IMPLEMENTATION GUIDE

Global harmonisation of whole life carbon assessments

March 2024

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Forewords

‘There is a compelling need for countries around the world to adopt a harmonised approach to whole life carbon assessments; this guide, as part of our suite of resources, details how implementation of the RICS WLCA standard can achieve this much-needed consistency of approach.

I am proud to say that the RICS standard is positioned to become the world-leading standard for carbon measurement in the built environment, and I’d like to thank the team involved in this project for their hard work and dedication to helping future-proof the industry.’

Tina Paillet FRICS
CEO and Co-Founder of Circotrade, and RICS President 2024

‘Designed to ensure consistency in GHG emissions calculations, the WLCA standard is an important step forward. It will lead to more accurate evaluation and reporting of life cycle emissions for buildings and infrastructure. This standard opens the path for a data flow from industrial products, through the design and construction phases, to handover documentation for asset owners and maintenance.’

Frank Hovorka MRICS
RICS Board Member and Sustainability Chair

‘The Buildings Breakthrough is a key initiative to accelerate the decarbonisation of the built environment. Harmonised measurement of progress made in reducing the whole life carbon emissions associated with buildings through decarbonisation and retrofit is an essential part of the process. The RICS WLCA standard 2nd edition provides a proven and robust basis for national harmonisation of measurement standards.’

Simon Rawlinson
Partner at Arcadis, and RICS Knowledge and Practice Committee Chair

1 Introduction

The urgency to address greenhouse gas (GHG) emissions from buildings is driven by the sector's significant climate impact and deviation from the 2050 net-zero trajectory, as global emissions have increased by 1% annually since 2015. In December 2023, the Buildings Breakthrough was introduced under the umbrella of the Breakthrough Agenda. It is a collaborative effort co-led by the governments of France and Morocco, and hosted by the Global Alliance for Buildings and Construction (GlobalABC), for nations, businesses and civil society to reduce building and construction emissions.

The Breakthrough Agenda aims to make 'near-zero emission and resilient buildings a new normal in all regions by 2030'. Five key recommendations are provided in the 2023 report to meet this lofty goal. These recommendations rely on consistent and reliable estimates of carbon emissions. In particular, recommendation B1 urges the sector to harmonise key definitions and assessment methodologies, and align certification schemes for near-zero emission and resilient buildings.

A **harmonised framework for whole life carbon assessment** (WLCA; see section 2 for details) paves the way for **precise reporting, reliable comparisons and fair target-setting**. It also guides financial decisions, attracts investors and can provide a model for the harmonisation of resilience frameworks, all while considering local climate conditions and construction practices. The other broad benefits of harmonisation are:

- **GHG reporting at the organisational level**: reporting accuracy improves with more precise distinctions between scope 1, 2 and 3 emissions, and the accurate apportioning of building and infrastructure assets' carbon emissions. (Direct emissions from organisation-controlled sources are called scope 1, indirect emissions from purchased energy or electricity are scope 2 and broader indirect emissions from the value chain are scope 3.)
- **Consistency in benchmarking**: standardised WLCAs allow comparable assessments across assets, their elements and life cycle stages, and reduce the administrative burden for actors that operate internationally. Results that are accessible and comparable across projects and countries simplify investment decisions.
- **Establishing baselines and carbon budgets**: accurate benchmarks allow the definition of limits and targets for different asset and project types to inform planning, building regulations and other relevant policies.
- **Integration with data and software**: A harmonised framework for WLCA drives the alignment of digital tools used to perform, report and analyse the assessments.

The second edition of the RICS professional standard Whole life carbon assessment for the built environment (referred to here as the **RICS WLCA standard**) is the most detailed and comprehensive methodology yet developed to assess emissions associated with the construction, use and disposal of buildings and infrastructure.

This document shows how the RICS WLCA standard can guide the development of a global harmonisation framework for WLCA, so that recommendation B1 of the Breakthrough Agenda is achieved.

2 What is a whole life carbon assessment?

Buildings and their supporting infrastructure produce human-generated GHG emissions during their construction, use and end-of-life phases, as well as when the construction products that go into them are manufactured. The climate change impacts of these emissions are measured in terms of their **global warming potential (GWP)** expressed in units of CO_2 equivalent (CO_2e), which is often interchangeably called 'carbon emissions' or 'carbon'.

Whole life carbon (WLC) is the sum of all GHG emissions and removals associated with an asset throughout its life cycle, including potential benefits and loads occurring after disposal (such as carbon savings due to reuse of materials). WLC is divided into embodied, operational and user carbon.

- **Embodied carbon** emissions relate to materials and construction processes. Embodied emissions are split into upfront, in-use and end-of-life, which is useful for carbon management.
- **Operational carbon** is emissions from all energy use, as well as from water supply and wastewater treatment, during the time an asset is in use.
- **User carbon** emissions are from users of a building or infrastructure, excluding the energy and water used to operate the asset. User carbon includes, for example, the emissions generated from workers commuting to an office building, or for a road infrastructure project, the emissions of the vehicles that use the road when it has been built.

A **whole life carbon assessment (WLCA)** is a process used to calculate and report estimated WLC. Figure 1 illustrates the product and asset life cycle stages used for a WLCA.

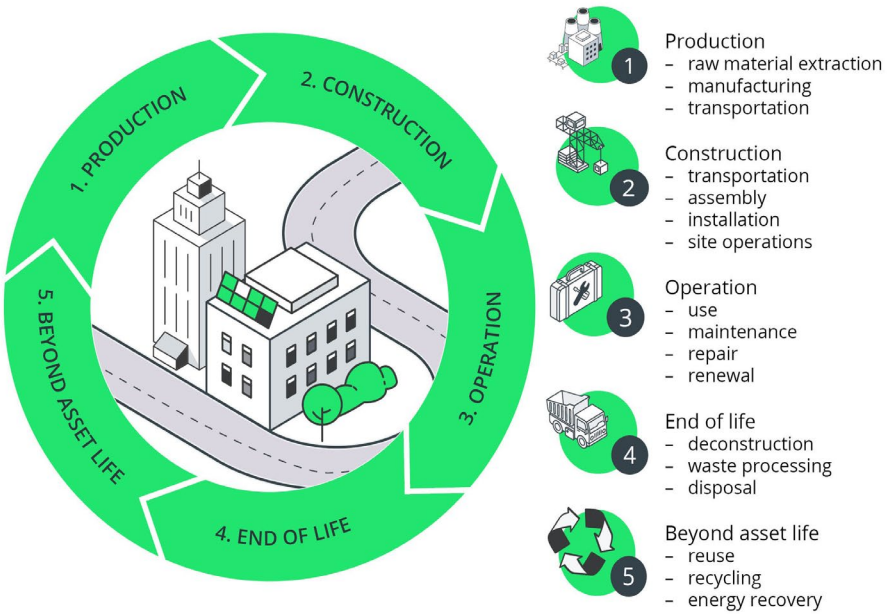

Figure 1: Product and asset life cycle for a WLCA

The WLCA must follow a methodical and systematic process, which is defined in the RICS WLCA standard. This process is streamlined by using information modules to structure information, calculations and reporting, and to connect the product and asset life cycle stages to the assessment.

Figure 2 shows the modular structure used in the RICS WLCA standard, which expands upon established environmental performance standards.

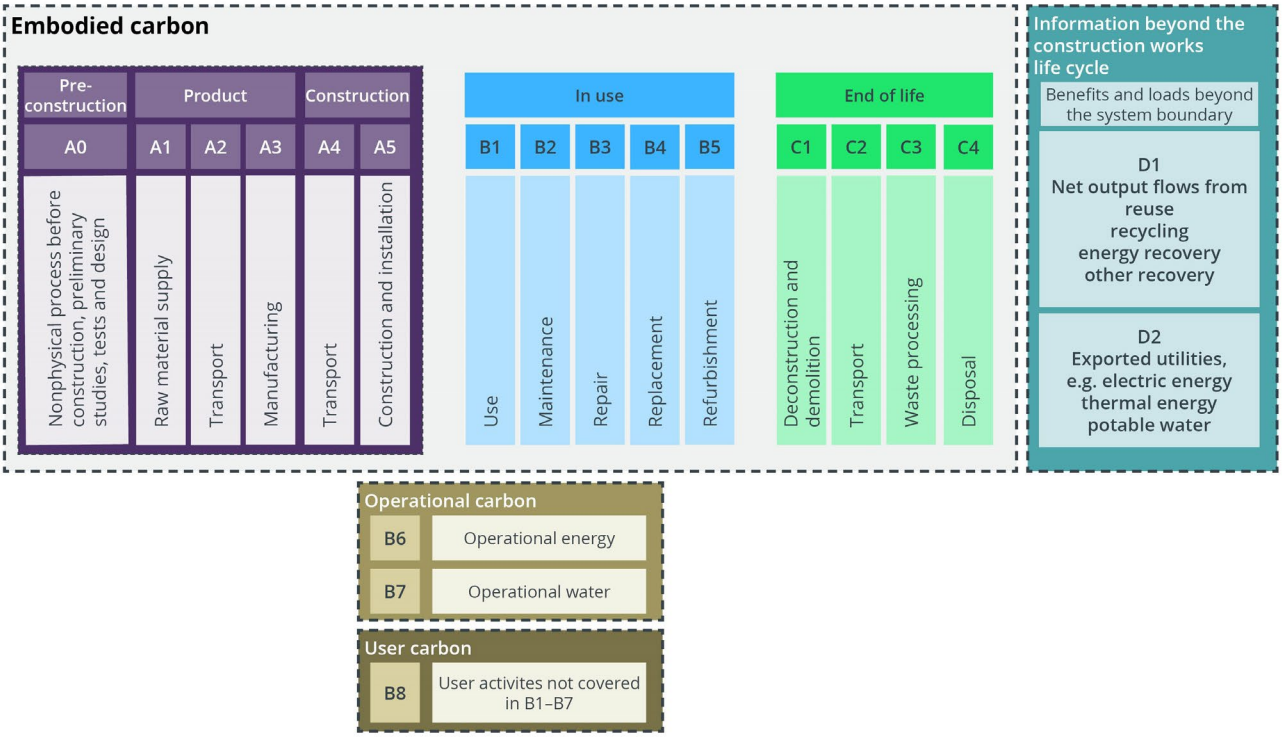

Figure 2: Modular structure of a WLCA

3 How to perform a WLCA

The steps needed to complete an assessment are shown in Figure 3.

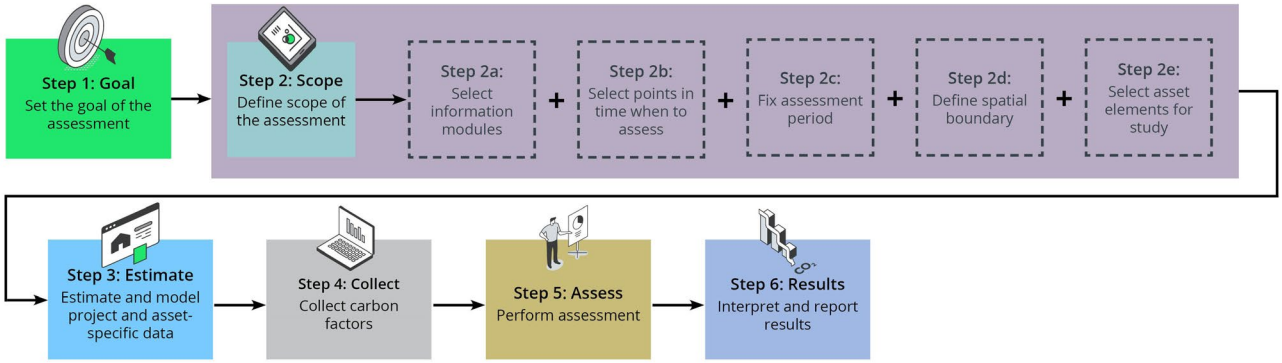

Figure 3: Steps needed for a WLCA

Establish the goal (step 1): the specific reason for conducting the WLCA affects key decisions in the next steps. For example, an assessment could be conducted at the design stage to compare design options, or at post-completion to check compliance against regulations. While both follow the same procedure, the choice of input data and the interpretation of the results differ significantly. Typical goals of a WLCA are:

- compare design options and products or materials
- make end-of-life decisions
- identify the most significant emissions contributors
- comply with regulations
- document environmental performance
- achieve green building rating certification
- develop a retrofit plan for existing assets and
- calculate the carbon footprint for a portfolio of assets for organisation-level reporting.

Define the scope of the assessment (step 2): the assessment's scope is defined by selecting:

- the information modules to be assessed
- when to do the assessment
- the assessment period (called the reference study period (RSP))
- the spatial boundary of the asset, and
- the asset elements (construction materials, products, components, systems and subsystems) to be assessed.

The definition of the WLCA's boundaries is greatly affected by the assessment goal established in step 1.

Estimate and model project and asset-specific data (step 3): primary data from construction drawings, building information models (BIM) and other project information is used to calculate material quantities, construction activities, site operations, energy consumption, water consumption and water treatment over the entire life cycle of the asset.

Collect carbon factors (step 4): this is secondary data, usually non-asset-specific, used to convert the primary data gathered in step 3 into GHG emissions. It includes carbon intensity data (for example, the GWP of 1m^3 of ready-mix concrete, expressed in kilogrammes of CO_2 equivalent ($kgCO_2e$)) and other secondary or background data (such as country or region-specific emissions from transportation of construction products per unit of travelled distance).

Perform assessment (step 5): this is a series of calculations based on the primary and secondary data gathered in steps 3 and 4. It is typically done with the help of specialised software tools or spreadsheets. Depending on the goal of the assessment, several iterations may be performed, for example by considering different design options or conducting a sensitivity analysis.

Interpret and report the results (step 6): in this final step, the assessment results are organised into a clear format, reported to the involved parties and interpreted (analysed) in the context of the goal of the assessment, which was established in step 1.

4 Why is the RICS WLCA standard so important?

The quality of a WLCA largely depends on the methodology underpinning the calculations. Globally agreed high-level principles for this methodology have been set out in EN 15978. However, many details are not specified in EN 15978, and significant variations across WLCA results are attributable to inconsistencies in methodological choices.

For this reason, RICS undertook substantial work to produce the first edition of the WLCA standard in 2017, which addressed the lack of a consistent methodology to conduct WLCAs for buildings in a UK context. It was quickly adopted across UK industry as a national methodology, and as guidance in other parts of the world. Based on market response, in 2023 RICS developed the second edition of the WLCA standard to expand on its scope and level of detail, and extend its use to a global audience. It now includes all types of buildings and infrastructure assets, covering new construction, retrofits, masterplans and fit-outs.

The strength of the RICS WLCA standard is based on the following features.

- **Methodological consistency**: describes a consistent process for conducting WLCAs, including guidance on assumptions and data choices, so that WLCA results are reliable and comparable.
- **Comprehensiveness and modularity**: expands on the life cycle modules introduced by EN 15978 to better cover and differentiate between sources of carbon emissions.
- **Process integration**: provides guidance on integrating WLCAs into design, construction, operation and end-of-life processes as a core decision-making and feedback tool.
- **Alignment with cost planning**: is aligned with global life cycle cost management frameworks such as ICMS 3 and RICS NRM.
- **Consistency with carbon management**: works with the GHG Protocol and any carbon management framework.
- **Digital integration**: is compatible with standard information management processes, digital tools, carbon calculators and databases.
- **Holistic understanding**: provides a combined method to assess embodied and operational carbon together, helping to optimise overall carbon performance by comparing options and making evidence-based decisions for assets and portfolios.

5 Harmonising WLCAs

The Breakthrough Agenda emphasises the need for countries to adopt harmonised approaches to WLCAs as a core mission of the agenda. Harmonisation of assessments hinges on applying a consistent and comprehensive methodology for calculating emissions over an asset's life cycle. The RICS WLCA standard provides this methodology. Embedded in this methodology are seven dimensions that are instrumental in achieving harmonisation, shown in Figure 4.

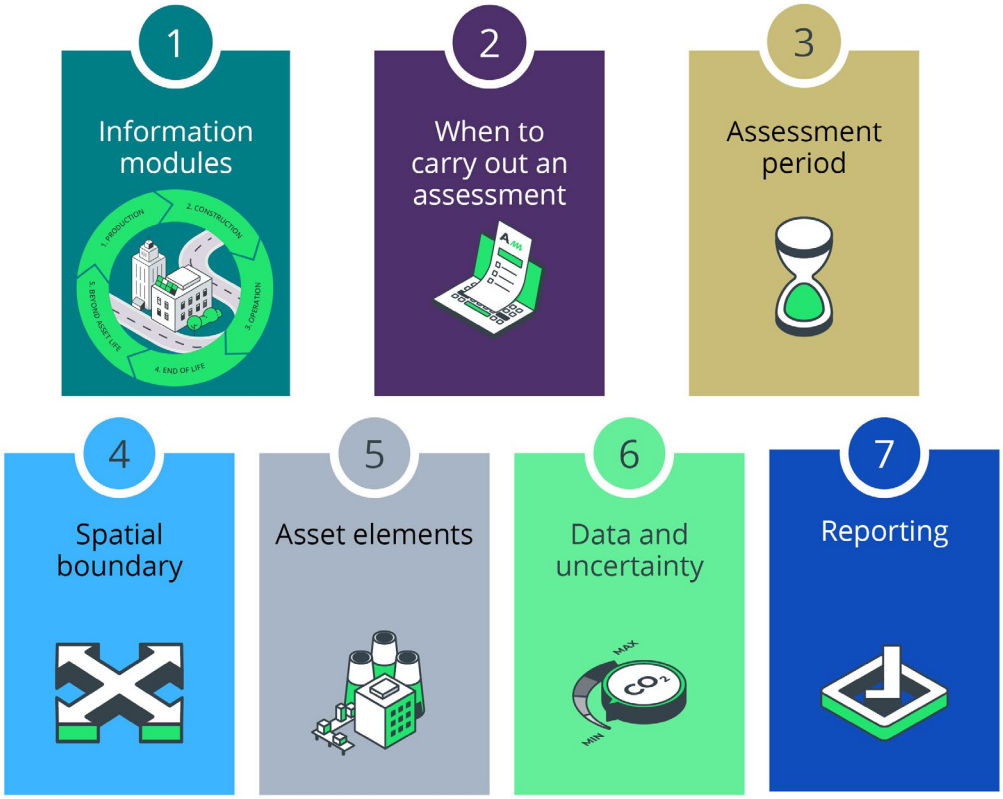

Figure 4: Global WLCA dimensions for harmonised WLCAs

Harmonisation can be achieved through consensus on these dimensions, coupled with their adoption and adaptation to reflect regional climate risks and local construction practices. This framework effectively balances comparability, allowing for spatial comparison of emissions estimates and representativity, ensuring that these estimates accurately account for regional climate risks and localised construction practices.

5.1 Information modules

The RICS WLCA standard expands the modular structure from established environmental performance standards such as EN 15978. The use of standardised modules ensures the reliability and consistency of the assessment. Dividing the asset life cycle into modules allows an assessment to focus only on some modules if needed (for instance, those related to operational carbon). In such cases, while the overall WLCA methodology is being followed, the resulting carbon emissions are only a share of the WLC of the asset.

Recommendation 1: Adopt the information modules and modular structure provided in the RICS WLCA standard at the national level. Provide additional guidance on their use and selection based on the goal and scope of the assessment.

5.2 When to carry out an assessment

WLCAs can be conducted at different points during a project development. These project phases are defined in the RICS WLCA standard to ensure consistency of assessments and provide criteria for data selection. The phases defined by the standard are concept design, technical design, construction and post-completion.

Recommendation 2: Define the project phases when assessments should be conducted. Map these to national and regional project phases, so assessors can follow global principles while remaining aligned with local construction practices.

5.3 Assessment period

The assessment period, known as the reference study period (RSP), is the period during which the time-dependent characteristics of the asset are evaluated. Establishing the RSP is essential for ensuring assessment consistency and achieving comparable results. The RSP is generally provided by national codes and standards, or is selected based on the assessment's objectives, regulatory requirements or national guidelines.

Recommendation 3: In countries with no published RSPs, adopt these from the RICS WLCA standard. In countries where RSPs differ from those in the standard, state this clearly. In such cases, national guidance on adjustment of calculated use stage emissions, and loads and benefits beyond the system boundary, should be published for comparison and benchmarking purposes.

5.4 Spatial boundary

The spatial boundary of the site must be clearly and consistently defined to encompass all activities related to the asset, including demolition, deconstruction, facilitating works and site preparation. Consistency in identifying the spatial boundary is important, in order to achieve uniform WLCA results. This may correspond to the property line in certain jurisdictions, and is generally guided by regulatory or national standards.

The RICS WCLA standard provides several illustrations and examples to help assessors determine the spatial boundary for an asset under study, considering demolition, new construction or interventions for existing assets.

Recommendation 4: Spatial boundaries for assessment should be aligned with the RICS WLCA standard and local regulatory requirements or national guidance. Adopt guidance on spatial boundaries from the RICS WLCA standard or publish national guidance on this dimension.

5.5 Asset elements

All assets comprise elements (construction materials, products, components, systems and subsystems) arranged in a hierarchy. The RICS WLCA standard provides an elemental breakdown of the asset to ensure consistency in calculating and reporting carbon emissions against these elements. Each asset consists of many parts, called element categories, forming level 1 of the breakdown. Each category consists of many elements at level 2, which consist of sub-elements at level 3. By standardising this breakdown and defining levels 1, 2 and 3, the RICS WLCA standard brings consistency to the assessment and helps assessors to calculate and report results at the summary level.

Recommendation 5: Use the elemental breakdown of assets in the RICS WLCA standard. To maintain alignment with local breakdown structures, map the local breakdown to the one provided in the standard to make assessments comparable nationally, regionally and globally.

5.6 Data and uncertainty

A WLCA uses several data types for the calculations. The quality of the asset-specific primary data (project quantities) can be improved by harmonising the first five dimensions described above. The availability and quality of secondary data (carbon factors), not under the direct control of the assessor and generally managed by national or regional economic or statistical organisations, have significant influence over the ability to conduct consistent and comparable assessments. National databases of secondary data – such as EPDs, decarbonisation factors, emissions associated with energy and water use, transportation-related emissions and waste factors – are required to support assessments.

The RICS WLCA standard provides criteria for selecting primary and secondary data appropriately, depending on the project phase and asset life cycle stage at which the WLCA is conducted. Appropriateness and quality of primary and secondary data should be incorporated into the assessment results through uncertainty modelling. The RICS WLCA standard lists the required data types by information module, and provides a method to account for uncertainty by using uplift factors in the WLCA results.

Recommendation 6: Develop strategies to increase the availability and quality of secondary data at the national level. Agree on criteria for appropriate data selection and an uncertainty model, as provided in the RICS WLCA standard.

5.7 Reporting

After completing an assessment, the results should be reported using a standardised reporting template. Without such a template, results are not comparable and benchmarking becomes difficult. The RICS WLCA standard provides templates for reporting the results of an assessment, sets minimum reporting requirements and specifies reporting units of measurement for embodied, operational and user carbon.

Recommendation 7: Adopt the reporting template provided by the RICS WLCA standard, starting with basic level of elemental breakdown, and develop maps to connect these templates to national or jurisdiction-specific reporting templates (such as reporting templates needed for planning or permit applications).

5.8 Recommendation summary

Details of these seven dimensions should be agreed through international collaboration, and aligned with definitions and assessment methodologies for near-zero emission and resilient buildings. In countries where standards and codes already exist, the harmonisation framework can be used to identify and reconcile existing differences, so that local practice can continue to be followed while results can be reported and used globally. In countries where WLCA policy and practice are not yet developed, the harmonisation framework can provide the basis for the creation of local standards and can guide the provision of secondary data. Given that WLCAs are central to decarbonisation policy, this robust framework can significantly aid these countries in creating an effective carbon measurement, comparison and benchmarking system.

RICS is committed to providing additional resources to make the implementation of the WLCA standard as straightforward as possible.

- *RICS National playbook for implementing whole life carbon assessments* and *RICS Capacity building framework for implementing whole life carbon assessments* are both available from the RICS WLCA standard web page.
- RICS is producing training products such as the Global Introduction to Whole Life Carbon Assessment - 3 Part Series and Certificate in Whole Life Carbon Assessment Training Programme.

6 Next steps

Global emissions from the sector are not reducing at the pace needed to meet sectoral targets. Action is needed to increase the pace of whole life carbon avoidance and reduction. The Buildings Breakthrough initiative challenges the sector to develop a harmonised WLCA framework. To fully achieve harmonisation, RICS recommends:

- developing internationally-agreed definitions and nomenclature for near-zero emission and resilient buildings that work for new and existing assets, and
- aligning and integrating the RICS WLCA standard with a harmonised framework to assess resiliency and circularity, highlighting their interconnectedness.

As international collaboration progresses towards harmonisation, individual countries should implement the following actions to embed WLCA-based decarbonisation into their policy.

- Establish a national carbon emissions reporting platform that provides asset- and sub-asset-level benchmarks and a library of carbon factors. Use the data reporting structure developed by the Built Environment Carbon Database and ICMS 3.
- Deploy international platforms for data and knowledge sharing to ensure data is comparable across projects in different countries.
- Progressively make WLCA mandatory for all buildings (new-build and retrofit), beginning with public buildings and then moving to all buildings over a specific size.
- Set science-based national trajectories for building decarbonisation. Develop performance targets for embodied and operational carbon in line with these trajectories.
- Based on the performance targets, develop (or update) building codes and procurement regulations to deliver building decarbonisation.
- Establish a system to track progress against national decarbonisation trajectories, taking corrective action and periodically updating the performance targets.

To support such decarbonisation policies, countries should also:

- Promote the role of digitalisation (including artificial intelligence, building information modelling and digital twins) and interoperable and machine-readable data.
- Use existing collaborative frameworks such as GlobalABC to promote the sharing of best practices, benchmarks, secondary data, case studies with primary data and testimonials.
- Increase carbon literacy across all built environment professionals and practice areas. Highlight the role of all specialisms, especially quantity surveyors, cost consultants, construction managers, asset managers, building surveyors, financial managers and valuers.
- Policymakers need to work with industry to identify knowledge gaps and capacity building priorities.
- Identify a skills and competency framework for educational institutions and working professionals. International guidelines for education and training need to be developed.

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