

Seizing the Opportunity:

# **RAPID URBANISATION AND THE CIRCULAR ECONOMY AT THE INTERSECTION OF CLIMATE CHANGE AND POVERTY**



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**Cities Alliance**  
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ARUP



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SEIZING THE OPPORTUNITY:  
**RAPID URBANISATION  
AND THE CIRCULAR ECONOMY  
AT THE INTERSECTION OF  
CLIMATE CHANGE AND POVERTY**



# FOREWORD



**Rapid urbanisation and climate change are two of the major challenges of the 21st century. This publication explores how existing approaches of circularity and the informal economy can be taken up and reinforced to find solutions to reconcile these challenges. People living in cities' poorest areas are agents of change both in terms of climate mitigation and adaptation.**

**This paper complements and expands upon the Cities Alliance flagship publication, *Building Climate Resilient and Sustainable Cities for All*<sup>1</sup> which shed light on the intertwining nature of climate resilience and urban poverty. It also showcased how approaches of integrated policies of urban planning and management, centred around local climate risks and people, can make a difference in strengthening the resilience chain of a whole city.**

The choices that will be made on urban infrastructure in the coming decades – on urban planning, energy efficiency, power generation and transport – will have a decisive influence on the global emissions curve. Indeed, cities are where the climate battle will largely be won or lost. But in addition to their enormous climate footprint, cities generate the bulk of global gross domestic product and, as centres of education and entrepreneurship, they are hubs of innovation and creativity, including innovative ways for reuse, recycling or redoing. Cities Alliance has been supporting cities across Africa, Asia,

and Latin America to address informality, while supporting inclusive and sustainable growth for all. This publication discusses some of the major challenges of a circular economy approach and showcases established practices from the informal economy.

This includes climate mitigation and identifying low carbon development pathways – the predicted growth must be climate friendly. While our future resource use must take into account the 'limits to growth', especially in the Global North, at the same time there must be a **just transition** for the fast-urbanising countries of the Global South. Cities are central to the delivery of the climate commitments of the Paris Agreement and Sustainable Development Goals. Ensuring climate justice for the urban poor, who are at the front line of climate impacts and urban growth, will be critical to their wellbeing and livelihoods, and therefore for the city as a whole.

The circular economy is an approach that decouples economic growth from resource production, consumption and associated environmental impacts such as climate change, while enhancing social value. It rethinks the traditional linear economy (take-make-dispose) by adopting design approaches, business models and policies that regenerate natural systems and keep resources in continuous use at their highest possible value in distinct biological and technical cycles. Strategies to keep resources in use include sharing, reusing, maintaining, repairing, refurbishing, remanufacturing and recycling.

A handwritten signature in dark ink, appearing to read 'Greg Munro'.

**Greg Munro**  
Director of Cities Alliance







While the sorting and recycling of 'waste' are important, in a circular system this would be a last resort. Ideally resources will be reused before becoming waste. Still, pragmatically, recycling is a better option than landfills, and efforts to increase recycling infrastructure in developing cities can have an important environmental impact. A holistic multi-pronged and multiscale approach is needed. One that ultimately seeks to eliminate waste, whilst also effectively managing and recycling residual waste.

By their very nature, informal settlements and their economies are a good basis from which to transition to more circular approaches that can support climate mitigation and create economic opportunities for vulnerable groups. Similar to incremental housing approaches that build upon existing approaches and take into consideration local knowledge and circumstances, some of the principles of the circular economy are already embedded in informal settlements and their economies. Thus, strengthening such processes and aligning them to more holistic, city-wide approaches will maximise their impact.

Cities Alliance will continue to advocate for people-centred solutions; this publication provides insights on how these may be achieved.



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# EXECUTIVE SUMMARY



**Cities account for 85 per cent of global GDP generation, but also the majority of consumption. In rapidly urbanising cities, the combination of fast and largely unplanned urban growth, increased consumption, and a lack of supporting infrastructure creates a recipe for rapidly increasing emissions, virgin material extraction and waste.**



In the first two chapters, this report provides an overview of the nexus between the circular economy, climate change mitigation and socioeconomic development in rapidly urbanising countries. It then examines how circular economy and climate mitigation actions can improve socioeconomic conditions in developing cities, and the role of an integrated, inclusive city planning approach.

In many ways, rapidly urbanising, lower-income cities of the Global South still have a relatively small impact with respect to carbon emissions, while they already bear the brunt of climate impacts created by historic emissions of industrialised countries. Informal settlements within these developing cities already exhibit circularity, in the sense that materials of value rarely go to waste, and the residual value of items is maintained for as long as possible. However, due to a lack of investment, infrastructure, policy, administrative and regulatory capacity, there is a lack of planned and strategic approaches to ensure the rapid urbanisation follows a low emission path and is circular. It is therefore important that cities are supported to follow sustainable, low carbon approaches in their ongoing development, including circular concepts that are inclusive in supporting the most vulnerable.



## Cities are the Cause and the Solution



**55%**

of the global population lives in cities.



**75%**

of global greenhouse gas emissions derive from cities.



**70%**

of cities are already dealing with the effects of climate change, and nearly all are at risk.



## The Opportunities

### Cities:



Cover only around

**1%**

of the Earth's surface.



Are home to over

**55%**

of the world's population.



Produce about

**80%**

of Gross World Product.



Consume about

**80%**

of the world's energy.

The circular economy is defined as "a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended. In practice, reducing waste to a minimum."<sup>2</sup>

## Informality

**1 billion**

urban citizens live in informal settings.

By 2030, this number could reach

**2 billion**

with many living in hazard-prone areas.





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## Circular Economy Approach for Supporting Climate Mitigation in Cities

The principles of the circular economy are key to global efforts to reduce carbon emissions. A global switch to renewable energy would address 55 per cent of emissions, while a circular approach to industry, agriculture, and land use would tackle the remaining 45 per cent.<sup>3</sup> An integrated approach can also connect the circular economy to local livelihoods, skills and learning, creating co-benefits for the overall environment, resource management and socioeconomic development. Existing infrastructure in many developing cities provides an opportunity to “leapfrog” past unsustainable technologies and towards low or net zero carbon ones.

Adopting a circular economy approach that supports climate mitigation within urban systems can be applied through the following main three principles:



### Eliminate Waste and Pollution

A circular economy reveals and designs out the negative impacts of economic activity that cause damage to human health and natural systems. This includes the release of greenhouse gases and hazardous substances; the pollution of air, land, and water; and structural waste such as traffic congestion.



### Circulate Products and Materials (at their highest value)

A circular economy favours activities that preserve value in the form of energy, labour, and materials. This means designing for durability, reuse, remanufacturing, and recycling to keep products, components, and materials circulating in the economy. Circular systems make effective use of bio-based materials by encouraging many different uses for them as they cycle between the economy and natural systems.



### Protect and Regenerate Nature

A circular economy avoids the use of non-renewable resources and preserves or enhances renewable ones, for instance by returning valuable nutrients to the soil to support regeneration or using renewable energy, as opposed to relying on fossil fuels.<sup>4</sup>





### Urban Planning, Governance and a Circular Economy

Cities Alliance have provided support to hundreds of developing cities over the past 20+ years, with approaches including CDS (City Development Strategy) and Eco2 Cities, which link environmental and socioeconomic development through integrated, inclusive planning. For rapidly growing cities, urban expansion planning provides a simple, cost-effective way for cities to secure space for sustainable growth and key infrastructure that supports the circular economy before land becomes built-up. This type of planning mitigates the need for financially and environmentally expensive and complex upgrading and resettlement at a later date. The opportunity exists for CDS, Eco2 Cities, urban expansion planning and incremental slum-upgrading practices to further promote a circular economy and help to address related requirements with respect to infrastructure, policy and regulation.

Chapters 3 and 4 explore opportunities for low carbon, circular economy transitions in the key sectors of solid waste management and construction and housing, while chapters 5 through 8 identify opportunities across additional urban systems and sectors, with examples drawn from projects around the globe, implemented by Cities Alliance and its diverse membership.



### Solid Waste Management

Due to rapid and unplanned urban expansion, the amount of solid waste in rapidly urbanising cities is increasing day by day, while management and disposal capacity is often overwhelmed. Although the urban poor may generate less waste, they are much more likely to suffer the consequences of inadequate waste management than their more affluent neighbours. Poor resource and waste management practices can have a negative impact on air quality, water quality, drainage, and incidences of disease.

Supporting a circular economy for resource and waste management in informal settlements, low-income areas, and rapidly growing cities generally, can reduce environmental risks and create livelihood opportunities. “Waste” is a last resort in a circular system: ideally resources will be sorted and reused before becoming waste. Still, pragmatically recycling is a better option than landfill, and efforts to manage waste in developing cities can have an important environmental impact. A holistic multi-pronged, and multiscale approach is necessary that ultimately seeks to eliminate waste, but that also effectively manages and recycles waste that is created.

Cities Alliance have demonstrated such an approach to solid waste management in their work over the past 20 years including projects in Liberia and Brazil. The Cities Alliance can continue to work with cities and informal settlements to build local administrative capacity and legislative support for waste and resource management, which integrates informal settlements and livelihoods, as well as supporting the development of required infrastructure and supporting innovation in key sub-sectors including e-waste, textiles and food.



## Construction and Housing

Most of the built environment, including housing and infrastructure needed by 2050 in Africa has yet to be built. Because of this, there is the opportunity to further embed circular and low carbon principles and techniques from the outset, while “leapfrogging” outdated construction techniques.

In informal settlements self-help housing initiatives play an important role in the construction and regeneration of local communities. While self-help housing is often a positive solution to local housing challenges, there is the potential to better integrate circular and sustainable principles into self-help housing and wider slum upgrading projects. Some of these include proper building orientation to allow for passive ventilation; durable construction; the use of small-scale solar panels; and the use and reuse of local, sustainable, healthy and bio-based materials with low embodied energy, all of which can reduce environmental impacts. Whether major city renovation projects or community-led self-help housing, circular economy housing projects, especially in informal settlements, must be fully cognisant of local context and conditions, for example, land tenure, rental mix, wider socioeconomic conditions, and local political context. This must be combined with an understanding of local environmental factors and hazard risk profiles.



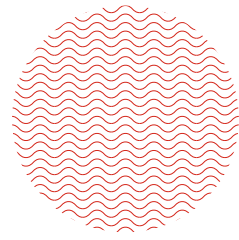
## Energy

Sustainable energy sources have a direct impact on resilience at the household, community, and city scale. Combining renewable energy and efficiency measures with circular economy principles, for example, the use and reuse of solar panels and waste-to-energy processes, and improving energy access can build the capacity of individuals and communities to better manage shocks and stresses.



## Water Management

Small- and large-scale water catchment and reuse programs, such as rooftop rainwater harvesting, city-scale wastewater treatment, and ecological regeneration can improve water quality and access. Circular economy principles can contribute to the effective management and protection of this vital resource, which is particularly crucial given the worsening effects of climate change.



## Transport

The need for supporting circular, low-carbon, and active transport systems in rapidly urbanising cities is paramount. As cities and settlements expand and upgrade, low-carbon mass transit must be written into plans to support socioeconomic development. These green transport solutions contribute to resilience and support climate-change mitigation through better air quality, better urban mobility inclusive of low-income individuals, and improved wider urban mobility by managing congestion.



## Agriculture and Food Production

Circular food systems ensure regenerative food production which both produces high quality food and improves the surrounding ecosystem, such as soil health. Greater efficiency can be generated and losses reduced by increasing the level of circularity within the agricultural value chain, in both rural and urban areas. This can increase food security and boost the livelihood productivity of millions.





### Cross Cutting Factors, Interdependence and Future Action

While the report presents circular economy actions and opportunities by sector, it is important to recognise the **interdependent nature of these sectors and systems**. Circular actions can affect and be affected by multiple other urban systems. Existing efforts and future initiatives must acknowledge this and comprise integrated, holistic solutions between cities, communities, and other affected stakeholders.

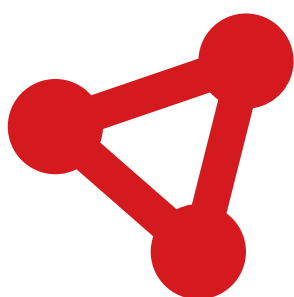
As cities rapidly urbanise, it is important that circular principles with socioeconomic co-benefits form the basis of urban planning strategies. Approaches should look at best practices replicability, but also be cognisant of the context-specific challenges that exist

in certain cities, including land and tenure issues, governance, and limitations with respect to basic infrastructure in the face of rapid urban growth and expansion.

Chapter 10 summarises the growing number of mechanisms, actors and agreements that are key to circular economy progress in rapidly urbanising, developing cities. An integrated effort is needed to support the existing circular practices evident in cities and informal settlements, build financial and technical capacity, and meet additional requirements – both physical and non-physical – for people living in cities. As an interface between international, national, city and community level actors, Cities Alliance is committed to these efforts.



# 1. URBAN NEXUS: CIRCULAR ECONOMY, CLIMATE CHANGE MITIGATION AND SOCIOECONOMIC DEVELOPMENT IN CITIES



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About 90 per cent of global population growth by 2050 will be in cities.<sup>5</sup> The majority of urban growth is taking place in developing<sup>6</sup> cities, however, and most of this is informal. People are increasingly migrating to cities due to climate change, insecurity

and other push factors, along with improved economic opportunities, livelihoods, and other pull factors. In light of this, not enough attention is being paid to the fastest growing urban areas of all, and those with the greatest potential to shape our urban future: smaller or medium sized cities, or secondary cities.





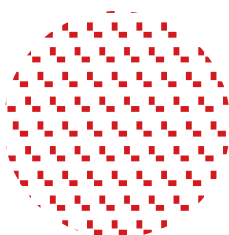
With rapid urbanisation in low-middle income countries, it is important that cities can evolve to manage growth in a way that supports planetary boundaries, while meeting socioeconomic development needs, especially for people living in informal settlements. This requires strategic oversight, governance, and policy development, alongside the development of industries, skills, infrastructure, and behaviours which can support a circular system.



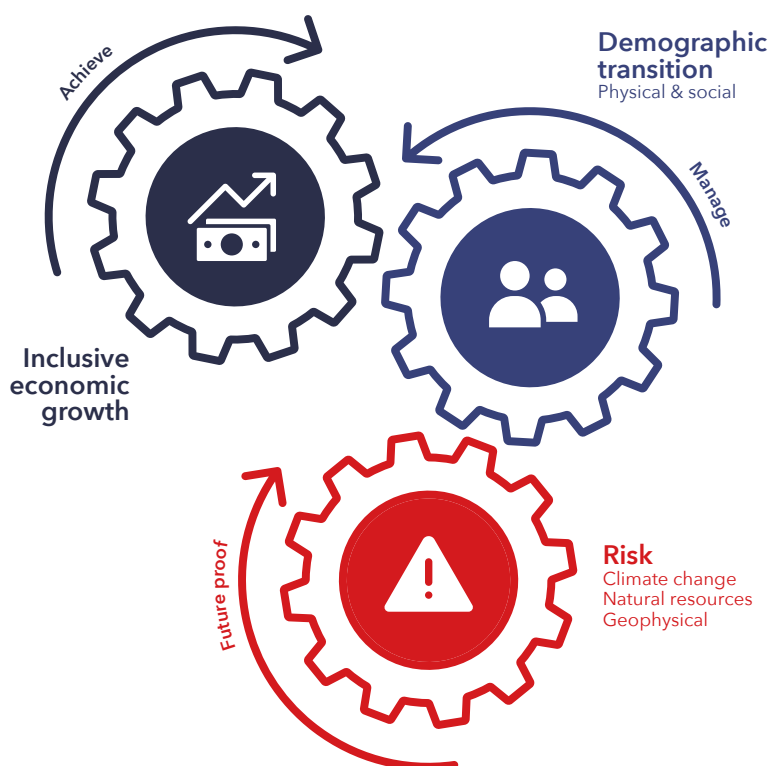
**Informal settlements within cities already exhibit circularity in the sense that materials of value rarely go to waste**, and the residual value of items is maintained for as long as possible. However, due to a lack of infrastructure, policy, administrative and regulatory capacity, waste is also often mismanaged. It is therefore important that cities can be supported to follow sustainable pathways that are low carbon and circular, but still inclusive in supporting the most vulnerable.

In many ways, these fast-growing, developing cities still have a relatively low impact with respect to carbon emissions and material extraction. Yet they nevertheless bear the brunt of climate impacts created by cities that are more economically developed and have a higher carbon footprint.

**Cities worldwide account for 85 per cent of global GDP generation, but also the majority of consumption, which typically takes the form of a take, make, waste pattern.** The Global North has responsibility for 92 per cent of existing greenhouse gas (GHG) emissions.<sup>7</sup>



**FIGURE 1**  
Drivers Shaping Urbanisation and City Growth (Cities Alliance, 2016).



**The combination of rapid and largely unplanned urban growth, increased consumption, and a lack of supporting infrastructure and policy will only exacerbate GHG emissions and waste.** As a consequence of urban growth, building stock will double in the next 30 years<sup>8</sup> – i.e., as much urban housing and infrastructure will have to be created in the next 30 years as was created in the last 300 years.

If we continue to build with conventional building materials (cement, steel, aluminium), 80 per cent of the CO<sub>2</sub> budget available for achieving the 1.5-degree target set by the Paris Agreement will already be consumed. To avoid carbon lock-ins, more circular, low-carbon construction methods and materials will be required today, as well as planning for the supply of energy from renewable sources. Developed countries must take responsibility for current and historic emission levels, and this responsibility must be taken through climate mitigation efforts. However, it is also crucial that developing nations and cities are able to develop in a way that meets socioeconomic needs, while not exacerbating climate change.



The circular economy is defined as ‘a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended. In practice, reducing waste to a minimum.’<sup>9</sup>



In order to meet the global goals as set out in the UN Sustainable Development Goals (SDGs), the world needs to operate within its planetary boundaries, supporting the transition globally to ensure all nations evolve in a just and sustainable way. Still, while the general impacts of climate change have been acknowledged by major global agreements, the local repercussions on informal settlements, and ways for cities to support mitigation efforts while contributing to more sustainable development is currently lacking. **Effort is needed to create greater linkages between international**

**and national climate mitigation targets or nationally determined contributions (NDCs)<sup>10</sup> and wider socioeconomic development targets (and ultimate investment) in low-income cities and informal settlements.**

As it stands, opportunities are being missed: With their high concentration of resources, capital, data, and talent spread over a relatively small geographic area, **cities make perfect hubs for innovation in the fight against climate change all of which can be achieved through the transition towards a circular economy.**

## Circular Economy Principles

The principles of the circular economy are key to global efforts to reduce carbon emissions. A global switch to renewable energy would address 55 per cent of emissions, while a circular approach to industry, agriculture, and land use would tackle the remaining 45 per cent.<sup>11</sup> Adopting a circular economy (CE) is an approach that supports climate mitigation within urban systems. It can be applied through the following three principles:



### Eliminate Waste and Pollution

A circular economy reveals and designs out the negative impacts of economic activity that cause damage to human health and natural systems. This includes the release of greenhouse gases and hazardous substances, the pollution of air, land, and water, as well as structural waste such as traffic congestion.



### Protect and Regenerate Nature

A circular economy avoids the use of non-renewable resources and preserves or enhances renewable ones, for instance by returning valuable nutrients to the soil to support regeneration or using renewable energy as opposed to relying on fossil fuels.<sup>12</sup>



### Circulate Products and Materials (at their highest value)

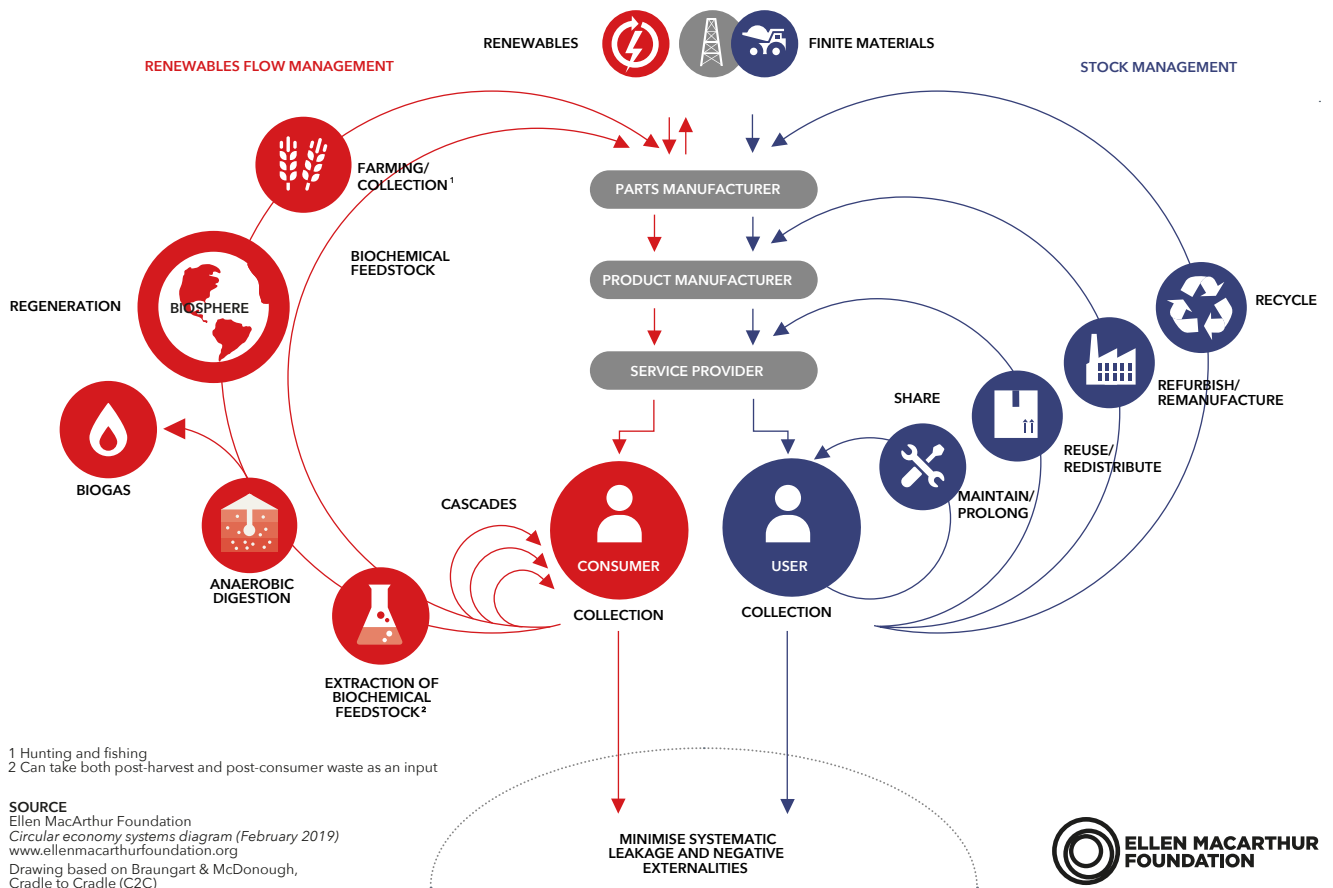
A circular economy favours activities that preserve value in the form of energy, labour, and materials. This means designing for durability, reuse, remanufacturing, and recycling to keep products, components, and materials circulating in the economy. Circular systems make effective use of bio-based materials by encouraging many different uses for them as they cycle between the economy and natural systems.

We will continue to revisit these three circular economy principles supporting climate change mitigation throughout this document in different contexts, highlighting opportunities for just and sustainable development looking forwards. These concepts are also illustrated in the diagram from the Ellen MacArthur Foundation shown in Figure 2.<sup>13</sup>





**FIGURE 2**  
Butterfly Diagram, Ellen Macarthur Foundation, 2019.



The diagram highlights that the circular economy supports a *continuous* flow of materials. The two cycles support both technical and biological cycles ensuring that all resources are processed to maintain their value for as long as possible. This may occur through a hierarchy of reuse, repair, remanufacture and recycling, or through returning nutrients back to the Earth, both of which support a reduction in GHG emissions.

**An integrated approach can also connect the circular economy to local livelihoods, skills and learning, creating co-benefits of climate mitigation and socioeconomic development.** Certain global cities have the resources to lead the transition to a more circular economy.<sup>14</sup> With the right political and economic support

and contextual consideration, best practice approaches can be replicated or adapted in other cities, including rapidly urbanising cities. Still, conditions for the circular economy will vary for each region; approaches should be cognisant of the context-specific challenges that exist in developing cities, including land and tenure issues, governance, and limitations with respect to basic infrastructure in the face of rapid urban growth and expansion.

**It is important to acknowledge that circular and low carbon approaches are already very much present in developing cities.** This is particularly evident in informal settlements – local markets and informal livelihoods are often inherently low carbon, based on the reuse of materials and resources. Innovation exists across developing

cities,<sup>15</sup> which can be harnessed and built upon, so that the world's fastest growing cities can grow sustainably. **The need to fill basic infrastructure gaps provides an opportunity for many cities to 'leapfrog' past unsustainable technologies and move ahead towards low or zero carbon ones.**<sup>16</sup>

**Efforts in addressing climate mitigation and a circular economy in rapidly urbanising cities need to be part of a 'Just Transition' – a transition that ensures environmental sustainability, decent work, social inclusion, and poverty eradication.** Circular economy efforts should also seek to combine opportunities to eliminate waste and emissions with opportunities that support inclusive socioeconomic development. This includes livelihoods and economic

development through the green and circular economies and promoting education and skills development for a sustainable future. For example, low-income workers can be upskilled to manage resources in a way that enables reuse rather than landfill, and centralised spaces can be established for storage and onward reuse. Over time, many processes will also eventually become digitalized, creating opportunities to upskill again and to create centralised systems that reach wider audiences in the supply chain. However, this transition must have the socioeconomic needs of citizens, including the most vulnerable, as a central focus, as will be explored in this report.

The following chapter focuses on communities and the relationship between the circular economy, climate mitigation and informality. It outlines the current situation in rapidly urbanising cities and within informal settlements, community-driven responses and initiatives, and the potentials and opportunities that might exist, if sustainable pathways are followed further. It then explores the role of integrated urban planning in climate mitigation and circular economy efforts.

In later chapters, these issues are further explored across seven key urban sectors, followed by a discussion of the interrelated nature of these systems and the implications and importance of systems-wide perspectives and approaches. The concluding chapter outlines key actors and actions that can support circular economy and climate mitigation for inclusive socioeconomic development in developing cities.

## BOX 1

### WHAT IS THE RELATIONSHIP BETWEEN CLIMATE MITIGATION, A CIRCULAR ECONOMY AND SECONDARY CITIES?

The function and geographical location of secondary cities make them an important piece in a national system of cities. They play a key role within national supply chains, linking smaller cities, towns and regional areas to rural hinterlands and larger metropolitan areas and regional economies.<sup>17</sup> These smaller urban centres represent approximately 30% of the world's population, but currently generate only 15% of global GDP.<sup>18</sup> Secondary cities are poised for cumulative and rapid growth, however, which means that climate mitigation and circular economy efforts are even more important in these contexts.

A large amount of the growth of smaller settlements will take place informally, in cities that lack the capacity to manage basic services. Because infrastructure in secondary cities is often less developed, it holds the potential for taking a different approach to future infrastructure planning and development. This means there is an urgent opportunity to plan rapidly growing secondary cities in a way that supports a more sustainable and at best circular economy, keeping resources circulating within the system and preventing them from entering the final stage as waste.

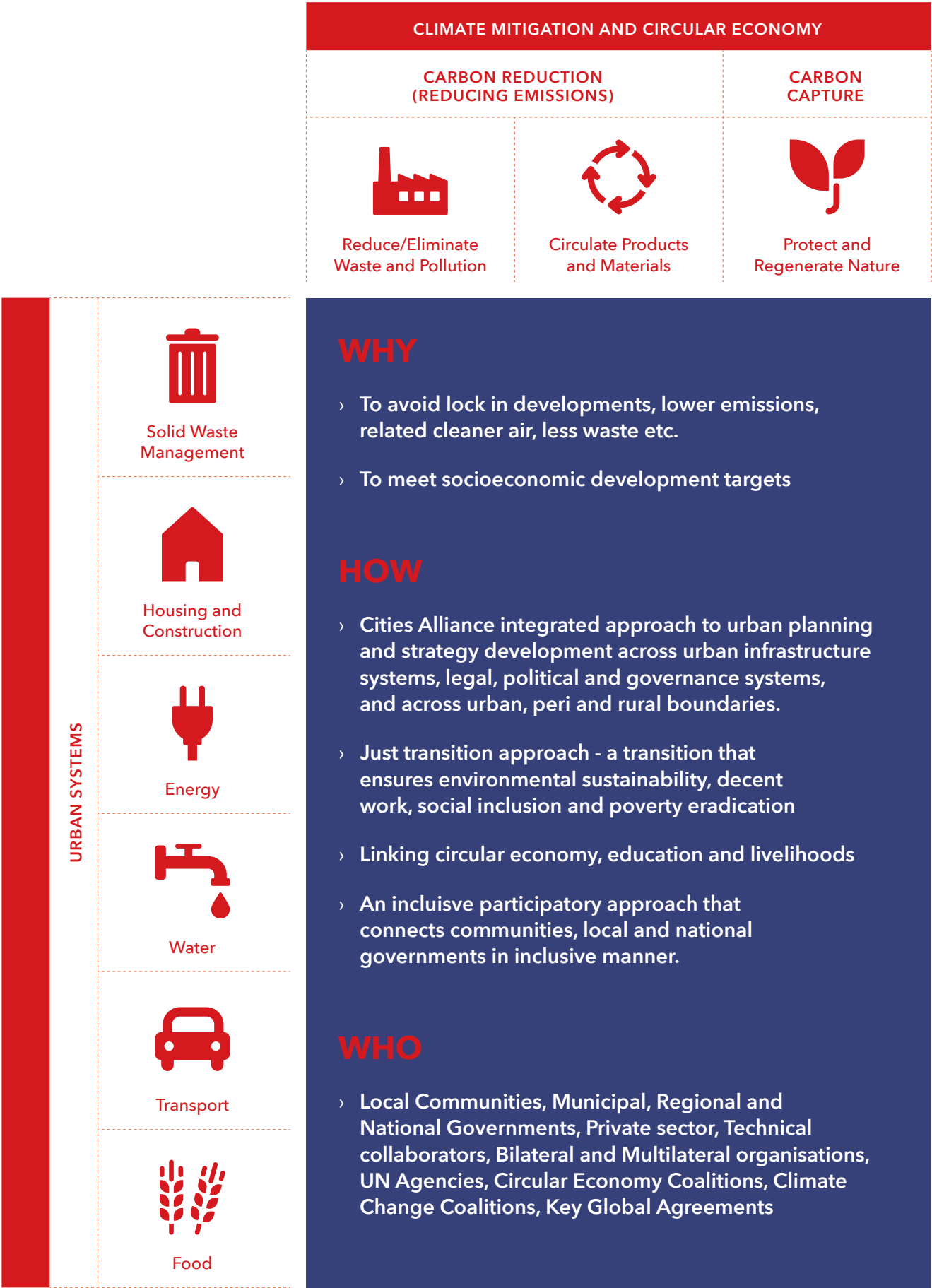
Secondary cities can lead the way in taking a symbiotic approach to growth and development, rather than a linear. These cities represent one of the biggest opportunities for urbanising economies globally. They could provide an important testing ground for circular economy innovation. Some examples include programs and policies that unlock the potential for nature to provide essential services and new economic opportunities by applying nature-based solutions, using blue and green infrastructure, and promoting green zones. There is also the potential to utilise the connectivity shared by many secondary cities and build clusters for circular and green innovation amongst nearby or strategically located cities.

New opportunities must be combined with existing processes and operations, which are often already low carbon and circular, including integration of informal, circular approaches to solid waste management, and low carbon, circular slum upgrading. Still, while lower-income neighbourhoods generally have a lower carbon footprint, this increases as people move up the income ladder. Thus, sustainable development is of paramount importance.

If actions are taken now, there is an opportunity for secondary cities to lead the way in circular development. But without action, rapid growth will take a largely linear – make-take-waste – pattern, adding to local and global climate and environmental challenges.



**FIGURE 3**  
 Conceptual Framework - Cities Alliance, Climate Change Mitigation and the Circular Economy in Rapidly Urbanising Cities.



## 2. CIRCULAR ECONOMY AND SOCIOECONOMIC CONDITIONS



**Cities Alliance has worked with cities, and communities and informal settlements within cities, to enhance basic services, build safe, resilient infrastructure and support resilient and sustainable urban and community-level planning and strategic development.<sup>19</sup> Cities Alliance has promoted circular economy approaches in existing work across these themes. Further opportunities exist to work with communities to ensure that a fully regenerative, circular model is adopted, however, one that builds on the positive evolution of developing cities and informal settlements.**

Communities in informal settlements have even greater involvement in the circular economy value-chain. There can be a kind of symbiotic relationship between the urban circular economy and what communities do already, for example, 'urban mining' or reclaiming raw materials from spent products, buildings and waste. When examining the circular economy through informal settlements, communities that have previously gone unrecognised or been marginalised become very important actors.

Whilst the focus is around informality and to an extent around opportunities in cities in the short-medium term, it is important to recognise that many rapidly urbanising cities will undergo significant technological and infrastructural transformation over the next decades as investment is made. This document will therefore also identify some longer-term opportunities for cities to evolve on a trajectory that incorporates circular economy principles and supports climate change mitigation towards a low-carbon development pathway.







# URBAN PLANNING, CLIMATE MITIGATION AND A CIRCULAR ECONOMY

In order to fully apply climate mitigation and circular economy approaches in developing cities, it is important that robust and integrated national and city-wide policy and plans are put in place that support the transition. These need to be integrated across sectors, ensuring that the cycles of resources are maintained and circulated and that cities become hubs for regeneration. This strategic approach will address basic infrastructure and daily needs of all citizens, including those living in informal settlements and specific vulnerable groups, and strengthen existing local community efforts.<sup>20</sup>

By their very nature, informal settlements are a good basis from which to transition to more circular approaches that can support climate mitigation and create economic opportunities for vulnerable groups. Due to their high density, informal settlements provide economies of scale and related efficiencies in the provision of basic services.<sup>21</sup> Informal residents usually have shorter travel times due to their central location and local livelihoods. Much of this transport is active travel (walking), low-carbon travel and low-zero emission.

With focussed, concentrated communities, it is also possible to enable more biophysical/ economic costs of water, waste and sanitation systems, and other public amenities.<sup>22</sup> As informal settlements are upgraded, it is important that these systems are all designed to enable materials to retain their residual value, as well as for adaptability and onward reuse.

However, rapid and unregulated urban growth that outpaces infrastructure development can also prove a key obstacle to sustainable development and circular operations at scale. Limited space for infrastructure, rights of way, and infrastructure deficiencies due to limited funding versus rapid growth all need to be overcome. Proactive, context-specific planning and strategic development can help to overcome such obstacles, while including existing circular approaches.

It is also important that urban planning and strategic development considers the rural-urban transition and role of value chains with respect to the circular economy. Considerations include rural-urban resource management processes, local hubs and their connectivity, construction value chains and production of regenerative sustainable local materials, sustainable rural-urban agriculture, and local watershed management.







# CITIES ALLIANCE EXPERIENCE

**Cities Alliance have provided support to hundreds of developing cities over more than 20 years, linking environmental and socioeconomic development through integrated, inclusive planning. This includes support in developing overall city strategic visions, down to local master plans and slum upgrading plans.**



## City Development Strategies (CDS)

The integrated CDS strategic planning approach and program was designed by Cities Alliance to promote equitable growth in cities, focusing on livelihoods, environmental quality, service delivery and energy efficiency, spatial form and infrastructure, financial resources and governance. To date, CDS has been undertaken in more than 140 municipalities globally.

Application of the CDS has already shown commitment to circular economy principles and climate change mitigation, while effectively promoting equitable development through the protection and regeneration of nature. For example, in Ha Long, Vietnam, environmental degradation is portrayed as a threat to tourism,

and therefore, more effective environmental management is linked closely to economic returns. Similarly, in Thimpu, Bhutan, the CDS emphasises the sustainable use of environmental resources as a strategy to help poor communities move out of poverty. Environmental protection is essential for mitigating the negative effects of climate change and for increasing carbon capture, and it can also be a source for green development, as well as key to climate adaptation and resilience building efforts (e.g., mangrove vegetation for flood protection).

Further examples from Cities Alliance include support for the World Bank Eco2 Cities planning framework,<sup>23</sup> designed to help rapidly growing cities to transform in an ecologically, restorative and sustainable manner. This framework encourages integrated urban planning and management, which harnesses the benefits of ecological systems and protects them. The model recognises the unique context of each city and writes this into the design.

## The CDS initiative and Eco2 Cities model provide useful frameworks from which to understand longer term strategic priorities for cities.

The frameworks encourage strategic decision making for urban development and master planning through the use of data and long-term investment. These approaches help to address circular issues such as design decisions, whole life costing and resource optimisation. These approaches can take into account a cross section of issues and identify strategic opportunities towards a symbiotic approach – for example, using the residual waste of one service to support the service delivery of another. This then reduces the need for disposing of waste, extraction of raw materials, burning of fossil fuels and impacting local air quality. The approach also offers wider benefits in terms of providing local people with jobs at a local level.



## Urban Expansion Planning

**One of the primary concerns for rapidly growing cities is securing space for sustainable growth before land becomes built-up.**

Planning urban expansion in advance, and then controlling and enabling incremental development over time, is essential for cost-effective and circular development. Expansion planning involves gauging the amount of land needed for growth, preparing a grid of arterial roads in the urban periphery before it is developed, and securing the rights of ways for the roads and key utilities before urban development happens. This time-tested approach in global cities such as Manhattan, Barcelona, or Villa El Salvador has been promoted in the last decade as a model for fast-urbanising cities of the Global South, for example in Ethiopia and Mozambique, and has been a cornerstone of the New Urban Agenda.<sup>24</sup>

Compared to other planning methods (comprehensive planning or master planning), urban expansion planning is stripped down to the core: On the ground, it focuses on promoting and protecting rights of way on the urban periphery for a grid of arterial roads 30 m wide and spaced 1 km apart, and for the preservation of environmentally sensitive areas. It requires, however, the ability to control development effectively to avoid encroachment (which entails a good legal, regulatory and enforcement environment) and proactive promotion of local economic development.

Urban expansion planning has been applied in 18 different rapidly growing cities with support of Cities Alliance.<sup>25</sup> Proactively securing the space for urban infrastructure from the outset can support both socioeconomic development objectives and climate mitigation and circular economy goals.<sup>26</sup> It can help manage challenges associated with urban growth and migration and sprawl, and support mitigation of GHG emissions and adaptation to climate risks.

Urban expansion planning is particularly important to small, but rapidly growing secondary cities. The approach is now being expanded beyond the initial 18 cities and is now being extended to nine cities in Ethiopia, Somalia, Uganda to help them manage rapid rural-urban migration.



### Citywide slum upgrading

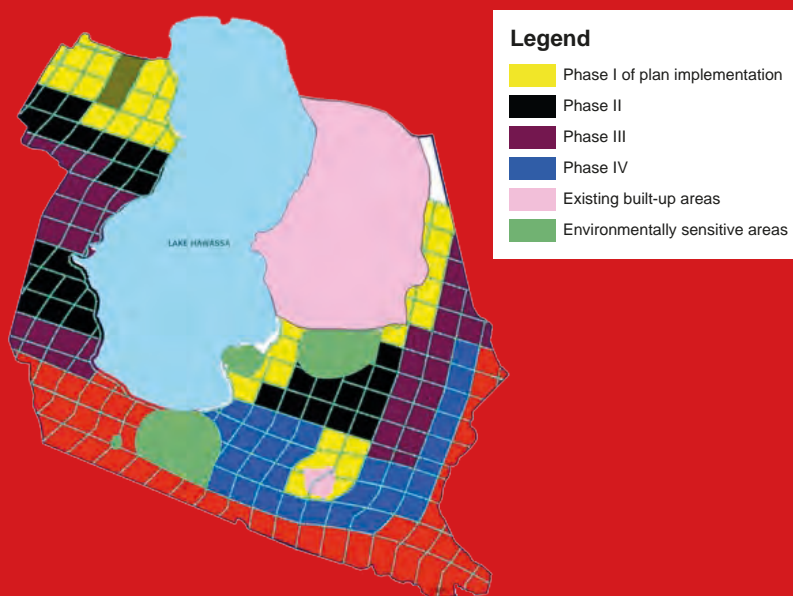
For many cities, the effects of widespread unplanned growth are already realised. Informal settlements have grown in parts of the city where most do not wish to develop, often lacking resilience to local environmental hazards. Cities Alliance has provided technical support to slum upgrading schemes across numerous cities over the past 20 years. Patient, regenerative upgrading of existing informal settlements offers a low carbon option to more extensive options and much circular economy and climate mitigation opportunity resides in this space, discussed in further detail in the Construction and Housing chapter later in this report.

## BOX 2

### ETHIOPIA: URBAN EXPANSION PLANNING IN HAWASSA

In Ethiopia, the Ministry of Urban Development and regional bureaus, have been supported by New York University and Cities Alliance in urban expansion planning. Four cities – Adama, Bahir Dar, Mekelle, and Hawassa – have collectively been able to construct and protect 570 km of arterial roads within three years, with ongoing development of related trunk infrastructure.

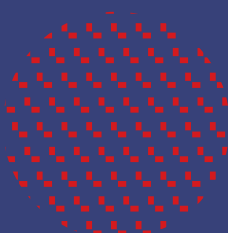
Hawassa draws its water from an endorheic lake that is closely abutted by urban development. Recognising that the city government is unable to afford sewerage and drainage water treatment, the urban expansion team included a 100-metre passive protective buffer along the lakeshore in the plan. This buffer is designed to remain heavily vegetated, capture contaminants from the urban area, and slow their infiltration into the lake. This removes the need for more financially and carbon expensive water purification solutions, which may also not be viable. Water and electrical supply lines, aligned with the arterial grid, are helping to facilitate larger projects connected to socioeconomic development.<sup>27</sup>





# OPPORTUNITIES

There is a whole range of land readjustment problems that cities face, and for which Cities Alliance and partners **provide technical support**, from urban expansion planning, to upgrade of brownfield and existing informal settlements. The preceding pages have outlined how **circular economy** and **climate change mitigation** relate to these approaches. The section below outlines further opportunities for **adopting a circular economy approach that supports climate mitigation within urban systems, according to the circular economy principles.**



## **Reduce/Eliminate Waste and Pollution**

- › **Making buildings adaptable to reduce construction waste:** When considering urban expansion and upgrading of existing slums and city areas, it is important that strategic planning decisions are made that ensure developments respond to the growing needs and requirements of communities. This involves identifying opportunities to make buildings adaptable, flexible, easy to deconstruct, and modular. This extends the lifecycle of buildings and reduces costs – both financial and carbon.
- › **Transport planning to reduce emissions:** Well-planned transport networks can improve public mobility and active transport (walking, cycling), limit travel time and congestion, and therefore reduce GHG emissions when compared to unplanned networks.<sup>28</sup>
- › **Planning for urban energy systems:** Urban expansion planning can also enable more efficient urban energy systems, aligning neighbourhood layout with inversion flows (breezes) and including solar-conscious plot design to encourage better building orientations, both of which can reduce night-time temperatures and offer a low carbon, low pollution alternative to other energy options.<sup>29</sup>



### Protect and Regenerate Nature

- › **Pre-emptively protecting environmentally sensitive areas:** Development control is the key problem in rapidly expanding cities of the Global South. Urban expansion planning prevents development in environmentally sensitive areas, including water-catchment areas. This proactive approach can help support drainage and replenishment, promoting the natural water cycle around cities.<sup>30</sup> This can help to mitigate the risks of drought and flooding, provide greater water security and lower emission processes. Protecting environmentally sensitive areas through development control can provide a stable environment from which communities can establish themselves and limit short-term climate risks that cause buildings and infrastructure to become obsolete. The protection and enhancement of green space and forest can also help reduce the urban heat island effect and help to reduce local energy demands.<sup>31</sup>



### Circulate Products and Materials

- › **"It's much cheaper to plan ahead for growth than to try and retrofit areas that are already built up."**<sup>32</sup>

The use of life cycle assessment and whole life costing can provide a more circular and low carbon approach compared with short-term decision making. For example, existing structures will not need to be demolished when they become obsolete, and areas can be planned with sustainable construction in mind.



# ENABLING ACTIONS

## Embedding circular economy and climate change mitigation principles in urban expansion planning

Many cities are largely undeveloped, and rapidly expanding. Cities Alliance-supported work with East African cities established that urban expansion planning is an effective approach to proactively manage urban growth, that is simple, cost effective, and delivers results.<sup>33</sup> Circular economy and climate change mitigation can be embedded into urban expansion planning guidance, technical support, and ultimate city actions. Programmes can be established to support actors in planning and managing urban expansion to identify opportunities for circular approaches. Examples of this in planning include factoring in the need for solid resource management and reuse/recycling infrastructure when preparing arterial grids and related land acquisition, ensuring that the subsequent development processes are low carbon and circular, and promoting flexibility and modularity so that cities can adapt to the demands of urban growth, climate change and other shocks and stresses, in a manner that is proactive yet adaptable.



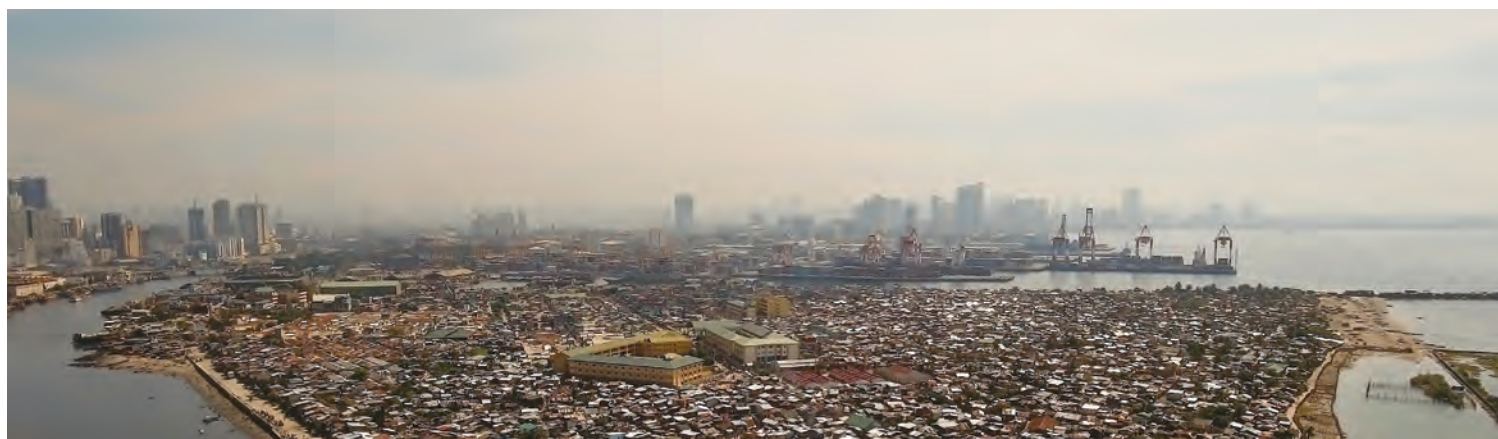
## Promoting the value of density in urban planning and slum upgrading for circular economy and climate change mitigation

The concentration of people and businesses in a small amount of space can support circular economies. Adaptive, and in cases circular, systems are already in place in informal settlements, in part in response to the density and social conditions. High-density informal (and formal) settlements could be supported to better realise circular economy benefits. For example, the activation and improvement of mass transit can reduce carbon emissions, particularly if reached through non-carbon intensive modes of transport such as walking or cycling. Furthermore, localised circular economies can be promoted within slum density, such as food production, clothing production (including reuse and recycling), and provision of local services such as resource management. The compact nature of informal settlements provides a challenge, but also an opportunity with respect to urban systems. Planning interventions could include a range of actions such as setting up and/or improving marketplaces for exchanging materials (both physical and in time virtual), promoting sustainable energy and electricity co-generation, renewable technology and use of shared and multi-functional spaces. With the right support, these ideas and other approaches can be built into planning and implemented.

## Incorporating circular economy and climate change mitigation principles in strategic city visions

While the CDS process already promotes a degree of circularity, circular economy principles could further support these strategic development processes. Cities could be encouraged to consider how their long-term vision addresses carbon emissions and socioeconomic needs, and how the circular





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economy can help the city to realise those ambitions. How can future initiatives eliminate virgin material and non-renewable materials and protect and regenerate nature?

The following pages outline a range of specific activities under different urban sectors that combine circular economy and inclusive socioeconomic development. These, and other initiatives, could form part of a catalogue of pipeline projects that the city could pursue.

### **Planning for the rural-urban transition and role of circular value chains**

It is important to consider the urban periphery and rural-urban transition with respect to the circular economy. Specific considerations for regional planning include, but not limited to, rural-urban resource management processes, local hubs for managing resources for onward reuse and related rural-urban connectivity, construction value chains and related production of regenerative sustainable local materials, sustainable rural-urban agriculture and value chains, and local watershed management.

### **Advocating for policies that incentivise investment in sustainable and circular development**

There is opportunity for urban governments to commit to policy changes and provide private-sector incentives to move away from less-sustainable forms of urban development.<sup>34</sup> The development of well-considered tax incentives around low carbon and circular solutions enables new businesses to develop and thrive, creating innovation and employment. It also supports local suppliers and businesses, over the import of materials with higher embodied carbon emissions. Wider business support can help to develop local circular economy enterprises, including existing formal and informal initiatives.

### **Addressing barriers to circular economy and climate mitigation in lower-income settlements**

Action is needed to identify and remove barriers to implementation of circular economy services. For example, in some cities, municipal authorities often focus their limited budget for solid waste collection on neighbourhoods of wealth and political power, neglecting less affluent areas.<sup>35</sup> Targeted funding, combined with local capacity building and empowerment can help to create an enabling and inclusive environment for a more circular urban economy.

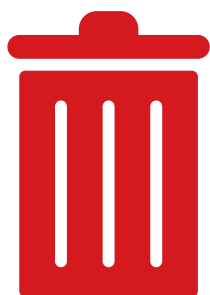
### **Context specific planning**

Circular economy and climate mitigation efforts need to be applied within the unique socioeconomic and political contexts of rapidly growing developing cities and informal settlements. (For example, how to upgrade housing in areas dominated by rental housing and absentee landlords? Or how to add resource management infrastructure in areas with inadequate land for construction of waste sorting and recycling infrastructure?) This is a Cities Alliance strength, working with local authorities using tools such as the CDS approach, and working with key community stakeholders, through members such as Slum Dwellers International (SDI). Cities Alliance holds a privileged position to further integrate circular economy and climate mitigation thinking into these strategic processes and relationships.<sup>36, 37</sup>

### **Specific Sectoral Findings and Opportunities**

Over the following chapters, we explore these concepts across the sectors of solid waste management, construction and housing, energy, water management, transport, and agriculture and food production, within the context of experience provided by Cities Alliance.

# 3. SOLID WASTE MANAGEMENT



Due to rapid and unplanned urban expansion, the amount of solid waste is increasing day by day, while management and disposal capacity is often overwhelmed. For example, only around one quarter of solid waste generated in Dori in Burkina Faso is formally managed, and half or less of the population of Nampula in Mozambique have access to solid waste management services.<sup>38</sup> This is an issue that will become more critical, as secondary cities like Dori and Nampula are some of the fastest growing settlements.

Although the urban poor may generate less waste, they are much more likely to suffer the consequences of inadequate waste management than their more affluent neighbours. Poor waste management practices can have a negative impact on air quality (burning of waste), water quality (waste flows into watercourses), drainage (clogged

rivers and plains) and disease (greater likelihood of waterborne diseases such as cholera, as well as the creation of a breeding ground for mosquitoes). Furthermore, waste picking is a common income source for many low-income communities, but can be hazardous if poorly managed or regulated.

**Gender and solid waste management research from rapidly growing cities in Latin America and the Caribbean** by Cities Alliance member *Women in Informal Employment: Globalizing and Organizing* (WIEGO) found that many women working as recyclers and waste pickers chose the informal sector due to their need to balance childcare and household responsibilities with income generation.<sup>39</sup> Women are paid less than men working as waste pickers, have more restricted access to equipment and vehicles for the job, and are also more vulnerable to health risks from waste and sexual violence while working. Though some women are members of waste picker associations, few hold leadership roles.<sup>40</sup> By empowering existing work in recycling and waste management,

encouraging regulation and protection, circular principles as well as women's empowerment can be simultaneously addressed.

**There are significant opportunities to better connect waste and resource management to the circular economy.** Circular waste management can support local livelihoods both through formal employment and also through a significant informal economy connected to resource and solid waste management. Through introducing circular approaches to organic waste, greenhouse gas emissions such as methane can also be reduced.

**Circular resource management significantly supports climate change efforts** with reduction in the burning of waste, reduction of waste in water networks and landfills, and the reuse of material (reducing carbon intensive resource extraction and manufacturing). The co-benefits are clear: supporting a circular economy for waste and resource management in informal settlements, and in cities generally, can reduce environmental risks and create livelihood opportunities.



**Many informal livelihoods are already strongly connected to resource management**, with reuse and recycling common practices in many communities and informal settlements. Positive practices require further support to better connect local activities with formal city operations. At the macro scale, rapidly urbanising cities need significant investment, supply chain support, local

upskilling and infrastructure that supports circularity. While this section often refers to sorting and recycling of “waste”, in a circular system this would be a last resort. Ideally resources will be reused before becoming waste. Still, pragmatically, recycling is a better option than landfilling, and efforts to increase recycling infrastructure in developing cities can have an important environmental impact.

**A holistic multi-pronged, and multiscale approach is necessary that ultimately seeks to eliminate waste, but that also effectively manages and recycles waste that is created.** Cities Alliance have demonstrated this type of approach to solid waste management in their work over the past 20 years.





# CITIES ALLIANCE EXPERIENCE

**Building the technical and administrative capacity of city and community stakeholders for improved solid waste management: In Liberia, Cities Alliance established a Solid Waste Technical Working Group to strengthen the coordination of sector players and conducted feasibility studies to understand the viability of recycling and composting interventions.<sup>41</sup> Grants and training have also been provided to Community Based Enterprises (CBE).<sup>42</sup>**

In Latin America, Cities Alliance member WIEGO supports the organised administration of waste pickers, and there is now the formalised agreement that municipalities should include them in solid waste management plans. This has been transformational for individual waste pickers being paid for the environmental service they provide, and also to the association, contributing to the circular economy.<sup>43</sup>

**Connecting waste management to national climate objectives, enabling a value chain approach**

In Monrovia, Liberia, European Union (EU) waste management activities supported by Cities Alliance are connected to national climate mitigation/emission reduction aims as outlined in NDCs. This project leverages other EU-Liberia funding and supports the government in putting in place a solid waste management system that looks at the waste value chain from the household to the landfill site – currently non-existent in Liberia. Efforts involved reducing GHG emissions from solid waste management services by infrastructure upgrades, building capacity of key local/national climate change actors, as well as creating awareness of climate change challenges amongst the local population. These efforts included a livelihoods component: harnessing waste management as a source of income.<sup>44</sup>

**Providing education to local communities for improved waste management**

In Liberia, the proportion of households with planned forms of garbage disposal in Greater Monrovia increased from 36 per cent at the Cities Alliance project baseline to 83 per cent mid-term, surpassing the 45 per cent target, an increase attributed to the awareness creation campaigns on waste collection and disposal.<sup>45</sup>

In Kampala, Uganda, practical learning sessions on proper waste sorting and the collection of segregated waste were provided for 1000 households.<sup>46</sup> Members such as WIEGO have also been providing training to civil society organisations and school children in Latin America.<sup>47</sup>

**Combining improved solid waste management through a circular economy, with livelihood opportunities**

In Tataouine, Tunisia, efforts to increase waste recovery through composting contributes to the development of local agriculture and is accompanied by the creation of jobs for the most disadvantaged populations.<sup>48</sup>

In one of their earliest projects in Alagados, Brazil, Cities Alliance had social objectives in job and income generation through training courses and support, which included skills development in waste collection and recycling.<sup>49</sup> In Cities Alliance work in Monrovia, Liberia, workers employed by CBEs have grown from 299 at baseline to 381 at mid-term, with more women employed (improved from 27% to 31%). The majority of the workers employed by the CBEs (70%) are youth from local communities.<sup>50</sup>



© WIEGO

### BOX 3

## BRAZIL: CIRCULARITY WITH AND FOR THE WORKING POOR



Waste minimization, reuse, and reduction strategies that work with and benefit the (urban) working poor are at the centre of circular economy models implemented by Cities Alliance member WIEGO. Their "Zero Waste Santa Tereza" project in Belo Horizonte city, Brazil, involves waste pickers, the local community of Santa Tereza neighbourhood, and other actors through various initiatives: food composting, a food coop system, a drop-off site for recyclables, vegetable gardens, and environmental awareness.

The Zero Waste Santa Tereza has two sites where residents can dispose of their recyclable and organic wastes through a drop-off system, under a monthly service fee. The project also provides a neighbourhood collection service in which the cooperative of waste pickers, Coopesol Leste, performs door to door collection of recyclables for a monthly fee paid by serviced residents. The cooperative also provides collection services for large waste generators, thus contributing to an increase in the volume of material collected and, consequently, to the overall income of workers. Coopesol Leste is also involved in the mapping of independent collectors in partnership with the city's Municipal Social Secretariat in an attempt to build solidarity links amongst organised and

non-organised waste pickers, with the view of extending workers' rights to independent workers. Creating green jobs for informal workers and reducing environmental impact is at the core of this bottom-up circular economy initiative.

**"I used to reflect about the relevance of sustainability but I didn't know how to put it into practice .... The way the project is structured makes me see the positive results ... through a lived experience of inclusive segregation at source I can talk to my kids about it ... I think this is transformative and helps in experiencing new concepts which makes a difference for me and my children."**

Resident and project participant



# OPPORTUNITIES



## Reduce/Eliminate Waste and Pollution

- Through forward planning, cities can integrate waste management infrastructure adequately before the facilities become too congested, ensuring that facilities can adequately manage resources in a way that reduces and eliminates waste from the system. This also reduces associated pollution into natural systems – water, air, land.



## Protect and Regenerate Nature

- Ideally, waste management systems that support the regeneration of land will become more common, through composting solutions and fertilisers that result from the output of services, such as leftover food or agricultural by-products. This should be managed in a way that reduces GHG emissions and instead forms part of a cycle of materials.



## Circulate Products and Materials

- The waste management process can look to evolve into a circular management system, whereby products are stored for onward reuse, rather than existing as part of a linear system. This circular process may even form part of a sharing economy, whereby products are repaired and sold. There is also a more sophisticated approach to managing resources, however, that is also supported through fiscal incentives and local business models that create a demand for these materials.



# ENABLING ACTIONS

**The following interventions require an integrated approach, which builds the capacity of local circular economy efforts that are already ongoing, but combines them with more macro, hard and soft support for resource and waste management, connected to local livelihoods.**

## **Building local capacity and skills for sustainable income generation through resource and waste management**

Cities Alliance continues to build on past experiences in education and skills development for improved solid waste management. It is important that any skills training and capacity building interventions lead to sustainable income generation longer-term. Best practices and lessons learned from programs delivered by Cities Alliance, partners and wider actors can be developed into capacity building guidance for holistic and circular waste management.

## **Strengthening local administrative capacity and legislative support for circular resource and waste management and livelihoods**

Active support is required from city mayors and elected officials for improved waste and resource management in informal and low-income urban settlements.<sup>51</sup> Cities

Alliance experience in Monrovia, Liberia, highlighted the risk of local community-based waste enterprises not being paid for their services due to lack of legislative support, which undermines their livelihood security. It also revealed the lack of regulation of private-sector waste actors who exhibit poor waste management practices.<sup>52</sup> It is important that municipalities can continue to build capacity to enforce waste management legislation, incentivising resource management, including collection and efficient sorting facilities. Cities could seek to replicate models like ARB, in Bogotá, Colombia, which has formalized waste collection systems to provide worker protections, higher wages and job stability, while also improving waste sorting for circular processes.<sup>53</sup> Legislation could also address the production of materials

at the source, through regulation that encourages large producers to be more circular in their operations, and creates employment opportunities in the process.

## **Funding for circular waste and resource management in cities**

It is important to recognise the limited funding that many developing cities currently have to improve local solid waste management. At the national level, efforts to link national mitigation efforts to local action has provided an enabling environment for holistic solid waste management interventions, as demonstrated in Liberia, but more is needed to improve such efforts, and to include the role of the circular economy in these efforts. Effective monitoring and collection of relevant data that shows local needs and progress, which is linked to climate mitigation and adaptation targets, is an important, related component. Sustainable public-private partnerships may also help to address infrastructure deficits, in addition to national, bi-lateral and multilateral finance, and revenue from regulation of large producers.



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## Supporting infrastructure planning and development

Infrastructure is one of the primary obstacles to solid waste management in rapidly urbanising cities.<sup>54</sup>

Community waste collection and sorting capacity can be strengthened and integrated into city operations, but if there is not centralised infrastructure for resources to be sorted, reused or recycled, then such efforts will largely be in vain. This is unfortunately a common situation for many developing cities, which need greater support and investment. Development funding and well-structured public-private partnerships are important for this purpose.

Cities whose growth has outpaced their waste management can learn solutions from actions taken by other global cities that have increased reuse and recycling through multiscale solutions.<sup>55, 56</sup> Secondary cities that are undergoing rapid growth can use urban expansion planning to ensure that there is the space for necessary sorting infrastructure from the outset and, with investment, benefit from technological advances in resource management.<sup>57</sup> While landfilling should be avoided, pragmatically it is important that rapidly urbanising cities are supported to ensure that non-recyclable waste can be properly stored without harming the environment, overcoming related spatial constraints.

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## Funding innovation

Innovators and entrepreneurs on the African continent are already working to improve resource management and reduce waste. For example, in South Africa, I-Drop, is a company that has developed 'Waterpods': self-service, purified drinking water refill dispensers for grocery stores, retailers, and hospitality venues.<sup>58</sup>

The Cities Alliance Innovation Programme aims to incubate fresh thinking and approaches to urban challenges, particularly in rapidly urbanising cities.<sup>59</sup>

Beyond these broader interventions there are specific waste sub-sectors that are of growing importance (see also box 4):

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### E-Waste

This form of waste has emerged as a policy priority in certain developing countries. This waste often comes from more developed countries, but there is an increasing amount of domestic e-waste, with Africa ranked as the world's fastest growing mobile phone market.<sup>60</sup> E-waste provides employment opportunities and sorting, and reuse occurs, with a notable informal economy. However, certain practices are often environmentally damaging, and greater policy, regulation, investment, and training is needed in response. For example, in India, more than 95 per cent of e-waste is processed in urban slums by untrained workers who lack adequate protective equipment.<sup>61</sup> The International Labour Organization (ILO) suggests that, in addition to skills and infrastructure development, partnerships between informal collectors and traders collecting large amounts of e-waste for export to recycling plants in neighbouring countries may be one solution for countries with limited recycling infrastructure. Ultimately, ILO note the need for informal actors in e-waste management to transition towards formality in order to be able to contribute to sound recycling of e-waste. Policy and skills development can help support this transition.<sup>62</sup>



### Textiles

There is growing demand for sustainable fashion, and African designers, tailors, and entrepreneurs are leading the way in circular fashion skills and business models. There is great potential to invest in and scale up these circular practices to tap into further income and job creation opportunities.<sup>63</sup> Further examples can be found around the textile industry beyond reuse; once the product has reached its useful life, these items can be then used more widely for housing insulation, creating a new market for onward recycling.

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### Food waste

Agricultural residues generated primarily in rural areas amount to 140 billion metric tonnes globally and have an energy potential equivalent to 50 billion metric tonnes of oil.<sup>64</sup> Under a green investment scenario, the United Nations Environment Programme (UNEP) calculates that by 2050, all biomass waste would be composted or recovered for energy.<sup>65</sup> Rural-urban opportunities exist in industrial symbiosis, valuing organic waste and agricultural by-products and processing these products for energy and farm inputs.<sup>66</sup>



## BOX 4

### GHANA: EXPORTATION OF WASTE FROM HIGHER-INCOME COUNTRIES TO LOWER-INCOME COUNTRIES

**A large proportion of waste from higher-income countries is exported to lower-income countries to meet domestic recycling targets, mitigate insufficient domestic recycling capacities, to overcome strict and costly domestic environmental standards for recycling,<sup>67</sup> and to reduce the burden on domestic landfills.<sup>68</sup>**

Waste exports from higher- to lower-income countries can provide an important source of income for the importing country, a source of employment, and valuable resources from material recovery. However, it also places a burden on waste systems already struggling to handle domestic waste,<sup>69</sup> and if not managed properly, can pose health and environmental risks, which are exacerbated in countries that lack the necessary regulation or enforcement around issues in the waste sector. Furthermore, much of the imported waste can be too contaminated or consist of compound materials, both preventing it from being recycled – often resulting in the burning or dumping of imported waste. Plastic and microplastic deposits can contaminate land and water bodies, and chemical pollutants can impact both health and the environment. The issue is paradoxical, however, as a trend in decreasing exports of plastic waste – as seen in recent years with the restrictions by China (previously the largest importer) and an increasing number of plastics banned from export under the Basel Treaty for Plastic Waste – likely leads to an increase in incineration and landfilling in the short-term, due to a lack of capacity in many higher-income

countries,<sup>70</sup> or to export to other countries with lower technical, infrastructural and regulatory capacity for recycling.

#### E-Waste

E-waste is the fastest growing waste stream globally, and while there are key socioeconomic benefits that can be drawn by the importation and repurposing of this waste in developing countries, there are also important environmental and health risks to consider. E-waste can offer an important contribution to bridging the digital divide. In Ghana, e-waste imported from higher-income countries has contributed to the demand for laptops for students, and refurbished phones have enhanced connectivity.<sup>71</sup> However, e-waste can present serious health and environmental risks if not managed properly. Particular risks include high levels of toxic chemicals, such as lead, mercury, nickel, brominated flame retardants and polycyclic aromatic hydrocarbons (PAHs).<sup>72</sup>

#### Textiles

Imported textile waste can be a key source of income for many informal workers in lower-income countries. In 2020, the largest net exporter of used clothes was the United States, which exported US\$ 585 million worth of textiles in net trade value, followed by China at US \$366 million and the United Kingdom at US\$ 272 million. The largest net importer was Ghana at US\$ 181 million.<sup>73</sup> In Ghana, textile imports arrive primarily at Accra's Kantamanto market – the largest second-hand market in West Africa and one of the largest in the world. Here, around 5,000 shops and 30,000 workers – retailers, tailors, textile dyers, and more – are thriving.<sup>74</sup> However, many of the textiles imported are not suitable for recycling or reuse and end up in landfills. In Ghana, approximately 40% of garments are deemed such poor quality that they are directed to landfills.<sup>75</sup>

Imported waste provides a valuable source of livelihood, but also an environmental and infrastructural burden. If the global trade of waste is unregulated, the environmental and health implications will outweigh the value harnessed through recycling. Importing countries need to consider the role of informal and low-income livelihoods, alongside environmental concerns with respect to their current and future waste import strategy, and the implications of changing export policy.



# 4. CONSTRUCTION AND HOUSING



Sixty to eighty per cent of the built environment needed by 2050 in Africa is yet to be realised.<sup>76</sup> Many developing cities need buildings, housing and infrastructure. This creates the opportunity to embed circular and low-carbon principles and techniques in such cities from the outset, and thus “leapfrog” over outdated, carbon-intensive construction techniques. Environmentally and socially sustainable construction can involve lower carbon building techniques and materials, reusing existing materials and the upgrading of structures to lower the carbon footprint of buildings and contribute to wider city carbon-emissions efforts. This process can also involve using the waste from one sector as a benefit to another.

**Durability is another important consideration: buildings should be high quality, well-designed, and adaptable for future demands.** Infrastructure and services which are well-designed, constructed, sited, and managed tend to be more resilient to climate impacts and other shocks and stresses. If construction projects are well-designed and delivered from the outset, this can lead to an extended lifecycle and less need for repair and/or reconstruction and related material wastage.<sup>77</sup> As cities become increasingly exposed to climate risks, reconstruction strategies should seek to effectively reuse existing materials where appropriate and safe to do so and to improve zoning to limit exposure, amongst other considerations.







**Housing is a key part of the urban built environment.** In rapidly urbanising, developing cities, the need for housing is at its greatest, and informal settlements form the majority of the urban landscape. These settlements are typically of poorer quality and are exposed and vulnerable to various environmental shocks and stresses. The challenge for municipalities and other urban stakeholders is to create a sufficient stock of affordable and sustainable housing. Incremental upgrading of informal settlements can provide local livelihoods and skills development connected to sustainable construction and improve livelihood potential for home enterprises,

thus building individual capacity. The concept of modularisation and standardisation enables residential spaces to be established that are affordable, are adaptable, and importantly, can be constructed by low-skilled workforces – because the model is simple and replicable, and it does not require complex construction techniques.

**In many places, grassroots, self-help housing initiatives play an important role in the construction and regeneration of local communities, offering a housing solution to those who often have little or no other options.<sup>78</sup>**

**"Assisted self-help housing is the most affordable and intelligent way of providing sustainable shelter. It is cheap because it is based on minimum standards and incorporates a substantive amount of sweat equity. It is useful because individuals and communities engaged in it acquire precious skills. It is practical because it responds to people's actual need and levels of affordability. It is flexible because dwelling units are often designed to be able to expand over time."**<sup>79</sup>

UN-Habitat







**However, self-help housing schemes can in some cases lack environmental sustainability.**

Common issues include poor choice of building materials, inefficiency in energy use, threats to biodiversity, poor planning, and a lack of construction control measures.<sup>80</sup> While self-help housing is often a positive solution to local housing challenges, there is significant potential to better integrate circular and sustainable principles into many of such projects. Collaborative self-help housing has already offered an effective solution in many informal

settlements. For example, in Rio de Janeiro, Brazil, local authorities provided self-help schemes with the materials to build settlements that are superior to typical local *barrio* construction. The neighbourhood occupants undertake the work, and the cash spared contributes to local services.<sup>81</sup> Today, all houses in Rocinha are built using cement and blocks; thus, the initiative led to more durable housing, but not sustainable materials. Still, this example highlights the opportunity to integrate climate mitigation and circular techniques and

materials into self-help housing schemes through community and government collaboration.

**Whether major city renovation projects or community-led self-help housing, circular economy housing projects, especially in informal settlements, must be fully cognisant of local context and conditions, such as land tenure, rental mix, wider socioeconomic conditions, and local political context.** This must be combined with an understanding of local environmental context and risk hazard profiles.



# CITIES ALLIANCE EXPERIENCE

## Advocating for sustainable construction and promoting durable and sustainable construction and repair and reuse of materials from the beginning

As part of its engagement to mitigate social, environment and economic impacts to the local population from a major infrastructure project in Uganda, the Kampala-Jinja Expressway (KJE), the Cities Alliance leads a project to establish a Housing Support and Settlement Upgrading Centre. The Centre is established as a non-profit organisation that facilitates secure housing through an effective and efficient implementation mechanism for a long-term incremental slum upgrading to local households. This transformational initiative will provide improved housing and community infrastructure to at least 2000 slum dwellers households currently living in the “right of way” of the KJE. It further supports capacity development in incremental upgrading, introducing sustainable construction and material usage and providing training to the community and thus supporting local education and skills development for sustainable construction.<sup>82</sup> An exemplary research project by IIED in Mukuru, Kenya, highlights lower carbon building techniques and materials which contribute to wider city carbon emissions efforts.<sup>83</sup>

## Promoting approaches to urban planning that support sustainable construction

For example, the Eco2 Cities approach works within the unique resource constraints of each city and looks to enhance resource efficiency, while reducing pollution and waste. Urban expansion planning supported by Cities Alliance has promoted better zonation across multiple African cities and has protected key arterial routes from development, reducing the need for carbon intensive and socially disruptive resettlement processes later.

## Navigating land tenure issues

Land tenure is one barrier to quality, sustainable, and circular construction in informal settlements. Cities Alliance member SDI is a key figure in working with informal communities and municipalities to resolve issues related to land tenure. The Social Tenure Domain Model (STDM) – a pro-poor land administration process and set of tools – provides an opportunity for authorities and slum communities to initiate dialogues for inclusive planning and access to basic services and infrastructure, and ultimately to improve land access and records.<sup>84</sup>



# OPPORTUNITIES



## Reduce/Eliminate Waste and Pollution

Construction offers huge opportunities for waste and pollution reductions, through designing waste out in the first place, as well as reducing associated GHG emissions through modularity and durability.

- Principles around design for deconstruction enables continual reuse and adaptability. Modular and standard approaches make it easier to replicate and reuse building elements again and again, rather than having bespoke elements that have a limited service life. These principles also support continual adaptability as slums upgrade and become more high rise, evolving over time. This may offer one solution to both slum upgrading and affordable housing provision in expanding cities. This approach also encourages people to upskill quickly to deliver these housing applications.
- Durability is an important related consideration. However, this should ideally come from materials with low embodied carbon, instead of carbon-intensive materials (e.g., steel and concrete). For example, the Government of Switzerland, member to the Cities Alliance, has supported lab trials and efforts to full large-scale productions of the ground-breaking Limestone Calcined Clay Cement (LC3), to make a contribution to decarbonise the cement industry.<sup>85</sup> Durable, yet sustainable construction can be promoted in self-help housing and wider city construction.



## Protect and Regenerate Nature

- Creating green spaces around housing and built-up areas supports nature and the bio-based economy and can serve a number of benefits. Through making greener spaces for people, natural shading and associated resilience can be provided for buildings as the planet temperatures increase. This then mitigates the need for cooling technologies that lead to increased GHG emissions.
- Sustainable timber and other regenerative and bio-based materials also offer valuable opportunities with respect to sustainable construction materials.<sup>86</sup> This also supports the generation of local employment and business development opportunities, rather than importing materials.



## Circulate Products and Materials

- Creating a city system that supports the circulation of products and materials is a first step towards creating the demand for designing-in reuse for new construction. This then supports less virgin material extraction and reduces GHG emissions that occur during manufacturing. It also creates employment opportunities for those who traditionally are disadvantaged. Research has highlighted that the “products of construction waste recycling can be the stimulating factor for slum upgrading through the ‘Learn to earn Model’”<sup>87</sup>



# ENABLING ACTIONS

## Making sustainable and circular construction at the forefront of urban policy and plans

An ecosystems approach to urban development and masterplanning – making use of tools like Eco2 Cities and Urban Expansion Planning – can promote the use of locally sustainable materials and environmentally sensitive zoning. Housing plans and programs also require integrated sustainable services provision: proper building orientation to allow for passive ventilation, use of small-scale solar panels and rainwater catchment and sustainable drainage.

## Improving technical capacity of local communities, municipal authorities, and local construction industry stakeholders in sustainable and circular construction

This is needed in major projects akin to KJE, as well as in smaller slum upgrading and self-help schemes. Innovation grants and other incentives can support local companies that are committed to sustainable and circular construction.

## Strengthening local coordination for sustainable and circular construction and slum upgrading

Cities Alliance forms an important bridge between local communities, municipalities, and other construction stakeholders when it comes to local slum upgrading and incremental housing. Technical skills development is perhaps the easier part of the equation. Circular construction and slum upgrading needs to respond to the local political and social context and related obstacles. Cities Alliance, and members like SDI, are well placed to help overcome obstacles of land tenure and issues related to urban planning and zoning, while ensuring that sustainable materials and techniques are at the forefront of projects.

## Building local financial and legislative capacity

A lack of relevant legislation and finance to support the upcycling and recycling of building materials, lack of green construction practices/regulation, and lack of public procurement support have all been identified as barriers to the circular economy in Africa.<sup>88</sup> Government departments too must address some of these legislative obstacles, while international finance is needed to support circular, sustainable infrastructure projects. Cities Alliance is well-placed to create a bridge between investors, administrations, local private sector organisations and communities.





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## BOX 5

### PAKISTAN AND GHANA: GREENING AFFORDABLE HOUSING SOLUTIONS IN EMERGING MARKETS



Affordable green homes have the potential to rapidly accelerate the transition to net-zero, drive-inclusive growth, reduce emissions, and build resilience. Climate-smart affordable housing offers a pathway for cities to address the twin challenges of addressing housing deficits and working towards net-zero emissions. Green buildings simultaneously avoid embodied emissions during the construction stage and reduce demand on a city's energy resources. Cities Alliance member Reall is additionally demonstrating that affordable housing is a viable green asset class that can direct green finance flows in Pakistan and Ghana communities.

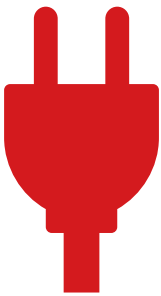
Safiya Homes Lahore is an example of a new generation of affordable housing which is environment-focussed. Developed and managed

by Ansaar Management Company, Safiya Homes provides 65 single- and double-storey units in a gated residential community on the outskirts of the historic city of Lahore, Pakistan. Aimed at lower income families, these homes make use of energy and water saving technologies, and the community has become the first EDGE (Excellence in Design for Greater Efficiencies) certified housing project in Pakistan. Additional solutions include infrastructure services such as fully paved roads, a centralised water supply distributing water to every home, an underground sewerage system, full-time electricity, a centre of worship, community and commercial centres, a graveyard and a water filtration plant. Through EDGE certification, expected benefits included 34% energy savings, 42% water savings, and 35% less embodied energy in materials.

Reall has also worked with the developer Afreh Group on the construction of climate-smart and affordable houses in Tamale, Ghana, all of which have achieved EDGE certification. This shows that homes that are climate-smart can also be affordable. Comprising 100 two-bedroom homes, it's the first EDGE certified project in Northern Ghana. Benefits have been achieved through improved green performance through measures such as low-flow water fittings, walls built with compressed earth blocks, and naturally ventilated spaces, resulting in estimated improvements of 34% in energy efficiency, 31% in water efficiency, and 56% in embodied energy in materials, compared with conventional local construction methods.<sup>89</sup>



# 5. ENERGY



Sustainable energy sources have a direct impact on resilience at the household, community, and city scale. Improving energy access can build the capacity of individuals and communities to better manage shocks and stresses. Safe, renewable energy can improve resilience by lowering costs of energy, reducing unsafe practices, and reducing emissions and pollutants, creating better air quality. Renewable energy initiatives, such as solar cookstoves, can limit the use of materials such as charcoal and paraffin, thereby directly improving the health of the users. Notably, this is particularly significant for women; through gendered responsibilities, women are typically at greater risk of respiratory illness due to unclean cooking fuels.

Renewable energy initiatives provide a valuable and viable alternative to fossil fuels and overexploited resources such as fuelwood, providing sustainable sources of energy, while simultaneously tackling issues of pollution and climate change. Sustainable Development Goal 7 outlines the need for equal affordable and clean energy access. Reducing energy consumption at the source is important, particularly through circular economy processes such as through reducing primary production, recycling, reusing, reducing consumption, seeking less energy intensive production processes, and minimizing losses in production. However, when energy production is required, renewable sources are essential for environmental, health and economic benefits.









**Renewable energy initiatives can provide energy security and reduce access inequality.** This is on both a local and national scale; renewable energy solutions can provide energy independence to developing countries, allowing them to move away from a dependency on external energy imports. On a local scale, which is particularly significant for remote or rural neighbourhoods, community-based renewable energy production can ensure equal energy access, to which there may otherwise be geographical and economic barriers.

**Capacity building and skills investment should be written into renewable energy projects to ensure their sustainability and longevity.** By focusing on capacity building in the localities in which the renewable energy project is implemented, the renewable energy infrastructure will be maintained, and its lifespan extended.

**Waste-to-energy initiatives are a key focus area for private investment in developing countries.** While efforts to reduce waste at the source through reduced consumption, or circular principles of reusing,

repurposing and recycling are preferable, waste-to-energy initiatives do offer a means of capturing some of the value in waste by converting it to energy. This can provide benefits to cities and rapidly urbanising areas, as centralised waste-to-energy plants can reduce the volume of waste to manage, can contribute to disease control, and can provide a source of energy, reducing reliance on external imports. Comparably, in remote rural areas, waste-to-energy plants can address issues of accessibility and energy poverty, reducing reliance on a central grid. However, it should be noted that the incineration of household and industrial solid waste can result in environmental and health risks from pollutants, which can be exacerbated in settings where governance is weak or technologies/practices are poor. Research has found that some waste-to-energy incinerator technologies being sold in developing countries would not be approved for use in their country of manufacture.<sup>90</sup> Furthermore, waste-to-energy initiatives must be supported by proper waste sorting mechanisms as a prerequisite to the benefits they can provide.

**Solar energy hardware can harness untapped renewable energy potential in many developing countries.** There is identifiable solar energy potential in many secondary cities that have extensive periods of sun throughout the year; however, many lack the adequate solar energy facilities to capture this. Members of the Cities Alliance, such as the Government of Switzerland, are actively seeking to promote this potential, facilitating social and economic development through clean and renewable energy initiatives.<sup>91</sup>

National and local energy strategies will likely need to use a combination of sustainable and circular approaches in order to meet growing energy demands that will come with rapid urbanisation and socioeconomic development.



# CITIES ALLIANCE EXPERIENCE

## Improving urban zoning for low-carbon energy delivery

Cities Alliance's promotion of urban expansion planning can help cities to effectively plan for future energy generation needs, without the need for economically and environmentally expensive and socially disruptive remedial works.

## Harnessing the potential of population density in informal settlements

Cities Alliance have advocated for the value in city densification – a compact city for accessible services<sup>92</sup> – an existing characteristic of many informal settlements. Through capacity building and slum upgrading practices,<sup>93</sup> the value of this spatial density can be tapped into for energy co-generation, district heating/cooling, and reduced energy consumption per square metre.<sup>94</sup>

## Promoting non-carbon, naturally regenerative urban cooling processes

Initiatives such as tree planting, building codes to support sun shades, solar-conscious plot design, building openings, building materials to reduce temperatures, maximum ventilation, green roofs, and white roofs can reduce building temperatures without the need for energy-intensive cooling mechanisms.<sup>95</sup> On the city scale, urban water bodies and wind corridors can improve air circulation and remove heat from urban areas.<sup>96</sup> It is important to address energy consumption reduction and climate change resilience as interrelated issues. By reducing fossil fuel energy consumption

through natural and regenerative practices, the effects of climate change are mitigated, and the effects of climate change, such as extreme temperatures, are mutually addressed.

Forming part of Cities Alliance's collaborative partnership with C40 on Resilient Cities, cooler housing design was piloted in the informal settlement of Mukuru, in Nairobi, Kenya. Nairobi will likely experience climate change induced periods of extreme heat, making this project especially significant. Mukuru also has low levels of vegetation, which is linked to higher urban temperatures. Cities Alliance addressed this through cooler housing design to address the extreme heat issues without the use of energy intensive cooling processes and with the provision of green spaces on a larger scale. This is comparable to the initiative conducted by World Resources Institute, in partnership with Cities Alliance, in Surat, India, in which urban vegetation and "greenbelts" were introduced around high heat-emitting land uses, reducing heat naturally and capturing carbon.<sup>97</sup>

Community-led efforts on climate adaptation are equally valuable. As part of the Cities Alliance innovation initiative "Stronger Partnerships: Local Innovations for New Climate Realities in Cities", residents of vulnerable communities in Yangon, Myanmar, applied citizen science techniques to identify urban heat islands and discuss potential mitigation measures.<sup>98</sup> Led by the local NGO Women for the World, the experiment used simple and affordable thermometers to measure air temperature in different parts of the city. The results were then used to raise awareness about the issue of excessive heat and how locally available, low-cost solutions could help to cool houses and public spaces and contribute to a healthier environment.<sup>99</sup>





### Furthering gender equality through renewable energy projects

Cities Alliance, in partnership with C40 on Resilient Cities, sought to improve energy access in Mukuru, Nairobi.<sup>100</sup> One aspect of this project involved providing solar-powered street lighting. This not only led to reduced GHG emissions and improved air quality, but also provided a safe environment for residents at night. This is a particularly important initiative for vulnerable groups, notably women, who may be disproportionately at risk. This is a key example of how gender-sensitive infrastructure planning<sup>101</sup> can coincide with circular economy initiatives as a sustainability and equality multiplier. Similar efforts have been delivered recently across Tunisian cities (Box 6).

### Prioritising training and capacity building in renewable energy projects

Cities Alliance have consistently placed skills training in the assembly, use and maintenance of renewable energy infrastructure at the centre of their projects. In Monrovia and Paynesville, Liberia, communities were provided with solar energy facilities and trained in sustainable usage.<sup>102</sup> Technicians from local communities were trained in basic installation, use and maintenance of the solar panels. Furthermore, the technology provided was relevant to the slum communities, and explanations of the value of these technologies was provided. These factors all ensure the longevity of the hardware and its sustainable use.

### Developing decision support tools

Cities Alliance developed a decision-support tool to enable cities to evaluate the potential of low-carbon initiatives in informal communities. Evaluation encompassed informal household energy use, energy cost, income, and energy-related health and social equity impacts. This was piloted in Dakar, Senegal, and Accra, Ghana, but plans are in place to utilise this tool more widely elsewhere.

# OPPORTUNITIES



## Reduce/Eliminate Waste and Pollution

Investing in local renewable energy systems and centralised renewable energy networks can reduce pollution and GHG emissions, as well as making operational costs more affordable in the long term.

- Opportunities exist for private sector participation in decarbonizing the production and waste management of goods and services. Whilst reducing the need for energy and moving towards renewables, there is a transition around using bio-based waste-to-energy processes that can support a net-zero carbon economy. For example, the Balbo Group in Brazil harnesses circular processes to produce 100 per cent of the energy needed by the company through thermoelectric power plants run on sugarcane bagasse. All organic by-products are used for organic waste-to-energy processes, with any excess energy sold back to the grid, or by-products recycled as fertiliser. Organic energy-to-waste technologies are scalable and have the potential to power homes, industries, transport, and cities. In this case, waste should be rethought as profitable and renewable, rather than simply as waste.

- Buildings can also be designed to support the transition to less reliance on energy generation, reducing the demand on energy networks and designing out the need for these in the first place. While many buildings in developed countries face a barrier to energy consumption reduction in the way their buildings were originally designed, many buildings in developing countries are yet to be built and can therefore incorporate circular economy principles from the outset. Renewable and low consumption buildings and industries can be designed into the city fabric as developing areas expand in a controlled and planned way.



## Protect and Regenerate Nature

Energy systems that are designed to protect nature by eliminating fossil fuels and harnessing renewable energy can support the regeneration of nature.

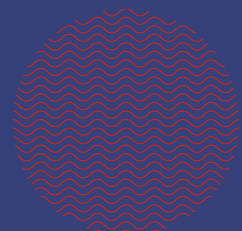
- Ideally cities will also move away from reliance on energy or at least pursue more sustainable forms of energy compared to incineration, such as solar, wind, or even bio-based fuel sources. The use of renewable and bio-based energy can be less harmful to the environment, allowing air and land quality to be protected and to regenerate.



## Circulate Products and Materials

Through moving towards a system that circulates materials, a reliance on creating energy systems for manufacturing is reduced, thereby creating less demand for new energy systems and networks.

- Energy system components such as solar and wind energy can be designed and implemented in a circular fashion so that the system and its components are continually repaired and reused.





# ENABLING ACTIONS

## Supporting low-carbon, circular energy systems in informal upgrading and wider urban policy, planning and design

The above large- and smaller-scale activities can be incorporated into city urban planning and slum upgrading approaches, provided there is the right level of support to municipalities and technical collaboration with wider stakeholders and communities.

## Providing short-term sustainable energy solutions and associated advocacy and education

Many informal settlements lack basic infrastructure, and systems such as solar micro-grids can form a short-term solution aligned with circular economy principles. Through participatory approaches and local presence, Cities Alliance and its members are able to provide customised solutions for various circumstances and at any scale, as demonstrated in Liberia, Tunisia and elsewhere. While sustainably addressing energy supply is a key issue, efforts can be taken to address demand too, such as by providing energy efficient lightbulbs to low-income households and associated education on other efficiency measures that can be taken.

## Supporting efficient building design

Energy savings can be made through building design, including the amount of natural light and the use of solar and related measures. Energy demand can be reduced through holistic approaches to slum upgrading.

## Connecting sustainable and circular energy to livelihoods

Smaller-scale processes such as the repair of solar micro-grids can help create and support circular economy enterprise if supported by technical training, skills development and business support. Longer-term energy plans should seek to boost local employment and provide opportunities for youth, including women, in a circular energy economy.

## Promoting gender equality through support for sustainable businesses

Harnessing the untapped potential of energy systems in developing African countries can provide opportunities for women in renewable energy industries. For example, a group of 5,000 women in Africa known as *Solar Sister Entrepreneurs* have reached 1.7 million people with clean energy, generating both income and accessible clean energy supply.<sup>103</sup> Similarly, 100 per cent of the operations of Jaza Energy, a solar energy initiative in Africa, are run by women known as the *Jaza Stars*.<sup>104</sup> These case studies demonstrate the potential for simultaneously addressing energy accessibility and women's empowerment through renewable energy initiatives.





## BOX 6

### TUNISIA: MUNICIPAL DEVELOPMENT THROUGH CLIMATE MITIGATION AND ENERGY TRANSITION

As a follow-up to the Madinatouna (Our City) CDS initiative, Cities Alliance is supporting local authorities in the eight Tunisian partner cities of Béja, Gabès, Jendouba, Kairouan, Medenine, M'saken, Sidi Bouzid and Tataouine. Besides capacity development around their implementation of urban and land-use planning tools, the cities are supported in implementing municipal 'quick-win projects' identified and prioritised through a participatory and inclusive consultation process with local stakeholders. This includes an energy-efficient, LED-powered public lighting project for greater safety in underprivileged neighbourhoods.

The public lighting project contributes to increasing the cities' energy efficiency through the supply and installation of intelligent (remote-controlled)

LED street lighting in the main streets of the cities. Improving the quality of public lighting will help the municipalities **cut expenditures**, considering that electricity bills make up a large part of municipal budgets – **often around 25% – and prices have seen a sharp increase in recent years**. This will not only **contribute to increasing the savings needed to finance** other investment projects, but also improve the safety of movement for residents, including **women, youth, children, the elderly**, members of vulnerable groups and those with special needs.

Throughout implementation, the municipal teams of each partner city receive assistance in capacity assessment, tailored training and coaching in project management, execution, and packaging from senior local development experts.



# 6. WATER MANAGEMENT



Water is a finite resource and should be protected and managed appropriately; circular economy principles can contribute to effective water management and protection. This is particularly pertinent with the worsening effects of climate change, which will increase water scarcity and make extreme weather events more frequent. Effective water management is essential for national, local, and personal resilience. Investment in water and sanitation is essential for building resilience in developing and informal settings. It is particularly vital for areas exposed to floods, droughts and heatwaves, and can also be a crucial means of preventing disease, curbing environmental damage, and increasing water security.

**Insufficient access to water is a gendered issue.** With insufficient local water access, as is the case in many informal settlements, a large portion of disposable income is required to purchase water from vendors, or large amounts of time are required, predominantly by women and girls, for moving water over large distances. Cities Alliance research in Liberia found that 80 per cent of households with water shortages relied on women and girls for water collection.<sup>105</sup>

**Poor water management is strongly linked to health risks.**

There is a strong link between water availability, water quality, sanitation services, and health. When water and sanitation services are inadequate, general health can decline due to dehydration, and waterborne diseases can rapidly multiply. Research by UNEP has shown that, in Cambodia, Indonesia, the Philippines and Vietnam, 2 per cent of combined GDP is spent on the costs of waterborne disease.<sup>106</sup>

Circularity in water systems can be achieved through the following:

- › **Reducing energy use** and increasing efficiency of operations
- › **Recovering and reusing water, treating** it as necessary for intended use
- › **Advancing nature-based solutions**, including the restoration of vegetation for catchments and key watersheds for sustainable drainage and recharge.

**There are also important linkages and opportunities for increased efficiency and circularity between water and other urban systems.**

This includes biogas energy, the role of water-tankers, water-points and associated plastic waste potential, and key dependency of agriculture on sustainable water systems. Some of the barriers that need to be overcome in order to increase water circularity in some developing countries include stakeholder engagement in water and sanitation systems, deficits in core infrastructure, and willingness to pay for treated wastewater.<sup>107</sup>







# CITIES ALLIANCE EXPERIENCE

## Supporting gender equality through improved water access in informal settlements

In Monrovia and Paynesville, Liberia, Cities Alliance implemented women-led water kiosks to address the issue of unequal responsibility for water carting, while empowering women through employment opportunities. The projects implemented 64 multipurpose water kiosks in 34 communities that lacked clean drinking water, due to congestion and polluted groundwater. Lighting systems for the kiosks are powered by solar power, and a storage tank is included. Women were trained in the maintenance and operation of the water kiosks, ensuring the initial uptake of the hardware and its longevity.<sup>108</sup> This project shows the potential for circular initiatives to address water security and accessibility, while also promoting socioeconomic empowerment, particularly for women.



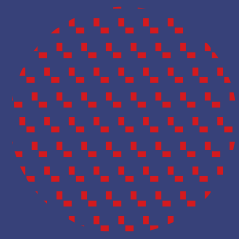
## Managing interrelated issues of water management, resilience, and environmental protection

In one of the first Cities Alliance projects in the slum area of Alagados, Brazil, infrastructure improvements led to mangrove restoration for better coastal protection and carbon capture, and drainage infrastructure and sewerage amenities improved water access, sanitation and health. In 2000, only 37 per cent of inhabitants were connected to a water network, and 21 per cent to a sewerage network. By 2006, these figures increased to 71 per cent and 84 per cent.<sup>109</sup> By constructing a sustainable water system, water as a finite resource is not wasted. Wastewater can be treated and circulated, with related health, sanitation and water security benefits. Cities Alliance are continuously promoting slum upgrading initiatives that work in harmony with ecosystems' natural functions, harnessing them for regulating hazards, such as stormwater catchment, and to supply resources, such as water, sustainably.<sup>110</sup> Another example of water body protection is the protective lakeshore vegetation buffer designed to capture contaminants from the urban area of Hawassa, Ethiopia (as discussed earlier; see Box 2).

## Addressing the link between water body protection and solid waste management

In Greater Monrovia, Liberia, interventions in solid waste management led to related improvements in water body protection as waste was prevented from being dumped in rivers, and other hazardous materials and chemicals from entering waterways.<sup>111</sup> Waste was redirected for recycling, reuse, and managed disposal, and water bodies were protected for future use.

# OPPORTUNITIES



## Reduce/Eliminate Waste and Pollution

- › Adopting approaches that reduce the need for water in the first place reduces the reliance on water and associated water infrastructure systems. Treating and reusing wastewater can also provide a resource in urban agricultural settings. These processes and services need to be designed to enable greater and wider uptake. As water systems become more established, greater efficiency and water reuse can reduce the volume of freshwater withdrawn, thereby reducing the energy required, and leaving more water for the environment.
- › Wastewater treatment can harness added value to operations through biogas recovery. This process consists of anaerobic digestion of wastewater sludge to reduce its volume and produce biogas, which can be used for renewable energy. This circular process harnesses all potential value of the wastewater, as both a renewable energy source and a means of reducing the pollution potential, and the remaining digestate can be used to displace fertilisers in crop production or for compost.<sup>112</sup> In Dakar, Senegal, wastewater is reused by market gardeners, as well as for energy production from biogas produced during the treatment phase.<sup>113</sup>



## Protect and Regenerate Nature

- › The preservation and enhancement of natural water systems, for example, through river restoration, pollution prevention and improved quality of effluent, is important, not only for human health benefits, but to enable water systems to support the wider management of water in connected systems, such as agriculture. Nature-based solutions are inspired by, or mimic, natural processes and are circular by default. Many include ecosystem restoration and conservation, or the creation of modified or artificial ecosystems in urban areas. Initiatives may include wetland restoration, more efficient groundwater recharge, rainwater harvesting, permeable pavements, riparian buffers, green roofs, green spaces, mangrove restoration and protection, and reconnecting rivers to floodplains.



## Circulate Products and Materials

- › Water-based systems should be optimised for yields and to enable greater reuse, rather than supporting a linear system, for example, through energy generation systems.
- › As with other systems, components of energy systems should be reused and repaired, or recycled if those options are not possible.



# ENABLING ACTIONS

## Supporting circular water management plans and programmes for climate change mitigation and adaptation

As the effects of climate change worsen, water scarcity can be exacerbated and people in developing/informal settings may be most at risk. This is particularly the case if the current water system is inaccessible or unregulated, or water is already scarce. Water management programmes are a key first step to managing demand and availability, and ensuring that water is circulated and not wasted. Water conservation awareness programmes, rainwater harvesting, improving reservoir capacity, groundwater recharge, improved infiltration, and water infrastructure maintenance and repair can all be written into city water management plans.<sup>114</sup>

## Promoting nature-based solutions for better water management in urban policy and planning

UN-Water have advocated a shift away from focusing primarily on human-built, 'grey' water management infrastructure, towards traditional and indigenous knowledges that embrace greener and more circular approaches.<sup>115</sup> Inspiration can be taken from China's 'sponge city' concept, which aims to improve water availability in urban settlements by collecting 70 per cent of rainwater through green roofs, walls and permeable pavement; restoring degraded lakes and wetlands; and introducing rain gardens and bioretention swales to collect runoff and remove pollutants.

## Building technical and financial capacity for improved wastewater treatment

Wastewater treatment can be a valuable method for improving health, as well as increasing environmental protection and water security in developing cities and informal communities. Untreated wastewater can pose health risks to communities and

disrupt ecosystems if nutrient levels are uncontrolled, particularly from soil irrigation runoff, or if contaminants enter groundwater supplies. Improved sanitation systems are the objective of SDG 6 and a primary concern for many informal and developing areas, and, with wastewater treatment technologies implemented in conjunction, can have multiple circular benefits.

## Promoting regenerative approaches linking ecological restoration to water security

Water security is closely linked to ecosystem stability; therefore, ecological restoration techniques can contribute to better protection of water assets. Such approaches may include wetland restoration/conservation, reconnecting rivers to floodplains, and creating and designating urban green spaces for groundwater recharge.

## Harnessing the value of spatial density for water supply and services

Cities Alliance have recognised the value of population and service density in many informal settlements and slums. This spatial structure can present valuable opportunities for sustainable and efficient water supply, lowering biophysical and economic costs per capita of providing piped treated water, sewer systems, and other forms of infrastructure and services.

## Delivering decentralised solutions, such as rainwater harvesting and grey water treatment at the household or business level, to improve resilience and sustainability

Rainwater harvesting via rooftop water catchment systems can be a valuable and low-cost method of securing water at zero cost on a household scale, similar to localised greywater treatment. This is also scalable technology that, with the right business support, can be used on larger business and industry scales. The rainwater collected is predominantly used for irrigation purposes and can be particularly valuable in urban agriculture initiatives. However, the water can also be treated and used for consumption.



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## BOX 7

### SENEGAL: WASTEWATER AND ITS CIRCULAR VALUE IN DAKAR

Tackling water insecurity is a key priority for Dakar, Senegal, particularly as it faces the dual challenge of population growth and climate change, which are multiplying current water stresses. In 2022, The World Bank warned that Senegal needs to urgently prioritise water security or risk constraining economic growth.<sup>116</sup>

Dakar has responded to water stress by implementing circular water management techniques, reusing water and sanitation resources, and reducing water losses. Treated wastewater is used for irrigation on farmlands, sanitation by-products are repurposed as fertiliser, and biogas produced from wastewater treatment powers the treatment plant itself.<sup>117</sup> These initiatives harness all circular economy principles of reducing wastage, preventing pollution, and preserving the environment.

These are scalable technologies that could be applied from the smallholder farm level to industry scale agriculture. Furthermore, excess products (such as biogas for renewable energy, or fertiliser products) could be sold for income.



# 7. TRANSPORT



**The need for supporting circular and low-carbon transport systems in rapidly urbanising cities is paramount. Research in China, India, and elsewhere shows that heightened traffic congestion leads to higher GHG emissions – as much as 70 per cent greater emissions rates per kilometre during congested periods in some real-world studies.<sup>118</sup> This will support improved air quality and accessibility for those most vulnerable and thereby open up opportunities for these groups, as well as alleviating the pressure to continually build carbon-intensive road networks and infrastructure.**

**Transport solutions in informal settlements can be, by default, low carbon.** This is predominantly due to the spatial density of the settlements and the short distances often required for social and work travel, meaning many destinations are within walking or cycling distance, both of which are zero-carbon solutions. However, as settlements expand and upgrade, low-carbon mass transit must be written into plans to support socioeconomic development. Shared transport is already popular in many informal settlements, and it

will be important to retain this and upgrade where necessary in inclusive and mobility-led urban planning. These green transport solutions contribute to resilience and support climate-change mitigation through better air quality, better urban mobility inclusive of low-income individuals, and improved wider urban mobility by managing congestion.

**Urban planning should support low-carbon, active transport.** Low-carbon, or zero-carbon transport planning may involve designating safe routes for pedestrians and cyclists, in addition to promoting accessible, affordable public transport options. While walking and cycling are prevalent forms of transport in many developing and informal settings, these can often be unsafe, inaccessible, or subject to disruption due to extreme weather events such as flooding, or heat-induced surface cracking – the frequency of which is worsening due to climate change. Therefore, accessible forms of low-carbon, active transport should be written into urban planning from the outset, and safe and accessible routes should be identified and amended in existing urban settlements.

**There is a large economy for automotive refurbishment already existing in developing countries.** The circular principle of recycling and reuse is demonstrated in the existing economy of second-hand vehicle refurbishment in many developing countries.



Forty per cent of global exports of used light-duty vehicles (cars, vans, and pickup trucks) go to Africa, for example, compared to only 2 per cent of new vehicles.<sup>119</sup> However, there will need to be future consideration of the impact of this on meeting climate goals by 2040 – estimates indicate that around 40 per cent of Africa's vehicles will need to be electric by this time to meet targets.

**Compact cities are a massive opportunity to reduce emissions while decreasing cost of travel for impoverished households.**

Ensuring that slums and informal settlements are upgraded to enable easier and efficient transport is a sure way to reduce travel time and therefore emissions for motorised transport. This also reduces the impact of transport tickets in the household income mix.

**The sharing economy is also a huge opportunity in transit, taking various forms including pay per ride, carpooling, renting loaning, car sharing or carpooling.** All these systems reduce the need for manufacturing more vehicles and reduce the burden associated with outlying significant capital costs. It also becomes an income generation opportunity, optimising the life and use of the vehicle.





# CITIES ALLIANCE EXPERIENCE

## Designing green transport systems

Forming part of the Eco2 Framework, Cities Alliance designed green transport systems for two projects in Vietnam.<sup>120</sup> These valorised circular economy principles of mass transit and integration with the development of surrounding land.

## Addressing gender equality in transport accessibility

In their urban development and transport plans, Cities Alliance have addressed gender-based transport accessibility needs and barriers. It has been recognised that women's reasons for using public transport often differ from men's and are commonly for care-related activities. Furthermore, women constitute a higher proportion of low-income groups and are

engaged in low-income jobs in many developing countries, meaning they will spend, on average, a higher percentage of their disposable income on transportation. This can often make transport less accessible, and women are more likely to travel long distances by foot, which simultaneously places a barrier on income opportunities that may require travel by public transport. Cities Alliance have therefore kept gender-based transport requirements in mind when designing slum upgrading plans and urban expansion planning projects, emphasising accessibility aspects for women.

## Promoting low carbon transport planning

Cities Alliance promotes the inclusion of a citywide arterial road network in urban expansion plans, which can reduce GHG emissions compared to unplanned networks due to reduced travel distances, less congestion, and fewer private vehicles. Urban expansion planning also facilitates the increased uptake of public transportation methods, walking and cycling, which is particularly important in developing countries where the transition to private vehicles is at an early stage. Arterial roads can include bike lanes, and expansion areas may include green paths for walking and cycling.<sup>121</sup>

## Spatial planning

In Nampula (Mozambique), Cities Alliance and UN-Habitat in 2013–2015 upgraded one informal settlement in the city to open a road, which enabled faster travel times and shorter routes. This immediately turned into savings for households who were previously forced to take long detours around the slum. A similar approach in Kibera, Nairobi (Kenya), by UN-Habitat in 2009–2011 secured similar outcomes.





© Dipti Mahapatro

## BOX 8

### INDIA: WOMEN AND TRANSGENDER CITIZENS DRIVE THE ELECTRIC MOBILITY REVOLUTION IN BHUBANESWAR

The transport sector in India and in most other parts of the world is dominated by males. There are almost no female drivers of buses, rickshaws or cabs. Additionally, the COVID-19 pandemic has had a negative impact on economic development in India. Marginalised groups are the most vulnerable in this situation.

Capital Region Urban Transport (CRUT), the local agency in Bhubaneswar responsible for the provision of the 'Mo Bus' public transport service, along with the local NGO ARUNA and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) came together to pilot an e-rickshaw feeder system. More than 100 women and transgender persons joined this transformative journey ready to be trained as e-rickshaw drivers. The project provides livelihood and employment opportunities for people from marginalised sections of society,

who formerly depended on working in unreliable informal jobs. Coupling e-mobility with the inclusion of women, trans persons, and members of other marginalised communities, such as HIV positive adults, is unique in India. Furthermore, this promising proposition will provide jobs and at the same time reduce CO<sub>2</sub> emissions and air pollution.

Integrated and Sustainable Urban Transport Systems for Smart Cities in India (SMART-SUT) is implemented by GIZ and the Indian Ministry of Housing and Urban Affairs, commissioned by the German Federal Ministry for Economic Cooperation and Development, BMZ. The project objective is to improve planning and implementation of sustainable urban transport systems in selected Indian cities and states. The project is part of the Green Urban Mobility Partnership between Germany and India.

**"Transportation has always been a male-dominated profession in India. Mo E-Ride is an innovative idea and CRUT happens to be the first agency to introduce women captains and guides. Through this initiative we are dealing with challenges and experimenting with beneficiaries and stakeholders."**

Dipti Mahapatro, General Manager (CRUT)



# OPPORTUNITIES



## Reduce/Eliminate Waste and Pollution

- › Designing and supporting integrated active-travel solutions will incentivise users towards zero-carbon solutions over carbon-intensive travel solutions. This will reduce the need for extensive carbon-intensive road infrastructure. Where infrastructure is put in place, planners should look to use materials and recycle, where possible.



## Protect and Regenerate Nature

- › Transport solutions should look to protect and enhance nature-based solutions, for example, providing tree canopies will provide shading for those walking and cycling, as well as supporting carbon sequestration and better air quality.



## Circulate Products and Materials

- › Reusing existing infrastructure will be important, as well as forward planning to ensure longevity and adaptability of infrastructure put in place. Establishing material reuse hubs will also support the reuse and recycling of materials for transport infrastructure development.



# ENABLING ACTIONS

## Promoting policy and supporting planning to make cities 'walkable' and high mobility

Despite the high rate of walking within high density neighbourhoods, many cities and routes are not 'walkable'. Footpaths may exist, but routes may be inaccessible, particularly for those with physical mobility issues, or routes may not have streetlighting. Routes may be commonly subject to weather events such as flooding, and there may be dangerous potholes, exposed electrical wire, open sewers, and hazardous waste.<sup>122</sup> Some of these risks disproportionately affect more vulnerable people, such as women and children. Pedestrian access is a key priority for future city development, with slum upgrading for interrelated safety and environmental benefits.

## Supporting a shift away from paratransit towards mass rapid-transit options

Paratransit is the dominant mode of transport in many sub-Saharan African cities, in response to the demand for privately owned minibus taxis, which largely cater to the middle class. In many cities, paratransit is the only available motorised transport besides motorcycle taxis. This presents environmental risks, particularly from paratransit's ageing vehicles, which

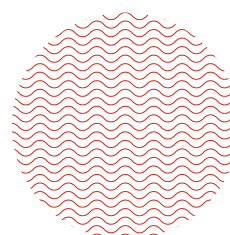
are a leading source of transport-related pollution, in addition to accessibility issues. Many cities in the region, however, are implementing new rapid-transit projects such as bus rapid transit (BRT) and light rail transit (LRT). These provide lower carbon alternatives for mass transit, with the potential for future improvements in carbon reduction through the use of biofuels, electric functioning, and solar power. For example, in Marrakech, Morocco, 10 electric BRT systems powered by a 1MW solar farm were put into circulation in 2017.<sup>123</sup> The growth of this industry is evidenced by the fact that Africa has roughly 350 km of BRT, LRT and metro across the continent, with 70 per cent of this built since 2007.<sup>124</sup> However, there is a need to address both the speed at which these systems are built, their low-carbon functionality from the point of design, and their affordability for low-income public transport users.

## Building rural-urban connectivity

Improved transport means can facilitate better rural-urban connection and, in turn, promote economic growth in developing countries. By facilitating accessible and affordable rural-urban links, the impacts of 'remoteness' are mitigated, and livelihood opportunities are made available. These links should be facilitated by low-carbon, active transport routes.

## Improving 'Last mile' connectivity in developing and informal settings

In all cities, it is rare that public transport options begin or end at the user's destination. Therefore, the 'last mile' of connectivity is an important aspect to consider, particularly when thinking about encouraging equal accessibility, uptake, and use of greener transport options. The 'last mile' connections should be low carbon, sustainable and accessible, and therefore may encompass pedestrianised routes and cycle lanes. They should consider aspects of safety and usability for those who may have disabilities and should connect even the most 'remote' areas. Pre-emptive forms of urban planning, such as urban expansion planning, can cater for these needs and ensure 'last mile' connectivity.





# 8. AGRICULTURE AND FOOD PRODUCTION



**An estimated US\$ 4 billion of value is lost from food post-harvest each year across sub-Saharan Africa. This has been calculated as enough food to feed 48 million people.<sup>125</sup> Greater efficiency can be generated and losses reduced by increasing the level of circularity within the agricultural value chain, in both rural and urban areas. This can increase food security and boost the livelihood productivity of millions.**

The “centre of gravity” of Africa’s food system is now in urban areas.<sup>126</sup> The urban-centric food systems of cities and rapidly urbanising areas now hold the fastest growing commercial opportunities for farmers and include an increasing role for new actors in local government and industry. Coordinated action is needed to harness the potential of urban food systems to improve food security and livelihoods, including circular economy centred action to reduce waste across the value chain and promote regenerative agriculture practices.

**Post-harvest food losses in developing countries are largely due to poor storage, transportation and processing**, with as much as 40 per cent of losses occurring at these points in the value chain, while losses in more industrialised countries primarily occur at the supermarket and consumer levels.<sup>127</sup> Issues stem from financial, managerial and technical constraints in harvesting techniques and subsequent storage facilities, many of which lack the necessary refrigeration temperatures to avoid losses. By strengthening the supply chain, supporting farmers, and investing in infrastructure, transport, and the packaging process, food wastage could be significantly reduced.<sup>128</sup>

**Circular food systems ensure regenerative food production which both produces high quality food and improves the surrounding ecosystem, such as soil health.** This may involve using organic fertilisers, rotational grazing of animals, crop rotation, and techniques such as agroforestry and permaculture. Agroforestry is a key circular approach to food production and agriculture, as tree roots release carbon into the soil, cycle nutrients needed for crops, and prevent soil erosion. It is a zero-carbon, regenerative solution to better

food production and agriculture, and the trees also contribute to carbon capture. Cities Alliance members such as the Government of Switzerland focus on the use of natural resources and dealing with the effects of climate change through the storage and marketing of agricultural produce and with continuous adaptation to changing environmental conditions.<sup>129</sup>

**Many of the above practices also contribute to climate-smart agriculture, providing significant opportunities for improving food security and accessibility by integrating food production into urban land use plans.** A circular economy for food can build resilience in communities in developing and informal settings as food is grown locally, making it sustainable and accessible, and reducing reliance on external supply chains. This can be particularly important in emergency scenarios when supply chains can be disrupted. Small agrobusinesses and commercial food production in localised urban settings also offer opportunities for income economic development. Furthermore, urban agriculture encourages the existence of green space in cities, which is important for mitigating climate change, improving health, and increasing carbon capture.







# CITIES ALLIANCE EXPERIENCE

## Supporting composting initiatives in Tataouine, Tunisia

In the Municipality of Tataouine, Cities Alliance sought to improve waste management strategies – with composting being a key focus area. This was promoted at the household level by encouraging residents to sort household waste and compost organic waste. This not only improved the management of household waste and reduced the impact of waste on the environment, but also contributed to local agriculture development and livelihood generation.<sup>130</sup>

## Promoting fisheries as a sustainable source of income

By incorporating key sustainability and circular economy principles into the fishing industry, Cities Alliance have enabled communities to realise benefits such as increased income and income protection, reduced waste, and sustainable, renewable energy power. Since their first slum upgrading project in Alagados, Brazil, Cities Alliance have strongly linked environmental protection to sustainable socioeconomic development. In this case, efforts to regenerate the mangrove swamp – a protective coastal ecosystem – allowed the bay's fisheries to recover and become a sustainable

source of food and income.<sup>131</sup>

This recovery project involved the participation of community youth, especially recruited and trained by the Foundation for the Development of Small-Scale Fishing Communities.

More recently, in their work with fisheries in Monrovia and Paynesville, Liberia, Cities Alliance tackled food waste through solar-powered refrigeration, simultaneously ensuring income protection.<sup>132</sup> The solution was made sustainable by training the community members in the use and maintenance of the solar-powered refrigeration facilities. Furthermore, this directly benefited women, as the majority of fishmongers in these areas are women.



# OPPORTUNITIES



## Reduce/Eliminate Waste and Pollution

- Developing cities and slums are already very efficient in terms of eliminating food waste; however, organic waste could be more usefully processed to support composting and fertilisation of urban agriculture, creating small market businesses. Rethinking organic waste as having value has the potential to create new markets and new income sources, while simultaneously providing ecological benefits and mitigating climate change by reducing carbon emissions.

- Food waste is often caused by inefficiencies in storage facilities, poor transport systems, lack of refrigeration facilities and other inadequacies along the value chain. A combined approach of shortening these chains and addressing issues such as storage and transportation in longer chains can reduce food waste.
- As populations in developing countries grow, so does the volume of wastewater. This wastewater can be harnessed for irrigation in small-scale farming, reducing water wastage and circulating the resource's value for edible crop production. Wastewater can also be used regeneratively in urban agriculture, a practice that can address mutual concerns about food and water security. Wastewater used in agriculture can recycle organic matter and other nutrients to the soil, reduce the use of synthetic fertilisers, encourage higher crop yields with lower irrigation costs, and avoid discharging pollutants to surface water bodies, which have lower treatment capability than soils;<sup>133</sup> and it can also encourage income generation.



## Protect and Regenerate Nature

Food production practice has the greatest opportunity to protect and regenerate nature.

- Through moving away from chemical-based farming and low carbon solutions, the land can be restored and can support wider environmental benefits.
- Focussing on plant-based food systems versus high carbon intensive farming systems, such as cattle farming, should be a priority. Through this process the by-products of plant-based crops can also in turn be used as a bio-based material for construction products. An example of this is the aquaponic system, which is considered to be a sustainable food production solution that follows circular economy principles, and the biomimetic natural system to reduce input and waste, which is a growing problem in cities.



## Circulate Products and Materials

- Through integrated infrastructure systems, it is possible to ensure that organic waste products from one industry, such as food markets, can be circulated back into urban agriculture, creating a symbiotic system that supports both the circular economy and climate change mitigation.



# ENABLING ACTIONS

## Integrating circular agriculture into regional development strategies

An integrated holistic, regional approach to agriculture can help to improve food security through increased circularity and reduced wastage. With the right technical support and investment, municipalities, other smaller local governments, wider regional bodies and implementing actors (farmers, related value-chain workers, traders and local communities) can support this transition and circular approach, which would also, in turn, reduce GHG emissions associated with landfilling.

## Building technical and infrastructure capacity to reduce losses

Reducing food waste from the outset is a key priority area for socioeconomic development, climate change mitigation, and environmental protection in developing and informal settings. This can be a key determinant in whether income is protected, can promote community health, can reduce GHG emissions, and can improve food security. Cities Alliance demonstrated how food waste can be prevented through renewable energy-powered refrigeration to protect the livelihoods of fishing

communities in Monrovia and Paynesville, Liberia. Similar initiatives could be implemented elsewhere. Another good initiative example is the collaborative effort between the World Bank and farmers in Rwanda, in which the problem of food waste created by efforts to overplant, in order to edge against risks and uncertainty, was addressed by improved weather and market information.<sup>134</sup>

## Increasing data and advocacy

In order to reduce losses, it is important to understand what is being lost and where. Analysis across the value chain can identify key areas in which improvements in efficiency and circularity can be made.

## Empowering traditional farming practices and smallholder farming

Often, traditional farming practices and existing smallholder farms can be overlooked in favour of importing crops and using synthetic fertilisers. This can inhibit local economic development, limit local livelihoods, contribute to ecosystem degradation, and exacerbate climate change through carbon emissions. Therefore, there is a valuable opportunity in empowering and investing in existing traditional farming practices and smallholder farms in developing countries, which can work in harmony with and with knowledge of local ecosystems, reduce carbon emissions, and promote economic development and local food security.

## Supporting innovation

Technological advances can reduce harvest losses and food waste generally. Technical and financial support for enterprises can help to reduce waste and support livelihoods.





## BOX 9

### **LIBERIA: COMMUNITY UPGRADING FUND AS A TOOL TO IMPROVE LIVELIHOOD RESILIENCE OF FISHING COMMUNITIES**

This intervention builds upon the longstanding work of the Cities Alliance in Liberia through its Community Upgrading Fund (CUF) mechanism. The CUF is financing small-scale infrastructure to improve the living conditions and livelihoods of local informal communities to finance concrete climate adaptation projects in two Monrovia communities, West Point and King Gray Town. The overall goal was to identify the vulnerability within the community in the informal settlements and to determine a community-driven response that helps improve their adaptive capacity and build community resilience.

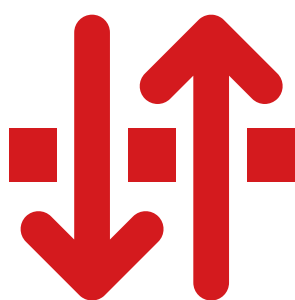
The project has provided local fishermen and fishmongers with freezers and ice makers powered by solar panels, which allow them to store the fish safely, instead of hastily selling, unsustainably drying, or even losing unsold fish. Individuals wishing to store their fish in the freezers must contribute money for the equipment's upkeep and are therefore contributing to a financially sustainable project. This project also greatly contributes toward improving local gender equity, as the vast majority of fishmongers in the area are women. Through the project, they can improve and sustain their livelihoods.

**"Our fish used to spoil rapidly. Now if there's no buyer, we can put the fish into the freezer. We don't have to sell it cheap like before because we can sell it tomorrow. My income has grown."**

Decontee Davis, female fishmonger in King Gray Community



# 9. CROSS CUTTING FACTORS



The following approaches and opportunities consistently appear across the preceding sectors and present continuing opportunities for Cities Alliance to influence and advocate for the application of circular economy principles and apply climate change mitigation approaches in rapidly urbanising cities.



## Education, skills and livelihood development for a circular economy

It is important that those most vulnerable are supported in the transition towards employment that supports a circular, low-carbon economy. The preceding chapters have discussed livelihood opportunities connected to solid waste management, construction, and agriculture and food production.



## Data, Knowledge and Awareness

This is a two-way process. The importance of environmental stewardship and related socioeconomic opportunities can be promoted within local communities, but there is also a significant amount of circular activity already taking place in informal settlements, from which learning can be taken and replicated elsewhere. Data capacity is key, in this respect, to understanding where in the value chain losses and waste occur.











### Connecting different stakeholders

Circular economy efforts across the preceding sectors involve local communities, government, private sectors and wider actors. Cities Alliance and members have historically formed a key bridging presence between these actors and others and can continue to play this important role for coordinated and participatory efforts in climate mitigation and a circular economy.



### Gender equality

Women are often adversely and/or uniquely affected by the challenges discussed throughout this document. Cities Alliance members and partners can play an important role in considering the challenges and opportunities for women and other disadvantaged groups with respect to climate mitigation and the circular economy, both sector specific and overarching (see Box 10).



### Youth

It is of utmost importance that short- and long-term circular economy initiatives in rapidly urbanising cities can create opportunities for new generations and stimulate and harness innovation for a brighter future through education, skills training and business support.



### Supporting innovation

Technological advances are helping to realise a circular transition. Support for local enterprises and larger companies through financial incentives and technical support, amongst other factors, can help promote the co-benefits of the circular economy.





### Investment in local infrastructure

Directing investment into specific infrastructure projects, such as waste management and off-site/modular housing factories, will enable the transition to a circular economy and mitigate the effects of climate change. It will provide local employment and support people to upskill quickly. Cities Alliance has an important role in promoting the need for further funding to address infrastructure deficits in cities and informal settlements, as well as technical support to ensure that subsequent delivery can address co-benefits of climate mitigation and socioeconomic development.



### Spatial planning support

Effective planning and zoning is key to increasing the circular economy across the sectors, including the efficient and effective siting of homes and the deployment of approaches such as urban expansion planning to secure space for key supporting infrastructure. Cities Alliance is vastly experienced in helping to navigate such challenges that present uniquely in informal settlements.



### Administrative capacity building

This needed capacity building includes support for governments in developing policy and legislation that promotes the circular economy, as well as the underlying provision of data, regulatory capacity and other related aspects that can inform and strengthen local action.



### Harnessing the bioeconomy


The role of the bioeconomy has been explored across construction, food and energy sectors. The bioeconomy promotes health and well-being and climate action and will help to drive circular economy efforts.



### Holistic urban strategy, planning and building design and a holistic value-chain approach to urban systems and programs

It is vital that the whole city is viewed as an integrated system: addressing the interconnected links between all the city systems and finding opportunities to improve efficiency and circularity in multiple systems through single or linked interventions (e.g., in individual building design, across a portfolio of buildings, in specific infrastructure programs connected to multiple systems and to livelihoods, and in broader area plans and strategies).



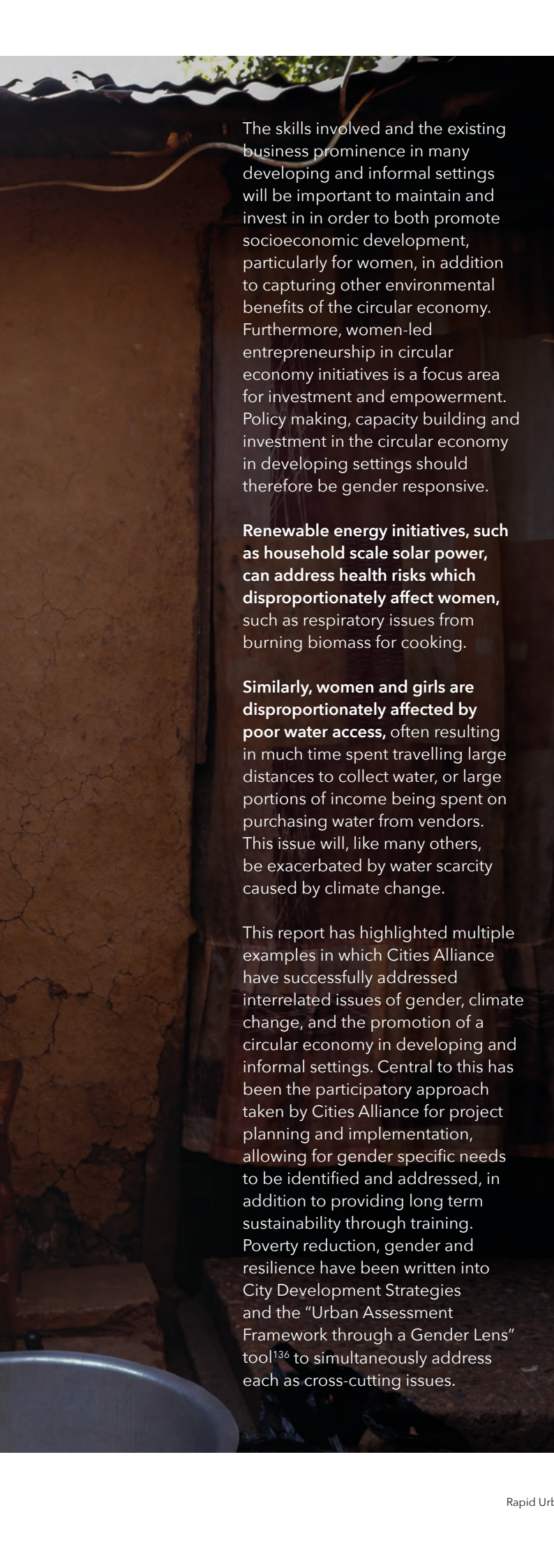
A smiling woman with dark skin and short hair is sitting next to a large bundle of bamboo poles. She is wearing a red and white patterned wrap and a beaded necklace. She is holding a white mug with a blue design. The background is a textured, brown wall. The title 'GENDER, CIRCULAR ECONOMY PRINCIPLES AND CLIMATE MITIGATION' is overlaid in white text at the top left.

# GENDER, CIRCULAR ECONOMY PRINCIPLES AND CLIMATE MITIGATION

**Circular economy principles and initiatives can help promote gender equality and contribute to the empowerment of women and girls.** This is particularly pertinent with the worsening effects of climate change and its exacerbating effects on already entrenched impacts of gender inequality. Women and girls constitute the majority of the world's poor, which will be the group most affected by climate change. Furthermore, women and girls are more likely to depend on natural resources that are threatened by climate change, such as food, water, and fuel, for income security or for providing for their families. The risk of gender-based violence, and the likelihood of girls being taken out of school, is also heightened during and following disasters – the frequency of which is increasing due to the effects of climate change.<sup>135</sup>

**There is a need to promote the representation of women in higher value-added activities in the circular economy, such as industry-scale green-building design and construction or commercial-scale circular agriculture, and to empower and invest in existing women-led circular practices.** While women are currently embedded in many existing circular economy practices, these are predominantly low-value added and informal activities. Women are well represented in circular activities such as textile recycling or waste picking and sorting.





The skills involved and the existing business prominence in many developing and informal settings will be important to maintain and invest in in order to both promote socioeconomic development, particularly for women, in addition to capturing other environmental benefits of the circular economy. Furthermore, women-led entrepreneurship in circular economy initiatives is a focus area for investment and empowerment. Policy making, capacity building and investment in the circular economy in developing settings should therefore be gender responsive.

**Renewable energy initiatives, such as household scale solar power, can address health risks which disproportionately affect women,** such as respiratory issues from burning biomass for cooking.

**Similarly, women and girls are disproportionately affected by poor water access,** often resulting in much time spent travelling large distances to collect water, or large portions of income being spent on purchasing water from vendors. This issue will, like many others, be exacerbated by water scarcity caused by climate change.

This report has highlighted multiple examples in which Cities Alliance have successfully addressed interrelated issues of gender, climate change, and the promotion of a circular economy in developing and informal settings. Central to this has been the participatory approach taken by Cities Alliance for project planning and implementation, allowing for gender specific needs to be identified and addressed, in addition to providing long term sustainability through training. Poverty reduction, gender and resilience have been written into City Development Strategies and the “Urban Assessment Framework through a Gender Lens” tool<sup>136</sup> to simultaneously address each as cross-cutting issues.

## BOX 10

### UGANDA AND LIBERIA: OPPORTUNITIES FOR WOMEN IN COMMUNITY LED INITIATIVES

Women’s ownership of community-led projects is essential for uptake of products or initiatives and to simultaneously address gendered issues and inequality. In Bwaise, an urban slum in Kampala, Uganda, women were disproportionately affected by flooding caused by poor garbage disposal due to their low-economic status and to responsibilities that confine them to the home. The Cities Alliance partnership with Tree Adoption Uganda addressed this by implementing waste management practices through practical learning opportunities, organising segregated waste collection for 1,000 households, and demonstrating the value of waste sorting for converting organic waste into briquettes for profit. As a result, women were at less risk of the harmful effects of poor waste disposal and flooding, and also had the opportunity to be involved in value-added activities for waste management.

In Monrovia and Paynesville, Liberia, Cities Alliance research found that women and girls are responsible for water collection in 80 % of households with water shortages. Cities Alliance addressed water accessibility through the construction of local water kiosks powered by renewable energy. Women were trained for 10 days on the kiosks’ operation, maintenance and management, providing economic and social empowerment.

Women can be climate champions, empowering bottom-up initiatives with their knowledge of local practices and sustainable solutions. The *Solar Sister Entrepreneurs* is a pertinent example of the impact that such groups can have on addressing gender inequality and climate mitigation simultaneously. The group, composed of 5,000 women, reached 1.7 million people with clean energy, while earning a sustainable income.<sup>137</sup>

Women should be empowered in initiatives as decision makers, leaders, educators, stakeholders, and experts, across different sectors in cities and informal settlements.



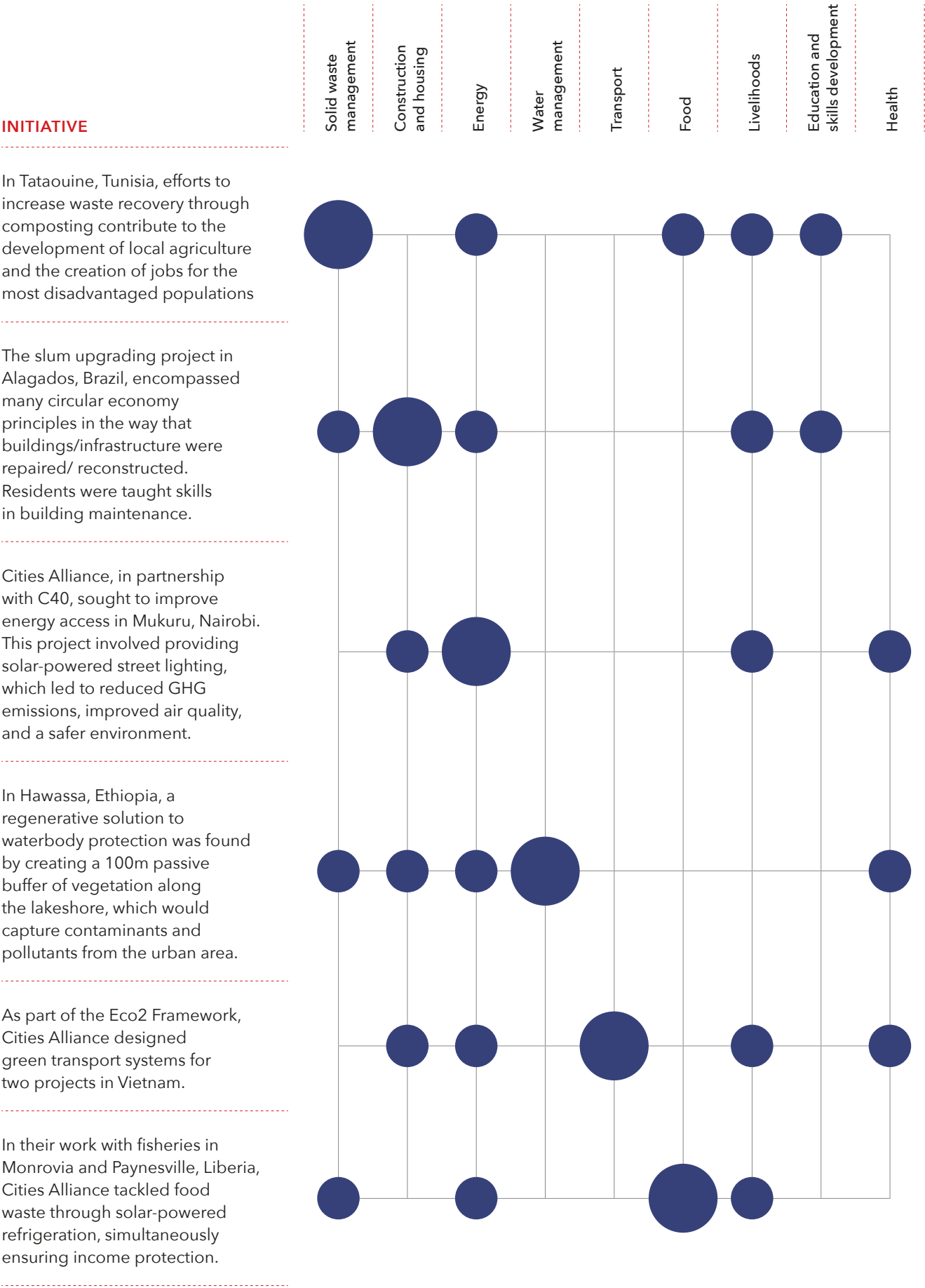
# INTERDEPENDENCIES AND INTEGRATED PLANNING AND PROGRAMMING

While the preceding chapters have presented circular economy actions and opportunities sectorally, it is important to also recognise their interdependent nature. Circular actions can affect, and be affected by, multiple other urban systems. The table on the following page emphasises this through an alternative presentation of exciting Cities Alliance initiatives. These initiatives embody integrated, holistic solutions among cities, communities, and other affected stakeholders (Figure 4).

Cities Alliance promotes and supports an integrated, holistic, and participatory approach to urban development and slum upgrading. They form a key interface between different stakeholders concerned with this and contribute to greater coordination and cohesion across plans and projects. The next chapter will discuss some of these stakeholders in more detail.



**FIGURE 4**  
Interdependencies and Integrated Planning and Programming.





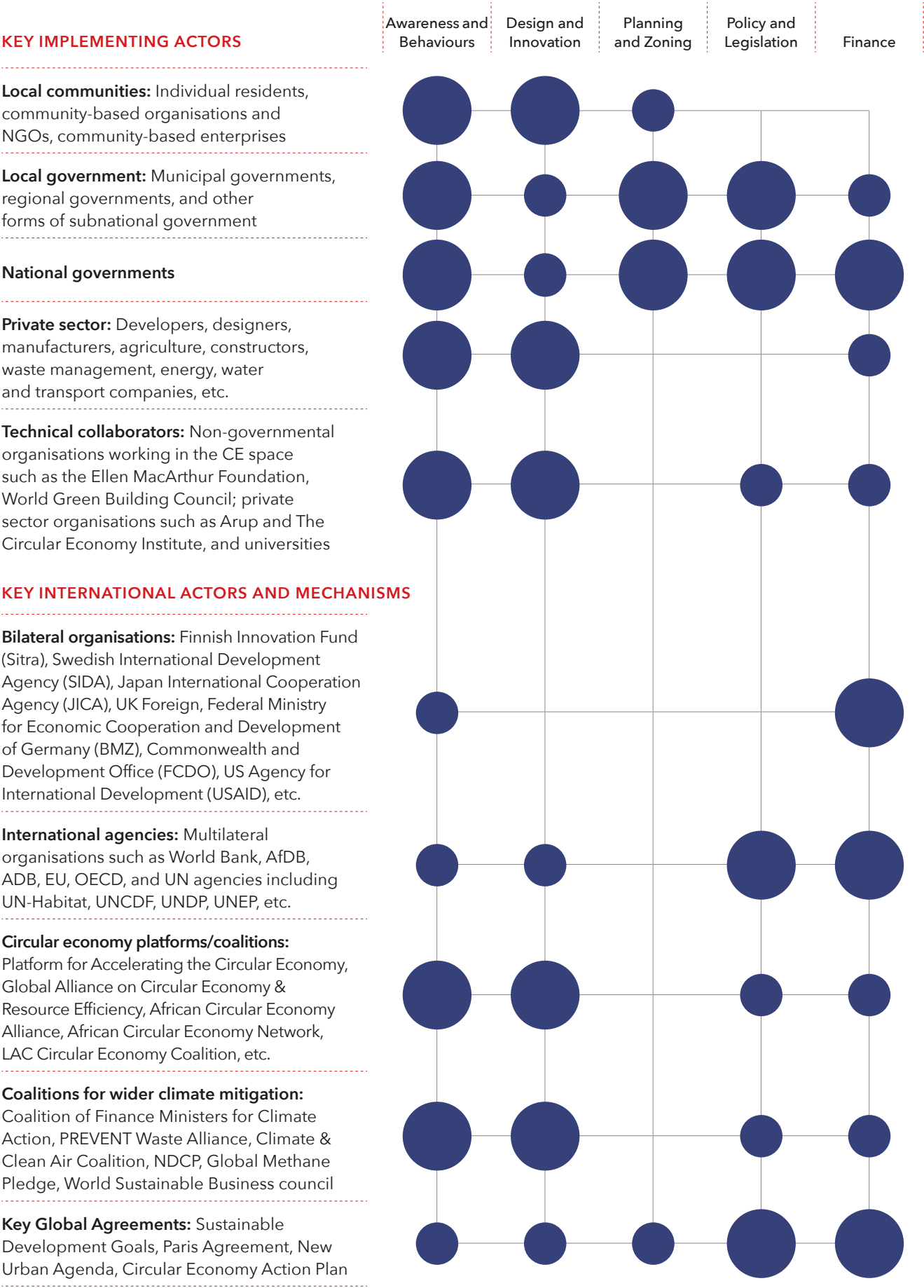
# 10. SUPPORTING A CIRCULAR ECONOMY AND CLIMATE MITIGATION FOR INCLUSIVE SOCIOECONOMIC DEVELOPMENT: KEY ACTORS AND ACTIONS



Transitioning toward a circular economy and mitigating the effects of climate change in rapidly urbanising cities requires a collective and coordinated effort to ensure inclusive socioeconomic development. Many actors, agendas and mechanisms have an important role to play in supporting a circular transition in rapidly urbanising cities (as illustrated in figure 5).



**FIGURE 5**  
Some of the Actors, Agendas and Mechanisms in the Circular Transition.





# KEY IMPLEMENTING ACTORS

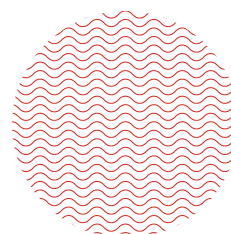
**City governments are key to climate action and the transition to a circular economy in cities.** Urban plans, policies and programs in rapidly urbanising cities affect global efforts in climate mitigation and the circular economy – for better or worse. Cities Alliance’s long-held relationships with global municipalities can help support circular economy and low-carbon planning efforts, while increasing socioeconomic conditions for citizens, including the most vulnerable. Plans and projects must be developed and delivered in a participatory fashion with local communities. **Low income and informal communities, previously under-recognised and somewhat marginalised, are key actors in the urban circular economy.** More attention must be paid to these communities and their development needs and support provided to enhance low carbon practices already evident in these communities. The role of wider civil society actors including Cities Alliance members like SDI and WIEGO is equally important in this respect.

**National governments can create an enabling environment for a circular economy and climate mitigation in cities through progressive policies and the provision of municipal finance and coordinated technical support for such programs.** Policy decisions taken in recent years in Kenya, for example, such as a nationwide ban

on plastic bags and a Sustainable Waste Management Bill and Policy, promote circularity (see below).<sup>138</sup> However, such decisions need to be delivered in a coordinated fashion and with corresponding support to ensure that decisions that benefit the environment support (and do not have a debilitating impact on) the most vulnerable. Action that links efforts in a circular economy and climate mitigation to NDC commitments can support a coordinated and holistic approach as discussed in the previous section and further expanded on below.

**Private sector stakeholders are key to the transition to a circular economy.** For example, multi-national companies are responsible for the production of waste (plastic waste, construction waste, etc.), and steps can be taken with the private sector to address such issues at the source. Private-sector actors may also play a key role in financing the infrastructure that is crucial to large-scale CE efforts. Public-private partnerships can be developed in cities to deliver specific infrastructure, such as recycling, and wider supporting infrastructure, such as sustainable transport networks. However, such partnerships need to be financially, environmentally, and socially sustainable. Cities Alliance forms a key bridge between private actors, municipalities, and civil society in helping to deliver sustainable partnerships and programs.

A great deal of innovation also exists within the private sector. Cities Alliance has a long-history of working with private sector, government departments and local communities to promote technological innovation for socioeconomic development. Efforts must now be doubled to increase the role of the circular economy in meeting these objectives – in circular construction, energy, water, waste, food production and elsewhere – for the benefit of cities and citizens. Technical collaborators such as Arup and the Ellen MacArthur Foundation can help to promote and implement advancements in climate mitigation and the circular economy, for the sustainable development of rapidly urbanising cities. In the example of Kenya, the country has recently joined the Ellen MacArthur Foundation Plastics Pact Network, alongside the Kenyan Government, private sector actors and NGOs, signing a commitment to increase circularity and to remove single-use plastic across the entire plastics value chain.<sup>139</sup>



# KEY GLOBAL AGREEMENTS, DONORS & FINANCIAL INSTITUTIONS AND MECHANISMS

Climate mitigation and circular economy efforts are key to major global agreements including the Sustainable Development Goals and the Paris Agreement on Climate Change.

The Paris Agreement and corresponding NDCs can be driven by, and help to drive, national and local climate mitigation and circular economy efforts. The United Nations Development Programme (UNDP) notes that

**“by ensuring that circular economy approaches are part of countries’ NDCs we can harness the huge potential that more efficient and cleaner use of resources has to deliver GHG emission reductions and additional benefits that efficiency and circularity provide.”<sup>140</sup>**

Chapter 3 highlighted, in the example of Greater Monrovia, Liberia, how projects with circular components can be linked to NDC efforts. UNDP and UNEP are developing a strategic partnership on the circular economy to: (i) support circular policies; (ii) help design innovative circular economy business models that engage systematically private sector actors; and (iii) facilitate access to finance to scale-up implementation of innovative solutions to enhance countries’ climate ambitions. This UNDP-UNEP collaboration will be developed with countries implementing NDCs and resource efficiency measures.<sup>141</sup> Cities Alliance member BMZ, through their implementing agency GIZ, advocates vertical integration of circular economy action at the local, regional, and national scale through climate finance, co-developed investment plans, and other policy instruments – termed “localizing NDCs.”<sup>142</sup>







# SUSTAINABLE DEVELOPMENT GOALS



Actions toward **NDCs have linkages, to various extents, with national development priorities for the 2030 SDGs.**<sup>143</sup> **Climate mitigation and circular economy efforts are also a key component to delivering the SDGs.** Goal 12 is “Responsible Consumption and Production” and Goal 13 is “Climate Action.” Efforts towards SDGs 12 and 13 should at the same time address socioeconomic challenges, namely poverty (SDG 1), hunger (2) health and wellbeing (3) education (4), work (8), gender and inequality (5, 10) and peace and prosperity (16). Efforts

in specific sectors, including water (4) and energy (7), can help support these objectives. Sustainable planning of coasts and oceans (14) and on land (15) are key overarching drivers, as is the provision of sustainable infrastructure (9). **Cities and Communities (SDG 11) are a key environment in which these challenges must be addressed: OECD notes that 65 per cent of the 169 targets behind the 17 SDGs will not be reached without engagement of local and regional governments.**<sup>144</sup> The Sustainable Development Goals therefore

cannot be addressed in any degree of isolation, and National Sustainable Development Strategies (NSDS) and activities need a collaborative, holistic and inclusive approach, with partnerships across sectors and scales (SDG 17).

Recent research notes the need for greater alignment between NDCs and NSDS for better impact and to avoid costly duplication of efforts. They suggest that new and updated NDCs should take account of existing NSDS, and that countries could use future NDC updates to better align their climate actions with the SDGs, and related buy-in of different stakeholders.<sup>145</sup> **Moreover, effort is needed to create greater linkages between NDCs, SDGs and city-level action, particularly investment in low-income cities and informal settlements.**

**Importantly, at present, there is still a significant financing obstacle to climate mitigation and circular economy efforts in rapidly urbanising cities and informal settlements.** For example, the value of the potentially recoverable resources that are not currently being collected in Africa is estimated at US\$ 7.6 billion per year.<sup>146</sup> At the time of this writing, the United Nations Human Settlements Programme (UN-Habitat) and the United Nations Capital Development Fund (UNCDF) have announced a USD 40 million Cities Investment Facility to support sustainable financing at the local level, including for the world's 46 least developed countries.<sup>147</sup> Specific to the circular economy, the African Development Bank has also just approved an Africa Circular Economy Facility to "drive integration of the circular economy" into African efforts to achieve NDC targets. The facility is a multi-donor trust fund that will operate over 5 years, with an initial €4 million investment from the Government of Finland and the Nordic Development Fund. **Still, much more action is needed.**

**Circular economy initiatives contribute significantly to reducing GHG emissions and to climate change mitigation and a therefore eligible for climate finance.** This forms one of GIZ's seven steps in the *Roadmap towards CE-smart NDCs* – specifically, cooperating with banks, investors, and service providers on climate finance.<sup>148</sup> Circular economy initiatives, as recognised by UNDP, offer considerable mitigation potential for NDCs and, with their cross-sectoral nature, make a strong case for accessing existing climate finance flows.<sup>149</sup> However, many countries currently fall short in delivering sufficient amounts of climate finance, and GIZ advocate the need for raised ambition in this regard.<sup>150</sup>

**Nevertheless, the past decade has seen a notable increase in specific international and regional mechanisms for the circular economy.** In 2018, the World Economic Forum, World Resources Institute, Philips, Ellen MacArthur Foundation, United Nations Environment Programme, and over 40 other partners launched the **Platform for Accelerating the Circular Economy (PACE)**. PACE is a global community of leaders working together to accelerate the transition to a circular economy. It seeks to promote real collaboration between business, government, and civil society, creating a space for leaders to work in partnership and overcome challenges together. The World Circular Economy Forum (WCEF) has also now been taking place for several years, funded by the Finnish Innovation Fund Sitra. The 2022 Conference will be held in Kigali, Rwanda.<sup>151</sup> Beyond these specific platforms for a circular economy, there are a range of related platforms and mechanisms that must be engaged, including Coalition of Finance Ministers for Climate Action, PREVENT Waste Alliance, Climate & Clean Air Coalition, NDC Partnership Global Methane Pledge, and World Sustainable Business Council.

**At the regional level, circular economy alliances are beginning to form across developing countries.** This includes the African Circular Economy Alliance (ACEA), a government-led coalition of African nations (Rwanda, South Africa, Nigeria, Ghana, Benin, Burkina Faso and Sudan) launched in 2017 to

**"spur Africa's transformation to a circular economy that delivers economic growth, jobs, and positive environmental outcomes."**

ACEA supports policy development, leadership and advocacy, and technical support. A similar regional alliance was launched in Latin America and the Caribbean (LAC) region in 2021, the Latin America and the Caribbean Circular Economy Coalition. There are also technical circular economy networks established, including the African Circular Economy Network (ACEN)<sup>152</sup> and Circular Asia.<sup>153</sup> **There is a significant opportunity to further the conversation of informality and rapid urbanisation within these circular economy networks, and to deliver action through these networks that addresses the co-benefits discussed in the preceding chapters.**

**The uptake in international climate mitigation and circular economy efforts is positive, but much more action is needed,** particularly in translating international agreements and mechanisms into climate and circular economy finance and action in cities and informal settlements. Success in doing so can prevent a dramatic cumulative escalation in carbon emissions from rapidly urbanising cities, but at the same time address the significant social development needs of many. **As an interface between international, national, city and community level actors, Cities Alliance is committed to these efforts.**



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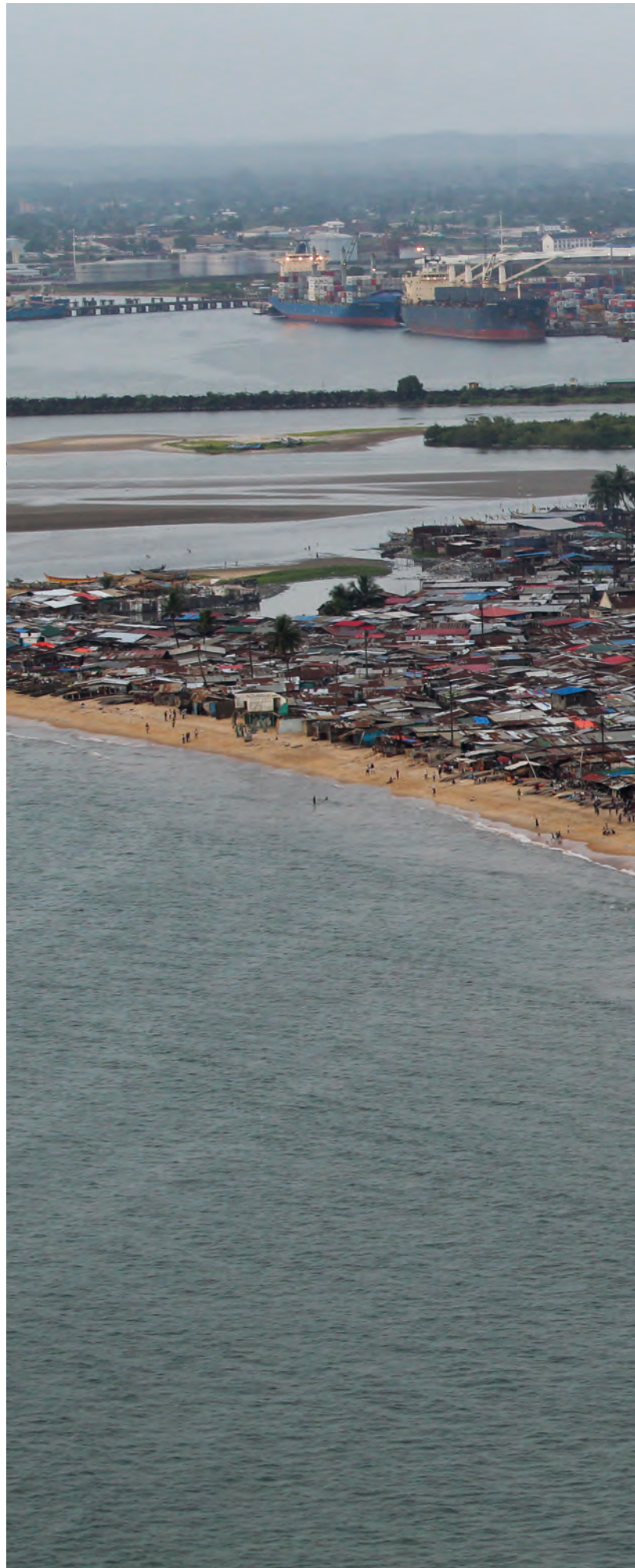


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# **CITIES** **WITHOUT** **SLUMS**