

Everything about Climate Change is Disproportionate: A Call for Spatial Justice in Urban Climate Action

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Abstract

As the future of urban living appears increasingly daunting, many people and communities are already experiencing climate impacts. This paper highlights the disproportionate nature of climate change, from unequal responsibilities for environmental degradation to unequal climate impacts that fall on the most vulnerable and unequal prospects that hinder people and countries from adapting to a changing climate now and in the future. Through a comprehensive literature review, the paper demonstrates that both the effects of climate change and the responses to them often reinforce existing inequalities, systematically pushing people, communities and countries into further vulnerability. Acknowledging that spatial processes play a critical role in creating, shaping, and perpetuating inequalities and oppression, we advocate for spatial justice in climate action and offer eight principles to support spatial scholars and practitioners in adopting a critical perspective on climate change in urban contexts.

Keywords— Spatial Justice, Climate Change, Inequalities, Cities, Urban Planning

1 Introduction

Extreme weather events have become a normality. In 2021, multiple events caused immense social and economic losses worldwide: heavy rainfall led to severe flooding in parts of Western Europe, particularly in Germany and Belgium; extreme spring heat waves in India and Pakistan with temperatures almost unbearable for human life; severe flooding in Ghana, Niger, India, Afghanistan and South Sudan; drought and heatwaves in Central Asia; Tropical Cyclone Seroja, which hit Indonesia in early April and Hurricane Grace, which hit Haiti two days after it experienced an M7.2 earthquake. In 2022, heavy rainfalls led to severe flooding in Pakistan, displacing millions of people; China, Europe, and the US witnessed dangerous and often unprecedented heat waves; Hurricane Ian hit Florida, leaving millions displaced. The years 2023 and 2024 were no different, with extreme wildfires in Chile, Hawaii, Canada and Greece; heavy rain in Pakistan, India and the Philippines; historical flooding in north-eastern Libya, Mozambique and Malawi, Myanmar and parts of Bangladesh, and in the South of Brazil. The list goes on and on. The impact of climate change is so severe that we updated this paragraph thrice during the writing process.

While climate change affects urban regions worldwide, climate vulnerabilities and adaptive capacities are unevenly distributed across spatial scales and social dimensions. People and countries are not equally affected nor have the same capacity to recover from disasters or adapt to a more extreme and unstable climate. At the global level, countries characterised by small carbon emissions, low income, and high vulnerability are already experiencing extreme heat, heavy rainfalls and flooding, and related multi-sector impacts across the food-energy-water nexus [1, 2]. At national levels, the impacts and risks of climate change are worse among poor and low-income communities, partially because they live in inadequate areas more susceptible to flooding, landslides, and earthquakes, but also because of limited capacity and resources to cope with climate impacts as well as reduced access to emergency response systems [2, 3]. At the same time, cities and urban areas currently grapple with increasing multidimensional inequalities, exacerbated by neoliberal government policies and planning [4]. Housing 4.2 billion people – over half the world’s population – cities are thus epicenters of both climate impacts and social inequalities. Their dense populations and stark inequalities amplify the risks associated with climate change, particularly for the most vulnerable groups. How cities plan and implement climate action in the coming years will largely determine the living conditions of the future.

This paper starts with acknowledging the disproportionate nature of climate change, from its responsibility to rising impacts and burdens and, ultimately, the future of peoples and communities (Section 2). We then outline the complex relationship between climate change and urban inequalities and stress the difficult task of planning for climate action in cities (Section 3). Next, through an extensive literature review, we describe the complex challenges a city faces when

addressing climate change, highlighting how climate change and urban inequalities are globally and locally intertwined processes that disrupt people’s livelihoods socially and spatially (Section 4). We highlight how various narratives of urban development, even the most progressive models, have failed to address existing inequalities, reinvigorating old claims for social justice in the city (Section 5). Underlying the urgent need for an alternative set of principles to underscore plans and strategies for climate action in cities, the paper ends with a call for spatial justice in climate action (Section 6) and offers eight principles to advance spatial justice in urban research and practice (Section 7).

Practice What You Preach. In our research and teaching, we strive to put the principles we propose into practice. In this paper, we have commissioned the artist and researcher Namrata Narendra to create the figures presented throughout the text, illustrating how research can transcend boundaries beyond academic walls to enable alternative narratives (principles 5 and 8, Section 7). The visuals in the paper use ships as a metaphor to challenge the idea that climate change affects people equally (Figure 1): We are not in the same boat!

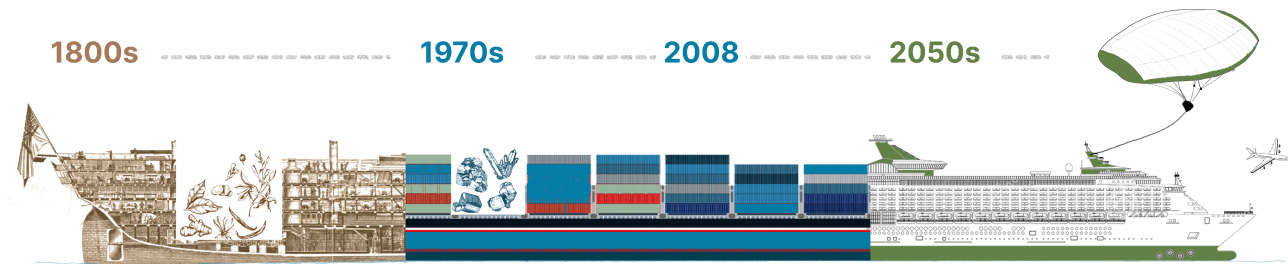


Figure 1: Using a ship as a metaphor for a city, the figure illustrates the connection between urban areas over time. The 1800s symbolises the colonial period, and the extractivist relations between colonies and empires. The 1970s represents a period of change characterised by significant social, political, and cultural movements that prompted urban scholars to engage with questions of justice, and 2008 marks a year when capitalist dynamics further transformed urban spaces through processes like surplus capital investment and accumulation by dispossession. Looking towards 2050s, the figure also illustrates the current approach to climate action, largely technology and capital driven, that ignores questions of justice.

2 Everything about Climate Change is Disproportionate

Unequal Impacts. Evidence about the disproportionate impact of climate change on socially and economically disadvantaged communities is unequivocal. Low-income communities are more affected by landslides, storms and flooding events for many reasons, such as higher population densities, poor-quality buildings, lack of risk-reducing infrastructure and services, and lack of resources to prepare for disasters [5]. These communities also have a significant part of their assets in physical forms (e.g., dwellings, household appliances, vehicles), which are more vulnerable to climate hazards [2, 6]. These are also often the groups racially-excluded from urban development and pushed to the margins [7]. Certain demographics also bear higher burdens: When compared to men and boys, women and girls not only experience disproportionately higher climate risks but are also associated with higher mortality rates, both directly and indirectly via related post-disaster events [8–11]. Children, the elderly, and people with health conditions are also particularly vulnerable to many climate impacts because of their greater sensitivity and dependence on caregivers for appropriate preparedness and response [12]. Climate change thus intersects across class, gender, age, etc., overlapping to create a cumulative exposure to the climate risks and burdens [13].

Unequal Responsibility. While there is no consensus on how to deal with unequal historical responsibility for climate change, high carbon emissions driving climate change are associated with a carbon-intensive lifestyle typical of high-income countries and cities and wealthier people therein [14–16]. For decades, high-income nations have pledged and provided “development” funds to lower-income countries to support a diverse range of projects and partnerships involving global and local actors, and both private and public sectors. The outcome of such development projects has often been the privatisation of public assets with the transference of profits to the private sector, and the socialisation of losses with mounting debt and government austerity guarantees that further push low-income nations and people into deprivation [17]. Climate-related development projects are no different. Solar farms in the developing countries, for instance, are associated with the dispossession of local communities of their land and vital resources, while the controversial carbon credits market additionally pushes local and indigenous communities off their land, disrupting their ways of living. Such techno-financial instruments operate under the guise of sustainability and climate solutions but systematically transfer wealth from low to high-income countries [18]. Moreover, with high-income nations pursuing ambitious climate goals that primarily rely on extensive technology adoption, this pattern is expected to worsen, as new technologies are produced along different manufacturing stages in various locations across the world in a global supply chain with enormous social and environmental impact, particularly in developing countries, where labour and environmental laws either tend to be less strict or have systemically been dismantled [19–26]. The transfer of socio-environmental impacts from developed to

developing countries does not only occur at the extraction and manufacturing stages but also at the end of the life cycle of devices, with extensive transboundary disposal of hazardous waste happening for decades now [27–29].

Unequal Prospects. Unequal impacts and unequal responsibility create unequal prospects in coping with and adapting to a changing climate. We can imagine a future in which only a privileged minority is safe from the climate crisis. Dystopian literature and cinema give us a glimpse into this possible scenario. *Space Sweepers*, a recent Korean science fiction movie, depicts precisely this dark future: It is 2092, and Earth is barely habitable anymore. A corporation builds a new orbiting home for humanity that reproduces the ecosystem on Earth. Only a few elite members are allowed on board, while the rest of humanity remains on Earth - a place now choked with smog with no life other than themselves. Another example is *Snowpiercer*, a movie based on the French climate fiction novel *Le Transperceneige*, which depicts a post-apocalyptic plot in which an attempt to stop global warming via stratospheric aerosol injection backfires and creates a new ice age. The survivors of this catastrophe are taken to a self-sustaining train, in which a small elite lives in extravagant front cars while the poor are packed into tail compartments overseen by armed guards. Despite being science fiction, these plots sound less fictional when persistent poverty [30–32] and pervasively inequalities [4, 30, 33] are juxtaposed with the dominant approach to climate action over-reliant on technocratic expertise and patterns of capital accumulation and financialisation that hardly address the root causes of the climate crisis [34].

Unequal impacts, responsibility, and prospects thus show that everything about climate change is disproportionate, from the individual to the global scale (Figure 2), underlying the urgent need to pursue spatial justice in climate action.

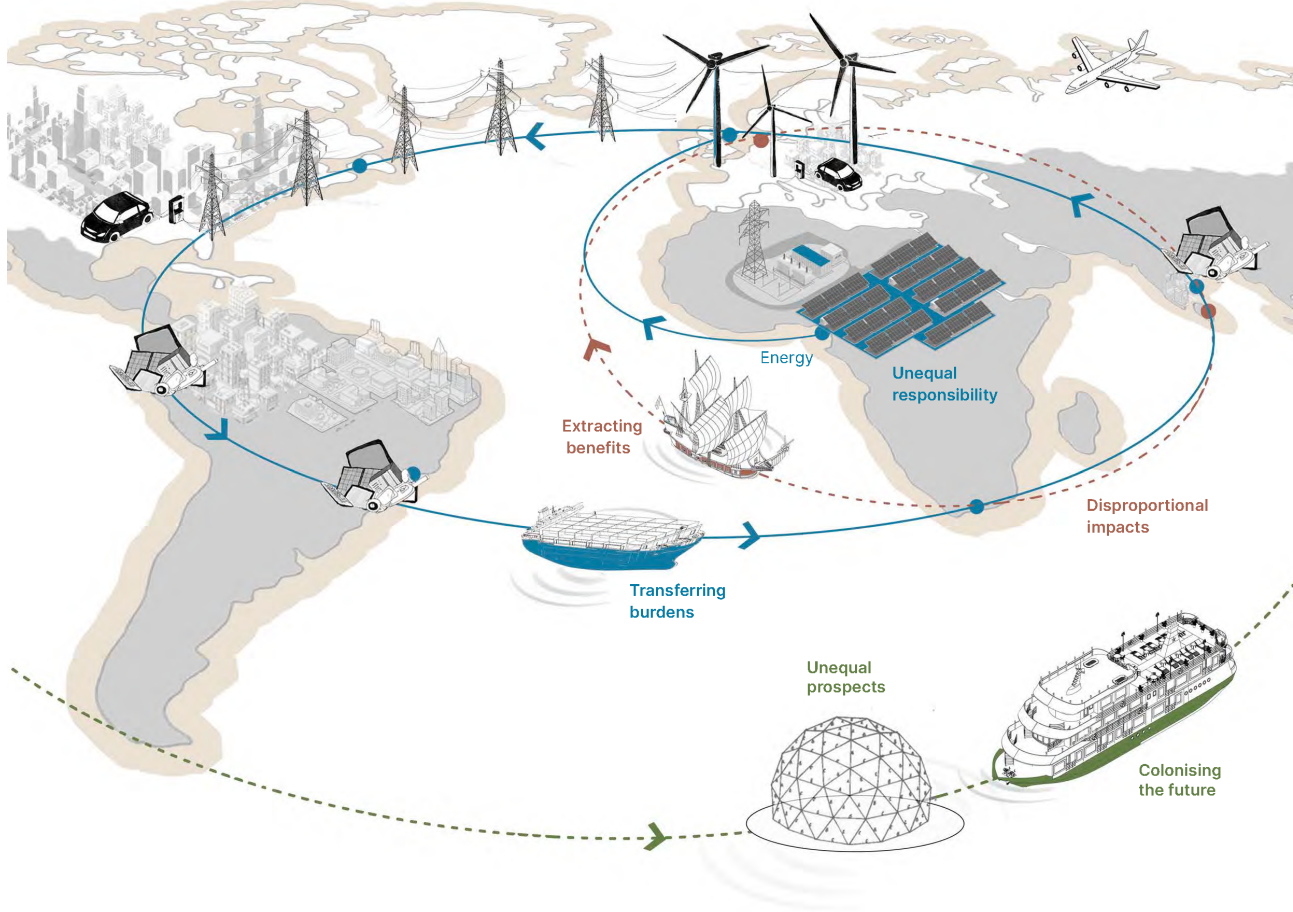


Figure 2: Everything about climate change is disproportionate: The carrack sailing ship alludes to the unequal historical responsibility rooted in colonialism that largely define the global power relations of today, the cargo ship represents the continued extraction of resources during globalisation, and the tourist-like ship represents the unequal prospects, in which a small privileged minority continues from accumulation and dispossession cycles.

3 Cities and Climate Change: A Complex Relationship

Cities have a role in climate action. Cities have an active role in addressing and redressing direct and indirect climate-related impacts through mitigation and adaptation measures. Mitigating climate change impacts generally involves reducing Greenhouse Gas (GHG) emissions associated with the urban environment, including material-embodied and operational emissions [35]. While mitigation measures remain important and will ultimately define the severity of climate change in the future, many climate impacts are already irreversible [2], requiring the adaptation of cities and urban systems to a changing climate. Both mitigation and adaptation strategies require multiple interventions in the city, including policy, investments, technology development and adoption, and entire system transitions. These interventions are deployed in an existing built environment composed of complex and dynamic urban sub-systems [36], affecting the livelihoods of people and communities in multiple ways, from daily disruptions to long-term infrastructure lock-ins that further perpetuate inequalities across the city [37,38].

Cities are complex. Besides climate-related impacts and a host of adaptation/mitigation measures [5], cities are impacted by ongoing urban processes and have to grapple with multiple interrelated challenges, such as intensified environmental degradation, changing urban demographics, growing inequalities and social vulnerability, increasing economic austerity, health and well-being, persistent poverty, and inadequate and ageing infrastructure [39–42]. Amid global geopolitical conflicts, urban places also act as arrival spots for a growing number of immigrants seeking better livelihoods [43], increasing pressure on governments to allocate limited resources in a fair and sustainable manner. In many cases, governments are unable to manage sufficient integration of communities [44], leading to a string of consequences unravelling across an individual and their communities' key aspects of well-being [45].

Urban inequalities are growing. Inequalities are so prevalent in cities [4,46] that, to get a sense of the problem, it is enough to move through neighbourhoods, look at aerial photography, or analyse satellite imagery [47]. The growing volume of data generated from urban activities combined with an increasing computational capacity has served scholars to unveil various urban geographies of inequalities across, e.g., housing ownership [48,49], accessibility to health or transport infrastructure [46,50–52], energy [53–55], disparities in internet use [56] and digitisation [57]. The attention of institutions worldwide to the issue corroborates a global consensus on the need to understand and address the problem of growing urban inequalities [58].

Climate action exacerbates urban inequalities. In a complex and highly unequal space such as the city, climate risks can also arise from mitigation and adaptation responses to climate change [59]. Risks arise from uncertainty in the implementation, effectiveness, and outcomes of climate-related interventions. Climate action may also lead to adverse consequences if interventions fail to achieve the intended outcomes or if they create adverse outcomes elsewhere. The failure of adaptation measures, in particular, has been termed maladaptation and recently entered the vocabulary of climate reports [2]. Viewing maladaptation from an urban lens shows that ill-conceived provision of infrastructure (e.g., green spaces) can lead to gentrification and displacement of certain social groups [60] or considerably impact the well-being and sense of community of those that remain [61]. The main reason for maladaptation is the lack of a long-term integrated and inclusive approach to the planning and implementation of adaptation measures [2]. Planning and designing for climate action in cities thus requires a deep understanding of underlying complex and interconnected urban challenges.

4 Urban Challenges

As it is clear that urban challenges are multiple [40,41], interlinked [40] and context-dependent [39,40,42], attempting to exhaustively describe them would be at best naive. Instead, in what follows, urban challenges are described in relation to inequalities and climate change as well as to each other (Figure 3).

4.1 Consumption and Economic Growth

Humanity currently uses 500 ExaJoules of primary energy [62] and 60 billion tones of materials per year [63]. Although cities occupy only 2% of global land, urban dwellers use 75% of natural resources, produce 70% of global GHG emissions, and 70% of global waste, leaving an enormous footprint on the climate and environment. Urban areas attract people with a higher purchasing power to consume increasingly more amenities and services, leading to high energy use and consumption of goods [64]. The rate and intensity of urban consumption have been increasing over the past decade [65–67], leading to an increase in the overall level of carbon emissions of urban households [68], subsequently degrading the environment and exacerbating climate change [65–67,69]. This logic of aggregation, while holding its ground, leads to the misconception that increasing urban population is necessarily associated with rising GHG emissions. Rather, the strong coupling between economic development and the growth in consumer base (and associated consumption) leads to environmental degradation and climate change [15]. This manifests through striking inequalities in consumption per

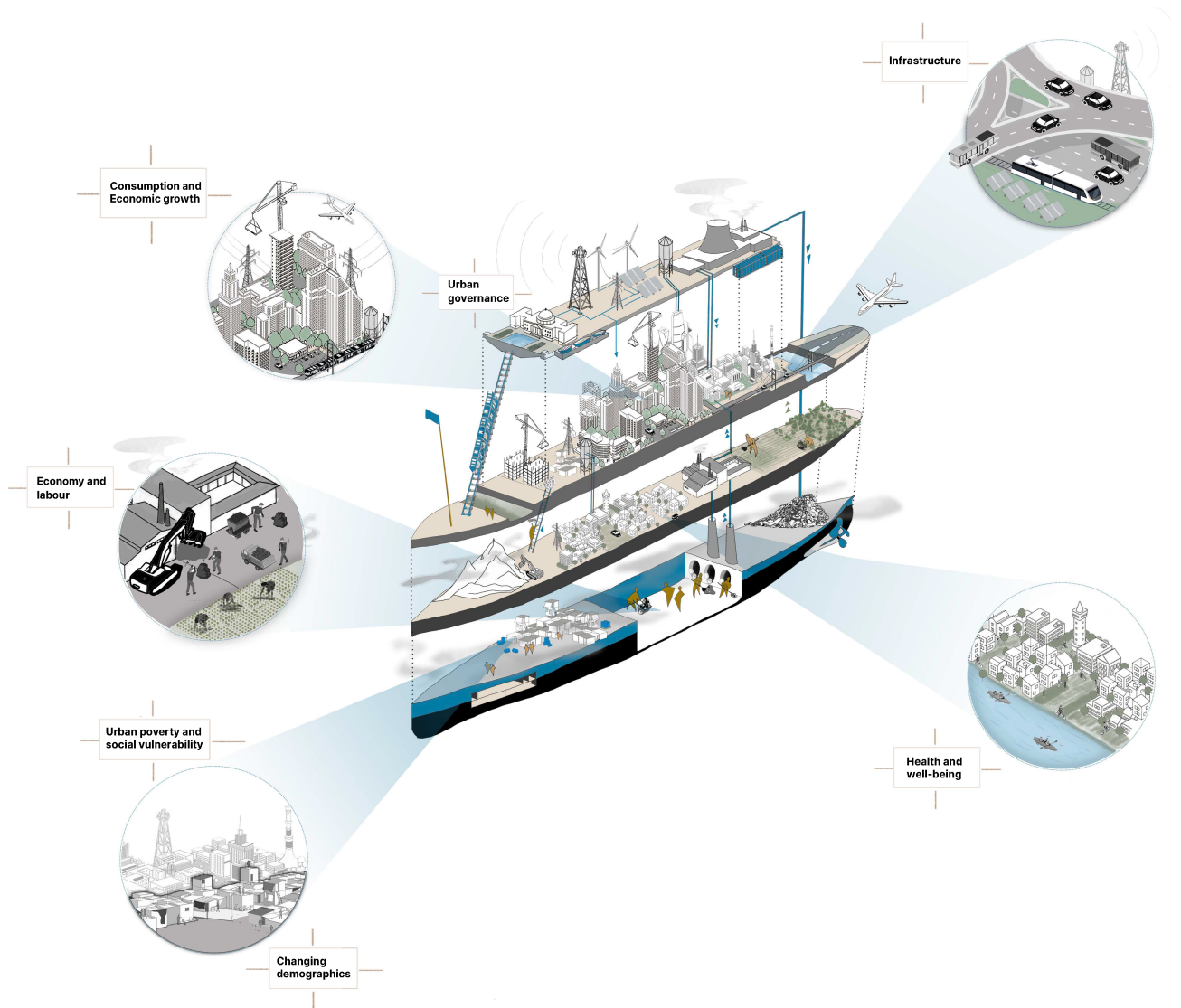


Figure 3: The figure richly illustrates the dispossession flow from the trunk, which hides extreme poverty and social vulnerability and is maintained by oppressive labour relations, to the crew's floor, which represents the ongoing extractive relations between countries and people, to the main deck, housing the global cities and their infrastructure, to the captain's deck, where neoliberal governance practices steer the ship towards an unsustainable and unfair future.

capita between the wealthy and the poor, with 10% of the world population using 40% of global energy and 27% of global materials [69].

Burgeoning evidence shows that decoupling economic growth from environmental degradation is hardly possible, spelling out a misaligned pursuit of growth. Cases of decoupling are either temporary, relative, or local [70], highlighting the need to transform consumption patterns in urban areas [71], ultimately transitioning to a system that prioritises well-being and limited growth only necessary for it [70, 72]. This is arguably the challenge of the current generation, aggravated by a geographical disconnection between places of production and consumption. Since the 1990s, the globalisation of production chains and increased international trade have re-arranged the spatial distribution of economic sectors [73]. As a result of the transfer of industry from developed to developing countries, up to 70% of global social and environmental impacts occur in geographies divorced from consumption that drives them [21, 74]. As most of climate-related interventions in cities does not dare to touch on questions of consumption and ignores these global consumption-production dynamics, climate action in cities is at risk of reproducing and deepening similar conditions of environmental degradation and inequality.

4.2 Economy and Labour

The global industrial transfer, coupled with high-income countries developing more technological and digital prowess, led to increasingly new opportunities for workers in high-income cities globally. People and economic activities agglomerate in cities for several reasons: The spatial proximity in dense networks of cities offers lower transportation and production costs, provides access to knowledge spillovers, and diverse skills [75,76]. The larger a city, the more probable it is to foster diversity and specialisation. As cities expand, they tend to become wealthier overall. City-level analyses have revealed that larger cities are more productive and efficient, as measured by e.g. total wages, income, number of patents, or gross domestic product (GDP) [77]. This, in turn, increases the likelihood of attracting a larger population due to the development of even more diverse and specialized opportunities [78,79]. While agglomeration analyses at the city explain economic and migration trends between cities, they hide important intra-city dynamics. The benefits of an increasing workforce agglomerating in cities, such as higher incomes, more production, and efficient and accessibility to services, primarily favour wealthier individuals [46,75]. Conversely, the burdens of urban development, like rising housing costs, disproportionately affect those with moderate and lower incomes [75,76], a process reinforced by disparities in how wealth accumulates over time [49,73,80].

Income and wealth inequalities in cities have been growing since the 1970s, when neoliberal trends in cities have shifted planning practices towards free-market principles, privatisation of public services, commodification of urban spaces, labour deregulation, and austerity measures [81]. After the 2008 global financial crash, cities were reconfigured in ways that further opened them up to new forms of financial and technological capital accumulation [82]. A global surge of “flexible employment” has brought along trends toward wage flexibility, loose constraints on hiring and firing, and relaxed employment protection policies, which manifest through new employment forms characterized by higher levels of job insecurity and an overall erosion of employment and working conditions [83,84]. In parallel, the increasing diffusion of digital platforms in the operation of urban systems and services has exacerbated issues of job security, working conditions, and living costs for many [57,85–87]. These precarious working conditions compounded with other inequalities, such as lack of access to urban services and inadequate living conditions, exposing certain demographics to higher levels of vulnerability. In particular, households where a member lives with a disability or illness, families with young children, and single mothers have been particularly affected by rising living costs and cuts in social benefits [53,88]. Austerity measures have also significantly affected the working class [73,89] and younger people [89,90]. Adding to that experience, migrant populations under flexible or precarious labour conditions are also confronted with language barriers, discrimination, and other burdens related to their migratory status [91]. While cities have become faces of economic growth and prosperity, they are held together by skill-based stratification, rising living costs, precarious working conditions, and migrant workforce.

4.3 Changing Demographics

Despite increasing global urbanisation [92], cities present varying urbanisation trends. In general, urbanisation eases off as high urban shares are reached. Europe, North America, Latin America, and the Caribbean and Oceania have urban shares over 70% with low urbanisation rates [93]. In Asia, the urban share is estimated to be the fastest growing in the 2010s, with its urbanisation rate of 1.4% per year, compared to 1.3% in sub-Saharan Africa, 0.5% in north Africa, and less in other regions [93]. In contrast, many regions and cities are experiencing ageing [94] and declining populations [94,95]; the phenomena of shrinking cities is observed, for example, across both the US [96] and the European Union [94,97,98].

The impacts of climate change and other external trends are rearranging the global landscape of migration by displacing people and communities, with significant implications for the provision of urban infrastructure and services [99,100]. Amid global geopolitical conflicts, urban areas act as arrival spots for a growing number of migrants seeking better livelihoods [43]. Cities with high-capital investments and technological dominance have become attractive for migrants who are highly skilled, well-educated, and well-paid [101]. In contrast, second-tier cities are hotspots for unskilled labour migration (a legal instrument that politically supports labour apartheid on the basis of skills). Under increasing pressure to allocate resources in a fair and sustainable manner, many governments fail to achieve sufficient integration of arriving communities [44]. As result, communities of socially vulnerable people are very often pushed into segregated neighbourhoods that are more affordable and/or familiar [102].

Segregation and Gentrification

Not surprisingly, migrants often find themselves at the centre of segregation debates. Segregation is a multidimensional phenomenon where population groups that share several factors such as occupation, education levels, income, wealth and/or ethnicity appear spatially sorted [103]. Segregation processes are the spatial manifestation of social inequalities, where different social groups are unequally distributed across the city. Literature suggests that there are at least four factors influencing segregation: social inequalities, changing economic structures and levels of global connectedness, welfare regimes, and housing systems. Segregation factors overlap, interact over time and space, and interact differently depending on the local context [103,104]. While racial segregation is particularly notable in the USA [105], and by religion and caste in the Indian sub-continent [106], residential segregation by class is on the rise in many European

cities [103, 107, 108], including the growing popularity of gated communities [107]. These segregated communities are under-served by urban amenities [46], e.g., high-quality schools [109] and healthy food conveniences [110–112], and are also more likely to present concentrated poverty and experience high crime rates [113, 114]. These conditions are frequently found to be associated with poor health and well-being [108, 111, 113].

Segregation processes are highly dynamic and unfold alongside other complex local processes like gentrification. As neighbourhoods gentrify, new residents often replace older residents in previously deteriorated areas, usually inner-city suburbs, in a spatially concentrated manner to a degree substantially differently from the general level of change in the community or region as a whole [115]. In this definition, the displacement of former residents is viewed as an inherent part of gentrification, not an outcome. In contrast, when neighbourhoods are “improved” without the displacement of actual residents, the process is termed as neighbourhood or “incumbent” upgrading [116, 117]. In addition, the demographics of the gentrifiers and the gentrified are recognised: new residents tend to be young, white, professional, technical, and managerial workers with higher education and income levels, while the former residents are disproportionately low-income, working-class and poor, ethnic minorities (e.g., foreign migrants), and elderly [60, 115, 117–119]. Remarkably, many neighbourhoods currently at risk of gentrification have been historically impacted by the burdens and externalities of urban development [108]. The causes of gentrification can be multiple, such as urban renewal projects [108], conversion of housing into holiday accommodation [120], and provision of green spaces [61], but the negative outcomes are always carried by communities systemically disadvantaged in the first place.

While climate action is imperative to mitigate climate change effects and adapt to a changed climate, it has also been seen as an opportunity for urban (re)development, renewal, or regeneration, depending on the local narrative. However, often associated with adding or improving green infrastructure, climate interventions have created the new phenomenon of “green climate gentrification” [118], with the displacement of the residents the green spaces were designed to benefit [60]. Such a process often affects the same groups displaced by past urban developments in the name of progress [108]. Displacement across generations is not only traumatic but also traps families in a vicious circle of vulnerability, eventually pushing them into deeper poverty conditions.

4.4 Urban Poverty and Social Vulnerability

Over the last two decades, there has been a growing discussion about the “urbanisation of poverty” [121], broadening the focus of poverty studies beyond rural areas. Globally, rural poverty has been in decline, while urban poverty is moving in the opposite direction [122, 123]. Although urban poverty manifests in different ways in developed and developing countries [124, 125], it is a global problem [126]. In developing countries, it is often associated with rapid urbanisation and the spread of slums and informal settlements [121, 126, 127], partly attributed to mass labour migration movements prompted by urban development as well as the ease of implementing informal labour conditions. In 2020, about one billion people (or one in four urban dwellers) lived in slums or informal settlements, with about 40% concentrated in Central and Southern Asia, 35% in Eastern and South-Eastern Asia, and 25% in sub-Saharan Africa [126]. Slums and informal settlements lack access to public transportation, energy, water and sanitation systems. Urban poverty is also a real and present problem in high-income countries [128]. In Europe, for example, poverty is relatively higher in large urban areas in countries with a low number of people living in poverty [124]. In contrast, in countries with a moderate to high number of people living in poverty, poverty is more pronounced in rural areas [124].

Understanding who lives in poverty and where is very important in planning for climate change both at the local/urban and global scale [129]. However, several authors have highlighted the inability of current poverty-related measurements to estimate the depth of urban poverty, showing how significantly it can be underestimated [121] or misconceptualised [104]. Living in poverty means people struggle to fulfil their most basic needs like health, education, and access to water, sanitation, and energy [130], and it has also been associated with food insecurity, lack of access to healthy food, and increased risk of malnutrition [131, 132]. Living in the current economic and global conditions, lacking such resources and amenities has direct consequences for peoples’ capacity to meaningfully participate in society, leading to exclusion and segregation [53, 133–135]. Moreover, certain socio-demographics have been more exposed to poverty than others: Women are more affected than men [130], children suffer from long-term detrimental effects [136], and communities of colour and minorities face historic burdens of being trapped into poverty [7, 114].

Some scholars have taken a different approach to understanding poverty, strengthening the link between the poverty and social vulnerability (e.g., [53, 137]). Generally speaking, vulnerability means the potential to suffer loss or harm. It describes the physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards [138]. Social vulnerability, in turn, refers to the potential for loss of human and social capital. It is shaped by drivers of inequality across multiple dimensions - e.g. gender, class, race, ethnic origin, age, level of ability, and sexuality - which are framed by cultural norms and practices, local values, and institutions, often deliberate and anchored in social and political structures [139, 140]. Being a critical concept in disaster management practices, understanding and measuring vulnerability is essential in planning for increasingly extreme and frequent hazards associated with climate change. Poor and low-income communities who have been forced into social vulnerability and hazardous geographical areas due to socio-political processes of growth, consumption and

migration, remain trapped in this condition and now face increasing climate risks due a lack of risk-informed governance, and inadequate social and physical infrastructures. Ineffective climate governance and planning thus leave people and communities vulnerable to climate disasters and their consequences [37, 141], which ultimately impacts several aspects of their well-being.

4.5 Health and Well-being

Well-being, broadly understood as the quality of life, is multidimensional in nature. This manifests not only in the multiple external factors that influence how an individual evaluates the wholeness of their lives but also in how one's life pans out across key aspects of their well-being. On the one hand, several factors affect people's well-being, for example, the provision of adequate conditions for active transportation, such as walking and cycling [142–145], and access to cultural and recreational opportunities, including parks, squares, and playgrounds [60, 146–150]. On the other, well-being is positively and significantly correlated with more schooling, better health, and sustained employment [151]. Although academics have been highlighting the complex nature of well-being for decades, it took a pandemic (COVID-19) to tragically expose the intersections and burdens faced by several communities. Epicentres of the pandemic, cities worldwide have been confronted with insufficient public health capacity, inadequate essential services, and a lack of public spaces, and inevitably, vulnerable groups have been affected the most [140, 152–155].

Well-being is thus not only determined by access to urban amenities or services (benefits) but also by the level of exposure to negative impacts of urban development (burdens), and both are unequally distributed across urban areas. While higher income groups have better access to health services [156, 157], green areas [60], and healthy food outlets [112], disadvantaged communities lack similar provisions [46]. Additionally, they are more exposed to urban development externalities, such as resource pollution and fast food outlets [110, 131, 158], and the burdens of labour deregulation [91, 159]. Differential capacities to cope with health and well-being stressors often exacerbate existing inequalities as high-income groups can invest in expensive solutions, including health protection and climate adaptation [160, 161]. One could find multiple positive associations between poor neighbourhood conditions and negative health outcomes along an individual's life trajectory [114], which highlights the disproportionate impact of constrained access and choices on the physical and mental health of disadvantaged groups in society.

Physical Health The main factors causing physical health problems in city dwellers are related to the quality of air, water, and soil [162]. Air pollution has been a severe issue in most global cities for decades now. It is estimated that 99% of the world's urban population lives in areas that exceed air quality guidelines defined by the World Health Organization (WHO) [126]. Several health problems are associated with air pollution, including increased risk of heart and lung disease and higher incidence of respiratory and allergic diseases (e.g., asthma, chronic obstructive pulmonary disease, pneumonia, and tuberculosis) [163–165]. The consequences of resource pollution are naturally more severe for people already in need of special care, support, or protection because of (old or young) age, disability, or neglect. In addition, there is an important spatial dimension to resource pollution. Socially vulnerable people are either displaced to already polluted areas, e.g., as they seek affordable housing in areas where prices are lower [24, 166], or pollution is forced into existing vulnerable communities, e.g., by building hazardous industry facilities [166, 167] or roads and highways [168, 169]. On a global level, with the tertiarisation of the economy of developed countries, resource pollution has been transferred to developing countries [21], an issue recently intensified by technological transitions associated with climate change [24].

Mental Health It is in cities that the multiple facets of modern society intersect, creating new challenges to mental health. The demands of a neoliberal meritocratic society lead people to stress and exhaustion [170]. Economic austerity and precarious employment put people under constant stress and insecurity, with the most vulnerable often under the highest pressure [159], including young people and migrants [91]. Furthermore, lack of adequate and affordable housing and exposure to poverty contributes to reduced mental health and overall well-being [113, 171], particularly among women, single parents, and providers of unpaid care [53]. Other challenges to mental health in urban areas include loneliness, violence, high crime rates, homelessness, exposure to noise, drug abuse, and insufficiency of mental health services [172]. Climate change adds another layer to mental health challenges. The prospect of a future under intense effects of climate change is affecting the mental well-being of many people [173], causing climate-related anxiety, particularly among the youth [174].

Inequalities in health and well-being are significantly exacerbated by climate-related hazards [175]. Children, for instance, are particularly vulnerable to many climate impacts because of their greater exposure, greater sensitivity, and dependence on caregivers for appropriate preparedness and response [12]. People with disabilities and chronic medical conditions, including the elderly and those living in nursing or assisted-living facilities, are also some of the most climate-vulnerable [2, 176]. Mental and physical health challenges also emerge locally due to changes in demographic trends, such as an ageing population in many western cities [94]. Loneliness in the elderly age has become such a pressing social concern that many cities are urged to take specific measures to address it, including planning for age-friendly urban centres and facilitating social activities for the elderly [177–180]. Moreover, elderly people suffer from reduced mobility due to increased levels of frailty, which affect their health and functional status [181–183]. Access to inclusive public transportation has specifically been highlighted as a factor in preventing loneliness and facilitating mobility, particularly

in older adults who stop driving [178, 180, 183–185]. Adequate and accessible urban infrastructure is therefore essential to ensure a healthy and liveable living environment in response to increasing climate risks and other urban challenges.

4.6 Infrastructure

The built environment shapes all aspects of urban life, from accessibility and mobility to living and working conditions and access energy, water, food, and waste management. Climate change entails transitioning from a carbon-intensive to a sustainable climate-resilient built environment, which requires the renovation and adaptation of old and the construction of new infrastructure and networked systems. This transition is critical because, once new infrastructure is built, its physical form and land use patterns can be locked in for decades, directly affecting the organisation of social life in cities [38]. New infrastructure projects, such as highways, railways, transmission corridors, irrigation canals, and the impoundment of water, physically divide and splinter communities, with consequent loss of social networks, loss of access to resources, and, in the worst cases, to displacement and dispossession [119, 186, 187]. Research already shows that infrastructure improvements in the built environment have predominantly benefited socio-economically advantaged people and communities [188, 189]. To revert and avoid this trend, planning for climate infrastructure in cities requires a strategic coupling between short-term and long-term interventions that consider the complex connections between infrastructure and urban life and existing inequalities.

Transportation

Transportation infrastructure has tremendous influence on the well-being of people in cities. It brings people closer to essential economic and social opportunities and allows them to move freely and independently. Public transportation, in particular, reduces the burden on global planetary resources by moving more people per unit cost for longer distances compared to private vehicles [190]. However, data from 2020 for 1,510 cities around the world indicated that on average only about 37% of the urban areas are served by public transport, measured as a walking distance of 500 metres to low-capacity transport systems (such as buses or trams) and/or 1,000 metres to high-capacity systems (such as trains and ferries) [126]. With variations in population concentrations within the cities, this average translates to only about 52% of the world population having convenient access to public transport.

Historically, transportation planning has followed an approach of “predict and provide”, forecasting demand and expanding infrastructural provisions to maximize traffic flows and minimize congestion [191]. This approach often leads to the displacing communities to build road infrastructure for reducing travel time to central business districts and propelling the development and growth of private vehicle infrastructure vehicle [192]. This improves accessibility to essential and leisure services for many, but at the unfair cost of economic, social, and environmental marginalisation of other groups. It is well documented that disadvantaged people generally have lower access to urban amenities [46]. Literature especially highlights that spatial concentration of jobs, public services, and commercial activity tends to influence human mobility around key destination centres in urban areas [193–195], and such mobility is easily afforded by middle and higher income groups.

The predict-and-provide approach has faced a lot of scrutiny as cities are progressively striving for higher livability, sustainability, and inclusion. As a result, transport planning objectives are slowly shifting from the narrative of efficiency and speed to an accessibility-oriented approach: prioritising traffic safety, low-carbon transport modes, and meeting the needs of different spatial regions and social groups. The shift to an accessibility-based approach is a necessary but challenging one as urban accessibility is mediated by a complex multi-layered process where several components of the built environment, political choices, urban processes (like segregation, gentrification, and migration), cultural norms and values, and socio-economic dynamics that intersect in space. With a focus on accessibility as a value-system towards a sustainable future, it is important to recognise that inequalities related to transportation and accessibility persist and exacerbate in the context of the transition towards a decarbonised transportation system [196–198]. Recently, Germany set an example to increase demand for public transport by lowering (not voiding) public transport costs, and Paris, France has substantially reduced car trips by creating a city-wide cycling infrastructure at record speed. Although European nations have made huge progress in providing more public forms of accessible transportation, there are other instruments through which private vehicle infrastructure machinery continues to grow, owing to lack of infrastructure for cycling, tax rebates for cars through corporate mechanisms, and reduced public transport access in remote and suburban communities [199].

Housing and Public Spaces

Housing is such an essential need for people that the Universal Declaration of Human Rights recognises it as the cornerstone to the right to an adequate standard of living. Given that households devote a large share of income to housing costs, adequate and affordable housing is paramount to keeping urban dwellers out of poverty and exclusion [126]. Housing is at the core of urban issues because it dynamically intersects with basic mobility infrastructure and dictates access to opportunities, essential services and amenities [46, 200]. In turn, better accessibility to services and public amenities tend to be associated with reduced car ownership and vehicle miles travelled, and higher use of active forms of mobility [201, 202]. However, universal access to adequate and affordable housing is far from reality. Over the past

decades, neoliberal and globalising trends have completely changed housing systems, profoundly impacting the right to adequate and affordable housing in different contexts and times. Through the political idea of homeownership [203], these trends have shifted the control of housing from states to the market, enabling the takeover of the housing sector by global finance, with a consequent reduction in social housing [204,205]. Despite differences in how housing financialisation occurred worldwide, it has resulted in increased housing precariousness particularly for vulnerable groups [49, 205]. Certain social groups are more likely to be living in inadequate housing or at risk of eviction, including the elderly, people with disabilities or illness, women, young children, single parents, providers of unpaid care, people of colour, and transgender people [53, 119, 206].

Looking beyond inequalities in housing, it is also via housing that people create community ties and develop a sense of belonging. The role of public spaces in enabling community connections is undeniable. Although less tangible and quantifiable, community and a sense of belonging have a material impact on peoples' lives. Single mothers can rely on the community for childcare support [119]; local meeting places prompt the elderly to move and socialise in a familiar environment, with ample benefits to their physical and mental health [119]. Spaces such as parks, squares, and playgrounds, are places where people can interact, playing a vital social role in urban life [146, 148]. Access to adequate public spaces is particularly beneficial to certain socio-demographics, such as children [207], the elderly [149, 178, 180], and women [208]. Furthermore, green and blue areas, in particular, promote physical activity and mental health, improving overall well-being [60, 147–150, 209], contribute to reducing air pollution [148, 150], attenuate air heat stress associated with the heat island effect and/or heat waves [150, 210–213], and reduce energy demand in the summer [214].

Yet, data for 2020 from 962 cities point to a poor distribution of open public spaces in most regions [126]. In these cities, only about 38% of urban areas are located within walking distance of 400 m to an open public space, which translates into only about 45% of the global urban population having convenient access to those spaces [126]. Moreover, (lack of) access to open public areas and the benefits they provide often overlap with socio-spatial inequalities. Literature reveals inequalities in the level of access to green areas across economic classes [215]. Parks in high-minority neighbourhoods are not as accessible, do not accommodate as many visitors, and/or are of lower quality than those in low-minority neighbourhoods [216]. Similarly, lower levels of walkability are observed in socio-economically disadvantaged communities [145]. With increasing climate risks in cities, particularly heat stress, municipalities worldwide have been promoting the “greenification” of cities through the regeneration of public spaces. However, the complex dynamics of how neoliberal housing markets does not leave space to redress or reduce inequalities in the provision and use of public spaces and, thus, attempts to “improve” public spaces have led to increasing living costs and gentrification, further segregating disadvantages communities, and ultimately displacing the very residents these spaces were designed for [60, 108, 118].

Water

Today, 2.2 billion people lack access to safely managed drinking water, 3.5 billion lack sanitation, and 2 billion lack basic hygiene services [217]. Inequalities in access to water and sanitation is a global issue, and many cities across Eastern Europe, Latin America, Asia and Africa still lack essential water services [218]. Although water availability depends on hydrological cycles, which differ globally, inadequate water and waste management and infrastructure lead to flooding, water scarcity, and water pollution. Due to the strong coupling with other sectors, disruptions in water systems have cascading effects: Flooding events cause disruptions to transport systems, waterborne diseases increase the pressure on health systems, droughts have an immense impact on food production, and landslides overwhelm emergency systems. Beyond basic needs, water security is also essential to poverty reduction, food security, peace, and ecosystems sustainability [217]. Over the past decades, while the rural population saw improvements in access, clean water and sanitation access in urban areas remained largely unchanged or decreased [217].

Changes in hydrological cycles caused by climate change exceedingly overwhelm water systems. Since the 1970s, 44% of all disaster events have been flood-related and 7% have been drought-related [219]. Heat waves, droughts, wildfires, and storms and subsequent floods and waterborne disease outbreaks are becoming more frequent, intense, and long, pressuring water systems that already operate at their limit. Not surprisingly, a large share of adaptation interventions (about 60%) have focused on water-related hazards [219]. Water adaptation is not only an opportunity to increase the coverage of clean water and sanitation, but also to reduce the exposure to flooding and water pollution, which are most pronounced among vulnerable communities [219, 220]. Similarly, some demographics are also more prone to suffering from excess heat, such as the elderly and very young children [221–224]. Furthermore, the high demand for water for agricultural use means that disruptions in water provision strongly affect food production [219].

Food

In 2022, about 735 million people in the world were suffering from hunger, with almost 30% – a stunning 2.4 billion people – under severe or moderate food insecurity, lacking regular access to adequate food [217]. In general, food security is not as severe in urban compared to rural areas, but food dynamics in cities are complex [225–227]. Critical scholarship highlights that such “urban advantage” may not benefit the most vulnerable, particularly minority communities and the urban poor [110, 228]. Disadvantaged communities not only have fewer food choices in general [46], but also less access to affordable fresh and organic foods. On the contrary, generally cheaper fast-food outlets and convenience stores pop up in disadvantaged or semi-industrial areas [112, 229]. The lack of access to healthy food has severe health implications, from

malnutrition to obesity [226,229]. Because low-income areas intersect with other socio-demographic characteristics, food inequalities disproportionately affect communities of colour, women and children, and people who do not have higher levels of formal education. [110,217,228].

Climate-related risks to food insecurity arise from multiple drivers. Climate change directly affects food availability through agricultural impacts, either due to drastic changes in climatic conditions (e.g., temperature, humidity, and precipitation patterns) or as a consequence of hazardous events that affect agricultural land (e.g., droughts, storms, and floods). Indirectly, climate change also disrupts ecosystems in response to changes in weather patterns, leading to, for example, pest outbreaks that damage crops, resulting in reduced agricultural productivity. Since entire communities worldwide depend on a particular crop and may not be able to find other food sources, climate impacts on agriculture take another dimension. Moreover, responses to climate change in other sectors induce multiple risks to food security, including the higher demand for land arising from adaptation and mitigation measures, such as energy or water infrastructure.

Energy

Despite global advances towards a sustainable energy system, energy poverty remains a global issue that manifests differently in developed and developing countries. Often, in developing countries, energy poverty is an issue of access to fuels or to the electricity grid [217]. In developed countries, it is more an issue of affordability. The recent energy crisis in the wake of the Ukraine War has exposed energy poverty as a real and present problem in European countries, particularly among the urban poor [230,231]. Across Europe, at least between 50 and 125 million people cannot afford proper indoor thermal comfort [232]. The impacts of energy poverty are translated into severe public health issues, social isolation, gender inequalities, and extreme poverty [53,233–235], mainly affecting disabled people, single parents, and people from ethnic minorities [53,236]. The multidimensional consequences of energy poverty prevent people from meaningfully participating in society [133], having a strong link to poverty [235,236].

As cities account for over 60% of global energy use, the energy transition remains a critical urban challenge with a significant impact on the climate. The tight coupling between the energy sector and multiple other sectors [64], such as transportation, housing, industry, and building construction and services, places the transition to a sustainable energy system at the centre of climate mitigation efforts. Ensuring access to affordable, reliable, sustainable and modern energy for all will open a new world of opportunities for billions of people through new economic opportunities and jobs, empowered women, children and youth, better education and health, more sustainable, equitable and inclusive communities, and greater protections from, and resilience to, climate change. However, growing evidence shows that efforts towards the transition to a sustainable energy system have left many behind [54,55,189,231,234,236]. On the one hand, energy transition policies, largely based on tax breaks and subsidies, require not only a high upfront investment but also high levels of financial literacy, excluding a large part of society [54]. On the other hand, the shift from fossil fuels to renewable energy sources has led to the shutdown of many coal power plants with consequent loss of local jobs in many regions around the world [237]. The destabilisation of the economic and labour landscape eventually leads to the decline of the whole region, with the working class clearly more affected [73].

Waste

The consequences of uncollected and untreated waste are multidimensional, including being a source of plastic pollution, an incubator for infections, and further contributing to GHG emissions [238]. Waste management in cities presents large discrepancies when compared globally: The global average municipal solid waste collection rate varies from 50 to almost 100%, and the global average rate of municipal solid waste management in controlled facilities between 18 and 94% [126]. In addition, cities in Central and Southern Asia and Sub-Saharan Africa present a large gap between the collection rate and management waste, indicating that many municipalities still rely on dumpsites [126]. Within these cities, it is the urban poor often living in informal settlements who bear the burden of insufficient or lacking solid waste management [239], including illegal waste dumping [240,241], and associated unhealthy living conditions [241,242]. The subsequent transboundary disposal of (hazardous) waste from developed to developing countries is a tragic outcome and metaphor of the cycle that continues to propel consumption among the most privileged people in the world at the expense of outsourcing the burdens of production, emissions, hazards, risks, and disasters to the developing world [27–29]. While climate change is expected to contribute to global inequality and thus exacerbate socio-ecological risks associated with waste mismanagement, particularly for the poor, a recent critique to waste management scholarship reveals its delay to engage critically with questions of inequality and justice [243], compared to other fields where scholars have already started to consider justice (e.g., transportation [244], housing and green spaces [60,245], water [246], food [110], and energy [247]).

4.7 Urban Governance

Interventions to address the urban challenges described above cut across sectors and spatial and temporal scales, creating tensions at different levels of governance, including:

Addressing urban complexity from a fragmented, single-sectoral, and short-term perspective. Cities are

spaces of organised complexity [36, 146, 248]. They inherently host a diverse society, multiple interconnected urban systems of sustenance, and the associated social, environmental, physical, technological, cultural and political challenges. At the *local* scale of a resident's perspective, all urban areas provide the same blueprint of resources: housing, energy, water, food, and transport, among others, that metabolise life in a city. From a *global*, political-economic standpoint, complexity also arises from the mutual reinforcement between globalisation and urbanisation as intimately intertwined forces driving transformations in peoples' living environments. Understanding the interplay among and across the micro and macro interactions is key to governing the transformation of city-wide systems for the benefit of all peoples and communities. Yet, cities currently operate in silos: They are structured in distinct sectors and departments, planning and governing each urban system without oversight of interconnections. Moreover, there is a shared focus on the short-term horizon of 15-20 years, motivated by various factors, including the complexity of long-term planning, the short-term nature of electoral cycles, and the degree of 'comfort' gained from thinking about everyday matters compared to uncertain long-term horizons [249]. Such a fragmented, single-sectoral, and short-term approach fails to address the complexity inherent in the urban environment, resulting in sub-optimal decisions and poor governance. Ultimately, people are kept oblivious to planning practices and decisions that affect their livelihoods profoundly.

Addressing people and communities from a top-down approach. In the 1960s and 1970s, participatory planning emerged in response to the more top-down, expert-driven, and technocratic model of the previous decades. Despite the potential to achieve more inclusive, sustainable, and effective decision-making processes, participatory planning is not without its criticisms. Empirical research reveals that these practices often remain tokenistic, where certain stakeholders are symbolically included without genuine influence, reinforcing existing power imbalances and inequalities [250, 251]. The controversy around such planning is not new; it has been a subject of criticism since the 60s [252, 253], either because of involving only a small number of people from under-represented groups or because of excluding these groups altogether. Elite capture is another issue, whereby influential groups might manipulate the process to serve their own interests, sidelining the needs of the broader community. Furthermore, participatory planning demands significant time, resources, and expertise in engagement. In public institutions already burdened by the reduction of public spending, participatory planning translates into extra workload, which may lead to internal resistance. In parallel, public participation has been increasingly outsourced to private consultants who have an explicit economic responsibility to their shareholders and not to the public [251, 254]. With such outsourcing practices becoming increasingly common, governments risk eradicating trust and transforming community relationship-building into a checklist of codified practices [251].

Addressing space beyond space. Every society produces its own space [255], and in the digital society, space is also digital. With the digitalisation of urban systems, large datasets are being created through the use of digital platforms and apps [256], so-called big data [257, 258]. Advances in data analytics and visualisation have enabled the extraction of multiple indicators about urban functioning from these datasets [258, 259]. Making decisions about cities assuming that these discrete analytical insights represent real experiences of people in a kind of "passive participation" is highly problematic, primarily because such datasets simply do not account for the groups who are not users of digital devices and services. Particularly in the case of mobile apps, a specific kind of user, and thus citizen, is co-constituted by the interactions with apps: One who is always on the move, as rationally and efficiently and smoothly as possible [256]. Digitalisation also influences institutional participation. Technological advances in the field of geographic information systems (GIS) have made it possible to gather and represent local knowledge in the form of digital maps [250, 260–262]. New digital tools for public participation have emerged, with great potential to reach larger numbers of participants, enabling remote participation and two-way interaction between stakeholders [250, 262, 263]. These tools are compatible with the ongoing digitalisation of urban governance practices, facilitating the documentation and monitoring of policies and supporting transparency and openness between the government and the public. However, with these possibilities, new challenges emerge, including concerns about privacy and consent [263], inequalities in terms of digital literacy [250], disingenuous use of digital tools in *mapwashing* practices [251], and new power dynamics and forms of colonialism and dispossession, often accentuating existing inequalities [256, 264]. It is thus necessary to ask which citizens are worthy sensors, for what and for whom, and whether they are aware of data-capital dynamics [251, 264].

5 Climate Action Renews Claims for Justice in the City

Cities are seen as sites of opportunities for climate action for several reasons. First, local governments are in a privileged position to lead the urban transformation because of their proximity to their constituents and a consequent higher level of accountability. Second, local governments can leverage local contextual knowledge and assessments to integrate climate action into local investments, policies, and regulatory frameworks. This way, local governments have been able to set ambitious targets for their cities, going beyond national goals [265]. In addition, many cities have public facilities to lead the way towards decarbonisation, e.g., by retrofitting public buildings first. Third, cities have emerged as key spaces of social experimentation and problem-solving in the 21st century [37, 266]. The concentration of people and industries in large cities provides the opportunity for technological innovations and for the rapid spread and adoption of new ideas and innovations, both in technical and behavioural solutions. Fourth, climate action in urban areas can lead to various other benefits if well-designed, planned and implemented [267]. For example, green spaces have the potential to improve air quality, mitigate flooding, enhance physical and mental health, and promote social and cultural well-being [268], and sustainable transportation may improve local public health through reduced air pollution and

increased physical activity [269]. Fifth, city transformations influence the broad transformation of society, with situated and contextual knowledge from place-based interventions helping to understand why transformations occur and are supported in some places but not others, facilitating trans-level knowledge transfer and the up-scaling of place-based initiatives elsewhere [267].

While there have been multiple institutional movements to leverage the opportunities presented by cities to drive societal change in response to urban challenges, dominant narratives fail to address urban inequalities. The idea of a *resilient* city, capable of surviving, adapting, and growing despite chronic stresses and acute shocks, has attracted significant attention in the context of climate change [36]. Other city concepts aim to address a specific urban challenge or a combination of them have been developed and implemented worldwide, including the smart city [257, 270], the 15-minute city [271], the feminist city [272], the circular city [273], and the sponge city [274–276]. Many such urban models acknowledge the intertwined issues of climate change and inequalities and the need for an inclusive approach to urban development. However, much of the criticism towards these concepts stems from a lack of *justice* and *equity* considerations to drive the development and implementation of transformative initiatives [277–283]. Not surprisingly, critical research and empirical evidence highlight extensively how these initiatives have often failed to deliver on their promises and, instead, have been exacerbating inequalities and creating new forms of dispossession [256, 264, 284–287].

Debates about justice in cities are not recent. In the late 1960s and early 1970s, when social and political movements of unprecedented strength exploded worldwide, scholars and academics were propelled to include a moral dimension in studies about the urban living condition. The concept of justice has a broad meaning when understood as the quality of being just or fair. From a philosophical point of view, justice is seen as the fundamental virtue of institutions [288], “the one that secures the basis for developing all of the rest” [289]. Beyond institutions, the symbolic force behind justice has the potential to foster collective action across cleavages of class, race, and gender, creating a sense of solidarity based on shared experiences [290]. This is important because the level and scope of action necessary to address climate change requires a collective focus on the most challenging problems in the contemporary world in ways that span large segments of the socio-political spectrum. Calls for justice in urban climate action also resonate with long-standing and increasing calls for environmental, sustainability and climate justice [7, 291–297]. Explicitly addressing justice in climate action is not only instrumental to achieving the level of political support for climate efforts, avoiding socio-political resistance and unrest [298], but also offers an opportunity to build solidarity among feminist, labour, anti-racist, climate, and environmental movements.

With important contributions from Rawls [288], Marcuse et al. [299], Young [300], Harvey [301], Massey [302], Fraser [303, 304], Fainstein [305], and Sen [306], and decades of environmental justice research and activism [292], justice scholarship now offers three perspectives for understanding (1) where injustices emerge, (2) which part of the society is ignored and excluded, and (3) which processes exist to include the ignored to reveal and reduce such injustices [307]. These refer to distributional, recognition, and procedural justice, respectively. They are not exclusive and should be addressed together, as inequitable distributions of benefits and burdens, lack of recognition, and limited participation in decisions, all work to produce and reinforce injustices and claims for justice [292]. Together, the three dimensions of justice challenge the dominant paradigm in urban decision-making. Distributive justice refers to the fair distribution of benefits and burdens among individuals in a society. Recognition justice means acknowledging the differences between social groups created by structural inequalities. Procedural justice refers to the fairness in the procedures through which decisions are taken. In their absence, decisions are taken in a utilitarian and exclusive way, resulting in the current scenario in which privileged groups are systemically the recipients of benefits and oppressed groups are systemically left out of the distribution of any resource or benefit. These injustices are even more pronounced when the oppressed, already left out of the distribution of urban development benefits, are also the ones that bear the burdens of climate action, such as climate risks and resource pollution [297].

6 A Call Spatial Justice in Urban Climate Action

Influenced by scholars like Edward Soja and Mustafa Dikeç, the concept of *spatial* justice highlights the importance of examining the socio-spatial structures that underlie the distribution of the burdens and benefits of spatial development and our life together in society. Soja, in particular, introduced the idea of spatialisation of justice, emphasising the interconnectedness of social and spatial processes calling for a “spatial turn” in the social sciences, where the spatial dimension is prioritised over the historical dimension [290], alluding to the “broader spatialisation of our basic ideas of democracy and human rights, as in the revival of Lefebvre’s notion of the right to the city” [308]. The central argument in Soja’s call for spatial justice is that the spatiality of (in)justice affects society and social life just as much as social processes shape the spatiality of (in)justice. In the absence of an explicit emphasis on the spatiality of (in)justice, many opportunities for theoretical and empirical analysis and spatially-informed social and political action are lost. Such intentional and focused emphasis on the spatial dimension, although temporary [290], has a strong appeal to spatial researchers and practitioners.

An important but often overlooked contribution in Soja’s book *Seeking Spatial Justice* is his stretching of the concept to its maximum spatial scope: “We can speak of unjust geographies involving the human body, as in debates about

abortion, obesity, stem cell research, the transplantation of body parts, sexual practices, or the external manipulation of individual behaviour. At the other extreme, the physical geography of the planet is filled with spatially defined environmental injustices, some of which are now being aggravated by the uneven geographical impact of socially produced climate change and global warming” [290]. It is this multi-scalar understanding that connects spatial justice to climate change as climate impacts, responsibility, and prospects are all unequal from the individual (the body) to the global level (the planet). Seeking spatial justice in climate action thus addresses colonial injustices that materialise today in staggering socio-spatial inequalities between the high-income, former colonial powers in the Global North and other countries homogenised into the “Global South” collective. Through asymmetrical power dynamics, global inequalities hit individual and community levels cumulatively and disproportionately across the intersectional dimensions of race, gender, and class. With the central role of cities between spatial scales, we contend that urban research and practice have a paramount role in ensuring spatial justice in climate action.

Scholars in spatial disciplines have always been collecting, gathering and analysing urban data to describe and document urban inequalities and have already started engaging with justice discussions (e.g., [50,53,54]). Perhaps because distributive injustices clearly manifest in space, the distributive aspect of spatial justice has received more attention so far. The growing volume of data about urban activities combined with an increasing computational capacity also contributes to the prominence of distributive spatial studies. While acknowledging these contributions, we call for a integrated spatial justice perspective that considers the geographical processes through which injustices are (re)produced, not only through the lenses of distributive justice (how benefits and burdens are distributed across space and how space influences such distributions), but also recognition justice (how space contributes to oppression and how oppression shapes space for the benefit of a privileged minority) and procedural justice (how space influences representation in decision-making and how decision-making sustains spatial inequalities).

7 Way Forward for Urban Research and Practice

The reviewed literature robustly shows that climate change and urban inequalities are intertwined challenges in cities. Both are multidimensional, and people and communities face their impacts disproportionately and cumulatively. Existing inequalities overlap with climate risks and hinders the capacity of people and countries to cope with, mitigate, and adapt to climate change. Climate change exacerbates existing inequalities, pushing people into further vulnerability, and creating new forms of dispossession. Another common thread is their manifestation across different spatial scales, from intersectional risks and burdens on individuals to cities, regions, and countries. In the context of dominant city narratives that overlook urban inequalities and their spatial and historical connections to climate change, the main implication of this paper is exposing the urgent need for an alternative set of principles to underline climate action in cities. To this end, we offer the following eight principles (P) to advance spatial justice in urban research and practice (Figure 4).

P1: Account for Cumulative Effects

Despite the overwhelming evidence of distributive inequalities, most studies look at the distribution of a particular infrastructure resource or urban service/amenity. Such an approach has two consequences. First, it does not capture socio-economic barriers that ultimately determine whether people can benefit from urban resources and services. For example, focusing on the distribution of metro stations without considering whether people can afford a ride. Second, it does not capture inequalities in the distribution of ‘real’ benefits. For the same example of the metro stations, the real benefits are not the stations but the destinations people reach with the public transportation system or, rather, the benefits they get at these destinations. Moreover, more attention should be given to the cumulative distribution of burdens, such as air pollution or traffic noise, as they also contribute to cumulative inequalities. In other words, distributive justice must go beyond infrastructure and services to consider the distribution of *real benefits and burdens* in a *cumulative* matter. Multiple frameworks exist to support a comprehensive assessment of both benefits and burdens, including social impact assessment [309,310] or the capabilities approach [311], which have recently gained attention across different fields evaluating spatial justice, e.g. transportation and energy [50,53,231].

P2: Go beyond Simplistic Demographics

Inequality studies also often take a simplistic approach to evaluate inequalities across socioeconomic groups, neglecting how systemic dimensions, such as race, gender, and class, operate together and exacerbate each other. Here, we argue for a serious engagement with the concept of intersectionality [312–315] to approach recognition justice. The concept of intersectionality helps to explain how multiple social forces, social identities, and ideological instruments work together to reproduce inequalities and legitimise asymmetric power relations. Intersectionality in recognition justice also implies a deeper commitment to decolonising, anti-racist, and other progressive scholarships and movements [119,316] and resonates with indigenous calls for self-recognition [317].

P3: Connect to Critical Theory

With overwhelming opportunities for data-driven urban research raising questions about “the end of theory”, we reinforce

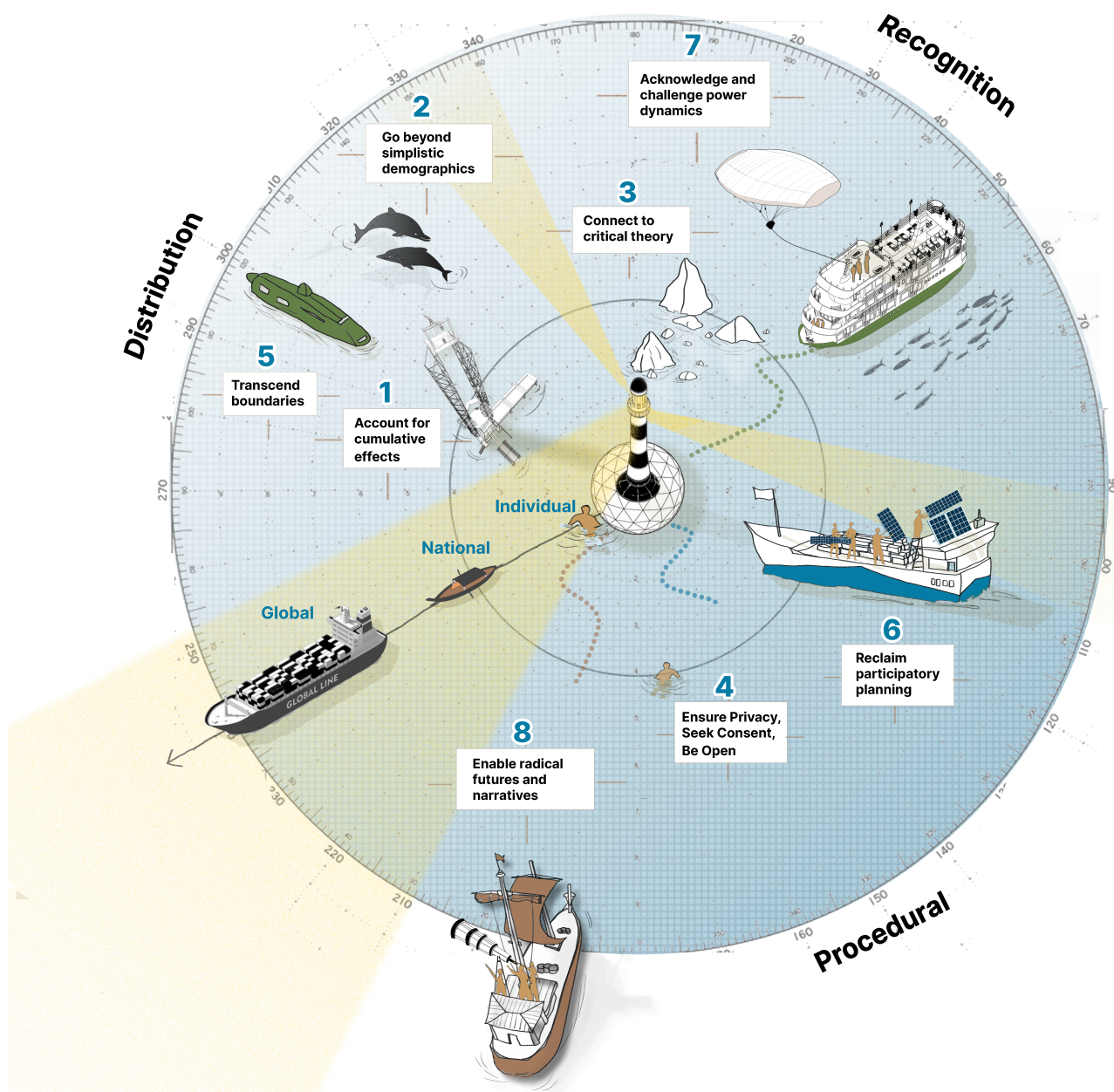


Figure 4: With spatial justice as the lighthouse, guiding climate action in cities from the individual to the global scale, this figure illustrates the eight principles we propose in the paper. We leave the interpretation of each element in this image open to the reader.

that critical urban theory remains or becomes even more important to interpret the patterns found or invisible in the data [259,264]. Not only existing theories are important, but also new theories have to be developed to account for the impact of digitalisation and algorithmic systems that currently shape social realities [318]. We argue, in particular, for a critical theory perspective that questions power dynamics in urban climate action, highlighting systemic and structural inequalities [264,297].

P4: Ensure Privacy, seek Consent, be Open

Given the scale at which urban data is being collected (or appropriated), renewed attention should be given to privacy and consent. Inspired by the Declaration on the Rights of Indigenous Peoples, we argue that consent has to be free (without manipulation), prior (to data collection), and informed (by complete and transparent documentation). At the same time, we argue for open research practices as a way to improve transparency and reproducibility and counterweight the increasing commodification of urban data and knowledge [256,264].

P5: Transcend Boundaries

Given the complex and interlinked nature of urban processes and climate change, we call for transdisciplinary practices to challenge established notions of knowledge. From a pragmatic perspective, a transdisciplinary approach enables collaboration between actors from different sectors (i.e., private, public, and/or civil society) around a specific problem statement, in a joint process to define new research questions, new methodologies, and new ways of inquiring results [319–321]. From a critical perspective, transdisciplinarity enables the creation of new knowledge by combining disciplinary inputs with lived experiences, for example, via the collective documentation of urban processes [251,322]. This requires going beyond conventional research and education methods: Maps, professional and community education, festivals, exhibitions, manuals, manifestos, and social media, all contribute to advancing a spatial justice perspective. Also, drawing from feminist and decolonial scholarship, it is imperative to advance knowledge systems that situate urban climate action within existing struggles for justice in the city [297,323].

P6: Reclaim Participatory Planning

Reclaiming participatory planning and design is not only instrumental to counteract tokenism and *mapwashing* practices but is also essential to ensure the democratic right of involving citizens in the decisions that affect them. To this end, we argue that participatory activities need to be embedded in the planning process with the clear goal of influencing decision-making [250], intentionally transferring decision and action power to people [253]. This entails new forms of participation that enable multi-way interactions among citizens and other actors for collective decision-making [324]. In this context, we also stress the importance of informal or indirect forms of participation that contribute to the development and design of a place, including community-led and insurgent forms of action [325].

P7: Acknowledge and Challenge Power Dynamics

Power relations strongly mediate access, use, and management of urban systems, directly influencing the achievement of fair decisions and outcomes in cities. We thus argue that urban research and practice must not be naive to the power dynamics shaping the urban environment, particularly in the current context of strong neoliberal influence in cities. This requires building new alliances (e.g., among labour and environment groups) and connecting with community groups and social movements to disrupt existing power relations. We particularly call for a decolonial approach to shed light on historical and geographical power asymmetries that are behind the causes of climate change and existing inequality patterns and will shape the adaptation of urban environments to a changing climate.

P8: Enable Radical Futures and Alternative Narratives

Cities have been pursuing sustainability transitions to deal with spiralling socio-ecological crises. Strongly reliant on expert-led processes, transition visions are highly exclusive and detached from citizens' lived experiences. Being at best informed by the needs and aspirations of citizens, current processes do not lead to disruptive but business-as-usual visions, perpetuating existing inequalities. The lack of a truly collective vision and narrative leads to public detachment from climate decisions, protests against proposed actions, political polarisation and, ultimately, threats to democracy. We thus argue for urban research and practice to empower citizens and other urban actors to formulate bottom-up agendas from the margins, enabling radical futures and alternative narratives for climate action [325,326]. From a decolonial perspective, we further stress that visions and narratives must accommodate various ways of living, in a truly pluriverse city [327].

8 Conclusion

With over half of the world's population living in urban areas, cities are hotpots of climate risk while offering huge potential for transformative change. As it becomes clear that the future of cities may be rather frightful, we contend that

this future has already arrived for many communities worldwide. In this paper, we show that everything about climate change is disproportionate, from unequal climate impacts to unequal responsibility and unequal prospects. The reviewed literature demonstrates that not only climate impacts but also many of the actions to address climate change come to reinforce existing inequalities and push people into further vulnerability. These climate-related inequalities overlap with existing urban challenges, renewing old concerns about social justice in the city. Acknowledging that inequalities are created, shaped, and maintained by spatial processes, we call for spatial justice in climate action and offer eight propositions that support spatial scholars and practitioners in pursuing a critical perspective on climate change in cities.

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