From Assessment to Action
→ *A Spotlight on Whole Life Carbon Processes in Cities*

World Business Council *for Sustainable Development*

Contents

Foreword

Global CO_2 emissions from buildings have stabilized (at a high level of ca. 14Gt per year, or almost 40% of total emissions) but we are not yet seeing the necessary steep decline that would bring us within reach of keeping global warming to between 1.5-2°C. While ca. 70% of these emissions are related to the energy used to heat, cool and run buildings (operational carbon), another 30% are due to the production emissions of construction materials (embodied carbon). We need to address both operational and embodied carbon emissions in conjunction, and we need to urgently work toward halving emissions from new construction by 2030 and deeply retrofitting the existing inefficient building stock (while not adding new embodied carbon).

This is why the implementation of Whole Life Carbon processes is critical, as it allows us to understand the full emissions profile of building projects and take a holistic approach to reducing them, from the earliest phase of decision-making in any project when the impact on total carbon emissions is highest. Whole Life Carbon is the common language that can align the goals and actions by all actors involved in the process, from owners and investors, to developers, architects and construction companies, to all stakeholders along the value chain.

With this report we are aiming to provide a consistent assessment framework and a spotlight on the implementation of Whole Life Carbon processes across 6 global cities, to share knowledge and best practice and to encourage more cities, regions as well as countries to adopt consistent and comparable Whole Life Carbon assessments as part of their planning processes. This will provide a level playing field for actors to come together and aim to achieve the best outcomes through collaboration and innovation, thereby driving carbon emissions out of buildings and construction projects, globally.

Roland Hunziker, Director,
Built Environment, WBCSD

Decarbonizing buildings is a recognized essential part of reducing greenhouse gas levels to meet our climate goals. A crucial step toward this is being able to measure and report with accuracy and credibility the whole life carbon (WLC) footprint of all buildings. Only from this point can targets and incentives toward meaningful reduction be driven. Business needs credible WLC policy to drive investment and reward innovation. Although much progress has been made in terms of developing WLC policy and practices, the stark truth is we're not moving fast enough, especially when viewed at a global scale. This in turn simply means we are not driving the required decarbonization of our buildings.

Where we see the best progress, it is generally being shaped at a city level, in line with evolving built environment planning processes. By creating a structured and consistent method of appraising WLC process implementation within all major cities worldwide, we can transparently enable clearer understanding, share best practice, and as a product of this accelerate wider WLC policy evolution. The appraisal framework presented here is a great starting point, and hopefully it will now be taken up more widely and used as a tool to facilitate meaningful progress.

Chris Carroll,
Arup Fellow, Arup Group Ltd.

Executive summary

The construction, operation and end-of-life of buildings account for approximately 37% of global energy- and process-related carbon emissions.[1] With global temperatures in 2024 already exceeding 1.5˚C above pre-industrial levels,[2] reducing emissions from the built environment requires rapid and systemic action.

Context: whole life carbon in the built environment
Whole life carbon (WLC) processes provide a structured approach to quantify and reduce emissions across a building's life cycle. Typically implemented through whole life carbon assessments (WLCAs), they support better-informed design and investment decisions. While operational emissions from energy and water use have historically been the primary focus, embodied emissions, arising from materials and construction, are increasingly significant. Managing trade-offs between operational and embodied carbon is now a critical challenge for practitioners.

WLC process adoption has already made significant progress. However, its uptake remains fragmented across regions. Inconsistent methodologies, policy approaches and reporting requirements limit comparability, slow adoption, and create uncertainty for industry. Greater alignment could unlock more extensive and effective WLC process implementation, improve the comparability of WLCA results, and create a level playing field that supports investment in low-carbon solutions. Consistency and comparability are critical for benchmarking progress across cities and supporting coordinated action across the global built environment ecosystem.

The Market Transformation Action Agenda
The WBCSD's Market Transformation Action Agenda (MTAA), endorsed by more than 80 organizations, brings together stakeholders across the built environment value chain to identify and address key barriers to decarbonization. One of its core priorities is aligning and accelerating the global adoption of WLC processes.

Assessment framework for the implementation of whole life carbon processes
The structured framework we introduce in this document assesses how effective the implementation policies and initiatives are for WLC processes at the city level. It enables consistent comparison across cities, identifies good practice as well as gaps in current approaches, and highlights opportunities to accelerate progress.

Cities often act as test beds for new policies and practices. Leading city-level action can build the confidence of national policymakers and support wider implementation. By assessing cities at different stages of WLC policy implementation, the framework identifies best practices and accelerates their global uptake. Its use can drive the public-private ambition loop[3], strengthening collaboration by enabling meaningful dialogue with business at the local implementation level. It supports cities in creating the conditions for businesses to accelerate decarbonization, in line with city net-zero pathways, and steers investment toward solutions that support this.

The criteria-based framework suggests what the maximum implementation of WLC processes could look like, facilitating the consistent assessment of their application in buildings in different cities. (Though the framework could be replicable for infrastructure, here we focus only on buildings). The framework captures the many city policies and initiatives that can apply and highlights their implementation mechanism, scope, and effectiveness.

Executive summary

Pilot cities demonstrating framework application
Six pilot cities are used to illustrate the application of the framework in several regions: Bogotá (Colombia), Cape Town (South Africa), London (UK), New York (USA), Paris (France) and Shanghai (China).

They demonstrate that, while approaches vary, several common trends are emerging. All the pilot cities have established operational energy or carbon requirements, including performance disclosure and minimum standards. But progress on embodied and whole life carbon is more uneven. Some cities, such as London and Paris, require WLC disclosure on some or all projects, while fewer have introduced performance limits for embodied or whole life carbon, or strong financial incentives for carbon reductions.

Notable exceptions include France's RE2020 regulation, which sets WLC limits, and New York's Local Law 97 and London Plan Policy SI 2, which apply financial penalties for exceeding operational carbon emissions limits. These illustrate potential models for broader adoption.

Next steps
Moving forward, we aim to scale the application of the framework to additional cities to highlight insights into WLC process implementation, to engage policymakers and industry stakeholders to refine and adopt it, and to establish a regular update cycle to track progress. Over time, this will support greater transparency, enable benchmarking and help drive alignment in WLC implementation globally.

Introduction

01.

01. Introduction

Emissions from the construction, operation and end-of-life of buildings account for approximately 37% of global energy- and process-related carbon emissions.[4] Reducing emissions from the built environment is therefore critical to achieving global climate targets. However, despite increasing ambition, current approaches remain fragmented, with inconsistent methods, policies and reporting practices limiting progress and comparability across regions.

Whole life carbon (WLC) processes have emerged as a key means to address this challenge. By considering emissions across the building's life cycle – from material production and construction through to operation and eventual decommissioning – WLC processes enable more informed decision-making and help identify trade-offs between operational and embodied emissions. While operational emissions have historically been the primary focus, embodied emissions are becoming increasingly significant, making a whole life perspective essential.[5]

Despite growing recognition of WLC, its implementation varies widely between regions and cities. This lack of consistency creates uncertainty for policymakers and industry, constrains investment in low-carbon solutions, and slows the transition to net zero buildings. Addressing this gap is a core priority of WBCSD's Market Transformation Action Agenda (MTAA) (see Figure 1). Endorsed by over 80 organizations, one of its central objectives is to align WLC approaches and accelerate their adoption globally.

In this context, this document introduces a structured framework to assess the policies and initiatives that influence the implementation of WLC processes for buildings at the city level. (Though the framework could be replicable for infrastructure, here we focus only on buildings.) The framework enables the consistent comparison of current WLC policies and initiatives, identifies gaps and leading practices, and supports more effective collaboration between public and private sector stakeholders. It is based on four key dimensions – definition, transparency, performance floors and incentivized goals – derived from the WBCSD-led 12-Step Action Plan for net zero buildings.

Cities are the focus for this work. Many of the key policies and legislation driving WLC adoption, such as local authority planning requirements, are initiated and implemented at the city level. As a result, cities often act as test beds for new approaches, with leading practices influencing wider adoption at national and international scales.[6] Understanding how cities are driving implementation of WLC processes is therefore essential to accelerating global progress.

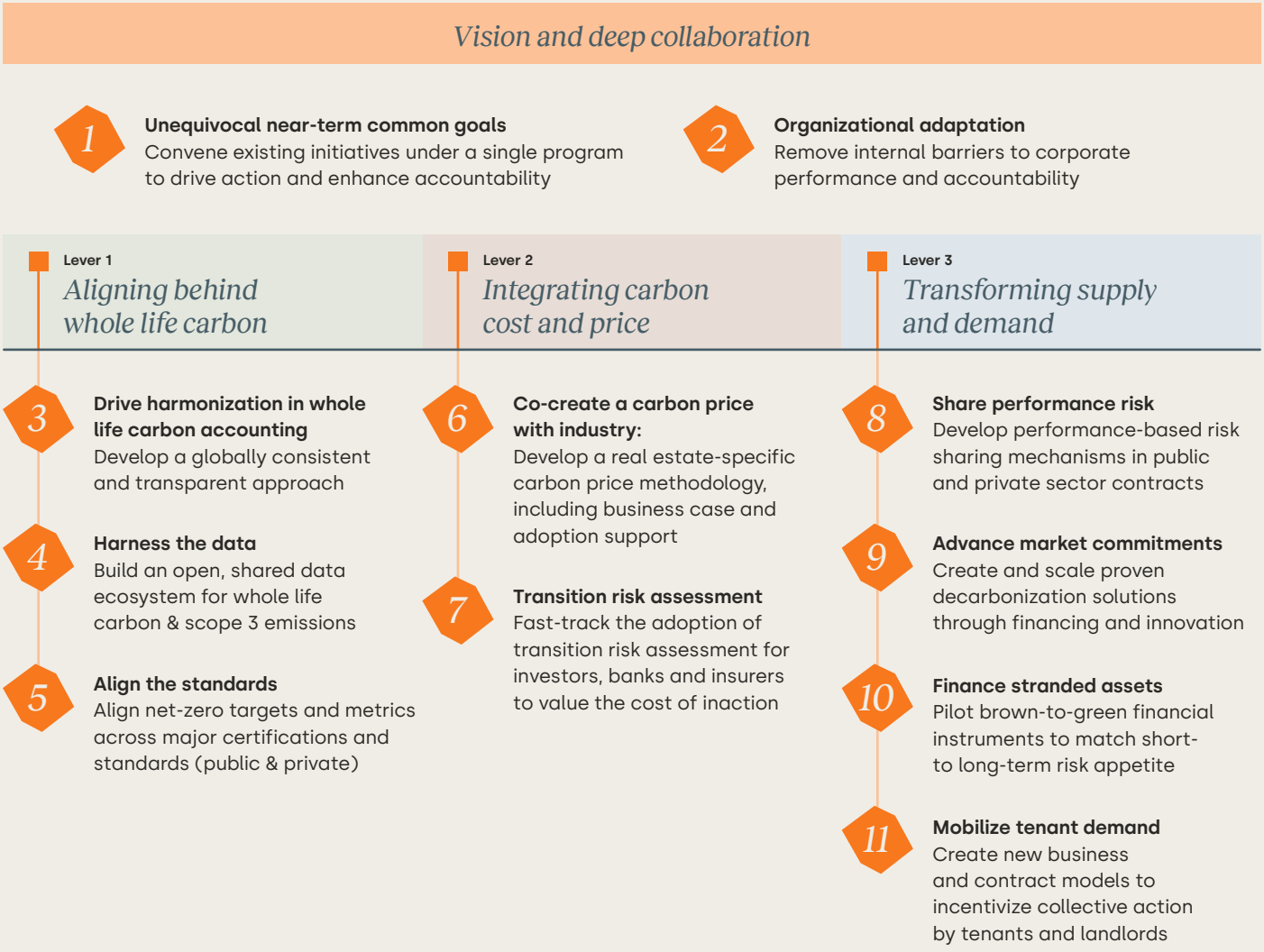
01. Introduction

To demonstrate its application, we have applied the framework to six pilot cities: Bogotá (Colombia), Cape Town (South Africa), London (UK), New York (USA), Paris (France) and Shanghai (China). These pilot cities highlight both common trends and regional differences, providing insight into current practices and opportunities for further advancement.

Policymakers, industry bodies and built environment professionals seeking to benchmark and strengthen WLC implementation in their jurisdictions are the focus of this framework. Its use drives the public-private ambition loop,[7] strengthening public-private collaboration by enabling meaningful dialogue at the local implementation level. It supports cities in the creation of the conditions for businesses to accelerate decarbonization in line with city net-zero pathways, and steers investment toward solutions that support this.

We aim to roll out the assessment approach to other cities, beyond those in this report, to develop a truly global picture of the status of WLC process implementation. You can access and download the assessment framework template and use it to assess those in your city.

Figure 1: The Market Transformation Action Agenda, led by WBCSD and endorsed by over 80 organizations.[8]



Definitions

02.

02. Definitions

The life cycle stage definitions below are based on European Standard EN 15978:2011 Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method of the European Committee for Standardization (CEN).

Operational energy
Energy consumed during the active use of a building, including for activities and amenities such as heating, cooling, lighting, hot water, and powering equipment.

Operational carbon
Greenhouse gas (GHG) emissions produced through operational energy and water usage related to the building's operation (life-cycle assessment – LCA – modules B6 and B7, shown in Figure 2).

User carbon
GHG emissions associated with how occupants use the building during the operation stage (LCA module B8), excluding LCA modules B6 and B7 (operational carbon). User carbon includes, for example, the impact of commuting to an office building.

Embodied carbon
GHG emissions associated with materials and construction processes throughout the whole life-cycle of the building. This includes emissions from material supply, transport and manufacturing (LCA modules A1-A3) transport to site and construction (LCA modules A4-A5) use, maintenance, repair, replacement, and refurbishment (LCA modules B1-B5) and deconstruction, transport, waste processing and disposal at end-of-life (LCA modules C1-C4). See Figure 2 for further details.

Upfront carbon
The embodied carbon up to practical completion of the building, meaning including LCA modules A1-A5.

Whole life carbon (WLC)
The sum of operational carbon, user carbon and embodied carbon.

Whole life carbon assessment (WLCA)
A way to measure and reduce emissions from building construction by considering the full life cycle of the building (LCA modules A-C) and impacts beyond the life-cycle (LCA module D). Figure 3 provides an example of a typical breakdown of WLC emissions from a new residential timber tower.

Figure 2: Whole life carbon assessment modules.[9]

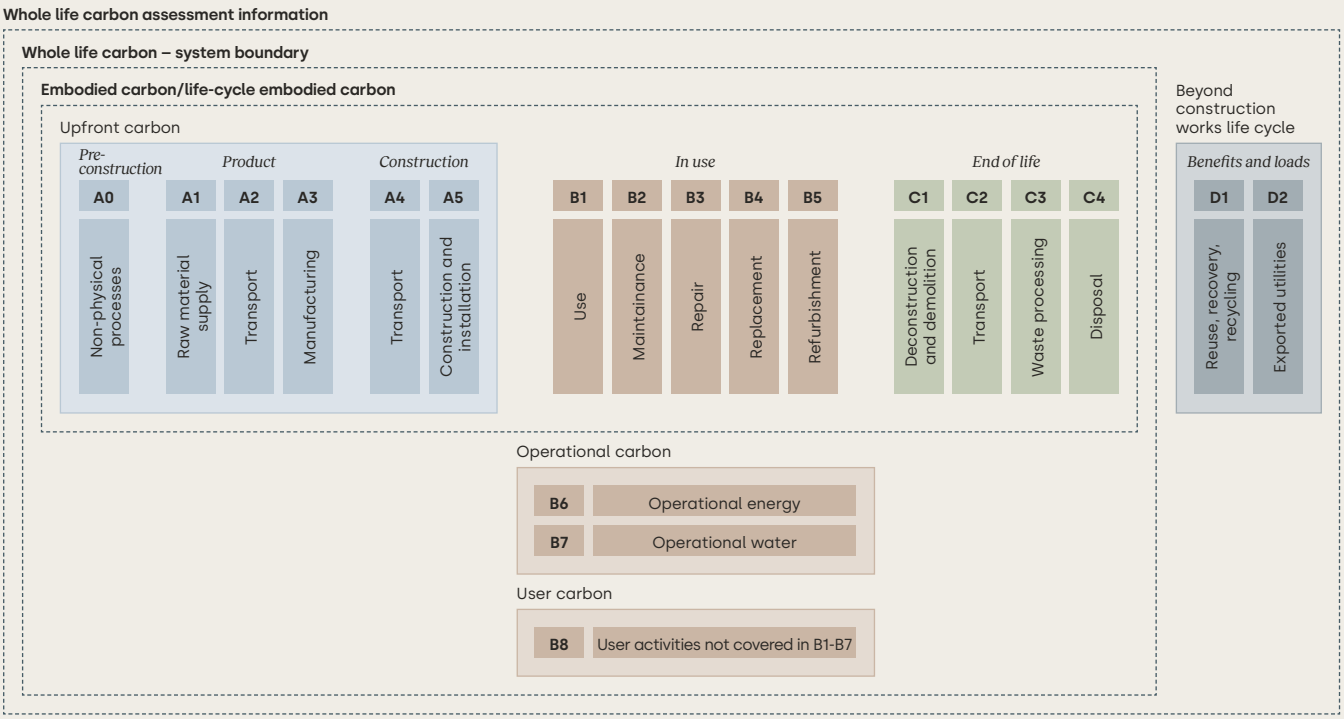
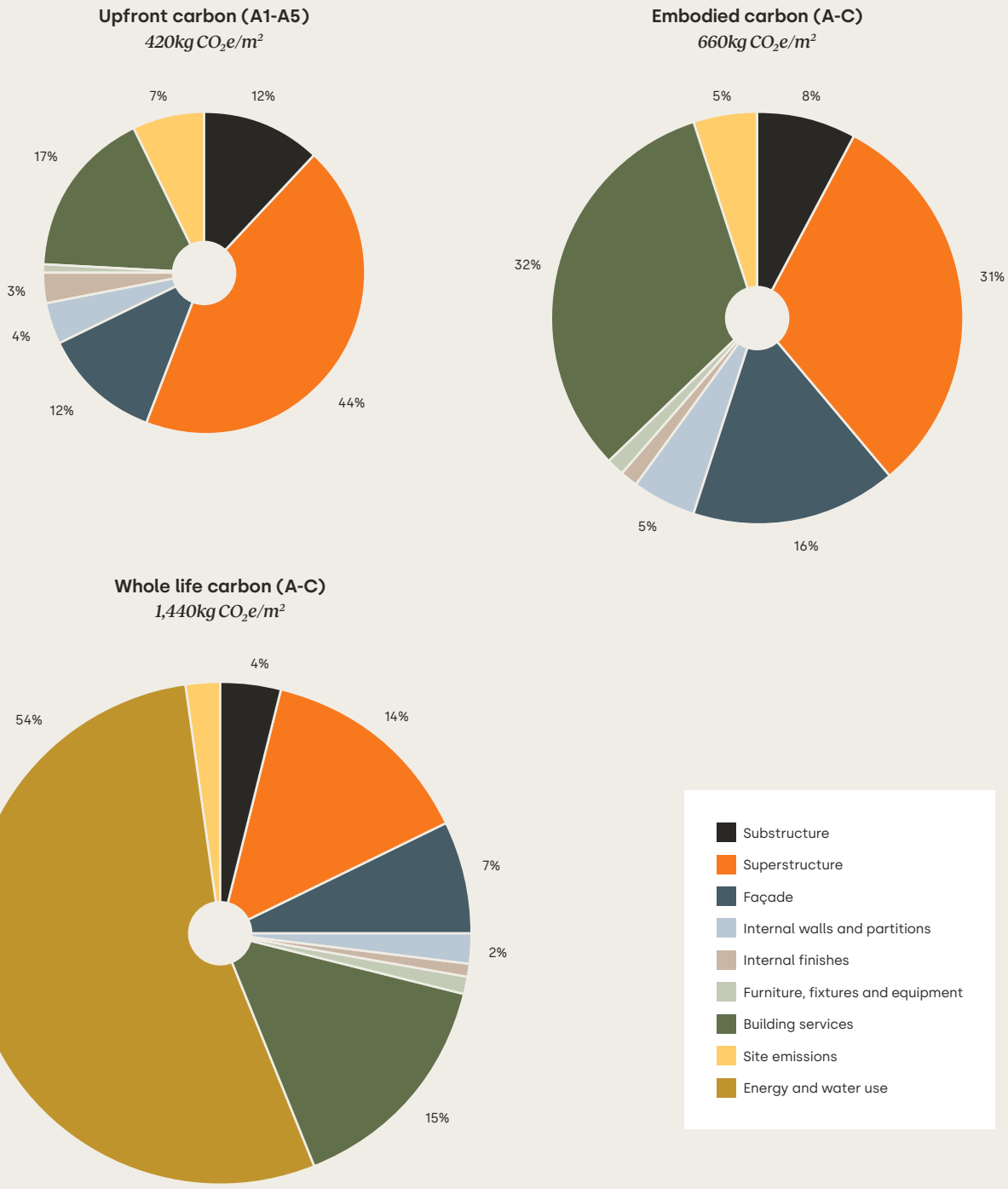


Figure 5: Breakdown of carbon emissions for a residential timber tower, Amsterdam (Netherlands), for illustrative purposes.[10]



Assessment framework *overview and development*

03.

03. Assessment framework overview and development

The objective of the framework is to assess how policies and initiatives are driving the implementation of WLC processes in each city in a clear, structured and repeatable way. This will enable consistent comparison across cities, identify gaps in current approaches, and highlight opportunities to accelerate progress. We have designed the framework to capture important differences between policies and initiatives driving WLC adoption in different cities and to highlight the many relevant policies and initiatives contributing to WLC adoption in each city.

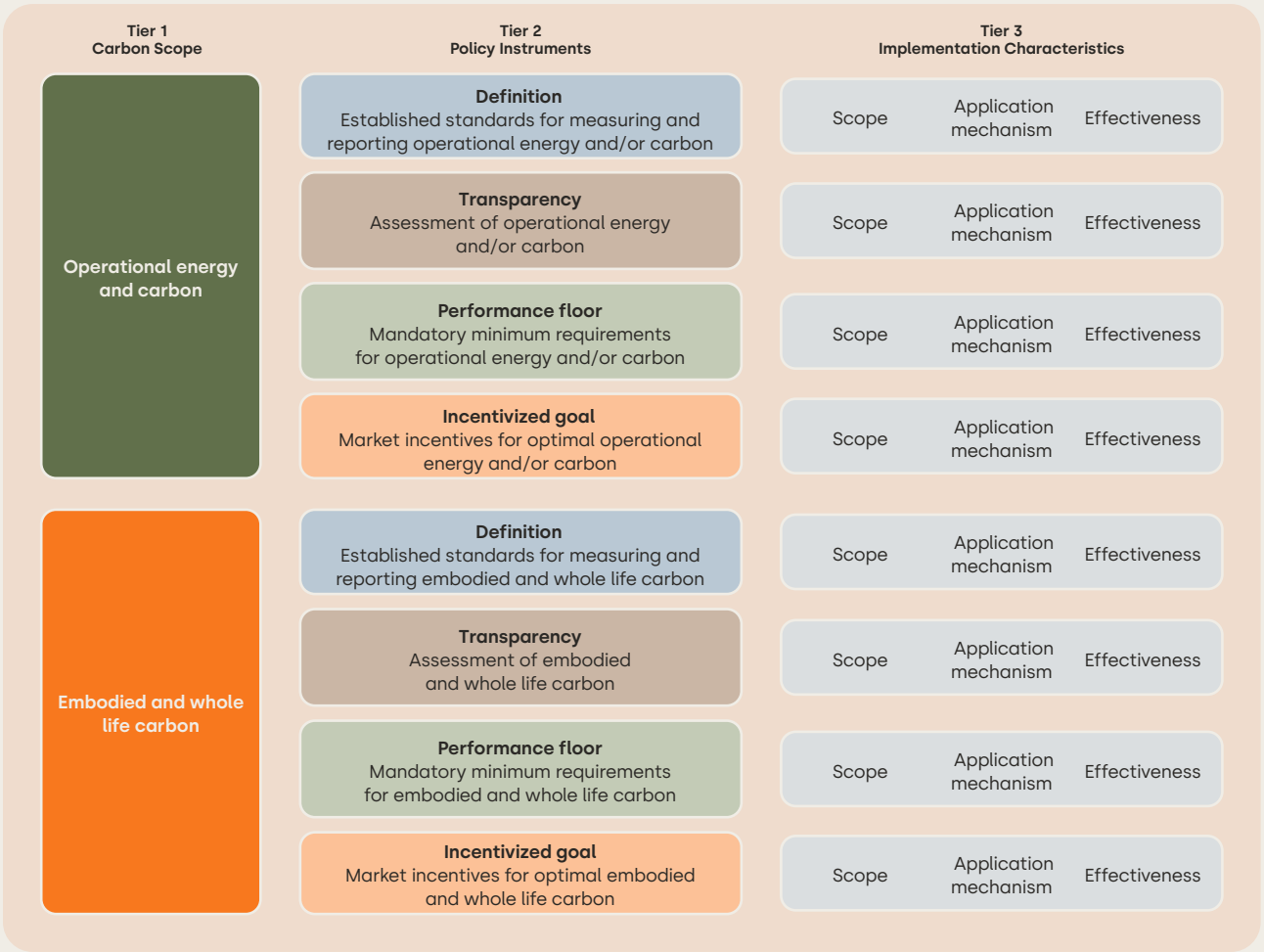
Appendix A: Criteria-Based Assessment Framework provides a list of criteria against which users assess the policies and initiatives driving WLC uptake. As shown in Figure 4, these criteria are structured in three tiers:

- **Tier 1 – Carbon Scope:** What part of whole life carbon the policy or initiatives addresses, meaning operational energy and carbon or embodied and whole life carbon;
- **Tier 2 – Policy Instruments:** How cities seek to influence whole life carbon outcomes, meaning through WLC definition, measurement, performance floors and incentivized goals;
- **Tier 3 – Implementation Characteristics:** How widely and effectively, and through what mechanism, the policy or initiative is implemented;

The following sections provide further details and justification for selection of these criteria tiers.

We have developed the criteria framework with input and feedback from industry experts covering several global regions. But we aim for it to be flexible to accommodate new criteria in the future through further development.

Figure 4: Structure of the framework for assessing the implementation of whole life carbon processes in cities



03. Assessment framework overview and development
Tier 1 - Carbon Scope

Tier 1 – Carbon Scope: operational energy and carbon versus embodied and whole life carbon
Tier 1 divides criteria into whether they apply to:

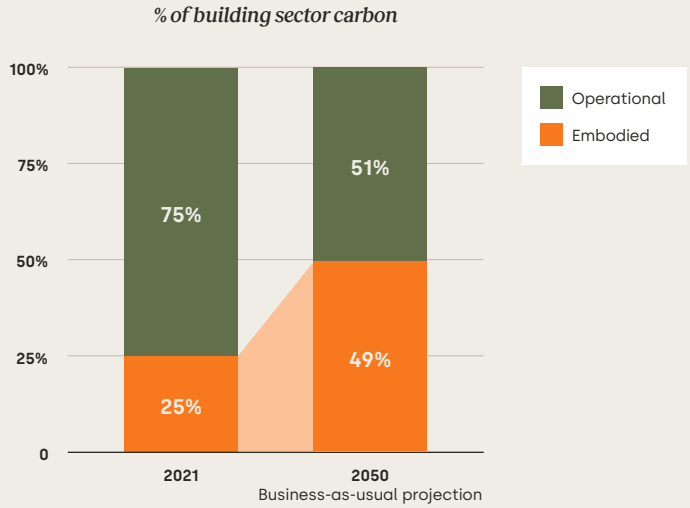
1. Operational energy and carbon
2. Embodied and whole life carbon.

As shown in Figure 2, WLC emissions from buildings are typically categorized as operational, user and embodied emissions.

While user emissions are part of whole life carbon, building WLCAs generally do not include them in practice since developers have limited control over users and less certainty regarding user emissions. WLC standards and guides therefore generally focus on, and require the reporting of operational and embodied emissions for buildings. We have therefore excluded user emissions from this framework.

Operational energy use and emissions from buildings are often measured and addressed first, and independently of embodied and whole life carbon emissions. This is because operational carbon emissions have historically been the largest contributor to WLC on typical building projects.[11] However, as energy sectors around the world decarbonize to meet net-zero commitments, the importance of embodied carbon is increasingly at the forefront. Figure 5 shows how its relative contribution to WLC is growing.

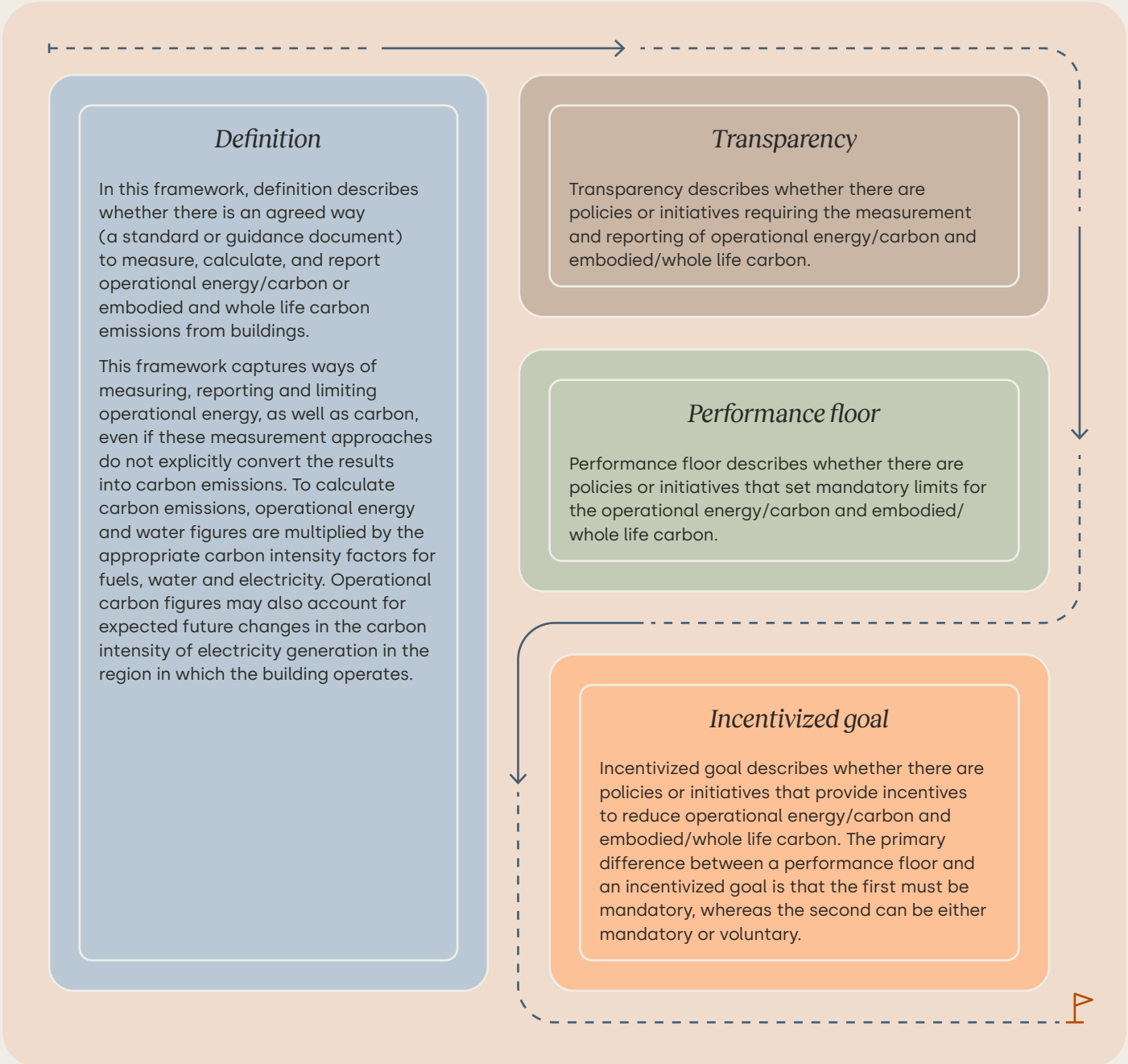
Figure 5: Projected contributions from embodied and operational carbon in the building sector.[12]



03. Assessment framework overview and development
Tier 2 - Policy Instruments

Tier 2 – Policy Instruments: Definition, transparency, performance floor and incentivized goal
We have adapted tier 2 from the WBCSD's Achieving Net-Zero Buildings – An Action Plan for Market Transformation. It sets out a 12-step action plan for market transformation, centred around four objectives: definition, transparency, performance floor and incentivized goal (see Figure 6).

Figure 6: The key actions for market transformation.[13]

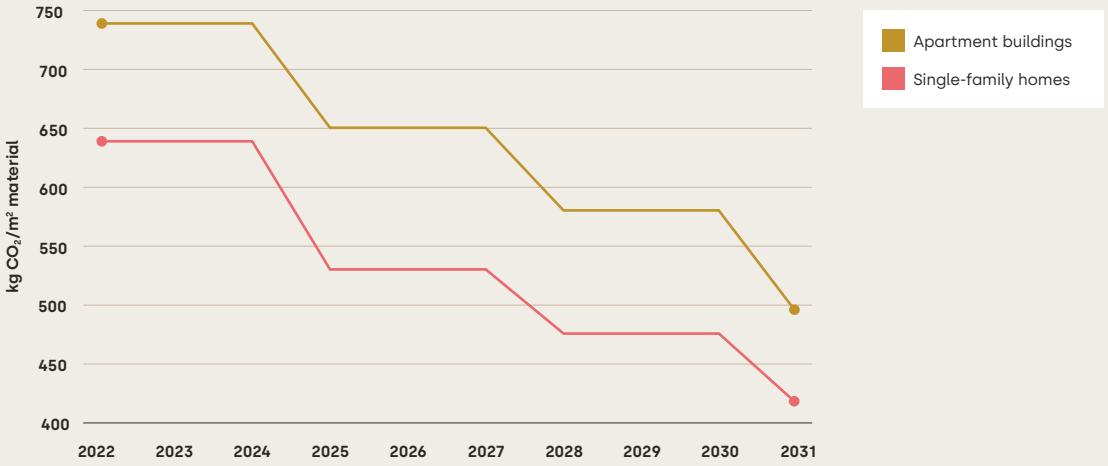


03. Assessment framework overview and development
Tier 3 - Implementation Characteristics

Tier 3 – Implementation Characteristics: scope, application mechanism and effectiveness
Tier 3 indicates whether criteria relate to either:

1. The **scope** of buildings, project types, building elements and LCA modules (as illustrated in Figure 2) that the policy or initiative applies to. For example:
    a. A performance floor for operational energy may apply to only major developments, or to both major and minor developments.
    b. A policy may require embodied/whole life carbon assessments to assess the building structure and façade but not to assess other building components such as finishes, building services, or external works.
2. The **application mechanism** of the policy or initiative. For example, whether it is led by policy (public sector) or by industry (private sector) and whether it applies at the city, state, or national level.
3. How **effective** the policy or initiative is at defining, measuring, limiting or incentivizing reductions in operational energy/carbon or WLC. For example, an operational performance floor (mandatory minimum requirements for operational performance) will be more effective if policies set performance limits at a level low enough to drive achievable improvement, if the limits are comprehensively enforced, and if the limits tighten over time. An example of tightening limits are the upfront carbon thresholds for residential buildings set by France's RE2020 Regulation, which drop gradually until 2031 (see Figure 7).

Figure 7: France's RE2020 upfront carbon emissions thresholds for residential buildings.[14]



03. Assessment framework overview and development
The criteria

We developed criteria for each of the tiers above, to highlight the important differentiating characteristics of policies and initiatives driving WLC process adoption. Appendix A: Criteria-Based Assessment Framework provides a full list of assessment criteria. Table 2 presents descriptions and examples for each criterion.

We have designed the criteria to be as objective as possible, answerable, and applicable to any city for the framework's global roll out and consistent application in different cities. The Pilot cities section presents how we tested the criteria in cities in different global regions.

Each criterion lists two or more choices relative to the policy or initiative in the city. For example, under operational energy and carbon > transparency > scope > users can select whether the policy or initiative applies to new buildings and/or refurbishments and/or existing buildings in operation.

For each criterion, the framework also defines the choice indicating greater implementation. In the example above, the answer indicating greater implementation is new buildings and refurbishments and existing buildings in operation. In other words, a policy requiring assessment of operational energy will exhibit greater implementation if it applies to new buildings and refurbishments and existing buildings in operation, rather than just to new buildings.

Use of color

The framework uses color to indicate the level of business implementation of WLC processes based on local policies and initiatives. They are simple, intuitive and indicative, but not rigidly defined. They are not precise definitions or scores.

For individual criteria, Table 1 outlines the general meaning of colors. Appendix A: Criteria-Based Assessment Framework outlines which colors correspond to answers provided for each criterion in the framework.

We also use color to indicate the overall WLC implementation level at tier 2 (Policy Instruments), as shown in Figure 9. Figure 8 presents the colors used to express this overall implementation level. Appendix A: Criteria-Based Assessment Framework outlines how we have designed them, depending on the answers provided for each criterion.

A city with policies or initiatives addressing all criteria would exhibit greater implementation of WLC processes according to this framework. On the other end of the spectrum, a city without policies or initiatives addressing the assessment criteria would show lower implementation of WLC processes. The criteria can therefore highlight ways a city could further advance WLC processes, by changing the scope, effectiveness and application mechanism of new or existing WLC policies and initiatives.

Table 1: Colors used to indicate the implementation of WLC processes for each criterion

Operational energy and carbon	*Embodied and whole life carbon*	*Criteria implementation levels*
Maximize	**Maximize**	Choice indicating that policies or initiatives address the criterion, and that aspect(s) of these policies or initiatives maximize their scope and/or effectiveness.
Significantly increase	**Significantly increase**	Choice indicating that policies or initiatives address the criterion, and that aspect(s) of these policies or initiatives significantly increase their scope and/or effectiveness.
Increase	**Increase**	Choice indicating that policies or initiatives address the criterion, and that aspect(s) of these policies or initiatives increase their scope and/or effectiveness.
Absence	**Absence**	Choice indicates the absence of policies or initiatives addressing that criterion.

Figure 8: The spectrum of whole life carbon implementation in cities

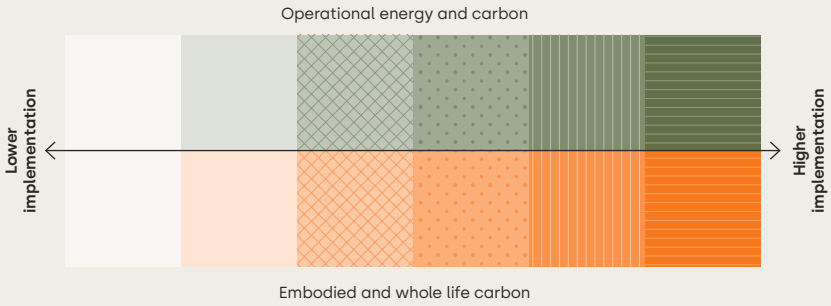


Table 2: Assessment criteria description and examples

Criterion	Description	Example(s)
Operational/WLC Yes OR no	Whether the policy or initiative addresses the relevant aspect in tier 2 criteria, i.e., definition, transparency, performance floor or incentivized goal.	Royal Institution of Chartered Surveyors' Professional Standard on Whole Life Carbon Assessment for the Built Environment (RICS PS 2nd edition), adopted in London, provides a definition (an established standard/ guidance for measuring and reporting whole life carbon) and therefore answers Yes for this criterion.
Operational Major developments AND/OR minor developments **WLC** Major developments AND/OR minor new developments AND/OR minor refurbishments	Whether the policy or initiative applies to major developments, and/or minor new developments and/or minor refurbishments.	London Plan Policy SI 2 requires the undertaking of WLCAs for major developments (including major refurbishments), but not for minor new developments or minor refurbishments.
Operational New buildings AND/OR refurbishments AND/OR existing buildings in operation	Whether the policy or initiative applies to new buildings and/or refurbishments and/or existing buildings in operation.	SANS 10400-XA sets an operational performance floor for new buildings and refurbishments in South Africa but not for existing buildings in operation.
WLC All building elements OR only major building elements	Whether the policy or initiative sets requirements for all building elements (e.g., substructure, superstructure frame, façade, internal partitions, finishes, furniture, fixtures and equipment (FF&E), building services, external works) or only for major building elements (e.g., superstructure frame and façade).	Leadership in Energy and Environmental Design (LEED) MRc1 requires WLCAs to include major building elements (i.e., structure and façade) only. LEED originated in the USA and is now one of the most widely used green building certification programs globally.
WLC Pre-construction AND/OR post-construction	Whether the policy or initiative requires the undertaking of WLCAs during the pre-construction/design stage, using design information and quantities, and/or post construction, using as-built information and quantities.	Green Building Council South Africa (GBCSA) Green Star Design & As Built Net Zero v1.1 certification requires the submission of a WLCA at both the design review (pre-construction) and as built (post-construction) stages.
WLC Upfront OR whole life carbon	Whether the policy or initiative requires WLCAs covering upfront carbon (LCA modules A1-A5, as shown in Figure 2) or the full life-cycle (LCA modules A-C).	LEED MRc1 credits require undertaking an LCA for the building that only includes upfront carbon (LCA modules A1-A5).
Operational/WLC Industry-led or policy-led	Whether a public or private-sector organization leads the policy or initiative.	Colombia's Ministry of Housing, City and Territory (a public sector organization) implements Resolution 0194.
Operational/WLC City-level OR state-level OR national-level	Whether the policy or initiative is applied at the city, state or national level.	Local Law 97 (2019) is applied at the city level in New York (USA), but not at the state or national level.
Operational Performance-based AND/OR prescriptive (code-compliance-based)*	Whether the policy or initiative takes a performance-based and/or prescriptive (code-compliance-based) approach to measuring and limiting operational performance.	UK Building Regulations Part L require the development of energy performance certificates (EPCs) for buildings and set limits for operational performance that are prescriptive (code-compliance-based), meaning they set requirements for the performance of individual building systems, such as the façade and building services. A performance-based approach is one where the overall operational performance of the building is estimated/measured and regulated, rather than individual building components and systems.
Operational Modelled AND/OR actual performance	Whether the policy or initiative requires the determination of operational performance via energy modelling and/or via measurements during occupation and operation.	New York City's Energy Conservation Code (and LL85) sets an operational performance floor based on the modelled performance of the building rather than the actual performance in operation.

* The core difference between prescriptive and performance-based standards for the operational performance of buildings lies in how businesses achieve compliance: prescriptive standards mandate the use of specific materials, methods, and designs, while performance-based standards define measurable outcomes (e.g., building energy use intensity) and functional goals that the building must achieve, regardless of how a business attains them.

Table 2: Assessment criteria description and examples *(continued)*

Criterion	Description	Example(s)
Operational/WLC Mandatory OR voluntary	Whether operational or WLC performance disclosure is mandatory or voluntary under the policy or initiative.	London Plan Policy SI2 makes WLC transparency mandatory for projects referable to the Mayor of London.
Operational/WLC Third-party verification OR not	Whether the policy or initiative requires operational or WLC assessment results to undergo third-party verification.	While RE2020 Regulation makes a comprehensive building-level WLCA mandatory, it does not strictly require an independent, third-party audit for the final submission.
Operational/WLC Requirement to enter performance data in database OR not	Whether the policy or initiative requires operational or WLC performance data to be entered into a database.	London Plan Policy SI 2 requires WLCA data to be entered into the Built Environment Carbon Database (BECD).
Operational/WLC Performance database publicly available OR not	Whether the above-mentioned database containing operational or WLC performance data is publicly available or not.	The UK-based Built Environment Carbon Database (BECD) is publicly available.
Operational/WLC Low enough to drive improvement OR not	Whether the operational or WLC performance floor is set at a level of emissions/energy use that is sufficiently low to drive performance improvement in the buildings sector.	There is some debate regarding SANS 10400-XA's ability to drive operational performance improvement in Cape Town, with some considering that the standard sets a relatively low bar for operational efficiency.
Operational/WLC Comprehensively enforced OR not	Whether the operational or whole life carbon performance floor is comprehensively enforced.	Whole life carbon limits set by RE2020 Regulation in France are comprehensively enforced, with developers required to prove compliance with RE2020 to receive building permits.
Operational/WLC Static OR tightening	Whether the operational or WLC performance floor is static or expected to become increasingly stringent over time.	There is an expectation that the operational performance floor set by SANS 10400-XA in South Africa will tighten over time, meaning the requirements may drive more ambitious improvement in the future.
Operational/WLC 1.5˚C aligned OR not	Whether the operational or whole life carbon performance floor is aligned with global requirements to reduce global warming to less than 1.5 ˚C.	NABERS 5.5 star is 1.5˚C aligned in the UK.
Operational/WLC Strength of incentive: Strong (direct financial, high) OR Medium (direct financial, low) OR Weak (indirect)	Whether the incentive provided for improved operational or whole life carbon performance is strong, medium or weak. In this context: • Strong incentives provide direct financial incentives at a high carbon price (indicatively >USD $100/tCO$_2$e in 2026 dollars). • Medium incentives provide direct financial incentives at a lower carbon price (indicatively <USD $100/tCO$_2$e in 2026 dollars). • Weak incentives provide indirect incentives such as improved marketability, energy savings, etc.	New York City's Local Law 97 applies a financial penalty to major developments of around USD $268 per metric ton of emissions for exceeding operational carbon limits.
WLC Benchmarks to compare against OR not	Whether the policy or initiative provides benchmark values for WLCA results for different building types and/or building elements.	The Greater London Authority's Whole Life-Cycle Carbon Assessments guidance provides benchmarks for upfront and whole life carbon, for various building types such as offices, residential buildings, and retail buildings, broken down by building element.
WLC Number of region-specific EPDs	The number of country-specific environmental product declarations (EPDs) available for undertaking WLCAs for buildings in the city.	Leading industry LCA software OneClick LCA contains more than 1000 China-specific EPDs (at the time of writing) that can be used for WLCAs for buildings located in Shanghai.

03. Assessment framework overview and development
How the framework assesses cities

Many policies and initiatives exist within a city, so we designed the assessment framework to capture and reflect this. The framework allows you to add a new column in the assessment for each policy or initiative relevant to WLC adoption in your city and to assess each independently against the criteria (listed in rows).

Typically, policies or initiatives would be introduced relating to some of the criteria (e.g., embodied or whole life carbon transparency) but not to others, while other policies or initiatives might apply to multiple tier 2 criteria. Often, more than one relevant policy or initiative can address a single criterion or group of criteria, but in different ways. For example, there may be a prescriptive performance floor for operational energy applied to all buildings at the national level, with a performance-based performance floor for operational energy applied to major developments at the city level. The framework captures all such variations.

The framework also allows for the inclusion of possible policies or initiatives proposed but that are not yet implemented. These are shown with a white column header. For example, the Building Regulations: Part Z initiative in the UK has developed a performance floor for the upfront carbon of large buildings at the national level but the government has not yet implemented it.[15] You can add possible policies and initiatives that do not yet contribute to the overall level of implementation of WLC processes in your city.

Policy/initiative aspects versus outcomes
While the criteria relate to aspects of WLC policies and initiatives, they do not indicate the measurable outcomes driven by them. For example:

- → The criteria assess whether operational energy/carbon transparency is required for major developments and/or minor developments (an aspect of the policy/initiative) but do not quantify the proportion of buildings that undertake operational energy/carbon assessments in the city (an outcome).
- → The criteria assess whether an embodied and whole life carbon performance floor is sufficiently stringent to drive improvement (an aspect of the policy/initiative) but do not measure the extent to which this has translated into real carbon reductions across developments in the city compared with a baseline (an outcome).

While an understanding of policy/initiative outcomes as well as aspects may be more useful, consistent data on such outcomes is currently sparse and inconsistent. Hence, the framework focuses on policy aspects, for which information is readily available. Future versions of the framework could focus more on outcomes as sufficient data becomes available.

How to compare cities
This framework does not calculate a single aggregated WLC implementation score, as this would require implicit or explicit criteria weightings. Instead, the comparing of assessments for different cities requires a criteria-by-criteria basis (at least at tier 2, and preferably tier 3). Nevertheless, the framework generates an overall color for the city at tier 2 (definition, transparency, performance floor and incentivized goal) for comparison at this level. Appendix A: Criteria-Based Assessment Framework contains the rules for assigning these overall colors.

03. Assessment framework overview and development
Framework limitations

You should understand the various limitations of the framework when assessing cities and interpreting the assessments done by others. The following are the most notable.

1. **The framework does not capture carbon-reducing initiatives applied at different points along the building construction supply chain.** The framework focuses on application of WLC processes at the building or asset level and does not capture policies or initiatives that measure and/or reduce emissions elsewhere along the supply chain, such as at the product level (such as product emissions standards) or whole economy level (such as emissions trading schemes or city-level carbon budgets for construction).
2. **The framework does not explain why differences exist in the implementation of WLC processes in different cities.** Some key barriers to implementation of WLC processes include the costs of undertaking operational and WLC assessments, the availability of adequate carbon data (such as Environmental Product Declarations (EPDs), WLC benchmarks) and specialist skills, and the level of political drive for reducing building-related emissions to mitigate climate change. It would be valuable to explore these underlying reasons for differences in WLC implementation, but it is not part of this initial study.
3. **It does not quantify the relative importance of criteria.** The framework does not weight, quantify or compare which criteria are most important to the overall WLC implementation assessment, given the matter's subjectivity. So it is up to you to decide which are the most important in your opinion and context. You should not infer any overall implementation "score" from the assessment. However, the framework does generate an overall color for the city at criteria tier 2, allowing for an easier comparison of cities at this level.
4. **It does not quantify the rate of uptake of policies and initiatives.** This is due to a lack of available data on market uptake of relevant policies or initiatives, like the percentage of new building projects that must undertake WLCAs in a city. We may add criteria expressing these uptake rates to future versions of the framework, but this would rely on data availability from the relevant public and private sector organizations implementing WLC policies and initiatives.
5. **The framework does not consider life-cycle environmental impacts other than GHG emissions.** As the focus of the exercise is to highlight the application of policies and initiatives to the implementation of whole life carbon processes, it does not address the assessment and reduction of other environmental impacts from building construction, such as ozone depletion or ocean acidification.

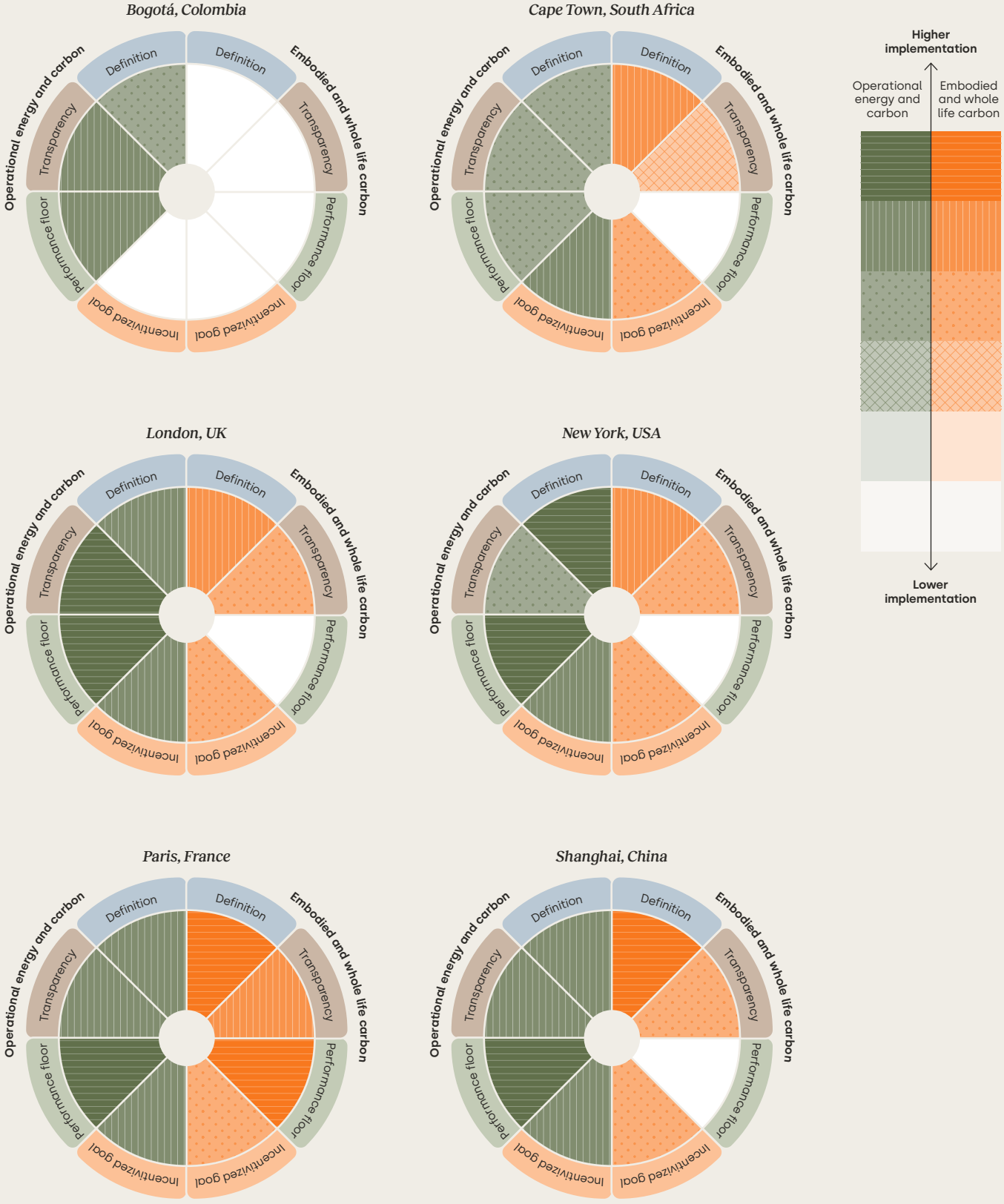
Pilot cities

04.

04. Pilot cities
Introduction

We undertook implementation assessments for Bogotá (Colombia), Cape Town (South Africa), London (UK), New York (USA), Paris (France) and Shanghai (China). Appendix B: City Assessments provides the full assessments. Figure 9 summarizes the results.

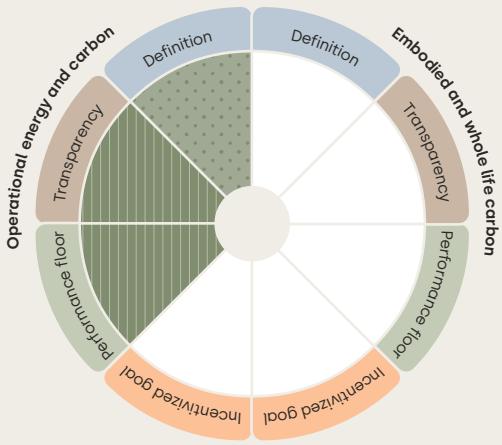
Figure 9: **Implementation of whole life carbon processes for pilot cities presented in this report**



04. Pilot cities
Bogotá, Colombia

Bogotá is advancing its WLC processes through initiatives such as Resolution 0194, which sets a prescriptive performance floor for the operational performance of buildings, and the Technical Guide: Sustainability Criteria for Buildings (Guía técnica: Criterios de Sostenibilidad para Edificaciones), which outlines sustainability criteria for buildings across their life cycle. However, since this technical guide does not require whole life carbon reporting, further work is needed to increase industry uptake of WLC processes.

Bogotá, Colombia



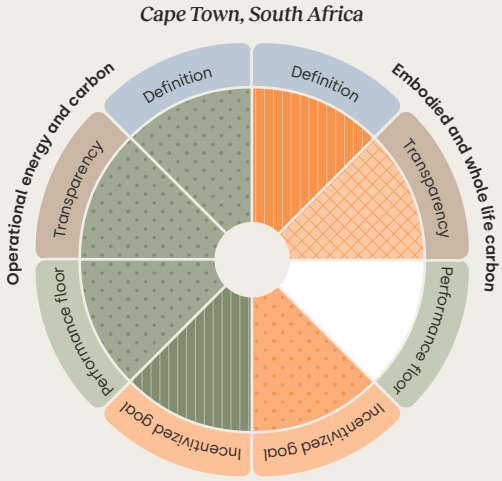
Operational energy and carbon
Colombia's National Roadmap for Net Zero Carbon Buildings provides a strategic framework aiming for net zero carbon buildings by 2050. Resolution 0194, implemented in 2025 by the Ministry of Housing, City and Territory, is the regulatory tool implementing key parts of the roadmap. Resolution 0194 refers to the Sustainable Construction Guide (Guía de Construcción Sostenible), which defines how to calculate, verify, and document water and energy savings in new buildings.

The resolution sets prescriptive requirements for the operational performance (energy and water consumption) of new buildings, with operational performance disclosure mandatory for new buildings and voluntary for existing buildings. However, as the market is still in the early stages of implementation, and in the absence of a national monitoring system with consolidated compliance data for new buildings, the government does not yet comprehensively enforce the requirements. The resolution also allows for the establishment of incentives for improved operational performance at the city level. Bogotá has not yet established any incentives but there is potential for the city to do so in the future.

Embodied and whole life carbon
The Ministry of Housing, City and Territory of Colombia adopted the Technical Guide: Sustainability Criteria for Buildings in 2025 to implement sustainability measures in new and existing buildings. However, the guide does not include standards for upfront or whole life carbon assessment. The measurement of WLC in Bogotá is currently voluntary, with standards, guidance and frameworks like Royal Institution of Chartered Surveyors' Professional Standard on Whole Life Carbon Assessment for the Built Environment (RICS PS 2nd edition), Leadership in Energy and Environmental Design (LEED) and Excellence in Design for Greater Efficiencies (EDGE) certification reportedly applied in the industry. Leading industry LCA software OneClick LCA has fewer than 100 Colombia-specific EPDs (at the time of writing), indicating that embodied and WLC assessments are emerging but not yet widespread, and still largely reliant on embodied carbon data that is not specific to Colombian products.

04. Pilot cities
Cape Town, South Africa

Cape Town's WLC processes are emerging with policy-led prescriptive standards and requirements for operational energy (and indirectly, carbon). There is not yet any formal policy driving the uptake of embodied or whole life carbon assessment, but the Green Building Council of South Africa (GBCSA) Green Star voluntary certification scheme includes credits for upfront carbon assessments for major building elements (structure, façade, etc.).



Operational energy and carbon
Regarding operational transparency, South Africa's EPC Regulations under the National Energy Act require the display of EPCs for major developments (depending on building size and occupancy classification). SANS 10400-XA (National Building Regulations – Energy Usage in Buildings) is a performance compliance path that establishes a performance floor for the operational performance of new buildings in the country. It is largely a prescriptive standard but does allow building developers to conduct energy modelling to demonstrate overall building performance.

There is debate regarding its ability to drive improvement, with some considering that the standard sets a relatively low bar for operational efficiency. However, there is an (informal) expectation in the sector that the standard will tighten over time, meaning the requirements may drive more ambitious improvement in the future.

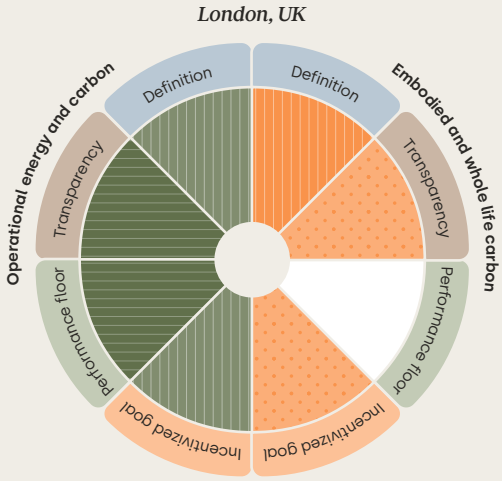
The GBCSA Green Star Certification scheme also provides an incentive for improved operational performance. But accreditation is voluntary and the incentives mainly indirect (meaning improved building star-rating, marketability and energy savings) rather than being a direct financial incentive like that implemented via Local Law 97 in New York City or via London Plan Policy SI 2.

Embodied and whole life carbon
While South Africa does not have a single, mandated national standard for WLCA, the Royal Institution of Chartered Surveyors' Professional Standard on Whole Life Carbon Assessment for the Built Environment (RICS PS 2nd edition) is globally applicable and the GBCSA Green Star rating system references it as best practice. (Thought the explicit and systematic alignment with RICS PS is less formalized than in London).

In the absence of any policy-led mandate for WLCA, the GBCSA Green Star rating system provides a voluntary system that is increasing the rate of uptake of WLCA in Cape Town. While the rates are not readily available, several notable projects are leading uptake and there is reportedly strong growth in scheme adoption, particularly among large commercial developments. However, there is no established performance floor for embodied or whole life carbon, meaning emissions from materials and construction remain unregulated at the building level.

04. Pilot cities
London, UK

Several industry- and policy-led initiatives drive WLC process uptake in London. However, in contrast to cities like Paris, there is no single overarching national mandate driving comprehensive WLC process uptake. Rather, there are multiple policies and guidance instruments at different levels, which may lead to confusion among practitioners. Some of the most mature apply only at the city level, creating a disparity in the implementation of WLC processes between London and many other UK cities. There is a notable absence of a performance floor (meaning enforceable limits) for a building's embodied carbon, meaning these emissions are effectively unregulated.



Operational energy and carbon
Building Regulations Part L (which uses energy performance certificates – or EPCs[16] – to report operational energy efficiency) provide an effective operational performance floor at the national level in the UK. However, this is a prescriptive or code-compliance-based approach. Studies show that EPC ratings are not closely related to the actual energy performance of buildings.[17]

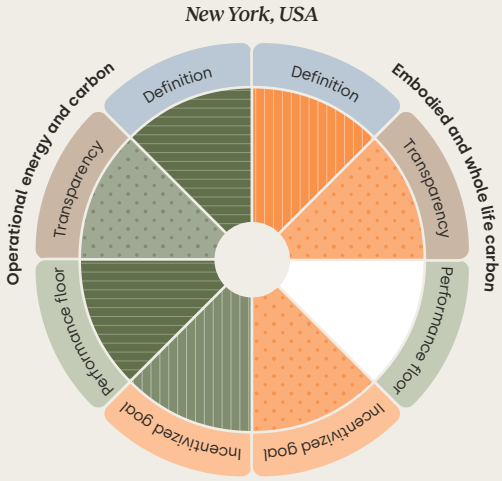
London Plan Policy SI 2 requires performance-based operational carbon assessment – grounded in the Greater London Authority (GLA) Energy Assessment Guidance – with NABERS UK in-use performance verification specifically mandated for new offices. NABERS UK and Building Research Establishment Environmental Assessment Method (BREEAM) – both industry-led green building certification schemes – are voluntary but include credits for performance-based operational carbon assessments and therefore provide an incentive for improved operational performance. London Plan Policy SI 2 also requires major developments to achieve net zero operational carbon, with any residual emissions offset through a contribution to a borough-managed Carbon Offset Fund, typically around £95 (USD $125) per metric ton of emissions (though the exact rate is set locally).

Embodied and whole life carbon
The Royal Institution of Chartered Surveyors' Professional Standard for Whole Life Carbon Assessment in the Built Environment (RICS PS 2nd edition), developed in London, has become the de facto guidance for WLCA in many other cities. It provides a clear and consistent way of measuring embodied and whole life carbon for buildings and infrastructure. UK national policy has yet to formally endorse it, but GLA Whole Life-Cycle Carbon Assessment Guidance does explicitly align with and reference RICS PS.

London Plan Policy SI 2 is driving the uptake of WLCA in the city, but the policy currently only requires the undertaking of WLCAs for referable, meaning large, developments. Other similar policies exist, led by local authorities outside London (such as the Bath and North East Somerset Council), but uptake across the UK is generally limited. The Building Regulations: Part Z initiative aims to address this policy gap by establishing a performance floor for the upfront carbon of major developments. However, the government has not yet adopted it.

04. Pilot cities
New York, USA

New York City's Local Law 97 is one of the strongest incentives for operational carbon reduction of the cities in this report, applying a financial penalty to covered buildings exceeding operational carbon limits. Regarding embodied and whole life carbon, the city is yet to establish a performance floor but is beginning to require WLCAs for city-owned projects.



Operational energy and carbon
New York City's Energy Conservation Code (NYCECC) and Local Law 85 establish an operational performance floor that applies to new and renovated buildings. The code is primarily prescriptive but with the option to demonstrate compliance through performance-based modelling.

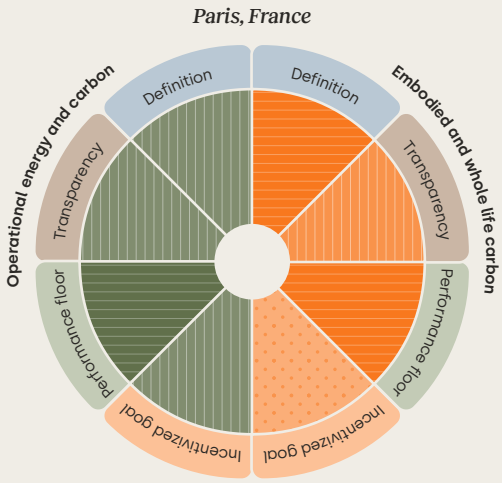
New York City's Local Law 97 mandates annual disclosure of operational carbon for major developments (depending on size, generally ≥ 2,300m² or ≥ 25,000 ft²) and incentivizes improved operational performance through penalties of around USD $268 per metric ton of carbon emissions emitted above the limit. This is one of the strongest incentives observed in the pilot cities in this report, as it is a direct financial incentive. Other incentive structures tend to be indirect (such as improving the building's marketability) or set a relatively low price for carbon emissions.

Embodied and whole life carbon
Industry still primarily leads embodied and whole life carbon practices in New York, with accreditation schemes like LEED providing credits for upfront carbon assessments of major building elements, including superstructure and façade. The New York City Mayor's Executive Order 23, implemented at the city level in 2022, also mandates the undertaking of WLCAs for certain city-owned capital projects, while Executive Order 22 (EO22), which the government has yet to fully implement,[18] would apply similar requirements at the state level.

Similar to other cities in the report (except for Paris) there is effectively no performance floor for embodied carbon in New York at the building level. However, the New York State and City Buy Clean initiatives, which set mandatory limits for the embodied carbon of concrete and steel on some public projects, is an example of policy developments designed to limit embodied carbon at the product or material level as opposed to the building level, signaling a pathway toward embodied carbon regulation.

04. Pilot cities
Paris, France

Paris exhibits a high level of WLC process implementation, with France's RE2020 Regulation[19] driving the widespread adoption of WLC measurement and reduction nationally. It is the only city in this report to establish a performance floor for the embodied and whole life carbon of buildings. It does this for a wide scope, including housing, offices, schools, hotels, retail buildings and gyms.

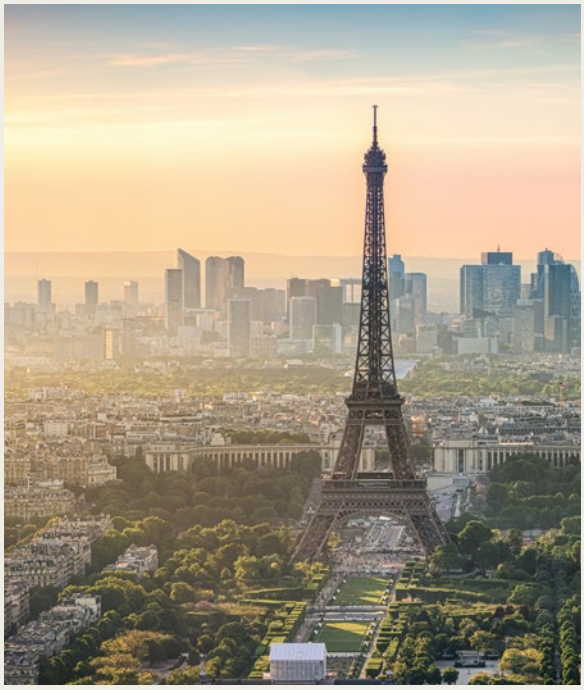


Operational energy and carbon
France's RE2020 Regulation provides an operational carbon definition, mandates transparency and sets a performance-based (rather than prescriptive) performance floor for the operational carbon of buildings. Industry-led initiatives, such as the leading French multi-criteria certification for the environmental performance of buildings (HQE Bâtiment Durable), provide incentives for improved operational performance.

Embodied and whole life carbon
Its RE2020 Regulation also includes requirements for embodied and whole life carbon. It defines the standards for measuring and reporting WLC, which includes adopting a dynamic life-cycle assessment approach for the quantification of biogenic carbon from bio-based materials like timber. This dynamic LCA approach accounts for the global warming potential impacts of temporary carbon storage in bio-based materials, in contrast to the static or -1/+1 approaches typically adopted elsewhere, which generally do not account for the time biogenic carbon spent out of the atmosphere.

Complementing the WLC performance floor set by the regulation, the country's environmental performance of buildings certification also provides indirect incentives (like increased asset value) for improved WLC performance. Reflecting the high level of WLC policy and initiative implementation, France is also the country with the greatest number of product-level EPDs in OneClick LCA, which provides the basis for detailed and regionally relevant building WLCAs. The INIES database – the French national reference for environmental and health data on construction products and equipment – is the main repository for this embodied carbon data.

At the wider regional level, the European Energy Performance for Buildings Directive (EPBD) will introduce an EU framework for life-cycle GWP of new buildings, using the Level(s) framework and EN 15978 standard. It will make GWP calculation mandatory for new buildings above 1000m² from 2028 and for all new buildings by 2030, with roadmaps for limit values from 2030. This will effectively supersede city-by-city and country-by-country experimentation within the EU.



04. Pilot cities
Shanghai, China

Shanghai has several policies and standards covering WLC processes, with notably stronger requirements than China more widely, as is observed for other major urban centres such as London. It has a mandatory code that establishes baseline requirements for energy performance in new buildings and retrofits, including some references to carbon emissions. Its national green building rating systems provide an incentive for improved operational and WLC performance via a voluntary star-rating system. And regulations at the city level require energy performance assessment for new civil[20] buildings and include carbon-related indicators, among others.

Operational energy and carbon
GB 55015-2021 is China's mandatory code for building energy efficiency, establishing baseline requirements for energy performance in new buildings and retrofits, with emerging references to carbon emissions. It establishes an operational performance floor for new buildings and refurbishments.

GB/T 50378-2019 (for new buildings) and GB/T 51141-2015 (for refurbishments) are the national green building rating systems, including requirements for measurement of operational energy as part of a broader sustainability scope. They assign star ratings (up to a maximum of 3 stars) as an incentive for improved performance.

While these national standards are voluntary, Shanghai's Green Building Regulations require most new civil buildings to achieve at least a 1-star rating, with larger public buildings and many government projects required to achieve 3-star ratings.

Embodied and whole life carbon
GB/T 51366-2019 is the Chinese national standard for embodied and WLC assessment in the construction sector. It provides calculation methods and emissions factors for each phase of a building's life cycle.[21] This standard does not require the explicit modular reporting of upfront (modules A1-A5) or whole life carbon (modules A-C) comparable to European Standard EN 15978-based LCAs. It includes operational carbon, construction, demolition, material production and transport, which can be broadly mapped onto LCA modules A1-A5, B6 and C1 in EN 15978. GB 55015-2021 introduces requirements for considering and analyzing carbon emissions during design but does not mandate a standardized WLCA or reporting framework.

China's national green building certification standards (such as GB/T 50378-2019) are generally voluntary at the national level. However, Shanghai's localized implementation standard for green buildings – DG/TJ 08-2090-2024 – adapts and tightens requirements for the city. New civil buildings in Shanghai are required to achieve at least a 1-star green building level and to meet certain preconditions. At the mandatory level, the standard refers to life-cycle carbon intensity indicators but does not prescribe a standardized calculation methodology or reporting structure.

However, it awards bonus credits for carrying out carbon emissions calculations, referencing GB/T 51366. Furthermore, the growing number of China-specific EPDs and the use of tools such as PKPM (the dominant building design and analysis software suite in China) and GB-SWARE (China's official green-building and energy-efficiency compliance software platform), tailored to the Chinese market, indicate increasing industry capacity for WLCA.

Conclusion
and next steps

05.

05. Conclusion and next steps

This report sets out a criteria-based approach for assessing WLC policy applications at the city level. It enables consistent comparison across city policies and initiatives, identifies good practice as well as gaps in current approaches, and highlights opportunities to accelerate progress.

The criteria-based framework suggests what the maximum implementation of WLC policies could look like, facilitating consistent assessment of their implementation for buildings in different cities. It captures the many policies and initiatives that can apply within a city and highlights their application mechanism, scope and effectiveness.

Six pilot cities – Bogotá (Colombia), Cape Town (South Africa), London (UK), New York (USA), Paris (France) and Shanghai (China) – were used to illustrate the application of these criteria to understand the current state and to identify potential areas for further implementation. They demonstrate that the criteria are widely applicable, answerable, and instructive by highlighting important differences between policies and initiatives driving WLC process implementation and therefore ways in which local policies could accelerate such processes.

They detail the significant progress being made to advance WLC process adoption but show that there is still more to be done to roll out WLC best practices more widely and consistently. Many cities have established operational carbon or energy definitions, require the disclosure of operational performance, and set operational performance floors. They are also applying embodied and whole life carbon definitions, with some cities requiring the disclosure of embodied and whole life carbon. Less common, but emerging, are established performance floors for embodied carbon, as well as strong (direct financial) incentives for improved operational and WLC performance.

France's RE2020 Regulation – which sets a performance floor for WLC – and New York's Local Law 97 and London Plan Policy SI 2 – which provide direct financial penalties for exceeding operational carbon limits – demonstrate both in practice. They have been effective at forcing the building construction industry to reduce its carbon footprint[22] and signal a potential path forward for others to follow.

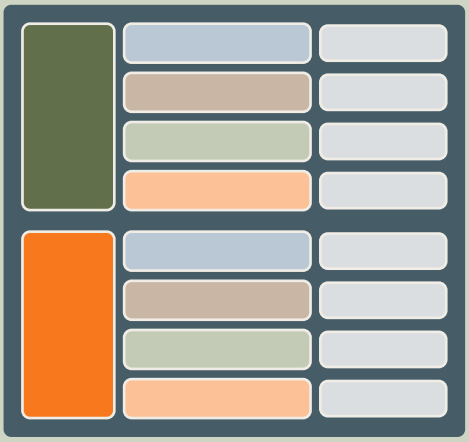
The next steps are to:

1. **Share** this framework with industry,[23] policymakers, municipalities, planners and developers to gather and address feedback on its effectiveness and utility.
2. **Apply** it to other cities to develop a truly global picture of the status of policies and initiatives driving WLC processes. We encourage you to use the framework to assess these in your own cities and to use the pilot city examples to understand what best practice looks like elsewhere. Applying the framework can enhance dialogue between public and private sector organizations about how to advance WLC process adoption and drive reductions in GHG emissions from the buildings sector.
3. **Update** it as WLC process policies and initiatives are changing rapidly, driving a need to periodically adapt the assessments to reflect progress. These updates will provide a way to track, share and celebrate progress on WLC process adoption globally.

Glossary of terms

Term/abbreviation	Meaning
ASHRAE/ICC Standard 240P	Proposed joint standard from ASHRAE and the International Code Council (ICC) titled Quantification of Life Cycle Greenhouse Gas Emissions of Buildings
BECD	Built Environment Carbon Database
BREEAM	Building Research Establishment Environmental Assessment Method, a sustainability assessment method for master planning projects, infrastructure, and buildings
DG/TJ 08-2090-2024	Shanghai Municipal Green Building Evaluation Standard
EPC	Energy Performance Certificate
EPD	Environmental Product Declaration
GB 55015-2021	China's General Code for Building Energy Efficiency and Renewable Energy Utilization
GB/T 50378-2019	The latest Chinese National Standard For Green Building Assessment
GB/T 51141-2015	The latest Chinese Assessment Standard for Green Retrofit of Existing Buildings
GB/T 51366-2019	Chinese National Standard for Building Carbon Emission Calculation
GBCSA	Green Building Council South Africa
GHG	Greenhouse gas
GLA	Greater London Authority
GB-SWARE	China's official green building and energy-efficiency compliance software platform
INIES	The French national, public access repository for environmental and health data on construction products and equipment
LCA	Life-cycle assessment (or analysis)
LEED	Leadership in Energy and Environmental Design (LEED) is a widely used green building rating system developed by the U.S. Green Building Council
MTAA	Market Transformation Action Agenda
NABERS	National Australian Built Environment Rating System, a performance-based framework that measures the environmental sustainability of buildings
NYCECC	New York City Energy Conservation Code
PKPM	The dominant building design and analysis software suite in China
RICS PS	Royal Institution of Chartered Surveyors' (RICS) Professional Standard on Whole Life Carbon Assessment for the Built Environment (2nd edition)
SANS 10400-XA	South African National Standard that mandates energy efficiency regulations for new buildings and significant renovations
UNEP	United Nations Environment Programme
WBCSD	World Business Council for Sustainable Development
WLC	Whole life carbon
WLCA	Whole life carbon assessment

Appendix A
Criteria-Based Assessment Framework



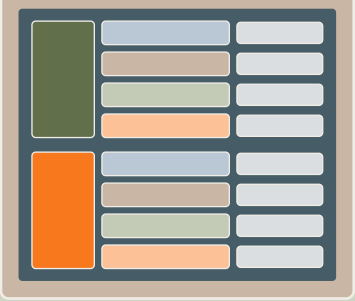
Download the assessment framework template here:

Download

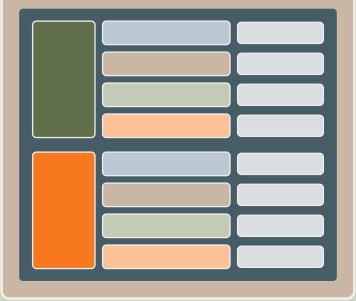
Appendix B
City Assessments

Download the pilot city assessments here:

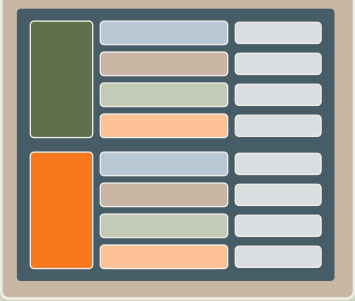
Bogotá, Colombia



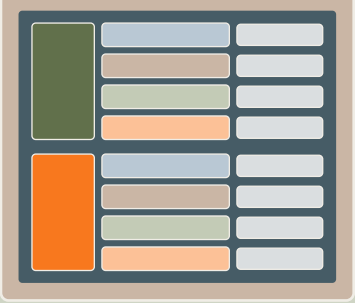
Cape Town, South Africa



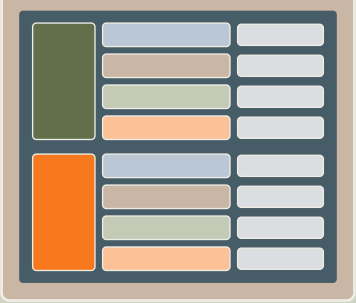
London, UK



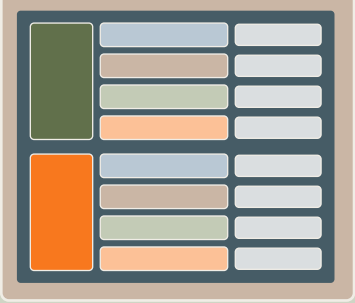
New York, USA



Paris, France



Shanghai, China



Endnotes

1 Figures from United Nations Environment Programme (UNEP), 2024. Retrieved from: Global Status Report for Buildings and Construction: Beyond foundations: Mainstreaming sustainable solutions to cut emissions from the buildings sector

2 World Meteorological Organization (WMO), 2025. Retrieved from: WMO confirms 2024 as warmest year on record at about 1.55°C above pre-industrial level

3 WBCSD, 2025. Retrieved from: Driving The Ambition Loop: A stocktake on critical levers for net zero transformation in the built environment

4 United Nations Environment Programme, 2024. Retrieved from: Global Status Report for Buildings and Construction: Beyond foundations: Mainstreaming sustainable solutions to cut emissions from the buildings sector

5 United Nations Environment Programme, 2023. Retrieved from: Building Materials and the Climate: Constructing a New Future. Chapter 2: Life-cycle thinking – Decarbonisation Requires a Whole Life-Cycle Approach

6 Luo, X., Lin, G., Wan, Q., Jin, G.; Journal of Cleaner Production, Vol. 428; 2023. Retrieved from: Inspiration or perspiration: Diffusion of China's low-carbon city pilot policies nationwide

Mara Prestes, O., Ultramari, C., Domingues Caetano, F.; Case Studies on Transport Policy. Vol. 10, issue 1, pp. 700-709, 2022. Retrieved from: Public transport innovation and transfer of BRT ideas: Curitiba, Brazil as a reference model

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9 Royal Institution of Chartered Surveyors (RICS), 2023. Retrieved from: Whole life carbon assessment (WLCA) for the built environment

10 Figure source: WBCSD & Arup, 2021. Retrieved from: Net-zero buildings: Where do we stand?

11 Turley, 2024. Retrieved from: Embodied carbon: the untold story

12 United Nations Environment Programme, 2023. Retrieved from: Building Materials and the Climate: Constructing a New Future. Chapter 2: Life-cycle thinking – Decarbonisation Requires a Whole Life-Cycle Approach

13 WBCSD, 2025. Retrieved from: Achieving net-zero buildings – An action plan for market transformation

14 NetZero Pathfinders, 2023. Retrieved from: Emissions Thresholds on Building Materials: France

15 Part Z. Retrieved from: Construction industry leaders call on new Labour Government to introduce embodied carbon regulation

16 Part L sets a performance floor via Standard Assessment Procedure (SAP)/Simplified Building Energy Model (SBEM)-based compliance metrics, with EPCs used for disclosure.

17 Few, J. et al.; Energy and Buildings, Vol. 228; 2023. Retrieved from: The over-prediction of energy use by EPCs in Great Britain: A comparison of EPC-modelled and metered primary energy use intensity

Jones Lang LaSalle; A Tale of Two Buildings; 2012. Retrieved from: Are Energy Performance Certificates (EPCs) a true indicator of energy efficiency?

18 Phase 1 of EO22 involves the Buy Clean initiatives for key materials like concrete, steel and asphalt. Subsequent phases will incorporate strategies to further reduce embodied carbon, such as requiring WLCAs for decision-making during design and procurement.

19 RE2020 is the specific environmental regulation for all new construction in France that came into effect in 2022. It translates the high-level goals of the Climate and Resilience Law (Loi Climat et Résilience) into concrete, mandatory requirements for the building industry.

20 In this context, civil buildings means most typical urban buildings, such as residential, commercial and public buildings used by people, as opposed to industrial buildings used for manufacturing or industrial production.

21 International Energy Agency (IEA), 2021. Retrieved from: National Standard for Building Carbon Emission Calculation GB/T51366-2019

22 Stora Enso, 2023. Retrieved from: French laws are decarbonising the building sector – could they provide a way forward internationally?

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23 Including C40 Cities, World Green Building Council and others.

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Finally, we wish to acknowledge the many individuals and organizations behind the implementation of whole life carbon processes in cities worldwide. These are the real leaders driving change – working to overcome the most critical barriers to market transformation. Their efforts form the backbone of this agenda and inspire the collective ambition to accelerate progress toward a net-zero built environment.

Disclaimer

This report is released in the name of WBCSD. Like other reports, it is the result of collaborative efforts by WBCSD staff and experts from member companies. WBCSD's Built Environment pathway participants reviewed drafts, ensuring that the document broadly represents the majority of pathway members' views. It does not mean, however, that every member company of WBCSD agrees with every word. Please note that the data published in the report are as of 09 April 2026.

Acknowledgements

About Arup

Arup is a sustainable development consultancy providing services in management, planning, design, and engineering. As a global firm we draw on the skills of nearly 20,000 consultants across the world. Our reputation in striving to continually develop innovative tools and techniques shared with industry, is founded on the people, expertise, processes engaged in delivering holistic solutions for clients.

Our work is shaped by our mission statement, to shape a better world, and in 2020 we revised our global strategy to put sustainable development at the heart of everything we do. Arup has committed to undertake lifecycle carbon assessments on its building projects globally and align its ambitions with the UN 2030 Breakthrough Outcomes, which state: all new and refurbished buildings should be both net-zero in operation and achieve at least a 40% reduction in embodied carbon by 2030.

In addition to its project aims, Arup has committed to achieving net-zero emissions across its entire operation by 2030, covering everything from the energy used in offices to goods and services purchased. To achieve this the firm has set a target to reduce its scope 1, 2 and 3 global greenhouse gas (GHG) emissions by 30% by 2025 from a 2018 baseline.

We are Race to Zero signatories and founding signatories of UK Architects and Engineers Declare Climate and Biodiversity Emergency.

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About WBCSD

The World Business Council for Sustainable Development (WBCSD) is a global community of over 220 of the world's leading businesses, representing a combined revenue of more than USD $8.5 trillion and 19 million employees. Together, we transform the systems we work in to limit the impact of the climate crisis, restore nature, and tackle inequality.

We accelerate value chain transformation across key sectors and reshape the financial system to reward sustainable leadership and action through a lower cost of capital. Through the exchange of best practices, improving performance, accessing education, forming partnerships, and shaping the policy agenda, we drive progress in businesses and sharpen the accountability of their performance.

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