

Coastal resilience, (mal)adaptation, and justice in Chennai

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Abstract: India's central and state governments have proposed large-scale projects to promote coastal resilience. The ongoing efforts to adapt to frequent episodes of urban flooding in Chennai, the capital of the state of Tamil Nadu in southern India, have led to thousands of people being displaced from urban centres to peri-urban areas. This "relocation" of population with the ostensible goal of climate adaptation has led to adverse impacts on coastal ecology and local livelihoods. It has significantly undermined the goals of improving coastal resilience and climate justice, and constitutes a process of maladaptation. What are the root causes of the apparent contradiction between climate adaptation and climate resilience interventions promoted by national and subnational governments? Drawing on field research involving key-informant interviews and analysis of ongoing policy developments, we show that maladaptation results from a lack of democratic decision-making and a failure of accountability. We conclude that policy responses for climate resilience and adaptation are mediated by the socioeconomic and political context. Under a policy context that excludes most of the city's residents from participating actively in the policy process, decision-makers do not pay heed to the interests and perspectives of low-income residents. Skewed policy responses are not only unjust; they are also ineffective. The "resettlement" of residents from the city's slums into the ecologically sensitive zones in the surrounding areas, and a failure to prevent the siting of infrastructure in ecologically sensitive areas of peri-urban Chennai, have led to continued degradation of the city's ecology. Future research must consider proposals for introducing mechanisms of accountability in climate resilience and adaptation.

Keywords:

1. Climate justice
2. Maladaptation
3. Coastal resilience
4. Accountability
5. Informal settlements

2025 Journal ASAP

DOI: [10.5281/zenodo.18047145](https://doi.org/10.5281/zenodo.18047145)

Special Issue on:

Indian Perspectives
on Environmental Justice

Received 4 July 2025

Revised 24 November 2025

Accepted 20 December 2025

Available online 27 December 2025

1. Introduction

Climate adaptation and climate resilience are usually seen as complementary goals, which reduce vulnerability and ensure that communities can recover quickly from the impact of climate change. Arguments about such synergistic relationships have been popularized by multilateral institutions and coalitions, such as the United Nations Foundation and the Organization for Economic Co-operation and Development (OECD), which suggests that national policy measures that prioritize adaptation are crucial for building countries' resilience to climate impacts.^{1,2} However, the relationship between adaptation and resilience is not that simple.

Ambiguities in the operationalization and use of the concepts and paradigms creates potential for confusion and contradictions (Meerow & Newell 2016, pp 309, 312-13; Zanotti *et al.* 2020). The involvement of a diverse group of stakeholders, including policymakers from different sectors working at different scales, further exacerbates the potential for such confusion. It poses additional challenges to the field of climate adaptation and resilience, resulting in a tendency to prioritize building new physical infrastructure to counter climate impacts. Yet, climate resilience depends as much, if not more, on ecological infrastructure – natural vegetation, mangroves, wetlands, and waterways that are crucial for responding to landscape level stocks and flows of flood waters and to urban heat effects. If not planned carefully, construction of new physical landscape or other types of urban planning interventions can adversely affect vital ecological infrastructure.

Social scientists have developed the concept of maladaptation to describe such cases in which adaptation planning and implementation produce adverse socioeconomic outcomes, especially for marginalized groups. Maladaptation could also undermine ecological functions that are crucial for building long-term climate resilience. In this article, we analyse the relationship between climate (mal)adaptation and resilience in the Indian city of Chennai, the capital of the state of Tamil Nadu in southern India, which suffered large-scale urban floods in 2015 that caused massive damage to city infrastructure and cost more than 200 human lives. We investigate the interactions between climate impacts and socioeconomic factors that influence policy and programs to address climate change and climate resilience. Our analysis shows that policies related to climate adaptation and resilience benefit affluent groups and disadvantage poorer populations. Yet, these policies are often justified—incorrectly—by citing the need to prevent environmental harm.

Climate change impacts are experienced differentially, and responses to climate change are mediated by social, political, and economic inequalities in society. This is also true of urban climate policy responses, which are often driven by a top-down approach by national and provincial governments, working with market actors and local governments (Chu and Michael, 2022). These climate resilience and adaptation responses are nested within broader contestations over urban development in which popular politics, elite aesthetics, middle-class environmentalism, and real-estate interests jostle for influence. As a result, strategies required for climate change adaptation can worsen the climate resilience of the already marginalized. This article presents a critical examination of the climate adaption and resilience building efforts on Tamil Nadu's coast.

¹ Organisation for Economic Co-operation and Development (OECD) (n.d.). Climate adaptation and resilience. <https://www.oecd.org/en/topics/policy-issues/climate-adaptation-and-resilience.html> (last accessed 4 July 2025).

² Toth, E., & Del Rio, C.R. (2023, June 2). Climate adaptation is key to a climate resilient future. But what does it mean? *United Nations Foundation*. <https://unfoundation.org/blog/post/climate-adaptation-is-key-to-a-climate-resilient-future-but-what-does-it-mean/> (last accessed 4 July 2025).

2. Theory and Methods: Unpacking the Links between Climate Adaptation and Resilience

The Intergovernmental Panel on Climate Change (IPCC) defines climate adaptation as an “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC, 2007, p. 6). The success of climate adaptation depends on how individuals, specific social groups, and society at large, “manage risk and moderate harm from perceived or projected change,” sometimes referred to as “adaptive capacities” (Nelson, 2011, p. 114). Yet, as Jesse Ribot (2009) has argued, damages from climate change-related disasters are distributed unevenly among local populations. This is so because, apart from geographical factors, socioeconomic structures – gendered social inequalities, intergenerational differences, and inequalities along social identities, political ideologies, and economic classes – mediate the distribution of local impacts of climate change. The ability to manage risks and adapt to climate change is conditional on “place-based social and political-economic circumstances” (Ribot 2009, p. 49).

The diversity of actors, interests, and institutions involved in adaptive processes creates possibilities of unintended and undesirable consequences of some efforts toward climate adaptation. Frequent reporting of such adverse effects prompted social scientists to develop the concept of maladaptation, which refers to adaptation strategies or interventions that may lead to “increased risk of adverse climate-related outcomes, including via increased greenhouse gas emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future” (IPCC, 2022a, p. 7, footnote 15). Maladaptation can result in infrastructure or institutional lock-in, that is, costly investments that are difficult or costly to reverse. Such lock-ins can increase vulnerability, exposure, and risks, and further exacerbate existing inequalities. For example, researchers have argued that the Mumbai Coastal Road (MCR) project that is intended to reduce flood risk and protect against sea level rise could cause damage to intertidal fauna and flora and livelihoods of fishing communities. (IPCC, 2022b, p. 1504). The concept of maladaptation is quite helpful in comprehending the full scope of links between climate adaptation and resilience.

Resilience is defined as “the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity of self-organization, and the capacity to adapt to stress and change” (Tyler and Moench, 2012, p. 312 citing IPCC, 2007). Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks, and taking steps to better cope with climate-related risks and shocks. Urban resilience can be defined as sustaining key functions within a city in the face of climate impacts, such as urban flooding and heat island effects. Following an extensive review of scholarly literature that identified contradictory definitions and conceptual tensions, scholars defined urban resilience as “...the ability of an urban system-and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales-to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity” (Meerow *et al.* 2016, p. 39). Urban actors’ understanding of “desired functions” vary significantly between urban residents and power holders with divergent interests, though these tensions are not always part of the analysis, especially by multilateral agencies and private sector actors keen on investing in urban resilience (Webber *et al.*, 2021).

These omissions are related to the origins of the concept of resilience in the field of ecological sciences, which meant that early scholarship on resilience focused heavily on the biophysical environment and infrastructure (flood-proofing; heat proofing etc.) without paying adequate attention to the social dimensions of resilience. The legacy of the natural sciences also

shaped early scholarship on socio-ecological systems, which often black-boxed social systems and neglected the agency of social actors. Resilience scholarship tended to focus narrowly on the goal of maintaining or reverting to a social and institutional status quo, which privileges social structures favourable to the beneficiaries of unequal power relations. Such an approach to resilience avoids questions of agency, power, and knowledge, which are crucial to address an important set of questions, as to “resilience for whom and at what cost to which others” (Cote & Nightingale, 2012, pp 484-5). These effects have been especially pronounced in the context of the dominance of market-based approaches, often referred to as neoliberal policymaking.

Powerful donor and multi-lateral institutions frame neoliberal policy and institutional interventions as technical solutions, though they are implemented centrally through top-down governance structures (Kashwan *et al.*, 2019, pp 9-11). Such top-down interventions driven by powerful actors in the state and markets can foreclose wider deliberations on the potential for progressive socioecological transformation (MacKinnon & Derickson, 2012, p. 254). In this sense, climate resilience has a justice blind spot. Recent scholarship has paid greater attention to questions of power, inequality, and justice within the context of climate change, adaptation, and resilience (Dewulf *et al.*, 2019; Garcia *et al.*, 2022; Kashwan, 2022). Yet, more research is needed, especially research that is grounded in specific ongoing interventions in large and diverse cities with high levels of vulnerability to impacts of climate crisis. We use this research to advance scientific understanding of the links between climate adaptation and resilience, especially in contexts rife with high levels of socioeconomic inequalities in cities located in ecologically sensitive regions in the global South.

Research Methods

This research draws on a toolbox of research methods. The first author conducted field research in Chennai, including 18 key-informant interviews with representatives from the state government, academics, NGOs, scientists, and environmental and social activists. In preparation for these interviews, we undertook an extensive analysis of past and ongoing policy developments drawing on the state and city-government policies on urban development, including slum redevelopment, resettlement and rehabilitation, climate action plan and resilience strategies for Chennai. We reviewed consultants’ reports on eco-restoration of rivers and on slum enumeration, and World Bank project documents on urban development and coastal resilience in Tamil Nadu. We also examined judicial documents and court judgements related to the cases of encroachment (i.e. squatting) on land classified formally as public land adjacent to waterways in Chennai. We drew extensively on media reports of the floods of 2015 and 2023, and on the links between Chennai’s urban planning, infrastructure development, and the city administration’s efforts to prevent floods in the city.

A second set of methodological choices ensure that our research is not biased by India’s age-old socioeconomic inequalities of caste, class, religion, and gender that greatly shape the workings of the Indian state and its institutions, including the judiciary (Kumar, 2014, pp 41-2). To this end, we also engaged with non-state perspectives from civil society groups, scholars, and environmental and social activists. We reviewed citizens’ reports on the impacts of the floods of 2015 and 2023, social scientists’ analyses of the impact of urban development on land use change and its environmental and social impacts, activist literature on neoliberal urban development policies and financialisation of urban land, NGO reports on eviction and resettlement, and reports by civil liberties and human rights groups on slum eviction and their assessments of the quality of life of resettled communities. This multi-methods approach allows us to capture a broad sweep of evidence and arguments relevant to the analysis of the links between climate adaptation and resilience in Chennai.

3. Background to Research Site: Chennai

The coastal city of Chennai, formerly Madras, is the fourth largest city of India and the capital city of the state of Tamil Nadu in southern India, and the state's main economic hub. The Chennai Metropolitan Area, covers an area of 1,189 sq. km which includes the city and its peri-urban areas, accounts for more than 16% of the state's income and contributes (as of 2021) an estimated US\$78.6 billion to India's GDP, which is expected to increase to US\$100 billion by 2025 (GoTN *et al.*, 2023, p. 45). It is home to a population of 8.5 million people (in 2021), which is projected to reach 10.677 million by 2030. With a decadal population growth rate of 32% between 2011 and 2021 and a population density of 26,553 people per sq. km., Chennai is the most densely populated city of Tamil Nadu (GoTN *et al.*, 2023, pp 38-9).

Chennai has the fourth-highest population of slum dwellers among major cities in India, with about 820,000 people (18.6 per cent) living in slum conditions (figures from 2016-17) and is sometimes referred to as "a city of slums" (GoTN *et al.*, 2023, p 49). It also has a large concentration of Dalit (lit. the oppressed; the so-called 'untouchables') settlements, known as *paracheris*, which housed the so-called "low-caste" migrants from the surrounding regions (Jain *et al.*, 2017, p. 11). Slums are the mainstay of housing for a significant proportion of the city's working population, employed in the informal sector, e.g., hawkers, family-based workers, and workers in low-paying sectors such as rickshaw pulling, repair of bicycles, and household services. The Tamil Nadu Urban Habitat Development Board (TNUHDB)³ estimates that approximately 108,000 families from economically weaker sections live in undeveloped slums, of which about 67 per cent live in "objectionable" slums, i.e. those alongside rivers and water bodies, and those on land required for public purposes (GoTN *et al.*, 2023, pp 49-50).

Chennai has an almost flat land surface, with contours ranging from 2–10 m (7–33 ft) above mean sea level, and a few isolated hillocks. Chennai is located at the tail-end of a catchment of four large natural drains, each with its own catchment, that open to the Bay of Bengal – the Kovalam backwaters and estuary in the south, with Pallikaranai marsh as an additional holding area, the Adyar and Cooum rivers that drain central Chennai; and the Kosasthalaiyar river and Ennore creek in the north. In the flat coastal plains surrounding Chennai, water tends to run-off slowly. Early settlements in the region designed *eris* (lakes), *thangals* (tanks), *kulams* (ponds) and *ooranis* (drinking water ponds) to harvest rainwater to irrigate fields and supply villages. The landscape of Chennai, Thiruvallur, Kanchipuram and Chengalpattu districts is a mosaic of such wetlands. The natural ecosystem of Chennai comprises three rivers, six forest areas, five major wetlands, and three major tanks that supply water to the city and drain their surplus water into the rivers. A colonial-era navigation channel, which links two of the rivers and runs parallel to the coast, and 31 minor canals play an important role in the city's drainage system (GoTN *et al.*, 2023, pp 54-7). These water bodies and wetlands mitigated floods by trapping and storing rainwater, and slowing run-off to the drainage network.

Chennai's tropical climate puts the annual maximum temperatures between 38°C and 42°C from April to June and an average annual rainfall of 1,300 mm (GoTN *et al.*, 2023, p. 28). The city has experienced heavier rainfall in shorter spells resulting in floods, as well as deficient monsoons leading to drought. One notable study did not find evidence to attribute the 2015 floods, which is the subject of this article, to anthropogenic climate change, most likely because of the concentration of aerosols from industrial emissions and urbanization counteracting the effects of global warming at the regional scale (van Oldenborgh *et al.* 2016). Yet, as climate change accelerates, Chennai will likely experience harsher events of flooding, heatwaves, and sea level rise that pose a risk to human health. These challenges are

³ Popularly known by its earlier name, the Tamil Nadu Slum Clearance Board (TNSCB).

likely to grow as the city's population and the economy grow. In the city's climate action plan, the adaptation strategy involves actions to make Chennai resilient against floods and droughts, with a focus on the impact on the vulnerable populations (GoTN *et al.*, 2023).

4. Evidence: Climate Adaptation and Resilience in the Wake of Chennai Floods

4.1. The Evolution of Policy Narratives Around Slums

Chennai's population and urban sprawl grew rapidly since the 1980s, leading to an urban sprawl on parts of hills, forests, agricultural land, and low-lying marshes and estuaries, ponds, and lakes. The World Bank financed housing projects on lakebeds in the 1970s and 1980s, including some housing development projects targeted at low-income residents and overseen by the TNUHDB (known then as the Tamil Nadu Slum Clearance Board). The Board interpreted "slum clearance" as *in situ* improvement of slums through tenement construction, which was the result of a negotiated accommodation between poor people's social movements and political parties, which sought to win and retain the support of low-income residents. Yet, these low-income neighbourhoods, many of which were located along waterways and water bodies, were threatened by the broader ecological changes from urban sprawl.

In the 1990s, the state government-led development of the IT Corridor ate into and fragmented the once-sprawling Pallikaranai wetland. The development of hazardous and polluting industries and thermal power plants undermined the ecological integrity of Ennore creek. Similarly, the expansion of private and public sector ports encroached upon beaches, salt pans and creeks, which along with the conversion of agricultural lands and flood plains into built areas compromised the landscape's flood mitigating mechanisms (GCC *et al.*, 2019, pp 22, 34-5).

On the other hand, the concept of "ecological value" began to figure in official planning documents in the 1990s. The state government's emerging attention to environmental issues could be attributed to three factors. One, under the Sustainable Cities Program of UN-HABITAT, the Government participated in the Sustainable Chennai Project to build capacities in urban environmental planning and management. Two, as protests by local environmental groups gained visibility among the public in India and beyond, policymakers could no longer ignore them. Three, the increased severity of droughts alternating with floods created unprecedented and contradictory crises of urban floods and scarcity of drinking water in the city. The emphasis on environmental planning and management led to greater attention to flood alleviation, water harvesting, and conservation of rainwater through water body reclamation and restoration. This was reflected in Chennai's Second Master Plan published in 2008 and in the planning documents of the Chennai Metropolitan Water Supply and Sewerage Board, each of which enjoyed widespread support in the state legislature (Coelho and Raman, 2013, pp 150-1).

The increasing concern about environmental issues in the 1990s converged with significant changes in the political settlement around the improvement and development of low-income neighbourhoods. The World Bank's funding of urban development programs, especially in the housing sector, steered the TNUHDB away from state support and political entanglements. State agencies and mainstream political parties began advocating slum resettlement as a way of mitigating risk from increased urban floods. The vision of a "slum-free Chennai," first articulated by middle-class environmental activists, started showing up in state government policy documents. In 2012, the state government issued the "Tamil Nadu Vision 2023," which included plans for the construction of 2.5 million affordable houses to create hut-free villages and

slum-free cities (ADB *et al.*, 2012, p. 15). The dominant form of intervention to render Chennai slum free was state-sponsored, large-scale construction of Economically Weaker Section tenement units in large resettlement colonies on the peripheries of the city (Coelho *et al.*, n.d., pp 20-30). These efforts were funded through various central government programs for 'slum-free cities.' The Tamil Nadu Urban Development Project funded by the World Bank, contributed to a shift from the earlier in-situ slum upgradation efforts to the sites-and-services schemes that offered serviced plots of land to low-income families on subsidised payment and thereafter to resettlement in peripheral areas of the city (Coelho *et al.*, 2022, pp 169-70). The TNUHDB developed large resettlement colonies on the urban peripheries, substantially funded by the central government's Flood Alleviation Programme, World Bank-sponsored post-tsunami projects, and the central government's Jawaharlal Nehru National Urban Renewal Mission (JNNURM). The central government also funded projects to restore lakes and tanks in the Chennai Metropolitan Area, including by removing squatter settlements (Coelho & Raman, 2013, p. 150).

In the 2000s, the narratives and reasoning for slum removal shifted from protecting low-income residents against urban floods to blaming them for the state of the rivers, with the implication that eco-restoration required their removal. Chennai's City Development Plan, written for the JNNURM in 2005, stated that approximately 35,000 households squatting in "objectionable locations" on the city's riverbanks would have to be removed as they were polluting the water with raw sewage.⁴ This claim contradicted all available evidence which showed that slum settlements were responsible only for a small proportion of the pollution (Coelho & Raman, 2010, note 6). Under the Adyar Poonga Trust formed by the state government in 2007, hundreds of families were displaced for creating an eco-park, ostensibly to restore the estuarine creek near the mouth of the Adyar river in an upmarket area within the city (Coelho & Raman, 2010, pp 158-62).

Chennai's Second Master Plan released in 2008 emphasized the need for protecting lakes and water bodies from squatting, removing existing squatter settlements to revert water bodies to their original state, and prohibiting or restricting development on the Pallikaranai Marsh and in the Red Hills catchment area, which is one of the main sources of the city's water supply. The masterplan also proposed developing a city-wide network of open spaces that could act as flood moderators and outlined regulatory approaches to safeguarding waterways and water bodies (Bremner, 2020, pp 747-9). In 2009, the state government project to revive the Cooum river was launched with the displacement of low-income residents ("slum eviction"). Trained social workers from the TNUHDB's Community Development Wing ran outreach campaigns to persuade community leaders and members to accept the proposals for relocation. These developments weakened the unity and resolve of low-income residents to oppose the campaigns for their relocation to peri-urban areas (Coelho & Raman, 2010, p 23; Diwakar, 2019, pp 1328, 1333-4).

The city leaders' attention was focused disproportionately on the low-income settlements, though the largest and most environmentally destructive forms of urban infrastructure development were related to commercial and industrial developments supported by the state. Between 1980 and 2012, the city's built-up area expanded from 47 km² to 402 km², while the area of wetlands declined from 186 km² to 71 km².⁵ Through the 1990s and the 2000s, a land baron who owned large areas of land in and around the Adyar estuary began to sell and build

⁴ Whitcomb, T. (2020, 29 July). *In India's Chennai, river restoration lands hardest on the poor*. Undark. <https://undark.org/2020/07/29/chennai-river-restoration-impacts-poor/> (last accessed 4 July 2025).

⁵ Jayaraman, N. (2017, 6 September). Viewpoint: Why poor planning leads to floods in Chennai and Houston. BBC. <https://www.bbc.com/news/world-asia-india-41144776> (last accessed 4 July 2025).

on tracts of land protected under the Coastal Regulation Zone rules. This building spree led to high-end residential complexes, five-star hotels, and commercial real estate targeted at IT companies on the fragile estuarine lands. A legal challenge against such construction in a fragile ecological zone failed, as the courts legitimized these constructions. Similarly, despite an earlier court ruling that the creek should be restored to its original condition, new construction came up in the neighborhood MRC Nagar near Adyar Creek (Coelho and Raman, 2013, pp 159-62).

In 2009, the state government began slum evictions as the first step to reviving the Cooum river. At the same time, the state government announced a project of the National Highways Authority of India for the construction of a 19-km elevated expressway for the movement of container trucks from the national highway at Maduravoyal, a neighborhood in western Chennai, to the Chennai Port. Hydrology experts and environmentalists pointed out that an expressway built into the riverbed would cause stagnation of sewage-laden river waters and inundation of adjoining areas during the monsoon. These concerns led to the government pausing the work on the highway in 2012, after pillars had already been sunk in the river (Coelho & Raman, 2010, pp 19-20). This history and the catastrophic 2015 floods notwithstanding, the central government revived the project in 2022.⁶

Following the destructive floods of 2015, activists highlighted instances of past elite encroachments: IT industry complexes built on waterways, the Phoenix Mall located in the Velachery watershed and high-end educational institutions along Thiruvallur, Kancheepuram and Chennai districts in the Chennai Metropolitan Area that occupied catchment areas,⁷ and automobile factories of Renault Nissan, Daimler Benz, and Ford on lands that were once water bodies, paddy lands, and forests in Oragadam, south-west of Chennai.⁸

4.2. Government Agencies and the Judiciary Respond to the 2015 Floods

The November–December 2015 floods in Chennai, Kancheepuram and Tiruvallur districts, a major part of which fall under the Chennai Metropolitan Area today, claimed 289 lives and inundated 2.32 million houses (GoTN, 2017). German multinational insurance and reinsurance company Munich Re estimated the losses in and around Chennai to be on the order of USD 3.5 billion.⁹ Some of the most severe flooding resulted from the secondary effects of surplus water released from nearby reservoirs, which flooded the Adyar, Cooum, and Kosasthalaiyar rivers, and Buckingham Canal beyond capacity, leading to widespread inundation. The city's low-income residents, including those who had been “rehabilitated” out of inner-city areas and into flood-prone outskirts, were worst affected and received the least amount of support during and following the disaster.¹⁰ Yet, state institutions continued to direct their ire against the people living in informal settlements on riverbanks and around

⁶ Perinchery, A., (2022, May 28). *PM Modi unveils infra projects of Rs 31,000 crore for TN. What will it cost the environment?* The Wire. <https://thewire.in/environment/pm-modi-unveils-infra-projects-of-rs-31000-crore-for-tn-what-will-it-cost-the-environment> (last accessed 4 July 2025).

⁷ The New Indian Express (2016, January 28). Experts redefine ‘encroachments’. <https://www.newindianexpress.com/cities/chennai/2016/Jan/28/experts-redefine-encroachments-874258.html> (last accessed 4 July 2025).

⁸ Jayaraman, N. (2015, 6 December). *Making of a disaster: Satellite images show how Chennai's new urban jungles caused flooding*. The News Minute,; <https://www.thenewsminute.com/tamil-nadu/making-disaster-satellite-images-show-how-chennais-new-urban-jungles-caused-flooding-36595> (last accessed 4 July 2025).

⁹ Vencatesan, A. (2021). From rains to floods: A case of Chennai in 2015. *Environment & Society Portal*, Arcadia (Summer 2021), no. 23. Rachel Carson Center for Environment and Society. [doi:10.5282/rcc/9323](https://doi.org/10.5282/rcc/9323) (last accessed 4 July 2025).

¹⁰ Coelho, K. (2016, January 4). Placing the poor in the flood path: Post-disaster slum resettlement in Chennai. *Caravan*. <https://caravanmagazine.in/vantage/placing-the-poor-in-the-flood-pathpost-disaster-slum-resettlement-in-chennai> (last accessed 4 July, 2025).

waterways. In the midst of the Chennai floods, during November 2015, the judges in an ongoing lawsuit conjectured that “the entire loss due to the flood was due to maladministration” as the authorities failed to stop “encroachment” of water bodies and water courses, leading to a “reduction in their flood storing and carrying capacity..” and the denudation of “residential areas causing devastating effects.”¹¹ Noticeably, despite references to maladministration, the judges focused specifically on “encroachments,” which is a reference to the low-income settlements, even though constructions in violation of zoning laws and other regulations are not limited to those communities. In the enforcement of court orders, there is a perceived bias against low-income neighbourhoods, whereas upper class residential and commercial complexes receive sympathetic consideration.

On 7 December 2015, the Chief Minister of Tamil Nadu directed state agencies to relocate about 50,000 families living on the banks of the Adyar river, Buckingham Canal, and the Cooum river (IRCDUC & HLRN, 2017, p. 3). The Chief Minister justified these orders, in part, “to ensure better outflow of rainwater in the city” (ibid., p. 2). Over the next year, state government agencies formalized this proposal by enlisting “objectionable settlements” located near water bodies, which were home to 50,096 low-income families.

Table 1. Details of “Objectionable Settlements” in Chennai

Name of the River/Canal	Number of Households
Cooum River within city limits	13,500
South Buckingham Canal	12,000
Adyar River	9,539
North Buckingham Canal	9,000
Central Buckingham Canal	5,300
Cooum River outside city limits	757
Total	50,096

Source: IRCDUC & HLRN, 2017, p. 6

Post-disaster, the narratives that conjoined environmental arguments with the fate of low-income residents grew louder. A 2015 executive order of the state government stated that “removal of encroachments is a critical activity” without which the authorities cannot undertake the cleaning, creation of walkways, cycle tracks, and parks (Diwakar, 2019, p. 1328).

Despite the objections from social movements advocating for the rights of low-income residents, government agencies and courts doubled down on aggressive measures. Though the past judicial decisions mandated “reasonable opportunities” and due process like legally mandated periods of notice prior to forcible removals, government agencies often violated these norms. Ironically, some of the Court orders themselves advocated the use of force, disconnection of electricity and water supply, and withdrawal of ration cards that entitled the families to government subsidized food grains. In one case, a judge ordered that encroachers should not be provided with alternative accommodation (IRCDUC and HLRN, 2019, p. 28). In another instance, a judge of the Madras High Court instructed officials to disconnect electricity and seek “appropriate assistance...from the military forces” to forcibly remove families.¹² Perhaps the most remarkable instructions came from a High Court order which forbade the

¹¹ From: Judgement in Writ Petition No. 1295 of 2009, delivered on 27.11.2015; <https://indiankanoon.org/doc/63753725/>

¹² Judgement in W.P.13648 of 2016, delivered on 29.04.2019.

affected families from seeking legal remedies in lower courts, thereby abrogating their right to appeal.¹³

The judicial pronouncements seemed to have encouraged government officials to launch aggressive relocation measures. Justifying a November 2017 drive to displace over 600 families living in Thideer Nagar slum on Greams Road, a police inspector argued that “we are evicting these slum dwellers since these dwellings are encroachments on the Cooum riverbed that makes them prone to flooding during heavy rains”. A social worker also defended this action by referring to a 1971 act, which identified and provided legal status to some slums recognized by the TNSCB. Since no new slums had been formally recognized since 1985, the social worker argued that the slums along Adyar or Cooum river ought to be cleared.¹⁴ Yet, the displacement of hundreds of families, often at a few days’ notice, violated the legal requirement of a 30-day notice period before the squatters are forcibly removed. In one instance, over 340 families were moved in the middle of a school year.

Government officials justified these actions in the name of averting yet another disaster: “If we don’t remove them now, when monsoon arrives and flood water gushes through the Cooum, we will not be in a position to evacuate the families immediately. At no cost will we allow a repeat of 2015.”¹⁵ In a little over 5% of these cases, government agencies commissioned a Social Impact Assessment required under the law (IRCDUC, 2025, p. 13). Between 2015 and 2020, more than 18,700 families comprising nearly 75,000 individuals from 69 settlements were evicted, with promises of “resettlement” in the sites of Perumbakkam, Ezhil Nagar/Kannagi Nagar, Navalur, Gudapakkam, AIR Site, and Athipattu. An estimated 96% of these evictions were justified by the goals of revival of water bodies (IRCDUC, 2022, p. 7).

In the next section, we provide evidence-backed analysis of the implications of these actions, often justified as a form of adaptation against urban floods, for social or ecological resilience in Chennai.

5. “Slum-Free” Chennai: Implications for Social and Ecological Resilience

The broader social and institutional effects of large-scale displacement and “resettlement” plans are worth examining in the fuller context of the urban and peri-urban landscape (and waterscape, that is, floodplains, marshlands, and lake catchment areas) around the city of Chennai.

As the city of Chennai continues to grow, there is a perceptible decline in the housing opportunities accessible to low-income residents working in the city. The classification of a larger number of urban neighbourhoods as ‘objectionable,’ and the imposition of stricter norms for allowing slum improvements and housing rights for the poor within city limits, has led to ‘scarcity’ of affordable housing (Coelho *et al.*, 2016, p. 9). At the same time, the resettlement sites are characterized by poor quality of construction, a poorly developed and dysfunctional healthcare system, inadequate early child-care and educational facilities, lack of adequate water, sanitation, and waste management services, and grossly inadequate and poor quality of roads and public transport. All of this translated into lack of safety for the “resettled” families and inadequate mechanisms of holding the government agencies and officials accountable for any of these failures (IRCDUC, 2022, pp 11-26).

¹³ Judgement in W.P.No.1294 of 2009, delivered on 30.10.2015.

¹⁴ Kalyani, S. (2017, November 29). Hundreds stare at uncertain future as Thideer Nagar slum evicted. *Citizen Matters, Chennai*. <https://citizenmatters.in/thideer-nagar-slum-perumbakkam-cooum-restoration-tnsccb/> (last accessed 4 July 2025).

¹⁵ Times of India (Chennai edition) (13 September 2017). Greater Chennai Corporation to evict 46 more families from Cooum bank. <https://timesofindia.indiatimes.com/city/chennai/corporation-to-evict-46-more-families-from-cooum-bank/articleshow/60485130.cms> (last accessed 4 July 2025).

The TNUHDB takes a technical view of its mandate to manage the bare minimum procedures for physical eviction and relocation. Its approach to resettlement and rehabilitation of low-income urban residents outside the city is not anchored in a comprehensive framework for affordable housing and land use.¹⁶ It also neglects the social geography of lives and livelihoods of target communities. As opposed to the middle and upper-class professionals whose jobs are rarely bound to the social geography of their residential situation, low-income, migrant workers often rely on social networks and place-based arrangements to support their livelihoods. The relocated communities had, in their original places of residence in the city, built housing, often built up to two or more stories, and secured amenities such as water supply, roads, streetlights and household electrical connections, which the residents had obtained by negotiating with authorities (Coelho *et al.*, n.d., p. 16). Employment, education, and healthcare were close at hand, and because of longstanding social networks and market spaces, there was a path for upward economic mobility, all of which were set back by involuntary resettlement.¹⁷

Instead of protecting people against floods, such “rehabilitation” introduces new vulnerabilities for tens of thousands of residents moved out of the city at such short notice. A survey among 9055 families that were relocated to Perumbakkam between 2017 and 2020 under the Integrated Cooum River Eco-Restoration Plan showed that 48 percent of the sampled relocated respondents experienced a significant loss of livelihoods and employment. There are no markets in the relocation sites or no designated spaces for small vendors. These effects were especially pronounced among women fish vendors (65 percent of whom lost livelihood opportunities) and women domestic workers (60 percent of whom experienced such losses) (IRCDUC and HLRN, 2021, pp 14, 16-17). Women’s mobility has been restricted because of the remoteness of, and lack of safety in, the new settlements.¹⁸ The social resilience of communities, i.e. their ability to cope with external stresses and disturbances because of environmental change, has diminished after their involuntary eviction and resettlement. Ironically, government agencies and officials justified these displacements in the name of protecting poor people against flooding along waterways in the city. In practice, as others have shown, the disaster event actually allowed these agencies and officials to justify “the anti-poor policy of slum relocation...as pro-poor by framing slums as not just risky, but also at risk” (Diwakar, 2019, p. 1314). These narratives of the at-risk poor combined with the generalized discourse of bolstering city resilience following the floods of 2015. As discussed above, the question of social resilience cannot be separated from ecological resilience.

Ecological resilience within the city of Chennai is intricately tied to waterways and waterbodies inside the city and the larger catchment outside the city perimeter, which are crucial for regulating flooding. Modelling of flooding in the city found that the loss of existing tanks upstream of the city would increase the flood damage by 44% (as compared to the already high baseline of the extreme 2015 flooding), increasing the population at risk of flooding by 40.5% (Nithila Devi *et al.* 2025, p. 12). This is a remarkable insight for linking the extent of flooding within the city to the flood plains and waterbodies outside the city. This is why it is crucial to analyse the ways in which the city’s efforts to pursue a “slum-free Chennai” affects the city’s peripheral waterscapes. The state government has targeted the ecologically sensitive waterscapes for building new housing for tens of thousands of people displaced from the city.

The extent of devastation caused by the 2015 floods should have alerted the government agencies and local government officials responsible for regulating urban land use and enforcing

¹⁶ Coelho, K. (2021, November 19). Missing an inclusionary vision for the urban poor. *The Hindu*. <https://www.mids.ac.in/assets/archives/urban%20poor.pdf> (last accessed 4 July 2025).

¹⁷ Personal communication, Sriram and Zakir Husain, Socialist Workers’ Centre, April 11, 2023.

¹⁸ Personal communication, Vanessa Peter, IRCDUC, April 12, 2023.

zoning laws. Yet, state government agencies and institutions continued infrastructure development in places and areas that were unsuitable for such development. As discussed above, this trend accelerated since the early 2000s, as TNUHDB built thousands of resettlement tenements in peri-urban Chennai. These settlements are built on the Pallikaranai marsh and in Perumbakkam, in or close to ecologically sensitive flood plains and waterways, as shown in table 2 below. Perumbakkam flooded frequently in the past – in 2015, 2018, 2019 and 2020.¹⁹ Yet, in 2021, the state government constructed over 1100 new units in six-storey buildings at the Perumbakkam rehabilitation site under the central government’s Light House Project²⁰ (IRCDUC, 2023, p. 8). It was flooded again in 2021 and 2023, which means that the Light House Project did little to protect the residents displaced from the city against flooding.

Similarly, Kannagi Nagar is located next to the Okkium Maduvu, which formed the primary channel for the critical interchange of freshwater and saline water needed to sustain Pallikaranai’s marsh ecology. To compensate, the Public Works Department built a canal to directly channel waters from the Maduvu channel to the nearby Buckingham Canal. However, this constructed canal does not fulfil the absorptive and flood-mitigative functions of the Maduvu channel (Coelho and Raman, 2013, p. 154). Like Kannagi Nagar, Ezhil Nagar was developed on a large tract of marshland that is part of historically established flood pathways and served as a buffer for floodwaters. During heavy rainfall episodes they fill up and breach their banks (IRCDUC, 2023, p. 2).

Table 2. Location of resettlement colonies in water bodies and flood-prone areas

Resettlement Site	Number of houses	Location	Affected Waterbody/Waterway
Kannagi Nagar/ Ezhil Nagar	23,704	Thoraipakkam, Chennai District	Okkiyam Maduvu (South); Buckingham canal (Eastern)
Perumbakkam/ Ezhil Nagar	21,528	Shollinganallur, Chengalpattu District	Marshland (Nookampalayam Canal)
Semmencherry	6,734	Shollinganallur, Chennai District	Marshland (Nookampalayam Canal)

Source: IRDCUC, 2023, p. 10

Despite the excessive focus on low-income households, they are not the only “encroachers” within the city or without. A citizens’ report in 2016 concluded that the “government institutions and middle to upper class private residential houses are the biggest encroachers of the waterbodies and waterways” (Arappor and Magasool, 2016, p. 39). In 2015, the Kamarajar Port owned by the Government of India was filled with earth dredged from the Ennore harbour to “reclaim” a section of water identified as salt pans and mud flats in official maps. Such developments interfere with flood regulation in the area, which includes the area where the

¹⁹ “In the 2015 flood, for 7 days, the flood water had risen to 3 to 4 feet because they had built houses in water bodies. In 10-storey buildings, there was no power, and elevators became non-functional. Toilets became unusable. For one bottle of water, people had to walk down 10 floors and climb back up. The elderly were not able to come down to collect the food supplied as relief.” (Personal communication, Sriram and Zakir Husain, Socialist Workers’ Centre, April 11, 2023.)

²⁰ The Light House Projects are model housing projects comprising nearly 1,000 houses at each location showcasing use of the best of new-age technologies, materials and processes in the construction sector, constructed by leading private agencies.

Kosasthalaiyar river flows into the Bay of Bengal.²¹ The proposed international airport in Parandur will be constructed atop agricultural wetlands, or water or land commons. Large-scale constructions and rapid increase in the built-up area in Parandur will greatly increase the risks of overwhelming the Adyar river with floodwaters, which contributed to the 2015 Chennai floods.²²

The Advisory Committee for Mitigation and Management of Flood Risk in the Chennai Metropolitan Area (CMA)²³ recommended protecting drainage pathways of floodwater and land that might serve as flood plain or flood cushion, and declaring them as "No Development Zones." It also recommended construction of new drainage canals and link canals in specific locations, automated pumping stations, completion of stormwater drains in the GCC area, and stoppage of sand mining in riverbeds that had damaged causeways.²⁴ This committee's final report is not in the public domain and no reasons have been cited for keeping it confidential.

Recent developments continue to undermine the ecology of the Pulicat lake and wetland complex north of Chennai, which act as a massive floodwater catchment site and climate buffer when cyclones hit the north Tamil Nadu coast. The Indian multinational Adani Group has proposed an expansion of the Kattupalli port south of the Pulicat lake, from the existing 300 acres to 6111 acres, which will bring the northern boundary within 2 km of the Pulicat Bird Sanctuary. The expanded area would be inside the Eco Sensitive Zone (ESZ), sited on a high coastal erosion zone, and encroach on large tracts of riverbed and wetlands, including the Kosasthalaiyar river, backwaters, salt marshes and creeks (Nagarajan *et al.*, 2021, p 14). In March 2024, the District Collector of Tiruvallur reportedly prepared for denotifying parts of the legally protected wetland-rich 10-kilometre Eco Sensitive Zone around the Pulicat Bird Sanctuary, which has been the target of the developers of industrial parks, factories, and other real estate projects.²⁵

The analysis of urban and peri-urban developments over time, including since the devastating Chennai floods of 2015, suggests that the root cause of maladaptation is related to skewed urban planning, which continues to enable high-end constructions in sensitive zones while displacing the urban poor to ecologically sensitive waterscapes around Chennai.

6. Conclusion: Lessons to Foster Climate Resilience

Discussions of climate adaptation and resilience often presume a positive symmetry, though interdisciplinary research on the topic cautions us against such assumptions. The debates following the Chennai floods of 2015 have drawn attention to the failure of state agencies and city administrations to pursue a model of urbanization that is respectful of its ecological context. For example, courts have chastised the administration for destroying "water bodies or water courses formed naturally for the benefit of mankind" and questioned the

²¹ Jayaraman, N. (2015, 25 December). *Shock, but no awe*. The Hindu; <https://www.thehindu.com/opinion/op-ed/Nityanand-Jayaraman-on-Chennai-floods-Shock-but-no-awe/article62116584.ece> (last accessed 4 July 2025).

²² Jayaraman, N. (2022, 20 May). Growing pains: Why Chennai's run-in with disasters will only worsen. Question of Cities. <https://questionofcities.org/growing-pains-why-chennais-run-in-with-disasters-will-only-worsen/> (last accessed 4 July 2025).

²³ Popularly known as the Thiruppugazh Committee, after its Chair, the retired administrator Dr. V. Thiruppugazh.

²⁴ Shivakumar, C. (2023, 8 December). Action on Thiruppugazh panel report would have saved Chennai? *The New Indian Express*. <https://www.newindianexpress.com/states/tamil-nadu/2023/Dec/08/action-on-thiruppugazh-panel-report-would-have-saved-chennai-2639537.html> (last accessed 4 July 2025).

²⁵ Srimathi, G. (2024, May 5). Pulicat in peril, again. *The Hindu*. <https://www.thehindu.com/sci-tech/energy-and-environment/pulicat-in-peril-again/article68140658.ece> (last accessed 4 July 2025).

authority of state agencies to “alienate or re-classify the water bodies for some other purposes.”²⁶ However, other court directives have also targeted low-income residents in a prejudiced manner, including by prohibiting judicial appeals.

The evidence presented above suggests that long-term changes in central government policies, multi-lateral agency programs, and state-level support for the urban poor have shaped Chennai’s responses to urban floods. In recent years, we have witnessed further consolidation of the tendencies to blame the low-income neighbourhoods (“slums”) located along water bodies and waterways for the city’s flooding. Over the years, those narratives have narrowed down to focus almost entirely on the city’s slums, which detracts from addressing the more systemic challenges of urban sprawl in an ecologically sensitive coastal zone. This adds to past research suggesting that policy responses to climate change, including climate resilience and adaptation are mediated by the socioeconomic and political context. Moreover, our research shows that the city’s flood disaster has been instrumentalized selectively to serve its middle-class residents and decision-makers. Under a policy context that excludes most city residents from participating actively in the policy process, decision-makers have few incentives to pay heed to the interests and perspective of the city’s low-income residents.

The analysis we presented above makes another important contribution to the scholarship on climate responses. We showed that skewed policy responses are not only unjust; they are also ineffective. Because the policy process lacks accountability and neglects the city’s socioecological context, the “resettlement” of residents from the city’s slums into the ecologically sensitive zones in the surrounding areas further disrupted the city’s waterscapes. As a result, despite relocating over 80,000 people out of the city and onto flood plains and marshlands on the city’s outskirts, the city continues to experience massive flooding, including in December 2023, when cyclone Michaung hit Chennai, and a large proportion of people from vulnerable groups like migrants, the elderly, people with disabilities, and marginalised communities living in low-lying areas and near drainage lines were evacuated and temporarily relocated (Sphere India, 2023, p. 43). Middle-class desires for a slum-free Chennai and a failure to prevent the siting of commercially and geo-strategically important infrastructure in ecologically sensitive areas of peri-urban Chennai have prevented meaningful responses to the city’s flooding woes. It has also led to continued degradation of the city’s ecology.

The failure to implement effective flood mitigation and climate resilience plans, nearly a decade after the 2015 Chennai floods, invites deeper investigations into the broader implications of socio-political and ecological contexts, beyond the all-important questions of social equity and justice. Future research would do well to consider proposals for introducing mechanisms of accountability in climate resilience and adaptation.

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²⁶ From: Judgement in Writ Petition No. 1295 of 2009, delivered on 27.11.2015; <https://indiankanon.org/doc/63753725/>

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