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Research on Social Justice Issues and Governance Paths in Urban Climate Resilience Construction

Yinuo Cao

School of Project Management, The University of Sydney, Sydney, NSW 2006, Australia

Abstract: With a focus on the social equity issues in the construction of urban climate resilience, this paper employs the analytical system of environmental justice and climate equity, draws upon domestic and foreign experiences in urban climate adaptation, and identifies the main problems in social equity at the core of resilience construction. Research has found that the inequity is manifested in five ways: spatial clustering of vulnerable groups and a mismatch in resilience resources; concealment of fairness issues through technical governance paths; lack of voice for disadvantaged groups in community participation; deficit in fairness of adaptation fund allocation; and neglect of fairness dimensions in governance system design. The five types of problems are not independent; rather, they are linked together and work in concert to produce an institutional reproduction of vulnerability. Based on the above analysis, the following paths have been proposed: differentiation of resilience planning, participation-based governance mechanism, fairness-oriented fund allocation system, decision-making framework with fairness assessment, and multi-party collaborative governance network. Transferring the concept of social equity from a secondary consideration to an essential component of resilience-building is necessary to address the conflict between efficiency and fairness in urban climate governance.

Keywords: Urban Climate Resilience; Social Equity; Environmental Justice; Climate Adaptation Governance; Vulnerable Groups.

1. Introduction

Climate Change Altering Urban Operating Conditions. According to the IPCC report, urban areas are exposed to all kinds of climate hazards simultaneously and have prominent social vulnerabilities; low-income groups, ethnic minorities, children and older people are especially vulnerable. Socioeconomic inequality determines the distribution of climate risks, and poor areas, older urban regions and vulnerable groups are exposed to higher risks and have weaker adaptation capabilities.

China is one of the countries most harmed by climate change around the world. The national adaptation plan aims to reduce the impact of climate risks on vulnerable groups at the core level and covers children, pregnant women, people with chronic illnesses and older adults, etc. Shenzhen is one of the pilot cities for the national construction of climate-resilient cities. Building resilience is moving closer to the people. However, there are problems: Who benefits from resilience building? This investigation suggests that the value presupposition of resilience building has been identified and provides a starting point for analyzing current practices.

Based on previous studies, climate-resilient construction is no longer considered a value-neutral "technical process". Meerow et al. (2019) studied the Rockefeller Foundation's "100 Resilient Cities" program and found that the concepts of fairness in urban resilience planning were mainly limited to a distribution orientation, with recognition and procedural fairness largely absent [1]. If the construction of resilience fails to consider fairness, it may strengthen the local disaster-resilience capacity at the expense of resource-poor groups. Social equity problems include the unequal distribution of climate risks and response resources, the lack of participation by vulnerable groups in decision-making, and a failure of fairness by governance institutions.

The three-dimensional framework of distributional fairness, recognition fairness and procedural fairness presented in this paper offers a foundation for studying the fairness aspect of resilience-building [1]. Therefore, this paper operationalises distributional fairness as the allocation of planning and funds; procedural fairness as the decision-making authority for community participation; and recognition fairness as institutionalised evaluation and cooperation.

The following will analyze the spatial differences in vulnerable groups, the masking effect of technical governance, the structural deficiency of community participation, the fairness deficit in fund allocation, and the fairness blind spots in governance institutions in sequence.

2. Spatial Differentiation of Vulnerable Groups and Mismatch of Resilience Resources

The spatial distribution of urban climate risks is shaped by the social spatial structure; thus, certain groups are confined to high-risk areas through mechanisms such as the housing market, land zoning and environmental governance. Many studies have found that heat exposure, lack of green space, social and economic disadvantages, and low adaptability are often clustered in space. Klopfer and Pfeiffer (2023) found that in the Ruhr area of Germany, about 27 per cent of the population lived in areas with high surface temperatures, low vegetation cover and social vulnerability. The Proportion of non-German residents was relatively high. Research in Johannesburg has shown that poverty, a low normalised vegetation index, and heat exposure are closely linked in the marginalised parts of the city [2]. A study in Johannesburg found that poverty, a low normalised vegetation index, and heat exposure are all concentrated in the historically marginalised urban areas. The vulnerability index of Alexandra Township was 0.87, its surface temperature was 29.8°C, and its vegetation index was only 0.08. Limited

access to medical care and high-temperature exposure together increase the vulnerability of this area [3]. Empirical studies in Chinese cities have shown similar trends. Li and others (2025) investigated 43 first-tier cities and found that around 60.46% of the cities had concentrated cumulative heat exposure in low-income groups, and the Lorenz curves of all the cities were above the line of perfect equality [4]. A case study in Hangzhou was also published in *Environmental Research*, which found that residents of low- and middle-socioeconomic-status areas were more exposed to heat inequality [5].

The formation of these spatial differences is due to historical institutional arrangements. Structural inequality due to redlining in the United States continues to create an uneven distribution of heat risk today. Data from the New York City Health Department show that African Americans are twice as likely to die of heat-related illnesses as white people, and low-income communities and communities of colour are bearing a disproportionate burden of heat exposure. Urban villages and old urban areas in China are concentrated areas of climate risks such as heat and flooding due to poor ventilation and a high proportion of hard surfaces. A survey by The Nature Conservancy in Shiyan Street, Shenzhen, found that the indoor temperature of top-floor residents in the urban village was 2-3 degrees Celsius higher than that of the downstairs, and the proportion of older people, children and people working outdoors in the area was relatively high. The Demand for climate change adaptation and protection in this area is also growing. Therefore, the above results show that the most vulnerable areas in terms of climate change are precisely those with weak resilience-building capacities.

3. Concealment of Social Equity by Technological Governance Pathways

Construction of urban climate resilience is dominated by engineering-technical solutions, and sponge cities, green infrastructure and nature-based solutions are often included in the planning. However, when climate adaptation is reduced to a technical proposal, the underlying issue of social equity is ignored.

A typical case is the practice of the Sponge City in Ningbo. Based on the interview results, the sponge city has been presented by the local government as a "technical repair solution" for urban water management [6]. This technocratic framing has de-politicised the project, hidden social inequalities, and reduced the space for participation of marginalised groups in decision-making. The flow of project benefits was also uneven; green facilities were often located in more affluent neighbourhoods or development areas with commercial prospects, and vulnerable communities prone to flooding were neglected and, in some cases, had to be relocated due to speculative development.

The problems in China are not unique. Nature-based Solutions are expected to achieve an ecological and social balance, but according to overseas research, whether NbS can be genuinely equitable depends more on the design of the governance system than on the high-tech level of the technical solution. Communities in lower social and economic groups often lack awareness of NbS solutions due to unequal power distribution, and their voices are seldom heard in the decision-making process.

Side effects of urban greening interventions also need to be addressed. In the absence of a guarantee mechanism, green projects may be used as a pretext for community-upgrading gentrification. A study of the 221 cities in the 32 African countries and their 5,503 administrative units shows that blue-green adaptation projects have raised housing prices by about 13 per cent and the all-around gentrification index by roughly 41 per cent [7]. The increase in rent and living expenses has forced some low-income families to move out. Resilience is up, and Fairness is down.

The root cause is a value conflict with the goal of technical governance. Generally, the engineering indicators for climate resilience are measurable, such as the control rate of runoff volume, the proportion of green spaces, and standards for drainage networks; social equity is not explicitly listed among them. When the focus of assessment is on engineering indicators, the problem of fairness is often regarded as an "external effect" or "social harm" problem and is not included in the core concepts of resilience. Technology is not the origin of injustice; rather, if we do not consider social equity in the application of technology, new forms of vulnerability may also be created.

4. Structural Lack of Voice for Vulnerable Groups in Community Participation

Community participation is often considered a path to realising social equity in the construction of climate resilience. However, due to the asymmetry of power in actual operation, this mechanism has been largely ineffective. Lao and Istrate conducted a systematic review in 2026, finding that the most vulnerable groups in urban areas are those already disadvantaged, and their participation in decision-making remains very low. Only about one-third of the studies reached the level of "consultation" or "passive response" in practice [8]. Some people lead the determination of priorities in the adaptation governance system, and the dominant group makes the final decision. Vulnerable groups are unable to affect the planning agenda in practice. Many organisations have been brought in to act as intermediaries for the participation process. According to the research by the ASSAR project, NGOs and intermediary organisations do play a linking role between vulnerable groups, the government and the private sector; however, this also means that the affected groups find it difficult to voice their own concerns directly.

The situation in China is the same, but there are different circumstances. The operation in Shiyan Street, Shenzhen, offers a representative case for observation [9]. After the pilot started in May 2025, the project team conducted extensive research over several months, and not only did they carry out superficial visits, but also "knocked on the doors of residents' homes, felt the heat on the rooftop, entered shops and corridors, spoke with delivery riders, merchants, community grid workers", and recorded one by one those "spaces that can be passed through but not lingered in" and water accumulation points. The demands raised in the study were very specific: Rooftop residents said that due to the high temperature, the rent was lower than in the open market, but the monthly electricity bill was also very high; delivery riders were concerned about whether there would be a place to take shelter from the sun and rain during their delivery journey; and parents hoped that there would be a shade and shelter near the kindergarten entrance. These demands themselves point out the problem: only by getting down to the grassroots level can the problem be truly identified, and regular public

announcements and hearings are unable to reach the daily lives of vulnerable groups.

In light of the above participation problems, the following climate resilience community pilot project in Shenzhen proposed a "co-construction and sharing governance model" to encourage residents to participate in the formulation of adaptation plans and enhanced public awareness of climate adaptation through training and drills [10]. The direction is correct, but whether the participation mechanism can be institutionalised, whether vulnerable groups can achieve guaranteed representation, and what the actual effect of participation is on decision-making, these questions have not been clearly answered yet and still need to be continuously observed and tested in future practice.

5. Fairness Deficit in Climate Adaptation Funding Allocation

Financing provides the material support for constructing climate-resilient infrastructure. The allocation of funds will directly affect who is able to obtain guarantees for resilience construction. At the same time, the distribution of climate adaptation funds around the world is also unequal. According to the report published by Cities Alliance at COP29, out of the 33.4 billion US dollars in funds approved by global climate funds between 2003 and 2023, only 1.2 billion US dollars (about 3.5%) were directed towards projects for the urban poor [11]. Out of the 3,428 climate projects in the monitoring area, 74 combined cities and poverty; 225 focused solely on cities. The structure of this funding will not address the real-life climate risks faced by the urban poor.

Identifying the recipients and establishing fair goals in the special allocation of funds are the keys to fairness. The Environmental Bond Act of New York State provides a system of referable institutional arrangements. The act requires the climate justice working group to develop identification standards for "vulnerable communities" across the country and legally stipulates that at least 35%, with a goal of reaching 40%, of the bond act funds must benefit vulnerable communities. In the fiscal years 2024-2025, 41.5% of the funds from the executed contracts will directly benefit vulnerable communities and exceed the legal minimum requirement [12]. Harlem River East Greenway Project is a representative case. The rate of asthma emergency department visits in the area of the project is in the 99th percentile of the whole province. Particulate matter concentration, traffic volume and the proportion of diesel-truck traffic are all in the upper quartile. At the same time, there are also high risks of coastal flooding, storm surges and inland flooding. A total of 43 million US dollars will be allocated to the communities most affected by the combined risks of climate change and social vulnerability.

The degree of fairness in the orientation of climate adaptation funds for Chinese cities is not yet clear. Gao et al. (2025) selected Zhengzhou as the case study and found that vulnerable communities were more severely damaged by floods but received a relatively small amount of sponge city investment; thus, there was a clear spatial mismatch between the distribution of investment and community vulnerability [13]. Based on foreign studies, to address the deficit in funding fairness, one can incorporate the results of vulnerability assessment into the decision-making process for fund allocation, set measurable fairness goals, and monitor their attainment regularly. For China, this means that in the funding allocation stage of climate adaptation projects, such as the construction of sponge cities, a vulnerability identification mechanism at the community level should be established to ensure that the flow of funds is in line with the distribution of risks.

6. Blind Spots in Governance System Design and Path Reconstruction of Fairness

The reason for the five types of fairness problems in the governance system is that it has been neglected. The urban climate resilience governance system generally starts with risk management and engineering efficiency, and the concept of fairness value is added later rather than being designed in advance. Shangguan (2026) has studied urban climate adaptation in China and found that it is "individualised"; thus, the responsibility for adaptation has been transferred to individuals and families, and population mobility and social-political processes have been ignored [14]. Shangguan thus proposes that in order to promote the public nature and fairness of climate adaptation, we should go beyond the logic of spatial-technical governance and integrate population mobility and political factors into the main tasks of building resilience.

Blind Spots of Fairness manifest at all levels in the Design of a system. Climate risk zoning and community vulnerability assessment are conducted separately in the planning stage, and physical and social vulnerabilities are not integrated [15]. At present, the assessment of environmental impact and resilience performance has not yet introduced the concepts of distributive, procedural and recognition fairness. Departmentalisation in the organisational stage leads to fairness problems due to a lack of clear accountability and coordination mechanisms. In light of the above, the Sixth Assessment Report of the IPCC reports that adaptation planning is rarely in consultation with marginalised communities and seldom takes into account their concerns.

The five links of the fairness-oriented governance path are: First, develop differentiated resilience plans according to the climate vulnerability assessment of communities and allocate more resources to high-risk areas with weaker adaptation capabilities. Shiyan Subdistrict, Shenzhen used the resilience map to find that the areas along the Shiyan River are a concentration of high-temperature and flood risks and provided a reference method. Second, build a participatory governance mechanism to increase the participation of vulnerable groups from "being invited to attend" to "joint decision-making", and establish a regular climate adaptation deliberation platform in the community. Third, create a fair-oriented funding allocation mechanism based on the statutory proportion of New York State, ensure that disadvantaged communities receive their fair share of benefits, set reasonable goals, and monitor and evaluate the allocation of climate adaptation funds. Fourthly, add a fairness evaluation system to the decision-making process, incorporate distributional and procedural fairness indicators in the pre-project assessment, and track and monitor the benefits for disadvantaged groups in the post-project evaluation to prevent green gentrification from causing spatial exclusion of low-income residents. Fifth, build a multi-party collaborative governance network, use the role of social organisations to connect marginalised communities with the decision-making system, be wary of intermediate organisations replacing the

voices of marginalised communities, and ensure direct representation by affected groups.

7. Conclusion

Based on the above analysis, the social fairness problems in urban climate resilience construction are not technical defects but rather systemic issues that span spatial resource allocation, technology selection, participation mechanisms, funding distribution and institutional design, and are mutually reinforcing to form a "reproduction of vulnerability" cycle. Low-income communities face higher climate risks due to spatial isolation, and resilience resources tend to flow to areas with higher expected returns; vulnerable groups lack substantive voice in participation, their needs are not included in the decision-making agenda, the fairness goals for funding allocation are vague, and the most disadvantaged groups are marginalised; the absence of the fairness dimension in governance systems leads to the repeated replication of problems.

Thus, the idea of social equity should be changed from an external attitude to an inner motivation. Resilience should be understood as the ability to recover from risks, and it should also include preventing the worsening of existing social disparities or the emergence of new ones in the recovery process. The final goal of urban climate resilience construction is not to build a more robust drainage system or increase the density of green spaces; rather, it is to enable all residents to face climate risks with dignity.

This analysis is also imperfect. Most of the discussion on the five dimensions is based on previous studies and public case studies; large-scale empirical data verification has not been carried out, and the causal mechanism of each dimension also needs to be explored quantitatively. In the future, an urban-scale fair evaluation index system can be established to monitor the distribution effects of resilience construction and compare the achievements of fairness under different governance models. Systematically incorporating the concept of fairness into all links of the risk assessment and project implementation, building institutional and organisational mechanisms to guarantee the actual participation of disadvantaged groups, and developing operating fair evaluation tools are necessary steps to make urban climate resilience construction an opportunity for promoting social fairness rather than a cause of widening inequality.

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