WORKING PAPER

Just Transitions- Cities

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Introduction

While Europe, North America, and Latin America already have most of their population living in towns and cities,[1] an additional 2.5 billion people worldwide are expected to live in urban areas by 2050, with up to 90 percent of this increase taking place in Asia and Africa. Indeed, 35 percent of this urban growth is projected to occur within just three countries - India, China and Nigeria (UNDESA 2018). As cities grow, so does the number of low-income urban residents. Poverty is becoming an increasingly urban phenomenon, with many low-income urban residents living in rapidly expanding informal settlements with inadequate basic services. In addition, there is a lack of financing, resources, and institutional capacity to support the livelihoods, wellbeing and resilience of the urban poor (Beard *et al.* 2016). As a consequence of this growth, cities are becoming more materially, socially, and spatially fragmented. Everyday life for urban residents involves *"fragments of stuff: toilets that often seem to be broken or inadequate, water pipes that don't keep their pressure or quality, houses that demand constant labor and maintenance…Urban life, for a growing number of people across the world, is more and more about the struggle of managing infrastructure, housing, and services that are unreliable or unable to meet basic needs"* (McFarlane 2021, p3).

At the same time, there is a need for a global climate transition, with a consensus to reduce emissions to 'net zero' by mid-century. Urban and infrastructure transitions are essential if this global need is to be met (de Coninck *et al.* 2018) and will include taking action towards lower carbon alternatives before cities lock themselves into unsustainable and unjust development pathways. The climate transition and the urban transition are taking place in parallel, with significant implications for both agendas. However, the way in which these transitions take place will not affect all people equally. For this reason, this paper examines the components that are necessary for just transitions in cities and proposes approaches that can support sustainable development, low-carbon pathways, and resilience.

We argue that cities and urban areas are particularly relevant in achieving just transitions in response to climate change for three main reasons. Firstly, they are critical sites of greenhouse gas emissions that drive global climate change. Various estimates for the scale of this exist, but there is a general consensus that around 70 percent of the global carbon footprint is attributable to urban areas (although this is concentrated in a relatively small number of high carbon footprint cities) (Moran, Kanemoto et al. 2018). While the contribution of low-income urban residents in the global South to greenhouse gas emissions are small in comparison to people living in cities in the global North, as they move into the middle class, they will increasingly adopt patterns of consumption that drive emissions and

[1] We refer to 'cities' and 'urban' not as bounded by city-limits, but defined by a wide variety of socio-spatial urbanisation processes. These range from scalar urbanisation stretching to metro-regions that shape local everyday realities as much as they play a role in transforming international order (Acuto 2013); to a blurring of urban territories from city-centre to small towns; as well as to the simultaneous expansion of industrial urbanisation into the hinterland (Schmid and Brenner 2011).

climate change, making cities in the global South important actors in the fight against climate change.

Second, many of the impacts of climate change will be felt most severely in urban areas. The recent IPCC Working Group I report (IPCC 2021) concludes that urban areas will see an increased frequency of extreme climate events including heatwaves and intense rainfall, as well as sea level rise. Moreover, urban residents will experience water scarcity (He, Liu et al. 2021).

Third, and most importantly, we argue that the technological and governance innovations, and socio-cultural adaptations required to sustain a just urban transition will arise, at least in part, from the everyday realities and challenges of specific groups in specific places identified by the wide variety of socio-spatial urbanisation processes shaping our world today, and across future generations.

The paper has three main sections. The next section provides an overview of the ways in which just urban transitions have been defined and explored in existing literature. After that, the paper delves into the processes which have resulted in significant injustice in urban areas, particularly around the ways in which climate change and disasters – and responses to these – unequally affect low-income residents. The final section proposes key elements of a just urban transition, looking specifically at transitions in the built environment and infrastructure; transitions in basic needs and services to support physical and mental wellbeing; transitions in society, politics and governance; and transitions in urban data systems.

Towards a framing of 'just urban transitions'

Setting the Context: approaches to urban climate justice

There is a rich literature on urban justice, environmental justice, climate justice, and just transitions. A full review of this is outside the scope of this paper, but this section provides insight into the current debates that are of particular relevance. Although a range of framings exist, most authors engaging with either urban justice or climate justice develop their analysis from a starting point of 'procedural' and 'distributive' elements – where procedural elements refer to the justice within processes, and distributive elements refer to just outcomes (see, for example, Bulkeley *et al.* 2013). Furthermore, the increasingly localised and place-centric nature of critical global challenges (e.g., sanitation, housing, energy) imply that both procedural and distributive elements require a geographical approach, which locates solutions, innovations, and adaptations in relation to the everyday realities and challenges of specific groups in specific places.

Several recent critiques of urban climate justice have highlighted the failure to adequately assess the outcomes of adaptation actions. At a global scale Eriksen *et al.* 2021 have shown that some interventions undertaken to address climate risk often and inadvertently reinforce, redistribute, or create new sources of vulnerability – an outcome which is clearly at odds with a just transition. At local scales, interventions often either conflate formal and informal practices, attributing agency to formal structures alone, or they tend to polarise formal and informal spheres of cities and towns, ignoring interconnectedness (Daniels 2004) or hybrid arrangements (AlSayyad and Roy 2003) between the formal and informal. These critiques highlight that the challenges of dealing with the "unplannable", as exceptions to the order of formal urbanisation, are not limited to the global South, but entirely relevant to urban planning concerned with distributive justice in a range of material, social and political contexts (Roy 2005).

An increasing number of cities around the world have implemented a growing number of adaptation projects (for example Westman and Castán Broto 2018; Hunter *et al.* 2020). However, reviews of these projects from a climate justice perspective have highlighted that these tend to focus on plans rather than on actions (Westman and Castán Broto 2021), and have failed to engage with *'how'* to advance climate justice and the relationship between urban form and justice (Mohtat and Khirfan 2021). Anguelovski *et al.* (2016) provide a detailed

assessment of the ways in which urban climate change interventions can lead to unjust outcomes, through either neglecting to consider the particular needs of vulnerable and marginalised groups (acts of omission) or through actions that directly have negative impacts on these groups (acts of commission). For example, the provision of protective infrastructure can benefit wealthier economic development and financial assets (omitting the needs of lower-income groups) or can actively displace the urban poor from long-term settlements and city centres.

Other authors have examined the ways in which 'nature-based solutions' to climate change, including in urban settings, have been applied uncritically without consideration of the power relations which shape their application (Tozer *et al.* 2020, Osaka *et al.* 2021). A final critical gap is the exploration of the link between urban climate justice and informality. Despite the fact that more than one billion people around the world are residents of informal settlements which are particularly vulnerable to climate change, urban climate responses regularly ignore or engage inadequately with building resilience in these settlements (Satterthwaite *et al.* 2020). Climate change responses in urban settings that do not take the needs of these settlements into account are patently failing to encourage just transitions.

Just transitions in response to climate change need to be considered alongside just responses to the Covid-19 pandemic. These are likely to require upholding the self-determination and agency of low-income nations in the pandemic response, giving priority to marginalised groups, ensuring equity in health-care provision, balancing critical care with essential health services, and respecting human rights in public health interventions (Kelley *et al.* 2020). Regarding urban settings, the connecting agendas of risk and vulnerability (including Covid-19) highlight affordable and healthy housing, social cohesion, minority and local leadership, and multiscale governance as entry points for recovery and renewal that addresses existing and emerging injustice (Pelling *et al.* 2021).

A framework for a just transition in cities

Drawing on the observations above, in this paper we propose three key elements that are essential to a just transition in cities. We recognise that this framing is not exhaustive, but it builds on existing academic understandings of just transitions in cities and provides a workable basis for policy and practice. These elements can be represented by three key statements:

i) A just transition in cities **integrates spatial and social components** of equity and justice. It will address the drivers of risk and emissions that are associated with the spatial and social dynamics of urbanisation, recognising that these dynamics are multi-scalar.

ii) A just transition in cities places '**nature-based' solutions** being offered in response to climate change, in the context of and in opposition to socio-cultural and behavioural drivers of inequality and injustice.

iii) A just transition in cities recognises and addresses equity and justice **across generations**. Alongside the significance of inter-group equity, just transitions in cities seed an aspiration to address equity issues across generations within present day mitigative and adaptive actions.

We acknowledge that making these recommendations policy relevant will require tailoring them to the specific sectoral responsibilities of different actors within urban areas. These include national government ministries and departments, municipal authorities, the private sector, and a wide range of community and local organizations. It will also require highlighting the enabling conditions that are required to support these, most notably addressing the gaps in sufficiently scalable climate finance, and the inaccessibility to many of the actors who are best able to implement responses (Colenbrander *et al.* 2018; Soanes *et al.* 2019).

Challenges in cities: the need for just transitions

Achieving just transitions in cities will require responses to a range of challenges such as worsening physical impacts of climate change, urban poverty, urbanisation and rapid urban growth, informality, and connectivity. While these challenges may be social, political, environmental, or economic in nature, they should not be viewed in siloes, but instead as at times competing and overlapping challenges that cities need to address. This section discusses several of the challenges that shape climate vulnerability and risk in cities. The extent of these challenges varies from place to place, but the impacts of them are of particular significance for cities in low- and middle-income nations. Taken together, these challenges highlight many dimensions of inequality and justice which provide the imperative for just transitions in cities.

Climate change impacts in cities

The most recent report of the IPCC confirms previous assessments that human activities have warmed the climate at an unprecedented rate and are likely to be the main cause for the retreat in glaciers, the increase in greenhouse gas emissions and the warming of oceans. This has led to an acceleration of natural disasters since the 1950s including heatwaves, drought, flooding, cyclones amongst others, which can be seen across most land regions (IPCC 2021).

These effects will be felt particularly severely in cities. Changes in land-use result in the urban heat island effect (that can exacerbate the extent of rises in temperature), with analysis suggesting that the major driver for increased heat exposure is the combination of global warming and population growth in already warm cities in Africa, India and the Middle East (Klein and Anderegg 2021). The effects of higher temperatures will affect parts of cities differently, with people living in poor quality housing, or working in strenuous occupations being particularly affected (Gough *et al.* 2019). Similarly, urbanisation often results in reduced permeability of the land surface, compounding the risk of flooding from more intense rainfall, with both river (Alfieri *et al.* 2017) and coastal (Nicholls *et al.* 2021) flooding expected to increase. Low-income groups are also most affected by flooding, both because of the direct impact on houses and neighbourhood infrastructure, and because of the risk of faecal contamination of drinking water supplies (Kayaga *et al.* 2021). Finally, climate change impacts will be felt across generations, with disasters reducing the ability for individuals and households to build long-term resilience.

Urban networks and governance

Cities do not exist in isolation but are connected to their surrounding areas (including managed and natural ecosystems) and other cities in multiple and complex ways. Shocks, including Covid-19, have highlighted how intertwined and interdependent urban societies and economies are. From the rapid spread of the virus to supply chain issues leaving some countries with limited supply of goods, it is becoming evident that actions in one location can have consequences for many others. The climate injustices urban residents in the global South are facing today are *"baked into the broader historical and present social and political trajectories and the ecological, biophysical and infrastructural patterns of the urban region"* (Goh, 2020 p. 567) as well as regional and global climate change. This also means that urban climate impact and efforts towards achieving just transitions have spatial implications beyond the territorial and administrative boundary of a city, as cities are *"entangled in broader networks of geopolitics, economics and governance"* (Goh 2020 p. 562). Just urban transitions therefore need to be understood in the context of this connectivity.

Cities and city networks have played a critical role in shaping global responses to climate change and influencing the global politics of this (Johnson *et al.* 2015; Bulkeley and Castán Broto 2012). By and large, this has taken place through global compacts, cities networks and international organisations. While the number of projects, programs and organisations that encourage partnership and collaboration across cities is growing, little is known about how actions from cities and city networks are contributing to mitigating the

negative impacts of climate change (Johnson 2018). Even less is known about this for cities in the global South (Carmin *et al.* 2012; Gore 2015).

The growing prominence of cities in global climate politics implies a move away from state-centric, multilateral governance that has been the status quo to a recognition of the diversity of players who are contributing to climate change. However, some authors suggest that the power of cities has been overstated (Johnson *et al.* 2015), noting that the agency of cities is constrained by national governments, multinational institutions, transnational networks and multinational corporations. The power of cities to implement effective urban climate policy depends on wider national policies such as trade, food, and fuel subsidies (Sassen 2015). Ultimately, this means that cities have limitations in how they can ensure just transitions and are dependent on the administrative and governance capacities of sectors including transportation, water and sanitation, health, housing and other basic services (Acuto 2013).

Urban poverty and inequality

The number of low-income urban residents is rising in cities in the global South (Beard *et al.* 2016). The urban poor often live in informal settlements on land that has been deemed unsafe for housing, struggle to access public services and have limited financial resources. A natural disaster such as a flood can rob a household of their home and livelihood. With few resources or savings, these households are often trapped in poverty, unable to move from these locations which are at high risk of natural disasters, reducing the quality of life for future generations. At the same time, addressing these conditions will require substantial new investments, which will need to be done in ways which avoid being locked in to high-carbon pathways.

Defining urban poverty is challenging due to the multiple deprivations the urban poor experience such as inadequate income, housing and access to services (Roy *et al.* 2016). Historically urban poverty has been measured by income or levels of consumption (in absolute terms) which fails to recognise the multiple deprivations that make up urban poverty (Mitlin and Satterthwaite 2013; Satterthwaite and Mitlin 2014; Roy *et al.* 2016). The often informal nature of the urban poor results in insecure tenure and employment, which are two of the biggest challenges they face in reducing their vulnerability. In addition, unstable social networks and lack of recognition through citizenship can mean that they have limited abilities to influence municipal decision-making. Through climate change new forms of injustices are created and existing ones amplified. Covid-19 has created additional challenges (Manzanedo and Manning 2020; Salas *et al.* 2020; Milner *et al.* 2021; Sverdlik and Walnycki 2021), as low-income groups who lack access to basic services and adequate housing are less able to practice social distancing, regular handwashing, and other efforts that can reduce risk. Efforts against current and future impacts of climate change will need to be considered with pandemics, as otherwise efforts may be undermined (Watts *et al.* 2021, Sultana 2021). Furthermore, power relations within the community might make some groups more dominant than others, hindering access to opportunities and services.

Groups and individuals most vulnerable in an unjust transition

The urban poor is not a homogenous group of people but is made up of individuals who experience poverty and the impact of climate change differently and have different adaptive capacities. Chu and Michael (2019) highlight how lack of recognition can lead some groups to experience environmental marginality and more extreme forms of climate injustice. Many of these impacts are intersectional, where different characteristics combine to shape the nature of vulnerability and marginalisation.

While urbanization is often associated with greater independence for women, most urban women experience profound disadvantages compared to men in their daily lives (Tacoli and Satterthwaite 2013). Women make significant contributions to

their households, neighbourhoods and the city through their paid and unpaid labour, building and consolidating shelter and compensating for shortfalls in essential services and infrastructure, but face persistent inequalities in terms of access to decent work, physical and financial assets, mobility, personal safety and security, and representation in formal structures of urban governance (Chant 2013).

Women are often more vulnerable to the effects of climate change in cities. **Factors such as limited access to productive resources, poor conditions of housing, low participation in adaptation decision-making, and heavy domestic responsibilities frequently make women more vulnerable, even when they experience similar levels of exposure to men** (Owusu *et al.* 2019). More broadly, the way in which urban spaces are designed and used, and the balance between access to public and private space, can put women in particularly vulnerable positions (Jabeen 2014, Jabeen 2019). However, gender and poverty also intersect with other social vulnerability markers. As Reckien *et al.* (2017, p.164) observe, "*while women are on average more vulnerable to climate impacts than men, upper-class women may be less vulnerable than low-income men living in informal settlements, and healthy adult women are often less vulnerable than disabled men or children.*"

Age is also a significant factor mediating the experiences of urban residents. Child poverty is widespread in cities across the global South (Bartlett *et al.* 2021), and climate induced shocks bring with them a range of environmental hazards such as water and air contamination which are particularly dangerous to children (Perry *et al.* 2011; Baker *et al.* 2008). Availability, access and quality of food during or after a shock can be challenging, increasing the risk of undernutrition in both adults and children. For children, this can lead to a series of developmental illnesses as well as weaker immune systems. According to UNICEF (2021) approximately 3.1 million children die from undernutrition each year, which is more than half of global child deaths. The disruption to education faced by children through a natural disaster is likely to have long term effects on their learning outcomes and job prospects.

Migrants and undocumented people can face extreme forms of climate (and other) injustice as they are often invisible to the state or in some cases erased due to discriminatory development policy (Earle *et al.* 2020). **Footloose migrants – those who continuously move from city to city – are at particular risk of climate injustice, due to their poor access to social networks and political agency** (Chu and Michael 2019). Finally, **disability increases vulnerability to climate change**, as evident through the higher mortality rates of people with disabilities (PWD) during extreme weather events (Cardona *et al.* 2012, Cadeyrn *et al.* 2017). There are a range of factors that contribute to their vulnerability such as personal factors (age, gender, social background, experiences etc.) and environmental factors (e.g., characteristics of built and natural environment, social attitudes). This area requires further research, given the limited understanding of how climate change impacts PWDs in the global South.

Rapid urban growth

Just transitions in cities will need to take place within a context of rapid urban population growth and spatial expansion. More people now live in urban than in rural areas: while only 30 percent of the world's population was urban in 1950, this figure had grown to 55 percent by 2018 and is projected to reach 68 percent in 2050. Up to 90 percent of this increase will be in Asia and Africa, and 35 percent of this will occur in just three countries: India, China and Nigeria (UNDESA, 2018). The increase in urban population is taking place at an unprecedented rate putting pressure on housing, public services as well as space in the city. Ultimately this means a rise in the absolute number of urban poor within cities defined as the urbanisation of poverty. Addressing the needs of the urban poor is one of the biggest challenges city governments in the global South are facing given their limited financial resources and institutional capacity.

While rapid population growth is putting pressure on services and the built environment in low and middle income cities, another major concern is the growth of greenhouse gas emissions due to increased consumption. In situations with inadequate public services, people will tend to *"fend for themselves in inefficient and costly ways that risk harming the environment"* (Beard 2016, p. 3). Urban population growth in itself does not cause an increase in greenhouse gas emissions – indeed, the countries with the most rapidly growing urban populations have very low CO_2 emissions per capita (Satterthwaite 2009). However, as the urban poor move out of poverty there is a risk of an increase in greenhouse gas emissions unless urban development planning and climate change are more integrated. Cities have a choice to either lock themselves in to unsustainable urban trajectories or promote ways of living that are context specific and safeguard the environment.

Informality and the informal economy

Informality in cities has been subject to much academic and policy debate, due to the 'fuzziness' of the term and its perception as an institutional failure. **As the number of people living in cities is rising, so is the extent of informal settlements and the informal economy.** Informal settlements, defined by UN-Habitat as land where residents have either constructed housing to which they have no legal claim or which is not compliant with building regulation (Beard *et al.* 2016) are often located in high-risk areas with weak housing infrastructure, no security of tenure, lack of sewage and drainage systems and limited access to government provided services. These deprivations make them particularly vulnerable to climate change (Satterthwaite *et al.* 2020).

Almost a quarter of all urban residents worldwide – or about 1 billion people – live in slums.[2] Despite this, little consideration is given to residents of informal settlements in urban planning especially when it comes to green economy and climate resilience agendas (Brown and McGranahan 2015). In part, this is due to issues related to informality being challenging for governments and international organisations to address, as they are considered irregular and beyond the purview of the state.

People living in informal settlements often work or are reliant on the informal economy. Although characterised as falling outside formal legal regulations, the informal economy exhibits a high level of diversity. Key activities in the informal sector include waste picking, vending, transportation, agriculture, and services. In terms of gender, 74 percent of women in Sub-Saharan Africa are employed in the informal economy compared with 61 percent of men (Beard *et al.* 2016). Some individuals choose to work in the informal economy as they can earn more than their counterparts in the formal economy. Given the informal economy's resilience, innovation and the fact that it is here to stay, it has received renewed interest amongst scholars and practitioners resulting in revisions in its definition (Chen, 2012; Rogerson, 2016b; Blaauw, 2017; Williams, 2017). While Hart's (1973) perspective still dominates the thinking on informality revisions to the term have highlighted its diversity and links to the formal economy (Brown *et al.* 2014).

Despite conversations around climate change failing to address the informal economy, the two are strongly intertwined. For example, reports on transitioning to a green economy emphasise the creation of new green employment opportunities but fail to highlight how existing jobs in or reliant on the informal economy can be safeguarded or adapted to fit the green economy model. (Brown and McGranahan 2016).

Just Transitions in Cities

Cities are by their nature complex systems, with sophisticated infrastructure, interconnected economies, and a wide range of institutions - all of which will need to undergo transitions to

[2] The nature of informal settlements makes it difficult to provide consistent and accurate measurements, but this proportion is referred to repeatedly in UN Habitat and other international reports, e.g., https://unstats.un.org/sdgs/report/2019/goal-11/

meet the multiple challenges of urban growth and climate change. An in-depth examination of any of these transitions, particularly in a way that makes evidence-based and implementable recommendations for how they can be achieved, is a substantial task.

In this section, we focus on **four specific transitions** that are of significance to achieving just transitions in line with our framework. We have selected these transitions because they are particularly relevant in cities in low- and middle-income countries and are central to redressing inequality. These are the **built environment / infrastructure; basic needs and services to support physical and mental wellbeing; social and governance; and data and knowledge** (table 1).

While each of these areas is cross-sectoral, they form policy clusters that can help to provide a basis for planning, financing, and implementation. Some of these have been frequently highlighted, while others have received less attention. Taken together, they address many of the key needs of low-income groups that are often neglected; yet they also speak to agendas that yield benefits for all urban residents.

Table 1: Summary of just transitions in sectors

Sector	Sub-Sector	Current Injustices	Elements of a Just Transition
Built Environment	Housing	• Poor quality housing that offers limited protection from climate change • Unaffordable to many low-income residents • Informal settlements located on hazardous land • Resettlement programmes often exacerbate inequality	• Increased availability and affordability of land for low-income residents • Participatory approaches to informal settlement upgrading • Community-led resettlement and land-purchase initiatives
	Energy	• Limited recognition of energy as an essential basic service • Large scale electrification does not reach informal settlements • Low-carbon / renewables may disproportionately benefit wealthier urban residents	• Involving low-income and/or informal workers in energy upgrading (e.g. waste-to-energy) • Appropriate and affordable use of off-grid and micro-grid solutions
Basic Needs	Food	• Cost of nutritious food / lower cost of less nutritious food • Disproportionate burden on women in accessing affordable nutrition • Disproportionate focus on food production rather than on affordability and access	• Support to local markets that are hygienic and provide nutritious food at affordable costs • Support to local (urban) agriculture (primarily as a supplement to main sources of food)
	Water and Sanitation	• Water costs are higher for residents without piped water • Poor quality of water, often unreliable supplies	• Improved access (location, safety) for water and sanitation facilities

		• Low-cost sanitation inadequate for dense settlements • Limited privacy and poor safety	• Reduced costs, particularly for unpiped water • Investment in city-wide infrastructure that connects to community sanitation systems
Society		• Marginalisation of most affected population groups • Erosion of indigenous knowledge	• Enhanced research on societal factors affecting just transitions with spaces for the inclusion of local & indigenous knowledge • Enhanced participatory processes to especially include those most affected, in adaptation and mitigation plans • Devolved political authority and decision-making in delivering social services and welfare
Data		• Tech-based solutions that further drive inequality • Lack of social justice considerations in the collection of data • Unequal access to data that drives urban climate governance • Lack of technical and institutional capacity to process data	• Increased computing power and adoption of smart technology that focuses on inclusivity • Enhanced data access

Just transitions in the built environment and infrastructure

The built environment is critical to human development outcomes and to achieving the Sustainable Development Goals in urban areas. The UK All-Party Parliamentary Group for Excellence in the Built Environment defines the built environment as encompassing *"all forms of building (housing, industrial, commercial, hospitals, schools, etc.,) and civil engineering infrastructure, both above and below ground and includes the managed landscapes between and around buildings"*.[3] The quality, affordability, and accessibility of the built environment – including the ways in which it is modified in response to climate change – can have either just or unjust outcomes for urban residents.

A range of factors related to the built environment, including land use strategies, exclusionary planning, unequal distribution of adaptation benefits and perpetuation of unsustainable development patterns, are significant in achieving just transitions in cities (Anguelovski 2016). In addition, the complexity of interactions between people and built environments, particularly in densely populated, fast-growing towns and cities in the global South, means that an integrated approach to understanding and addressing issues associated with the built environment is required. The built environment affects and is affected by a range of other

[3] http://cic.org.uk/services/all-party-parliamentary-group.php

urban processes, including informality (of livelihoods, housing, transport and other basic services), migration (both forced and economic), and the impacts of and responses to climate change (Earle and Goh 2020). This section takes an integrated approach, while using the housing and energy sectors as specific entry points to understand the types of transitions have taken place, and that are required, in the built environment.

Injustice in housing

Deficiencies in the built environment have a significant impact on low-income urban residents. The availability of housing – particularly affordable and safe housing, in accessible locations – is one of the key struggles facing low-income urban residents around the world. In addition, it encapsulates a range of sustainability challenges, including location (with implications – for example – for energy use in transportation and exposure to climate related hazards), building materials (with implications – for example – related to carbon footprint and resilience to shocks and stresses) and affordability (with implications – for example – around accessibility and inclusion).

Housing is extremely important for the livelihoods of low-income urban residents, especially women who are often involved in home-based (informal) economic activity. However, **much housing is constructed from low-quality materials and is located in hazardous sites, ultimately leading to an increased exposure to climate-related events**. Many urban residents live in structures built from materials such as bamboo, wood, corrugated tin, straw and jute sticks leading to high levels of risk from infectious and parasitic diseases, accidental fires, extreme weather and pollution. Inadequate planning of housing developments can further exacerbate risks associated with housing and climate change: for example, poorly engineered housing on unstable slopes can induce landslides. It can also have serious health consequences, as exposure to extreme weather conditions increases with poorly planned and engineered housing, which can lead to a higher exposure to illness and disease (Dodman *et al.* 2021).

Large scale government-led housing programmes often involve relocating or upgrading existing settlements. However, **resettlement programmes may exacerbate existing inequalities, if they remove people from their livelihood opportunities and social networks.** There can also be gendered dimensions to this, as differentiated gender needs and roles are often missed out in displacement or relocation plans, which usually lack planning for access to community services and childcare facilities. (Reckien *et al.* 2013). However, some positive examples do exist such as the community-led resettlement of riverbank communities in Bengawan Solo River in Indonesia (Taylor 2013). The relocation process was undertaken as a response to the 2007 flooding that hit the city and damaged 6,368 houses. In partnership with civil society organizations, the city government of Surakarta initiated a participatory approach for resettlement. This entailed organising the communities to be resettled, entrusting them with managing financing and collectively purchasing the land on which resettlement is to take place. This process has resulted in the relocation of 1,571 households from the Bengawan Solo Riverbank to form new communities in more than 10 locations that are less at risk of the impacts of climate change.

More examples exist of community residents and community organisations working with local governments to implement upgrading programmes. Comprehensive community-led upgrading, such as that led by organisations including CODI (in Thailand) (Archer 2012a, Boonyabancha and Kerr 2018) and networks of slum-dwellers (in a range of countries) (Archer 2012a, Satterthwaite and Mitlin 2013) can form a strong basis for assessing current risks and anticipating future risks. Upgrading while retaining high levels of density is also significant in ensuring residents are able to access livelihoods and social networks. Examples of plans that do this can also be seen in Karachi, Pakistan, which ensure that street-level activities and local amenities are supported as well as multi-storey housing.[4] Low-cost housing can also be designed in ways that specifically takes local climate hazards into account. For

[4] see www.urbandensity.org

example, projects in Vietnam have designed and built houses that are more resilient to storms; projects in Pakistan have adapted structures to manage high levels of heat; and houses in India have been made more flood-resilient (Moench *et al.* 2017).

Injustice in energy infrastructure

The energy sector is one of the main contributors to global emissions, and there is growing acceptance of the need for cities to provide greener, more renewable energy in urban areas. Yet, at the same time, clean and modern energy is unavailable or unaffordable to many urban residents, and policy responses may have unjust outcomes. Energy access for all is a goal that remains unattained for the majority of cities in the global South, particularly for the urban poor (Singh *et al.* 2015). This is in part due to the lack of recognition of energy as a basic service and a limited understanding of how energy supports people's lives (Singh *et al.* 2015, Castán Broto 2020).

Through massive infrastructural developments, such as those in the energy sector it becomes evident that while the large-scale investment might be economically beneficial to certain groups and also safeguard the environment it can exaggerate existing socio-economic differences or in fact create new ones. Transitioning to lower carbon alternatives can make access to energy more challenging and more expensive, ultimately resulting in lower levels of electrification among the urban poor. For example, renewable feed-in tariffs that can contribute to decarbonisation are likely to disproportionately benefit households that have sufficient space and ability to invest in solar photovoltaics or other sources of generation. Furthermore, without looking at energy access holistically, greenhouse gas emissions could actually increase. For example, under current conditions in Kolkata, switching from diesel to electric vehicles would lead to a net increase in greenhouse gas emissions due to the inefficiencies in electricity production and supply (Colenbrander *et al.* 2017).

What does a just transition look like in the housing and energy sectors?

Housing and energy are essential requirements for all urban residents, and the way in which these needs are met has major implications for the achievement of climate adaptation and mitigation. Transitions in these sectors are therefore urgently required – but these transitions need to be made in ways that produce more just outcomes. Central to this will be access to adequate housing and energy (i.e. that supports health, wellbeing and livelihoods) that is affordable to all urban residents. An overarching requirement for a just transition in this space is a recognition of adequate housing as a right, and the recognition of the validity of different mechanisms and strategies for addressing this.

First, just transitions in housing and energy need to address both social and spatial inequalities. One of the major drivers of risk for low-income urban residents is the lack of availability and/or unaffordability of land for housing in appropriate locations. This often results in the creation of informal settlements on marginal and hazard-prone land because this enables access to livelihoods and other urban benefits, or the displacement of low-income residents to peripheral locations thereby limiting livelihood opportunities. Redressing spatial inequalities requires that relevant authorities consider accessibility and affordability of land for all residents as a fundamental element of spatial and sectoral planning. This can be supported by more thorough participation of urban residents in decision-making about upgrading and relocation. New models and approaches such as community led resettlement and land purchase initiatives and in-situ participatory redevelopment of resilient housing are relevant in this space. A good example of an approach that can be scaled up comes from the Baan Mankong Collective Housing Program that was started in Thailand in 2003. The program channels government funds, in the form of infrastructure subsidies and soft housing and land loans, directly to poor communities. The communities then plan and carry out improvements to their housing environment including basic services and tenure security while managing the budget themselves. The process entails

close collaboration between poor communities, local governments, professionals and NGOs to ensure that the housing needs of poor communities are considered in broader urban development processes (Archer 2012b).

Second, just transitions in housing and energy need to redress inequality both within and between generations. Consideration of the implications of transitions in housing and energy for the livelihoods of low-income groups are particularly important in this regard. There is a need to recognize the disproportionate impact transitions are likely to have on the urban poor and identify ways that these can be better integrated and addressed in policy and programs. For example, while waste is a relatively small proportion of greenhouse gas emissions in cities in the global South, the sector provides roughly 2% of all livelihoods in the informal economy in the global South through waste picking and sorting. Waste to energy has a large potential for emissions reductions as it is an efficient way of recycling. Furthermore, waste to energy infrastructure is economically attractive and has the potential to provide stable jobs (Colenbrander *et al.* 2016). However, without the inclusion of the informal sector, those who are currently sustaining their livelihoods through waste picking will be left out and further marginalised. The Alliance of Indian Waste pickers has seen some success in formalising the employment of informal waste pickers through cooperation with local non-governmental organisations and community-based organisations (Colenbrander *et al.* 2017). More resilient and low-carbon construction practices are also significant here. Informal builders often construct houses or slum upgrading or provide energy access by illegally tapping into energy sources. Programmes that enhance skills and capacity not only enhance their ability to manage risks but also allows government to provide training on earthquake or flooding resistant building for example. Guidelines and regulations that respond directly to climate risks – while ensuring social acceptability and affordability – need to be mainstreamed into housing and energy planning to ensure resilience.

Third, just transitions in housing and energy – and in the built environment more broadly – need to engage seriously with the preservation of nature and ecosystems. This includes incorporating climate vulnerability assessments into resilient housing and energy developments in cities and considering nature-based approaches that can contribute to reducing risk and emissions. Government agencies leading housing programmes need to institute processes to map the risks that affect target communities using scientific (e.g., satellite remote sensing) and participatory (e.g., community surveys) approaches (ensuring that communities are equal partners in the process, and not merely collectors of data). These programmes must be organized to bring about reductions in exposure (e.g., through ensuring that dwelling units are based on plinths to reduce risk from floods), vulnerability (e.g., through the provision of improved water and sanitation) and hazards (e.g., by ensuring that new construction does not contribute to destabilizing slopes and increasing landslide risk). This in turn would result in the development of 'adaptive housing' where units are built to withstand climate impacts. This can incorporate both structural and nature-based solutions, including the use of new building materials (e.g., to withstand the impact of heat or moisture), elevated storage spaces (e.g. to ensure that important assets and documents are not impacted by flood events), passive cooling systems including green roofs and neighbourhood greening (e.g. to ameliorate the risk of extreme heat), and rain water harvesting systems (e.g. to reduce the risk of water scarcity). While there is also the potential for nature-based solutions to contribute to inequality and injustice, they can be an important element of context-appropriate responses that contribute to multiple positive outcomes.

Just transitions in basic needs

Just transitions in cities will require making sure that the basic needs of all urban residents are met. The significance of basic needs is often under-estimated, perhaps partially because many of the components of basic needs are managed by or have their most significant implications for marginalised groups. For example, women spend a disproportionate amount of time managing the water, food and health needs of households; and the effects of poor-quality

water, inadequate sanitation, and low-quality nutrition are most severe on infants and the elderly.

The term basic needs can cover a wide range of human requirements for surviving and thriving in urban settings. However, we use the term here explicitly to refer to the necessary requirements for life, and key contributors to human wellbeing, that are not explicitly covered through the focus elsewhere in this report on the built environment. Urban systems of various kinds play a role in meeting basic needs. These include the physical systems that connects water supplies from groundwater or river basins to the reticulation networks that distribute these to urban residents; the economic systems that shape the distribution and affordability of food; and the institutional systems that enable access to public health facilities.

Injustice in urban food systems

It is well documented that access to adequate diets is a major challenge for low-income communities in cities across the global South (Boonyabancha *et al.* 2019). **A just transition in cities will require a stronger focus on how different groups within cities can access nutritious food in an affordable way.** Understanding and improving the ways in which urban residents – including the urban poor – access food requires taking a systems approach that looks at the flows of food into cities, from surrounding areas and from further away.

Access to food and consumption depends on gender, race, age, marital status as well as socioeconomic status and class. The greatest determinant of food access is income and financial resources – those with a stable income are more food secure (Mackay 2019). The challenge cities in the global South face is that rapid population growth has not been in tandem with economic growth, resulting in many residents facing challenges in accessing food (Sabiiti and Katongole 2016). Within households, women are frequently in charge of cooking, with many cooking stoves use biomass fuels in inadequately ventilated living spaces. Women are more exposed to these risks on a day-to-day basis which according to UN Habitat can lead to a range of diseases including perinatal mortality, tuberculosis and cancer. However, as men in this neighbourhood are largely in charge of financial decisions related to the household women are unable to make any changes without the man's approval (Kareem 2012).

In cities in the global South food is predominantly purchased in markets and supermarkets, rather than grown by the consumers themselves (Mackay 2019). For the urban poor, traditional food retail outlets such as markets are the most commonly used, despite the increasing number of supermarkets available. Supermarkets are however associated with unequal access to food, as they are expensive and often unaffordable for the urban poor. Furthermore, they are heavily stocked with processed food which contains high levels of salt, fat and sugar which are strongly linked to non-communicable diseases. In comparison to markets they have better food hygiene standards and food safety governance. (Heck *et al.* 2019).

While there has been a shift in policy debates from food production to consumption, however the urban dimension is largely absent from research and policy. In particular, there is a lack of understanding on the key challenges the urban poor face in terms of nutrition and food security. Community driven food production could act as a potential solution, examples of which can be seen in Thailand, Cambodia and Nepal (Boonyabancha *et al.* 2019, Tacoli 2019).

What would a just food transition look like?

Food and nutrition inequities need to be addressed in a just urban transition. This needs to consider requirements for nutritious and safe food that is affordable and provides what is necessary to live a healthy life. Understanding food shopping practices and how these differ across socio-economic status, heritage and culture, gender and age is a prerequisite for a just

food transition. It is also important to consider the burden involved in reaching markets and other places food can be purchased as this often has a strong gendered dimension.

There are important environmental considerations to limit the negative impact of food production and consumption on the planet. Responding to the spatial components of equity and justice, where possible, food should be locally sourced and farmed in sustainable ways to limit its carbon footprint. In relation to bridging social and natural drivers of inequality, a just food transition will also consider the environmental impacts of production and the human inputs required (including from temporary and migrant labour that is often vulnerable to exploitation).

Water and sanitation

Access to safe, reliable and affordable drinking water is recognised as a human right. Despite the privatisation of the water sector across the global South in the 1980s, access to water remains challenging, especially for informal settlements. Climate change and rapid population growth will further exasperate this (Mitlin *et al.* 2019). Inhabitants of cities in the global South often self-provide water or in cases where they have access to municipal water the quality is compromised and frequency intermittent. Data on access to water is overestimated, due to significant limitations in definitions and methods of collecting data. The UN measures and monitors water access however only superficially considers quality, regularity and affordability. The cost of water to low-income groups is also significant. For example, Mitlin *et al.* (2019) estimate that the cost of piped water for residents of informal settlements in Dar es Salaam would amount to 11.7 Percent of household income, in comparison with 3.6 Percent for households not living in informal settlements.

Urban areas rely on a range of complex socio-natural systems for extracting, treating and distributing water – which has implications for people and ecosystems both inside and outside the city. Water availability is often posed either as an issue of 'water scarcity' (e.g. droughts) or 'unequal distribution' (i.e. poor infrastructure or institutions). Current systems of providing water in cities in the global South therefore have negative consequences for ecosystems, agriculture, and urban residents – and a just transition will need to address all these elements. It will also need to address the competing needs and trade-offs between different end-users, including industrial, agricultural, and domestic use.

Similarly, access to sanitation is a challenge for the urban poor across cities in the global South. Globally, the number of urban residents who lack safe sanitation has increased from 1.9 billion in 2000 to 2.3 billion in 2015, costing $223 billion a year in health costs and lost productivity and wages (Satterthwaite *et al.* 2019). Poor urban planning in informal settlements results in inadequate provision being made for sanitation facilities. Pit latrines are often inadequate, as they are unlined or poorly lined causing wastewater to flow into the surrounding environment, especially during rainy seasons. Furthermore, waste removal is often done manually posing significant health and environmental risks. There is also a privacy and hygiene concern with many families sharing facilities: infrastructure is often insufficient to allow for privacy, making many, especially women uncomfortable in using these facilities. When households cannot afford safe sanitation services, they often resort to unsafe practices, putting themselves and the entire city at risk.

What would a just water and sanitation transition look like?

Developing accessible, safe and affordable sanitation facilities for all urban residents is essential for a just urban transition. Solutions need to be holistic in nature and consider the environment and diversity especially in terms of age, gender, safety and health. Improving basic services for low-income urban residents will need to be a significant component of just transitions in cities. The uneven provision of these services – and the implications that this has for health, livelihoods and wellbeing – is a key element of urban inequality and injustice.

Similarly, the extent to which these deficiencies are addressed, and the approaches used to address them, will have major implications for the achievement of a just transition.

A just transition in water systems needs to have several key elements.

- First, it requires an expansion of access. This will require providing water and sanitation services in low-income neighbourhoods and – as far as possible – ensuring that these are within dwellings or at points close to where people live. It also needs to be accessible at all times of day and night, reducing the need for long periods of time spent waiting to collect water, and to avoid the negative consequences of unsafe sanitation facilities at night (particularly for girls and women) – thus addressing both spatial and social factors.
- Second, it needs to be affordable. While the privatisation of the water sector was anticipated to enhance accessibility of piped water, it still meant that water was inaccessible and/or unaffordable – especially for the urban poor (who frequently pay water vendors a price per unit that is up to 50 times more expensive than public water (Mitlin *et al*. 2019).
- Third, it needs to be safe – free from the risk of disease or contamination. Finally, it needs to take into account environmental considerations, avoiding overextraction from river basins or groundwater systems, and bridging the social and natural drivers of inequality and justice.

The treatment of sanitation also needs to be expanded in ways that address local and regional environmental and public health issues. In many cases, this will require significant investment in sewerage systems – the lowest cost options for sanitation (particularly pits) are impractical in the densest urban settings, while middle-cost options (e.g., ventilated pit latrines and septic tanks) often have high costs for individual households and require a level of regulation (to manage health risks) that is impractical. Where private tanks and similar solutions are used, these should be seen as a transition to off-site sanitation (Satterthwaite *et al*. 2019).

Just transitions in society, politics and governance

A just urban transition does not only require technological innovation, but political will, institutional capacity and good governance in equal measure (Colenbrander *et al*. 2016; Dodman *et al*. 2021). The profound shift over the past decade in the way we understand climate, from a global issue to a networked one that is transnational, regional, urban, even personal, requires equally profound shifts in the way climate politics is conducted at these various scales (Bulkeley 2021), as well as in the way governance institutions respond (Dodman *et al*. 2021). In other words, just urban transitions will not be achievable without the build-up of institutional systems, processes and capacities, in ways that understand and respond to transnational, regional, local climate politics. We argue that this specifically requires recognition, engagement and representation of the widest possible range of stakeholders to participate in and support new cross-boundary and cross-sectoral cooperation, but while continuing to privilege civil society organisations and grassroot movements that represent subaltern interests.

Recognition and participation

Participation in climate politics provides the opportunity to unlock local knowledge about the socio-economic norms of those who are or will be impacted by climate change and the corresponding adaptation or resilience strategies (Atte, 1992; Barkin, 2010; Berkes, Colding, & Folke, 2000; Green, 1999). The inclusion of local and indigenous knowledge is key to successful adaptation and resilience (UNFCCC, 2016), in that it simultaneously helps ensure the effectiveness of adaptation and resilience strategies put in place by local and national authorities (Ajibade and Adams, 2019), whilst preventing the damaging of cultural heritage

and erosion of indigenous knowledge and practices brought on by climate change (Byskov *et al.* 2021).

However, doing so is not straightforward. The social and cultural diversity that is at the core of cities across the world produces a wide range of local and regional political strategies – those of contention, collaboration or subversion – which are employed by civil society or citizen-led social movements (see for example Mitlin 2018) just as they are relied upon by states and local governance authorities (see for example Bhan 2020). The arena of climate politics has tended to be dominated by adversarial (or 'contentious' as articulated by McAdam *et al.* 2001) relationships because, on the one hand, these are the only relationships that social movements can enact as they lack financial recourses and access to the state's authority to make and implement policy (Bulkeley *et al.,* 2014), and on the other, governance institutions across local, national and transnational scales are hard wired to wean out adversarial interactions with their citizens, but in doing so, undermine a central and defining feature of social movements (Tarrow 1998). Even well-crafted legislation and governance structures often lack effective follow through action by national governments evident in the insufficient allocation of financial and institutional resources, while at the same time, these legislative and governmental instruments serve to depoliticise adaptation interventions, which in practice involve ongoing struggles over power, resources and control (Eguavoen *et al.,* 2015). This has meant that despite an increasing emphasis on participatory processes, inclusion of the most marginalized remains peripheral to adaptation planning (Dodman *et al.* 2021).

Our argument here has specific implications for devolving political authority to ever localised levels and moving away from central decision-making to a more decentralised approach to governance. We recognise that while the success of devolution as 'a pathway out of poverty and conflict' (Hartmann 2008) has been mixed, there has no doubt been a strong emphasis on devolution, with countries across the global South moving towards providing more decision-making power at the local level. This is important as it allows for more sustained relationships between populations and local government. However, while devolution has taken place in law, practice looks different. Allocation of budgets and fiscal capacity remain a key constraint as well as the devolution of political decision-making. The financing structure for resilience and adaptation is often complex, with the majority being managed by multilateral entities and/or national governments in the global South. Only a small proportion of resources are channelled to the local level, and very few projects are locally designed and locally led (Fenton *et al.* 2015), which admittedly in part is due to the limited systems and capacity at the local government level to manage budgets of all sizes. However, with limited allocated financing also comes the inability to act and ultimately allow for locally led solutions to address climate change (Henrique *et al.* 2020).

The governance structures are noticeably complex in climate change adaptation. In addition to cutting across global, national and sub-national levels, climate change adaptation also relies on both formal and informal networks (Gregorio *et al.* 2018, Jordan *et al.,* 2015). However, the politics of climate change aims to unfold these very dynamics and climate change agendas are arenas where institutional authority and resource control between traditional, local, sub-national and national actors can synthesise their individual objectives while respecting each other's mandates. We therefore posit that for a just urban transition these strengths need to be acknowledged and leveraged, to ensure that capacity and resources are used in effective and multi-scalar ways, and to allow for space for organisations to develop. Specifically, to translate knowledge resulting from participatory processes into adaptation and resilience planning will require adequate systems, institutional capacity, flexible governance and potential for learning within government. An illustration of such multi-scalarity is the adoption of low carbon options in Malaysia: Colenbrander *et al.* (2016) note that national and sub-national governments have a range of policy tools at their disposal to encourage low carbon energy. National governments for example can implement mechanisms such as reducing pay back periods of low carbon options, de-risking low carbon investments and inducing private investments through regulation. These policy tools, they argue, are not available to local governments due to capacity and resource constraints. However local government can implement and enforce stricter planning and approval processes such as green public procurement processes. Last but not least, is the role of the international community, who can

provide evidence and research on the best practices for just transitions and support capacity development. Furthermore, as funders they can focus on locally led and context specific programs.

Table 3: Actors and their role in achieving just urban transitions

Actor	Role in achieving just urban transition
Grassroots organisations and NGOs	• Provide enhanced capacity to work with data/systems/processes • Allocate funding for flexible/adaptive planning that can be community driven • Manage and implement participative approaches • Support the documentation of indigenous and local knowledge
Local/ Municipal Government	• Collaborate with grassroot organisations and NGOs to implement participatory approach • Identifying local priorities and ensuring alignment with national objectives • Oversee project implementation, including managing fiscal processes
National Actors	• Providing guidelines for planning through the development of plans and national objectives • Allocation of budgets • Developing accountability mechanisms for local government
International Actors	• Providing funding • Collaborating with projects to implement Monitoring, Evaluation and Learning systems • Alignment with international guidelines and compacts

Our championing of empowering local authorities is not without acknowledging the inherent risks of supporting local patronage networks and clientelism, of overburdening local actors with responsibilities beyond existing capacities, and of formalising unjust processes currently in place which can cement exclusions and create new ones (see Colenbrander *et al.* 2018 for a more in-depth take on these risks). However, the devolution of finances to locally relevant authorities, for example, could allow for greater flexibility, quicker response times to shocks and sustained engagement with local populations, if institutional capacity deficits are addressed jointly between state and society in a stepwise fashion moving from single to double to triple loop learning, and if informal networks are considered to play a crucial role in such learning processes (Pahl-Wostl 2009).[5]

Just transitions in urban data systems

With increasing computing power, and availability of open-source software offering new ways to understand the urban socio-environment, just urban transitions must interact with the new power geometries of corporate, legal and regulatory transformations of urban data systems, and the corollary implications on 'smart city' initiatives that are dominating urban planning, governance and legislation processes in cities of the global South. While smart 'urban platforms', or digitally enabled socio-technological assemblages (Caprotti 2022) are being used to gather urban data, improve performance of urban services and to connect urban communities with each other and with the built environment (Costin and Eastman 2019), the endless possibilities of managing and analysing large sets of both structured and unstructured data is changing the very landscape of cities by enabling machine learning, automated decision-making and other public services (Kharrazi, Qin *et al.* 2016; Löfgren and Webster

[5] See for example the DaCCA programme https://daccaprogramme.org

2020). However, the challenges associated with delivering big data solutions in public services and urban contexts are important to consider especially with a view on those that have limited access to technology and the internet (Gupte 2021; Joss et all 2019; Lofgren and Webster 2020). That is, the nature of the data relied upon to trigger a sustainable transition, as well as the data ecosystem produced as a result of adaptations, are both relevant in determining probable transitions.

There is no doubt that there are competing visions of 'smartness' being employed. On the one hand, digital technological innovations and application of information technologies are argued to add value to digital governance in particular relation to service delivery and policy formulation (Löfgren and Webster 2020), be more efficient and therefore more sustainable, and resilient, with a better ability to respond rapidly to changing circumstances. However, these approaches are limited by their market-driven focus on optimising existing urban systems (Sengupta *et al.* 2017). As Gupte and Mitlin (2021, p214) argue, "there is a critical gap between the technological solutions being suggested and whether they contribute to inclusive, resilient and sustainable responses from the perspective of economically and socially disadvantaged urban residents. We see that tech-based responses are often based on uncritical and unnuanced techno-utopian understandings of what are deeply unequal relationships. At the same time, techno-utopian narratives are an "easy sell", particularly to those who do have access to digital infrastructures and therefore stand to benefit from technological interventions, and they serve as an illusory alternative for meaningful local action".

On the other hand, where data ecosystems have led to transformative adaptation, open data landscapes for cities have adopted transnational standards to ensure interoperability amongst the widest possible set of technology providers, local authorities and citizen stakeholders (Ahlgren *et al.* 2016). At the same time, such interoperability has also been extended to blended data environments where formal and informal data architectures are encouraged to coexist, and frugal innovation is not inherently superseded by investments into frontier technologies (Gupte *et al.* 2021). The growing national and international commitments to tackling climate change, are reinforcing the importance of research and evidence in just urban transitions. This has led to increasing attention on data, the way it is collected, stored and shared. New and continuously advancing technology is allowing data to be collected, shared and stored in a myriad of ways (Hughes *et al.* 2020). However, as the amount of data being collected by city governments to guide urban decision-making on climate change increases daily (together with the number of actors involved in climate governance) there are important considerations on the implications of accountability for local government and those collecting and using the data.

Unless the principles of social justice and data accessibility, in articulations that are explicitly relevant locally, are applied to data collection, storage *and* sharing there is a risk that data driven urban climate governance inhibits broader urban and climate objectives on poverty reduction (Hughes *et al.* 2020). When data is collected by private entities for commercial benefit, it may be fundamentally different in purpose, and employ varying standards and methodological rigour from data gathered for public services or as a public good (Löfgren and Webster 2020). Citizens-led data ecosystems where the purpose of generating, managing and storing data is to empower city residents to collect and access data, can create pathways towards just transitions for vulnerable communities. Boonyabancha *et al.* 2015 (p650) note that for defining and collecting data on poverty, the "poor know the truth about poverty the best", and it is essential to address any capacity gaps to further enable collective action and address community development needs (Albornoz *et al.* 2019).

At the same time however, datafication coupled with unequal access to digital technologies and infrastructure can deepen those inequalities and reproduce oppression. It can alienate communities by reinforces their lack of knowledge and capabilities (Albornoz *et al.* 2019). It is illustrative that data collected through mobile devices are likely to be incomplete and potentially even inaccurate and unreliable, as it may exclude many urban areas that suffer from patchy phone reception, or older or disabled populations who are not tech-savvy enough to respond to mobile surveys. There are key concerns around privacy and consent as large

quantities of data are routinely collected without informed consent. A just urban transition therefore goes beyond the immediacy of requiring new and innovative data ecosystems. It requires integrating digital, governance and socio-cultural systems to promote trust across and within groups and institutions (see for example Fan *et al.* 2020), while not solely focusing on 'frontier technologies', which by design tend to exclude those who are under resourced or under capacitated.

Conclusion

This paper has provided an overview of the ways in which just urban transitions have been defined and explored in existing literature. It has delved into the processes which have resulted in significant injustice in urban areas, particularly around the ways in which climate change and disasters – and responses to these – affect low-income residents unequally. It has also proposed several key elements of a just transition, looking specifically at the areas of built environment and infrastructure; basic needs and services to support physical and mental wellbeing; society and governance; and data and knowledge.

The worsening effects of climate change highlight the need for radical action, but this needs to be undertaken within a framework that incorporates the principles of a just transition if it is not to worsen existing inequalities.

This paper has argued that just transitions in cities should incorporate three key elements: the spatial and social integration of equity and justice; placing nature-based solution in the context of and in opposition to socio-cultural and behavioural drivers of inequality and injustice; and the recognition of equity and justice across generations. This lens helps provide an understanding of the key challenges cities are facing to achieve just transitions, as well as entry points for policy to mitigate unjust practices.

Cities in the global South are ill-equipped to tackle the challenges of climate change today. Rapid population growth is putting pressure on public services as well as space in the city, resulting in the urbanisation of poverty. A large proportion of the urban poor live in informal settlements and/or work in the informal economy. They have a small carbon footprint, but the complexity of the multiple deprivations the urban poor face means that they are disproportionately vulnerable to the consequences of climate change. The socio-political marginalisation of women, children, people with disabilities, migrants and refugees, means that these groups face more extreme forms of environmental marginality and climate injustice, many of which have been amplified by Covid-19. However, global compacts and reports on green employment opportunities fail to recognise their particular circumstances, including participatory alternatives to informal employment, that is presently dependent on carbon intensive industries.

The economic case for investing in climate change responses – both mitigation and adaptation – is well established. Much can be learnt from the way large scale infrastructure projects in the housing and energy sector have been implemented today. Uneven public participation has led to cementing or in some cases even worsening inequalities. Stronger efforts are therefore needed to ensure inclusive participation that is iterative and takes the views and priorities of the urban poor and other relevant stakeholders on board.

A lack of capacity building of local builders or stricter guidelines that can be mainstreamed into housing and energy planning, has inhibited development towards a just city at the local/municipal level. At the national level more can be done to safeguard vulnerable communities such as developing national frameworks and guidelines and making climate hazards and vulnerability assessments part of the planning approval process. Globally, there are no binding emission reductions in international law for low- and middle-income countries, however this is needed to ensure that low carbon growth reductions to take place now, rather than waiting for an arbitrary indicator of economic growth that locks countries into unsustainable development pathways.

Just transitions in cities will require making sure that the basic needs of all urban residents are met. The significance of basic needs is often under-estimated, however urban systems of various kinds play an important role in meeting basic needs. Just transitions will require a stronger focus for example on how different groups can access nutritious food and safe water in an affordable way. However, the level of access will depend on gender, race, marital status, socioeconomic status and class. Understanding food shopping practices and how these differ across different groups will be essential for a just transition in food and water. Also important is to consider limiting the negative impact of food. A just transition in water and sanitation needs to be free from risk of disease or contamination, secure and note require long distances of travel and be available at all times of day.

Above all, a just transition requires appropriate and effective governance. Without the build-up of inclusive systems, processes, financing and capacity that allow for a wide range of stakeholders to participate, support cross-boundary/cross-sectoral cooperation, involve CSOs and grassroot movements, there is limited chance for change to be sustainable. Furthermore, technology based smart solutions, and availability of open-source software which offers new ways to understand the urban environment, necessitate the consideration of how new technologies as well as data collection, storage and sharing can contribute to inclusive, resilient and sustainable responses from the perspective of the most marginalised. In other words, achieving just transitions is a collective effort that requires the coordinated participation of grassroots, municipal, national and international actors across multiple scales of the urban environment.

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