Independent Commission for Aid Impact

UK aid for sustainable cities

Literature review

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1. Introduction

The Independent Commission for Aid Impact (ICAI) is conducting a review of UK aid in support of sustainable cities – one of the 17 Sustainable Development Goals (SDGs). It examines the UK's urban development portfolio from an economic, social and environmental perspective, in accordance with the UK government's stated objectives, and considers how well it contributes to the UK's climate and sustainability goals.

This literature review is one component of the methodology for the ICAI review. It provides an overview of the most important peer-reviewed academic and grey literature on making cities inclusive, safe, resilient and sustainable under SDG 11. It provides commentary on current issues and debates, summaries of the available evidence of good practice or 'what works' in aid-funded interventions, and observations on the strength of the evidence base. The review focuses on how development programmes can seek to address the constraints to sustainable urbanisation across low- and middle-income countries (LMICs), and how they can unlock opportunities, achieve value for money and maximise returns on investment. To this end, it aims to support informed decision-making on how UK official development assistance can be used to further SDG 11 and support progress towards the UK's net-zero strategy in the UK *Climate change strategy 2021-24*. Where relevant, the literature review reflects upon the strength of the evidence base and what more can be done to build evidence on good practice and 'what works'.

SDG 11 is the goal of making cities and human settlements inclusive, safe, resilient and sustainable, and includes multiple sub-goals (see **Box 1**).

Box 1: The sub-goals of SDG 11

SDG 11.1: Ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums.
SDG 11.2: Provide access to safe, affordable, accessible and sustainable transport systems for all.
SDG 11.3: Enhance inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management.
SDG 11.4: Strengthen efforts to protect and safeguard the world's cultural and natural heritage.
SDG 11.5: Significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.
SDG 11.6: Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.
SDG 11.7: Provide universal access to safe, inclusive and accessible green and public spaces, in particular for women and children, older persons and persons with disabilities.
SDG 11a: Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.
SDG 11b: [By 2020] substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels.
SDG 11c: Support least developed countries, including through financial and technical assistance, in building sustainable resilient buildings utilising local materials.

To address the various dimensions of SDG 11, the review summarises literature relating to the sub-goals that are most relevant to the needs of the ICAI main review, namely: key information sources (Section 2); definitional issues (Section 3.1); trends, drivers and effects of urbanisation in LMICs (Section 3.2); and models and challenges of urbanisation in LMICs (Section 3.3). It concludes by identifying successful approaches for development partners in supporting progress towards SDG 11 (Section 4). With the overarching concern of poverty reduction in urban populations, themes selected for special focus in this review include municipal governance models; infrastructure and services; equality and inclusiveness; climate adaptation and mitigation; and municipal finance (Section 3.3). Finally, the review also draws together a summary of the key findings and provides an assessment of confidence in the evidence base.

The selected themes are important because the 2023 Sustainable Development Goals Report shows mixed progress towards SDG 11 (UNECSC, 2023). Approximately 1.1 billion people currently live in slums or slum-like conditions in cities, with 2 billion more expected in the next 30 years (UNECSC, 2023). In 2022, only half of the world's urban population had convenient access to public transportation (UNECSC, 2023). Urban sprawl, air pollution and limited open public spaces persist in cities (UNECSC, 2023). The lack of progress towards the SDGs is universal, but it is abundantly clear that developing countries and the world's

poorest and most vulnerable people are bearing the brunt of failure to realise the goals (UNECSC, 2023). To achieve Goal 11, therefore, efforts must focus on implementing inclusive, resilient and sustainable urban development policies and practices that prioritise access to basic services, affordable housing, efficient transportation and green spaces for all.

2. Scope, methods and limitations

The review followed a semi-systematic approach[1] to covering the themes listed above, guided by the review questions in Appendix 1. It used key term searches in Google Scholar and Web of Science to identify peer-reviewed literature. Key terms used included thematic search terms of: "sustainable"; "sustainability"; "urban"; "cities"; and "development". This was combined with a snowballed approach to identifying grey literature both from publications cited in the peer-reviewed literature and those identified by the Google search engine using complementary search terms.

The review intentionally sought literature produced in LMICs and promotes their perspectives in these findings. However, an important limitation of the study is that most of the knowledge creation on inclusive, safe, resilient and sustainable cities across LMICs has been generated from research nodes across Europe and North America. In total, this review referred to more than 400 peer-reviewed articles and grey literature and explicitly cites a body of literature that includes 240 peer-reviewed articles and 104 grey literature publications. While the literature cited in this review focuses mainly on LMICs across Africa, Asia and Latin America, approximately 38% of these articles are authored by individuals outside those regions and based in the EU, North America and Australia.

A preliminary exploration of the use of AI to assist in this literature review was discarded after several trial searches produced unreliable reviews that were both out of date and included severe disproportions in geographic, thematic and temporal scales.

3. Key information sources

The literature has been drawn from a range of academic and grey literature. Of the peer-reviewed publications, the most influential literature in the field came from the following journals: AMBIO, Cities, Current Opinion in Environmental Sustainability, Ecology and Society, Environment and Planning D-Society & Space, Environmental Research Letters, Geoforum, Nature, Nature Climate Change, One Earth, Habitat International, Journal of Cleaner Production, Journal of Environmental Management, Land Use Policy, Landscape and Urban Planning, Renewable & Sustainable Energy Reviews, Science of the Total Environment, Sustainability, Urban Studies and Sustainable Cities and Society. These sources reflect multiple disciplinary domains, including environmental sciences, environmental studies, green sustainable science technology, development, urban studies, regional urban planning, geography, construction building technology, civil engineering and environmental engineering. Of the grey literature research, the most important sources of information generally came from ACC, C40, FAO, Global Platform for Sustainable Cities, Cities Alliance, Climate Policy Initiative, the Organisation for Economic Co-operation and Development (OECD), Local Governments for Sustainability (ICLEI), International Institute for Sustainable Development (IISD), Institute for Housing and Urban Development Studies, Mistra Urban Futures, Habitat III, ODI, the World Bank, the United Nations (the SDGs), The United Nations Educational, Scientific and Cultural Organization (UNESCO), The United Nations Human Settlements Programme (UN-Habitat), The United Nations Development Programme (UNDP), The United Nations Environmental Programme (UNEP), The United Nations University (UNU), UN Trade and Development (UNCTAD), and the World Resources Institute (WRI).

3.1 Definitional issues

Taxonomies that define and characterise sustainable and inclusive urban development

Sustainable and inclusive urban development is a holistic and integrated approach to urban planning and management that seeks to balance economic growth, environmental protection and social equity. It involves planning for long-term, stable and

[1] A semi-systematic approach to a literature review does not attempt to identify and critically appraise all relevant published research in a given area, but rather to select and review enough relevant sources – following a clear and transparent research strategy – that will allow the reviewer to provide an understanding of complex subject areas, to look at how research in a certain topic has progressed over time, and to identify the principal sub-topics within that subject area. See, for example, Snyder, H. (2019): "Literature review as a research methodology: An overview and guidelines", *Journal of Business Research 104*, link for a more developed account of different types of literature review methodologies.

sustained economic growth and structural optimisation of cities (Zhu et al., 2018). It requires reducing the potential negative effects of urban development on the environment and communities, to minimise environmental harm and promote sustainable practices (Cui et al., 2016; Mortoja and Yigitcanlar, 2020)

Inclusive urban development involves creating cities that are accessible, equitable, and provide opportunities for all residents (Pineo, 2022; Kebede, 2023). Urban architecture can support these aims by improving accessibility, diversity, adaptability and sustainability through designs that consider the needs and preferences of diverse populations. Inclusive green cities aim to create equitable and liveable environments for all residents. This is important because provision of, and access to, open public spaces remains low across regions, impacting negatively on the quality of urban life (Ramos-Vidal and de la Ossa, 2023). Likewise, urban planning that focuses on 'density', 'diversity', and 'design' of urban neighbourhoods has been effective in developing urban forms that address access, equity and opportunity for all residents (Gerten, Fina and Rusche, 2019).

Nature-based solutions can contribute to sustainable and inclusive urban development by integrating nature into urban areas, providing multiple benefits such as climate adaptation, biodiversity conservation, multifunctionality, connectivity, resilience, equity, and improved quality of life for all residents (Kabisch et al., 2016; Kabisch, Frantzeskaki and Hansen, 2022; Simpson et al., 2024).

Despite all planning efforts to control urban sprawl, such as compact city policies and urban growth management initiatives, urban land use has continued to increase worldwide (Prieto-Curiel, Patino and Anderson, 2023). The main reason for this increase is a rise in living standards that goes along with more land consumption per person (Gerten, Fina and Rusche, 2019).

3.2 Trends, drivers and effects of urbanisation in low- and middle-income countries

3.2.1 Trends and drivers of urbanisation in developing countries, how have they evolved over time, and future predictions

The main driver of urbanisation, population growth, is expected to bring the global population from 7.7 billion people in 2019 to 9.7 billion in 2050, a 26% increase (UNDESA, 2017; UNDESA, 2023). This growth is expected to occur with varying rates across world regions, ranging from 99% increase in sub-Saharan Africa to only 2% in Europe and North America. More than half of the projected growth is expected in only nine countries: India, Nigeria, Pakistan, the Democratic Republic of the Congo, Ethiopia, the United Republic of Tanzania, Egypt, and the USA (UNDESA, 2017; UNDESA, 2023).

As developing countries experience industrialisation and economic growth, there has been a general increase in urban population, economy, and urban area (Cui et al., 2016; Prieto-Curiel, Patino and Anderson, 2023). This trend is expected to continue in the future, with the urban population of developing countries projected to increase further (Chai et al., 2022; Chen et al., 2022). However, across developing countries, the growth of populations and urban areas have not always been linked to economic growth, presenting challenges to the inclusive and sustainable development of cities (Seto et al., 2011). For example, in many African countries, urbanisation is occurring at lower levels of income, compared to other developing regions, weakening the historical link between urbanisation and prosperity (UN Habitat, 2022). For developing regions, urbanisation is also taking place within the context of rising unemployment, financially weak municipal authorities, weak governance structures, increasing levels of poverty and inequality, proliferation of slums, and other forms of vulnerability (UN Habitat, 2022). The world will continue to urbanise from 56% in 2021 to 68% in 2050, with urban areas absorbing virtually all the future growth of the world's population (UN Habitat, 2022). Without effective planning, most expansion of city land area will occur in low-income countries. Over the next five decades, most growth of city land area will take place in low-income countries (141%), as compared to lower-middle-income (44%) and high-income countries (34%). This growth is projected to be highest in Oceania and sub-Saharan Africa, where it is estimated to (almost) double (UN Habitat, 2022). Growth in city land will be relatively lower in Eastern and South-Eastern Asia (10%), Latin America and the Caribbean (14%) and Europe (16%) (UN Habitat, 2022).

Urban sprawl is outpacing population growth in most cities in Africa, with detrimental effects on sustainability (Hanberry, 2023; Prieto-Curiel, Patino and Anderson, 2023). Research underscores the increasingly longer commutes in urban areas linked with sprawl, along with the repercussions of travel costs for low-income communities, which frequently face the

greatest distances to travel to economic hubs within cities (Wei and Ewing, 2018; Guerra et al., 2018; Poku-Boansi, 2021). However, densification is happening in multiple other low-income regions of the world, including India and China, contrasting with the trend observed in Africa that urban land is generally expanding faster than population growth. It is important to recognise that, within this mega-trend, small cities and towns remain critical to achieving sustainable urban futures in low-income countries (UN Habitat, 2022). Small cities (less than 250,000 inhabitants) account for almost half of city land (about 45%) in low-income countries, a trend that will persist over the coming decades. Therefore, adequate territorial planning and enhanced capacities in these settlements can strengthen the pivotal role they play in realising sustainable futures in these countries (UN Habitat, 2022).

Urban poverty and inequality remain among the most intractable challenges confronting cities (UN Habitat, 2022). Urban poverty and inequality are intertwined; they reinforce each other to create conditions of disadvantage that constrain the poor from enjoying the benefits of sustainable urbanisation. Smaller cities and towns in many regions are recording faster growth in slum populations than major cities (Friesen et al., 2018). The demand for urban transportation continues to grow exponentially, particularly in developing countries (ITF, 2019). The multidimensionality of urban poverty and inequality should be at the centre of interventions to create inclusive and equitable urban futures globally (UN Habitat, 2022). For those with fewest resources and already constrained life chances, losses from climate change-associated events reduce well-being and exacerbate vulnerability (Dodman et al., 2022). Urban processes are important as they can create differential vulnerability to climate change that escalates risks and impacts for key groups, leading to uneven social, spatial and temporal loss, risk and experiences of resilience, including capacity for transformation (Dodman et al., 2022; Ayanlade et al., 2023).

3.2.2 The relationship between urbanisation and climate change

Urbanisation is a significant driver of climate change, but cities also hold the potential to make some of the most scalable action on greenhouse gas (GHG)[2] mitigation and adaptation to climate change. Settlements bring together people, buildings, economic activities and infrastructure services. The integrated nature of urban systems means that climate change impacts can cascade across key urban sectors. For example, impacts on water can cascade to impacts on energy, finance, biodiversity and health (Trisos et al., 2022). Nonetheless, emerging options show that integrated, cross-sector adaptation actions offer concrete solutions for cities to build resilience to climate change impacts (Dodman et al., 2022).

Across different regions of the world, the relationship between urbanisation and climate change manifests with diverse implications for climate change responses, and it is important that city-level interventions reflect these realities. For example, across most low-income countries that have contributed little to human-caused climate change, urbanisation presents substantial challenges for adaptation to be integrated with development planning and basic service delivery, such as ensuring equitable access to water and sanitation amid increasingly severe droughts and rainfall variability. For rapidly growing cities that currently rely on high-carbon energy sources, particularly across middle-income countries, GHG emissions mitigation becomes increasingly important to avoid future carbon lock-in while concurrently addressing growing adaptation needs and core service delivery imperatives.

As cities continue to grow and develop, they contribute to increased GHG emissions, altered land-use patterns, changes in energy consumption, heat islands and indoor heat (Calvin et al., 2023). An increasing share of GHG emissions can be attributed to urban areas (between 2015 and 2020 they contributed 67-72% of the global share of emissions, particularly through construction, transport and consumption patterns of urban systems) (Calvin et al., 2023). Urban sprawl may have lasting implications for a city's energy needs for intra-urban mobility. It is projected that an additional 950 million will transition to urban living by 2050 in Africa, in contrast to 574 million people in 2015. Additionally, one study estimates that when the population of an African city doubles, its energy demand, especially from transportation, triples (Prieto-Curiel, 2023). Urbanisation can lead to heat islands that contribute to local warming and indoor heat, which can exacerbate the impacts of climate change, especially in low-income and developing countries that have limited capacity to adapt to rising temperature (Roca Cladera, Arellano and Batlle, 2018; Zhao, 2018; Chapman et al., 2019).

An additional 2.5 billion people are projected to be living in urban areas by 2050, with up to 90% of this increase concentrated in Asia and Africa (Dodman et al., 2022). About 70% of African cities are highly vulnerable to climate shocks, with small and medium-sized towns and cities the most at risk (Trisos et al., 2022). Sea-level increase and increases in tropical cyclone storm

[2] GHGs consist of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), chlorofluorocarbons (CFCs) and water vapour (H_2O).

surge and rainfall intensity will increase the probability of coastal city flooding, with more than a billion people in low-lying cities and settlements expected to be at risk from coastal-specific climate hazards by 2050 (Dodman et al., 2022). Globally, sub-Saharan Africa has the largest population living in extreme poverty that are exposed to high flood risk (~71 million people or 55% of the global total) (Trisos et al., 2022). An additional 350 million people living in urban areas are estimated to be exposed to water scarcity from severe droughts at 1.5°C warming, and 410.7 million at 2°C warming (Dodman et al., 2022). As a result of climate impacts, cities will be dynamic hotspots of climate mobility – the movement of human populations in response to climate change (Trisos et al., 2022). For example, although most African cities are projected to continue to grow, climate impacts could force up to 4.2 million people out of high-risk zones within African urban areas by 2050 (Amakrane et al., 2023).

The combined effect of urbanisation and climate change can lead to intensified and more frequent peak runoff, increasing flood risks and reducing the potential of ecosystem-based approaches to address these impacts, given that urbanisation can result in a significant loss of ecosystem services and trigger climate change through changes in land cover and increases in GHG emissions (Mortoja and Yigitcanlar, 2020). Urban infrastructure, including transportation, water, sanitation, and energy systems, have been compromised by extreme and slow-onset events, with resulting economic losses, disruptions of services and negative impacts to well-being. Observed adverse impacts are concentrated among economically and socially marginalised urban residents (Calvin et al., 2023). Studies in India, Indonesia and sub-Saharan Africa showcase how climate change can impact stormwater management, leading to changes in runoff patterns and flood risks in urban areas (Arnone et al., 2018; Dhiman et al., 2019; Kaykhosravi, Khan and Jadidi, 2020; Ramiaramanana and Teller, 2021; Nasution et al., 2022).

However, the greatest gains in well-being in response to climate change can be achieved in urban areas, for example by prioritising access to finance to reduce climate risk for low-income and marginalised communities, including people living in informal settlements (Trisos et al., 2022; Calvin et al., 2023). To support the sustainability of cities, equitable adaptation actions in urban areas are crucial. Research has highlighted the importance of considering the lived experience of actions that target shaping more just and equitable outcomes, and emphasising the need for equitable nature-based solutions in cities for climate change adaptation and mitigation (Chakraborty et al., 2022; Grêt-Regamey and Galleguillos-Torres, 2022). Furthermore, it has been found that many of the hottest urban areas tend to be inhabited by resource-limited residents and minority groups, underscoring the emerging lens of environmental justice as it relates to urban climate change and adaptation (Hoffman, Shandas and Pendleton, 2020). Additionally, disparities in heat exposure among different racial and socioeconomic groups in the US have been identified, highlighting the urgent need for detailed information about the sources of these disparities in current urban settings to support equitable adaptation and mitigation efforts (Yin et al., 2023).

Equitable adaptation actions in urban areas can be hindered by structural constraints, including deficits in finance, staffing capacity, information, and local leadership, which further affect the degree to which strategic actions can truly redress entrenched forms of poverty and inequality (Chu, Anguelovski and Roberts, 2017). However, it is essential to note that there is a wide range of adaptation actions in urban areas, within and outside plans, and a diversity of means available to prepare for climate change impacts even when resources are limited (Broto, 2022).

3.3 Models and challenges of urbanisation in low- and middle-income countries

3.3.1 Municipal governance and municipal power structures

Municipal governance models in developing countries

Good municipal governance is a cornerstone for sustainable development and well-being in cities. In LMICs, where weak governments are common, sound and responsive governance is pivotal for effective service delivery, infrastructure development, and public health initiatives (Khilare, 2020). Strong governance structures at the municipal level are an important enabler of service delivery and equitable distribution of resources in contexts of limited access to finance, weak institutions, or limited support from national governments for city needs (Bennet, Glandon and Rasanathan, 2018). According to Kassi et al. (2021) for example, governance quality substantially impacts the relationship between finance, renewable energy, and growth. Similarly, Gök and Sodhi (2021) emphasise the importance of governance structures in attaining improved environmental outcomes without compromising economic objectives. However, it is noteworthy that municipal governance frameworks in these regions exhibit diversity that is often influenced by historical, cultural, and political factors that require deep attention to local context. Within many of these countries, complex municipal governance structures

emerge, characterised by a spectrum of centralised and decentralisation strategies and integrated governance models. Various elements contribute to shaping these models, including fiscal decentralisation, the relative importance of the urban area, country size, and the influence of municipal fiscal policies on business growth.

In Asian and African developing nations, despite endeavours to promote decentralisation, centralised governance models persist. Countries like Nepal, Senegal, Mali and Pakistan witnessed the retention of centralised powers by central governments, even within devolved structures of local governance (Ali, 2022). Limited political power and delegated authority at the local government level can hinder effective local action (Eissa and Khalil, 2022b). Furthermore, challenges to local government reform that would transfer greater power to local governments reveal the historical persistence of highly centralised governance systems controlled by the interests of the national ruling party. This can make the successful administration of African cities highly challenging, particularly those administered by opposition political parties (Muchadenyika and Williams, 2018; Nyikadzino and Vyas-Doorgapersad, 2022).

The literature emphasises that widespread adoption of decentralisation in developing countries is primarily driven by a desire to improve participation, democracy, responsiveness, accountability and equity (Agyemang-Duah et al., 2018). Decentralisation is observed to play a significant role in shaping locally responsive governance models, with many developing countries decentralising public spending and revenue collection from central governments to local governments (Faguet, 2014; Kyriacou, Muinelo-Gallo and Roca-Sagalés, 2015; Klarić, 2021).

There is a need to move beyond traditional fiscal federalism and consider the unique institutional context of developing and transition economies (Bardhan, 2002). For example, in China, fiscal decentralisation has enhanced economic efficiency by enabling local governments to deliver public services that align with local preferences and needs (Zhang and Zou, 1998). In Indonesia, decentralisation has been proposed as a model for developing tourism, illustrating the diversity of decentralisation approaches within a single country (Omara and Tauda, 2023). Municipalities are increasingly taking on responsibilities traditionally held by nation states, especially in the realm of climate change governance (Castán Broto and Westman, 2020).

The shift towards decentralisation in many nations is aimed at enhancing democratic processes, improving the delivery of public services, overcoming communication challenges for information sharing, and creating incentives for better service delivery, while reducing macroeconomic instability and ineffective governance (Klarić, 2021; United Nations, 2023). The development of e-government and e-governance has also been a focus in many developing countries, with efforts to expand the use of e-government to encourage citizen engagement and improve access to public services.

Participatory and community-based governance models are often seen as crucial for democratic decentralisation and to restrict clientelist policymaking and elite capture at the local level (Wilfahrt, 2018; Ferreira and Allegretti, 2019). Additionally, the quality of municipal government in developing countries has been linked to citizen engagement and cooperation between political leaders and constituents, rather than relying solely on electoral mechanisms (Waddington et al., 2019; Grossman and Slough, 2022). Moreover, the financial autonomy of municipal governments in developing countries has increased significantly through fiscal decentralisation, allowing them greater control over their fiscal policies (Van Cauwenberge, Beyne and Vander Bauwhede, 2016).

In the context of developing countries in Asia and Africa, public-private partnerships (PPPs) have been used to supplement government expenditure on basic amenities and social services, such as healthcare, education and housing, to address the needs of growing populations (Leigland, 2018). The influence of population age structure on the size of government expenditure has been studied in Africa and Asia, with high population growth rates leading to partnerships with the private sector to provide basic amenities and social services (Azolibe, 2022). Furthermore, the bureaucratic structures and personnel required for governance have been noted to differ between East Asia and sub-Saharan Africa, with implications for the implementation of governance models. In East Asia, bureaucratic structures are typically marked by strong state control, efficient administration, and merit-based civil service, facilitating smooth governance implementation (Brouwer, Ramayandi and Turvey, 2006; Kim, 2017). Conversely, in sub-Saharan Africa, bureaucratic inefficiencies, corruption and weak institutional capacity often impede effective governance models, leading to slower progress or failure to achieve desired outcomes (Osei-Assibey, Domfeh and Danquah, 2018).

Effects of municipal governance models on sustainable urbanisation

Multi-stakeholder engagement and coordination is essential to the effectiveness and inclusivity of municipal governance. Inclusive local governance can facilitate the transition towards sustainable societies (Leal Filho et al., 2016). The decentralisation of public administration to the municipal level, along with local autonomy and the application of governance methods at the local level, introduces opportunities for the success of urban development programmes (Eissa and Khalil, 2022). In the context of sustainable development, inadequate or weak governance practices are often linked to limited awareness of sustainable development among municipal development planners and decision-makers (Leal Filho et al., 2016). This includes shortcomings in policy integration, intersectoral cooperation, collaboration between municipalities and stakeholders, and urban management practices. In contrast, multi-stakeholder engagement and coordination involves employing both top-down and bottom-up approaches that are synchronised and concurrent.

Box 2: Doorstep Delivery of Public Services – Delhi, India

Challenges: Improving citizen access to public services is fundamental for effective governance. However, policymakers face challenges in managing the diverse range of government services and the complexities in their delivery processes. Citizens also encounter difficulties, such as long queues, document inconsistencies, and instances of corruption while accessing government services.

Solutions: Doorstep Delivery of Public Services is an innovative governance reform in Delhi that transformed public service delivery. Instead of citizens visiting government offices, the Delhi government now delivers 100 essential services across 13 departments directly to citizens' doorsteps. These services, including income and domicile certificates, are crucial for proving eligibility for government welfare schemes, particularly for those from low-income backgrounds. Citizens can book appointments by calling a toll-free number, resulting in over 2 million calls, 430,000 service requests processed, and 360,000 citizens served. Despite disruptions caused by the pandemic, Doorstep Delivery strengthens governance by reaching the last-mile citizens, especially those without internet access or with limited IT literacy.

Source: Doorstep Delivery of Public Services – Delhi's model of transforming public service delivery, Case Study, Observatory of Public Sector Innovation, 2018, link; Good climate governance in practice: case studies from leading cities, C40 knowledge hub, 2021, link.

Over the past few decades, sub-municipal governance has emerged to play a crucial role in democratic processes across various countries, including those in South-Eastern Europe (Klarić, 2021). This form of decentralisation goes beyond the municipal level and involves engaging citizens through public consultations during its establishment. Additionally, investigations into the restructuring of municipal governance in metropolitan areas of Africa have shown that the single-tier governance arrangement, typical of metropolitan municipalities, can be more effective than the two-tier model seen in district/local arrangements (Feiock, 2007; Subramanyam and Marais, 2022).

In their study, Zhao et al. (2020) emphasise the crucial role of local governments in enhancing paediatric primary health and improving access to high-quality healthcare facilities for both urban and rural populations, especially in terms of responsiveness and the ability to deal with complex healthcare needs of older adults and children in urbanised areas (also see Obosi, 2019).

Municipal governance can facilitate community participation and engagement, leading to better decision-making processes that address the specific needs of the local population (Klaric, 2021). Key indicators such as voice, accountability, rule of law, and political stability have been identified as influential factors affecting social services and public health outcomes, including child mortality rates in developing nations (Lin et al., 2014; Kayembe and Nel-Sanders, 2022). Adaptive governance mechanisms also need to explicitly consider diverse understandings of risk and identity (Boyd et al., 2014). This approach allows governments to assess the historical and institutional context of power relations, particularly in informal settlements. By ensuring transparency, accountability and responsiveness, municipal governance can enhance public trust and confidence in government institutions, fostering socio-economic development and stability (Rasanathan et al., 2018).

Corruption affects governance quality and serves as a common indicator of poor governance. As a significant obstacle to the inclusive and sustainable development of cities and an unnecessary drain on expenditure, it is a reality that needs to be addressed in many countries across Asia and Africa (Nicolaides and Tornam Duho, 2019; Duho, Amankwa and Musah-Surugu, 2020). Additionally, issues related to municipal demarcation, intergovernmental relations, urban autonomy and local government financing have been identified as structural factors contributing to the collapse of urban municipal governance in some developing countries (Pieterse, 2021).

3.3.2 Infrastructure and services

Key approaches to planning, operationalising and delivering urban services for public utilities, transport systems, healthcare and education

A combination of strategic approaches can address the unique challenges and opportunities that arise in LMICs, to improve integrated urban planning, community engagement and participation, capacity building, innovative finance, and technology adoption. Comprehensive urban planning requires an understanding of the specific needs and context of urban areas, encompassing factors such as population size, economic conditions and cultural nuances (UN Habitat, 2022). Another crucial strategic approach involves engaging diverse local stakeholders and enhancing their capacities through skill and knowledge development (Calvin et al., 2023). Additionally, promoting PPPs and exploring innovative financing mechanisms, such as municipal bonds, public grants, and impact investments, holds promise for ensuring the financial sustainability of urban service projects (Agyemang-Duah et al., 2018). A combination of these approaches is often used within different sectors, as described below.

In the context of public utilities, especially power, water and sanitation, multiple approaches have evolved over time, and these largely focus on service expansion and infrastructure development. The challenges faced by water utilities in extending, operating and maintaining water services in low-income urban settlements are significant (Kayaga, 2013). In the power sector, there is a growing emphasis on large renewable energy infrastructure projects, particularly in the context of hydropower (Braeckman, Markkanen and Seega, 2022). There is a similar emphasis on the need for large infrastructure projects in the sanitation sector, connecting low-income communities, especially within informal settlements (Alam et al., 2020). Given the rise of financialisation – the increase in the size and importance of a country's financial sector relative to its overall economy – the concept of adaptive governance has been suggested as a strategy for achieving public objectives in the provision of utilities, as seen in Medellín, Colombia (Shika Kwami and Tyler, 2020). This underscores the significance of governance structures in delivering public goods through the provision of vital public services.

Recent research from the World Bank reveals that governments throughout the world are investing significant funds in subsidies for public utilities, especially energy, water and sanitation. Unfortunately, these financial resources often fail to reach those who require them the most. Nevertheless, assistance like operational subsidies, conditional cash-transfers, and tariff subsidies can serve as potent and equitable instruments for providing water and sanitation services when crafted intelligently, targeted strategically, and executed efficiently (Andres et al., 2019).

The challenges created by the growth in urbanisation and the use of motor vehicles in LMICs necessitates strong political will and stable funding coupled with an integrated, holistic and smart approach to city planning and transport management to mitigate the direct impacts on sustainable development (Siddiqui and Eren, 2022). Several key approaches have been implemented and documented by countries. One such approach involves integration of data and technology to facilitate multi-modal urban travel, particularly in sub-Saharan Africa and Asia (Yanocha, Mason and Hagen, 2021). This approach leverages recent advantages in technology and data to address the challenges of urban transport development and planning, with a focus on sustainable transportation to enhance mobility (Peungnumsai et al., 2020).

The use of Geographic Information Systems (GIS) can significantly enhance sustainable urban planning and management in low-income countries (Reddy, 2021). Establishing robust GIS databases can facilitate data-driven decision-making processes for urban planners, thereby improving the efficiency and effectiveness of service delivery. Adoption of a spatial model for integrated transit-oriented development (TOD) has been emphasised as a critical strategy for addressing urban planning challenges associated with public transport in megacities, including the Jakarta Metropolitan Region (Taki, Maatouk and Ahmadi, 2019) and the MyCiTi Bus Rapid Transit (BRT) system in Cape Town. Bus and shuttle services, like the TransMilenio BRT system in Bogotá, are key parts of first- and last-mile planning, partly because the existing plans focus on active transportation modes while neglecting land-use considerations (Ferranti et al., 2020; Salter and Alexander, 2022).

The approaches to planning and delivering healthcare services include the development of scalable healthcare plans, the implementation of community-based healthcare teams, the reform of medical education admission and training, the use of telemedicine and tele-rehabilitation, and the integration of mental healthcare into primary care systems (Singh, 2023). The deployment of community-based healthcare teams can mitigate the staffing shortages experienced in low-resource contexts (Ludwick et al., 2021). Furthermore, there is an urgent need to confront obstacles in public health service provision, for

example for cancer treatment, stroke management, chronic non-communicable diseases, and paediatric critical care (Abu-Odah et al., 2020; Haque et al., 2020). These difficulties frequently arise from socioeconomic inequalities, limited access to healthcare services, and insufficient infrastructure, impeding the efficient delivery of preventive healthcare services in LMICs (Ranjit and Kisson, 2021; Hasan et al., 2021). Hence, implementing integrated health service delivery frameworks can help overcome barriers and enhance the operationalisation of preventive care services, especially during crises like the COVID-19 pandemic (Rossaki et al., 2021). Leveraging mobile health (mHealth) technologies can enhance the performance and retention of community health workers in underserved areas (Källander et al., 2013). These technologies can disseminate clinical updates, learning materials, and reminders, improving the delivery of integrated community case management for common illnesses like diarrhoea, pneumonia and malaria. The design and implementation of proven innovations for delivering primary healthcare services in rural communities, such as Ghana's Community-based Health Planning and Services (CHPS), can be adapted to urban settings, particularly with lessons on resource efficiency (Adongo et al., 2014). These innovations focus on improving access to healthcare services in resource-constrained environments, a common challenge in low-income countries. Finally, across all these interventions, understanding the meaning of urban liveability and well-being is crucial, as existing frameworks may not fully capture healthy liveability considerations (Alderton et al., 2019).

Allocation of resources to primary, secondary and tertiary education can have substantial impact on economic growth (Keller, 2006). The educational pyramid in Africa and Central Asia needs to be rethought to emphasise a bottom-up approach to empowering communities and addressing educational challenges (van Pinxteren et al., 2021). The focus on enhancing the quality of education through teacher training, curriculum development and the provision of adequate learning resources is imperative, especially in underserved regions (Abebe and Woldehanna, 2013; Glewwe et al., 2021). Hence, many governments and organisations often launched campaigns to promote universal access to education and increase enrolment rates (Mundy, 2012). Enforcing legislation and policies requiring free and mandatory education, exemplified by India's Right to Education Act (Rao and Murthy, 2010), investing in school facilities, and offering complimentary meals or nutritional initiatives, like Brazil's National School Feeding Programme, are specific strategies that have proven to be effective (Sidaner, Balaban and Burlandy, 2013).

Infrastructure development is crucial for creating a conducive learning environment and accommodating growing student populations. Investment in the construction and improvement of school infrastructure, including classrooms, libraries and sanitation facilities, is a common approach (Barrett et al., 2019). Furthermore, the use of technology in education, such as e-learning platforms and digital resources, is increasingly being adopted to improve access to, and the quality of, education (Kumar Bhowmik et al., 2018). This is especially relevant in areas with limited traditional educational infrastructure (Trucano, 2014). Nevertheless, in recent decades there have been noteworthy increases in the numbers of girls and young women in formal education in LMICs, signifying a positive trajectory in educational achievement (Neves et al., 2021).

Amid all these approaches across various sectors, a context-specific and participatory approach is imperative. Tailoring strategies to the unique challenges and strengths of each urban area, along with robust monitoring and evaluation mechanisms, is essential for sustainable urban development in LMICs.

3.3.3 Equality and inclusiveness

Identifying and managing synergies and trade-offs between economic development and climate goals

Synergies and co-benefits between economic development and climate goals

There are significant synergies and co-benefits between economic development and climate goals. These include cost savings in pollution control, contributions to sustainable economic growth, benefits for energy and climate policy, improved public health, and positive impacts on food security and ecosystem services. For example, co-reductions in air pollutant emissions under climate policies can lead to significant cost savings in pollution control, thus demonstrating the economic benefits of climate actions for health (Tang et al., 2022; Vandyck et al., 2022). Furthermore, the pursuit of sustainable energy development can have considerable benefits in terms of fulfilling energy and climate policy, as well as co-benefits for economic and societal well-being (Cook, Davíðsdóttir and Gunnarsdóttir, 2022). There are further synergistic relationships between climate change and other sustainable development goals, such as clean and affordable energy, good health and well-being, and responsible consumption and production (Kostetckaia and Hametner, 2022). Soil organic carbon sequestration offers not only substantial climate change mitigation but also co-benefits for food security and ecosystem

services, indicating the potential economic and environmental advantages of such actions for urban agriculture and public space. Finally, ecosystem services-based strategies contribute to conservation-related SDGs and generate co-benefits on social-related goals, such as those dealing with food security, sustainable cities, water resources, and production systems (Bitoun, David and Devillers, 2023).

Identifying trade-offs

To comprehend the balancing act between economic development and climate objectives, it is crucial to examine the interrelationships between climate actions (both GHG mitigation and adaptation), progress on the SDGs, and environmental and social justice (Schipper et al., 2022).

The pursuit of economic growth often entails heightened energy consumption, industrialisation, and urbanisation, contributing to elevated GHG emissions and environmental deterioration (Barbier, 2014; Calvin et al., 2023). In many cases, there are significant trade-offs between economic development and climate goals. Such dominant models of energy-intensive and market-led urbanisation have built high carbon dependency and high vulnerability into cities. Veland et al. (2022) highlight the dangers of using a selective approach in assessing renewable energy and the SDGs, revealing how trade-offs may often be considered between energy (Goal 7), economic growth (Goal 8), responsible production (Goal 12), and climate action (Goal 13), while overlooking potential conflicts with other SDGs. While trade-offs between economic development and the environment, as well as between economic development and social justice, have garnered attention, less emphasis has been placed on the trade-off between environmental and social justice goals (Mitchell, 2005).

In contexts where low-carbon options are not yet viable, there can be trade-offs between reducing the unemployment rate or achieving productive employment and decent work, and the simultaneous goal of mitigating CO_2 emissions (Ngankam, 2019). In the context of urban food systems, there are trade-offs between equity and climate change mitigation, which are influenced by structural issues such as limited or unequal access to markets, transport and storage facilities, competing demands for land use, and disparities in access to information and technology (Zurek, Hebinck and Selomane, 2022; Patil, 2023). However, empirical studies have demonstrated that increased trade liberalisation is often associated with higher levels of GHG emissions, suggesting a trade-off between trade openness and carbon dioxide emissions (Leitão and Balogh, 2020).

Rapid urban growth in Asia and Africa has resulted in heightened energy requirements, escalating GHG emissions, and increased levels of air and water pollution, deforestation, and habitat loss, placing additional stress on water resources (Brelsford et al., 2017; Gurney et al., 2021). The growth of urban zones and modifications in land use can result in a rise in impermeable surfaces, thereby contributing to the urban heat island effect and modifying local climate conditions (Santamouris, 2015). Additionally, the conversion of natural land cover to urban areas and subsequent deforestation brings about alterations in land use, disrupts the provision of ecosystem services, and threatens the habitat of local biodiversity, thus complicating land-use planning and environmental assessments (García-Nieto et al., 2018; Enoguanbhor et al., 2021). This in turn presents trade-offs for ecosystem-based adaptation in degraded environments, which can intensify existing inequalities and vulnerabilities (Williams et al., 2019; ZIG, 2023).

Transitioning cities to low-carbon development may involve multiple trade-offs including financial constraints, changes in urban configurations, and technological constraints. For example, the requirement for significant investments and substantial upfront costs can pose challenges for cities operating within constrained budgets. Moreover, the incorporation of carbon-neutral practices and technologies may necessitate alterations in urban layouts and building inventory. This might entail the enhancement of existing buildings and infrastructure to align with carbon-neutral objectives, potentially impacting financing approaches and payback periods (Orleans Reed et al., 2013).

Managing trade-offs

The unique characteristics of cities in Asia and Africa, including elements like urban organisation, economic progress, and cultural background, pose specific challenges and opportunities in meeting climate objectives and implementing efficient economic development (Chen, Chiu and Lin, 2020; Naydenov and Atanasov, 2022). The interdependence of economic, social and environmental objectives within the SDGs underscores the necessity to confront trade-offs among these goals (Nilsson, Griggs and Visbeck, 2016). Furthermore, social and political networks and power relations can dictate how trade-offs between climate change and development goals are navigated (Newell et al., 2019).

Urban administrations play a vital role in devising adaptation and resilience strategies that are closely aligned with local contexts. Incorporating climate policies into economic planning and development is crucial for mitigating the impacts of climate change, while maximising opportunities for economic development. Furthermore, integration of climate policies in sectoral policies also prevents climate and environmental issues from being neglected (Aboltins and Jaunzems, 2021). For instance, Seoul, South Korea, has implemented integrated transport policies that focus on improving public transport, cycling infrastructure and pedestrian-friendly spaces, with the aim of reducing carbon emissions and contributing to sustainable development (Rubiano and Jen, 2019). Zeemering (2009) emphasises that initiatives explicitly outlining equity as an objective in economic development and investing in human capital, such as microfinance programmes like Grameen Bank in Bangladesh or social protection programmes like Bolsa Família in Brazil, contribute to the establishment of a more sustainable local economy (Rahman et al., 2012; Neves et al., 2022).

Studies indicate that incentives for economic development are more widely employed in affluent cities, thereby contributing to their economic growth (Reese, 2006; Jensen, Malesky and Walsh, 2015). Moreover, existing literature indicates that state tax incentives significantly influence both economic growth and the decisions of firms regarding their location (Buss, 2001; Ugwu, Nnado and Idemudia, 2020). This underscores the pivotal role of incentives in shaping the trajectory of economic development. Furthermore, external entities such as governments and industry actively influence and promote economic and reputation-based incentives, highlighting their critical role in fostering sustainable practices (Lubchenco et al., 2016; Chottai, 2023). Subsidies and penalties are yet another set of mechanisms used to promote climate-friendly practices (Rasul, 2016; Dou, Zhang and Meng, 2021). For instance, the implementation of controls on nitrogen oxides have proven effective in mitigating the formation of photochemical smog and could potentially alleviate the severity of anticipated consequences related to climate change (Bloomer et al., 2009).

However, it is crucial to recognise the dual nature of subsidies. On one side, they can incentivise the adoption of environmentally friendly practices such as solid waste management and renewable energy (Papathanasiou, 2021; Singh, Koduganti and Patil, 2023). However, they can also create a divergence between prices and production costs, leading to market distortions, hindering optimal outcomes, and redirecting resources towards less productive purposes (Gencer, 2023). In general, subsidies have tended to favour more affluent households rather than directing assistance to those in greater need (González, 2018; Gencer, 2023).

Technological innovation is pivotal in fulfilling climate and development objectives, and effective management of capabilities for technological change is essential for achieving these goals (Sagar, 2019). Electrification of public transport is being explored to achieve carbon neutrality in many megacities (Vehviläinen et al., 2022). Nature-based solutions, such as green infrastructure, have the power to help cities adapt to climate change and deliver outcomes for biodiversity, contributing to both environmental and economic objectives (Enzi et al., 2017; Rao et al., 2022) (also see Section 3.3.4).

Involving the private sector in research, development, and deployment endeavours is an important enabling condition that can streamline the commercialisation of novel technologies, mitigate financial risks, and boost competitiveness and innovation capacity (Lee and Mwebaza, 2022).

Furthermore, the emergence of sustainable smart cities represents a strategic approach aimed at striking a balance between economic growth and environmental sustainability (Tyas et al., 2019). Using the Internet of Things and applications involving big data, smart cities have the potential to ameliorate environmental conditions, address mobility challenges, and elevate living standards for residents (Talebkhah et al., 2021). Yet it is important to recognise that the smart city development paradigm carries the risk of overly relying on technological innovation without holistically considering diverse urban and social contexts. Municipalities must exercise caution in implementing smart city strategies to avoid potential pitfalls (UN Habitat, 2022).

Community-based approaches to development and adaptation to climate change, at both city and national levels, have been recognised as essential in achieving inclusive urban adaptation (Archer et al., 2014). In the realm of climate change adaptation, it is crucial to acknowledge the social and political linkages within and among diverse stakeholder groups, especially across informal spaces in Asian and African cities (Satterthwaite et al., 2020a; Cobbinah and Finn, 2023). Similarly, recognising the participation of local communities in the sustainable management and safeguarding of urban forests and parks has been acknowledged as a valuable strategy (Rubio et al., 2021).

Box 3: Leading circular economy through sludge-to-energy programme: Xiangyang, China

The circular bioeconomy is emerging as a promising approach to address global environmental and sustainability challenges. The production of bioenergy and biomaterials sustains the energy-environment nexus. The city of Xiangyang in China has successfully implemented this strategy through a collaborative effort between the government and business leaders, resulting in a sludge-to-energy programme. In this public-private partnership, a biorefinery was established at an existing wastewater treatment facility. The refinery uses sludge from the wastewater treatment process and combines it with local food waste to generate biochar and compressed natural gas. This initiative has led to a substantial reduction of GHG emissions by 95-98% and has achieved financial viability through the sale of biochar and natural gas.

Source: Sludge to energy: an environment-energy-economic assessment of methane capture from sludge in Xiangyang city, Hubei Province, Word Resources Institute Ross Center working paper, 2017, link.

The engagement of local communities in diverse initiatives, including the construction of schools, roads, and water systems, and environmental conservation, has been emphasised as a method to contribute to urban development, especially in informal settlements (Plummer, 2013). Furthermore, engaging local communities and citizens in scientific research and data collection can aid decision-making processes and promote behavioural change, in addition to providing valuable insights to environmental challenges (Groulx et al., 2017; Kythreotis et al., 2019).

Enhancing gender equality and support for vulnerable groups in urban environments

Urban environments can play a pivotal role in promoting and bolstering gender equality and supporting vulnerable groups in Asian and African cities. Individuals residing in cities are more inclined to endorse gender equality in areas such as education, employment, leadership, and leisure (Evans, 2019). Urban environments offer fresh possibilities for achieving gender equality; however, achieving this goal necessitates the reconfiguration of urban infrastructure to enhance parity in the utilisation and advantages of urban spaces for all genders (Ojo and Pojwan, 2021).

Mainstreaming gender into urban planning and design is crucial for fostering inclusivity and gender equality (Terraza et al., 2020). This entails considering the requirements of both men and women, individuals with disabilities, and marginalised groups during the formulation and planning of urban spaces. Furthermore, addressing gender disparities in urban mobility is vital to guarantee that urban design facilitates equitable access and opportunities for all individuals (Gauvin et al., 2020). By integrating principles of accessibility and inclusive universal design right from the outset of planning and design, urban infrastructures and facilities can be created to cater to the requirements of every user, especially people with disabilities (Selanon et al., 2022).

Box 4: My Mumbai, My BMC

The 'My Mumbai, My BMC' initiative in Mumbai, India, is dedicated to enhancing street lighting in public spaces. Adequately illuminated areas play a crucial role in fostering the safety of all residents, especially women and vulnerable groups, as they diminish the likelihood of crime and improve overall visibility.

Source: Brihanmumbai Municipal Corporation website, link.

It is essential to acknowledge that systems prevalent in peri-urban areas and informal settlements often lead to the marginalisation of vulnerable groups, including the elderly (Nagesh et al., 2023). Therefore, prioritising the safety of urban environments is crucial for promoting inclusivity and offering support to vulnerable populations. For example, the creation of secure urban roadsides and the incorporation of psychological comfort considerations in urban spaces can play a significant role in establishing inclusive and safe environments for all residents of the city (Anderson et al., 2017). Furthermore, the creation of participatory geographic information systems (P-GIS) in inclusive urban design can facilitate engagement with populations that are challenging to reach, ensuring their perspectives are considered in the urban planning process (Cinderby, 2010).

The complexities of housing affordability and affordable housing, especially for marginalised communities, can be tackled through a combination of national, state, and local policies, along with collaborations between the public and private sectors. Studies on housing markets in Malaysia have provided insights into the formulation of housing policies, particularly in the context of ensuring affordable housing in urban settings (Soon and Tan, 2019). Additionally, the concept of sustainable

affordable housing strategies has been proposed to address housing issues for low-income individuals in Nigeria (Sunday, Shukor Lim and Mazlan, 2021).

Box 5: Safe housing programmes, Dhaka, Bangladesh

Dhaka, Bangladesh, has implemented cost-effective housing initiatives prioritising safety and security, especially for households led by women. These programmes encompass well-lit communal spaces, secure architectural designs, and community involvement to tackle the distinctive challenges encountered by vulnerable groups.

Source: Women's Action Towards Climate Resilience for Urban Poor in South Asia, 2023 UN Global Climate Action Awards, United Nations Framework Convention on Climate Change, link.

Slum upgrading encompasses providing environmental and social enhancements to the urban poor, covering aspects such as housing, infrastructure, and health services (Corburn and Sverdlik, 2017). This approach has the potential to empower communities and bring about social transformation, thereby contributing to urban development (Sibyan, 2020). In Nigeria, it is suggested that slum upgrading initiatives be implemented to improve the conditions of slum households and foster inclusive housing finance systems (Adewumi Adedeji, Junaid and Mohammed Sanni, 2022). Integrating slum upgrading with initiatives aimed at alleviating poverty and improving health, education, and sanitation can strengthen disaster resilience and contribute to the well-being of marginalised communities (Tauhid, 2019).

Promoting equality and aiding vulnerable groups, such as migrants, in Asian and African urban centres involves ensuring access to key public services like health, education, and social services. For instance, in China, equal access to basic healthcare services has been found to influence the long-term settlement intentions of internal migrants, underscoring the significance of providing equitable healthcare access for vulnerable groups, including migrants, to enhance their well-being and integration into urban communities (Lu, 2023). Moreover, primary healthcare serves as a fundamental element in fortifying health systems in LMICs, highlighting the connection between the accessibility and availability of services (Bitton et al., 2017).

Naito et al. (2021) emphasise that social services offered by governments or organisations can mitigate social isolation, especially in low-income countries where social networks may be robust, but social services are limited. On similar lines, Baklanov et al. (2020) underscore the effective deployment of integrated urban services in diverse cities, tailoring these services to meet the distinct needs of local stakeholders.

In LMICs, there is a lack of initiatives for inclusive urban public transport systems, presenting difficulties for people with disabilities (Hosen et al., 2021). Developing nations are actively pursuing agendas to enhance urban transportation, prioritising safety, affordability, and environmental sustainability, underscoring the need to specifically address the requirements of vulnerable populations (Shiddiqi et al., 2022). Nevertheless, the vulnerability and resilience of urban transportation, particularly regarding the challenges faced by vulnerable groups in accessing safe and affordable options, have been under-researched (Zhang et al., 2021). It is crucial to address financial exclusion barriers to ensure timely access to financial services, including affordable transportation, for vulnerable groups such as low-income individuals (Muhammad, Ngah and Obad, 2022).

Box 6: TransJakarta - a case of accessible public transportation, Jakarta, Indonesia

The TransJakarta bus system in Jakarta, Indonesia, has implemented gender-segregated buses during specific hours to enhance the safety and accessibility of public transportation for women, addressing concerns related to harassment.

Source: Transjakarta: A Study in Success, Transport Matters Blog, Institute for Transportation and Development Policy, 2019, link.

To assist marginalised communities, it is essential to deploy focused social welfare initiatives aimed at providing financial aid, healthcare and housing (Rozenfeld et al., 2020). For instance, in Mumbai, India, the Slum Sanitation Programme is dedicated to enhancing sanitation infrastructure in informal settlements, thereby benefiting marginalised groups (Kshetrimayum, Bardhan and Kubota, 2020). Additionally, directing resources towards vocational training and fostering economic opportunities for the urban poor can markedly enhance their quality of life (Lal, 2021). For example, the Comuna 13 Social

Urbanism Project in Medellín, Colombia, offers vocational training and entrepreneurial prospects to young people residing in marginalised neighbourhoods, including women (Anguelovski, Irazábal-Zurita and Connolly, 2018).

Box 7: Training and business incubation, Accra, Ghana, and supporting informal women entrepreneurs in Lagos, Nigeria

Accra, Ghana, has achieved success in promoting gender inclusion in the tech sector through initiatives like the MEST Incubator. This programme supports female tech entrepreneurs by offering training, mentorship and resources, contributing to economic inclusion and reducing the gender gap in the technology industry.

Source: The Meltwater Entrepreneurial School of Technology Case Study, International Finance Corporation, link; MEST programme call for applications, 2020, link.

In cities like Lagos, Nigeria, initiatives like the Leadership Empowerment and Resource Network (LEARN) are dedicated to supporting women in the informal sector. These efforts involve providing training, facilitating access to markets, and offering financial assistance to women entrepreneurs, particularly those engaged in activities such as street vending.

Source: LEARN website, link.

Amid these opportunities, it is crucial to acknowledge that the autonomy of women and other vulnerable communities is significantly constrained in LMICs, often causing them to dedicate more time to unpaid work compared to their counterparts in high-income countries (Magaña, Martínez and Loyola, 2018). Encouraging various aspects of equality and rights, including education, ownership, mobility, income opportunities and decision-making, can play a pivotal role in fostering the economic development of tribal communities in India (Panda, 2021). This highlights the importance of ensuring that development programming in other sectors, such as education, health and trade are made aware of, and contribute to, progress and planning for urban areas.

3.3.4 Climate adaptation and mitigation

Challenges to implementing climate change mitigation and adaptation measures in cities

Implementing climate change adaptation and mitigation measures in LMIC cities involves a range of complex challenges, including institutional, infrastructural, financial, political, socio-economic and environmental dimensions.

Institutional and governance challenges

One of the primary hurdles is insufficient resources and capacity limitations, which dissuade cities from undertaking initiatives for climate change mitigation and adaptation (Dulal, 2017). Inefficient, corrupt or weak governance coupled with political instability and limited political will can significantly hinder the implementation of climate measures (Dodman et al., 2022). Inadequate collaboration across sectors and the absence of public health sector engagement in adaptation processes pose significant obstacles (Macassa et al., 2022). For instance, metropolitan areas such as Kolkata, India, might face challenges in coordinating the efforts of transportation, housing and environmental agencies (Bandyopadhyay, 2023).

The lack of sufficient attention to climate change in the planning procedures of city authorities, attributed to limited skills and technical capacity, puts at risk cities' ability to build long-term resilience against the impacts of climate change. As an example, urban centres in sub-Saharan Africa, like Nairobi, Kenya, could experience difficulties due to a scarcity of qualified experts for the development and implementation of sustainable initiatives (Satterthwaite et al., 2020).

The active involvement of the public in climate initiatives is essential, yet certain cities, like Jakarta, Indonesia, might face challenges in fostering sufficient public awareness and participation. These difficulties could arise from communication gaps or cultural barriers (Ministry of Environment and Forestry, 2022). Challenges such as poverty, inadequate basic infrastructure, and informality pose significant obstacles to climate change adaptation in these urban areas (Yarney et al., 2021). Each of these challenges is described in the following sections.

Infrastructure challenges

Cities need fiscal models that are able to cope with transitions in their infrastructure and the implications for revenue collection, and strategies like cross-subsidisation that are required to deliver key services for lower-income groups (Simpson

et al., 2020). The intricate nature of cities and the anthropogenic and natural climate pressures they are subject to present challenges for urban environments and, as a result, predominantly infrastructural and technical solutions are being emphasised to support adaptation (Dodman and Mitlin, 2015). Many cities have ageing infrastructure that may be ill-equipped to handle impacts of climate change, like increased floods, droughts, heatwaves or extreme events (Dodman et al., 2022).

Urban areas include multiple infrastructures that can support adaptation, mitigation and biodiversity. Many urban adaptation plans focus narrowly on climate risk reduction, missing opportunities to advance co-benefits of climate mitigation and sustainable development, compounding inequality and reducing well-being (Dodman et al., 2022). Furthermore, infrastructure across its various types consistently faces a common constraint, primarily in terms of risk transfer. Present adaptation strategies in urban areas, settlements and critical infrastructure often involve shifting risks from one sector or location to others (Satterthwaite et al., 2020). Adaptation actions can also have unintended consequences, causing maladaptation (Schipper, 2020). Hence, care needs to be taken to ensure climate adaptation planning and development of new infrastructure do not exacerbate inequality or negatively impact other sustainable development priorities.

Multi-level leadership and institutional capacity, together with financial resources (including climate finance) to support inclusive and sustainable adaptation in the context of multiple pressures and interconnected risks, can help to ensure that global urbanisation of an additional 2.5 billion people by 2050 reduces rather than generates climate risk (Dodman et al., 2022).

Informality and socio-economic challenges

The presence of informality, which manifests in unplanned settlements, informal economies and insufficient infrastructure, presents notable obstacles to the successful execution of climate change initiatives in LMIC cities (Dodman, Archer and Satterthwaite, 2019). Insufficient resources and limited access to formal support systems in these regions intensify the susceptibility of inhabitants to the effects of climate change, thus complicating the implementation and continuity of efforts related to adaptation and mitigation measures (Hondula, Rocklöv and Sankoh, 2012; Calvin et al., 2023).

Informality also has a significant impact on the viability and effectiveness of climate change policies. The acceptance and success of these policies are closely intertwined with the roles of social protection and cohesion in shaping responses to climate change within these regions. Furthermore, implementing climate measures often involves formalising land tenure or economic activities (Malerba, 2022). However, in many cases, authorities are reluctant to allow formalisation as they fear that it will encourage more informal settlements. And in some cases, residents of informal settlements may themselves resist such formalisation owing to fear of displacement or loss of livelihoods (Roy, 2009; Octifanny, Norvyani and Pertiwi, 2022; Roberts and Okanya, 2022; Ndevu, 2023).

Data and information challenges

Lack of data and information regarding local climate change impacts, limited access to financial and human resources, and challenges in coordinating policies and measures across local agencies and government levels are all significant barriers to implementing effective climate policies, particularly in LMICs (Wang, 2013; Li et al., 2021). Many cities encounter difficulties in gathering precise climate data and information crucial for making well-informed decisions. For example, in locations like Lima, Peru, there have been problems with incomplete data concerning local vulnerabilities to climate-related issues (Dodman et al., 2022).

Financial challenges

LMICs often possess fewer financial resources to support their domestic populations and invest in post-climate-disaster reconstruction efforts, resulting in more substantial adaptation challenges (Otto et al., 2022). Implementing adaptation measures frequently results in increased workloads, a challenge compounded in many instances by the limited availability of financial and human resources (also see 'Institutional and governance challenges' in Section 4.3.4). Additionally, executing projects today, with benefits only manifesting several years later, if at all, poses difficulty, irrespective of the projects' economic viability (Cortekar et al., 2016).

Disaster planning for slow-onset, city-wide shocks will be become increasingly necessary as cities face increasingly severe climate hazards. Five key lessons from the Cape Town drought and the COVID-19 pandemic include: (i) the need for cross-functional planning and response skills; (ii) the need for integrated, up-to-date and scale-appropriate data; (iii) the

importance of scenario-based simulations, communication and rapid costing to enable the rapid scaling-up of a response; (iv) the value of being able to use outsourced expert capacity effectively; and (v) the application of previously used disaster management and planning experience to build resilience in cities (Cole et al., 2021). At times of climate disruption, reliable and equitable access to adequate provision of public goods is likely to become increasingly challenging in cities across the world, due to observed and anticipated disruption to city-wide infrastructures (Simpson et al., 2020). Higher-income private actors responded to the Cape Town drought by using off-grid water technologies to secure their own supply, while curtailing their dependence on the public water system. This off-grid capacity precipitated system transformations and challenges for the municipality to absorb and manage the impacts of disrupted public systems; most notably the sustainability of the municipal finance model. The substantial reduction in revenues from water produced a 'shock within a shock' to the municipality's budget (Simpson et al., 2019). A more recent development in the energy sector involves households adopting off-grid solar energy. Initially, this trend raised concerns regarding revenue collection by the City of Cape Town, because a substantial part of the city's revenues relied on the sales of both water and electricity (Simpson et al., 2022; Cole et al., 2021). However, drawing lessons from the drought experience, the city's financial model has been overhauled. Instead of resisting shift, it now aims to encourage and facilitate the installation of solar power systems at household and business level. This approach seeks to reduce energy demand on the strained national energy grid (City of Cape Town, 2024).

It is observed that the majority of publicly accessible climate adaptation planning for large cities focuses on encouraging behavioural changes, rather than fostering capacity building, providing information, or initiating infrastructure actions. This trend is particularly notable in the limited reporting of such efforts in LMIC cities (Sheehan et al., 2022). Cities facing financial constraints might embrace climate mitigation programmes to leverage co-benefits or achieve cost savings, but the implementation of such programmes can be hindered by fiscal stress. Furthermore, the economic impacts of climate change, including the withdrawal of businesses from urban areas, present difficulties for the execution of climate change initiatives (Bellon and Massetti, 2022).

Urbanisation is often occurring amid escalating unemployment, financially fragile municipal authorities, ineffective governance systems, rising poverty and inequality levels, and the proliferation of slums, thereby exacerbating the challenges of implementing climate action measures (Berrang-Ford et al., 2014; Dodman et al., 2022; UN Habitat, 2022).

How can nature-based solutions and biodiversity be integrated into urban environments?

Nature-based solutions (NBS) present an opportunity to address both environmental and social challenges in urban areas by providing multifunctional benefits (Colléony and Shwartz, 2019). For example, actions to manage flood risk include installing flood-proofing measures within and outside properties, improving capacity of urban drainage along roads, incorporating NBS within urban areas, constructing flood defences and managing land upstream of settlements to reduce runoff (Dodman et al., 2022). As urban areas expand, a deeper understanding of ecological processes becomes increasingly vital for the conservation of biodiversity (Lepczyk et al., 2017). Many NBS entail bringing back plants and trees into cities, which also helps to reduce the concentration of heat-trapping GHGs in the atmosphere (Dodman et al., 2022).

Cities can host a diversity of plants and animals, supporting various regulating, provisioning, and cultural ecosystem services (Kowarik, Fischer and Kendal, 2020). Urban forests, serving as crucial habitats for native and endangered species, provide urban dwellers with the experience of encountering wild urban nature. Planning streets with an emphasis on biodiversity involves integrating green infrastructure, planting trees, and implementing landscaping that is conducive to wildlife (Felappi et al., 2020). Promoting eco-friendly construction practices, such as integrating green roofs and walls, aids in establishing habitats for wildlife in urban areas (Mihalakakou et al., 2023). Integrating biodiversity and natural assets into the design of urban infrastructure systems enhances liveability and sustainability (Paul, Bardhan and Ananthula, 2023). Explicitly incorporating NBS in urban planning, ranging from blue-green infrastructure to sustainable rainwater drainage, aids the advancement of city sustainability (Marvuglia, Rugani and Adell, 2018), and can alleviate the adverse effects of climate change in urban settings (SilvestriniI, Fratini and Magini, 2021). Achieving biophilic cities through urban biodiversity planning involves engaging the local community, establishing science-based goals, and prioritising actions (Panlasigui et al., 2021). Additionally, incorporating ecological knowledge into urban planning systems is vital to mitigate biodiversity loss and habitat destruction (Opoku, 2019).

Incorporating community gardens and urban agriculture not only helps ensure food security, but also improves green areas, promoting biodiversity (Rao et al., 2022). Similarly, promoting rooftop gardens and vertical greenery in densely populated regions, like Gardens by the Bay in Singapore, boosts green coverage and creates habitats, enhancing the overall aesthetic appeal of urban areas (Gardens by the Bay, no date). Integrating natural water management systems such as wetlands and bioswales to manage stormwater runoff, improve water quality, and provide habitats for aquatic species can both improve water management and promote ecosystem services, which are the benefits that such ecosystems provide to humans (Prudencio and Null, 2018). For instance, in Colombo, Sri Lanka, efforts have been underway to safeguard biodiversity through the preservation of urban wetlands, including initiatives focused on places like Beddagana Wetland Park (Fernando, 2016). Similar actions were implemented to protect and rejuvenate the East Kolkata Wetlands, a crucial flood defence system facing challenges from real estate developers (Barkham, 2016).

Finally, NBS should be integrated to work alongside traditional 'grey' or engineered infrastructure. Vegetation corridors, greenspace, wetlands, and other green infrastructure can be woven into the built environment to reduce heat and flood risks, while providing other benefits such as health and biodiversity (Dodman et al., 2022).

3.3.5 Municipal finance

Challenges and opportunities in raising finance for development

Challenges in raising finance

The rapid rise in population, especially in Asia and Africa, has placed greater demands on urban infrastructure and services. Local governments in these regions face substantial hurdles in funding development initiatives, especially amid constrained fiscal capacity (Bharadwaj, Rai and Nepal, 2020). Furthermore, the difficulties related to property taxation and the allocation of revenue in financing urban infrastructure, especially in sub-Saharan and Asian cities, emphasise the complex nature of funding development initiatives at the municipal level (Mabe and Kuusaana, 2016).

Political and institutional obstacles, including factors like political instability, corruption and inadequate institutional capacity, significantly hinder the timely delivery of essential infrastructure assets, particularly in the water sector (Dithebe et al., 2019). For example, South African municipalities experience political interference, mismanagement of municipal revenue, and performance issues stemming from an unsupportive institutional environment, negative power struggles and excessive regulation (Masiya, Davids and Mangai, 2021; Magagula et al., 2022). Additionally, deficient property data systems, political interference, lack of law enforcement, and insufficient technical capacity pose obstacles to property rating in municipalities, and impact their financial capabilities (Kuusaana, 2015).

The management and oversight of grant funding – for instance, from global health organisations – pose significant difficulties for cities, given their dependence on external development financing (Harste et al., 2021). Significant challenges arise from the dispersal of small grants and a lack of coordination among funders, undermining capacity development. This emphasises the necessity of well-coordinated grant funding for effective development (Bennett et al., 2008).

Municipalities require access to capital markets to secure funding for development initiatives (Benton and Smith, 2017). Nevertheless, their creditworthiness, which is linked to revenue streams and spending patterns that are impacted by shocks and stressors from climate change, significantly influences their access to capital markets (Białek-Jaworska, 2022; Simpson et al., 2023). Economic uncertainties, such as recessions or external shocks, present considerable challenges for securing funding for municipal development projects in LMIC cities in Asia and Africa. During shocks, there is a rise in bank financing and a decline in bond financing, leading to a greater proportion of bank debt in municipal financing, particularly in low-income countries (Ivanov and Zimmermann, 2018).

A study on investor behaviour in stock markets, particularly in West Africa, reveals that factors such as loss aversion and risk perception significantly influence stock investment decisions (Edeh, 2020). This emphasises the impact of behavioural biases on investment choices, a phenomenon applicable to municipal finance in LMICs. Similar behavioural biases may impact investment decisions in development projects at the municipal level (An, Zou and Kargbo, 2021).

Opportunities for raising finance

In LMICs, national government has historically been a key influencer in guiding investments in infrastructure, particularly in urban water infrastructure (Ruiters, 2013). This emphasises the importance of financial support from both national governments and international entities in funding municipal-level infrastructure projects. Additionally, broadening the tax base, including property taxes, presents an avenue for funding local governments in developing nations (Boamah and Okrah, 2016).

PPPs have been identified as a potential avenue for financing and operating new healthcare facilities and services in sub-Saharan Africa, highlighting the role of innovative financing models in addressing development needs (Hellowell, 2019). The development of financial instruments such as green bonds, green financing and national Development Finance Institutions has been recommended to support initiatives related to the transition to sustainable energy (Taghizadeh-Hesary and Yoshino, 2020; Phung Thanh, 2022). Public financial institutions can also offer long-term financing for addressing challenges in developing country cities (Bharadwaj, Rai and Nepal, 2020). These institutions can attract institutional investors using structured financial products, making them an appealing option for raising finance (Packham, 2021). Moreover, collaborative programmes supported by international organisations and funding from development cooperation agencies have been instrumental in addressing challenges such as sustainable waste management in low-income countries, underscoring the potential for international cooperation in financing municipal development initiatives (Wilson, Velis and Rodic, 2013).

Municipal bonds can finance urban infrastructure in emerging economies (Leigland, 1997; Tumanggor, 2020). The effectiveness of issuing municipal bonds, however, depends on the robust connections between central and sub-national governments (Gorelick, 2018). Additionally, utilising capital market funds via municipal bonds has been proposed to finance inventive projects, as seen in initiatives like the Smart Cities Mission in India (Malhotra, Mishra and Vyas, 2022).

3.4 Successful approaches for development partners to support progress towards SDG 11

3.4.1 The role of international aid and cooperation from bilateral and multilateral providers in supporting progress towards SDG 11 in developing countries

International aid and cooperation from both bilateral and multilateral providers play a crucial role in supporting developing countries in achieving SDG 11, especially funding development projects like housing, urban infrastructure and deployment of information technology (Eweje et al., 2020; Abraham and Tao, 2021). International aid organisations increasingly recognise the importance of urban planning and housing in reducing disaster risk, which is in line with the Sendai Framework (Carrero et al., 2019). Furthermore, the importance of renewable energy and the transfer of technology through global collaboration has been underscored as a pivotal element in regional energy transitions, aligning with the goals of climate-smart technologies for SDG 11 (Goers et al., 2020).

Bilateral donors frequently engage in partnerships with local public authorities, governments and non-governmental organisations (NGOs) from developed nations. This collaboration is instrumental in delivering focused assistance and backing to local governments, thereby strengthening their ability to tackle challenges associated with urbanisation, sustainable infrastructure and resilience in developing countries (Abuselidze, Chkhaidze and Makharadze, 2021). Moreover, international aid agencies and organisations have a crucial role in coordinating actions and offering assistance for enhancing the capabilities of local governments. They contribute to poverty reduction, the delivery of services, and community empowerment, all of which are integral elements of SDG 11.

Collaboration between environment and finance ministries also plays a crucial role in fulfilling climate finance commitments, as a lack of collaboration can lead to divergent positions on key policy matters (Pickering et al., 2015). The literature underscores the importance of international development cooperation projects being aligned with government implementation priorities (Winters, 2010; Calvin et al., 2023).

The changing dynamics of foreign assistance, marked by the emergence of new contributors such as China and other non-traditional donors, have led to substantial alterations in the principles governing foreign aid. These shifts have implications for the functions of multilateral institutions and the concept of conditionality (Woods, 2008). Moreover, the mobilisation of

global assistance is crucial for bridging the resource deficit confronting governments in developing nations, particularly in realising ambitions and goals associated with sustainable urban development (Rahaman and Khan, 2017). Collaboration plays a vital role, for instance, in securing food and nutrition stability for urban populations in developing nations, thus aligning with the objectives of SDG 11 (Soma, Hennen and van Berkum, 2023). Furthermore, the utilisation of frameworks to assess and track cities' advancement towards SDG 11 targets highlights the significance of international assistance and collaboration in promoting urban sustainability (Osman et al., 2021).

3.5 Effective interventions that bilateral agencies should focus on

UN Habitat (2022) highlights how localising the New Urban Agenda and SDG 11 provides a promising pathway for urban futures. In developing countries, urban priorities for the future are rising levels of poverty, providing adequate infrastructure, affordable and adequate housing and addressing the challenges of slums, high levels of youth unemployment, and investing in secondary cities (UN Habitat, 2022). Designing compact, dense and better-connected urban forms will help cities be more sustainable and liveable (Prieto-Curiel, 2023; Duque et al., 2019; Monroy et al., 2020).

On similar lines, the Intergovernmental Panel on Climate Change (IPCC) highlights that intersectional, gender-responsive and inclusive action can accelerate transformative climate change adaptation (Dodman et al., 2022; Calvin et al., 2023). The greatest gains in well-being in urban areas can be achieved by prioritising investment to reduce climate risk for low-income and marginalised residents and targeting informal settlements (Dodman et al., 2022; Calvin et al., 2023). The execution of extensive urban development initiatives must adhere to democratic principles and tackle socio-spatial segregation within the city (Bertuzzi et al., 2019). Additionally, localised urban interventions should actively engage and value the local populace throughout the intervention process to guarantee long-term sustainability (Adelina et al., 2021). It is essential to acknowledge the potential impact of cooperation among various agencies and fields in directing interventions focused on mitigating risks (Dodman et al., 2022). Additionally, recognising cities' legal authority to address, for instance, fundamental health determinants is crucial (Burris and Lin, 2021). It is also crucial to underscore the significance of utilising big data to establish a strategic, knowledge-driven decision-support system for targeted interventions. This aims to improve urban living standards, stimulate economic growth, and create expanded opportunities (Allam and Dhunny, 2019).

Furthermore, urban growth will exhibit heterogeneity, and varying rates of growth within most countries will also present challenges. This distinction is significant because urbanisation and the emergence of large agglomerations in regions such as Africa are not solely due to rural exodus but also, conversely, to the densification of rural areas and the amalgamation of smaller settlements into larger ones (OECD, 2023). This underscores the need for novel research to extend its focus beyond large agglomerations.

The path to sustainable urban futures will therefore be determined by inclusive and transformative policies to eradicate poverty and inequality; produce urban economies that provide opportunities for all; generate greener investment for sustainable consumption and production patterns; set the framework for responsive urban and territorial planning; implement collaborative and integrated systems of urban governance; prioritise public health; deploy inclusive innovation and technology; and build resilience, which enables cities to respond to and withstand a wide range of shocks (UN Habitat, 2022).

4. Summary of key conclusions

1. **Taxonomies**
   Sustainable and inclusive urban development aims to achieve a balance between economic growth, environmental protection and social equity by planning for long-term economic stability and minimising negative environmental and social impacts. Inclusivity focuses on creating accessible and equitable cities that provide opportunities for all residents, achieved through urban architecture that considers the needs of diverse populations, and urban planning that emphasises access, equity and opportunity for all. Nature-based solutions (NBS) are integral to this approach, integrating nature into urban areas to offer multiple benefits like climate adaptation, biodiversity conservation, and improved quality of life for all residents.

2. Trends and drivers

The global population is projected to increase by 26% from 7.7 billion in 2019 to 9.7 billion in 2050, with varying rates of growth across regions, and especially high growth projected in a handful of countries, including India and Nigeria. Furthermore, urban growth will exhibit heterogeneity, and varying rates of growth within most countries will also present challenges. This distinction is significant because urbanisation and the emergence of large agglomerations in regions such as Africa are not solely due to rural exodus but also, conversely, to the densification of rural areas and the amalgamation of smaller settlements into larger ones. This underscores the need for novel research to extend its focus beyond large agglomerations. Developing countries are experiencing increased urbanisation, presenting challenges to the inclusive and sustainable development of cities, amid rising unemployment, weak governance, growing poverty and inequality. African cities are experiencing urban sprawl, outpacing population growth, while cities in Asian countries such as India and China exhibit increasing urban density. Small cities and towns play a vital role in achieving sustainable urban futures in low-income countries. The expansion of city land area, projected predominantly in LMICs, impacts on sustainable urban development and agricultural land preservation in peri-urban regions.

3. Urbanisation and climate change

The review highlights the dual role cities play in climate change, both contributing to and mitigating its impacts. Urbanisation drives increased GHG emissions, altered land-use patterns, and changes in energy consumption, leading to heat islands and indoor heat. Rapid urbanisation, coupled with climate change, intensifies flood risks, leading to economic losses and disruptions of services, particularly affecting marginalised urban residents. Equitable adaptation in urban areas is crucial, focusing on providing finance for low-income and marginalised communities, but structural constraints and deficits in finance, staffing capacity, information and local leadership hinder these efforts. Considering the lived experience in cities when shaping more just and equitable outcomes, together with implementing equitable NBS, is essential in reshaping cities for sustainability and resilience. Additionally, transforming urban planning processes through creative methods inclusively addresses delivery of the SDGs, particularly in urban areas.

4. Municipal governance models

Governance frameworks in developing nations are influenced by historical, cultural and political factors, resulting in diverse and complex municipal governance structures with both centralised and decentralised elements. Despite efforts to promote decentralisation, many Asian and African developing nations maintain centralised models, impeding local action and reform. Decentralisation in developing countries is intended to promote participation, democracy, responsiveness, accountability and equity, shifting public spending and revenue collection from central governments to local governments. It seeks to enhance democratic processes, improve public service delivery, and address macroeconomic instability and ineffective governance. Participatory and community-based governance models are crucial for democratic decentralisation, leading to increased financial autonomy for municipal governments. Public-private partnerships (PPPs) help meet the needs of growing populations, through increased government expenditure on basic amenities and social services. The influence of population age structure on government expenditure has been studied, with high population growth rates encouraging governments to enter into partnerships with the private sector.

5. Effects of governance models on sustainable cities

Effective and inclusive municipal governance is crucial for sustainable cities, requiring multi-stakeholder engagement and coordination. Decentralisation to the municipal level and increased local autonomy create opportunities for successful urban development programmes. Sub-municipal governance also plays a crucial role in democratic processes and citizen engagement. Local governments can improve paediatric primary health and healthcare access for urban and rural populations, highlighting the importance of governance in public health outcomes. However, corruption and structural factors pose significant challenges to the inclusive and sustainable development of cities in many developing countries, underscoring the importance of addressing governance concerns for sustainable urban development. This synthesis highlights the importance of multi-stakeholder engagement, decentralisation and effective governance in achieving sustainable cities, while recognising the challenges and obstacles that must be addressed for inclusive and sustainable urban development.

6. **Infrastructure and services**

Cities need fiscal models that are able to cope with transitions in their infrastructure, and the resulting impact on revenue collection and cross-subsidisation strategies for lower-income groups. The literature stresses the importance of strategic approaches for sustainable cities in LMICs. It highlights the need for integrated urban planning, community engagement, capacity building, innovative finance, and technology adoption, to address the unique challenges and opportunities in these regions. Engaging with diverse local stakeholders and enhancing their capacities is crucial for financial sustainability, along with PPPs and financing mechanisms like municipal bonds and public grants. The literature also underscores the significance of governance structures in achieving public objectives, especially in the power, water and sanitation sectors. Additionally, it emphasises the importance of strong political will, stable funding and a holistic approach to city planning and transport management, to mitigate the direct impacts of urbanisation and motorisation on sustainable development. PPPs and innovative financing mechanisms, such as municipal bonds, public grants and impact investments, hold promise for ensuring the financial sustainability of urban service delivery and projects.

7. **Equality and inclusiveness: synergies and trade-offs**

Making cities sustainable involves understanding the synergies and trade-offs between economic development and climate goals. The literature highlights the positive economic impact of climate actions on health and the benefits of sustainable energy development for overall well-being. However, there are significant trade-offs, particularly in regions where low-carbon options are not yet viable, exacerbated by rapid urban growth in Asia and Africa, leading to heightened energy requirements and environmental deterioration. Transitioning to low-carbon development may involve multiple trade-offs, including financial constraints and changes in urban configurations. Managing these trade-offs requires integrating climate policies into economic planning and development. Engaging local communities in diverse initiatives, especially in informal settlements, is an important factor. Economic incentives like state tax incentives and subsidies significantly influence economic growth and firms' location decisions. Technological innovation, NBS and private sector involvement in research and development are essential for achieving climate and development objectives.

8. **Equality and inclusiveness: supporting gender equality and vulnerable groups**

The literature underscores the crucial role of urban environments in promoting gender equality and supporting vulnerable groups in Asian and African cities. It stresses the importance of reconfiguring urban infrastructure for equal use and benefits, emphasising the need for gender mainstreaming in planning and design. Addressing gender disparities in urban mobility is highlighted, as in the "My Mumbai, My BMC" initiative in Mumbai, India, which enhances safety for women and vulnerable groups through improved street lighting.

The literature also stresses the importance of housing affordability and collaborations between the public and private sectors, such as the safe housing programmes in Dhaka, Bangladesh, in promoting safety and security for women-led households. Slum upgrading is identified as a key strategy for community empowerment and social transformation. The literature underlines that access to public services is essential for gender equality and supporting vulnerable groups. It emphasises the need for inclusive economic opportunities, like promoting value addition to food crops grown locally by women and supporting women street entrepreneurship. Successful initiatives in Accra, Ghana, and Lagos, Nigeria, are cited for promoting gender inclusion in the tech and informal sectors, respectively.

The literature also highlights constraints on women's autonomy in LMICs and the importance of women's rights for the economic development of tribal communities in India. Inclusive urban public transport systems and addressing financial exclusion barriers for timely access to financial services are crucial for vulnerable groups. The literature emphasises the importance of gender mainstreaming in urban planning and design, addressing housing affordability, ensuring access to public services, promoting inclusive economic opportunities, and supporting inclusive urban public transport systems for sustainable cities. Finally, climate impacts are felt unevenly, with differentiated human vulnerability leading to uneven social, spatial and temporal loss. Climate risk is also experienced unevenly, as is vulnerability to climate change and the capacity for adaptation and transformation in the face of such change.

9. **Challenges implementing climate adaptation and mitigation**

The implementation of climate change adaptation and mitigation measures in LMIC cities faces multifaceted challenges across institutional, infrastructural, financial, political, socio-economic and environmental dimensions. Institutional and

governance challenges, such as insufficient resources, capacity limitations, weak governance and limited political will, impede implementation of climate measures. Inadequate sectoral collaboration and a lack of public health sector engagement pose significant obstacles, while a lack of climate-focused city planning procedures, due to limited skills and technical capacity, jeopardises the long-term resilience of cities. Challenges in fostering public awareness and participation, along with poverty and inadequate infrastructure, hinder urban climate change adaptation.

Ageing infrastructure ill-prepared for climate impacts and narrow adaptation plans complicate climate risk reduction efforts, leading to missed opportunities for co-benefits between climate mitigation and sustainable development. Common constraints in infrastructure, primarily in risk transfer, and the potential for unintended consequences or maladaptation present challenges. Inclusive and sustainable adaptation requires multi-level leadership, institutional capacity and financial resources.

Disaster planning will become increasingly necessary, particularly as cities face more severe climate hazards. Cities need to build resilience through cross-functional planning and response skills; integrated, up-to-date and scale-appropriate data; scenario-based simulations, communication and rapid costing to enable the rapid scaling-up of a response; the effective use of outsourced expert capacity; and the application of previously used local disaster management and planning experience.

Socio-economic challenges, including informality in unplanned settlements and insufficient infrastructure, intensify the vulnerability of communities to climate change impacts, complicating the implementation and sustainability of adaptation and mitigation measures. Lack of data, limited access to financial and human resources, and poor coordination across local agencies and government levels exacerbate these challenges. Financial limitations, increased workloads, and economic impacts impede climate change initiatives, especially in urban areas with unemployment, fragile municipal authorities, ineffective governance, rising poverty and inequality, and the proliferation of slums.

10. Nature-based solutions and biodiversity

Nature-based solutions (NBS) offer a multifaceted approach to addressing environmental and social challenges in urban areas, providing benefits like flood risk management, biodiversity conservation and GHG reduction. As urban areas expand, a deeper understanding of ecological processes is crucial for biodiversity conservation. Integrating green infrastructure, urban forests and eco-friendly construction practices can enhance urban biodiversity, liveability and sustainability. Incorporating community gardens, urban agriculture and natural water management systems supports food security, green areas and stormwater management, creating habitats for aquatic species. Combining NBS with traditional 'grey' infrastructure not only reduces heat and flood risks, but also provides additional benefits such as improved health and biodiversity.

11. Municipal finance

Rapid population growth in Asia and Africa has intensified the demand for urban infrastructure and services, increasing the financing needs of local governments. Political and institutional obstacles, including political instability, corruption and inadequate institutional capacity, impede the timely delivery of essential infrastructure assets, particularly in the water sector. Economic uncertainties hinder municipalities' access to capital markets, impacting their capability to secure funding for development projects. Behavioural biases significantly influence investment decisions in municipal finance in LMICs, adding to the complexity of financial decision-making in these contexts.

Despite these challenges, there are opportunities for raising finance for sustainable cities. National governments and international entities play a crucial role in providing financial support for urban infrastructure projects. PPPs, green bonds and national Development Finance Institutions have been recommended as methods to support sustainable energy initiatives and innovative financing models. Municipal bonds have also been identified as a potential avenue for financing urban infrastructure in emerging economies, highlighting the importance of robust connections between central and sub-national governments.

12. **Role of international aid**

The literature underscores the pivotal role of international aid and cooperation in supporting sustainable cities, particularly in achieving SDG 11. It highlights the value of funding development projects like housing, urban infrastructure and information technology through bilateral and multilateral aid. Crucial elements for achieving climate-smart technologies for SDG 11 include renewable energy, technology transfer and regional energy. Collaboration between bilateral donors, local public authorities, governments and NGOs is important. International aid agencies play a crucial role in coordinating actions for poverty reduction, service delivery and community empowerment. The literature also emphasises the importance of international cooperation in ensuring that projects are aligned with government priorities. It discusses the changing dynamics in foreign assistance, including new contributors and the role of multilateral institutions in bridging resource deficits for sustainable urban development. The use of frameworks to assess and track cities' progress towards SDG 11 targets highlights the significance of international assistance and collaboration in promoting urban sustainability.

13. **Effective interventions**

UN Habitat emphasises the importance of localising the New Urban Agenda and SDG 11 for addressing urban priorities in developing countries, including poverty, infrastructure, housing and youth unemployment. The IPCC stresses the importance of inclusive and gender-responsive action for climate change adaptation, with a focus on informal settlements and investment for low-income residents. Engaging with the local populace and fostering cooperation among urban agencies is crucial. Recognising cities' legal authority, utilising big data for decision-making, and implementing inclusive and transformative policies are all essential for sustainable urban futures, with the aims of eradicating poverty and inequality, promoting greener investment and responsive urban planning, and prioritising public health.

5. Confidence in evidence

Confidence in the assessment is based on the total availability of literature (for instance, more studies on a topic enhances confidence), on its agreement or disagreement (where disagreement or contrary findings reduces confidence), and quality of reporting (for example, where research is based on cutting-edge methods that are well reported including acknowledgement of limitations). This is an application of a modified version of the confidence language used by the IPCC (2023) for climate change assessments and categorised according to high, medium, and low confidence. **Table 1** below provides a high-level summary of confidence in the literature for key sections of the report.

Table 1: Confidence matrix of review

SECTION		CONFIDENCE	AVAILABILITY	AGREEMENT	QUALITY
3.2.1	Trends and drivers of urbanisation in developing countries, how have they evolved over time, and future predictions	**High**	High	High	High
3.2.2	The relationship between urbanisation and climate change	**High**	High	High	Medium
3.3.1	Municipal governance and municipal power structures	**Medium**	Medium	Medium	Medium
3.3.2	Infrastructure and services	**High**	High	High	High
3.3.3	Equality and inclusiveness	**Medium**	Medium	Medium	Medium
3.3.4	Climate adaptation and mitigation	**High**	High	High	High
3.3.5	Municipal finance	**Medium**	Medium	Medium	Medium
3.4.1	The role of international aid and cooperation from bilateral and multilateral providers in supporting progress towards SDG 11 in developing countries	**Medium**	Medium	Medium	Medium
3.4.2	Effective interventions that bilateral agencies should focus on	**Medium**	Medium	Medium	Medium

Table 1 shows there is *high confidence* that a substantial quantity of well-conducted peer-reviewed studies and models exists, examining the trends and factors influencing urbanisation in both large metropolises and smaller towns within LMICs.

Likewise, there is *high confidence* that numerous articles and non-peer-reviewed literature delve into the connection between urbanisation and climate change. Nonetheless, notable uncertainties persist, particularly regarding the quality of reporting in some areas of research including urbanism in the Global South.

There is a moderate amount of evidence that elucidates the municipal governance and power structures in LMICs. Nevertheless, confidence is reduced due to the lack of standardised approaches, divergent views (beyond pluralism), the quality of reporting and the extent of agreement among sources (*medium confidence*). Likewise, there is a moderate amount of peer-reviewed evidence examining issues of equity and inclusivity in urban areas. Despite the growing significance of this topic, there are several uncertainties regarding the quality of reporting and the level of consensus (*medium confidence*).

There is a wealth of evidence, including well-peer-reviewed literature and non-peer-reviewed sources, that thoroughly examines fundamental strategies for planning, operationalising and delivering infrastructure and urban services in LMIC contexts (*high confidence*). Likewise, a substantial volume of peer-reviewed and non-peer-reviewed literature investigates climate adaptation and mitigation in urban areas, employing rigorous models and methodologies (*high confidence*).

There is a moderate amount of evidence that seeks to explore the opportunities and challenges associated with securing financing for development at the municipal level in cities. Uncertainties remain, particularly concerning the extent of consensus and the quality of published articles (*medium confidence*). Likewise, there is a moderate amount of evidence that investigates the contribution of international aid and cooperation from both bilateral and multilateral sources to SDG 11, along with the effective interventions required (*medium confidence*). Nevertheless, uncertainties exist, particularly in terms of the quality of agreement and reporting concerning existing challenges.

Across all categories, current medium confidence assessments could be significantly improved through future research funding that redresses the balance towards inclusive and sustainable cities through support to scholarship in LMICs rather than research on cities in these areas (Overland et al., 2022). For example, examination of a database totalling $1.51 trillion of research grants from 521 organisations worldwide, spanning all research fields from 1990 to 2020, reveals that, at most, a mere 3.8% of global funding allocated for climate change research is directed and spent on African topics – a figure incommensurate with Africa's share of the world population and vulnerability to climate change (Overland et al., 2022). Moreover, institutions based in Europe and North America absorbed 78% of funding for climate research focused on Africa, while African institutions received only 14.5% (Overland et al., 2022). Importantly, research on cities constitutes a minuscule fraction of the thematic allocations (less than $30 million), trailing behind areas that have received far greater attention, such as food systems, ecosystems, fresh water, health, poverty and livelihoods. Deep understanding of the governance, social and political dimensions of sustainable cities under climate change is also hampered by the disproportionate allocation of climate research funding between 1990 and 2018. During this period, the natural and technical sciences received 770% more funding than the social sciences for research concerning climate change issues. This constrains the body of knowledge informing our understanding of key aspects affecting sustainable cities, such as governance, institutions, finance, equity, public policy and well-being (Overland and Sovacool, 2020).

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Appendix 1: Review research questions

With the overarching concern of poverty reduction in urban populations, this review responds directly to the following research questions which form the structure of **Sections 3 and 4**.

Appendix Box 1: Key research questions of the review

Definitional issues

1. What are the main taxonomies that define and characterise sustainable and inclusive urban development and the notion of it?

Trends, drivers and effects of urbanisation in low- and middle-income countries

2. What are the primary trends and drivers of urbanisation in developing countries, how have they evolved over time, and what are future predictions including in response to climate change and population growth?
3. What is the relationship between this urbanisation and climate change?

Models and challenges of urbanisation in low- and middle-income countries

4. This should include discussion of trade-offs and challenges of LMICs in Africa and Asia, and of the overarching issue of poverty reduction in urban populations. Example research questions that can be elaborated on by the author:

Municipal governance models

5. What are the principal municipal governance models in developing countries?
6. Which municipal governance models have supported or constrained inclusive and sustainable urbanisation?

Infrastructure and services

7. What have been the key approaches to plan, operationalise and deliver urban services in LMIC contexts including public utilities (power, water, sanitation), transport systems (notably congestion), healthcare and education?

Equality and inclusiveness

8. Are there trade-offs between economic development and climate goals and how can they be managed?
9. How can urban environments enhance and support gender equality and support vulnerable groups?

Climate adaptation and mitigation

10. What are the main challenges cities face in implementing climate change mitigation and adaptation measures?
11. How can nature-based solutions and biodiversity be integrated into urban environments?

Municipal finance

12. What are the opportunities and challenges involved in raising finance for development at municipal levels?

What are successful approaches for development partners in supporting progress towards SDG 11 in relation to the five key areas identified?

13. What role do international aid and cooperation from bilateral and multilateral providers play in supporting progress towards SDG 11 in developing countries and what are the gaps?
14. What are the effective interventions and challenges of such interventions?