



Climate mobilities into cities: A systematic review of literature from 2011 to 2020

Jin-ho Chung^{a,*}, Bhawani Buswala^b, Michael Keith^b, Tim Schwanen^a

^a Transport Studies Unit, School of Geography and the Environment, University of Oxford, South Parks Road, Oxford OX1 3QY, United Kingdom

^b The Centre on Migration, Policy and Society, University of Oxford, 58 Banbury Road, Oxford OX2 6QS, United Kingdom

ARTICLE INFO

Keywords:

Climate change
Climate mobilities
Climate migration
Informality
Research agenda
Systematic review

ABSTRACT

The relationship of climate change with human migration and mobility has been of interest to researchers and policymakers for >25 years but the past decade has seen a marked growth of attention on climate migration into cities. This paper offers a systematic review of publications across disciplines from 2011 to 2020 on the relationship. An initial 1037 publications on climate change, migration and urban development have been considered and it is shown that their appearance is closely related to the publication of influential policy documents on climate migration. A subset of 173 publications is reviewed in greater depth and urban informality, labour migration and policy intervention are identified as key topics that have been studied. This literature is disproportionately focused on South Asia and Sub-Saharan Africa as well as large cities. Much attention continues to be directed towards the importance of climate change in the causes for migration although multiple conceptual and methodological difficulties are identified. Based on the findings, a research agenda for future research on climate mobilities are identified: the importance of scientific definitions of migrants and mobilities, sophisticated conceptualisations of the causalities that structure climate mobilities, and a better understanding of how those mobilities reconfigure urban informalities.

1. Introduction

Public interest in climate migration and climate mobilities has dramatically increased over the last decade. A simple search on Google using the terms ‘climate’ and ‘migration’ shows the rapid growth in the number of times people have used them as search terms since 2011 (Fig. 1). The relationship between climate change and human mobilities in physical space is also of growing interest to researchers and policymakers (Hunter et al., 2015; Klepp, 2017; Boas et al., 2019; Choudhary et al., 2019; Zickgraf, 2021). To some extent this reflects that migration away from climate-vulnerable (rural) areas can be an effective strategy of climate adaptation (Adger et al., 2015; Kanta et al., 2018), although those moving may be settling in (urban) locations that are comparatively vulnerable to climate change-related floods, droughts or heatwaves (Pläntz, 2019).

Climate migrants have been referred to as the “human face of climate change” (Gemenne, 2011:225 in Klepp, 2017), and various high-profile studies have suggested that their numbers will rise sharply in the coming decades. In the 1990s, Norman Myers famously coined the term ‘environmental refugees’ in his role of consultant at The World Bank. He predicted that there would be 50 million

* Corresponding author.

E-mail addresses: jin-ho.chung@ouce.ox.ac.uk (J.-h. Chung), bhawani.buswala@compas.ox.ac.uk (B. Buswala), michael.keith@compas.ox.ac.uk (M. Keith), tim.schwanen@ouce.ox.ac.uk (T. Schwanen).

environmental refugees by 2010 and up to 200 million when the full effects of global warming have taken hold (Myers, 1995). The President of the UN General Assembly, Srgjan Kerim, also claimed in 2008 that there would be between 50 and 200 million environmental refugees worldwide by 2010. This discourse is called ‘maximalist’ because it sees environmental change as the direct cause of migration with alarming estimations of future environmental migrants (Suhrke, 1994). Its focus is squarely on the national scale, and its alarmism was and remains to a considerable degree driven by fear that environmental refugees from the Global South might ‘flood’ countries in the North. The maximalist approach was popularised in public and policy arenas during the 1990s in parallel with the prevalence of the minimalist approach in academia led by high-profile migration scholars who took the role of skeptics and understated the role of environmental change compared to economic paradigms in mainstream migration studies (Suhrke, 1994; Gemenne, 2011; Piguet, 2013).

Simultaneously, both approaches have been criticised by academics such as Kibreab (1997) and Black (2001) for insufficiently appreciating that migration is a multi-causal phenomenon (Piguet, 2013; Baldwin et al., 2014; Boas et al., 2019). The argument is that climate change affects human migration and mobility mostly indirectly, via its impacts on a range of social, economic and political drivers that affect migration processes. The extent and complexity of the interactions between different drivers at different scales means that it is rarely possible to “distinguish individuals for whom environmental [climate change] factors are the sole driver” (UK Government Office for Science, 2011, page 9). This middle-ground perspective on the causes and nature of climate-related migration has been labelled as “the pragmatic stance” (Piguet, 2013, page 155). It now arguably dominates the academic literature, and has helped to pave the way for the articulation of climate mobilities perspective on migration in the last few years (Baldwin et al., 2019; Boas et al., 2019; Cundill et al., 2021).

The past decade has also seen a shift in analytical focus from international migration to movements within countries that are somehow related to climate change (Millock, 2015; Kanta et al., 2018; Turhan and Armiero, 2019; Cundill et al., 2021). The World Bank’s *Groundswell: Preparing for Internal Climate Migration* report (Kanta et al., 2018) has played an important role in this shift, not least because of its prediction that globally there will be >140 million climate migrants who have moved within country borders by 2050. A corollary of this attention is increasing interest in the role of cities as the destinations and places of (economic) opportunity to which climate mobilities are directed. Those moving may hail from rural areas where climatic events such as droughts and heatwaves have further complicated their livelihoods that were already challenged by poverty, economic stagnation and population growth. However, not all climate mobilities within countries migration can be classified as rural-to-urban because of the complexity of movement trajectories over people’s life-course: many individuals originally hailing from rural areas may move between cities, looking for work and depending on where they have relatives or (former) fellow villagers who can help with settling in a city (Surie and Sharma, 2019).

Irrespective of the character of such trajectories, climate migration into urban areas have potentially significant ramifications for urban development and the realisation of policy objectives, including the Sustainable Development Goals (SDGs). The interplay of climate change, migration and urbanisation can intensify vulnerabilities, particularly in rapidly growing cities in Africa and Asia. Pressures on urban infrastructures and institutions for housing, employment, water and sanitation, public health and transportation may be exacerbated, and climate-related migrants become disproportionately dependent on ‘informal’ housing, employment, sanitation and water provision, healthcare, transportation and other services (Chu and Michael, 2019).

Given the above considerations, this paper offers a systematic review of the current state of knowledge regarding the relationships among climate change, migration and urban development, with specific attention directed towards urban informality. It seeks to identify and examine key research themes and to offer an agenda for further research regarding those relationships. Section 2 offers some brief reflections on the terms climate mobilities and informality after which Section 3 outlines the systematic review method used for this study. It also motivates the selection of publications, all of which have appeared since 2011, for inclusion in the analysis. This is

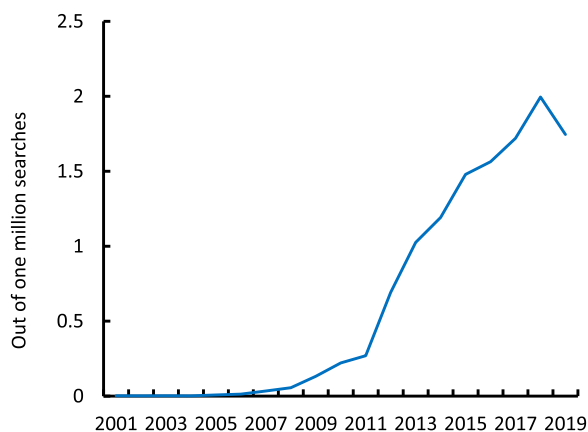


Fig. 1. Frequency of the set of keywords – climate and migration – being searched for the period 2001–2019, by year (Source: Google Ngram Viewer from UK IP address, 26 May 2021).

followed by a descriptive analysis of trends in the corpus of selected 173 publications in Section 4, and in-depth thematic reviews of the insights on the selected key topics – labour migration, informality and policy intervention – that emerge from this corpus of literature in Section 5. The final section offers conclusions and an agenda for future research on the relationships among climate change, migration and urban development.

2. Key concepts

The notions of ‘climate mobilities and ‘informality’ are two terms at the heart of this review that warrant some introduction and explanation before attention is directed to the actual review in the following sections. Out of the pragmatic stance on climate migration (Piguet, 2013) and the ‘new mobilities paradigm’ (Sheller and Urry, 2006; Psaltoglou, 2016), a mobilities perspective on climate migration has emerged in the last few years (Wiegel et al., 2019). This perspective proposes the concept of climate mobilities to highlight that most climate-related migration remains within national borders and the differentiated nature of that migration (e.g., Boas et al., 2019; Michael et al., 2019; Cundill et al., 2021; see also Baldwin et al., 2019). Climate mobilities is broader and more inclusive concept than climate(–related) migration. The former recognises, for instance, that movements may be seasonal, circular, over short distances, somewhere on a spectrum from entirely voluntary to fully forced, and consisting of multiple sequences of movement among different origin-destination pairs and interspersed with periods of immobility. Such periods may reflect that people stay put, get trapped or wait in particular locations – in the community or communities where they grew up or wherever they moved to – in the wake of climatic events. A climate mobilities perspective thus recognises that mobilities and immobilities can take on many different forms and are often relationally linked responses to climate change (Wiegel et al., 2019). Interdependencies of mobility and immobility can also exist within households, for instance when a male spouse moves to a nearby city but his wife and children remain in the community of origin to look after the land and/or because education is perceived as better and easier to access there than in the city (Cundill et al., 2021).

Paying attention to interdependencies of mobility and immobility is a hallmark of the new mobilities paradigm (Adey, 2006) and, in the climate change context, helps to pluralise the debate about the relationship between migration and climate change. Nonetheless, climate mobilities is a term that has not yet received much traction outside the social sciences and especially outside academia. This is why we use ‘climate mobilities’ and ‘climate migration’ as synonyms in the remainder of this paper, and understand the latter in a

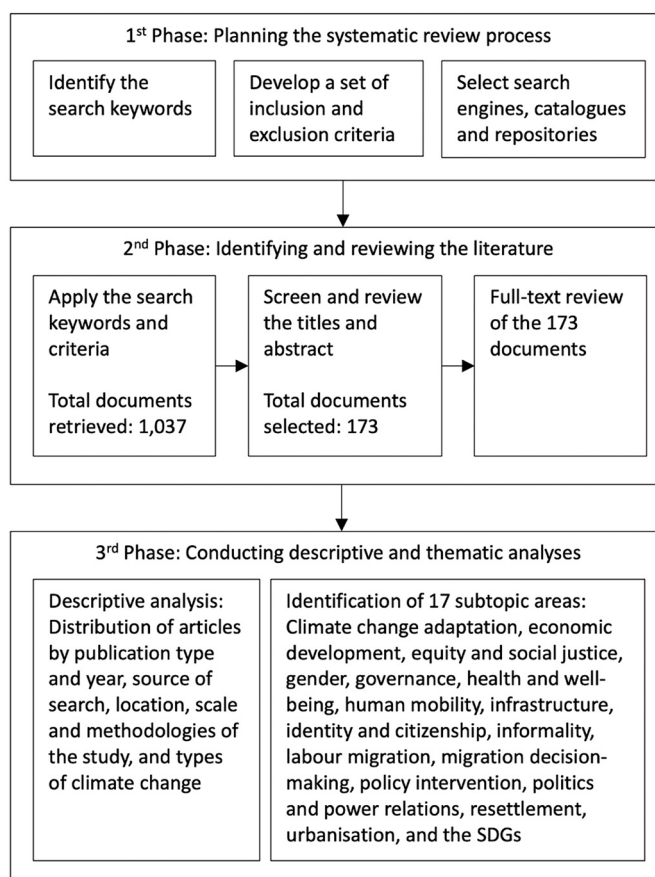


Fig. 2. Structure of the systematic literature review process.

similarly expansive manner as the former.

There is a large and extensive literature on ‘informality’ that stretches across many different disciplines, and the term is easily used and not always clearly defined. The origins of the literature lie in Keith Hart’s coining of the term ‘informal sector’ on the basis of research in Accra, Ghana in which he suggested that the traditional or subsistence economy was too large, persistent and resilient to disappear or even shrink with further growth of the modern, industrial sector (Hart, 1973; Dell’Anno, 2021). As McFarlane and Waibel (2012) explain, the use of informality as an organisational form remains common. Thus the informal/formal distinction is commonly used to separate that which is unstructured, unruly and/or unpredictable from what is structured, rule-based and/or predictable, very much in the manner that Hart proposed for labour and the (urban) economy and numerous others have done since in analyses of domains such as the economy, housing, healthcare provision and transportation.

This use has been complemented by multiple others (McFarlane and Waibel, 2012; Acuto et al., 2019). Of these, informality as a spatial categorisation to denote particular territorial formations – i.e., “‘slum’ settlements on the legal, political, economic, social and environmental margins of the city” (McFarlane and Waibel, 2012, page 3) – is widespread across both academic and policy literatures. Somewhat less common but particularly influential in critical urban scholarship is the idea of informality as a governmental tool, whereby particular domains or spatial areas are identified as informal in order to legitimise interventions by the State and public actors that will ‘formalise’ those domains or areas (e.g., Roy and AlSayyad, 2005). This use of informality as a discursive resource opens up to a broader perspective on informality as produced in everyday practices and as fluid and entwined with formality, with any (rigid) distinction between the two constituting an act of politics (McFarlane and Waibel, 2012; Acuto et al., 2019).

Given the multiple uses and understandings of informality in the social science in general and urban scholarship in particular, the term is inevitably deployed in slightly different ways in the discussion of the review results below. It refers typically to either a particular organisational form or a spatial categorisation, in both instances denoting urban conditions and practices that are not directly or fully regulated by the (local) State.

3. Methodology

Following Evangelista et al. (2018), we have employed a three-stage methodological approach: 1) planning the systematic review process; 2) identifying potential literature and reviewing the selected literature; 3) conducting descriptive and thematic analyses (Fig. 2).

In the first stage, the keywords, a set of inclusion and exclusion criteria, and search engines were selected. Given the aim articulated in the Introduction, ‘climate change’, ‘migration’ and ‘urban development’ were selected as the search keywords. Four criteria for the in/exclusion of publications were then identified:

1. Publications should cover one or more issues related to climate-related migration in an urban context. This framing reflects the shift in the academic and policy debate over the past decade and detailed in Section 1, from environmental change to climate change, and from the national to the city level;
2. Publications can relate to geographical locations worldwide and do not have to be restricted to localities in the Global South because climate change entails a series of processes across the planet, and mobilities can, in principle, occur everywhere;
3. Publications should have appeared in the 2011–2020 period and be written in the English language. The start date of 2011 was chosen partly because of the publication of *The Foresight Report on Migration and Global Environmental Change* by the UK Government Office for Science in that year. This report not only promoted the public interest in climate migration (Baldwin et al., 2014) but also influenced the research landscape (see Section 3 below). The requirement for publications to be written in English reflects the constraints on the authors’ language capabilities; and
4. Publications can include articles in peer-reviewed journals, monographs, book chapters, conference papers, reports, magazines, theses and blog posts. Different publication formats are considered to enhance both the policy relevance of the systematic review and the inclusion of as wide a range of perspective on climate mobilities as possible (Oliver and Cairney, 2019).

The decision-making around search platforms was informed by decisions about in/exclusion criteria for publications. Because the review considers multiple publication types, it is based on searches on online search engines and in online catalogues and repositories. The latter are provided by development-related organisations located and active around the planet. The seven search engines used are Web of Science, Google, Google Scholar, Social Science Research Network (SSRN), OpenAIRE, Semantic Scholar, and the Bielefeld Academic Search Engine (BASE). The eleven catalogues and repositories are supplied by the British Library, Overseas Development Institute (ODI), the Institute of Development Studies (IDS), the Center for Global Development (CGD), the International Institute for Environment and Development (IIED), the Department for International Development (DFID), The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Japan International Cooperation Agency (JICA), United States Agency for International Development (USAID), The World Bank and the United Nations Database.

With regard to the second phase, we conducted the actual search on the identified platforms on 21 September 2020 with ‘climate change’, ‘migration’ and ‘urban development’ as the three keywords. ‘Migration’ was used rather than ‘mobilities’ because of the much greater familiarity with the former term in relation to climate change across the wider cross-disciplinary academic literature and especially the policy debate (see Section 2). The use of the three keywords in combination means that publications speaking to only two or one of the themes were less likely to be identified in the search. Because Google and Google Scholar returned very high numbers of search results, only publications listed on the first 10 pages (i.e., 100 search results) were considered. Furthermore, the search keyword ‘urban development’ was adjusted to ‘urban*’ on Web of Science in an attempt to include as many peer-reviewed academic

publications as possible in the review. The search process resulted in an initial selection of 1037 documents. Citation information and abstracts for these documents were downloaded, duplicates eliminated, and the available information screened for inclusion in the full-text review; 173 documents were eventually selected. Information about publication date, location of interest, geographical scale of analysis, methodology, form of climate change, and themes for those 173 documents was summarised in a Microsoft Excel database.

In the third phase, we tabulated and cross-tabulated publication type, source of search, publication date, location, scale, methodology, form of climate change. Through an iterative process, we aggregated the themes covered in the publications into 17 subtopic areas: climate change adaptation, economic development, equity and social justice, gender, governance, health and well-being, human mobility, identity and citizenship, informality, infrastructure, labour migration, migration decision-making, policy intervention, politics and power relations, resettlement, urbanisation and the SDGs. Most of publications cover multiple subtopic areas. As shown in Section 3, three sub-topic areas act as central nodes in the network constituted by all 17: informality, labour migration and policy intervention. We have conducted a thematic analysis on the publications belonging to these areas to identify important findings, shared logics, salient studies and research gaps to be considered in future research.

4. Trends and patterns in the climate mobilities literature

The distribution of the 173 documents by publication year is uneven, with clear increases in 2012, 2015–16 and 2019 (Fig. 3). The increase in 2012 appears linked to *The Foresight Report on Migration and Global Environmental Change*, published in 2011 by the UK Government Office for Foresight. Offering the first “authoritative scientific account of the relationship between climate change and human migration” (Baldwin et al., 2014, page 122), the Report also made a convincing case for the minimalist approach to climate migration. The increase in 2015–16 can, citation analysis suggests, be attributed to the publication of the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC, 2014), and the Paris Agreement (United Nations, 2015) finalised during the 21st Conference of the Parties (COP21) in 2015. Both the AR5 and Paris Agreement recognised that migration can be an effective means for adapting to climate change, with the latter also calling COP member states to respect and promote migrant rights. Citation analysis further indicates that the increased number of publications on climate migration in 2019 reflects the publication of *The Groundswell Report: Preparing for Internal Climate Migration* (Kanta et al., 2018). Drawing attention to the importance of within-country migration related to climate change, it is one of the most highly downloaded reports in The World Bank’s database with almost 100,000 download records.

In terms of manifestations of climate change, there is a balance between fast-onset and slow-onset climate change across the 173 documents in our database for analysis. Fast-onset climate change refers to extreme weather events such as typhoons, hurricanes, cyclones or heavy precipitation that often results in floods, whereas slow-onset climate change refers to the risks and impacts associated with sea level rise, increasing temperature, desertification, loss of biodiversity or glacial retreat. More than a quarter ($n = 48$) of the reviewed literature address both manifestations. In contrast, 31 documents consider only fast-onset events and 38 are limited to slow-onset events only; 30 documents consider environmental change rather broadly; and 26 documents do not distinguish between types of climate change.

There are, however, geographical differentiations in this distribution. Fast-onset climate change, particularly floods and cyclones, is discussed more often than slow-onset climate change for South Asia (12 versus 8 documents), whereas the converse is true for Sub-Saharan Africa (2 versus 12 documents) for which there is a strong focus on desertification. This difference may have implications for the temporal (e.g., permanent, circular) and spatial (e.g., rural to rural, rural to intermediate cities, rural to large/capital cities, intermediate to large/capital cities) nature of climate mobilities in the two regions. This is, however, a topic for further research as the extant literature does not allow robust conclusions to be drawn about the relationships between manifestation of climate change and type of mobility.

In terms of the geographical focus of research, academics, practitioners and policymakers continue to perceive climate migration as an issue that is particularly pertinent for the least developed and developing countries. Two-thirds ($n = 112$) of the reviewed

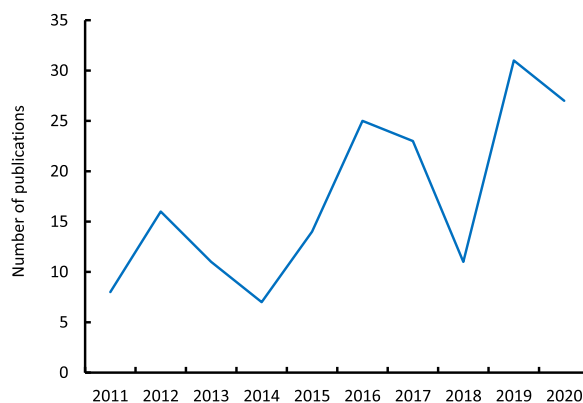


Fig. 3. Publications considered in the systematic review ($n = 173$), by year.

documents focus on Latin America (n = 9), Sub-Saharan Africa (n = 38), South Asia (n = 40), Southeast Asia (n = 9), the Middle East and North Africa (MENA) (n = 8), Pacific Islands (n = 7) and the Caribbean (n = 1). In other words, 45% of the documents centre on South Asia and Sub-Saharan Africa. Of the 40 documents covering South Asia, 22 consider Bangladesh – with 13% of the full database, the country for which climate mobilities have been studied most extensively – and another 14 concentrate on India.

In terms of geographical scale, a shift in orientation towards the city level can be witnessed (Fig. 4). The dominance of the city level is particularly pronounced after the publication of The World Bank's *Groundswell Report* in 2018, with more than half of the 74 publications focusing on the city scale dating from 2019 or 2020. Overall, 40% (n = 74) of the 173 documents reviewed focus explicitly on the city level, and the dominance of this scale is particularly dominant in 2019–2020. The level of the world region (n = 50) and country (n = 37) have also been considered frequently, followed at a distance by the global (n = 10) and neighbourhood (n = 2) levels. Within the city-oriented literature, there is a strong privileging of capital cities and/or the largest cities (n = 32; 43%), while medium-sized or small cities feature three times fewer (n = 10; 14%). Although disproportionate attention to the largest cities is common across the wider urban studies literature, the pattern observed here suggests that the idea that bigger means more important is pervasive in research on climate mobilities into cities.

Among the 17 substantive subtopics that have been identified, urbanisation (n = 98), policy intervention (n = 96) and climate change adaptation (n = 73) are the most common. They are followed in descending order by migration decision-making (n = 56), resettlement (n = 56), informality (n = 55), labour migration (n = 54), economic development (n = 50), governance (n = 49), infrastructure (n = 34), politics and power relations (n = 34), human mobility (n = 31), health and well-being (n = 28), equity and social justice (n = 27), gender (n = 25), identity and citizenship (n = 15) and the Sustainable Development Goals [SDGs] (n = 8). Many documents address more than one topic, and the topics themselves are intricately related to each other (Fig. 5). Labour migration, informality, and policy intervention are particularly closely linked to other sub-topics. Labour migration is connected to migration decision-making; informality to urbanisation, economic development, and health and well-being; and policy intervention to equity and social justice and to the SDGs. Substantive findings from the reviewed literature are therefore discussed below on the basis of this structure of interrelation.

5. Thematic analysis

5.1. Labour mobilities

Almost one-third (n = 54) of the reviewed literature addresses labour-related climate mobilities in which the prospect of paid work in the city plays a key role. Three themes prevail in these publications: decision-making processes, the benefits to places of origin, and migrants' precarious employment and living situation in the cities to which they have moved.

5.1.1. Decision-making

About half (n = 26) of the documents labour-related climate mobilities address issues of decision-making. Within this literature, it remains common to see the decision to move as the outcome of the interplay of 'push' and 'pull' factors at the individual or household level, even though this approach has been criticised by the new mobilities paradigm (Sheller and Urry, 2006; Psaltoglou, 2016) and disciplines such as geography and sociology more widely. Frequently climate change-related factors are understood as a direct push factor (Penning-Rowsell et al., 2013; Dasgupta et al., 2016; Jessoe et al., 2018). For instance, using the 2008 Mexico National Rural Household Survey, Jessoe et al. (2018) show that a greater number of days with harmful temperatures (>32 °C) for maize – the dominant crop – in May–October increased labour migration from rural communities. Migrants are more likely to go the US if the temperature shock happens early in the growing season (May–June) and to urban areas in Mexico if they occur mid-season (July–August).

Nonetheless, there is also a range of literature associated with the pragmatic stance on climate migration (Piguet, 2013) that understands climate change, particularly its slow-onset manifestation, as a process that intensifies the prevalence of other factors that make people move away from the rural areas where they live (Beine and Parsons, 2012; Titel, 2013; Nawrotzki et al., 2015; Chisari and

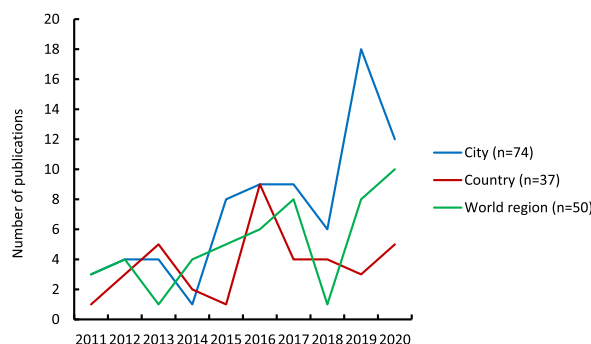


Fig. 4. Prevailing geographical scale in documents on climate change, migration and urban development, by year (n = 173).

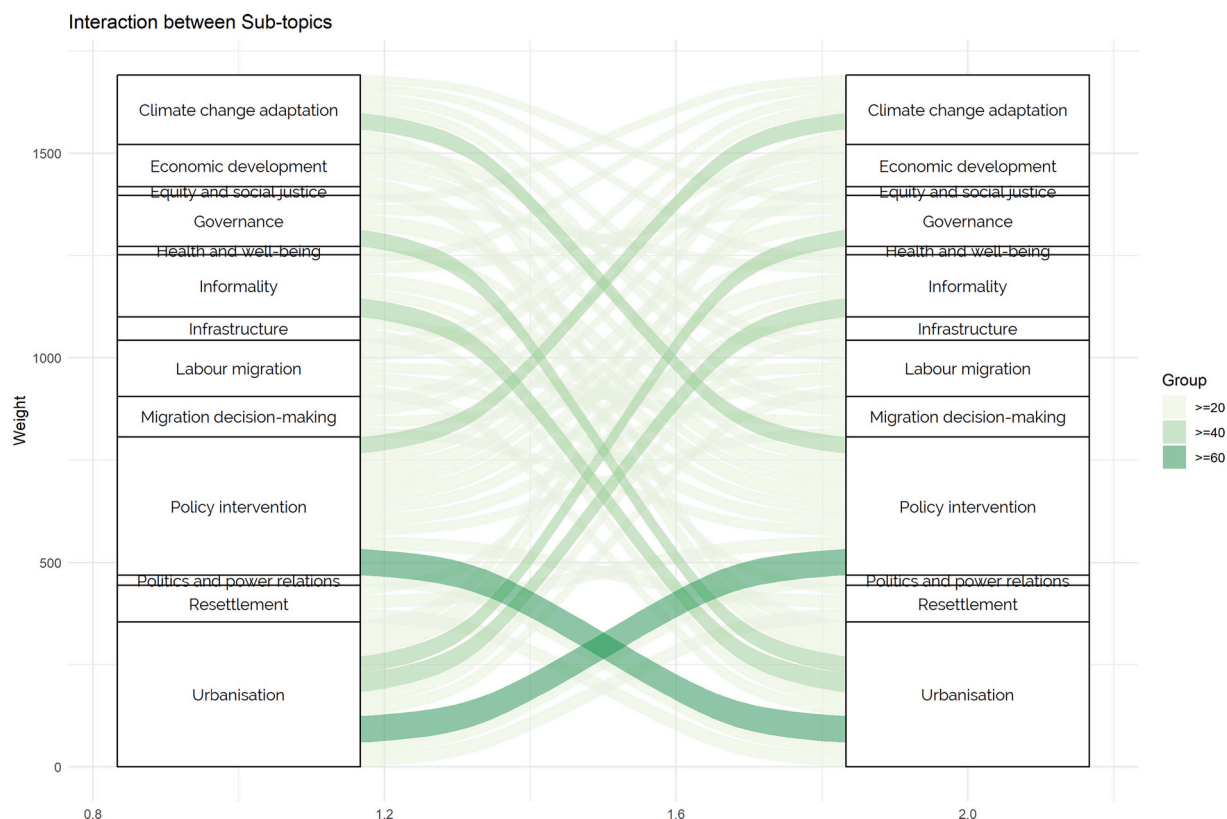


Fig. 5. Interconnections among the 17 sub-topic areas ($n = 173$).

Miller, 2016; Henderson et al., 2016; Tan et al., 2016; Jessoe et al., 2018; de Longueville et al., 2019). Those factors include un- or underemployment (Titel, 2013; Nawrotzki et al., 2015; Jessoe et al., 2018), poor access to agricultural land (Henderson et al., 2017; Mallick et al., 2017), low economic productivity (Chisari and Miller, 2016), indebtedness (Mallick et al., 2017), limited education opportunities (de Longueville et al., 2019), low incomes and poverty (Beine and Parsons, 2012; Titel, 2013; Henderson et al., 2016; Tan et al., 2016), poor health of family members (Tan et al., 2016), and negative impact on housing and connectivity to other locations (Tan et al., 2016).

It is also recognised that migration is not necessarily a common coping strategy in conditions of significant deprivation (Adger et al., 2015; Walter, 2015; Mueller et al., 2020) and sometimes acts as a measure of last resort (Penning-Rowsell et al., 2013). In nationally representative panel data for 2009–2014 in Ethiopia, Malawi, Tanzania, and Uganda, Mueller et al. (2020) find no statistically significant effects of temperature or rainfall on temporary out-migration (<1 yr) from rural areas in these East African countries. However, extreme temperatures and rainfall shocks are associated with reductions in temporary out-migration from urban areas in this study. Meanwhile, de Longueville et al. (2019) show that unfavourable rainfall conditions increased short-term (0.25–< 2 yr) migration but slightly diminished long-term (≥ 2 yr) migration by individuals from 600 villages that heavily rely on rain-fed agriculture, to urban areas in Burkina Faso in the period 1970–1998. The negative effect on long-term migration reflects that unfavourable rainfall reduces a village's socioeconomic status, which reduces the propensity to migrate in general.

Some reviewed studies suggests that the direct and indirect impacts of climate factors on migration decision-making need to be seen in relation to the opportunities that cities offer. In other words, unfavourable climatic conditions only encourage people to migrate to cities if the latter offer the pull factor of better economic opportunities (Population Action International, 2011; Henderson et al., 2017; Mallick et al., 2017; Horlings and Marschke, 2020). For instance, Henderson et al. (2017) have shown that drought has increased urbanisation across 29 African countries in the period 1960–2010, but urban growth has been concentrated particularly in those 25% of cities that have a strong manufacturing base and thus constitute an attractive destination from an employment perspective for rural-to-urban migrants. The remaining 75% comprise market towns that mostly service agriculture and thus offer far fewer opportunities for labour migrants.

One of the 26 studies on decision-making argues that the relationship between anthropogenic climate change and migration needs to be understood in a historical context. Based on empirical research among coastal communities in Ghana and Indonesia, Hillmann and Ziegelmayer (2016) critique the assumption of a 'mono-causal' relation from current anthropogenic climate change to migration. They conclude that in both study areas people have for centuries responded to environmental change through mobility in ways that are conditioned by governmental and institutional regimes. Specifically, contemporary relations between environmental change and

migration must be understood as embedded in long-term regional histories reaching back to the colonial era: “the integration of past migration experiences as well as the perception and expectation of former environmental changes among the local population into the analysis are crucial” (Hillmann and Ziegelmayer, 2016, page 132).

While the literature has enhanced understandings of how climate change may be implicated in labour-related decisions to move to a city, significant gaps remain such as the question how different manifestations of climate change affect migration processes by different social groups in different geographical contexts. It has repeatedly been recognised that climate change encourages men working in farming in rural areas to migrate into cities more than other groups (Penning-Rowsell et al., 2013; Dasgupta et al., 2016; Henderson et al., 2016), but findings are equivocal about whether climate migrants have higher or lower socioeconomic status (Lewin et al., 2012; Bernzen et al., 2019). For instance, Lewin et al. (2012) show that weather shocks reduce people’s inclination to migrate because severe weather shocks decrease a household’s stock of capital to a degree that their members are not able to afford the migration costs.

5.1.2. Migration to the city: beneficial or a source of precarity?

Two narratives about labour-related climate mobilities prevail in the reviewed literature. A substantial number of reviewed documents ($n = 18$) highlight the benefits of such mobilities for places of origin in terms of development – in particular, increased income and poverty reduction – and climate change adaptation. In this strand of literature, migrants are typically portrayed as active agents of change who enhance their own economic capital and, through remittances, support their families and home community. In contrast, another group of studies ($n = 18$) draws attention to the precarious working and living conditions of migrants and their well-being in destination areas. Work in this vein tends to place more emphasis on the broader politico-economic context within which climate mobilities takes place, and often draws on broader critiques of neoliberal capitalism.

Studies that highlight the benefits of climate mobilities for development often draw attention to the role migration can play in improving individuals’ economic capital and in spreading the livelihood risks of their households in the place of origin. Examples of the benefits mobilities can offer include many more job opportunities in urban areas (Nawrotzki et al., 2015; Walter, 2015; Jessoe et al., 2018; Surie and Sharma, 2019), increased net income of migrants (Henderson et al., 2016), improved adaptive capacity of migrants to climate change (Birk and Rasmussen, 2014) and increased economic capitals of migrants’ households in the place of origin by sending remittances (Greiner and Sakdapolrak, 2013; Titel, 2013). For instance, focusing on Bengaluru, India, Surie and Sharma (2019) show how the platform economy – i.e., becoming a driver for Uber or Ola – in cities offers different coping strategies than just working in the informal economy for male workers whose migration decision was influenced by excessive rainfall and drought or extreme temperatures. Yet, none of the 90 drivers in their sample considered “platform work a long-term livelihood option” (Surie and Sharma, 2019, page 135), which is related to the issue of job security of migrants.

It is, however, not uncommon for labour-related climate mobilities to deteriorate the socio-economic conditions of rural villages further. Dasgupta et al. (2016) shows that rural-urban migration often makes those left behind face a far greater risk of poverty than before because climate mobilities hollow out rural villages by reducing the number of working-age adults. This negative effect is widely recognised in the broader migration studies literature but hardly examined in relation to labour-related climate mobilities.

In the meantime, critical migration research has increasingly engaged with precarious working and living conditions of labour migrants in neoliberal urban economies. Precarious conditions refer to the multi-dimensional insecurity of life in terms of such as employment, social protection, income, representation and work environment. Important issues highlighted in the reviewed literature are equity and social justice ($n = 9$), politics and power relations ($n = 9$), and identity and citizenship ($n = 15$). For the topic of equity and social justice, the literature has improved our understanding through empirical studies from India (Santha et al., 2016; Chu and Michael, 2019; Michael et al., 2019; Surie and Sharma, 2019), Bangladesh (Ahsan, 2019a), Ghana (Alhassan, 2017) and Tanzania (Titel, 2013). Alhassan (2017, page i), for instance, describes how climate-related migrants in Ghanaian cities jostle for employment while continuously being “victimised, stigmatised, criminalised and challenged with physical injuries, indebtedness”. They usually cope with these challenges of ‘onward precarity’ (McIlwaine and Bunge, 2019) by seeking help from peers in their ethnic group with whom they share a spiritual and religious background – a response that has also been identified in other studies in other geographical contexts (e.g. Titel, 2013; Ayeb-Karlsson, 2021).

Key to onward precarity is also the perception among many of those who have been born or living for a long time in the city that recent climate-related migrants increase pressure on already overstretched infrastructures and compete with long-time residents over access to employment, housing, water and sanitation, transportation, and so forth (see e.g. Titel, 2013; Campbell, 2019; Chu and Michael, 2019). This typically occurs in a context of stark natural population growth in cities, which makes cities themselves important sites of vulnerability to climate change (see Parnell and Walawege, 2011 for a version of this argument for African cities). Research by Chu and Michael (2019) in the Indian cities of Bengaluru and Surat suggests that this is one of the reason why climate-related migrants are misrecognised in various ways. New forms of stigma of recent arrivals are amplified by older social divisions. If the newly arrived are from lower castes, religious minorities or do not speak the locally dominant language, they are negatively stereotyped in public discourse, denied citizenship rights and at heightened risk of social conflict, discrimination and living and working in parts of the city that are particularly vulnerable to climate impacts such as water scarcity, heat island effects and flooding. Because their political voice has been erased, the environmental concerns of climate-related migrant communities are not recognised and addressed in urban climate policies spearheaded by ‘native’ local political and economic elites.

Questions of potential conflict because of precarity following climate-induced mobility into have been addressed in another way as well. Selby et al. (2017) question the well-known thesis that exceptional drought in the late 2000s in Syria triggered substantial migration into cities which exacerbated socio-economic stresses and conflicts among new arrivals and long-time city residents and ultimately resulted into the country’s descent into civil war in 2011. The authors suggest that the drought in North-East Syria was not

evidently related to anthropogenic climate change and only triggered migration on a limited scale, and that drought-related migration was not a significant contributing factor to the onset of the country's civil war. This study and the work by authors like [Chu and Michael \(2019\)](#) foreground the need for careful analysis that neither exaggerates nor simplifies the socio-economic and political aspects of climate migration and its potential impacts on cities and their longer-time residents.

5.2. Informality

The discussion of the thematic analysis of 55 publications considering informality will be structured on the basis of two themes given that questions of informal labour and the informal economy have already been covered in the previous sub-section. The two themes are informal settlements as nexus of climate change, migration and urban development, and health risks and water as key constituents of migrant vulnerability. It is evident, then, that the cross-disciplinary literature on climate mobilities into cities tends to understand informality typically as spatial categorisation and as organisational form (see Section 2). Informality is a multi-dimensional concept that refers to modes of living, working and getting by that are normally invisible or illegible to (local) government institutions.

5.2.1. Informal settlements as nexus of climate change, migration and urban development

The relationships between climate mobilities and the growth of informal settlements in cities is a key consideration in the reviewed literature. Three out of every five publications on the theme of informality focus on the development of those settlements, which constitute a crucial nexus of climate change, migration and urban dynamics ([Bharti et al., 2020](#)). They are iconic sites within cities for understanding climate vulnerability as well as key empirical contexts to understand and plan empirically informed adaptation practices ([Trundle et al., 2019](#)), not least because their residents experience insecurity over land and housing tenure ([Orcherton et al., 2017](#)). It has been argued that whether migration to cities should be seen as a suitable adaptation strategy to climate change demands differential analysis of vulnerabilities of 'climate-induced' and 'non-climate induced' migrants ([Adri and Simon, 2018](#)). The adaptation plans of migrant and non-migrant groups located in low-elevation coastal zones has also provided a focus of comparison ([Zhen and Balk, 2020](#)).

Since informal settlements are often more vulnerable to the effects of climate change than other areas of the city, those brought there through climate mobilities can be at risk of having jumped 'from the frying pan into the fire'. This thus raises the question if moving to the city should be seen as a suitable climate change adaptation strategy, especially for poor migrants: usually less likely to leave their region of birth (e.g. [de Longueville et al., 2019](#); [Mueller et al., 2020](#)), they are more likely to settle in precarious flood-prone, low-elevation urban locations along the coast according to [Liu and Balk's \(2020\)](#) thoughtful spatial analysis. The risk of what, inspired by [McIlwaine and Bunge \(2019\)](#), we call onward climate vulnerability – moving away from conditions of climate vulnerability to settle, at least temporarily, in largely self-built developments susceptible to climate risk – has prompted [Adri and Simon \(2018\)](#), focusing on Dhaka, to recommend that the vulnerabilities of 'climate-induced' and 'non-climate induced' migrants be analysed separately.

Informal settlements as nexus of climate change, migration and urban dynamics have been examined in different world regions and cities, including Pacific Small Island Developing States ([Orcherton et al., 2017](#); [Campbell, 2019](#); [Trundle et al., 2019](#)) and Latin America ([Parry et al., 2019](#)) as well as different cities in Bangladesh ([Sikder et al., 2015](#); [Adri and Simon, 2018](#); [Rahaman et al., 2018](#); [Liu and Balk, 2020](#); [Ayeb-Karlsson, 2021](#)) and in Manila ([Tadgell et al., 2017](#); [Ajibade, 2019](#)), Lagos ([Ajibade, 2019](#)), Bengaluru ([Deshpande et al., 2019](#)), Accra ([Stacey, 2018](#)) and Alexandria ([Nassar and Elsayed, 2018](#)). They have also been the topic of multiple reports (e.g., [Metcalf et al., 2011](#); [O'Reilly, 2015](#); [Psaltoglou, 2016](#); [Campbell, 2019](#)) and some blogposts (e.g., [Vivekananda, 2017](#)). Empirical studies are dominated by the use of qualitative methods ($n = 35$) such as interviews ($n = 22$), followed by mixed-method approaches ($n = 13$), with quantitative methods accounting for one in every eight relevant publications ($n = 7$).

The conceptualisation of informal settlements as relationally produced at the intersection of rural and urban contexts constitutes a challenge for understanding climate mobilities into cities. [Niva et al.' \(2019\)](#) socio-ecological systems approach makes a useful contribution in this regard. These authors link the growth of informal settlements to structural and individual-level factors, both in the rural and urban contexts. The adaptive capacities at the structural and individual levels shape the reasons for migration and the challenge of informality in the city. They suggest that the emergence of informal settlements is a result of low adaptive capacity across the root causes of migration.

At times, the reviewed literature has privileged structural factors that link mobilities and informal settlements, such as poverty, education, and urban planning ([Luetz, 2018](#)) or food insecurity ([Nickanor et al., 2016](#)), over individual-level factors. Nonetheless, [Orcherton et al. \(2017\)](#) have examined barriers to, and enablers of, the adaptive capacities of informal settlers and communities, while [Deshpande et al. \(2019\)](#) have considered how those capacities relate to development agendas.

5.2.2. Health as important vulnerability for migrants in informal settlements

Within the 55 documents on informality, health risks feature prominently as a key concern and constituent of vulnerability. Migrants of course share these issues with others in informal settlements but are often in a situation of greater precarity than, say, adults born in a city's informal neighbourhoods. This is especially so if migrants have settled in recent, make-shift developments with few institutionalised infrastructures and particularly vulnerable to scarcity of water at times of drought or rather its abundance because of flooding and/or erosion.

A study of the health issues in informal settlements in Khulna City, Bangladesh has found that migrants from (rural) areas with strong climate vulnerabilities settle overwhelmingly in slums and squats in the city ([Rahaman et al., 2018](#)). The biggest health challenge these migrants face is access to decent basic urban services, and water and sanitation in particular, with the result that they are frequently exposed to different waterborne diseases and risk under-nutrition. Poor mental health is an additional and integral

element of the overall health risks for migrants in informal settlements (Parry et al., 2019; see also McMichael, 2019). A study among people in the Bhola Island informal settlement – named after the place they were displaced from by a cyclone – in Dhaka, Bangladesh foregrounds how loss of mental health and (gendered) experiences of depression and anxiety traps them in a location associated with danger, conflicts and hunger (Ayeb-Karlsson, 2021). Resettlement is, however, no solution per se as it does not guarantee that wellbeing loss is overcome.

As Parry et al. (2019) explain, physical and mental health issues among migrants in informal settlements are often intensified because of the invisibility of the latter to state and other authorities. Key issues in this context are “under-diagnosis” of trauma related to climate change earlier during the life-course or while living in the informal settlement, “poor disease control from lack of treatment, and under-reporting” (page 4). These issues can be compounded by social marginalisation of migrants in the city and the interplay of misrecognition by state agencies and migrants’ lack of trust in the public health system.

5.3. Policy intervention

More than half ($n = 96$) of the 173 reviewed document address policy intervention in some way. The most common is the provision of policy recommendations ($n = 76$, 79%), often rather briefly at the end of an academic publication. Twenty publications, however, review and critically reflect on current policy and practice (21%). In terms of methods, the use of policy/literature reviews ($n = 46$) and interviews ($n = 18$) prevail across the 96 publications.

The shift in geographical scale from the national to the city level generates different ways of seeing, representing and understanding the policy challenges of climate mobilities. A key question here is how climate mobilities into cities are understood: Are they first and foremost a system-level and/or household-level response of adaptation to diverse problems in rural areas intensified by climate change that in the longer term will benefit both those who move and the communities they leave? Or are those arriving in the city at risk of onward precarity and onward climate vulnerability and thus in need of policy deliberate intervention? The answers to these questions are not mutually exclusive and map to some extent onto the narratives about labour-related climate mobilities in Section 4.1.2. Unsurprisingly, authors whose answers to the second question are affirmative tend to discuss policy issues and responses by local and other – especially national – authorities in greater detail. Ahsan (2019b), for instance, examines how climate-related migration creates both national and urban level policy challenges in Bangladesh. The author highlights migrants’ precarious economic and socio-cultural conditions in the city and the inadequacy of policy at multiple levels of governance to support them. It is suggested that policies focused on social justice and securing migrants’ rights are becoming a central and integral part of climate change adaptation programmes.

A series of policy issues regarding climate mobilities at the city scale are discussed in the reviewed literature. These include the multi-dimensional vulnerability, marginality and exclusion of migrants’ experience in cities, particularly in terms of employment, sanitation as well as citizenship rights and the right to the city (Santha et al., 2016; Ahsan, 2019a; Chu and Michael, 2019; Turhan and Armiero, 2019). Given the earlier identification of health as a primary site of vulnerability for migrants in informal settlements (Section 4.1.2), it is not surprising that public health concerns also feature prominently in the reviewed literature (McMichael et al., 2012; Santha, 2015; Rahaman et al., 2018; Schwerdtle et al., 2018). Rahaman et al. (2018) explore the health disorders of climate migrants in the informal settlement of Khulna city, Bangladesh, and discuss how their limited access to urban amenities such as clean water and health services make the risk of different waterborne diseases a priority for urban planning policies.

Publications also imply that policy intervention should not only target climate migrants into cities but also the attitudes and view of those who have been born or lived a long time in the city. The previously discussed paper by Chu and Michael (2019) on Bengaluru and Surat suggests this at least implicitly. The same can be inferred from Spilker et al. (2020) analysis of survey data among long-time urban residents in Kenya and Vietnam. These authors show that those displaced by drought or flooding are not perceived as more deserving of access to the city and its infrastructures than economic migrants from rural backgrounds. This in part reflects the relatively positive views of economic migration in both countries and possibly urbanites’ limited familiarity through first-hand experience with climate migrants. Nonetheless, even if the authors themselves do not conclude this, we believe their results indicate a role for campaigns to increase public understanding of climate migration.

Various documents frame the challenges that climate mobilities pose to urban sustainability with reference to the SDGs agreed by the UN in 2015 (e.g., Foresti and Hagen-Zanker, 2018; Serraglio et al., 2019). Unsurprisingly, SDG11 on urban sustainability features most prominently with eight times. However, in line with the prominence of health and water as important vulnerabilities for migrants in informal settlements (Section 4.2.2), SDG3 on health and wellbeing, SDG6 on clean water and sanitation, and SDG16 on effective and inclusive institutions are also discussed (e.g., Nagabhatla and Brahmabhatt, 2020). Studies also discuss how climate mobilities into cities can help the realisation of different SDGs (Hunter et al., 2019; Mpandeli et al., 2020). This framing reflects that climate mobilities can have both positive and negative impacts on development outcomes at the place of origin and destination depending on the policies in place (Section 4.1.2.).

Some studies recognise the major uncertainties on how common climate mobilities into cities might evolve in future, and therefore advocate a ‘no-regrets’ approach to policymaking that produces broadly beneficial outcomes whatever “particular [climate] scenarios are ultimately realised, and might even make sense in the complete absence of climate change” (Luetz, 2018, page 69). For the Bangladeshi context studied by Luetz, these include poverty reduction and free and compulsory education for all in rural areas and targeted infrastructure service planning in the areas of electricity, health care, water and waste management facilities in informal settlements in arrival cities. The latter demand “concerted and coordinated interagency planning” (ibid.). While somewhat useful, the recommendations by Luetz (2018) – and many other publications – are often generic rather than tailored to the particular issues and the institutional realities in the cities on which attention is centred.

6. Discussion and future research

The literature review shows the growing significance of the urban lens through which climate mobilities have been understood in recent years. It also demonstrates why future research needs to consider carefully the use of not only policy-based rather than scientific definitions of migrants and mobilities but also sophisticated conceptualisations of the causalities that structure these climate mobilities into cities. Fuller understanding of how those mobilities condition and reconfigure urban informalities is also warranted.

6.1. The limits of policy concepts in scientific research

The notions of climate migration and the climate migrant are primarily policy constructs. They do not always map easily onto identifiable demographics or straightforward taxonomies of those arriving in cities. Not only did climate migration emerge as a subject of popular and political concern globally with the coining of the term ‘environmental refugees’ in the 1990s (see Introduction). Our analysis has also shown that specific moments of public policy interest have been particularly influential in shaping the endeavours of researchers and some of the problems this engenders. Two major events – the work of the UK Foresight programme and the World Bank’s major review (UK Government Office for Science, 2011; Kanta et al., 2018) – prompted significant upticks in the appearance of new documents on climate migration, and the latter has played a major role in shifting attention towards climate migration within countries and directed at cities.

6.2. The geographical scales of mobility and migration

The notion of ‘the migrant’ is commonly used and commonly misunderstood in popular discussion. In United Nations terminology ‘migration’ references people that move across international borders for at least twelve months, and the analytical search for a corresponding group of climate migrants has seen very limited success. Based on our review, we suggest that the absence of large numbers of international climate migrants is a consequence of not so much of the ‘fabrication of a migration threat’ faced by global North countries (De Haas, 2020; De Haas et al., 2019) as a (Eurocentric) misunderstanding of spatial scales. Climate mobilities are mostly happening within countries rather than crossing national borders, commonly sustaining relations of domestic remittances, kinship and belonging, between rural and urban locations of departure and arrival respectively. This is particularly true for India and China that alone account for over 35% of world population and are two of the most rapidly urbanising countries on the planet. The situation is more complicated in other parts of the planet – large parts of Africa in particular – where national boundaries are less meaningful and cross-border movement may be weakly regulated.

These reflections suggest that future research should work with both a theoretically nuanced representation of mobilities and their spatialities and temporalities, and a sophisticated methodological understanding of the plural motivations behind why people move. We agree that the term ‘climate mobilities’ captures the complexity and social differentiation of (non-)movements and non-movements better than climate migration does (Boas et al., 2019; Wiegel et al., 2019; Michael et al., 2019; Cundill et al., 2021; see also Baldwin et al., 2019). Nonetheless, the term climate migration has become so embedded – particularly in policy circles and among scientists who are not (yet) familiar with the ‘new mobilities paradigm’ (Sheller and Urry, 2006; Psaltoglou, 2016) – that there is perhaps more potential in inserting theoretical ideas from that paradigm into scholarship about climate migration than seeking to overturn what is now an established vocabulary. Our systematic review revealed the strong indebtedness of publications to the classic theoretical notion of the decision to move as the result of location-specific push and pull factors. This understanding – rooted in a Eurocentric understanding of the (non)migrant as economically rational, utility-optimizing Man – may be applicable in certain situations. These should, however, be established empirically rather than assumed a priori. Work within the new mobilities paradigm can help to dislodge the push/pull factor model from its central position in how researchers conceptualise individual and household decision-making in response to climate events and process.

6.3. Understanding the causes of mobilities

Some of the reviewed literature attempts to distinguish the difference between migrants who moved to the city for climate-related reasons and migrants who move there for other reasons. Based on the systematic review, we are unconvinced about the usefulness of such a distinction in future research. Attributing proportions of causality to climate change in contrast to other migration drivers is consequently deeply problematic in both conceptual and methodological terms. Conceptually, the material circumstances from which somebody moves, the material cause and the propensity to move, constitutes one register of causality. The cognitive processes, aspirational deliberation, demographic attributes or modes of travel to the city constitute what realist epistemologists sometimes distinguish (following Aristotle) as formal, final or efficient causalities. Philosophically, these domains of the causal are not straightforwardly commensurable or comparable with each other (Archer et al., 1998; Harré, 1979; Lewis, 2000). Practically, the review here suggests that the ‘push/pull’ framing of migration and the climate/non-climate migrant dichotomy may have limited research purchase on the complex interaction of urban life and environmental change. This is reflected increasingly in social scientific thinking that focuses on how future change evolves and how it might represent the propensity of particular configurations of mobility and urban change or the geographical and historical affordances of combinations of nature and culture (Ingold, 2018; Julien, 1995). This matters when understanding how small changes in complex and open urban systems may trigger significant changes in the DNA of whole cities.

Attempts to identify to what extent climate change is a cause of migration entails the risk of environmental determinism and

placing the analysis in an ontology that places nature, including the climate, outside human societies (Hulme, 2011). Environmental determinism is a set of beliefs according to which conditions and processes in nature are assumed to have a direct effect on human behaviour and societies, irrespective of their social organisation and cultures (e.g., Castree et al., 2013). Literature that seeks to isolate biophysical manifestations of climate change, such as flooding or depletion of groundwater reserves, as direct causes for the decision of individuals or households to move to the city is aligning itself with environmental determinism, which is conceptually problematic. Different strands of social theory, including Marxist political ecology and actor network theory, have shown that nature and society are fundamentally entangled and entwined. Moreover, the separation of nature from human society has its roots in the history of Euro-centric thought and is not recognised in most, if not all, Indigenous philosophies (Descola, 2013).

Methodologically, the majority of people who move do so for an array of reasons, many of which may evolve in retrospect into *justifications* of past actions as much as *causes* of them. One might argue that researchers could work around this issue by undertaking research in situations where a natural experiment can be created, for example when a major climate-related disaster affects one geographically defined 'treatment' population but not another untreated but in many similar population. Nonetheless, both groups would not be as distinct as it might seem: people in the treatment group may be moving for multiple interrelated reasons, and those in the untreated group may have been affected in complex ways by climatic events earlier in their life-course or by slow-onset forms of climate change. Given this, it makes more sense to consider climate change as a 'new normal' context in which mobilities occur (Boas et al., 2019) and that is in complex, dynamic and to a degree extent unknowable ways shaping decisions about how individuals, households and communities respond to changing climates.

6.4. Foregrounding the diversity of urban spaces and temporalities

With regard to spatiality, the systematic review indicates not only that the city as an empirical category – the concentration of people and human activity in topographical space – has become increasingly significant in climate mobilities research. It also reveals a strong focus of research on capital cities and the largest cities. This bias is common across the wider urban studies literature as the idea that bigger means more important is still pervasive. We suggest that the role of medium-sized and small cities needs to be revisited in future research. This is partly because such cities are home to the majority of the planet's population globally and are experiencing fast population growth. It is also because many migrants from rural communities do not always migrate to big cities directly – unless they have existing social networks there – but move throughout the urban hierarchy, often via the smaller and medium-sized cities.

We also found that there is geographical differentiation in the global focus of climate change research reviewed in the literature. Fast-onset climate change is discussed more often for South Asia, whereas slow-onset change is more commonly considered for Sub-Saharan Africa. This difference may have implications, recognising the interplay of temporal and spatial dynamics of migration and mobility in the two regions, which requires further research to provide robust conclusions about the relationships between manifestations of climate change and the drivers, time scales and spatial scales of migration.

The spectrum that ranges from high-impact localised disasters that precipitate movement to slow moving forms of agricultural degradation over several decades implies that scientific analysis of climate mobilities demands a sophisticated understanding of the interplay of temporalities and geographies of climate mobilities. People move from rural areas to urban areas but there remains a relationality between the two; flows of seasonal movements and remittances. Slow-onset environmental degradation in agricultural economies, demonstrable rises in sea level and climate related disasters such as extreme weather events or flooding may all relate to the mobilities of people but may do so in very different ways as our review has indicated, albeit – we add – not necessarily in the manner of traditional push/pull factor models of migration decision-making.

Cities tend to be the engines of development. Even in some of the least promising settings, the city as a site of social dynamism and economic flux tends to be the source of employment opportunities, however unstable and precarious these might be. However, for climate migrants and others, the search for somewhere to work is sometimes less difficult than the struggle to find somewhere to live. The latter generates the self-build, extemporised settlements that are commonly characterised as informal forms of slums, squatting and occupation. Hence, with regard to climate migration, 'informality' is both a city-wide organisational form within the city-wide labour market (and the provision of services such as healthcare) and a spatial categorisation that denotes territorialised concentrations of large numbers of people living in situations where their legal status and right to dwell are at best precarious (cf. Section 2). These two aspects of informality are logically distinct, and future research needs to scrutinise how climate change in areas where migrants (bigger) cities hail from affects and contributes to each in different geographical contexts. Embedded engagement through ethnographic methods is probably more suitable to this kind of inquiry than the quantitative approaches that dominated the literature we surveyed. This may also help researchers to explore whether other uses and understandings of informality (see Section 2) are directly relevant to how climate migrants live, work and get by in the city.

More straightforwardly, the research reviewed in this paper demonstrates both an increasing interest and a significant research gap in understanding how the territories of informal settlement function as sites of migrant arrival and settlement. In sites across very diverse geographical settings, the new city emerging tends to concentrate evolving combinations of formal and informal economies and labour markets but is marked by significant territorial separation between modes of formal and informal settlement. Informal settlements evidence an urban paradox of visibility. The need to sustain somewhere to live incentivises low profiles for those who move, avoiding the exposure to legal regimes that may displace informal settlements across the city. Yet research also demonstrates both the detailed and at times autonomous working of settlements themselves and the imperatives to address both sub-standard infrastructures and challenges of public health related to water supply and sanitation that demand intervention and higher profile visibility and claims making. Consequently, a focus on sites of settlement and engagements between the newly arrived, the longer settled and regimes of governance at a time of climate crisis – as pursued, for instance, by Titel (2013), Campbell (2019) and Chu and

Michael (2019) as discussed in Section 4.1.2 above – might be a more rewarding orientation of future research than an analytical lens that scrutinises the taxonomic shibboleth of ‘climate migrants’.

7. Conclusion

The systematic review has shown the increased interest in climate mobilities into cities over the past decade, with labour migration, informality and the policy responses to climate migration as key themes. Across much of the cross-disciplinary literature understandings of climate change as push factor and the prospect of (better) work and income remain influential, which we have suggested generates multiple conceptual and methodological difficulties. If climate mobilities are indeed the new normal (Boas et al., 2019), then it is perhaps more productive for future research on mobilities and urban development to start from the strong overlaps between climate and economic migration. This would also help researchers circumvent the logical and analytical barriers to the identification of crisply defined demographic of climate migrants.

The review has revealed a clear distinction between studies that see climate migration into cities as a sign of successful adaptation and upward social mobility and those understand such mobility primarily as a route towards onward precarity and onward climate vulnerability. The risk of the latter is significantly more pronounced if migrants end up in conditions of informality, which has mostly been understood as either organisational form – typically in relation to the urban economy but also with regard to service provision, as in the case of healthcare – or as a spatial categorisation that denotes, especially in global South settings, particular settlements where new migrants tend to be concentrated.

Many of such informal settlements are subject to longstanding neglect from city governments, which causes multiple and intersecting vulnerabilities in which a wide range of health disorders play a significant role. Yet, when it comes to policy interventions, studies frequently stress the moral case for more just interventions in the city, particularly in the spaces of informal settlement. Such normatively oriented publications are commonly cautious about advocating preferred and specific policy interventions that are tailored to the specific cities being considered. Nonetheless, a case can be made for research at the intersection of science and action that co-produces knowledge, public awareness and interventions with all relevant constituencies about how the multiple and intersecting vulnerabilities and marginalisation of the vast majority of migrants into cities can be addressed, mitigated and prevented.

The absence of the predicted numbers of ‘climate refugees’ moving from the global South to the North does not obviate the significance of climate mobilities of people as both a response to and future determinant of climate change. It instead demands multi-scalar and multi-temporal perspectives on how we think about migration and a relational understanding of how we understand global networks of metropolitan growth. Empirical research that adopts and develops such perspectives should not be limited to the fairly limited set of iconic cities that are typically large and strongly concentrated in South Asia. It seems particularly germane to critically examine the potential significance of smaller of and medium-sized cities across the wider planet to climate mobilities into, between and within urban areas.

Funding

The work reported in this paper was financially supported by the Oxford Martin School at the University of Oxford.

The manuscript has not been previously published and is not currently under consideration for publication elsewhere. To the best of my knowledge, we have no conflicts of interest to disclose.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Acuto, M., Dinardi, C., Marx, C., 2019. Transcending (in)formal urbanism. *Urban Stud.* 56 (3), 475–487.
- Adey, P., 2006. If mobility is everything then it is nothing: towards a relational politics of (im)mobilities. *Mobilities* 1 (1), 75–94. <https://doi.org/10.1080/17450100500489080>.
- Adger, W.N., Arnell, N.W., Black, R., Dercon, S., Geddes, A., Thomas, D.S.G., 2015. Focus on environmental risks and migration: causes and consequences. *Environ. Res. Lett.* 10 (6), 060201 <https://doi.org/10.1088/1748-9326/10/6/060201>.
- Adri, N., Simon, D., 2018. A tale of two groups: focusing on the differential vulnerability of “climate-induced” and “non-climate-induced” migrants in Dhaka City. *Clim. Dev.* 10 (4), 321–336. <https://doi.org/10.1080/17565529.2017.1291402>.
- Ahsan, R., 2019a. Climate change and uncharted social challenge in existing urban setup in Bangladesh. In: Hussain, S. (Ed.), *Climate Change and Agriculture*. <https://doi.org/10.5772/intechopen.83409>. IntechOpen.
- Ahsan, R., 2019b. Climate-induced migration: impacts on social structures and justice in Bangladesh. *South Asia Res.* 39 (2), 184–201. <https://doi.org/10.1177/0262728019842968>.
- Ajibade, I., 2019. Planned retreat in global south megacities: disentangling policy, practice, and environmental justice. *Clim. Chang.* 157 (2), 299–317. <https://doi.org/10.1007/s10584-019-02535-1>.
- Alhassan, A.Y., 2017. Rural-Urban Migrants and Urban Employment in Ghana: A Case Study of Rural Migrants from Northern Region to Kumasi. University of Agder, Norway. Available at: <http://hdl.handle.net/11250/2459938>.
- Archer, M., Bhaskar, R., Collier, A., Lawson, T., Norrie, A., 1998. *Critical Realism: Essential Readings*. Routledge, London.
- Ayeb-Karlsson, S., 2021. “When we were children we had dreams, then we came to Dhaka to survive”: urban stories connecting loss of wellbeing, displacement and (im)mobility. *Clim. Dev.* 13 (4), 348–359. <https://doi.org/10.1080/17565529.2020.1777078>.

- Baldwin, A., Methmann, C., Rothe, D., 2014. Securitizing 'climate refugees': the futurology of climate-induced migration. *Crit. Stud. Secur.* 2 (2), 121–130. <https://doi.org/10.1080/21624887.2014.943570>.
- Baldwin, A., Fröhlich, C., Rothe, D., 2019. From climate migration to anthropocene mobilities: shifting the debate. *Mobilities* 14 (3), 289–297. <https://doi.org/10.1080/17450101.2019.1620510>.
- Beine, M.A.R., Parsons, C.R., 2012. Climatic Factors as Determinants of International Migration. In: CESifo Working Paper Series, p. 3747. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2016071.
- Berzen, A., Jenkins, J.C., Braun, B., 2019. Climate change-induced migration in coastal Bangladesh? A critical assessment of migration drivers in rural households under economic and environmental stress. *Geosciences* 9 (1), 51. <https://doi.org/10.3390/geosciences9010051>.
- Bharti, N., Khandekar, N., Sengupta, P., Bhadwal, S., Kochhar, I., 2020. Dynamics of urban water supply management of two Himalayan towns in India. *Water Policy* 22, 65–89. <https://doi.org/10.2166/wp.2019.203>.
- Birk, T., Rasmussen, K., 2014. Migration from atolls as climate change adaptation: current practices, barriers and options in Solomon Islands. *Nat. Res. Forum* 38 (1), 1–13. <https://doi.org/10.1111/1477-8947.12038>.
- Black, R., 2001. Environmental refugees: Myth or reality? In: *New Issues in Refugee Research, Research Paper*, 34. United Nations High Commissioner for Refugees (UNHCR).
- Boas, I., Farbotko, C., Adams, L., et al., 2019. Climate migration myths. *Nat. Clim. Chang.* 9, 898–903. <https://doi.org/10.1038/s41558-019-0633-3>.
- Campbell, J.R., 2019. Climate Change and Urbanisation in Pacific Island Countries, vol. 49. Toda Peace Institute Policy Brief. Available at: <https://toda.org/assets/files/resources/policy-briefs/t-pb-49-john-campbell-climate-change-and-urbanisation-in-pics.pdf>.
- Castree, N., Kitchin, R., Castree, N., 2013. *A Dictionary of Human Geography*. Oxford University Press, Oxford.
- Chisari, O., Miller, S., 2016. Climate Change and Migration: A CGE Analysis for Two Large Urban Regions of Latin America. IDB Working Paper Series, IDB-WP-659, available at: <https://publications.iadb.org/publications/english/document/Climate-Change-and-Migration-A-CGE-Analysis-for-Two-Large-Urban-Regions-of-Latin-America.pdf>.
- Choudhary, B.K., Tripathi, A.K., Rai, J., 2019. Can 'poor' cities breathe: responses to climate change in low-income countries. *Urban Clim.* 27, 403–411. <https://doi.org/10.1016/j.uclim.2019.01.001>.
- Chu, E., Michael, K., 2019. Recognition in urban climate justice: marginality and exclusion of migrants in Indian cities. *Environ. Urban.* 31 (1), 139–156. <https://doi.org/10.1177/0956247818814449>.
- Cundill, G., Singh, C., Adger, W.N., Safra da Campos, R., Vincent, K., Tebboth, M., Maharjan, A., 2021. Toward a climate mobilities research agenda: intersectionality, immobility, and policy responses. *Glob. Environ. Chang.* 69, 102315. <https://doi.org/10.1016/j.gloenvcha.2021.102315>.
- Dasgupta, S., Hossain, M.M., Huq, M., Wheeler, D., 2016. Facing the Hungry Tide: Climate Change, Livelihood Threats, and Household Responses in Coastal Bangladesh. In: *The World Bank Policy Research Working Paper*, vol. 7148. Available at: <https://openknowledge.worldbank.org/handle/10986/21143>.
- De Haas, H., 2020. Climate Refugees: The Fabrication of a Migration Threat. Available at: <https://heindehaas.blogspot.com/2020/01/climate-refugees-fabrication-of.html>.
- De Haas, H., Castles, S., Miller, M.J., 2019. *The Age of Migration: International Population Movements in the Modern World*. The Guildford Press, London.
- Dell'Anno, R., 2021. Theories and definitions of the informaleconomy: A survey. *J. Econ. Surv.* <https://doi.org/10.1111/joes.12487> in press.
- Descola, P., 2013. *Beyond Nature and Culture* (Translated by Janet Lloyd). University of Chicago Press, Chicago, IL.
- Deshpande, T., Michael, K., Bhaskara, K., 2019. Barriers and enablers of local adaptive measures: a case study of Bengaluru's informal settlement dwellers. *Local Environ.* 24 (3), 167–179. <https://doi.org/10.1080/13549839.2018.1555578>.
- Evangelista, P., Santoro, L., Thomas, A., 2018. Environmental sustainability in third-party logistics service providers: a systematic literature review from 2000–2016. *Sustainability* 10 (5), 1627. <https://doi.org/10.3390/su10051627>.
- Foresti, M., Hagen-Zanker, J., 2018. Migration and the 2030 Agenda for Sustainable Development. ODI, London. Available at: <https://www.odi.org/publications/10913-migration-and-2030-agenda-sustainable-development>.
- Gemenne, F., 2011. How they became the human face of climate change. Research and policy interactions in the birth of the "environmental migration" concept. In: Piguet, E., Péoud, A., de Guchteneire, P. (Eds.), *Migration and Climate Change*. Cambridge University Press, Cambridge, pp. 225–259.
- Greiner, C., Sakdapolrak, P., 2013. Rural-urban migration, agrarian change, and the environment in Kenya: a critical review of the literature. *Popul. Environ.* 34 (4), 524–553. <https://doi.org/10.1007/s11111-012-0178-0>.
- Harré, R., 1979. *Social Being: A Theory for Social Psychology*. Blackwell, Oxford.
- Hart, K., 1973. Informal income opportunities and urban employment in Ghana. *J. Mod. Afr. Stud.* 11 (1), 61–89. <https://doi.org/10.1017/S0022278X00008089>.
- Henderson, J.V., Storeygard, A., Deichmann, U., 2016. 50 Years of Urbanization in Africa: Examining the Role of Climate Change. In: *The World Bank Policy Research Working Paper*, vol. 6925. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2456048.
- Henderson, J.V., Storeygard, A., Deichmann, U., 2017. Has climate change driven urbanization in Africa? *J. Dev. Econ.* 124, 60–82. <https://doi.org/10.1016/j.jdeveco.2016.09.001>.
- Hillmann, F., Ziegelmayer, U., 2016. Environmental change and migration in coastal regions: examples from Ghana and Indonesia. *Erde* 147 (2), 119–138. <https://doi.org/10.12854/erde-147-9>.
- Horlings, J., Marschke, M., 2020. Fishing, farming and factories: adaptive development in coastal Cambodia. *Clim. Dev.* 12 (6), 521–531. <https://doi.org/10.1080/17565529.2019.1645637>.
- Hulme, M., 2011. Reducing the future to climate: a story of climate determinism and reductionism. *Osiris* 26 (1), 245–266. <https://doi.org/10.1086/661274>.
- Hunter, L., Luna, J.K., Norton, R.M., 2015. Environmental dimensions of migration. *Annu. Rev. Sociol.* 41, 377–397. <https://doi.org/10.1146/annurev-soc-073014-112223>.
- Hunter, L., Brandi, C., Connell, J., Hermans, K., Newig, J., Smith, M.S., 2019. On the Move: Migration Can Contribute to Sustainable Economic Development? Re. Think. Available at: <https://rethink.earth/on-the-move-migration-can-contribute-to-sustainable-economic-development/>.
- Ingold, T., 2018. Back to the future with the theory of affordances. *HAU* 8 (1/2), 39–44. <https://doi.org/10.1086/698358>.
- IPCC, 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC, Geneva. Available at: <https://www.ipcc.ch/report/ar5/syr/>.
- Jessoe, K., Manning, D.T., Taylor, J.E., 2018. Climate change and labour allocation in rural Mexico: evidence from annual fluctuations in weather. *Econ. J.* 128 (608), 230–261. <https://doi.org/10.1111/ecoj.12448>.
- Julien, F., 1995. *The Propensity of Things: Toward a History of Efficacy in China*. Urzone, New York.
- Kanta, K.R., de Sherbinin, A., Jones, B., Bergmann, J., Clement, V., Ober, K., Schewe, J., Adamo, S., McCusker, B., Heuser, S., Midgley, A., 2018. Groundswell: Preparing for Internal Climate Migration. The World Bank, Washington, D.C. Available at: <https://www.worldbank.org/en/news/infographic/2018/03/19/groundswell-preparing-for-internal-climate-migration>.
- Kibreb, G., 1997. Environmental causes and impact of refugee movements: A critique of current debate. *Disasters* 21 (1), 20–38. <https://doi.org/10.1111/1467-7717.00042>.
- Klepp, S., 2017. Climate change and migration. In: *Oxford Research Encyclopedia of Climate Science*. <https://doi.org/10.1093/acrefore/9780190228620.013.42>.
- Lewin, P.A., Fisher, M., Weber, B., 2012. Do rainfall conditions push or pull rural migrants: evidence from Malawi. *Agric. Econ.* 43 (2), 191–204. <https://doi.org/10.1111/j.1574-0862.2011.00576.x>.
- Lewis, P., 2000. Realism, causality and the problem of social structure. *J. Theory Soc. Behav.* 30 (3), 249–268. <https://doi.org/10.1111/1468-5914.00129>.
- Liu, Z., Balk, D., 2020. Urbanisation and differential vulnerability to coastal flooding among migrants and nonmigrants in Bangladesh. *Popul. Space Place* 26 (7), e2334. <https://doi.org/10.1002/psp.2334>.
- de Longueville, F., Zhu, Y., Henry, S., 2019. Direct and indirect impacts of environmental factors on migration in Burkina Faso: application of structural equation modelling. *Popul. Environ.* 40 (4), 456–479. <https://doi.org/10.1007/s11111-019-00320-x>.

- Luetz, J., 2018. Climate change and migration in Bangladesh: Empirically derived lessons and opportunities for policy makers and practitioners. In: Leal Filho, W., Nalau, J. (Eds.), *Limits to Climate Change Adaptation*. Springer, Cham, pp. 59–105. https://doi.org/10.1007/978-3-319-64599-5_5.
- Mallick, B., Ahmed, B., Vogt, J., 2017. Living with the risks of cyclone disasters in the south-western coastal region of Bangladesh. *Environments* 4 (1), 13. <https://doi.org/10.3390/environments4010013>.
- McFarlane, C., Waibel, M., 2012. In: Waibel, M., McFarlane, C. (Eds.), *Urban Informalities : Reflections on the Formal and Informal*. Ashgate, Farnham, pp. 1–12.
- McIlwaine, C., Bunge, D., 2019. Onward Precarity, Mobility, and Migration among Latin Americans in London. *Antipode* 51 (2), 601–619. <https://doi.org/10.1111/anti.12453>. In press.
- McMichael, C., 2019. Human mobility, climate change, and health: unpacking the connections. *Lancet Planet. Health* 4 (6), e217–e218. [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(20\)30125-X](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30125-X).
- McMichael, C., Barnett, J., McMichael, A.J., 2012. An ill wind? Climate change, migration, and health. *Environ. Health Perspect.* 120 (5), 646–654. <https://doi.org/10.1289/ehp.1104375>.
- Metcalfe, V., Pavanello, S., Mishra, P., 2011. Sanctuary in the City? Urban Displacement and Vulnerability in Nairobi. ODI, London. Available at: <https://www.odi.org/publications/5943-sanctuary-city-urban-displacement-and-vulnerability-nairobi>.
- Michael, K., Deshpande, T., Ziervogel, G., 2019. Examining vulnerability in a dynamic urban setting: the case of Bangalore's interstate migrant waste pickers. *Clim. Dev.* 11 (8), 667–678. <https://doi.org/10.1080/17565529.2018.1531745>.
- Millock, K., 2015. Migration and environment. *Ann. Rev. Resour. Econ.* 7, 35–60. <https://doi.org/10.1146/annurev-resource-100814-125031>.
- Mpandeli, S., Nhamo, L., Hlahla, S., Naidoo, D., Liphadzi, S., Modi, A.T., Mabhauddi, T., 2020. Migration under climate change in southern Africa: a nexus planning perspective. *Sustainability* 12 (11), 4722. <https://doi.org/10.3390/su12114722>.
- Mueller, V., Sheriff, G., Dou, X., Gray, C., 2020. Temporary migration and climate variation in eastern Africa. *World Dev.* 126, 104704. <https://doi.org/10.1016/j.worlddev.2019.104704>.
- Myers, N., 1995. *Environmental Exodus: An Emergent Crisis in the Global Arena*. Climate Institute, Washington, D.C.. Available at: <http://www.climate.org/archive/PDF/Environmental%20Exodus.pdf>.
- Nagabhatla, N., Brahmabhatt, R., 2020. Geospatial assessment of water-migration scenarios in the context of sustainable development goals (SDGs) 6, 11, and 16. *Remote Sens.* 12 (9), 1376. <https://doi.org/10.3390/rs12091376>.
- Nassar, D.M., Elsayed, H.G., 2018. From informal settlements to sustainable communities. *Alex. Eng. J.* 57 (4), 2367–2376. <https://doi.org/10.1016/j.aej.2017.09.004>.
- Nawrotzki, R.J., Hunter, L.M., Runfola, D.M., Riosmena, F., 2015. Climate change as a migration driver from rural and urban Mexico. *Environ. Res. Lett.* 10 (11), 114023. <https://doi.org/10.1088/1748-9326/10/11/114023>.
- Nickanor, N., Crush, J., Pendleton, W., 2016. Migration, rural-urban linkages and food insecurity. In: Crush, J., Battersby, J. (Eds.), *Rapid Urbanisation, Urban Food Deserts and Food Security in Africa*. Springer, Cham, pp. 127–142. https://doi.org/10.1007/978-3-319-43567-1_10.
- Niva, V., Taka, M., Varis, O., 2019. Rural-urban migration and the growth of informal settlements: a socio-ecological system conceptualization with insights through a “water lens”. *Sustainability* 11 (12), 3487. <https://doi.org/10.3390/su11123487>.
- Oliver, K., Cairney, P., 2019. The dos and don'ts of influencing policy: a systematic review of advice to academics. *Palgrave Commun.* 5 (1), 21. <https://doi.org/10.1057/s41599-019-0232-y>.
- Orcherton, D., Mitchell, D., McEvoy, D., 2017. Perceptions of climate vulnerability, tenure security and resettlement priorities: insights from Lami town, Fiji Islands. *Aust. Geogr.* 48 (2), 235–254. <https://doi.org/10.1080/00049182.2016.1236429>.
- O'Reilly, D., 2015. *Urbanization and Climate Change in Small Island Developing States*. UN Habitat, Nairobi. Available at: [https://sustainabledevelopment.un.org/content/documents/2169\(UN-Habitat,%202015\)%20SIDS_Urbanization.pdf](https://sustainabledevelopment.un.org/content/documents/2169(UN-Habitat,%202015)%20SIDS_Urbanization.pdf).
- Parnell, S., Walawege, R., 2011. Sub-Saharan African urbanisation and global environmental change. *Glob. Environ. Change-Human Policy Dimens.* 21, S12–S20. <https://doi.org/10.1016/j.gloenvcha.2011.09.014>.
- Parry, L., Radel, C., Adamo, S.B., Clark, N., Counterman, M., Flores-Yeffa, N., Pons, D., Romero-Lankao, P., Vargo, J., 2019. The (in)visible health risks of climate change. *Soc. Sci. Med.* 241, 112448. <https://doi.org/10.1016/j.socscimed.2019.112448>.
- Penning-Roswell, E.C., Sultana, P., Thompson, P.M., 2013. The 'last resort'? Population movement in response to climate-related hazards in Bangladesh. *Environ. Sci. Pol.* 27, S44–S59. <https://doi.org/10.1016/j.envsci.2012.03.009>.
- Piguet, E., 2013. From “primitive migration” to “climate refugees”: the curious fate of the natural environment in migration studies. *Ann. Assoc. Am. Geogr.* 103 (1), 148–162.
- Plänitz, E., 2019. Neglecting the urban? Exploring rural-urban disparities in the climate change–conflict literature on sub-Saharan Africa. *Urban Clim.* 30, 100533. <https://doi.org/10.1016/j.uclim.2019.100533>. <https://www.jstor.org/stable/23485232>.
- Population Action International, 2011. *Why Population Matters to Migration and Urbanization*. Population Action International. https://pai.org/wp-content/uploads/2012/02/PAI-1293-MIGRATION_compressed.pdf.
- Psaltoglou, A., 2016. *Urbanization and Development: Emerging Futures*. In: *World Cities Report 2016*. UN Habitat, Nairobi. Available at: <https://wcr.unhabitat.org/wp-content/uploads/sites/16/2016/05/WCR-%20Full-Report-2016.pdf>.
- Rahaman, M.A., Rahman, M.M., Bahauddin, K.M., Khan, S., Hassan, S., 2018. Health disorder of climate migrants in Khulna City: an urban slum perspective. *Int. Migr.* 56 (5), 42–55. <https://doi.org/10.1111/imig.12460>.
- Roy, A., AlSayyad, N., 2005. *Urban Informality: Transnational Perspectives from the Middle East, Latin America, and South Asia*. LexingtonBooks, Lanham, MA.
- Santha, S., 2015. *Climate Change and Migrant Workers in India—From Vulnerability to Adaptation*. Asian Cities Climate Resilience Working Paper Policy Brief. International Institute for Environment and Development (IIED), London. Available at: <https://pubs.iied.org/10747IIED/?k=climate+change+migration+urban>.
- Santha, S., Jaswal, S., Sasidevan, D., Khan, A., Datta, K., Kuruvilla, A., 2016. Climate variability, livelihoods and social inequities: the vulnerability of migrant workers in Indian cities. *Int. Area Stud. Rev.* 19 (1), 76–89. <https://doi.org/10.1177/2233865915626832>.
- Schwerdtle, P., Bowen, K., McMichael, C., 2018. The health impacts of climate-related migration. *BMC Med.* 16, 1. <https://doi.org/10.1186/s12916-017-0981-7>.
- Selby, J., Dahi, O.S., Fröhlich, C., Hulme, M., 2017. Climate change and the Syrian civil war revisited. *Polit. Geogr.* 60, 232–244. <https://doi.org/10.1016/j.polgeo.2017.05.007>.
- Serraglio, D.A., Ferreira, H.S., Robinson, N., 2019. Climate-induced migration and resilient cities: a new urban agenda for sustainable development. *Sequência* 42 (83), 10–46. <https://doi.org/10.5007/2177-7055.2019v41n83p10>.
- Sheller, M., Urry, J., 2006. The new mobilities paradigm. *Environ. Plan. A* 38 (2), 207–226. <https://doi.org/10.1068/a37268>.
- Sikder, S.K., Asadzadeh, A., Kuusana, E.D., Mallick, B., Koetter, T., 2015. Stakeholders participation for urban climate resilience: a case of informal settlements regularization in Khulna City, Bangladesh. *J. Urban Reg. Anal.* 7 (1), 5–20. <https://doi.org/10.37043/JURA.2015.7.1.1>.
- Spilker, G., Nguyen, Q., Koubi, V., Bohmelt, T., 2020. Attitudes of urban residents towards environmental migration in Kenya and Vietnam. *Nat. Clim. Chang.* 10 (7), 622–627. <https://doi.org/10.1038/s41558-020-0805-1>.
- Stacey, P., 2018. Urban development and emerging relations of informal property and land-based authority in Accra. *Africa* 88 (1), 63–80. <https://doi.org/10.1017/S0001972017000572>.
- Suhrke, A., 1994. *Environmental degradation and population flows*. *J. Int. Aff.* 47 (2), 473–496.
- Surie, A., Sharma, L.V., 2019. Climate change, agrarian distress, and the role of digital labour markets: evidence from Bengaluru, Karnataka. *Decision* 46 (2), 127–138. <https://doi.org/10.1007/s40622-019-00213-w>.
- Tadgell, A., Mortsch, L., Doberstein, B., 2017. Assessing the feasibility of resettlement as a climate change adaptation strategy for informal settlements in metro Manila, Philippines. *Int. J. Disast. Risk Reduct.* 22, 447–457. <https://doi.org/10.1016/j.ijdrr.2017.01.005>.
- Tan, Y., Liu, X., Hugo, G., 2016. Exploring the relationship between social inequality and environmentally-induced migration: Evidence from urban household surveys in Shanghai and Nanjing of China. In: McLeman, R., Schade, J., Faist, T. (Eds.), *Environmental Migration and Social Inequality*, vol. 61. Springer, Cham, pp. 73–90. https://doi.org/10.1007/978-3-319-25796-9_5.

- Titel, W., 2013. Rural-Urban Migration of the Maasai Nomadic Pastoralist Youth and Resilience in Tanzania: Case Studies in Ngorongoro District. Albert-Ludwigs-Universität, Freiburg, Arusha Region and Dar Es Salaam City. Available at: <https://freidok.uni-freiburg.de/data/9162>.
- Trundle, A., Barth, B., Mcevoy, D., 2019. Leveraging endogenous climate resilience: urban adaptation in Pacific Small Island developing states. *Environ. Urban.* 31 (1), 53–74. <https://doi.org/10.1177/0956247818816654>.
- Turhan, E., Armiero, M., 2019. Of (not) being neighbors: cities, citizens and climate change in an age of migrations. *Mobilities* 14 (3), 363–374. <https://doi.org/10.1080/17450101.2019.1600913>.
- UK Government Office for Science, 2011. Foresight: Migration and Global Environmental Change (Final Project Report). UK Government Office for Science, London. Available at: <https://www.gov.uk/government/publications/migration-and-global-environmental-change-future-challenges-and-opportunities>.
- United Nations, 2015. Paris Agreement to the United Nations Framework Convention on Climate Change. United Nations Framework Convention on Climate Change (UNFCCC), Bonn. Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf.
- Vivekananda, J., 2017. The Fragility of Cities. Climate 2020. UNA-UK. Available at: <https://www.climate2020.org.uk/the-fragility-of-cities/>.
- Walter, P., 2015. Floods and rural-urban migration in Bangladesh. In: Gemenne, F., Zinkgraf, D., Ionescu, D. (Eds.), *The State of Environmental Migration 2015: A Review of 2014*. The Hugo Observatory, University of Liège, pp. 51–64. Available at: <http://labos.ulg.ac.be/hugo/wp-content/uploads/sites/38/2017/11/The-State-of-Environmental-Migration-2015-51-64.pdf>.
- Wiegel, H., Boas, I., Warner, J., 2019. A mobilities perspective on migration in the context of environmental change. *WIREs Clim. Change* 10, e610. <https://doi.org/10.1002/wcc.610>.
- Zhen, L., Balk, D., 2020. Urbanisation and differential vulnerability to coastal flooding among migrants and nonmigrants in Bangladesh. *Population Space and Place*. <https://doi.org/10.1002/psp.2334>. In press.
- Zickgraf, C., 2021. Climate change, slow onset events and human mobility: reviewing the evidence. *Curr. Opin. Environ. Sustain.* 50, 21–30. <https://doi.org/10.1016/j.cosust.2020.11.007>.