

A FRAMEWORK FOR GROUPING CIRCULAR CITIES

Developing a city typology to
support the circular transition

INTRODUCTION

Cities were home to more than 54% of the global population in 2015¹ and are predicted to house 68% of the population by 2050. With half of the world's population living in cities, 70% of all energy-related carbon emissions can be attributed to urban agglomerations.² As urbanisation continues around the world, defining possibilities for cities' sustainable development becomes increasingly relevant. What's more, to limit global warming to 1.5-degrees in this century, we must put policies and interventions in place to halve annual greenhouse gas (GHG) emissions over the next seven years.³ The circular economy can play an important role in achieving this goal.

In recent years, the concept of the circular economy has gained increasing recognition for its ability to contribute towards the creation of sustainable urban systems from both an environmental and socioeconomic perspective. However, questions remain on how to support cities in putting this concept into practice.

Conventional approaches to support circularity in cities have relied on data-intensive processes, such as material flow analysis. However these approaches are not scalable, particularly when it comes to working with data-sparse regions, such as those in the Global South. Sharing common lessons and knowledge between cities with similar characteristics provides a means for supporting practical and scalable action.

WHAT IS THE CITY TYPOLOGY FRAMEWORK?

The City Typology framework helps to cluster the vast range of cities around the globe into a more manageable and generalised set of **city clusters**.

Grouping cities by clusters can help with the identification of common policy challenges and opportunities for sets of similar cities, providing a spring board for identifying and prioritising tailored solutions for local development using circular economy interventions.⁴ The process of using the City Typology framework to identify relevant circular interventions for clusters of cities also:

- Builds cities' awareness of and interest in the circular economy as a tool for local development,
- Fills data gaps, and
- Supports learning and knowledge sharing between cities.

What variables are being used to cluster cities?

The City Typology is formed from three key variables. These variables were selected because of their relevance to the circular economy, applicability and related data availability across the greatest number of cities. Together, these three variables form the resulting **four city types**.

The following variables were selected for the City Typology framework. For each, the link to the circular economy is highlighted. Annex one presents additional variables that were considered.

Variable	Circular economy considerations	Categories
Population size (2015)	Population size can be an interesting dimension from which to infer the type of socioeconomic activity of a city. A city's population size will influence the scale and nature of urban provisioning systems, such as housing, mobility and waste management. From a circular economy perspective, this can influence associated challenges and opportunities: for example, large cities may require a substantially larger capacity for their management system.	Small (<500,000)
		Medium (500,000–1,000,000)
		Large (>1,000,000)
Population growth rate (2000–2015)	The population growth rate provides a sense of whether a city's development is static or growing. Different circular actions and interventions can assume relevance based on this aspect, as growing cities will need to accommodate an increasing number of inhabitants.	Declining or static
		Growing
Built up area growth rate (2000–2015)	The growth in the built up area of cities is indicative of the material- and land-footprint stemming from urban development. From a circular economy perspective, cities that have growth in their built up area should consider how to accommodate this growth in a way that does not dramatically increase the material- and land-footprint of the city. Whereas, for cities that do not have a growth in their built up area, preserving and making better use of their existing urban environment and stock is more likely to be a priority.	Declining or static
		Growing

The current threshold used for the classification of cities is 10% for both variables: population growth and built up area growth. This means that all cities with a growth of lower than or equal to 10% between 2000 and 2015 are considered to have low growth. This arbitrary number was selected in order to achieve a good distribution between low- and high-growth cities. The team is currently defining a more objective procedure to set a more appropriate value for these thresholds.

The city Types

Exploring the key variables together ultimately leads to the creation of **four city types** or types. These clusters, although relevant for grouping cities in other strategy development processes, help bring distinct considerations and opportunities for a circular economy to light. These four city types provide a top-level division of cities into common groups with shared characteristics and circular economy considerations.

City Type	Circular economy considerations	Example cities
Shrinking	<ul style="list-style-type: none"> • With a stable or decreasing population, cities should consider supporting the retention and development of skills for the circular transition within the existing workforce. • A stable or decreasing built up area highlights an opportunity to repurpose and/or revitalise existing urban space and buildings through the circular economy. • Circular solutions could be implemented to slow new resource consumption (by using existing resources for longer) and close the loops of existing resources. 	Tulsa, USA
		Huambo, Angola
		San Salvador, El Salvador
Sprawling	<ul style="list-style-type: none"> • The growth of built up areas highlights an increased demand for products and services of urban systems, from housing and nutrition to mobility. • These new systems must be designed and implemented in a sustainable way that also avoids 'linear lock-in'. • Embracing circularity in the design of buildings, mobility and energy systems can support the development of such cities without dramatically increasing their ecological footprints. • This circular design can help to narrow resource flows (by using less) and close resource cycles at the end of their (first) lifecycle. 	Racine, USA
		Bahawalpur, Pakistan
		Mexico City, Mexico
Densifying	<ul style="list-style-type: none"> • A key consideration in the circular transition relates to the provision of goods and services in a manner that is ecologically and socially beneficial, such as energy, mobility and food, among others. • It also requires an examination of how to utilise, strengthen and direct the expanding skills-base in the growing labour force towards circularity. • Solutions could include the adoption of circular principles to regenerate resource flows and design clean and renewable provisioning systems. 	Salvador, Brazil
		Salt Lake City, USA
		Mumbai, India
Growing	<ul style="list-style-type: none"> • These cities are physically sprawling: they cover a larger geographic area. • These cities must consider how to support their development without placing increased pressure on the natural environment, both locally and globally. • Circular solutions that support cities in narrowing their consumption of resources (by using less) could be particularly relevant for these cities. 	Ambato, Ecuador
		Edmonton, Canada
		Monterrey, Mexico

WHO IS THE FRAMEWORK FOR AND HOW CAN IT BE USED IN PRACTICE?

The City Typology framework has been developed for change makers who require a framework to navigate the opportunities and challenges the circular economy presents cities. The City Typology will help municipal stakeholders, for example, to identify, connect to and learn how similar cities are approaching or have already implemented circular economy interventions. Using the [Circular Jobs Monitor](#), municipalities across the world can easily navigate and pinpoint leading circular cities –that is, cities with a high proportion of circular jobs– within their city type, also to learn from the policies and practices that have been implemented.

Recognising that cities will have different motivations and starting points for engaging with the circular economy, the framework has been designed to be flexible.

The city clusters in the framework act as a starting point to further specify and tailor a city's priorities. Depending on the needs and interests of a city, additional variables can be explored for each of the city types using an accompanying database of metrics and indicators. From key sectors of the economy, to GHG emissions and labour-force demographics, additional variables can be explored to tailor a city's next steps. For example, a city might be interested in developing its agriculture sector and have biodiversity set as a priority at the national level. These preferences help to further refine and customise recommendations related to which circular economy interventions are suited to the city. Annex one provides a list of some of the additional variables that can be drawn from.

The City Typology framework can help change makers explore and discern common policy challenges for particular groups of cities, and their respective policy implications for the local workforce, as well as economic and environmental development. Through the grouping of similar cities, transition pathways can be identified to explore the policies and actions that can effectively enable the transition towards a more circular economy.

HOW WAS IT DEVELOPED?

The first step was to determine the method of clustering. A simple classification of cities—which prioritises a few top-line and clear variables—was selected, as the approach lends itself to a more intuitive understanding of the resulting typology, rather than a highly technical output.

Subsequently, variables were selected that would form the structure of the City Typology framework. The Global Human Settlement⁵ database was analysed to ensure that the needed data would be available for cities around the world. The diversity of cities in this dataset ensures the framework is designed to suit cities in both the Global North and South.⁶

Since there are many potential variables that could be selected, time was spent exploring and testing the feasibility of different variables. A number of key considerations were used to understand the feasibility of the variables and guide their prioritisation and selection:

- Availability of data,
- Uniformity of data across cities,
- Global coverage, and
- Relevance of variables to form clusters relevant to the circular economy.

In some cases, desired indicators that are conceptually relevant in the formation of city clusters (such as the Human Development Index to highlight the level of socioeconomic development) were discounted due to being unavailable at the city level.

The City Typology, as such, provides a high-level clustering of cities, which gain more depth as cities select additional variables, share knowledge and refine their priorities.

NEXT STEPS

The City Typology can support the identification of various circular economy interventions and activities for the different groupings of cities, and their relative importance to each. Combined with the Circular Jobs Methodology and database developed by Circle Economy and the United Nations Environment Programme (UNEP), this could support the identification of important levers for practically implementing the circular economy in the future, for example pinpointing the skills required in the labour market to carry out circular economy interventions and activities.⁷

In line with this, a next step in this project will be to develop an overview of the intervention landscape for policy-makers and local stakeholders, which will support the depiction of 'transition pathways' for each city type.

Local stakeholders and policy-makers from representative cities in each cluster will be engaged to validate the circular economy policies and interventions that the framework points to through a survey. We believe that this instrument could help local governments to not only overcome data challenges and knowledge gaps, but also to quantify the investment on training in specific skill sets required for workers to shift towards circular practices.

This framework is a work in progress. Circle Economy and UNEP welcome support and input from city stakeholders and other stakeholders supporting efforts towards sustainable development at the city level in order to further validate and improve the current framework, as well as helping to shape next steps towards practical implementation and collective planning at the city level.

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ANNEX ONE

The table below is a filtered list of other variables considered for the development of the City Typology framework, highlighting their relevance for the circular economy and the justification as to why the variable was not selected for the construction of the city typologies.

Category	Variable	Circular economy considerations	Why was it not prioritised for the city typology?
Ecological	GHG emissions	Infer the ecological footprint of a city.	No city-specific data available.
	Material footprint	Highlight the material footprint of a city to determine which cities are more or less ecologically damaging and which circular solutions could support cities with different footprints.	No city-specific data available.
Socio economic	Main economic sector	Infer the types of sectors that could lead the circular transition in the city, and therefore determine which circular interventions may be more relevant.	Large quantity of potential classes.
	GDP (per capita)	Highlight the economic resources of a given city which can determine the types of circular activities that might be available.	Down-scaled national estimates.
	Human Development Index (HDI)	Infer the stage of development and pathway of development. Highlighting some cities with a need to raise their HDI, and others who possess a high HDI.	No city-specific data available.
Geography	Climatic zone	Used to discern the availability of local resources.	Less broadly relevant for all cities when determining circular interventions.
Labour	Education level distribution across working population	Inform which types of circular economy actions and interventions would be feasible within a city. Highlights whether skill development programmes might be required to support circular actions.	Data not available for all cities.
	Age distribution of the working population	Inform the nature of transformation and skills development pathways: For instance, older workers may be more vulnerable to large scale circular transformation, while younger workers may need to develop transferable circular skills.	Data not available for all cities.
	Share of informal workers in the working	Highlight the type of work that is carried out in the city. This can inform how circular economy strategies are	No uniform data collected on cities globally.

	population	designed: for instance, to work with and for a large informal sector.	
Circular economy	Percentage of circular jobs	Highlights the share of jobs contributing to a circular economy as part of the formal economy.	Framework designed to encompass a range of circular jobs scores, rather than creating types based on their current circular performance.