



## Article

# Message Sent, Now What? A Critical Analysis of the Heat Action Plan in Ahmedabad, India

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**Abstract:** To protect public health, heat-related policies are increasingly being adopted by city authorities to address the unequal impact of heatwaves. Ahmedabad's Heat Action Plan (HAP) is an acclaimed and successful policy response in India and beyond. While the pilot evaluation of the initiative suggests that almost a thousand deaths were avoided annually after its implementation, it is not yet clear whose lives were saved, and to what extent this statistic was due to the HAP, rather than other factors. By reviewing the published and grey literature centering on the HAP target groups, outreach strategies, and impacts on urban services, this paper points out major knowledge gaps concerning the potentials and impacts of the HAP, which may lead to the systematic exclusion of vulnerable and disadvantaged groups from the intended benefits. In this paper, it is argued that the effectiveness and inclusiveness of the HAP predominantly depend on its integration into urban development projects, which is a challenging task given the existing horizontal and vertical fragmentation in the planning of city projects. Moreover, urban plans and policies, including the HAP, are shown to be overly focused on technology, and as a consequence, they do not realize their limited scope in addressing the associated issues, which are fundamentally social, deep, and structural, such as spatial inequality in Indian cities.

**Keywords:** heatwaves; inequality; urban heat vulnerability; Heat Action Plan; urban policy; India

## 1. Introduction

Extreme heat accounts for more weather-related deaths per year than all other forms of extreme weather combined [1]. While the most severe effects are projected for urban areas, they are not evenly distributed [2]. For example, in Indian cities, which are faced with rising inequality and warmer summers (35 °C on average), the health risks are higher for more than one hundred million people living in the slums, as compared to the middle- and upper-class urban dwellers [3].

To protect public health, heat-related policies are increasingly being adopted around the world by city authorities to address the unequal impact of heatwaves. For example, more than thirty cities in India have adopted a Heat Action Plan (HAP), wherein particular attention has been paid to vulnerable and disadvantaged groups. The adaption strategies highlight the importance of defining temperature thresholds, which are based on a city's historical climate and geography data, and designing early warning systems and planning for emergency conditions, especially concerning vulnerable and disadvantaged groups [4–6]. Additionally, a city's HAP often includes cool roof initiatives and increasing vegetation cover within cities to mitigate heat effects in residential neighborhoods (ibid).

Despite the above endeavors, the data and analyses concerning the relevance and impacts of heat-related policies are significantly limited. Thus, this paper aims to contribute to a better understanding of the criteria on the basis of which policy initiatives are evaluated and to examine their actual impacts on the target groups. Furthermore, it aims to move beyond describing the limitations of



policy responses and provide a critical analysis of the drivers of urban heat vulnerability in order to outline pathways towards more inclusive and effective heat action plans.

To achieve these aims, the paper draws on the case of Ahmedabad's HAP, which represents a critical case, which has strategic importance regarding the general problem [7]. Ahmedabad's HAP is considered to be a critical case because of its increasing popularity among policy-makers, considered to be so effective that the governments of India and other South Asian countries have urged heatwave-prone cities to develop similar plans [8]. A pilot evaluation of Ahmedabad's HAP suggests that more than one thousand deaths were avoided annually after its implementation (*ibid*). However, the analysis did not indicate whose lives were saved (e.g., were they among the most vulnerable and disadvantaged groups?), nor to what extent this statistic is the result of the HAP, rather than other factors. Addressing these questions becomes crucial, because if the evaluation of the flagship of policy responses reveals that the most vulnerable and disadvantaged groups may not benefit from the HAP as intended, then other cities should adopt a more inclusive strategy to address the unequal impacts of heatwaves.

The remainder of the paper is structured as follows. Section 2 outlines different understandings of urban heat vulnerability and corresponding responses and provides a critical perspective on the driving forces that make some social groups more vulnerable than the others in times of heatwaves. Section 3 delineates the methodology and the systematic literature review conducted in the research in order to provide the context of the HAP and analyze its impacts. Correspondingly, Section 4 demonstrates how urban heat vulnerability and responses are demarcated in the HAP, and Section 5 identifies the knowledge gaps in the HAP evaluation regarding the target groups, outreach strategies, and impacts on urban services. Section 6 discusses some of the barriers to implementing an inclusive and effective HAP in connection to the root causes of urban heat vulnerability, as explained in Section 2. Finally, in Section 7, the paper provides some suggestions for future research and potential entry points to addressing urban heat vulnerability.

## 2. Urban Heat Vulnerability: Different Understandings and Responses

There is robust evidence that in the age of climate change, heatwaves will become more frequent, intense, and prolonged [9]. This not only increases the likelihood of heat-related illnesses, but also increases the stress on water resources, energy systems (e.g., electrical systems), animals, and plants [1,9]. While in this paper, the importance of analyzing the impacts of heatwaves on ecological and social systems, as well as their interlinkages, is recognized, it is beyond the scope of this short essay to discuss all of these factors. By focusing on the effects of heatwaves on human health, this section brings together different understandings of urban heat vulnerability, leading to different framings of vulnerable and disadvantaged groups and policy responses and strategies.

By mapping out the health risks in urban areas across different age groups and working conditions, several research studies have demonstrated that the vulnerability to extreme heat varies among different social groups in cities. For example, older age groups are more susceptible to heatwave effects because of their health conditions or because they live alone and are isolated [5,10]. Children, especially infants, pregnant women, and those with heart or chronic diseases are also more susceptible to the effects of extreme heat [2,11]. Outdoor workers, such as construction workers, street vendors, waste pickers, rickshaw drivers, and traffic police officers are other vulnerable groups in terms of excessive heat exposure [12–15]. Even indoor workers, who work in poorly ventilated buildings or are engaged in the manufacturing or sewing industries, are vulnerable for the same reasons: heat stress, occupational injuries, or decreased labor productivity, which results in economic loss (*ibid*).

Understanding heat vulnerability based on the above health risk assessments has led to a number of policy responses, often based on risk management approaches, wherein the importance of technical definitions of heatwaves (e.g., temperature thresholds), designing early warning systems, and planning for emergency conditions for vulnerable people are highlighted [16].



While health risk assessment and consequent policy recommendations are indeed crucial for protecting public health, there has been a growing body of literature drawing attention to the importance of socio-economic factors, leading to different degrees of heat vulnerability [17–19]. Drawing on the environmental justice literature, these analyses highlight how the spatial characteristics of marginalized communities and their limited adaptive capacity make them more prone to the effects of extreme heat (*ibid*). These characteristics include, for example, having fewer amenities (e.g., air conditioners or swimming pools) due to the age or price of the buildings [6,18], having fewer trees [20], and having a high percentage of impervious surfaces in the area [19]. These neighborhoods are often dominated by low-income households, and the residents are typically ethnic minorities. Additionally, language barriers [17], limited access to public cooling centers [21], and a lack of property insurance, essential to rebuilding infrastructure [4], are additional factors that lower marginalized communities' adaptive capacity in addressing the impacts of heatwaves. These research studies call for a better integration of quantitative and qualitative data on heat vulnerability to recognize the disadvantaged groups and to ensure that they are the primary beneficiaries of policy responses. In achieving this, both institutionalized and noninstitutionalized channels (e.g., local protests) of communication with policy makers have been advocated by environmental justice scholars and activists.

While the aforementioned understandings of urban heat vulnerability shed light on the correlations between vulnerable and disadvantaged groups and various health and socio-economic factors, they do not adequately explain why such factors persist [22]. To remedy this, scholars of critical urban theory argue that analyzing and addressing the unequal impacts of climate change, like different degrees of heat vulnerability, requires examining the rules of the game in the governance of cities [22–28]. This, in turn, calls for analyzing the influence of global economic systems on public policy in cities, as well as a transformation of urban governance and its implications in creating uneven socio-ecological conditions (*ibid*). This line of thinking also highlights the processes through which regulatory responsibilities are shifted from the government to local and international institutions, where market-based and voluntary solutions are promoted to address socio-ecological problems (*ibid*). From this perspective, it is unlikely that environmental justice activism and recognition strategies, in terms of citizen and community empowerment and policy reforms, will address the issue of vulnerability, because they are often too focused on the local issue and do not challenge the forces of the marketization and commodification of resources and services [22,24,26]. Constructing new forms of urban solidarism, between and within cities, under different mottos, e.g., “cities for people, not for profit” [27], is seen as a way of uniting different urban struggles in order to draft transnational pledges for just, democratic, and sustainable cities [22,27,28].

### 3. Methodology

As Flyvbjerg (2012) argues, in the case study research, the intent of a critical case is to obtain information that permits a logical deduction of the following type: “If this is not valid for this case, then it is not valid for any (or only few) cases” [7]. Following this logic, the case of the HAP was selected in Ahmedabad over other cities, because the city is pioneering in terms of implementing innovative policy responses to heat vulnerability. One could argue that if one wished to see a lot of disadvantaged and vulnerable groups that benefited from policy responses to extreme heat in the cities of India and South Asia, one should examine the case of Ahmedabad. If there is evidence that this might not be the case, then it is likely that other cities that are steadily following the same strategy will face similar challenges, if not worse. Thus, providing and analyzing the data on Ahmedabad's HAP and its acclaimed impacts, can allow us to draw preliminary conclusions regarding its potentials and challenges. Additionally, analyzing the root causes of these challenges can help us to better understand and address the barriers to effective and inclusive policy responses for vulnerable groups in cities where heatwaves are becoming more intense and inequality is widening. In a sense, this article follows a critical realist view in its case study methodology, according to which researchers look for the causes of known effects by examining the mechanisms and conditions leading to the identified



outcomes in the case study [29,30]. In accordance with this view, the concepts or causal patterns under investigation are “relevant for understanding phenomena elsewhere (including by way of contrast)” [29], p. 315 (for detailed description of the critical realist philosophy of science and its application to case studies See [29,30]).

In collecting and analyzing the data in a critical case study research, a common first step is to conduct a literature review to synthesize the current knowledge and provide insights for further investigation [7,31]. The first stage in this process is to refine the research questions [31], which are: (1) How is heat vulnerability understood in Ahmedabad’s HAP, and what strategies are adopted?; (2) What do we know about the HAP acclaimed outcomes, and what are the knowledge gaps?; and (3) What factors are linked with the success or failure of the HAP? The next stage in the process of the systematic literature review is to describe the inclusion criteria. As argued by Petticrew and Roberts [31], the choice of literature is not an inherent feature of the systematic review method, but rather a decision made by the researcher that is guided by the research questions and the theoretical stands [31]. Considering the research questions above, the article draws on insights from environmental justice and critical urban theory (see Section 2) to (1) provide the context of Ahmedabad’s HAP, (2) assess the acclaimed outcomes and ascertain the knowledge gaps, and (3) determine the underlying factors leading to the current outcomes in Ahmedabad, as explained below.

In providing the context of the HAP, the academic articles’ abstracts, titles, and keywords were searched using the algorithm of TITLE-ABS-KEY (Ahmedabad AND Heat) AND (Action OR Plan OR Policy) in the Scopus database. The initial search returned 29 sources. After reviewing the abstracts and browsing the articles manually, only 9 were found to be relevant to heat vulnerability and policy responses in Ahmedabad, having a direct and indirect reference to the HAP. By reviewing these articles, a series of policy responses to and reports on natural disasters in urban settings were identified. The key actor groups drafting these documents included the Ministry of Home Affairs, Ministry of Housing and Urban Affairs, National Disaster Management Authority, Ahmedabad Municipal Corporation, and Natural Resources Defense Council, a U.S.-based non-profit international environmental advocacy group, which has worked closely with the municipality in drafting the HAP.

In collecting data regarding the HAP impacts, all the articles and reports identified in the previous stage were thoroughly reviewed. Additionally, press releases and reports by governmental and non-governmental organizations, locally and internationally, were examined through a Google News search and by using the keywords “Ahmedabad” and “Heat Action Plan” in combination with the keyword “Vulnerable” OR “Vulnerability” between 2013 (when the HAP was initiated) and 2020. The initial result returned 51 sources. After reviewing these sources manually, it became evident that the articles by Hess et al. [8], Knowlton et al. [14], and Azhar et al. [32], with overlapping authorship, are the main data sources, based on which the appraisals of the HAP were made.

In analyzing the acclaimed impacts of the HAP on vulnerable groups, especially slum dwellers (as framed in the HAP), the paper sought to examine how these groups are identified and how their access to urban services, particularly to water and green spaces, has changed because of the HAP. These elements were selected for further investigation based on the environmental justice theoretical stands, wherein the notion of heat vulnerability is asserted to be linked with socio-economic factors, such as access to city amenities. Thus, in the first step, the data on the slum population from the Census of India were retrieved and compared to other data sources, including interviews with governmental officials stated in the local media, newspaper articles, and data collected by academics and local non-governmental organizations through fieldwork. In the next step, the data on access to water and green spaces were collected from the sources identified in the previous stages, and the search was extended by using new keywords concerning access to water and green spaces between 2013 and 2020. Following this, the algorithms of TITLE-ABS-KEY (“Ahmedabad” AND “Water”), ABS (“Management OR Plan OR Access” OR “Development”), TITLE-ABS-KEY (Green OR Tree), and TITLE-ABS-KEY (“Ahmedabad”) ABS (“Management OR Plan OR Access OR Development”) were used. The search results returned 38 and 25 sources for access to water and green spaces, respectively.



Sorted by relevance, the abstracts were reviewed, and the sample results were further limited to include the articles providing information on the infrastructure and quality of accessible water ( $n = 16$ ) and green spaces ( $n = 6$ ) in the city. By reviewing these articles and through a snowball sampling, new keywords were identified (e.g., “Municipal Corporation,” “Drinking Water,” “Green Cover,” and “Green Action Plan”) and searched in Google, in combination with “Heat Action Plan” and “Ahmedabad,” to identify additional sources.

The data collected through the above stages provided a foundation for ascertaining knowledge gaps in the HAP evaluation and acclaimed impacts, as presented in Section 5. These findings were analyzed using insights from critical urban theory, wherein the effects and implications of policy responses are examined and understood in broader contexts of urban governance and global economic systems, as explained in Section 6.

It is worth mentioning that the data collection and analysis offered here constitute the first steps in identifying knowledge gaps and raising a flag in promoting policy initiatives in other contexts, without critically reflecting on the outcomes and limitations. The next step, which is outside the scope of this article, would be to bridge the knowledge gap by conducting extensive fieldwork in disadvantaged neighborhoods, with a focus on access to urban services during heatwaves. By triangulating these data with the ones collected and analyzed in this study (extracted from academic journals, news articles, governmental and non-governmental reports, and other media outlets), we can gain a better understanding of how city development plans are interlinked with the HAP and how inclusive strategies for addressing heat vulnerability can best be practiced.

#### 4. Heat Vulnerability in the Heat Action Plan (HAP)

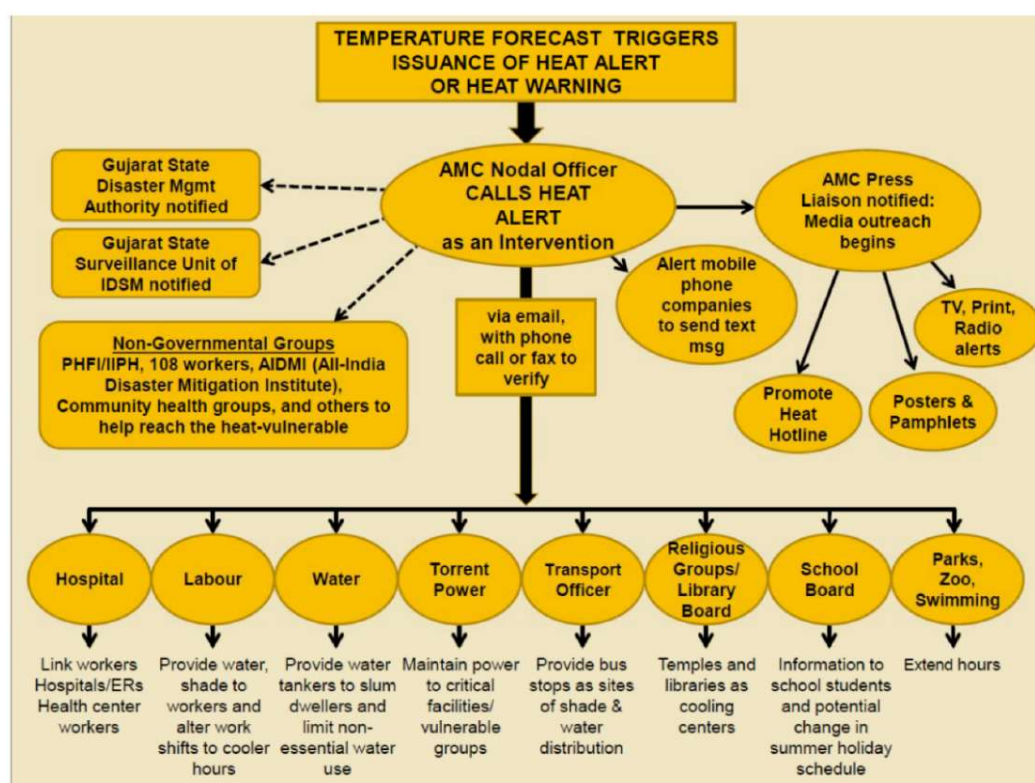
##### 4.1. Ahmedabad's HAP Strategies in Addressing Heat Vulnerability

Ahmedabad, with a population of about 6.3 million in the urban agglomeration area in 2011 [33], is known for its comprehensive urban development that focuses on smart planning, infrastructure, and resource utilization [34]. Since the city is prone to severe climatic conditions, such as heatwaves, flood, and droughts, preparing disaster management plans has been one of the top priorities of the local government (ibid). The Heat Action Plan (HAP) in Ahmedabad was initiated in 2013 and implemented by the Ahmedabad Municipal Corporation (AMC) and partners in response to the devastating May 2010 heatwave, which caused 1344 more deaths than the heatwaves of May 2009 and May 2011 combined [32].

In identifying the groups vulnerable to extreme heat, AMC and its partners conducted a cross-sectional randomized cluster sample survey in 2011 [35,36]. Vulnerability was analyzed in relation to age, work, and health conditions, access to water, sanitation, health care, information, and social connectedness, i.e., social connectivity and reliance on neighbors in times of need (ibid). The results indicated that children, the elderly, slum dwellers with a low income, limited access to resources, and thus a lower coping capacity, as well as outdoor workers are the most vulnerable to heat exposure [35,36].

The main strategy of the HAP is to alert the identified vulnerable groups prior to or during heatwave periods (i.e., a significant deviation ( $>5\text{ }^{\circ}\text{C}$ ) from the normal (or expected) hot weather, which varies by location and duration in India) so that they can take appropriate precautions [37]. In a sense, the HAP is based on early warning systems and community outreach to increase awareness of the risks of heatwaves and how they can be prevented (ibid). In doing so, as illustrated in Figure 1, AMC disseminates information through media outlets, e.g., by email, text messages, and WhatsApp messages, and by distributing pamphlets and advertisements in the city before a heatwave hits.





**Figure 1.** Ahmedabad Municipal Corporation (AMC)'s communication plan, incorporated in the Heat Action Plan (HAP), for issuing heat warnings. Source [37].

As shown in Figure 1, the HAP also initiates an early warning system to alert the relevant agencies to take precautionary measures in their sectors in order to protect public health in times of extreme urban heat. For example, during the hot seasons (i.e., March–July), AMC—along with other agencies—should increase efforts to distribute fresh drinking water and make cooling centers, such as temples, public buildings, and malls accessible to the public [37]. Additionally, they should ensure that night shelters stay open for the migratory population, outdoor workers, slum dwellers, and other vulnerable groups.

The HAP also aims to improve the capacity-building among healthcare professionals (e.g., through training workshops) and to promote adaptive measures to reduce ambient temperatures, focused on vulnerable communities, through cool roof strategies [14].

#### 4.2. Acclaimed Impacts

A pilot evaluation of the HAP conducted by Hess et al. [8] suggested that the HAP may be effective in addressing heat vulnerability in disadvantaged communities in crowded cities. Drawing on epidemiological evidence, their research evaluated the impacts of the HAP on all-cause mortality in 2014–2015, relative to a baseline from 2007–2010. The results indicated that more than one thousand deaths were avoided annually after the implementation of the HAP. The authors, however, acknowledged some unmeasured factors in their assessment of the HAP. For example, the role of air pollution and infectious disease outbreaks, as well as general public awareness of heatwave casualties in Europe and North America, were considered equally important factors associated with the mortality rate over the summer in Ahmedabad [8].

Apart from not determining which factors (e.g., the HAP, less air pollution, or access to other channels of information) led to the drop in the mortality rate, it is not clear whose lives were saved. Were those who survived the heatwaves among the most vulnerable and disadvantaged groups?



If the local government intends to devise effective and inclusive heat policies, these questions must be discussed and addressed.

The section presented below identifies the knowledge gaps in the evaluation of the HAP based on a review of the published literature (e.g., books and journal articles) and grey literature (e.g., news articles and reports by governments and NGOs). By identifying the knowledge gaps, this section provides guiding questions for collecting data that are essential for devising and evaluating an effective and inclusive policy response that can ensure that “no one will be left behind,” the core principle of the 2030 Agenda.

## 5. Knowledge Gaps in the Evaluation of the HAP

### 5.1. *Who Is Included in the Statistics, and Who Receives the Warning?*

Slum dwellers are among the identified vulnerable groups in the HAP. The data used for estimating the number of this target group were based on Ahmedabad’s Slum-Free City plan in 2014, wherein 691 notified slum settlements were listed with a population of 727,934 [37]. This figure constitutes approximately 12% of Ahmedabad’s population, which is a significant reduction compared to the figure in 2001 (25%), while the growth rate was reported to be 3.5% in 2011 and 3.2% in 2001 [38–40].

By providing a cautionary tale of progress in Ahmedabad, Bhatkal et al. [39] argued that the significant decline in the number of slums is largely due to a change in the criteria for identifying slums, and it may not necessarily represent major improvements in housing conditions for many people. Even if we assume that the statistics used by the local government to identify slums are an accurate reflection of reality, we should not assume that everyone living in a slum is necessarily poor. Slum dwellers are a heterogeneous population, where some people have a reasonable income and the ability to cope with the impacts of heatwaves [39].

Furthermore, in many cities, there are more poor people outside the slums than within them. In India, Killemsetty [41] and Wang et al. [42] highlighted that the census data on slums do not consider the population of chawls, comprising working-class residential units of very poor conditions. Considering the combined population of chawls and slums, between 20% and 30% of the city’s population live in subhuman conditions [41–43]. Moreover, Shah [44] argued that the number could be increased by approximately 10%, if the number of non-notified slum dwellers was also taken into account. The uncertainty concerning the number of people living in poor housing conditions can lead to their exclusion from the benefits of the HAP, since they are not even recognized in the official statistics.

In addition, the effectiveness of the HAP’s early warning systems depends on the extent to which the identified risk groups receive the heat alerts in time. This requires a good understanding of the target groups’ access to information, e.g., through emails, social media, digital tools, text messages, etc., which all require (digital) literacy and internet or phone connectivity. As argued by Khan, et al. [45], although there is a high penetration of digital technology in India, literacy and digital literacy are highly contentious issues, complicated by gender and the caste system, resulting in the exclusion of many people. According to the Census of India, Ahmedabad has a literacy rate of 85%, and the figures for access to a computer or laptop with an internet connection or a mobile phone are reported to be 10% and 63%, respectively [33]. Nevertheless, the data on the (digital) literacy rate and access to information (via internet, phone, television, radio, etc.) in low-income settlements are either outdated or missing. For example, a survey conducted in 2002 by an NGO indicated that the literacy rate in slums is around 60% or less [46]. Even an optimistic estimation of the improvement in the literacy rate over the past two decades calls for precaution when assuming that all the vulnerable groups will be informed in time before a heatwave hits.

Thus, it is crucial to identify vulnerable groups and determine their access to information, beyond the definitions and contested figures used in official reports and documents. This requires

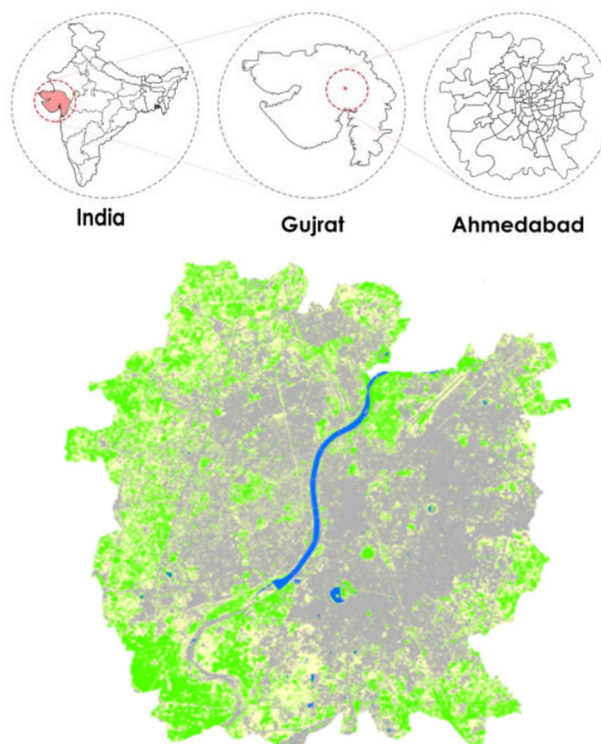


conducting extensive fieldwork in the city, developing a protocol to identify the most vulnerable groups and their access to information, and revisiting the notion of vulnerability in connection with exposure to extreme heat. Without conducting this research, the effectiveness of the HAP for different social groups cannot be meaningfully evaluated.

### 5.2. Impacts of the HAP on Access to Services

Beyond the identification of vulnerable groups and early warning systems, the HAP intends to improve access to services through other initiatives. For example, following the HAP, the Green Action Plan was initiated in 2015 to plant thousands of trees not only in order to provide cooling shade, but also to enhance the city's green cover in general [47]. Despite the potential, however, the preliminary data suggest that this initiative has little, if any, impact on city development plans [48]. As of 2016, green spaces accounted for only 3–4% of the total AMC area of 466 km<sup>2</sup> [34]. According to a senior AMC official, the number of trees planted in the city declined by 40%, from 109,896 in 2016–2017 to 64,912 in 2017–2018 [49]. Additionally, the number of trees cut in these years increased from 2630 to 3771 in order to widen roads, to expand metro systems, and to develop residential or commercial sites [43,49,50]. In such development projects, when trees are cut, authorities and project managers should plant a similar number of trees somewhere else. However, as argued in the case of converting the four-lane Sarkhej-Gandhinagar Highway into six lanes, planting new trees will not compensate for the ecological damage (e.g, terminating an entire ecosystem of flora and fauna that depends on a 20-year-old tree) or implications for nearby residents, such as heat-trapping via roads, which leads to an increase in temperature by at least a few degrees [51].

The uneven distribution of green spaces across the city also does not appear to have been affected by either the HAP or the Green Action Plan [52,53]. The western parts of the city, occupied by high-income groups in new high-end gated communities, still have more green space than the eastern parts (Figure 2), where industrial and low-income residential areas are located (ibid).



**Figure 2.** Distribution of green areas across the city of Ahmedabad, 2017. The green, blue, and grey areas indicate vegetation, water bodies, and urban sprawl, respectively. Source: [54].



Another issue to be addressed by the HAP is that many vulnerable groups do not have access to water, even if they are well-informed in advance to stay hydrated during the day. According to the 2011 Census of India, approximately 75% of households living in the urban areas of the Ahmedabad district had access to water from treated sources [33]. This, however, does not mean that water is always available from these sources. A survey of the vulnerability to extreme heat within 300 households in Ahmedabad's slums across six zones by Tran et al. [35] revealed that while 86% of the respondents had in-home taps, the availability of water in 93% of the cases was restricted to the mornings. Coping with extreme heat is even more challenging for informal settlers who do not have in-home taps and rely on water from community taps, hotels, gardens, etc. In a study by Mahadevia et al. [52], the researchers conducted a survey on 860 low-income households across 26 low-income settlements, revealing that around 13% of the respondents, mainly payment dwellers, did not have access to piped water.

In addressing this issue, the HAP advises the AMC to ensure staff presence during heatwave periods to distribute fresh drinking water across the city and to communicate with various sectors, advising them to suspend all non-essential uses of water [37]. Additionally, it suggests that the Labor Department provides water at work sites during heatwave days (*ibid*).

Despite these recommendations, the AMC's endeavors to set up water facilities in association with shop owners and volunteer organizations have not effectively addressed the issue [55]. A field observation of more than 50 locations in April 2019, in which free water facilities were expected to be located, revealed that many citizens could not obtain drinking water for free or at an affordable cost (*ibid*). The Rs 20 water bottles were reported to be expensive for most people, while Rs 5 and Rs 10 water bottles were not available in the facilities (*ibid*). In another field study conducted on 16 traffic police officers, Raval et al. [13] pointed out that not all traffic junctions are equipped with shaded break areas and/or water canteens designated for workers. As noted by the authors, while the research participants had seen advertisements on prevention strategies, mainly in newspapers, they had seldom heard about the HAP [13].

While the HAP is indeed a pioneering initiative, with the existing knowledge gap regarding the impacts on vulnerable groups in terms of improving their access to water and green spaces, it might be too early to celebrate the success of its implantation. As the environmental justice literature on heat vulnerability suggests, a better integration of quantitative and qualitative data on vulnerable groups and their limited adaptive capacity is required to evaluate the impacts of the HAP and to improve it.

Beyond this recognition, it is argued in this paper that the scope of national guidelines [56], on the basis of which Ahmedabad's HAP is devised, should go beyond adaptive measures, such as voluntary-based water provision. Additionally, the current mitigating and long-term measures, i.e., increasing green areas and constructing green buildings and cool roof initiatives, have proven to be difficult or unaffordable for implementation in low-income areas [52,53]. Moreover, the long-term measures in the national guidelines do not include any component related to dealing with the housing situations of low-income groups with limited access to water and electricity [56]. In the case of Ahmedabad, as the preliminary findings suggest, if the HAP aims to improve the coping strategies of vulnerable and disadvantaged groups, it should be linked to city development plans, e.g., upgrading existing low-income settlements and managing water resources and service delivery [48,52]. The reasons why these factors have not yet been realized are discussed below.

## 6. Discussion: Barriers to Implementing an Inclusive and Effective HAP

### 6.1. Institutional Challenges

An integrative approach to addressing the impacts of heatwaves, as employed in the HAP, requires coordination between various agencies and institutions in different sectors and at different levels of government (i.e., federal, state, and city). This, however, has proven to be a difficult task to accomplish. The fragmented planning and overlapping roles within and between water, energy, health, waste, and other sectors, as well as agencies at different governmental levels, have often been cited



as institutional barriers to implementing effective and inclusive climate adaptation and mitigation plans [48,57,58].

In the water sector, for example, Shah [59] argued that the lack of coordination between surface water and groundwater organizations has been an obstacle to integrative approaches to water management. Because of this, many cities miss the opportunity to adequately manage their water resources through rainwater harvesting, storm-water management, and groundwater recharging [59]. As a result, cities continue to import water from distant sources, despite the mounting evidence of negative social and ecological outcomes of inter-basin water transfers [60].

In the city governance settings, there are also multiple issues associated with coordinated and integrated planning in relation to the provision of housing and services [57,58], which directly affect adaptation and mitigation strategies, such as the HAP. While the provision of services falls under the responsibility of the municipality and other utility organizations, they have limited financial and administrative autonomy in India's federal structure to deliver their tasks. For example, the provision of 12 million affordable houses and 100% sanitation coverage by 2022 is a goal set by the central government, and the state is the key actor in financing the project [58]. As shown in a previous urban renewal mission of the Government of India, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), 2005–2014, the political dynamics between ruling parties at different governmental levels can lead to a delay of finances for urban local bodies [60]. Additionally, the inadequate organizational capacity in urban local governments remains a major constraint in implementing projects. A lack of time, human resources, and interdisciplinary knowledge and thinking are some of the challenges that still exist, despite the fact that various capacity-building programs and workshops have been organized by the government and international agencies [45,61]. Moreover, a lack of continuous engagement with citizens at various stages of planning has proved to be an impeding factor in the implementation of city projects [45,48]. As shown in several studies, the degree and quality of public participation in the planning and preparation of projects has long been a vague aspect of city development plans (ibid).

With restricted political, administrative, and financial support, cities often tend to formulate climate action plans that are implementable with visible outcomes in the short run [57], a trend that is identifiable in mitigation and adaptation strategies such as the HAP. As a result, climate action plans are often funded by international donors, with measurable deliverables in a short time frame and often with narrow outcomes (ibid). As argued by Khosla and Bhardwaj [57], the upscaling of city mitigation and adaptation strategies requires engaging with the more politically difficult issues of managing trade-offs and making the decision-making process more democratic.

## 6.2. Uneven Urban Development and Implications of Becoming a Smart City

As explained above, the effectiveness of the HAP largely depends on its integration into other urban development policies, centering on improving quality of life, especially for vulnerable and disadvantaged groups in the city. In the case of Ahmedabad, there is, in fact, a number of rejuvenation and beautification plans and projects that focus on low-income urban dwellers [34].

For example, recently, under the Smart Cities Mission (SCM) initiated in 2015, the AMC proposed to redevelop the Wadaj slum, one of the largest slums, with a population of 8000 dwellers, by 2022 [34]. The proposed project includes the rehabilitation of slum dwellers to multi-storied buildings developed at the same location (known as in-situ redevelopment) by utilizing planning interventions (e.g., providing a high Floor Space Index of 3), installing smart features (e.g., smart metering for water and electricity, rainwater harvesting, and solar energy), and creating public–private partnerships (PPP) under various housing schemes (ibid). The provision of green spaces is a mandatory part of the project, seen as a way of promoting a healthy and resilient urban environment and attracting visitors for various recreational purposes. As mentioned in the proposal, “in-situ slum redevelopment will organize a growth pattern in a manner that will ensure the quality of life and livability standards, while keeping the slum economically vibrant and environmentally sustainable.”



While the outcomes are yet to be seen, there is a body of research arguing that the benefits of smart city projects may have little actual impact on improving the living conditions for low-income dwellers. According to the data of the Ministry of Housing and Urban Affairs (MoHUA), 80% of the SCM's funding will be spent on area-based development, whereas less than 5% of the population in 17% of the cities might actually benefit from the outcomes (on average, only 22% of India's urban population might benefit from SCM's projects, meaning less than 8% of the total population [62]), and in the case of Ahmedabad, this figure is only 1.5% [62]. As for the area coverage, only 0.5% of Ahmedabad's total area of 450 km<sup>2</sup> is listed under the SCM's in-situ slum redevelopment project. As argued by Mahadevia [63], "this is hardly making the whole city smart!" Furthermore, under the in-situ slum redevelopment projects, the developer is mandated to obtain the consent of 75% of the occupants to start the project [34]. It is, however, not clear how the remaining 25% will be dealt with, which may result in the prolongation of the project or the displacement of the most disadvantaged [64].

The displacement that is occurring in other slum developments of the SCM is even more alarming. By monitoring the forced evictions in 34 of the 100 smart cities, HLRN 2018 [65] revealed that SCM-related projects have resulted in about 17,000 people losing their homes. Additionally, the poor quality and the location of the houses provided in such rehabilitation and redevelopment projects have left houses unoccupied [65]. In 2017, 30% of 800,000 low-cost houses constructed by the government were lying vacant (*ibid*). Moreover, relocation to these houses often results in a loss of social networks, jobs (particularly for vendors and maids working in nearby residential areas or business centers), education (e.g., school dropouts), and security, as well as an increase in the commuting time for the affected groups in the name of city development [39,63,65]. In Ahmedabad, for instance, the most acclaimed and awarded project for beautifying and reclaiming Sabarmati River's east bank led to the relocation of 10,000 slum households to the periphery of the city, despite their opposition, with severe impacts on their livelihoods [39].

In a sense, the current city development projects seem like new forms of promoting and implementing neoliberal urban policy [45,66,69]. While under the previous government, this process was pursued under the rhetoric of becoming "world-class" or "global" cities [60], it is now being framed under the rhetoric of becoming smart cities, with little reflection on the lessons learnt from the past and with no intention of deviating from that direction. In a sense, the development ideas behind becoming smart cities follow the same urban development strategy, seeking the commodification and privatization of public assets and services [22,23,27]. As shown by a large body of research, the focus of such strategies is primarily to attract investments in and professionals to particular areas in the city, which often leads to the destruction of the dignity and social well-being of vulnerable populations and the countries that are to be developed (*ibid*). As is evident in India, the SCM follows the same logic of "entrepreneurial governance" [23], resting on PPPs with a focus on investment and economic development. The profit-driven strategies embedded in smart city projects seek to offer technological fixes and smart solutions to structural socio-economic problems manifested in the housing and provision of services in cities. However, as shown in JNNURM, these approaches result in a dramatic increase in land and real estate prices, which not only affects low-income dwellers, but also the middle-class in terms of their ability to access formal housing and urban services in metropolitan cities [60]. The living conditions of a lucky few under the in-situ redevelopment plan may be improved. However, for the above reasons, smart city projects may indeed adversely affect the adaptation strategies of many with inadequate housing and leave them further behind, which runs directly counter to the core principle of the 2030 Agenda for sustainable development.

## 7. Concluding Remarks

Ahmedabad's Heat Action Plan is undeniably one of the most progressive adaptation and mitigation strategies to protect public health and lives in times of heatwaves in India, which are predicted to be more frequent and intense in the future. However, the preliminary data collected and analyzed in this article indicate major knowledge gaps when it comes to the assessment of the HAP



and its impacts. Inadequate and arbitrary data and statistics regarding disadvantaged and vulnerable groups and their access to information, water, and green spaces during the heatwave periods may severely hinder the HAP's potentials and lead to the systematical exclusion of the target groups. To address this, the knowledge gaps identified in Section 5 can be used to create a protocol for collecting data through more qualitative and extensive fieldwork.

Additionally, as discussed in Section 6.1, the effectiveness and inclusiveness of the HAP depend, to a great extent, on its integration into urban development projects, which is a challenging task, given the existing horizontal and vertical fragmentation in the planning of city projects. This calls for radical reforms not only at the organizational level, but also at the broader political and economic levels, at which national urban renewal missions and plans are drafted. Without these, it is unlikely that the HAP will be as effective and inclusive as it is intended to be.

Furthermore, this article argues that the challenges of implementing policy initiatives in a particular field should be understood in a broader context of uneven urban development. Many of the urban projects and initiatives under the Smart Cities Mission are overly focused on technology and thus do not realize their limited scope in addressing the associated issues, which are fundamentally social, deep, and structural, such as spatial inequality in Indian cities. As shown in Section 6.2, such a focus in city development plans has already resulted in widening inequality between the privileged and unprivileged. While the former can afford to have access to smart buildings and infrastructure, the latter have to struggle with issues linked with resettlement and, in many cases, displacement, which hampers the quality of their access to resources and services. In such circumstances, early warning systems have limited impacts in protecting the health and lives of the unprivileged.

The aforementioned arguments lead us to the final remark that addressing the driving factors, which lead to the practical challenges associated with the HAP, requires broadening the political participation of citizens in the discussions on *how*, *for whom*, and *at what costs* cities compete to become “smarter.” Here, active social groups can play a significant role in coordinating collective-claims in decision-making processes concerning, for example, municipal budget allocation and monitoring. This, in turn, requires that these groups, e.g., environmental justice movements, go beyond coordinating efforts that are often too focused on recognition strategies and to adjust their mobilization strategies towards enhancing collective control over city governance practices. Building ties with social movements fighting against market forces and neoliberal urban policies at the national and international levels could be one way, among others, to accomplish this. Only then, in light of uniting urban struggles to draft transnational pledges for equal, democratic, and sustainable cities, we could expect more people to benefit from the integrative climate responses of cities, such as the HAP, in the long run.

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