confidence. Software engineers often spend one day to 1.5 weeks negotiating with the HR management over their "income and welfare package" after their job interviews. During the negotiation period for job hopping, the HR department of the company constantly provided misleading information based on the programmers' actual circumstances and communication context. Disturbing information is released to confuse the software engineers, reducing their confidence in bargaining and making them willing to compromise. One HR manager said:

> There was a candidate who seemed indecisive and not very proactive during our salary negotiation, so I purposely kept him waiting for two days without responding. When he finally approached me, I mentioned that the position was quite competitive and that we had many candidates vying for it. I also emphasized that due to our current work phase, we were willing to lower the requirements temporarily but that they would soon be raised again. Upon hearing this, the candidate became anxious and decided to join our company. (M2, 2021-10-14)

When faced with software engineers who lack salary negotiation experience or have difficulty understanding internal information within the company, HR can utilize tactics such as delayed responses and decreased engagement to create a sense of urgency and ultimately influence candidates' decision-making processes.

In reality, during the job-hopping process, software engineers and employers often experience three stages of salary negotiation: (a) mutual probing, in which employers tend to downplay the candidate's resumé; (b) getting to know each other, when employers deliberately conceal important information; and (c) reaching a compromise, where employers interfere with the candidate's decisions. Due to the reasons noted above, labor unions are absent throughout this process. Unless the programmers in the new energy vehicle industry initiate impactful collective actions, the official labor union will not respond. Consequently, salary negotiations and benefits coordination are individual matters for software engineers. However, this does not mean that programmers are passive or unresponsive. On the contrary, many software engineers find ways to leverage their strengths in negotiations and power struggles with their employers. The following section will discuss this issue.

## 5. Professional Advantages and the Actions of Software Engineers

In the low-carbon transition driven by economic development, software engineers at the W Company have found themselves in a political economy in which ensuring sufficient institutional justice is difficult. Whether they can fully leverage the opportunities presented by the low-carbon transition to achieve practical justice depends largely on their own strength and actions. Workers' structural power including marketplace bargaining power and workplace bargaining power. Skills and low unemployment rates are important sources for individual workers to gain marketplace bargaining power (Silver, 2003, p. 13). Fortunately, in recent years, financial capital and the Chinese government have made significant investments in the new energy vehicle industry. This industry needs more programmers, and companies are vigorously competing for capable programmers to win the technology and market race, which has increased the structural power of individual programmers. Many programmers, owing to their technical skills or work experiences, can negotiate for more benefits through market bargaining. We found that, faced with capital's intention to pay low wages and a persistently harsh working environment, software engineers employ three strategies to counterattack and demand higher wages and benefits.

First, to bypass HR's resumé critique and highlight their technical advantages, software engineers tend to submit their resumés through internal referrals from acquaintances. When a candidate is recommended and vouched for by an employee at the W Company, HR will not scrutinize the candidate's resumé during the initial communication. Consequently, software engineers can engage directly in technical negotiations, and their bargaining advantage with the employer is reversed. Most Chinese new energy vehicle companies are in their budding stage and are fiercely competing in autonomous driving technology and AI chip development. The ability to attract talent is a crucial factor in determining a company's success. Consequently, the W Company is willing to invest a substantial amount of money in recruiting scarce talents. For example, it values software engineers with a background in big data analysis and programming skills, and it is willing to offer high salaries to software engineers proficient in Java, Python, C++, and Go. Using their understanding of the company's talent needs, software engineers rely on their technical expertise and work experience to negotiate salaries and demand higher material benefits. They demonstrate their technical advantages by showcasing their programming languages and technical frameworks. They emphasize their past work achievements, project management experience, and year-end bonuses to demonstrate their work capabilities. They also highlight their comprehensive qualities by showcasing awards such as "Outstanding Employee of the Year" or "Development Star." In addition, programmers with higher professional ranks emphasize their influence in the industry and claim that they can attract or lead more talented individuals to join the company. The demonstration of their technical capabilities pushes the salary negotiations between labor and capital to the next stage, where both parties exchange information and explore further.

The second strategy involves software engineers' efforts to acquire confidential information from multiple sources to enhance their bargaining power with the employer. When negotiating compensation with candidates, the W Company often reveals only a rough offer plan without discussing the salary levels of other employees at the same level or the actual recruitment situation of the team. However, this information is crucial for job seekers because once they have access to it, they can gain the upper hand in salary negotiations. Consequently, although senior software engineers have not attempted to form labor unions, they have formed a network of acquaintances. One interviewee found a job at the company through the introduction of friends in his network. He said:

> I know many friends who are programmers. We often exchange information about various companies, including their benefits, reputation, and R&D atmosphere. I came to the W Company through a friend's recommendation. That's how our network works, with active information sharing and mutual assistance! (L19, 2022-04-06)

In addition, IT engineers also build salary discussion groups on platforms such as Maimai, LinkedIn, Zhihu, and Offerhero, where they share internal information about companies, including their development status, work style, salary structure, and team capabilities. One interviewee said:

> I didn't know that the W Company offered "signing bonuses" until I saw someone mention it on Maimai. That's when I realized I could discuss this with HR. Besides the "signing bonus," I also got information about the company's salary structure, benefits, and so on. (L20, 2021-12-27)

Female programmers are equally engaged in various efforts to gather information through different channels, and they may even put in more effort than their male counterparts. For example, one interviewee sought

help from an AI technology training institution, purchased "one-on-one" job-hopping guidance services, and participated in an "interview training class." She said:

> My target position was quite high. I aimed to be the responsible person for a project module. I felt like I might not have the time to thoroughly understand W, so I reached out to a training institution. If the negotiation was successful, I would pay the institution 30% of my first month's salary. If it did not work out, the institution only charged $686 as a service fee. The mentor was indeed very professional. The mentor first organized my previous projects and worked based on the target company and position, then refined and detailed the projects completed for the target position in the past two years, extracted the required abilities and skills, and then matched them with my existing abilities. After that, we prepared my resumé, practiced for interviews, and formulated salary demands. We spent over a month preparing, anticipating all their questions, and, in the end, I secured the position. (L6, 2021-09-03)

In online discussion groups, members ask questions like: "Is a $40,000 front-end position at Tencent worth it?" "Which is better, Alibaba's test development or Shopee's software development?" Female programmers will inquire whether the company has gender discrimination policies and whether policies support the professional development of women; junior software engineers form and join various chat groups to share information about salary levels, the signing of letters of intent, and whether offers have been extended in campus recruitment situations. When negotiating salaries with the W Company's HR department, many software engineers present salary levels for their positions in different companies and use this information to request a salary structure that better aligns with their interests.

The third strategy involves exploiting the competition between new energy vehicle companies to gain room for salary increases. Until both labor and management reach an agreement on the salary plan, they will use their existing advantages and exploit each other's psychological weaknesses to disrupt the other party's judgment and force them to compromise first. Software engineers often apply to multiple companies simultaneously, aiming to secure multiple job offers and the leverage to negotiate with the companies. They utilize the competition among the companies to push their favorite company's HR managers to make concessions. For example, one interviewee recounted:

> My usual method is to apply to multiple companies, gather as many offers as possible, and then compare them. Once I pass the interviews, I usually verbally accept the company's offer and wait for them to provide a specific salary figure. I then compare the offers and consider factors such as the company's business direction and prospects to choose the one I prefer. If the salary offered by that company is not the highest, I will show the other offer packages I have received to the HR representative. This is to showcase my qualifications and negotiate for a higher salary. (L10, 2022-02-24)

When faced with such candidates, HR managers at W Company often compromise. Besides the salary package, company employees enjoy various benefits, such as phone subsidies, meal allowances, company shuttles, signing bonuses, and holiday gift packages, but not all employees have equal access to them. Software engineers may request additional benefits from the company, citing reasons such as the expiration of stock options due to resignation or increased living costs due to a change in work location. Employers often agree with software engineers' requests to demonstrate their generosity and enhance their reputation in the industry.

With the development of digital information technology, the labor market in the new energy vehicle industry today has a large number of ordinary workers who possess programming skills and are relatively substitutable. However, experienced and creative high-level software engineers are rare. Importantly, the HR manager finds it difficult to accurately assess the technical level and development potential of software engineers. In rapidly advancing industries, traditional skill certification systems have little effect, whereas soft indicators such as leadership experience and industry reputation are more valuable references. Given this, software engineers employ strategies such as seeking internal referrals, highlighting their technical expertise, obtaining company information, and creating market scarcity to negotiate with capital, pursuing their perceived justice through practical actions.

Certainly, whether individual programmers can succeed in negotiations depends to a large extent on their knowledge of the industry, social experience, and negotiation skills. People who lack confidence, have poor communication skills and limited work experience, and are information-poor may find it challenging to succeed in negotiations. This often applies to programmers over the age of 35, fresh graduates, and women. However, these programmers are aware of their weaknesses and make efforts to improve their skills to achieve success in future negotiations. Their pursuit of justice does not end, they continue to strive for it. With accumulated experience, they become clearer about their interests and how to attain them. Correspondingly, companies are developing new strategies to deal with challenges from programmers. For instance, in the past, programmers in China's new energy vehicle companies were formal employees, but in recent years, companies have started employing informal workers such as contract programmers, outsourced programmers, and interns. In this sense, the gathering of individual negotiations is important to understanding the activism of Chinese programmers in their pursuit of justice transition.

## 6. Discussion and Conclusion

In the context of China's low-carbon transition, there are two regions: the rustbelt and the sunbelt. The rustbelt for China's low-carbon transition includes western provinces such as Shanxi and Shaanxi. The national government has implemented strict environmental policies to limit industries related to carbon fossil energy production in these areas. The sunbelt, on the other hand, encompasses eastern regions such as Shanghai and Shenzhen. Industries such as new energy vehicles and lithium batteries have experienced rapid development, supported by local government. In the study of transition justice, it is important to focus not only on the challenges faced by traditional carbon fossil energy communities in the rustbelt but also on how core labor groups in the sunbelt pursue their interests and share the benefits of this transition. Therefore, this article discusses the sense of justice among core labor groups in China's low-carbon transition, specifically software engineers in the new energy vehicle industry and their specific activism. Based on this, we aimed to expand the academic research on the issue of just transition.

The working conditions of software engineers in Chinese new energy vehicle companies differ from their counterparts in the global north. They receive much lower salaries, work long hours, and lack fair promotion opportunities. In contrast to programmers in Silicon Valley, where software engineers can earn annual salaries exceeding $400,000, their Chinese counterparts earn less than $45,000 annually—all while living in S City where housing prices reach as high as $14,000 per square meter. Furthermore, Chinese programmers humorously refer to their work schedule as "996," which means working from 9 A.M. to 9 P.M., six days a week. Chinese programmers have voiced grievances and discontent about these working conditions and

initiated the 996.ICU movement on GitHub to protest it. However, in China, collective action can potentially violate the law, and this online movement has not transformed into an offline social movement to change the actual conditions of programmers. Moreover, unions do not represent programmers in collective negotiations with employers to demand promotions and pay raises because the role of Chinese unions is to maintain harmonious labor relations and safeguard workers' basic legal rights, rather than make additional demands on employers.

In terms of this, software engineers have formed their own sense of justice. First, they seek to obtain income that matches their market position, and second, they demand opportunities for good career development. Accordingly, promotions and pay raises have become their core interests. To achieve these, they engage in wage negotiations and power struggles with employers during job hopping in the labor market. Employers use tactics such as criticizing resumes and hiding unfavorable information to lower labor contract terms and working conditions. On the other hand, programmers use strategies such as highlighting their technical advantages, obtaining internal company information, and leveraging inter-company competition to request higher wages and more benefits. Female programmers are equally active in participating in this game. Therefore, individual wage negotiations among Chinese programmers cannot be regarded as a pursuit of money by technical elites but rather as the activism of a new labor group that refuses exploitation and seeks justice. However, individual wage negotiations should not replace collective action organized by unions. In individual negotiations, programmers with less experience or those over age 35 often struggle to achieve success, and competition and division among programmers also exist. Nonetheless, this action still, to some extent, improves the situation of the core labor group and encourages employers to take programmers' concerns seriously.

In conclusion, workers in the sunbelt of China's low-carbon transition are more likely to benefit from the development of the new energy vehicle industry and the gains of the transition. However, individual negotiations alone are insufficient for achieving the goal of just transition in China. The collective action organized by unions cannot be totally replaced by the gathering of individual wage negotiations. The social impact of individual wage negotiations is highly limited, and they often fail to become influential public issues that draw widespread attention across various sectors and drive changes in national policies. Furthermore, while these individual actions have, to some extent, improved the situation of the core labor group and encouraged employers to take programmers' concerns seriously, it is difficult for older or less experienced programmers to succeed, and competition and division among programmers are also common. Therefore, the advancement and achievement of just transition require the joint participation and action of a coalition that includes unions, NGOs, NPOs, labor lawyers, policymakers, and so on.

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## Conflict of Interests

The authors declare no conflict of interests.

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# Local Government-Led Climate Governance and Social Inclusion: The Case Study of J County in China

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## Abstract

Social inclusion in climate governance is related to social justice and inclusive climate justice explicitly aims to open up climate policy and politics to a broader range of actors and voices, especially those most exposed to climate-related injustice. This article employs qualitative research methods to comprehensively examine the issue of social inclusion in the context of local government-led climate governance in J County, Zhejiang province, China. The study finds that the climate governance in J County demonstrates a certain degree of social inclusion in terms of participation by local farmers and benefit distribution. However, this social inclusion has a hidden fragility: It is limited and unstable. The limited social inclusion is manifested in the fact that, throughout the entire process, bamboo farmers were unable to participate due to their lack of a comprehensive understanding of the climate governance action plan, and the distribution of climate governance benefits is characterised by a lack of transparency in the design process and uncertainty regarding potential benefits. The unstable social inclusion is manifested in the great differences in the environmental governance actions of J County in different periods, especially regarding public participation and benefit distribution. Fundamentally, this is mainly due to the significant influence of China's unique top-down performance evaluation system on local government-led climate governance actions in J County. Social inclusion in local government-led environmental governance may again be marginalised if the top-down performance evaluation indicators faced by local governments change in the future.

## Keywords

climate governance; local government-led; performance assessment; social inclusion; forest farmers

## 1. Introduction

The issue of social inclusion in climate governance is of significant importance as it pertains to whether different regions and populations can achieve full participation and equitable sharing of the benefits of climate governance. As the world's largest carbon dioxide emitter, China's proactive attitude and efforts in climate governance are paramount for global climate governance. However, due to the unique characteristics of its national context, climate governance in China faces distinct challenges in terms of social inclusion. Since the 75th United Nations General Assembly, when the Chinese government proposed the goals of peaking carbon dioxide emissions before 2030 and achieving carbon neutrality before 2060, reducing carbon emissions and increasing carbon sequestration has become a national strategic priority for China. It has also become a political task for local governments at all levels. Under the guidance of national macro-level policies and the transmission of top-down pressures, some economically developed regions along China's eastern coast have taken the lead in exploring climate governance actions. Although these regions consciously involve societal participation, they fundamentally follow the traditional government-led environmental governance model, wherein the public, enterprises, and social organisations often find themselves in a position of being "governed" that affects the social inclusion of the environmental governance process and the results. However, this problem has not yet attracted full attention from academic circles.

This article is based on qualitative research and discusses a climate governance action known as the Bamboo Carbon Sequestration Reform conducted in J County, Zhejiang province. This initiative has emerged in the context of China's "dual carbon" strategy and serves as a typical case of local government-led climate governance in China's eastern coastal regions. Zhejiang province is one of China's most economically developed provinces. J County is not particularly outstanding in its economic development but is well-known for ecological governance and green development. In 2021, within the broader macro-strategic context of the nation advocating for the "carbon reduction and carbon sequestration" strategy, the local government of J County in Zhejiang province took the lead in initiating the Bamboo Carbon Sequestration Reform, aiming to restore the ecological environment of bamboo forests and increase their carbon sequestration capacity through a cooperative collective management model. Since the implementation of China's forestry responsibility system in the 1980s, a framework of individual household contracting for forested areas and independent family operations in bamboo forests has been in operation in China's forestry regions. However, with the changing local environmental policies and market demands, the price of bamboo has continued to decline, weakening forest farmers' enthusiasm for this kind of work. J County faces the challenge of bamboo forest mismanagement and a decline in carbon sequestration capacity. To address this issue, J County has attempted a collective operating model with bamboo forest farmers' cooperatives as the organisational structure. They have mobilised approximately 49,000 forest farmer households in the county to first transfer the management rights of bamboo forests to village-level farmer professional cooperatives and then further transfer them to the county-owned enterprise LS Company for the collective production of bamboo forest industries. During this process, the local government's financial department guided banks to provide low-interest loans to LS Company. Additionally, in collaboration with LS Company, they undertook the collection, verification, and trading of carbon sequestration products. Ultimately, a certain percentage of earnings from the Bamboo Forest Carbon Sequestration Reform is returned to the villages and forest farmers.

This study aims to provide a comprehensive examination of the issue of social inclusion within the context of local government-led climate governance actions in J County. To evaluate this case more objectively, we assess the positive efforts and partial achievements made in terms of social inclusion within climate governance actions advocated by the central government and led by local governments. On this basis, we focus on analysing the local government-led climate governance action in J County and the lack of social inclusion, such as the participation of forest farmers and benefit distribution, which reveals the hidden fragility of this social inclusion. The article begins by introducing the most fundamental aspects of social inclusion within the climate governance field. It then analyses the trend towards social inclusion of the climate governance action in J County, focusing on the participation and benefit distribution among local forest farmers in the context of local government-led climate governance actions. Lastly, the study further discusses the fragility of social inclusion in local government-led climate governance under China's unique system and its causes.

## 2. Climate Governance and Social Inclusion

Social inclusion is a concept that lacks a unified definition since different scholars interpret it in various ways. However, it is generally recognised that public participation is a central element (Capetola, 2008; Liu, 2022; Xu, 2015). Public participation is crucial in climate governance. This means respecting the public's right to be fully engaged in matters relevant to their own lives and recognising the benefits of their full participation. Therefore, in this climate governance research in J County, we focus on two main aspects of social inclusion: the full participation of forest farmers and the distribution of benefits to the forest farmer group.

Research has shown that public engagement in climate governance is severely restricted, lacking attention to social inclusion and broader equity (Armitage et al., 2017; MacCallum et al., 2014; Ojha et al., 2016; Ziervogel et al., 2014). Valuing public engagement in climate governance, especially involving local communities, means actively embracing local knowledge, opinions, and aspirations (Green et al., 2012). Local people have a better understanding of local conditions, localised knowledge, and relevant, advantageous resources, which is beneficial for formulating local climate governance policies. However, the right to participate in climate governance is not equally distributed across different levels of governance (Brugnach et al., 2017). Local society and local people are often excluded from the governance structure, which inadvertently weakens local people's risk resilience and ability to develop their livelihoods, especially for vulnerable groups. Therefore, in climate governance, it is crucial to actively empower local communities and fully respect their right to expression. Particularly, their prior consent is required before climate governance activities can be carried out on their territories (Whyte, 2013). This approach ensures meaningful public participation and enhances social inclusion.

Achieving equitable distribution of benefits for the public in climate governance is crucial. In reality, due to disparities among actors with different rights, fair distribution of benefits in climate governance is often not fully realised. In fact, policy practices nominally centred around equity in climate governance may, in practice, exacerbate inequalities (Sapkota et al., 2018). History has shown that unless poor and vulnerable groups can effectively organise and raise their voices, it is challenging for them to obtain a fair share of resources. This also means that when addressing the world's most challenging global climate issues, it is crucial to ensure that the voices of ordinary people, including men, women, youth, elderly, farmers, and various other groups, are heard loudly and clearly, and respected (Toulmin, 2010). Therefore, we believe that

emphasising the participation of local communities in climate governance, particularly focusing on their substantive participation in climate governance actions and providing policy recommendations, as well as ensuring equitable distribution of benefits in climate governance among local communities, is conducive to constructing an inclusive environmental governance framework and promoting inclusive climate justice (Newell et al., 2021).

This study attempts to build upon existing research findings to objectively evaluate the proactive efforts made by the local government in J County regarding public participation and achieving a more equitable distribution of benefits within the context of local government-led climate governance action. This represents a significant advancement compared to previous climate governance initiatives, indicating a positive breakthrough by local governments in China. However, on this basis, we focus on analysing the limited and unstable characteristics of such social inclusion, revealing core issues surrounding China's unique top-down performance evaluation system.

## 3. Methods

Given that the primary objective of this study is to comprehensively examine social inclusion issues within local government-led climate governance in J County under the backdrop of China's "dual carbon" strategy, a qualitative research approach is more appropriate. We gather experiential data through in-depth interviews and participatory observation to gain an interpretive understanding of the social actions of key stakeholders in climate governance. Social actions exhibit complex internal structures (Parsons, 1937). Understanding social actions requires close attention to the means and objectives of their actions, the values that drive them, the emotional background behind the actions, and the subjective "meaning" attributed to them by the actors involved (Weber, 1978). From March to June 2023, we conducted face-to-face, in-depth interviews with various stakeholders in J County, including local government officials, business leaders, community leaders, and forest farmers. Interviews with local government officials involved key personnel from the County's Ecological and Environmental Bureau, the Forestry Bureau, the Government Financial Services Center, the Development and Reform Commission, and four staff members responsible for forestry work in three forestry towns. We also conducted interviews with the management personnel of the county-owned enterprise LS Company, which is responsible for collecting and trading carbon sequestration in bamboo forests. Forest farmers were the most important subjects of our research. To ensure a comprehensive understanding, we conducted field surveys in four different types of villages selected based on their bamboo forest management status. To gain the forest farmers' trust, we lived in the villages for an extended period. During this time, we observed their production and daily life and learned about their values, attitudes towards bamboo forest management and ecology, and their views on the government's governance actions. In total, we conducted interviews with four community leaders, six other village officials, and 35 forest farmers, making efforts to ensure a balance in age, gender, and family economic status among the forest farmers interviewed. We designed semi-structured interview outlines tailored to the social characteristics of each interviewee to ensure each interview lasted between two to three hours. The diverse selection of interview subjects aimed to cross-validate critical information and ensure the accuracy and reliability of the data collected.

In addition, this study used literature analysis to grasp the local historical and social context. On the one hand, we collected and read documents such as city and county annals, statistical yearbooks, and other literature

to gain insights into the historical development of the local bamboo industry, its current phase characteristics, and the local cultural background. On the other hand, we gathered and analysed policy documents issued by the local government to systematically understand the policy orientation towards environmental governance in the bamboo industry over the past two decades. Additionally, we examined the policy design regarding bamboo-related issues in climate governance, such as bamboo forest carbon sequestration and bamboo forest management in recent years.

## 4. Climate Governance Towards Social Inclusive and Its Phase-Wise Effects

J County is located in the northwest of Zhejiang province, upstream of China's fifth-largest freshwater lake, Lake Taihu. It is renowned for bamboo, with a bamboo forest area of 1.011 million acres in 2022. Since the 1980s, J County has vigorously developed the bamboo processing industry, capitalising on its abundant bamboo resources. As one of the key industries in J County, the bamboo industry once accounted for 20% of the national bamboo industry output value with only 1.8% of the national bamboo production. However, this development has come at a significant environmental cost. During the late 1990s to the early 21st century, the pollution caused by the bamboo product processing industry in J County and other industrial pollution resulted in severe water contamination in the West Tiaoxi River, a crucial water source for Lake Taihu. The situation attracted significant attention from the central government. The top-down environmental governance pressures have driven the local government in J County to implement mandatory environmental governance measures. Within a short span, many energy-intensive and heavily polluting bamboo product processing enterprises were shut down, severely impacting the livelihoods of the forest-farming community. Furthermore, coupled with a reduction in the demand for bamboo products in the market, declining bamboo prices, and increased operational costs for bamboo forestry, a significant portion of forest farmers shifted towards alternative livelihoods. This resulted in a substantial abandonment of bamboo forests, with peak abandonment rates reaching as high as 20%. The bamboo species in J County is Moso bamboo, a member of the Poaceae family. It grows rapidly, and forest farmers need to regularly cut and manage large bamboo culms while preserving small ones every two years to ensure the continuous renewal of bamboo forests. The growth cycle for Moso bamboo is approximately eight years. If not cut and managed on a schedule, Moso bamboo can die off on a large scale. The abandonment of 20% of the bamboo forest area in J County has led to the deterioration of the bamboo forest ecosystem and a reduction in its carbon sequestration capacity. This presents a challenge for the local government, which is trying to restore the ecology of the bamboo forests, revitalise the bamboo industry, and help forest farmers increase their income.

To tackle this challenge, local communities in J County have spontaneously explored breakthrough pathways. Among these efforts, H Village took the lead in 2015 by establishing a professional cooperative for bamboo forestry, which set up a collective management model for bamboo forests. The cooperative expanded the bamboo sales market, engaged effectively in price negotiations in market transactions, and ultimately distributed the benefits to forest farmers based on their shares in the cooperative. The operational model in H Village has become widely known in J County and has garnered the attention of the local government. In 2021, the central government issued two policies: (a) Opinions on the Complete and Accurate Implementation of the New Development Concept to Achieve Carbon Peak and Neutrality Goals and (b) Opinions on Accelerating the Innovative Development of the Bamboo Industry. These policies provided a transformation framework for the local government in J County. Taking this as an opportunity and drawing inspiration from the cooperative operation of bamboo forests in H Village, the local government in J County

initiated a climate governance action centred around the Bamboo Forest Carbon Sequestration Reform in 2022. This action includes objectives such as increasing carbon sequestration in bamboo forests, revitalising the bamboo industry and enhancing the income of bamboo farmers throughout the entire county.

In the context of the lack of proactive management of bamboo forests by most forest farmers in J County, the local government has attempted to promote reform in forest tenure systems. They have implemented unified management of bamboo forests and established a process system encompassing "bamboo forest land transfer, bamboo forest collateral loans, bamboo forest carbon sequestration resource collection and storage, carbon sequestration product trading, and benefit distribution" (Figure 1). In the first step, the local government facilitated the establishment of 119 joint-stock professional cooperatives for Moso bamboo in villages with bamboo forest areas exceeding 1,000 mu (about 66.67 hectares) in J County. Local government officials and village leaders mobilised forest farmers hierarchically from the top down to transfer their bamboo forests to these village cooperatives. To maximise the benefits of unified management of bamboo resources in J County, the local government further encouraged all 119 villages to collectively transfer all bamboo forests to the county-owned enterprise LS Company in the name of cooperatives. As of the end of 2022, the bamboo forest transfer rate in J County had reached a remarkable 99%, with a transfer period of 30 years.

The rapid and efficient bamboo forest transfer work is closely related to the organisational structure of local administration in China. In general, at the local government level, the county-level government plays a crucial role in implementing various national policies. County-level governments must adhere to the implementation of higher-level policies while also having a degree of autonomy. The actions taken by county-level governments are closely tied to the performance assessment indicators from higher-level governments. Township-level governments primarily follow the specific tasks assigned by county-level governments, driven by the pressure from above. Local organisations within villages, particularly the "village committees" (the Communist Party Village Branch Committee and the Villagers' Self-Government Committee), are often more influenced by the township party committee and government rather than the villagers themselves in their practical work. Leveraging this characteristic of China's local administration organisational structure, J County's various government levels collaborated with the "village committees" of 119 villages, making it very smooth and efficient to mobilise forest farmers to transfer their bamboo forests to cooperatives.

In the second step, the local government's financial department guided banks to introduce financial products called "carbon sequestration storage loans." LS Company used the bamboo forest resources from all

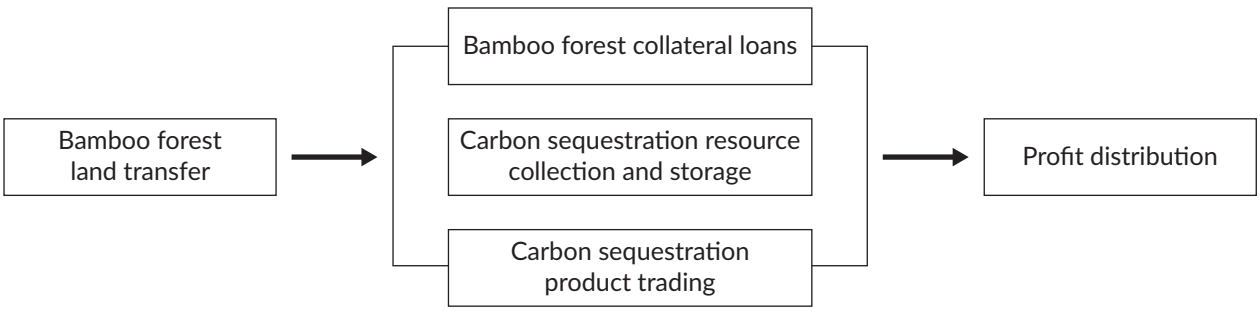


**Figure 1.** Flowchart of the Bamboo Carbon Sequestration Reform in J County.

119 Moso bamboo professional cooperatives in the county as collateral capital to apply for these low-interest loans from banks. Currently, 103 billion yuan in low-interest loans with a 30-year term has been fully secured. According to local policy, bamboo forest rent payable to forest farmers included in the loan is managed by LS Company and used for investment and operation. After the 30-year term, the bamboo forest rent will be distributed to the forest farmers. During these 30 years, LS Company pays a fixed interest to each village cooperative annually, which the cooperatives use to provide dividends to and support collective production by the forest farmers. In the third step, LS Company subcontracts the bamboo forests to each village cooperative for operation. LS Company funds the villages for building forest roads, bamboo decomposition points, carbon sequestration monitoring flux towers, and other infrastructure. It is also responsible for supervising the bamboo forest management by the cooperatives to ensure the carbon sequestration levels of the bamboo forests. The fourth step involves the local government leading LS Company in establishing the Bamboo Carbon Sequestration Storage and Trading Center. The centre collects carbon sequestration resources from each village cooperative, and after verification by a third-party organisation, these resources are used in transactions with carbon-purchasing companies. Once LS Company covers the principal and interest, 70% of the net proceeds from carbon sequestration trading will be distributed to the cooperatives for dividends in the future.

Overall, compared to J County's previous environmental governance models, with the continuous adjustment and optimisation of China's environmental governance structure, the local government-led climate governance actions in J County have made certain positive efforts in terms of social inclusion. This is specifically evident in two aspects: "involvement of forest farmers" and "benefit distribution."

Firstly, the local government has shown a trend towards accommodating forest farmer participation. Through field investigations, we learned that, especially in the top-down mobilisation of bamboo forest transfer work, local government officials and village leaders emphasise the importance of explaining the relevant regulations and price standards for bamboo forest transfers to forest farmers. They also focus on collecting feedback from forest farmers regarding benefit distribution schemes. These issues are negotiated to determine the terms of bamboo forest transfers and benefit distribution schemes. In G Town, a prominent forestry town in J County, the town government, village committees, and Party branches employ a multi-tiered approach to communicate climate governance policies effectively. They organised a series of meetings, including a village party branch secretaries meeting, a village representatives meeting, a village group leaders meeting, and a household heads meeting, to clarify the bamboo forest transfer policy. They placed particular emphasis on addressing issues that are prone to disputes among forest farmers during land transfer:

> We held a total of 65 meetings, both large and small, in our village. Since each household's forest land is located differently, there are significant differences in labour costs. Land located at the bottom of the mountain and close to the road has lower costs, while land on the mountain and far from the forest road has higher costs. Villagers compared and questioned why one household's labour cost was 5 yuan per 100 kilograms while another household's was 4 yuan per 100 kilograms. We evaluated the labour costs for one piece of land six times and continuously for four nights on another piece of land. We pay attention to the villagers' opinions and strive to satisfy them. (Community leader, Ma)

> Village cadres explained the benefits of bamboo forest transfer to us, and then they asked us to raise any disputed issues. They explained each issue clearly. Finally, we went out to promote the policy to

> the villagers. The villagers did their calculations, and most voluntarily chose to transfer their bamboo forests. (Village group leader, Hu)

> The village group leader told us that bamboo forest transfer is good. Many young people from the village work elsewhere, and the elderly find it labour-intensive to manage bamboo forests. Additionally, with the decrease in bamboo prices, we are unwilling to manage them ourselves. Families without enough labour resources in the village are willing to transfer their bamboo forests. (Villager, Yu)

Secondly, the local government recognised the importance of fair distribution of benefits among forest farmer communities. Under the opportunity presented by this climate governance initiative, the local government is actively exploring the integration and development of the entire bamboo industry chain. They established a three-tier system: upstream bamboo preprocessing in villages, midstream primary bamboo processing in townships, and downstream deep processing by enterprises. Compared to individual forest farmer operations, after the Bamboo Carbon Sequestration Reform, forest farmer communities can enjoy three stable sources of additional income:

> 1. Bamboo forest management income: According to the distribution plan, once bamboo has been sold, the cooperative will return the income to forest farmers based on their shares. This income will continue to grow thanks to collective management by the cooperative and the improved bamboo forest infrastructure.

> 2. Benefit-sharing from transferred rents: LS company invests the bamboo forest transfer rents of each village cooperative in a unified manner. It should be further explained that the bamboo forest transfer rent is 400 yuan per acre every year, 12,000 yuan per acre for 30 years, and the bamboo forest transfer rent of J County is 10.3 billion yuan. In order to avoid risks and protect the long-term income of forest farmers, LS company unified investment. Forest farmers get fixed interest from the bamboo forest transfer rents every year until the principal of bamboo forest transfer rents of LS company is returned to the forest farmers after the 30-year circulation expires. LS company mainly invests in bamboo forest transfer rents in the high-quality projects of J County to ensure that the annual rate of 5% income is returned to the village cooperatives and distributed to forest farmers.

> 3. Income from labour for bamboo forest management: Establishing cooperatives across the county has created over 3,600 job opportunities, with an average annual income of around 60,000 yuan per person. Additionally, there may be future income from carbon trading.

According to the local government's estimates, forest farmer households can potentially increase their annual income by an average of 8,000 yuan. Many elderly individuals, middle-aged women, and young people working outside the area interviewed expressed positive views about this potential significant income increase:

> In my family, we used to hire people to manage our bamboo forest, and the income was meagre. Joining the cooperative means I don't have to manage it myself, and I've heard we can earn a good amount every year. This is a good thing. (Elderly individual, Fe)

> I'm usually at home alone, and I hired people to manage the bamboo forest. The income from one acre of bamboo forest is only 200–300 yuan per year. Joining the cooperative is great; I won't have

> to manage it myself, and the village cadres said we'll get more money than we do now. (Middle-aged woman, Lu)

> I work outside. People like us, born in the 1980s, have no idea how to manage bamboo forests and don't want to come back to manage them. Cooperative management of bamboo forests is indeed beneficial. We also hope that the cooperative will take care of bamboo forest management so we won't have to do it ourselves. (Young person working outside, Ga)

The local government takes two approaches to ensuring a fairer distribution of climate governance benefits among bamboo farmers. Firstly, according to the relevant provisions of the Property Rights Law, the government acknowledges the bamboo forest area and ownership allocated to farmers since the 1980s when the forest land was contracted to households. However, due to the fixed nature of the forest land contracting policy, individuals born after the 1980s or new brides from outside the village who married into the community did not receive any bamboo forest allocation. To address the income issue for these individuals and to achieve a fairer distribution, the local government actively explored a "flexible approach" that maximises the consideration of different stakeholders' interests. After repeatedly seeking opinions from local retired officials and village representatives, a benefit distribution plan called Initial Distribution + Secondary Distribution was devised. According to this plan, 60% of the cooperative's total income from the collective operation of the bamboo forest is distributed fairly based on the proportion of bamboo farmers' initial investment in the cooperative. The remaining 40% of the income is set aside as a profit adjustment fund, which is used for benefit distribution among individuals in the village who do not possess bamboo forests and for the construction of public infrastructure in the entire village. This benefit distribution plan is mainly designed to ensure relative fairness among all stakeholders:

> According to the Property Law, distributing benefits based on the bamboo forest area and property rights held by bamboo forest farmers when they join cooperatives is deemed unfair. There are many conflicts among villagers, and in practice, we need to consider the situation in rural areas. Therefore, we have to seek alternative methods, such as the "soil approach," to establish a fairer distribution scheme. (Town government staff, Re)

> In the 1990s, villagers who didn't receive bamboo forests through allocation took legal action to secure their interests, leading to significant conflict among villagers. This time, the village has allocated a portion of the funds to balance income distribution, and it has indeed resolved the issue of unfair income distribution. (Villager, Wu)

Objectively speaking, the climate governance action in J County has demonstrated a certain degree of social inclusion in terms of "bamboo farmers participation" and "benefits distribution" and has achieved some phase results in increasing bamboo forest carbon sequestration, revitalising the bamboo industry, and increasing the income of farmers. Compared to the relatively coercive environmental governance model that J County had in the past, climate governance action shows a trend towards social inclusion. However, we find that this social inclusion inherently hides a fragility: J County's climate governance actions still exhibit the typical features of government-led environmental governance, and there are limited and unstable climate governance actions under administrative intervention.

## 5. Limited Social Inclusion

As mentioned earlier, the local government has recognised the importance of farmer participation and a fairer distribution of climate governance benefits, particularly in the process of bamboo forest land transfer. However, climate governance is a comprehensive program, and aside from these two aspects, there are still aspects where inclusivity is lacking toward the forest farmers, whether in the initial policy formulation and implementation or in later stages like benefit distribution.

Firstly, the forest farmers cannot participate in the full process or provide feedback since they lack a comprehensive understanding of the overall climate governance plan. Research shows that formulating environmental governance policy requires engaging in public dialogue and collecting opinions (Yang & Kagawa, 2023). However, through investigations, we have learned that when most forest farmers heard about the Bamboo Carbon Sequestration Reform project in J County, it signified that the policy had already been completed under the guidance of the local government. This means that most forest farmers had no opportunity or channel to participate in the initial policy design and assessment. In fact, the farmers' perspectives, opinions, and willingness to participate are crucial in policy design, but it appears that forest farmer involvement in this stage was overlooked. Once the policy had been formed, forest farmers could only choose whether or not to transfer their bamboo forests to participate in the project. However, we also observe that the bamboo forest transfer policy promotion activities were mainly carried out by local government officials and village cadres, with only village representatives and a few ordinary villagers involved. While local government officials and village cadres have made extensive efforts to inform as many ordinary farmers as possible about the policy, their ultimate task is to make farmers aware of the potential benefits of the project and to address their questions to encourage bamboo forest transfers, rather than consulting, collecting, and conveying the will and opinions of the forest farmers:

> I have a dozen or so acres of bamboo forest at home, and it's quite labour-intensive to manage. I transferred it to the cooperative last year. I didn't know about the bamboo carbon sequestration project; I only heard that joining the cooperative has benefits. It's a good policy from above. (Elderly person, Qi)

> The village group leader posted a notice in our WeChat group, telling us that after transferring our bamboo forests to the cooperative, we wouldn't need to manage them ourselves, and the income we'd receive annually would be more than what we earned from managing them ourselves. I didn't want to manage the bamboo forest myself and wasn't making much money from it. This opportunity sounded beneficial, so I signed up for it. (Villager, Ha)

Secondly, the climate governance benefit distribution plan has issues related to its lack of transparency in the design process and uncertainty regarding potential benefits. Through field investigations, we found that while bamboo forest owners can receive investment returns from the bamboo forest transfer rents, the per-acre transfer amount, who controls the transfer rents, and the distribution of investment returns are all determined by the local government. Bamboo farmers are merely informed that their land transfer rents will be collectively invested and managed by the state-owned enterprise LS and that they will receive a certain proportion of the investment dividends each year. The local government justifies this approach by stating that it is from a risk management perspective:

> There are no professional investors in these villages, and if these village communities were to invest these funds, the likelihood of failure would be high. (Government's Financial Services Center official, Ch)

From an objective perspective, local government officials' considerations have their merits. However, this paternalistic and rigid approach by the local government did not consider the preferences of bamboo farmers. It did not provide opportunities for capable villages and individuals in rural areas to participate in the investment. From the expected benefits related to climate governance obtained from the local government and the information provided by government officials in relevant departments, it is evident that the potential benefits of J County's climate governance action are substantial. However, at present, these potential substantial benefits have not been fully distributed to the forest farmers, and it is still expected that, as stated, the cooperative management of bamboo forests by the cooperatives is more profitable for forest farmers than self-management. The actual situation may involve various uncertainties:

> Currently, we haven't received any money, and we don't know when or how much money will be distributed. Village cadres assured us that they would distribute it to everyone. (Villager, Le)

An important unintended consequence is that since the implementation of the Bamboo Forest Carbon Sequestration Reform in J County in 2022, farmers have gradually withdrawn from bamboo forest ecological restoration. For a long time, farmers had been both protectors of the bamboo forest ecosystem and beneficiaries who relied on it for their livelihoods. They have a rich ecological knowledge accumulated through generations of production. Undoubtedly, collective management through cooperatives and employing specialised teams to run the bamboo forests is beneficial for increasing bamboo forest carbon sequestration and improving the income of forest farmers. However, an unintended consequence is that it has artificially severed the close relationship between most farmers, bamboo forest production, and the ecological aspects of the forests. The previously interdependent relationship between farmers and the bamboo forest has been reduced to a singular economic connection. This could lead to a weakening of farmers' ecological responsibilities and the disruption of intergenerational transmission of ecological wisdom:

> We, those born in the 1960s, understand that managing bamboo forests is a skilled activity. Knowledge about techniques like preserving bamboo shoots to nurture bamboo forests, the right timing for hillside cutting and pruning, and the practice of harvesting large bamboo while preserving the small ones every two years is crucial. Now, all the bamboo forests in the village have been transferred to the cooperative. We try to hire older people in the village, who are in their 60s and have technical knowledge, to manage the bamboo forests. However, only a few of these elderly people are directly involved in managing the bamboo forests. At present, most villagers in the village are no longer directly involved in the management of bamboo forests, and these bamboo forest management techniques might slowly fade away. (Cooperative leader, Ga)

In conclusion, the climate governance initiative led by the local government in J County, while demonstrating concern for the involvement of forest farmers and benefit distribution, is severely limited. This limitation arises from both established traditions in environmental governance and the attitudes of the forest farmers themselves. In practice, forest farmers generally show indifference to the unreasonable practices of the local government, and they tend to adopt a simplistic economic rationality, accepting the land transfer if the

income is higher compared to their past individual management. As stated by a local official: "Farmers will calculate, and if it seems suitable, they will be willing to join the cooperative" (Forestry Bureau official, Yu). Under this simplified economic rationality, forest farmers appear to have no intention of engaging in profit negotiations with the relevant departments of the local government. The local environmental governance structure lacks a public participation force to promote climate governance to be more socially inclusive.

## 6. Unstable Social Inclusion

Compared to the environmental governance implemented in most regions of China in the early 21st century, the local government in J County has shown more consideration for the participation of farmers and the distribution of benefits to them regarding climate governance. This approach is not only influenced by the local government's more inclusive mindset but also rooted in the top-down performance evaluation pressure faced by the local government, which can create underlying instability risks in the social inclusiveness of the locally-led climate governance actions.

The compatibility and parallel operation of the pressure-based system and the personnel assessment system are not only crucial pathways for the central government to achieve national governance goals (Yuan & Jiang, 2023) but also represent a unique governance model for government officials in China (L. A. Zhou, 2007). Under the centralised administrative and personnel system, local governments have long been engaged in an internal "competition" within the administrative system (F. Z. Zhou, 2009). Performance assessments directly linked to promotion serve as a key factor that restrains various governance actions of local governments. Overall, China's top-down performance assessment system has indeed driven actions by local governments and has achieved various results. The local government-led climate governance in J County is a typical case. However, in the pursuit of performance, local governments compete with each other, leading to a certain degree of deviation between the original intentions of national policies and the actual consequences. Looking back at the period since the early 21st century, the approach of J County's local government to social inclusion in environmental governance and even its level of emphasis on environmental governance itself has changed based on different performance assessment indicators at different times in China's environmental governance.

Amid China's current emphasis on global climate governance, the central government has given significant political significance to environmental governance objectives, including the "dual carbon" strategy, common prosperity, and rural revitalisation, among others. Local governments actively establish these objectives as key breakthrough points in performance assessments. Consequently, the local government of J County not only attaches great importance to improving bamboo forest carbon sequestration but also consciously incorporates multiple objectives of social inclusion into climate governance actions, such as the prosperity of forest farmers and rural development in mountainous areas. As a pioneer in such innovative practices in Zhejiang province and even in China, J County has been designated as a national pilot county for forestry carbon sequestration, and its bamboo forest carbon sequestration reform has been recognised as the best practice for common prosperity and rural revitalisation in Zhejiang province. The local government of J County and its key officials have received praise and policy support from higher levels of government due to their innovative practices in the Bamboo Carbon Sequestration Reform:

> In 2021, the bamboo industry development policy led by the state is an important opportunity for our county to carry out the bamboo carbon sequestration reform. In addition, Zhejiang province is

> a national pilot demonstration area for common prosperity. According to the national policy, we will focus on planning together the multiple objectives of the bamboo forest carbon sequestration, common prosperity of forest farmers and rural revitalisation to try to make some achievements. (Government's Financial Services Center official, Ch)

In fact, at the beginning of the 21st century, environmental governance in many parts of China neglected social inclusion. This was because, at that time, China was facing severe environmental pollution, and the central government formulated a one-vote veto system for environmental governance. This meant that if a serious environmental pollution incident occurred in a certain area, the local government's entire year's work would be negated, and the key officials would lose their chances of promotion. To emphasise achievements in environmental governance, local governments have prioritised environmental governance as a top priority. In some cases, they have even taken measures such as the forced and rapid closure of a significant number of polluting enterprises to improve environmental governance indicators, regardless of the willingness of enterprises to transform and upgrade the employment of workers. J County is located upstream of Taihu Lake, and the outbreak of the Taihu Lake blue-green algae incident in 2007 placed the local government under pressure regarding its environmental governance performance assessment. Avoiding the political risks posed by environmental pollution in the short term (Huang, 2020) became the most pressing concern for the J County government. After many bamboo product processing enterprises in J County were shut down, the lack of local enterprises to buy forest farmers' bamboo meant their livelihoods were seriously damaged. This is also an important reason why forest farmers abandoned the bamboo forest and why the bamboo forest is being ecologically degraded. At this stage, the environmental governance of J County lacks full consideration of social inclusion, which mainly stems from the conflict between social inclusion and the need for local governments to demonstrate their environmental achievements:

> In the past, when the environmental protection policy was loose, much of the primary bamboo processing was completed in peasant households. Later, the water pollution problem became serious, the national environmental protection policy became stricter and stricter, and the local governments were under great pressure. From 2007 to 2008, we focused on regulating sewage and shut down more than 100 small businesses in a short time. (Forestry Bureau official, Lv)

> Without consulting the forest farmers, small bamboo processing enterprises in our villages were simply shut down. There was no negotiation; it was an order! (Villager group leader, Pa)

> After the closure of many small bamboo processing enterprises, the price of bamboo was greatly affected. We are slowly becoming unwilling to manage the bamboo forests. (Villager, Wa)

In this context, environmental governance is a social action embedded in specific political, economic, and social systems (Chen, 2020). Social inclusion in J County's climate governance appears merely a byproduct of the local government's pursuit of performance assessment to a certain extent. It lacks the active engagement of governance actors to fully involve the public and ensure equitable distribution of benefits as part of their intrinsic value structure. Moreover, it does not arise from an optimised power structure within the governance framework. As a result, if there is a change in the performance assessment criteria the local government faces, social inclusion in the local government-led environmental governance may once again be marginalised.

## 7. Conclusion

One significant characteristic of environmental governance in China is the central role of the government. In local environmental governance, local government-led governance is the most important practical form. Compared with environmental governance in other countries, its advantage is that local governments have an extensive capacity to mobilise local society. For example, J County was able to realise the bamboo forest transfer work of the vast majority of farmers in a short period and realise the improvement of carbon sequestration capacity through collective management. However, this form of environmental governance also has unique problems regarding social inclusion, which has a hidden fragility.

Objectively speaking, the climate governance policy in J County, led by the local government, to a certain extent, focused on the involvement of bamboo farmers and fairer distribution of benefits, incorporating the multiple objectives of ensuring prosperity for forest farmers and rural revitalisation, providing valuable domestic experience within China's "Dual Carbon" strategy for achieving local economic growth and social equity. However, this approach is mainly due to carbon sequestration, common prosperity, and rural revitalisation, which are the most important indicators in the top-down performance assessment. This approach differs from the mandatory environmental governance model of neglected social inclusion in the early 21st century. Therefore, J County's local government-led environmental governance action has consistently revolved around different performance evaluation indicators over different periods in China's environmental governance history. Social inclusion in local government-led environmental governance may again be marginalised if the top-down performance evaluation indicators faced by local governments change in the future.

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### Conflict of Interests

The authors declare no conflict of interest.

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ARTICLE

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# "Small Sacrifice for the Greater Good": Decoding Just Transition in a Chinese Peripheral Region

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## Abstract

The notion of just transition is important and debated in discussions about climate change and low-carbon shifts. This study aims to refocus on just transition from a spatial perspective. We investigate perceptions in Chun'an, Zhejiang, to redefine just transition beyond Western ideas. Our case offers one key yet under-explored dimension in the interpretation of justice: spatial scale. First, the green transition of Chun'an can be regarded both as a sacrifice of economy from a local perspective (Chun'an county) and as a valuable social contribution from a broader regional perspective (Hangzhou city area). Second, the multi-scalar interaction of the transition process shapes the perceptions of justice. It is represented by the growing local tensions between developmentalism and environmentalism. Such a process is aimed at generating a wider scale of well-being, contributing to a process of/for justice. We argue just transition is about a spatially sensitive process towards (rather than of) justice. In China, realizing transition is the way towards justice, and justice itself is transition in the long run.

## Keywords

China; Chinese periphery; just transition; multi-scalarity; perceptions; transition practices

## 1. Introduction

In the field of international climate politics, there is a growing emphasis on social justice, coupled with the narrative of a "just transition" (JT; see Heffron & McCauley, 2018; McCauley & Heffron, 2018). The central idea is that major structural changes will reinforce existing inequalities and/or introduce new ones (Curran & Tyfield, 2020; Huang & Liu, 2021; Miller et al., 2013). As cautioned by some scholars (Newell & Mulvaney, 2013), the adoption of green technologies in existing social-technical systems can lead to unexpected forms of injustice. Consequently, there is a growing consensus among key stakeholders to ensure fairness in the processes of transitioning to a low-carbon future (ILO, 2015). Undoubtedly, this has brought about new challenges for global climate governance.

In the existing literature, Western conceptualizations of JT are rooted in the democratic ideology and political legitimacy-seeking for absolute, preconditioned, decentralized justice before transition practices unfold. They remain normative and aspirational policy discourses (McCauley & Heffron, 2018). Moreover, the Western concept of JT offers a holistic framework to capture the preconditions, processes, and outcomes of socio-technical transitions. It mainly involves labor-oriented governance and perceptions of social justice and equality (Stevis & Felli, 2020). In short, JT focuses on geographically certain and industrially targeted vulnerable groups during transitions, seeking compensation and skills training for their particular "justice" (Cha, 2020). Some scholars argue, however, that injustice emerges not because of transitions. It may be rooted in long-lasting social relations, collective interests/identities, and power inequalities, and it is also highly contextual and place-specific (Evensen et al., 2018; Motz, 2021). Providing justice governance to certain groups in certain localities may present injustice to others elsewhere (Wang & Lo, 2021). Recent research has pointed out that JT is a multi-dimensional, multi-scalar, multi-actor, and context-sensitive process, calling for more grounded elaboration on the role of scalarity in JT (Huang & Liu, 2021; Malakar et al., 2019).

China plays a significant role in the global transition toward decarbonization (Huang et al., 2021). It is pursued through the "dual carbon strategy," which has evolved into both a government-led top-down initiative and a growing number of grassroots greening projects. Various stakeholders on the ground interpret and implement this strategy through green transition practices to not only address climate change but also promote "ecological civilization" (Huang & Westman, 2021). Furthermore, these practices are deeply rooted in Chinese socialist ideology and cultural philosophy, emphasizing social justice. However, there has been relatively little scholarly research on the connection between transition practices on the ground and the concept of JT in China.

In recent years, China aimed to create a more socially balanced and environment-friendly growth model, which is a pivotal component of the country's modernization strategy (Hansen et al., 2018; Zhou, 2021). The implementation of transition projects is not about creating green industries and technologies, but about a system-level change that shapes Chinese society. This involves the process of social learning among various actors, encouraging the wider social acceptance of a new development model in the social-technical system. This envisioned model is centered on achieving concrete goals of development, which are supported by on-the-ground policy actions (Huang et al., 2021). In this sense, JT in China may differ significantly from Western interpretations. Therefore, several questions remain unclear: How do China's transition practices align with JT in theory? How do concrete transition initiatives on the ground generate JT, and JT of what kind, for what, and for whom? What does JT look like in China from a spatial perspective?

This article thus investigates who learns and accepts JT, how, and for what, focusing on concrete transition initiatives in China. To bridge JT theory with transition practices we zoom in on Chun'an, a designated ecological county with a troubled economy and also a peripheral region of Hangzhou municipality, Zhejiang. Through an examination of green transitions and the perceptions of local stakeholders and residents, we uncover JT's true meanings on the ground. Our case investigates how the transition that has been practiced in Chun'an generates divergent scales of (in)justice. It highlights the multi-level governance dynamics that contribute to justice, and we explore the tensions between exclusivity and inclusivity from a multi-scalar perspective.

The article is structured as follows: Section 2 establishes our conceptual framework connecting China's transition strategies and JT. Section 3 outlines our research region, methodology, and data. Section 4 presents the transition story in Chun'an and shows the tensions between justice and transition. The final section concludes and places our findings in the broader context of understanding JT in China.

## 2. Putting the Concept of JT Into the Chinese Context

### *2.1. Understanding the Concept of JT*

The concept of JT holds a prominent place in Western scholarly discussions. Its formal introduction was facilitated by the International Labor Organization and the United Nations Framework Convention on Climate Change. In its original concept, JT aims to prevent negative consequences for workers and communities during the transition to a low-carbon economy. It emphasizes protecting labor rights, job security, and skill development in certain industries (e.g., mining) affected by environmental policies to achieve a transition with social justice (Sweeney, 2019). In other words, transitions require a balanced approach that can manage to align environmental goals with socio-economic inclusiveness (Agyeman & Evans, 2003; Burke & Stephens, 2017). In essence, JT is about striking a balance between economic stability, labor rights, and social and environmental justice as societies embrace the structural shift toward more sustainable practices.

Recently, the notion of JT has quickly gained attention from an array of global policy stakeholders. Particularly in Europe, it has captured policy design, cutting across different sectors and encompassing a wide spectrum of principles, aims, and visions. Despite increasingly becoming a "policy buzzword," JT has received insufficient scrutiny in terms of its core meaning, involving "just," "transition," or "just transition" itself (Snell, 2018). Present policy interpretations primarily revolve around labor rights and community assistance during transitions, potentially trivializing the concept or, conversely, elevating it to a utopian ideal (Evans & Phelan, 2016).

Addressing the challenges of JT also involves making it relevant in non-western contexts. JT assumes Western notions of justice, whose core narratives and meaning may not be applicable to countries with varying resources, development stages, cultures, and socio-political structures. Normative and politically standard "justice" ideas are certainly insufficient to address concrete (in)justice issues that are often deeply embedded in specific contexts on the ground (Jamal & Hales, 2016). It is particularly the case when mainstream global climate politics with the idea of JT travel to developing countries. JT projects, likely, fail to unfold on the ground or overlook localized rights and unfairness for the sake of global interests in sustainability.

In this regard, JT raises a persistent question: What does "just transition" practically mean, so that its realization on a global scale in various locations is feasible? This requires a departure from adopting a normative definition of JT and then applying it to specific instances. Such an approach runs counter to the challenges associated with JT, including its unsettled nature, diverse components, contextual variations, and the need for a concrete, rather than abstract, approach (Huang & Liu, 2021). Instead, the true meaning(s) of JT should be based on empirical analysis of specific examples, made from the collective insights drawn from these cases on the ground (Wang & Lo, 2021).

Moreover, questions of "just transition for whom" and "for where" remain understudied (Cha, 2020). On the one hand, the politically right answer to "JT for whom" is that it should be "JT for all" (Stevis & Felli, 2020). Existing research often focuses on who is involved in and who benefits or disadvantages from transition projects in certain places. However, less attention has been paid to long-term structural injustice from a multi-actor and multi-scalar perspective (Avelino & Wittmayer, 2016; Luke, 2023). Transitions often involve a spatial and socio-economic restructuring at the systemic level. Vulnerable skills, knowledge, and workers are interconnected within broader supply chains spanning various geographical spaces (Garvey et al., 2022; While & Eadson, 2022).

The spatial dimension is critical for rethinking JT. It is, however, unclear how decisions at one scale affect others, creating trade-offs, compromises, and conflicts among stakeholders at different scales. The multi-scalar approach acknowledges that JT involves complicated and interconnected causes, perceptions, and governance across various geographical contexts (Gürtler et al., 2021; Raven et al., 2012; Wang & Lo, 2022). Regardless of a transition's origin, mechanism, and pathway, it's essential to consider "just transition for whom" and "for where" to understand and reflect on the multi-dimensional, relational nature of JT. The concept of space in JT has received attention in the literature (Malakar et al., 2019). However, research on spatial aspects and its constellation of JT ideas in non-Western contexts is lacking. JT deals with a social balance among heterogeneous groups of interests whose socio-economic concerns are at and involve multiple geographical scales, but question about "JT for where" and its theoretical implications remain unclear.

All in all, considerations of scalarity offer insights into justice during transitions as contextually responsive and conceptually adaptable. The meaning of justice in transition is dynamic and rooted in real-life situations. This implies that by prioritizing the real narratives and interpretations of various stakeholders within their specific spatial settings, the conceptualizations of JT can be enhanced in practice.

### *2.2. The Interpretations of JT With Chinese Characteristics*

China is now harnessing ecological civilization and dual carbon strategies to address the Chinese-specific pattern of socio-economic transformation, differing from Western capitalist models. These strategies are being implemented across the country by a series of top-down well-designated transition policies, regulations, and investments. In line with these national strategies, stakeholders are allowed to address localized needs and practice grounded transition projects accordingly. These transition practices aim at achieving economic and political tasks while simultaneously addressing environmental and resource challenges with social justice (Huang et al., 2021). In other words, sub-national regions and cities are the key players in China's JT practice and experimentation (Wang & Lo, 2023).

China's concept of JT not only implies a commitment to global climate justice, but it also demonstrates a solution-based and action-led interpretation of Chinese-style modernization, or indeed, of a new and distinct development model that China can show to the world. Its JT embodies two pivotal facets: Firstly, JT does not go against or exclude socio-economic development. In this sense, justice is read as a dynamic and relative definition that can change with the context, while transition should maintain or empower the right of development. This is different from Western JT ideas on de-growth and anti-development. Secondly, JT emphasizes a "transition" that fosters continuous development while upholding environmental justice (Sovacool et al., 2020). Unlike the Western focus on "just" elements, China values more what JT actually delivers by striking a dynamic balance between environmental sustainability and socio-economic development. To sum up, the term "just transition" is formed and interpreted by doing transitions in actual contexts, which is neither a policy terminology nor a jointly accepted concept itself. It is regarded as, probably, a never-ending process toward a new development path.

China's JT discourse and ongoing practices differ from what the Western concepts explain. China's "transition" leans towards a decentralized governance system, in reality, a technologically advanced approach, and the realization of both national strategies and local needs. It seems to be both strategic and pragmatic but also contextual, whose actual implementations are diverse in processes, pathways, and consequences. Such JT is not comparable to the deliberative, democratic process and procedural/absolute justice with which Western JT is usually associated (Lo, 2015). This Chinese view of JT-as-process and JT-as-context may align with the demands of governments and citizens in the Global South. That is, JT shall generate actual changes in promoting the model of techno-economic development.

Yet significant questions remain. The geographically diverse, institutionally fragmented, and economically decentralized nature of the country raises the question of how JT is being realized through transition practices. While the central state's stance on socio-technical transition is becoming clearer, much remains to be explored about its actual impact on the ground. The contextualized cases of transition practices are expected to reshape and guide the future discourse of JT in China and beyond.

To sum up, China's low-carbon transition provides an ideal arena to explore JT on the ground for two reasons. First, despite China's experiencing a recentralization of power with top-down interventions on environmental governance and economic transition, its governance system is still a combination of economically fragmented (and decentralized) administration and political adaptability (and accountability; see Xu, 2011). This unique political landscape empowers various geographical scales and contexts, making the role of spatial interface and governance highly relevant to the understanding of JT (Coenen et al., 2012; Miörner & Binz, 2021). Second, although there is a lack of public participation in Chinese society, this does not mean there is no critical voice and perceptions regarding transition practices. Transitions not only affect stakeholders but also impact everyday life for ordinary people. A JT perspective in China raises crucial questions about justice in dimensions that may not naturally align, such as outcomes, procedures, recognition, and capacity.

## 3. Research Area, Methodology, and Data

### *3.1. Regional Background*

Chun'an is a peripheral county under Hangzhou's jurisdiction. It is Zhejiang province's largest county by size, covering 4,427 km$^2$. Notably, Chun'an houses Qiandao Lake, spanning 573 km$^2$, formed as an artificial reservoir after the completion of China's first indigenously designed hydroelectric station—Xin'an River Station—in 1959. Qiandao Lake became a tourism destination during the 1980s. In the 1990s, Chun'an embarked on a path of industrialization, capitalizing on its water resources to attract manufacturing industries like steel, chemicals, coking, and papermaking. This endeavor, however, contaminated Qiandao Lake and Qiantang River, which also traverses Hangzhou (Figure 1). Consequently, since the 2010s, Hangzhou has urged Chun'an to enhance environmental protection by carrying out the enforcement of an act of de-industrialization. This enforcement has pushed nearly all contaminative sectors and factories out of Chun'an (Chun'an County Government, 2022).


**Figure 1.** The locations of Chun'an county and Hangzhou in Zhejiang Province, China.

Chun'an's development trajectory shifted after 2003. Zhejiang's then CCP Chief Secretary Xi Jinping introduced a development strategy for Zhejiang known as the Double Eight Strategy (Hu et al., 2021). This strategy particularly designated Chun'an, a periphery, as a demonstration region for fostering green transition. Moreover, Xi Jinping visited Chun'an on many occasions, underlining the importance of safeguarding Qiandao Lake as a prerequisite for the envisioned transition. Empowered by this impetus, Chun'an established an explicit environmentalism regime, focusing on maintaining Qiandao Lake's water quality.

However, overemphasizing environmental protection hindered Chun'an's economic growth. From 2011 to 2020, its GDP grew modestly, from 2.2 to 3.78 billion US dollars. This placed Chun'an among Zhejiang's economically weaker regions. In response, Chun'an shifted focus to tourism and real estate sectors.

However, in 2018, nationwide environmental regulations forced the closure of lakeside establishments like hotels, golf courses, restaurants, small farms, and factories. These regulations prompted provincial government action. In 2019, Chun'an was designated by the Zhejiang government as a "special ecological functional area." Stricter environmental actions were introduced. Recognizing Chun'an's economic decline, the Zhejiang government also designated it as a pilot area for ecological and low-carbon development, offering more administrative flexibility for transition strategies. By 2021, Chun'an's economy rebounded to its 2017 level (Chun'an County Government, 2022).

The transition story of Chun'an serves as an Illustrative case to examine the concept of JT in China due to four key factors. First, Chun'an's transition towards sustainability is both influenced by local dynamics and motives and guided and mediated by local, municipal, provincial, and central government interventions. Second, the environmentalist-led practices in Chun'an have raised questions about the implications for local economic development, emphasizing key considerations of transition within the JT concept, such as who/where the transition is being targeted at and who/where it impacts. Third, the county balances the need to protect a critical national water source through environmental actions to improve economic prospects and livelihoods for residents, aligning with the fundamental principle of JT in China: promoting socialism and fairness among people. Finally, Chun'an's transition projects involve multiple levels of governance, leading to complex interplays and potential conflicts among stakeholders with varying interests at multiple geographical scales. This complexity highlights the scalarity of the JT concept. It showcases the complex trade-off between environmental preservation and economic development and is behind JT nuances of grounded transition practices in a non-Western context.

### *3.2. Methodology and Data*

We collected both first-hand and second-hand data for our case study. First, we conducted a desk analysis of secondary materials, including (a) statistical data and government reports released by public agencies, (b) digital materials in media agencies, such as historical documentaries, website articles, and newspaper reports, and (c) published academic papers.

We conducted a two-week on-site fieldwork in Chun'an, including semi-structured interviews and informal conversations with stakeholders. The fieldwork, carried out by our research team between 17 and 28 January 2022, involved 12 formal interviews with 20 key informants from government authorities (three of which were from Hangzhou), enterprises, and a CCP academy. We also had informal discussions with 19 residents in Chun'an. Each interview or conversation lasted from 10 minutes to one hour, covering three main areas of inquiry: (a) stakeholders, key tasks, purposes, and their narratives related to transition practices/projects; (b) the actors and their motives for transition practices, including those who facilitate or hinder transitions for different parties; and (c) the impacts, outcomes, and perceptions of transitions about (in)justice. To ensure the reliability of our findings, we cross-referenced all primary data with secondary sources. Moreover, all interviews were conducted with the consent of the interviewees and were treated anonymously. We only refer to the identities and positions of the interviewed stakeholders generally to avoid potential ethical concerns.

## 4. Practicing Green Transitions in Chun'an: Local Loss Yet Regional Gain

### *4.1. The Perceptions of Transitions on the Ground*

Transitions in Chun'an are rooted in two narratives that reflect the county's unique context and needs: environmental protection and economic development. While green development is emphasized as a crucial path for transition, the reality leans toward prioritizing environmental protection. Residents hold varying and often ambiguous perceptions of this transition. They generally agree that the concept of transition is closely linked to "environmental protection" and "development." Most interviewees possess a logical and rational understanding of transition, perceiving it as synonymous with "green development." As illustrated by a key official from Chun'an's Development and Reform Commission:

> In Chun'an, even though our primary focus is on environmental protection and eco-construction, we also require economic development. In my view, transition involves creating a development pattern that brings both ecological and economic benefits.

Besides, several interviewees provided similar explanations from a historical development perspective, arguing that transition is practically not new to Chun'an. One faculty from Chun'an CCP academy offered a critical point of view:

> Even though the concept of transition is gaining attention due to climate change today, Chun'an has been implementing it since the early 1990s. In our efforts to protect Qiandao Lake, we started de-industrialization much earlier than other regions in Zhejiang. We have had a strong focus on green economic development due to various environmental policies and regulations. So, for Chun'an, transition means promoting green development.

More specifically, a government official working in the Ecological Monitor Department of Chun'an defined the transition of Chun'an as "development with a precondition of environment protection of Qiandao Lake." He added:

> Thirty years ago, both the Zhejiang and Hangzhou governments considered Qiandao Lake as a crucial water source for Zhejiang. This decision shaped Chun'an's entire development direction, emphasizing the importance of going green. It means that we must prioritize environmental protection as a prerequisite for development.

However, other interviewees, including government and firm institutions, hold contrasting views that differ from the "transition as green development" cognition. They suggest that development, even a green one, is not the core of Chun'an's transitions. Instead, they propose the idea of "environment protection as transition." Some interviewees view environmental protection and development as a zero-sum game, highlighting the difficulties and even impossibilities of balancing them. As described by a senior official from the Chun'an Government Office:

> Here, transitions primarily focus on environmental protection. We have not received significant support for boosting our economy, neither from Hangzhou nor Zhejiang province. That is the reality. Transitions

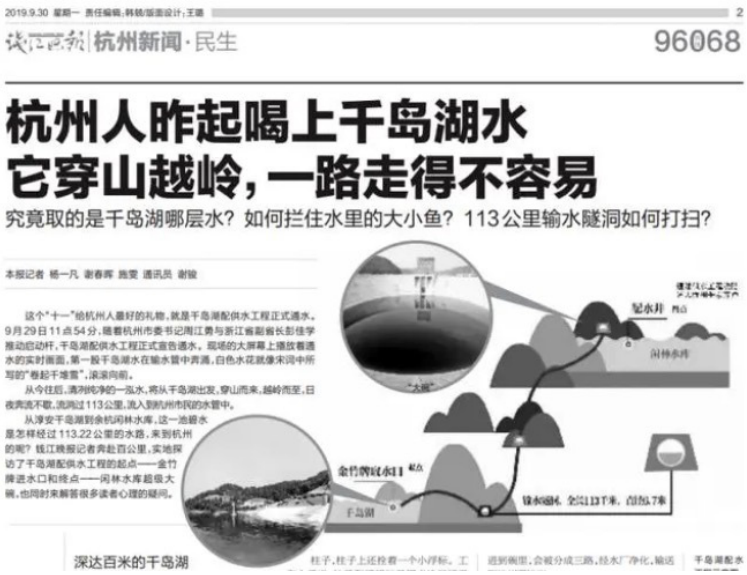
> do emphasize economic development, but the prerequisite of economic development is the protection of the environment. Overall, I believe transitions mean shifting towards eco-friendly, low-carbon, and sustainable development. But as a national-key drinking water place, taking care of the environment is the primary goal. That is to say, ensuring the preservation of Qiandao Lake's eco-system is the most important and biggest transition for Chun'an….This is a must-do obligation given by the state.

These interviews show that transition narratives and interpretations are intimately embedded in the unique context of Chun'an, addressing place-specific practical challenges and needs relating pragmatically to the development issue. In Chun'an, it is clear that the idea of JT delves deeper than merely industry decarbonization and responding to global climate change. It reflects a nuanced approach to the local development trajectory and history, where a strong focus on environmental preservation takes precedence. Although the current transition projects are designated by national strategies and the tightening of environmental regulations, local stakeholders treat the idea of "transition as green development" with equanimity mainly due to the long history of Qiandao Lake protection. By bridging the concept of JT, even though views on transitions may differ, a holistic view reveals a congruence between the pursuit of development and environment preservation, embodying the essence of JT's vision with strong Chinese characteristics for a sustainable future.

### *4.2. The Losses and Sacrifices of Chun'an's Transition: A Local Perspective*

Chun'an, designated as a special ecological functional area by the Zhejiang government in 2020, places the topmost priority on environmental protection in its nearly everyday governance. The Qiandao Lake Great Protection Initiative, as a central aspect of Chun'an's green transitions, revolves around environmental conservation and the nurturing of the Qiandao Lake ecosystem. This initiative is recognized as a crucial political undertaking at various governmental levels, including the county government of Chun'an, the city government of Hangzhou, and the provincial government of Zhejiang. Indeed, it is closely tied to a significant project known as the Qiandao Lake Water Diversion Project, which was planned in 2011 and completed its construction in 2019 (Figure 2). This project aimed at diverting natural water directly as drinking water from Qiandao Lake to downtown Hangzhou. This required the establishment of higher-level environmental protection standards in Chun'an. For instance, the closure, in 2014, of 220 farms and the relocation of 918 farmers for fish farming highlights the rigorous measures that were undertaken, according to an official from the Chun'an government. Besides, in 2020, the Zhejiang Development and Reform Commission introduced stringent regulations on industry entry, prohibiting 101 types of manufacturing industries from establishing operations in Chun'an. These measures, however, have had adverse effects on potential economic development, as explained by a senior official from the Chun'an Government Office:

> When Hangzhou chose to get its drinking water supply from Chun'an, it marked Chun'an as a critical water source area. This led to the implementation of new environmental protection regulations. It increases the compulsory financial costs associated with investment in ecological projects and deters new investments in manufacturing sectors.



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# 杭州人昨起喝上千岛湖水
# 它穿山越岭,一路走得不容易

究竟取的是千岛湖哪层水?如何拦住水里的大小鱼?113公里输水隧洞如何打扫?

本报记者 杨一凡 谢春晖 施雯 通讯员 谢骏

这个"十一"给杭州人最好的礼物,就是千岛湖配供水工程正式通水。9月29日11点54分,随着杭州市委书记周江勇与浙江省副省长彭佳学推动启动杆,千岛湖配供水工程正式宣告通水。现场的大屏幕上播放着通水的实时画面,第一股千岛湖水在输水管中奔涌,白色水花就像宋词中所写的"春起千堆雪",浪涛向前。

从今往后,清冽纯净的一泓水,将从千岛湖出发,穿山而来,越岭而至,日夜奔流不歇,流淌过113公里,流入到杭州市民的水管中。

从淳安千岛湖到余杭闲林水库,这一路碧水是怎样经过113.22公里的水路,来到杭州的呢?钱江晚报记者奔赴百公里,实地探访了千岛湖配供水工程的起点——金竹牌进水口和终点——闲林水库超级大碗,也同时来解答很多读者心理的疑问。



**Figure 2.** A Hangzhou-based newspaper article from 2019 celebrates that Hangzhou residents get access to drinking water from Qiandao Lake. © *Qianjiang Evening News*.

Despite the opportunities presented by Qiandao Lake for water-related industries, eco-tourism, and real estate, Chun'an's economy remains weak. It contributes only 1.5–2% to Hangzhou's GDP and has become a peripheral county for a decade. Chun'an grapples with limited economic prospects. This challenge is amplified by Chun'an's peripheral status and the absence of a robust industrial base. Yet the limited opportunities and scope of economic development encouraged Chun'an to embrace green transition. From a local perspective, the commitment to transition has required significant sacrifices and costs. As emphasized by a local official:

> We're stuck in a paradox: We have a strong will to develop, but our options and opportunities are restricted. The long-term lack of competitive industries, coupled with the difficulties of attracting inward investment due to increasingly added environmental costs, has left local people feeling disheartened. From 2010 to 2020, our population decreased from 450,000 to 320,000 due to economic instability under increased environmental regulatory pressures from upper governments. The substantial financial burden of ecological protection has led to a prolonged economic slowdown. To me, this transition feels like a loss and pain.

Since 2018, the Chun'an government has allocated around 10 billion RMB to compensate lakeside businesses that were severely affected by strict environmental regulations. Despite receiving an annual transfer payment of two billion RMB from the provincial government, the spending on transition practices significantly surpasses these funds. Besides, several government officials expressed their dissatisfaction with the lack of ecological compensation from the Hangzhou municipal government. As one of them criticized:

> Hangzhou's municipal government did not care about our difficulties in development. Instead, Hangzhou allocated specific funds to Chun'an Water Resources Bureau only for the management of the Water Diversion Project. The funds involve a one-off payment of 250 million yuan to ensure people's livelihoods. An additional annual fund of 250 million yuan is divided into pollution control

> initiatives and incentives for the environment-related government departments of Chun'an. That means there is no money really oriented to industry development projects.

It is evident that there's a lack of a people-centric ecological compensation system related to the water diversion project. Financial transfers from higher levels of government primarily focus on environmental protection and management, with limited allocation for economic development. While there's acknowledgment of ecological compensation for Chun'an from various government bodies, there's no well-defined policy framework, and the sustainability and sources of these funds remain uncertain.

More interviews with residents further demonstrate a strong sense of sacrifice and compromise on green transition. Some express grievances against giving up economic development opportunities for the sake of maintaining/enhancing higher-level environmental preservation. Others, while acknowledging the value and need to improve ecological conditions, believe that the emphasis on transition practices has overshadowed the improvement of people's livelihood standards, including job opportunities and income. One elderly resident expressed concerns:

> Chun'an's history, dating back to the 1950s, is marked by sacrifice. Approximately 300,000 residents were compelled to leave their homes during the construction of the Xin'an River hydropower station. Today, Chun'an carries the responsibility of environmental conservation, which has deprived us of development rights.

Several interviewed residents echoed this sentiment, expressing significant concerns regarding the justice of the water diversion project for Chun'an. They believe that making Chun'an environmentally friendly is not worth the sacrifice of economic development and income growth for ordinary people. Their typical reasoning includes:

> The water diversion project hasn't directly compensated Chun'an's residents. It appears that our environmental efforts primarily benefit the people in urban Hangzhou by providing clean drinking water. In other words, we sacrifice our economy for their [Hangzhou residents'] social and economic benefit.

Despite the prevalent critiques, approximately 70% of the residents we interviewed possess a broader vision, comprehending the prevailing "sacrifice only us, benefit more others" (舍小家, 为大家 in Chinese) paradigm. This very Chinese-specific view certainly captures the core meaning of China's socialist ideology and particularly of the long transition of social/cultural norms—namely, the spirit of "collectivism" or the "minority yielding to the majority" perspective. This, in turn, reflects how Chun'an's transition is regarded as a process toward a wider scale of social justice, though the local economy is likely in trouble. One resident articulated a forward-looking stance:

> Considering Chun'an's future dependence on the lake and its ecological significance, our sacrifices in the economy, though substantial, contribute to a greater purpose. Since Qiandao Lake not only belongs to us but also to Hangzhou, Zhejiang, and even China. Our green transition generates greater benefits to the whole Xin'an river basin region, whose development and growth are more important than we are. I think our sacrifice is worthy and strategic for the greater good.

Moreover, two individuals highlighted the intrinsic relationship between development and environmental protection. One resident argued that it is not right to blame local sacrifice only for environmental protection. Transition practices are not merely for our "own development" but granted as a strategic mission or a contextually dependent obligation for the greater development and higher value-added creation of Hangzhou. As he put it:

> At present, Chun'an's strategic significance and historical value within Zhejiang is well clarified, with its pivotal role in demonstrating a sound transition model of cross-regional cooperation by delivering greater ecological and economic benefits to Zhejiang's capital city—Hangzhou.

Another respondent put a rationale note that Chun'an's sacrifice for JT is not solely due to recent strict environmental regulations themselves but also largely to the long-term lack of endogenous capacity to establish a developmental mechanism of green economy.

Despite the focus on green development and transition, residents haven't seen significant improvements in their incomes and living standards. Many believe there's a trade-off between economic growth and ecological well-being in the current situation. The question of whether these sacrifices are justified at multiple scales and who benefits from them remains a topic of ongoing discussion in the next section.

### *4.3. The Contribution and Gain of Chun'an's Transition: A Regional Perspective*

From a broader regional standpoint, Chun'an's transition practices have been continuously supported and jointly governed by multi-level governments, with a greater purpose beyond the local ones. Back in 2003, Xi Jinping visited Chun'an, which has since been marked a historically pivotal moment. There he outlined significant development pathways and laid the foundation for the core principles of today's transition in Chun'an. In particular, he stressed that the environmental protection of Qiandao Lake was central to Chun'an's tasks, as it not only matters for its future development but for the wider interests of Zhejiang as well. Since then, Chun'an has been entrusted with the solid responsibility of conserving Qiandao Lake, a duty directly given by Zhejiang province. In response, the Chun'an government proactively raised its environmental standards to surpass all other counties in Zhejiang. Furthermore, many extraordinary efforts were made to exceed the national first-class water quality standards for Qiandao Lake. These practices, in turn, resulted in explicit socio-economic benefits for downstream regions—namely, allowing them to significantly save environmental costs and to focus more on economic development. An official leader from Chun'an Ecological and Environment Protection Bureau noted:

> Qiandao Lake is the core of the whole ecological system of the Qiantang River basin. This means that its environmental condition or our performance of action on protecting the environment can directly impact Hangzhou's sub-ecosystem. What we do is worthwhile. Extending beyond our own interests, our efforts benefit the entire region.

Chun'an's investments in environmental protection for Qiandao Lake—as one of the key transition projects—have resulted in cost savings for Hangzhou in terms of environmental governance. An official from the Chun'an Government Office explained further:

> The more we invest in environmental protection on Qiandao Lake, the less Hangzhou pays for environmental governance. So, it is a win-win game: It saves money while benefitting broader regions.

Notably, Chun'an stood out by being chosen for Hangzhou's "Beautiful Hangzhou" Initiative in 2013 and Zhejiang's "Five Water Governance" in 2014. This made it a role model for environmental governance. In 2015, the central government granted Chun'an the status of a national key ecological functional area, with the mission of raising local environmental standards. Chun'an aimed to surpass Hangzhou and Zhejiang standards by developing its unique environmental governance. This was emphasized by a senior director from the Chun'an Government Office:

> Thanks to our ongoing efforts in ecological construction, our environmental metrics consistently surpass the benchmarks established by the Hangzhou and Zhejiang governments. We've also been shaping our own environmental standards and associated governance practices, setting an example for neighboring regions to follow.

The implementation of the Qiandao Lake water diversion project holds significant importance beyond Chun'an. This project has a substantial impact, transferring a substantial annual volume of freshwater—978 million cubic meters—from the lake to Hangzhou's urban area. This supply is crucial for meeting Hangzhou's water needs. It supports its urban expansion and enhances the quality of life for its residents. The project represents an innovative solution that transcends administrative boundaries, reflecting Chun'an's commitment to sustainable resource management. It effectively addresses a pressing environmental challenge not only for Hangzhou but also for the broader region, including Zhejiang province. One key official from the Chun'an Government Office emphasized:

> This initiative highlights the crucial role of environmental protection in Chun'an. It transformed Hangzhou's urban water supply, shifting from sole dependence on the Qiantang River to a secure, cost-effective, multi-source supply from Qiandao Lake. This change ensures high-quality drinking water for Hangzhou at a low purification cost.

In 2019, the Zhejiang government designated Chun'an as a special ecological functional area—the sole experimental area of its kind in China—further translating the principles of green transitions into practice. As previously mentioned, Chun'an was thrust to the forefront of a new environmental protection initiative by national authorities. The enduring practices of transition in Chun'an have not only been upheld but revitalized as well with potential wider political gains. With a profound, rational, and culturally reflective voice, if not common sense, what was repeatedly heard from various stakeholders and ordinary residents was that "we make our small sacrifice for the greater good." This, at least, demonstrate a broader, relative, spatially related idea of justice.

## 5. Discussion and Conclusion

In this article, we explore the grounded transition practices in China into the framework of JT, revealing a notable divergence in the understanding of justice between the multi-level Chinese government and its residents. Within China, there is a prevalent belief, if not a cultural norm, that large-scale social justice hinges on continued socio-economic transitions, despite the emergence of small-scale conflicts and injustice which

itself is a part of any form of transition. The practice of transition is seen as a means to deliver new dynamism for green development, as well as, as we have shown in our case, new value and positive elements for wider social justice in a broader scale. Our study also shows that while transition practices unfold and occur locally, they are legitimized and implemented by multi-scalar governance involving multiple authorities. Such governance is characterized by the trans-local strategic balance of both positive and negative factors of transitions at and across multiple geographical spaces.

The case of Chun'an serves as a clear illustration of this perspective. At a regional level, guided by state-led environmental governance, Chun'an shoulders significant ecological responsibilities, particularly in safeguarding freshwater resources, even at elevated costs. However, when viewed from a local standpoint as a left-behind peripheral county, Chun'an also faces the imperative of improving people's livelihoods and fostering economic growth. Despite the challenges, local endeavors are still concentrated on forging a green economy. We argue that Chun'an's transition practices are translated by various stakeholders as a process of multi-scalar governance for socio-economic development. The process is specifically designed and implemented to deliver much greater justice, in a broader scale, although small-scale sacrifices, injustices, and compromises in Chun'an still emerge. Moreover, the perceptions of most interviewees on JT are rooted in the Chinese-specific mindset associated with socialist thinking and collectivist cultural norms (Huang et al., 2021). They are also well contextualized to serve China's current national-level strategies such as "ecological civilization" and "regional integration development" for modernization. Moreover, such a mindset reflects an intriguing interpretation of JT with a spatial perspective, which differs from most Western JT conceptualizations (Jones et al., 2019). This perspective regards local initiatives as strategic instruments for social justice on a much broader scale, transcending local small-scale needs and injustices. The case of Chun'an certainly demonstrates a pragmatic process of transitions in which the delivery of justice is more important than keeping justice itself by its normative meaning.

We propose one key element in interpreting JT on the Chinese ground: scale. Scale in transition refers to the magnitude and geographical scope of the transition, as well as the interplay of governance processes and geographies. The significance of scale in JT is apparent due to the intricate nature of multi-level governance (Liu et al., 2022). The absence of a just ecological compensation mechanism for the water diversion project exemplifies the diverse and conflicting perceptions, interests, and actions of various stakeholders. Therefore, environmental protectionism in Chun'an is seen as a means to ensure sustainability transitions. It also serves as a green development pathway both at the local and regional scale, with social justice naturally generated and achieved in the broader sense. The spatial perspective of transition influences justice perceptions, leading to tensions and conflicts between developmentalism and environmentalism at the local level. While this can generate local injustices by sacrificing the economy, it has the potential significance to deliver wider well-being and greater social justice at a larger scale, namely so that the whole region and the majority of people could enjoy socio-economic gains and dynamics for a bigger green economy. To put it more explicitly, realizing transition is justice (as an effective way towards justice), justice is transition (Huang & Hu, 2023).

To sum up, the Chinese government takes a pragmatic yet visionary approach to transition, focusing on its implementation on the ground. Because transition inevitably incurs social injustices and creates winners and losers, the focus is placed upon the actual delivery of transition in a way as just as possible. However, as transition deepens, tensions between local development and top-down environmental conservation policies may intensify, giving rise to social justice issues. This dilemma is evident in the Chun'an case and is likely to

be present in other cases as well (Huang & Hu, 2023). Since 2020, a higher-level and nationally designated JT strategy, the Common Prosperity Strategy, has been implemented in Zhejiang to put more transition projects into practice (Dunford, 2022). Zhejiang is expected to act as a role model for China in terms of establishing a comprehensive JT mechanism. The provincial government is now building twinning partnerships between core and peripheral counties for economic cooperation, rural-urban integration, resource sharing, and JT (Hu et al., 2022). The key question is how can a healthy balance between transition and development for sustainable spatial and social justice be achieved (White, 2020). This is a question yet to be answered, and hopefully, China's transition experimentations with profound political accountability and flexible local innovations with dynamic leadership and contextual sensitivity may offer insights in the near future.

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## Conflict of Interests

The authors declare no conflict of interests.

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