Buildings Criteria - Background Paper

The Buildings Eligibility Criteria of the Climate Bonds Standard & Certification Scheme

Updated: September 2023

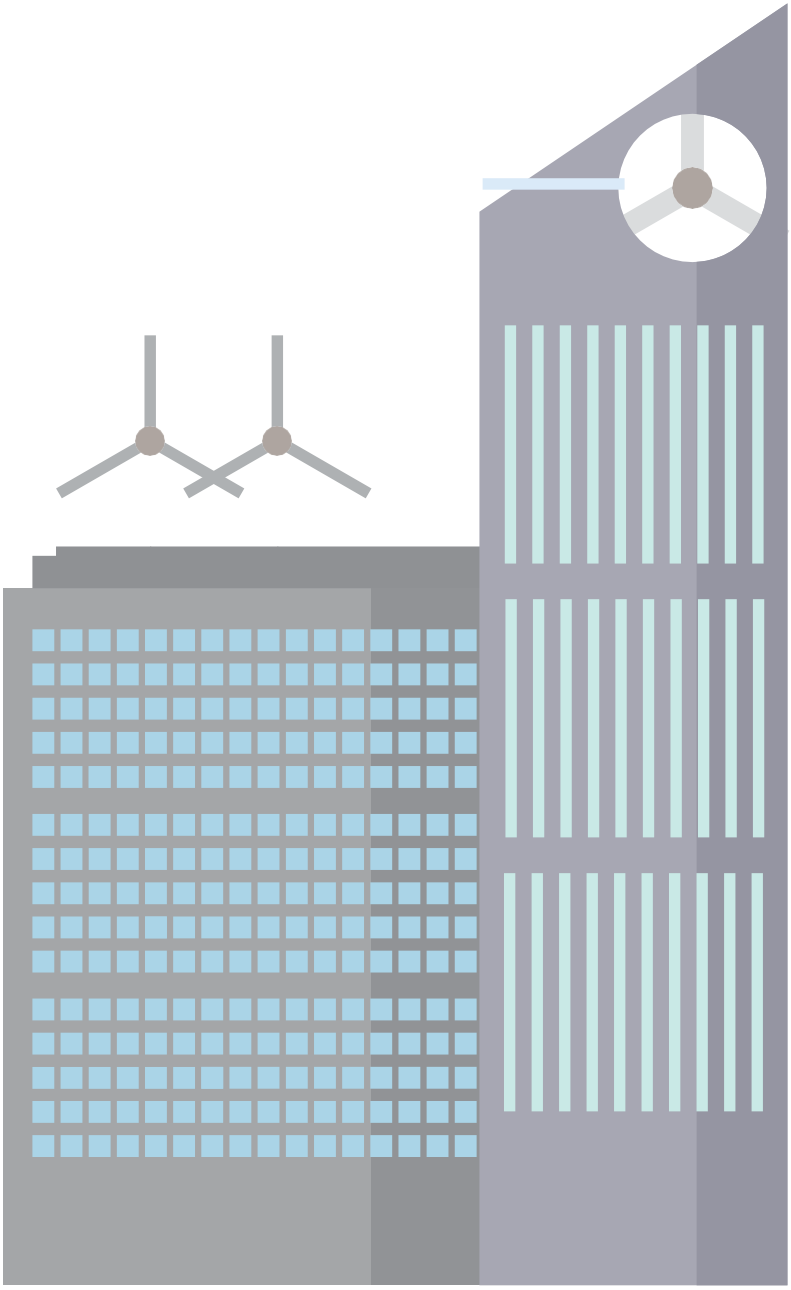
NOTE: These Criteria can be used to certify Use-of-Proceeds Instruments and Assets, and also in some circumstances, Sustainability-Linked Debt Instruments and Entities per the Climate Bonds Standard v4.0

Revision	Date	Summary of Changes
Rev. 2.1	September 2023	Issued for public review. Updates to New Buildings to include embodied carbon, GHG assessment rules and alignment with the EU Taxonomy and alignment with 1.5-degree pathway
Rev. 1.1	13 April 2023	Revisions to enable Entity Certification and SLD Certification in line with release of CBS v4.0
Rev. 1.0	July 2022	Final for Issuance

Acknowledgements

Climate Bonds gratefully acknowledges the Technical and Industry Working Group members who provided their time and expertise during the development of these Criteria. Members are listed in ***Appendix A: TWG and IWG members*** at the end of this document.

Special thanks are given to ***Ché Wall*** of Flux Consultants the lead specialist co-ordinating the development of the Criteria through the Technical Working Group.



Definitions

Applicant: The term or name for any potential bond issuer, or non-financial corporate entity that might seek certification under the Buildings Criteria.

Capital Expenditure (CAPEX): Funds used by a company to acquire, upgrade, and maintain physical assets such as property, plants, buildings, technology, or equipment.

Certified Entity: The entity or part thereof which is being certified under the Climate Bonds Standard. Currently, Entity Certification is limited to non-financial Entities or segregated segments thereof, for which the Climate Bonds Initiative has Climate Bonds Standard Sector Criteria for Entity Certification.

Climate Bonds Initiative (Climate Bonds): An investor focused not-for-profit organisation, promoting large-scale investments that will deliver a global low carbon and climate resilient economy. Climate Bonds seeks to develop mechanisms to better align the interests of investors, industry and government to catalyse investments at a speed and scale sufficient to avoid dangerous climate change.

Climate Bonds Standard (CBS): A screening tool for investors and governments that allows them to identify green bonds the proceeds of which are being used to deliver climate change solutions. This may be through climate mitigation impact and/or climate adaptation or resilience. The CBS is made up of two parts: the parent Climate Bonds Standard and a suite of sector specific eligibility Criteria. The parent standard covers the certification process and pre- and post-issuance requirements for all certified bonds, regardless of the nature of the capital projects. The Sector Criteria detail specific requirements for assets identified as falling under that specific sector. The latest version of the CBS is published on the Climate Bonds website.

Climate Bonds Standard Board (CBSB): A board of independent members that collectively represents $34 trillion of assets under management. The CBSB is responsible for approving (i) Revisions to the CBS, including the adoption of additional sector Criteria, (ii) Approved verifiers, and (iii) Applications for Certification of a bond under the CBS. The CBSB is constituted, appointed, and supported in line with the governance arrangements and processes as published on the Climate Bonds website.

Climate Bond Certification: allows the applicant to use the Climate Bond Certification Mark in relation to that bond. Climate Bond Certification is provided once the independent CBSB is satisfied the bond conforms with the CBS.

Commercial building: A building that is intended to generate a profit, either from capital gain or rental income. There are sub-categories of Commercial Buildings, including offices, shopping centres and hotels.

Critical interdependencies: The asset or activity's boundaries and interdependencies with surrounding infrastructure systems. Interdependencies are specific to local context but are often connected to wider systems through complex relationships that depend on factors 'outside the asset fence' that could cause cascading failures or contribute to collateral system benefits.

Energy Efficiency: A term used to describe reduction in energy required to provide products and services

Emissions Factor: A term used to describe GHG emissions intensity of the energy consumed in a building. For electricity, location-based factors must be used. Where available, users (customer) mix Emissions Factors must be used. Market methods and purchase of off-site green power are not considered.

Emission Performance: A term used to describe emissions intensity and associated emissions reductions of a building. This is expressed in terms of kg of CO2e per square meter determined from total emissions divided by net lettable floor area.

Emissions Intensity: A quantitative figure expressed as kgCOe/ m^2, or $kgCO_2e/sq^2$.

Emissions Performance Target: A quantitative emissions intensity figure falling on or below the emissions performance trajectory and is expressed as $kgCO_2e/ m^2$ or $kgCO_2e/sq^2$

General Corporate Purpose Bond: a bond the proceeds of which are not ringfenced for specific assets or activities, but which finance general OPEX and CAPEX of a company without disclosing the exact uses. SLBs are examples of general corporate purpose bonds.

Green Bond: A green bond is a bond of which the proceeds are allocated to environmental projects or expenditures. The term generally refers to bonds that have been marketed as green. In theory, green bonds proceeds could be used for a wide variety of environmental projects or expenditures, but in practice they have mostly been earmarked for climate change projects.

Industry Working Group (IWG): A group of key organisations that are potential applicants, verifiers and investors convened by Climate Bonds. The IWG provides feedback on the draft sector Criteria developed by the TWG before they are released for public consultation.

Investment Period: The interval between the bond's issuance and its maturity date. Otherwise known as the bond term or tenor.

Net-zero: Net zero-carbon buildings are understood as highly energy-efficient buildings, in which CO_2 emissions from all operational energy consumed over the course of a year are balanced out to reach zero through renewable and/or other zero-emission energy supply.

Net-zero ready: Net zero ready buildings meet the definition of (fully) a net zero building (e.g. efficiency, electrification and embodied carbon targets) but are waiting on the decarbonisation of the electrical grid supply (scope 2).

Operating Expenditure (OPEX): Expense a business incurs through its normal business operations. Often abbreviated as OPEX, operating expenses include rent, equipment, inventory costs, etc.

Residential building: A building that is used or suitable for use as a dwelling.

Sustainability-Linked Debt (SLD): Any debt instrument for which the financial and structural characteristics can vary depending on whether the issuer achieves predefined Sustainability/ ESG objectives. Such objectives are measured through predefined KPIs and assessed against predefined performance targets. Proceeds of SLD are intended to be used for general purposes.

Technical Working Group (TWG): A group of key experts from academia, international agencies, industry and NGOs convened by Climate Bonds. The TWG develops the Sector Criteria - detailed technical criteria for the eligibility of projects and assets as well as guidance on the tracking of eligibility status during the term of the bond. Their draft recommendations are refined through engagement with finance industry experts in convened Industry Working Groups (see below) and through public consultation. Final approval of Sector Criteria is given by the CBSB.

Use-of-Proceed (UoP) Bond: a bond the proceeds of which are ringfenced for specific assets and activities. Green bonds, blue bonds, and transition bonds are examples of UoP bonds.

Whole Life Carbon Assessment (WLCA): an assessment of the sum total of all building-related emissions over a building's entire life.

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1 Introduction

1.1 Overview

This document serves as a reference document to the Criteria Document for the Low-carbon Buildings. The Criteria are developed through a consultative process with Technical Working Groups (TWGs) and Industry Working Groups (IWGs), and through public consultation. The TWGs comprise academic and research institutions, civil society organizations, multilateral banks, and specialist consultancies whereas IWGs are represented by industry experts including potential bond issuers and investors. A period of public consultation offers the opportunity to any member of the public to comment on the Criteria.

Buildings-specific information to support Applicants and Verifiers is available at Buildings as follows:

- Buildings Criteria Brochure.pdf (climatebonds.net) a 2-page summary of the Building Criteria
- Background Paper the rationale behind the Building Criteria
- FAQs (FAQ's)
- Methodology for Establishing Low Carbon Trajectories: a guidance document for developing thresholds in new markets.
- Methodology for Establishing Proxies: a guidance documents for developing proxies in new markets.
- Methodology for Calculating Emissions Retrofits: a guidance documents for determining the emissions upgrade requirement.

In addition, the following cross cutting information to support Applicants and Verifiers is available as follows:

- The Climate Bonds Standard v4.0: contains the requirements of the overarching CBS
- The Climate Bonds Standard v4.0 Entity and Sustainability-Linked Debt Checklist documents: provides further information on the cross-sectoral requirements for Entity and Sustainability-Linked Debt Certification respectively.

For more information on Climate Bonds and the Climate Bonds Standard and Certification Scheme, see www.climatebonds.net.

1.2 Funding the goals of Paris Agreement

The current trajectory of climate change, expected to lead to a global warming of 2.7 - 3.1°C by 2100[1], which possess an enormous threat. As part of the Paris Agreement, the international community committed to limit the global average temperature to no more than 2-degree C above pre-industry levels, and to pursue efforts to limit it to no more than 1.5-degree C. The effects of climate change and the risks associated even with a 1.5°C rise is significant: rising sea levels, increased frequency and severity of hurricanes, droughts, wildfires and typhoons, and changes in agricultural patterns and yields. Meeting the 1.5°C goal requires a dramatic reduction in global greenhouse gas (GHG) emissions.

In 2021, investments in building energy efficiency increased by 16% to USD 237 billion, but growth in floor space outpaced efficiency efforts. Rapidly reducing greenhouse gas emissions in the buildings sector will be critical, given that it is estimated to account for approximately one-third of the anthropogenic emissions globally at present.

1.3 The role of bonds

The need to invest in climate action is widely recognised. Various agencies have estimated the amount of investment needed by sector and technology, released as investment roadmaps[2] Today, the capacity of government to directly fund the transition to a low-carbon economy is limited, but the world has deep capital resources.

[1] According to Climate Tracker, under current policies we could expect 2.7 - 3.1°C (Temperatures | Climate Action Tracker)

[2] Advancing the Green Development of the Belt and Road Initiative (2022) (WEForum.org)

However, the development of investment and financing roadmaps is required at all levels, by a wide variety of stakeholders. This includes commercial real estate funds and organisations looking to finance their activities and assets. It includes governments looking to turn their National Development Strategies into investment plans and finance strategies. It includes a variety of public entities looking to finance their own activities and assets and support the private sector to do so via appropriate policy and fiscal support.

The IEA estimates that total investment in the global buildings sector must increase from USD 4.9 trillion to approximately USD 5.4 trillion in 2050 to limit global warming to well below 1.5°C. It is crucial for the bond market to play a critical role in this transition. Currently Green Bonds only account for less than 0.2% of a global bond market of USD128 trillion[3]. This is most notable when looking at the current scale of green bond oversubscription. Without increased efforts to provide visibility on financing needs, issuers risk missing the opportunity to align assets under management with climate compatible scenarios and investors risk investing in incremental and unsustainable efforts.

1.4 Introduction to Climate Bonds Standard

Activating the mainstream debt capital markets to finance and refinance climate friendly projects and assets is critical to achieving international climate goals, and robust labelling of green bonds is a key requirement for that mainstream participation. Confidence in the climate objectives and the use of funds intended to address climate change is fundamental to the credibility of the role that green bonds play in a low carbon and climate resilient economy. Trust in the green label and transparency to the underlying assets are essential for this market to reach scale but investor capacity to assess green credentials is limited. Therefore, Climate Bonds created the Climate Bonds Standard & Certification Scheme, which aims to provide the green bond market with the trust and assurance to achieve the required scale.

Investor demand for Green Bonds & Climate Bonds is strong and will increase in line with the delivery of quality products into the market. Standards, assurance & certification are essential to improved confidence and transparency and enabling strong growth in the market. The Climate Bonds Standard and Certification Scheme is an easy-to-use screening tool that provides a clear signal to investors, asset owners, portfolio managers, and intermediaries on the climate integrity of Certified Climate Bonds.

A key part of the Climate Bond Standard and Certification Scheme is the overarching 'Climate Bonds Standard' available at www.climatebonds. This documents the common fund management and reporting requirements that any and all Certified Climate Bonds must meet. Also important is the complementary suite of sector-specific eligibility Criteria. Each set of Criteria establishes climate change benchmarks for that sector. They are used to screen assets and capital projects so that only those that have climate integrity, either through their contribution to climate mitigation, and/ or to adaptation and resilience to climate change, will be certified.

Existing Sector Criteria cover solar energy, wind energy, marine renewable energy, geothermal power, buildings, transport (land and sea), bioenergy, forestry, agriculture, waste management and water infrastructure, hydropower, electricity grids and storage, Cement and Steel. Additional Sector Criteria currently under development include Hydrogen.

2 Sector Overview

2.1 The Buildings sector in a Climate Compatible Future

Buildings meet a range of occupancy demands, providing everything from an individual's housing need to a business's commercial space. At present, there are over 400 billion square meters of gross floor area globally, three times as large as New York State. These buildings account for roughly 30% of global final and 40% of primary energy consumption.

The building sector represents one of the largest contributors to climate change, both on a local and global level. The good news is that there is vast potential for cost-effective mitigation through proven demand reduction and energy efficiency technologies.

[3] Bond Market Size » ICMA (ICMAgroup.org)

Unfortunately, the current level of global investment in emissions efficiency in the buildings sector still falls far short of what is required to achieve mitigation goals for a 1.5°C scenario.

Whether new construction or existing buildings, all buildings are comprised of a combination of structural, mechanical, and operational strategies, together providing the building's end-use service, and determining its energy demand. The delivery of these services currently depends on the on-site (direct) input of energy via a range of fuel types and off-site (indirect) grid electricity.

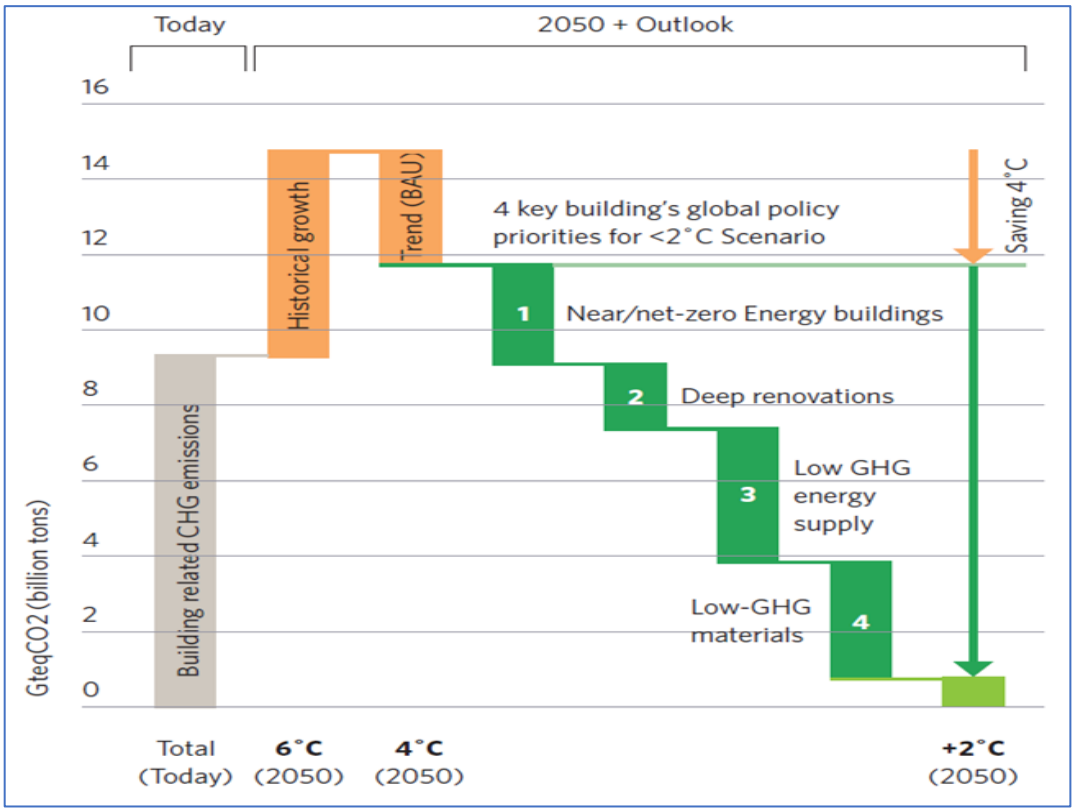
2.2 Future of Buildings

The World Bank's Climate Change Action Plan recognizes that cities will be key for this transition to a low-carbon, sustainable economy. The plan aims to direct 35 percent of financing to climate on average, with half of its climate finance supporting adaptation and resilience and all financial flows in line with the Paris Agreement by 2025.

Taking the urban housing, for example. Residential buildings account for nearly three-fourths of global building energy use. Because two-thirds of the buildings standing today will still exist in 2050, even small investments in energy-efficient retrofits could cut energy costs by billions of dollars and greatly reduce emissions. At the same time, promotion of green buildings is crucial to improve the quality of life and protect natural resources. Green buildings can help businesses lower utility costs, cut construction spending, and may lead to higher property value. They can also have a positive impact on the environment by generating their own energy or increasing biodiversity.

The need for decarbonisation strategies is growing. Figure 1 illustrates the relative potential of four key strategies: energy efficiency in new buildings, deep retrofits for energy efficiency in existing buildings, ensuring low GHG grids for indirect energy supply, and the use of low GHG materials in building materials. Of course, given the complexity of the energy demand, distributed nature of the assets, and disaggregated structure of the industry, in practice the relative importance of these decarbonisation strategies will be highly site or asset specific.

Figure 1: Split of Global Building-related Emissions



2.3 Buildings sector scope

The Buildings Criteria are made up of several complementary parts. These reflect appropriate groupings of assets in this sector, as green bonds are linked to eligible assets and use of proceeds. These are:

- Commercial Buildings, i.e., buildings that are intended to generate a profit, either from capital gain or rental income. There are sub-categories of Commercial Buildings, including but not limited to, offices, shopping centres and hotels.
- Residential Buildings, i.e., buildings that are used or suitable for use as a dwelling.
- Public Spaces, this includes projects and assets that are not specifically buildings related, but are part of the wider built environment, such as street lighting upgrade projects or residential block projects.

2.3.1 PRINCIPLE: Compatibility with a 1.5 or 2-degree future

The Building Criteria relies on scientifically derived climate scenarios and associated transition roadmaps and carbon budgets to determine what level of performance required in and by the building sector. Working within this climate-science framework ensures not only that all actors and assets in the building sector play their part, but also that each part adds up to the necessary rate and volume of decarbonisation called for in the global carbon budget.

In this context, in 2013 when the Criteria were developed, it was determined that aiming for zero-carbon emissions across the buildings sector by mid-century would ensure a level of carbon mitigation necessary to stay below the 2-degree warming threshold. This rate of decarbonisation was first proposed by the Potsdam Institute and has since been expanded upon by many others including the IEA and the IPCCs in the World Energy Investment 2016 and Climate Change 2014 reports respectively. These later efforts continue to refine more specific targets by building typology (commercial, residential) and stage of investment (new construction, existing asset).

Therefore, the current Buildings Criteria aim to ensure that buildings related assets included in Certified Climate Bonds are compliant with emissions trajectories compatible with net zero carbon emissions by 2050. These trajectories represent the rapid decarbonisation paths required to ensure the 1.5-degree Paris Agreement and provide a structure for the improvement or transition pathways that need to be rolled out across the buildings sector. Importantly, they also recognize that zero net energy buildings are not currently technically feasible at scale at floor space ratios typical in urban centres.

In addition, these ambitious, but necessary target trajectories can also be used to identify performance gaps or target misalignment in existing mandatory or voluntary building codes.

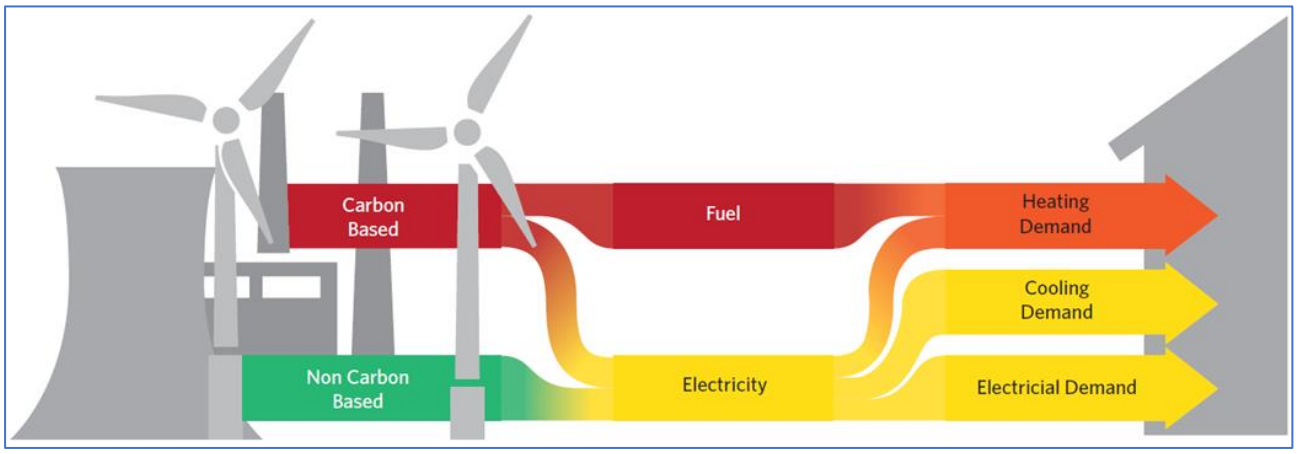
The Climate Bonds Initiative continues to conduct assessments of developing building sector modelling in order to ensure future Criteria are in-line with the latest science.

2.3.2 Focus on emissions, not energy

There are currently efforts underway to track building performance including via; energy use (MW/year), EUI or energy use intensity (kWh/m^2/year), emissions produced (kgCO2e/year) and emissions intensity (kgCO2e/m^2/year).

However, measuring what matters remains a missing step in aligning the climate science and investment and financing roadmaps with asset owners and investors. The building sector has made progress institutionalising building performance by measuring energy use intensity (EUI). Some have gone so far as to measure both site and source EUI to track energy efficiency both at the site as well as across the entire energy supply chain (source). While increases in energy efficiency and therefore reductions in a buildings energy use intensity (EUI) can reduce emissions intensity of a building, EUI reduction does not consider the underlying fuel's emission intensity going to supply the assets energy demand. ***Figure 2*** highlights the integrated natural of emissions within an energy supply system.

Figure 2: Emissions embedded in energy and energy efficiency



Note: The useful energy demand of a building asset has in it, varying proportions of emissions dependent on the composition of the energy source and end-use technology on-site (Source: Buildings | Climate Bonds Initiative)

The building sector's diverse use of direct and indirect fossil fuel, both on-site and offsite, requires a metric that allows cross comparison of assets from a holistic, climate impact perspective. The traditional energy use intensity (EUI) metric used by the industry is unable to measure climate impact effectively.

As energy is not all equal regarding emissions, it is necessary to measure emissions directly to both account for high performers and identify assets ripe for improvement. A focus on emissions can also help uncover opportunities for fuel switching, where assets can improve their emissions intensity by say, moving from direct combustion for heat to indirect electricity from a decarbonised grids to run a heat pump. The current EUI metric does not reward this type of activity, which is critical to rapid decarbonisation in the building sector.

For this reason, the Climate Bond's Building Criteria's preferred unit of measurement is emissions, and more specifically emissions per square meter (emissions intensity). The metric sends a strong signal to investors, asset owners and developers of building standards and codes that emission is the metric to measure.

In practical terms, this includes the following scope of emissions, as defined in the Greenhouse Gas Protocol methodology.

- **Scope 1** - direct emission sources from buildings including the energy conversion-through-combustion of fossil fuels such as natural gas, fuel oil, biomass and in some cases coal on-site. Other types of direct emissions such as refrigerants are not currently required.
- **Scope 2** - indirect emissions sources from building including the energy conversion-through combustion of fossil fuels such as coal, oil, and natural gas, AND/OR the emissions associated from non-fossil fuel such as nuclear and renewables (when substantial enough i.e., reservoir emissions from hydro) when providing electricity and/or district heating/cooling to the building.
- **Scope 3** - indirect emissions sources associated with the sourcing, transmission, and distribution of energy to the building. Other scope 3 emissions from transport, waste, and water are not currently incorporated.

2.3.3 Focus on landlord, not tenant

In addition to considering the scope of emissions in which to account for, there are also boundaries within a given building asset. The two most common boundaries are the "Base Building" and "Whole Building".

- **Base Building** reporting includes only the emissions production typically under the control of the landlord or asset owner i.e. the heating, hot water, ventilation and air-conditioning of the whole building, light and power in common areas, and the lifts.
- **Whole Building** reporting includes both the emissions production under the control of the landlord (or asset owner) and the tenant, i.e., tenant lighting, office equipment, etc.

Benchmarking regulations and demand from investors for more transparent reporting is driving increased sub-metering of buildings, effectively delineating whole building reporting into base building and tenant energy and emissions. All forms of building performance benchmarking should be actively encouraged, including both base and whole building. Long-term, increased demand from tenants for high-performance buildings will require tenant level performance tracking and therefore, whole building with sub-metering is ideal when considering future demand growth in this area.

That said, currently the Buildings Criteria focus on the emissions associated with energy use within the control of the landlord i.e. base building services also known as "core and shell."

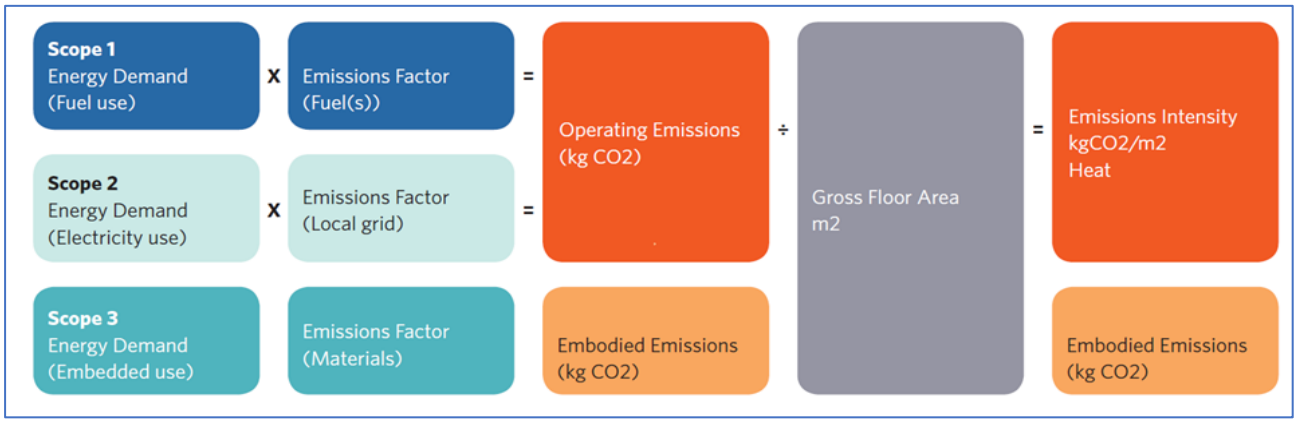
The reasons for this are that:

- Light, power, and miscellaneous end-use energy demand within tenant spaces is outside the financial or management control of the building owner.
- Commercial buildings may experience a change in occupiers during the term of the bond.
- Driving down end-use energy demand at the tenant level also benefits from a direct return on investment for a tenant,
- These investments and energy reduction strategies are outside the control of the landlord who ultimately issues the bond.

Converting tenant energy use to scope 1 and 2 emissions

Converting energy use to emissions is a principal step in accurately accounting for an assets contribution to a climate compatible future. While policy and regulation efforts continue to bridge these two performance tracking metrics, current efforts by issuers to identify climate compatible asset is still a challenge. While various methods for converting energy use to emissions exists, the Building Criteria require accounting by final energy use. This is in line with ISO 16745-1:2017. ***Figure 3*** above highlights the methodology used to account for differences in final energy demand and associated emissions (direct & indirect).

Figure 3: Converting final energy demand to carbon dioxide equivalent emissions



Note: (1) ***Scope 1 and 2*** emissions accounting does not require Life Cycle Assessment (LCA).
(2) ***Scope 3*** emissions accounting require such, as embedded emissions in building materials DO requires an LCA model to determine total embedded emissions.
(3) Building labelling schemes are bringing these efforts to the market. Source: Buildings | Climate Bonds Initiative)

3 Metrics, tools, and indicators for climate compatibility

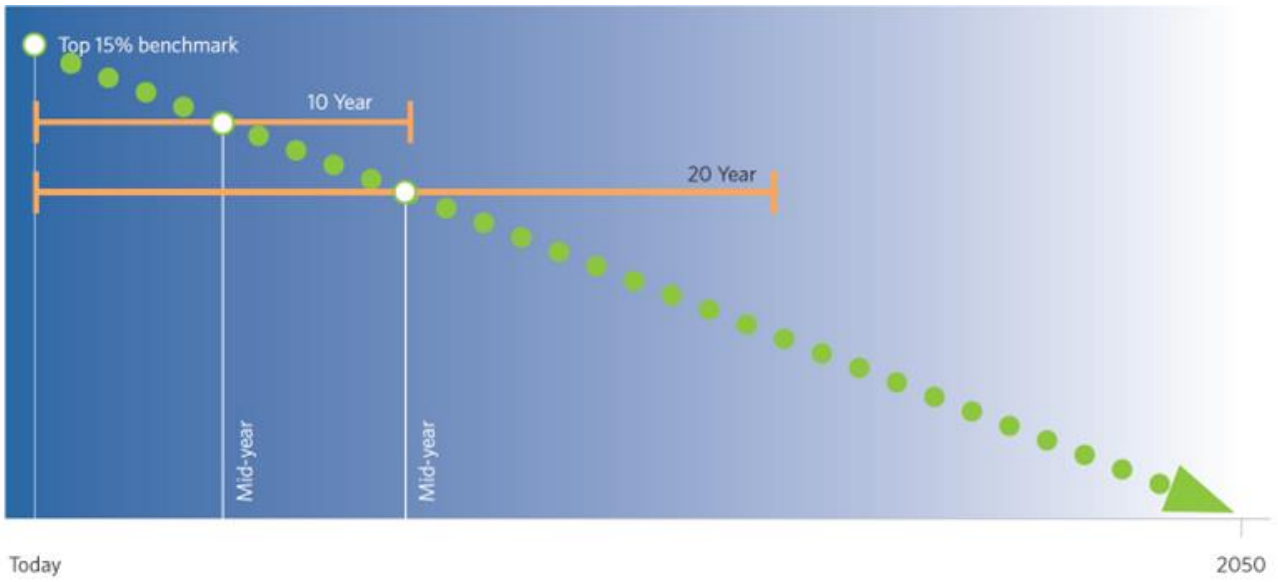
3.1 Establishing low carbon trajectories

the overarching objective of the Buildings Criteria is to establish emissions trajectories compatible with net zero carbon emissions by 2050, so that only buildings performing within these trajectories would be eligible for inclusion in a Certified Climate Bond. Below are the principles used to establish the Building Criteria Emission Trajectory.

Net-zero-carbon trajectories are established by drawing a linear line between the emissions performance of the top 15% of the relevant market (residential, non-residential) 'today' and the net zero-carbon target for 2050. Notably, these trajectories are established on a city-by-city basis, rather than a single global trajectory. ***Figure 4*** illustrates this approach.

The simplicity of this approach enables rapid screening and meaningful monitoring and verification for assurance without transaction costs undermining any price benefit green bonds may offer. The Criteria has been designed with an ambition of a zero-carbon future in 2050 and offers a pathway to reach that outcome in a manner bespoke to each city's present circumstance. It aims to leverage the best data available to establish appropriate emission intensity baselines and offers an alternative pathway where lack of data prevents reliable market insight.

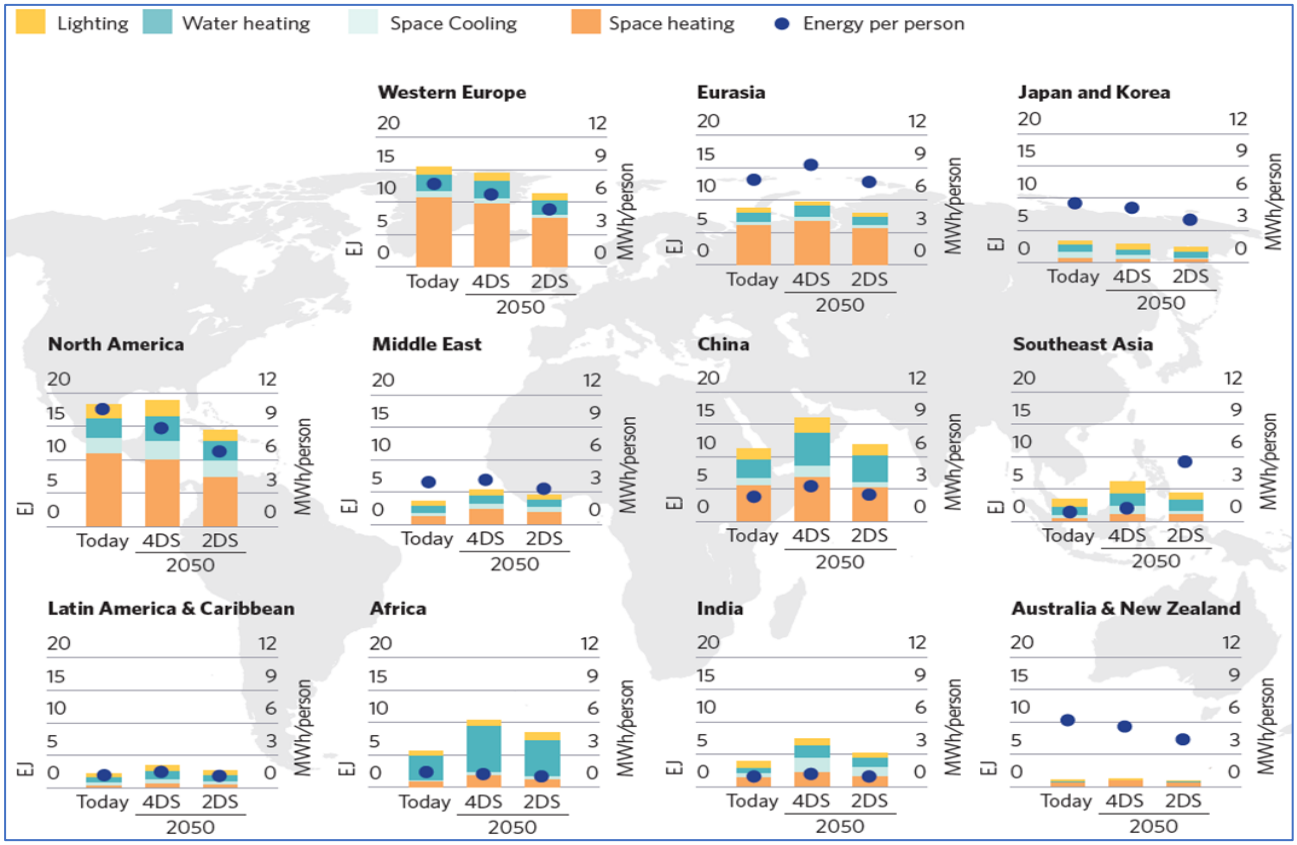
Figure 4: Example structure of a low carbon trajectory



3.1.1 Why established on a city-by-city basis?

Figure 5 below highlights the range of final energy demand across regions broken down by end use service (i.e., heating, cooling, lighting) and the required reductions determined by the IEA to meet a 2-degree scenario.

Figure 5: Building Sector Final Energy Demand in 2050



Source: Map provided by IEA Energy Dashboard)

The variability illustrated by region is indicative of a broader point: that there are a variety of local characteristics that may influence emissions intensity in the buildings sector. These include:

- Local climate, such as daily and seasonal temperature and weather patterns which affect demand for lighting, heating and cooling etc
- Local grid mix and associated emissions intensity of off-site energy. Box 6 explores the impact of these factors in more detail.
- Local building characteristics that influence operational performance outcomes, such as the proportion of energy supplied on-site and the fuel source for that energy.
- Local occupancy use patterns.

Setting zero carbon trajectories on a city-by-city basis therefore ensures that buildings in locations where higher levels of energy are needed to meet end-use need are not penalised. Instead, decarbonisation of energy as a means of achieving climate compatibility is incentivised.

3.1.2 Why start the trajectory from the top 15% of the market

To ensure that Climate Bonds Certification achieves both significant scale and environmental impact, the starting emissions intensity is established by the performance level of the top 15 percent of buildings in a city. The 15% was seen as the correct start position based a need to balance the following:

- Desire to establish high standards of performance - requires very strict performance standard

- Need to create some opportunity in the existing market - so that best performers can be identified and certified, so long as they continue to improve their performance in line with the declining emissions trajectory.
- Need to ensure that the resulting trajectories are aligned to the capacity of the market to deliver improved outcomes.

A market average approach was not adopted as this would arbitrarily permit 50% of the existing stock to qualify, and the Climate Bonds Standard would then not meet its objective of ensuring signalling of assets with are compatible with the Paris Agreement. An averaging across the market for the building stock, given the potential significant 'legacy' building stock that impacts the average and the focus on asset level rather than portfolio level (as in the 1.5°C portfolio tool from the 1.5° Investing initiative, which applies a market average), would have unduly skewed the eligibility of the building stock.

3.1.3 Why a linear trajectory

A linear trajectory puts in to place an early and rapid decarbonisation target. A concave trajectory would delay decarbonisation and risk not meeting the stringent demands of a 2-degree scenario. A convex trajectory, by requiring too rapid decarbonisation, may prevent the Building Criteria from gaining traction in the market and reaching significant scale and impact.

Recalibration

The "initial baseline emissions intensity" is established using available emissions intensity data of a representative sample of buildings by category (residential, non-residential) in a city. The sample must be of sufficient size and cover a random sampling of assets in the market. Once set, it is not expected to be updated unless in exceptional circumstances.

The two key circumstances that warrant a recalibration of initial baseline emissions intensity are

- when the size and quality of the underlying data set improves significantly and
- when there is significant decarbonisation of the grid.

The Climate Bonds Initiative will undertake a review every 3 years to check for these two circumstances and whether they warrant a recalibration of initial baseline performance.

3.1.4 Expanding the pool of low carbon trajectories via data interpolation

The scarcity of reliable operational performance data for buildings in many parts of the world has been a significant limitation to establishing low carbon emissions trajectories. Without this data, Climate Bonds Initiative is unable to determine overall market performance needed to establish low-carbon trajectories in most locations. This has led to Climate Bonds being unable to certify assets in many locations, and leaves investors with a lack of clarity of the climate performance of building assets in those locations.

A New Way Forward

A process has been developed to allow estimation of the baselines needed where operational performance data for buildings of sufficient quality cannot be sourced for that location.

This means that Climate Bonds is now able to estimate market benchmarks with high confidence where the climate characteristics for that market are within the zones of climates associated with our established city baselines. In essence, established benchmarks can be interpolated to similar climate regions currently not covered by Climate Bonds - so long as the new location is within similar climatic zones regions as the established baselines.

3.1.5 Alternatives in practice

Establishing emissions trajectories on a city-by-city basis requires robust buildings data for each city. This is often challenging to obtain.

The Climate Bonds Initiative has established alternative methods to determine whether an asset or portfolio is on a climate compatible zero carbon trajectory, in instances where emissions trajectories cannot be reliably established for a given building type and location.

Currently, support for two alternative methods to determine whether a building asset or portfolio is on a climate compatible zero carbon trajectory exist.

- Market Accepted Proxies
- Significant Improvement from current performance

- Alternative 1: Incorporating Market Accepted Proxies

  Globally, markets have begun to adopt a range of various building design, construction, or performance schemes. They range from voluntary and mandatory national schemes such as Energy Star in the US and Energy Performance Certificates in the EU to voluntary industry standards such as BREEAM and LEED. Many of these are well established in the market but aimed at difference audiences such as developers.

  As an interim solution, in markets where data challenges have meant that zero carbon trajectories cannot yet be established, the Climate Bonds Initiative looks to leverage these codes or schemes as proxies to demonstrate the necessary level of performance of the building's assets in question.

  Specifically, the Climate Bonds Initiative has established a framework to evaluate the compatibility of these schemes and standards with the climate targets embedded in the Paris Agreement and the associated buildings emissions targets for Certified Climate Bonds as described above. With this framework, the suitability of any given scheme or code can be assessed, and those that are compatible with delivering the emissions outcomes required can be adopted as a potential performance proxy. Any building appropriately rated under that approved proxy is hence deemed climate-compatible and is eligible for certification under the Climate Bonds Standard. Importantly, as proxies are meant to serve as an interim solution until data becomes available to establish a local zero carbon trajectories, a limit is placed on the term of bonds that can be certified via a proxy. This ensures that green finance is not 'locking in' buildings that are not sufficiently low carbon over the longer term.

  Methodology for Establishing Building Proxies_gives this assessment framework for building schemes or codes. It is standardized to prevent unfair treatment across given performance standards as well as ensure reliability and cross comparison on all Certified Climate Bonds and the underlying building assets.

  The framework allows for two methods of assessment and are dependent of whether a city specific baseline has been established.

  - Benchmarking against local market emissions performance
  - Benchmarking against proportion of total ratings/ labels awarded

  Market accepted proxies, while having the benefit of increased adoption, are stationary benchmarks that undergo updating and replacement over time. The performance dictates of these proxies also only meet compliance with the zero-carbon trajectory over a limited period due to the declining nature of the trajectory.

  To account for these two scenarios (outdating and no long compliance) the established proxies are earmarked for review after a set period (expiration date), in this case, either a new proxy becomes available or the existing one has undergone updating and compliance is maintained.

- Alternative 2: Financing upgrade activity

  This option has been included to allow financing of upgrade activity across a range of different asset types that might be included in a bond, such as street lighting programmes and other public space renovations, or finance incentive schemes

such PACE or ESCO. This option also captures buildings that may not be able to be refurbished to meet the zero-carbon trajectory hurdle due to constraints such as heritage and historic protection orders. Significant improvements in emissions intensity has been shown to achieve similar emissions reductions called for in the low-carbon trajectory.

To ensure a path to compliance exist for the entire buildings sector, a significant improvement pathway has been determined as an alternative hurdle rate for eligibility for certification under the Climate Bond Standard.

This significant improvement is defined as a 30-50% improvement from current emissions performance. The exact percentage depends on the term of the bond, i.e., how long green finance is being locked up for. For a 5-year bond, a 30% improvement is required. For a 20-year bond, a 50% improvement is required. With a linear sliding scale between these two points. 30% was established as the minimum expectation for GHG reduction from an upgrade based on building components only, with no interruption to the building's lifecycle. 50% was established as a reasonable reduction for the repositioning of a building that would requirement full refurbishment of plant and envelope. These bookends then set against the short and long-term targets expected of bond issuance.

3.1.6 Asset pools to which these should be applied

Several assets are often included within a portfolio linked to a bond. To gain traction in the market, the Climate Bond Standard must minimize transaction costs for issuers and make it as easy as possible for them to demonstrate compliance with the Criteria.

Therefore, to uphold the level of stringency required to ensure assets and portfolios are indeed aligned with zero carbon trajectories, it is necessary to determine in what circumstances the Criteria could be applied and assessed at the portfolio level, as opposed to separately for each asset within the portfolio. The approach taken on this is as follows:

- Method 1: Portfolio Aggregation

  Where emissions intensity baselines are well established, properties across a portfolio compliant with the Climate Bonds trajectory OR Climate Bonds approved proxy (building code, energy labelling scheme or rating tool) can be measured by their collective emissions intensity. Those portfolios (pooled assets) that meet a Climate Bonds approved compliance pathway are certified as a whole, known as the Full Aggregation or "area weighted approach."

- Method 2: Individual Asset Verification

  Where emission intensity baselines are not established, properties compliant with a Climate Bonds approved proxy (building code, energy labelling scheme or rating tool) must be compliant and only assets that meet the proxy requirements can be pulled into a Certified Climate Bond. This is because certifying proxies assume an increase level of risk over a zero-carbon trajectory approach.

4 Assets Standards for Financing with a 1.5-Degree World

4.1 Compliance standards

There are, in essence, two pathways to eligibility for inclusion of buildings in a Certified Climate Bond. These are:

- **Pathway 1**: Compliance with the zero carbon emissions targets: Assets or portfolio MEETS or WILL MEET the zero emissions trajectory or already meets the requirements of an approved proxy (refer to ***Figure 6***), OR
- **Pathway 2**: Upgrades: HAS or WILL achieve a significant improvement in emissions efficiency against an asset/portfolio relative baseline (refer to ***Figure 7***).

Figure 6: Trajectory and proxy pathway

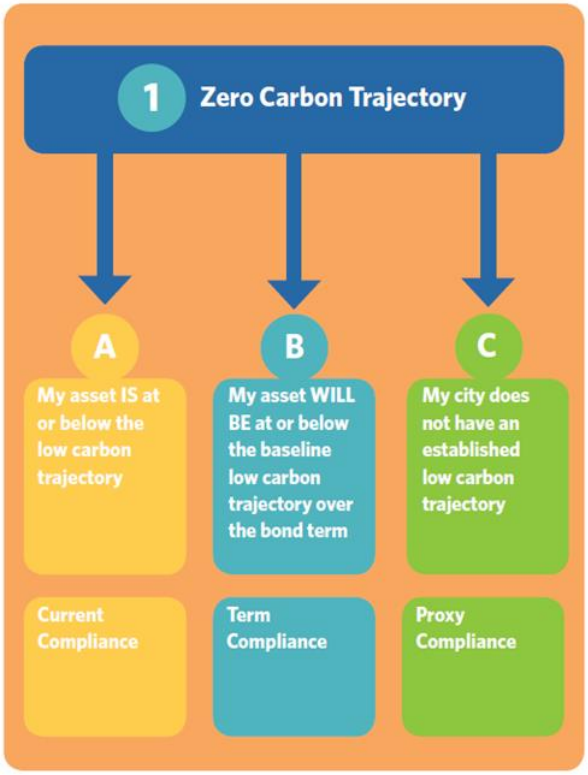
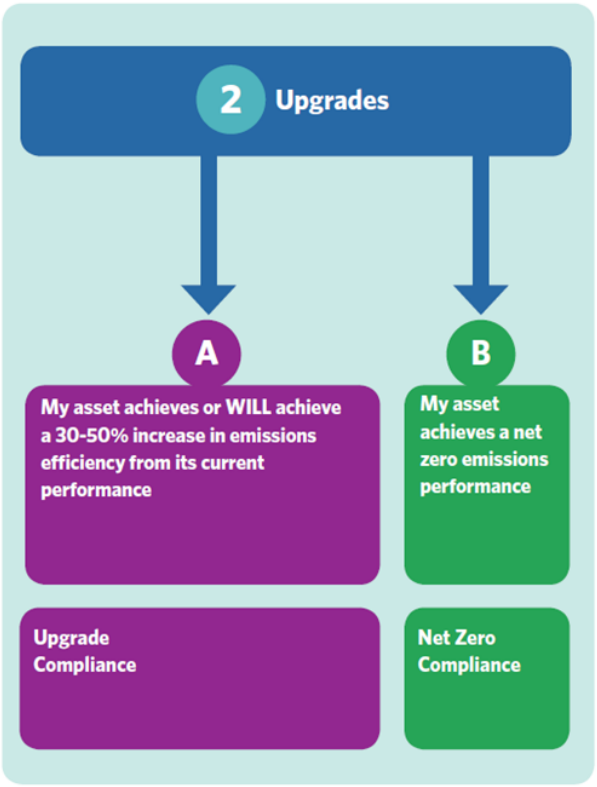


Figure 7: Upgrade and net zero emissions



4.2 What is new in the Low-carbon Buildings Criteria

The focus of the existing Buildings criteria is reduction of emissions from the operational phase of a building's life cycle. These emissions are influenced by the energy efficiency of the buildings, the sources of energy and intensity of use.

Previously, the Climate Bonds Low-carbon Buildings criteria did not have a separate definition for New Buildings. The new criteria will now have a distinguishing definition for New Buildings. New construction is required to be delivered without the use of fossil fuels and with infrastructure for electric mobility to ensure that built assets are net-zero ready without planned redundancy of plant or future investment requirements. Additionally, the New Buildings are also required to report and account for Whole Life Carbon Assessment (WLCA), Please also refer to section 4.2.1 for requirements on the same.

Introducing a set of additional criteria for new buildings represents a significant step change for the buildings criteria in the Climate Bonds Initiative and will have several advantages, including:

- It increases the clarity on the use of the criteria for new buildings.
- Leverages the technological capabilities available for new buildings
- Addresses the fact that not all building typologies are currently addressed in the Climate Bonds Criteria

4.3 Whole Life Carbon Assessment

The current Climate Bonds building criteria focus on the in-use phase of a building's lifecycle. However, the impacts of material procurement and the construction of buildings represent an important source of emissions from the building sector.

Given that the knowledge and technologies exist to deliver net zero/ready buildings, the use of emissions proxies measuring only operational phase environmental impacts for buildings in construction is increasing unfit for purpose for certifying new buildings.

Further, as operational emissions fall, the embodied emissions attributable to the delivery of new buildings and renovation of existing buildings becomes increasingly important. These emissions are not currently considered by the Climate Bonds buildings criteria. See Section 5 for detailed information.

4.3.1.1 Embodied carbon emissions

The development of new buildings, and the renovation of existing building requires a carbon investment in materials, many of which are carbon intensive. This embodied, or embedded, carbon has, until relatively recently received little attention in the built environment. However, as buildings' operational emissions shrink through energy efficiency and the use of renewables, the proportion of the whole life carbon that relates to these embodied emissions grows.

This increased focus on embodied carbon suggests that it is appropriate to include criteria related to embodied carbon into the Climate Bonds building criteria. However, there are significant data challenges around establishing appropriate benchmarks for embodied carbon, *viz:* There is no globally agreed methodology for identifying embodied carbon benchmarks by country, city, or building.

The emissions concerned are considered as scope three emissions for developers, and so sit under the relevant manufacturers' scope one and two emissions. However, certification schemas should work to reduce demand for emission intensive materials to encourage the manufacturers to reduce their impacts.

The embodied impacts of materials are specific to the place and time of manufacture, distance, and method of transportation to the construction site. This specificity makes estimation at the early lifecycle stages a challenge.

The market for carbon-based information in construction materials, while growing, is still not mature. As a result, some materials and components do not have any information and data quality is an issue in many locations.

Hence, reporting and accounting of embodied carbon (up-front emissions) has been made mandatory and This will be an interim step and a new practice to disclose the nature of assumptions the market is marking. This will give an indication of the data quality around the world which will keep us informed better for developing local Embodied Carbon pathways.

4.3.2 Why net-zero ready or net-zero compliance

The IEA defines a zero-carbon ready building is one which is highly energy efficient and either uses renewable energy directly or uses an energy supply that will be fully decarbonised by 2050, such as electricity or district heat[4]. Additionally, there are some components of buildings that should not be contemplated for a net zero ready buildings. No new buildings should be locking in fossil fuel use for decades.

On-site energy consumption only relates to the parts of a building that an owner has operational control over, consistent with the existing Commercial Buildings Criteria. Climate Bonds adopts the Greenhouse Gas Protocol's definition of operational control: "…has the full authority to introduce and implement its operating policies at the operation". Two example building types are provided below for guidance:

- An office building owner will generally be responsible for "base building" energy consumption relating to heating, ventilation, and air conditioning; lifts and escalators; car park lights and ventilation; common area light and power; exterior lighting and signage. Base building consumption excludes energy end uses controlled by the tenant including lighting within tenant areas; tenant power; tenant supplementary cooling; tenant data facilities.

[4] Net Zero by 2050 - A Roadmap for the Global Energy Sector (windows.net)

- A hotel building owner will generally be responsible for "whole building" energy consumption, covering the entire scope of energy end uses in a building.

- Portfolio application requirements

  Such an issuer with multiple projects can aggregate them into one portfolio and it is the aggregated portfolio that must satisfy the required minimum improvement in emissions efficiency rather than each project included in the pool having to comply.

- Post-issuance requirements

  For new buildings, the issuer will need to provide technical consultant reports, design documents or similar documentation to demonstrate that the building post-construction will deliver net zero carbon.

- Ongoing reporting requirements

  Issuers will need to demonstrate evidence on an annual basis that the building continues to be net zero carbon.

  If the building misses the net zero carbon target by a small amount and this is attributed to unusual climate conditions for that year, a climate-correction mechanism may be applied to adjust the target. Climate Bonds will then assess the building's performance against this adjusted target. The climate-correction mechanism will apply the methodology adopted by Energy Star in the US or the Department for Business, Energy & Industrial Strategy in the UK. (This mechanism is already included in the existing Buildings Criteria.)

  Any renewable energy generated that is not used on-site must be exported to the grid or stored. Any renewable energy certificates related to renewable energy generated on-site must be retired and must not be sold to other parties.

Note: *There are varying definitions of Zero Energy/ Carbon Buildings. The definition that aligns with Climate Bonds's is "Net Zero Energy Emissions", where a building produces at least as much emissions-free renewable energy as it uses from emissions-producing energy sources.*

4.3.3 Role of hydrogen in Buildings

When the initial proposal to preclude fossil fuels from newly built buildings was agreed, there was some market resistance to the proposal on the basis that the hydrogen economy was developing and might, in time, make for an appropriate replacement for natural gas.

In response to these suggestions, we refer to the IPCC's statement on hydrogen:

> *"The ease of switching to electricity means that hydrogen is not expected to be a dominant pathway for buildings … Using electricity directly for heating, cooling and other building energy demand is more efficient than using hydrogen as a fuel, for example, in boilers or fuel cells. In addition, electricity distribution is already well developed in many regions compared to essentially non-existent hydrogen infrastructure, except for a few chemicals industry pipelines. "*.

The delivery of an entirely green hydrogen system is also limited by the availability of renewable technologies in a country and is only considered feasible in the longer term. It therefore is considered unlikely that green hydrogen will be available in sufficient amounts to decarbonise heating within the necessary timescales. The current scale of expansion of renewables also means that there will be competition for green hydrogen, and that - given the other technologies available to buildings - it may be better used in contexts where it adds the most value, such as in industrial uses.

As the physical and chemical properties of hydrogen differ from those of natural gas, it is not possible to simply exchange natural gas for hydrogen in the existing natural gas infrastructure. Further, metal pipes can degrade when they are exposed to hydrogen over long periods, and the resulting hydrogen leakage would be a significant risk to the delivery of the ambitions of the Paris

Agreement. If the existing gas network were to be switched to just hydrogen, therefore, costly modifications to the gas pipeline infrastructure would be necessary.

For existing building that already have a natural gas supply, the option to wait for the shift to a hydrogen economy rests with the building owner. However, from a Climate Bonds certification perspective, the continued use of fossil fuels will preclude certification of the building/bond.

4.3.4 Electrification of Buildings

Electrification of Buildings is an important step in decarbonising the buildings sector. The Intergovernmental Panel on Climate Change (IPCC) states that to avoid the worst impacts of climate change, the world must dramatically reduce its carbon emissions and prevent global warming from exceeding the 1.5-degree C. To achieve this, we must halve carbon emissions by 2030 and aim to fully decarbonise by 2050. To achieve this in the buildings sector, research concludes that the lowest-cost pathway to eliminate direct emissions from commercial and residential buildings is to electrify across different geographic locations.

Electrification of buildings can reduce the environmental impact of running a building significantly. Which in turn will reduce the reliance of traditional energy sources such as oil and gas, as electrified buildings rely on renewable energy.

Although the pathway towards electric buildings requires some initial upfront investment, the benefits are varied and with Government funding available organisations will have support in achieving sustainability targets.

5 Reporting and Accounting on Embodied Carbon and GHG Scope 3 emissions

5.1 Whole Life Carbon Assessment and Embodied carbon

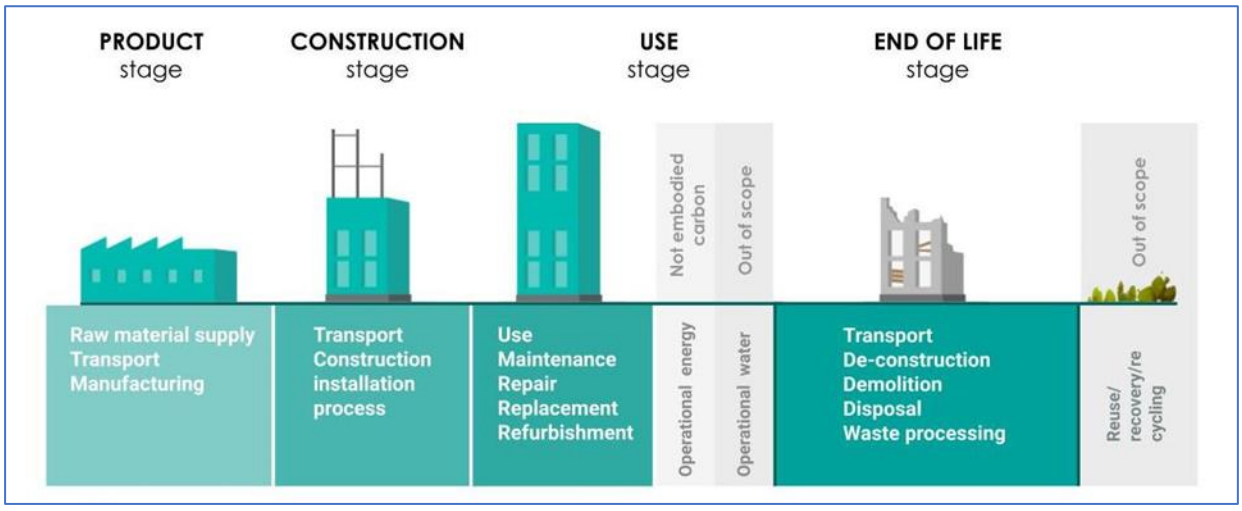
5.1.1 Background

The built environment sector has a vital role to play in responding to climate change. Buildings currently being responsible for 40% of global carbon emissions[5], decarbonising the sector is one of the most cost-effective ways to mitigate the worst effects of climate breakdown. Some of these emissions are from the operational emissions, those that we know and has been talked about leaving behind, until recently the focus on embodied carbon. In the total 40% global carbon emissions, embodied carbon accounts for 13% annually. This is expected to grow in the coming years with the increased construction initiatives. With the pressure to decarbonise the built environment and deliver carbon neutral buildings in pursuit of global and national net zero goals, it is becoming increasingly important for contractors and developers to tackle embodied carbon appropriately.

What is Embodied Carbon

According to the European Commission (2020), embodied carbon relates to "*the greenhouse gas (GHG) emissions associated with the non-operational phase of a project, namely the emissions released through extraction, manufacturing, transportation, assembly, maintenance, replacement, deconstruction, disposal and end of life aspects of the materials and systems that make up a building (cradle to grave).*"

Figure 8: Embodied Carbon lifecycle of a building



Source: How to address the challenges of embodied carbon in 2023? - Deepki

5.1.2 Scope of WLCA in New Buildings Criteria

As Climate Bonds already has established operational carbon pathways (that across the global covering specific countries/cities in a region, this is intended to look at the cradle to site instead of the WLCA approach. Meaning, Climate Bonds will look at:

- Module A,
- Module C (where the property/asset is demolished for a New Building) and
- Module D (where Module C is covered)

[5] Embodied Carbon - World Green Building Council (worldgbc.org)

Figure 9: Scope of WLCA under Climate Bonds Initiative low-carbon Buildings criteria

Scope for	Reporting on
Whole Life Carbon Assessment (WLCA)	Mandatory reporting of WLCA for: • New Buildings built on or after 2025 - For new build assets, buildings, or infrastructure civil works all life cycle stages must be assessed, including module D, and all building elements or infrastructure elements within the project site boundary must be included in WLCA. This includes any facilitating works and site preparation inside and outside of the asset footprint within the site boundary. • Demolition/deconstruction of existing asset for the purpose of New Buildings - When any full/part demolition or deconstruction of an existing structure is required to facilitate the construction of a new asset within the designated boundary, the emissions associated with that demolition or deconstruction should be included in the WLCA in sub module of module A5 which are classified into 4 parts (A5- (1-4)).
Scope of Modules	• **Module A:** A0 - A5 • **Module C:** C1 - C4 • **Module B:** B6 - B8 (where applicable)
Key project stages to undertake WLCA	• Adopt as written in EN 15978 or RICS Guidance/international equivalence
Recommend steps to carry out WLCA	• Adopt as written in EN 15978 or RICS Guidance/international equivalence
Spatial Boundary	• A WLCA should consider all construction works relating to the project, including any demolition or deconstruction, facilitating works and site preparation required for building the asset, and external works within the site boundary. The site boundary should be in line with the intended use of the built asset, including all areas associated with the project that are integral to its operations. A town planning red line can serve as the site boundary where appropriate.
Element category for building assessments	• All buildings are made up of building elements, that are grouped into categories such as foundations, superstructure, envelope, and services. Please refer to Table 1.
Material impacts	• Choosing Low-carbon Environmental product declaration (EPD) - this provides detailed information about specific products that improve the accuracy of buildings LCA, and comparative analysis can be carried out to be better informed.
Area measurement	Floor areas from the following sources must be used and clearly stated in the WLCA, in the following order and/or subject to availability at different project phases: • BIM Model • Bill of Quantities (BoQ) or cost plan • Consultants drawing
Material quantity	A WLCA must cover all the items listed in a projects BoQ, cost plan, or as identified in other records (3D models, drawings or specifications, etc) (Refer to Table 2). Material quantities from the following sources must be used for each phase, and their source clearly stated.

5.1.3 Reporting on Whole life carbon assessment in Climate Bonds Low-carbon Buildings criteria for New Buildings

This mandatory reporting of WLC assessment should follow the **RICS Guidance (Edition II)**, which has an international equivalence.

5.1.4 What is Whole Life carbon assessment?

A Whole Life Carbon Assessment (WLCA) is an estimation of the quantity of all carbon emissions expected to be emitted over the entire life cycle of a built asset. The assessment includes all life cycle stages of a project, which are explained using a modular structure:

- **Module A**: Sourcing of raw materials - transport and fabrication of components (product stage) and the construction process, including the demolition of any previous structure (construction stage).
- **Module B**: Use stage - maintenance, repair and replacement, any planned refurbishment and the use of energy and water over the life of the asset. It will include the emissions resulting from the use of asset, in addition to energy and water use (e.g., cars using a road).
- **Module C**: End of life stage - anticipated emissions from demolition/disassembly, waste processing, associated transport, and eventual disposal.
- **Module D**: Potential benefits or costs from the recovery of materials leaving the asset during any stage, such as for reuse, recycling an or energy recovery, and the export of any energy generated by the asset. Module D is part of the WLCA process but must be reported separately.

5.1.5 Scope of the WLCA

The scope of WLCA is adapted from the RICS Guidance (or international equivalence). This standard addresses all element and component categories making up a built asset, during every stage: from extracting raw materials and manufacturing constituent construction products, through operation, to recovery or disposal at end of life. This document standard can be applied to any type of construction or civil project infrastructure, including building and/or infrastructure assets involving the following:

1. New construction/new build assets
2. Demolition of existing and construction of new assets

WLCAs should be undertaken by an 'assessor' using the document directly or through software tools that functions in compliance with its methodology (where applicable).

5.1.6 Process and structure of undertaking a WLCA

A full WLCA will identify figures for all the modules, covering life cycle stages A, B, C and D.

Module A: Covers emissions from all activities necessary to complete the construction of the asset.

- **Module A0** - non-physical pre-construction activities, is generally assumed to be Zero for buildings. However, for infrastructure projects A0 can include ground investigations and activities associated with designing the asset.
- **Module A1 - A3 (Product Stage)** - extraction, transporting and manufacturing processes necessary to produce the construction products, components and technical equipment required to construct the asset.
- **Module A4 - A5 (construction stage)** - Transporting construction products and any construction processes necessary to produce the construction products, components and technical equipment required to construct the asset.

Module B: Covers emission that occur over the use stage of the asset.

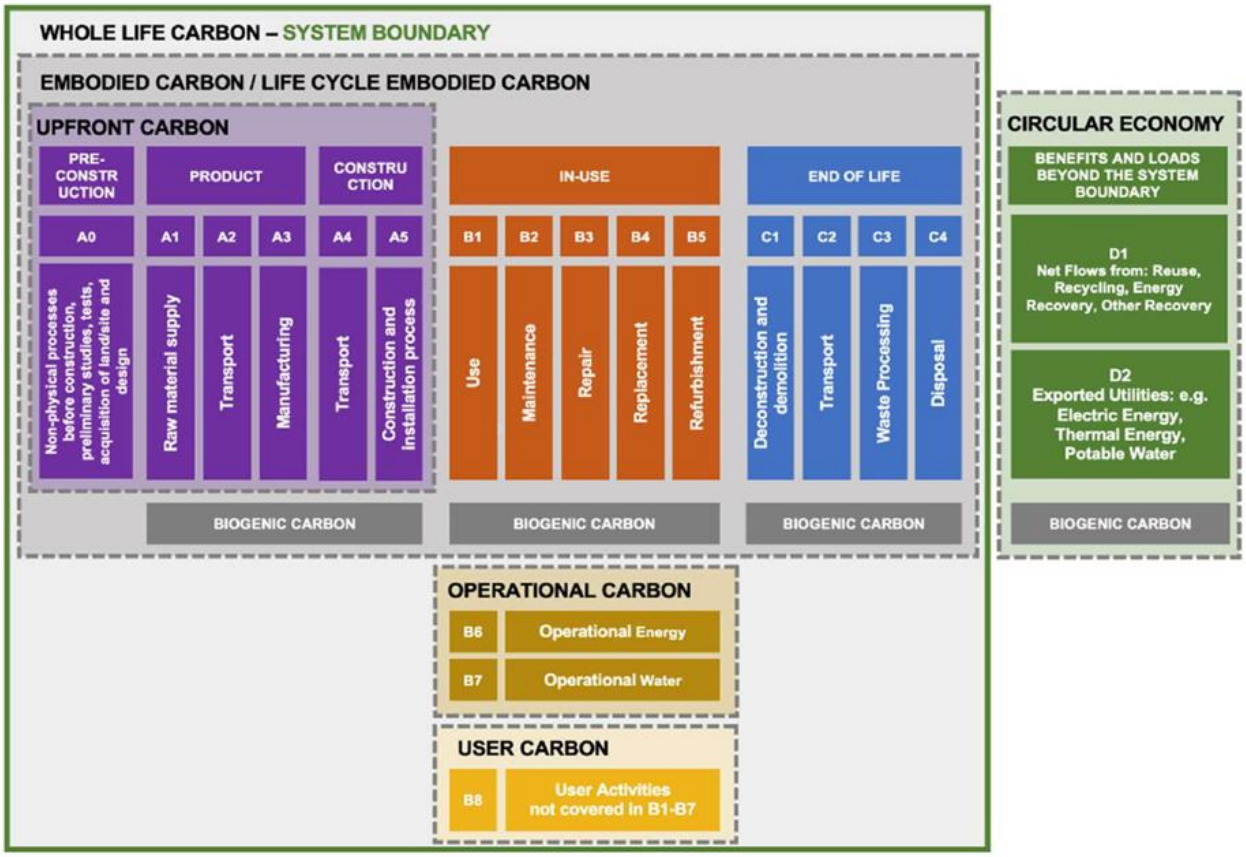
- **Module B1 -** reports direct emissions and removals from construction products, such as emissions of blowing agents from insulation, refrigerants from MEP or removal of CO2 through carbonation of concretes.
- **Module B2 - B4** - Material related emissions that occur from maintenance, repair, and replacement of the asset.

- **Module B5** - Any refurbishment or change in performance of the asset (e.g., retrofit/refurbishment or extension) planned at the outset of the project to occur at some point after construction is completed.

Module C1 - C4: Covers emissions during the end-of-life stage of an asset. This includes deconstruction or demolition, waste processing, recovery or disposal and associated transport.

Module D: Covers the potential carbon loads (costs) and benefits beyond the system boundary from any recovery of material arising from the construction (A4 - A5), use (B2 - B5) or end of life (C1 - C4 stages). This module covers the potential carbon benefits beyond the system boundary of any utilities exported from the asset during use stages B6 - B8, such as generated electricity or treated water.

Figure 10. Building life cycle stages and information modules



The key terms relating to carbon emission relate to these modules as follows:

- Upfront carbon – modules **A0 – A5**, covering all impacts up to the completion of the project but excluding any sequestered biogenic carbon stored within any construction products incorporated into the asset.
- Embodied carbon – Modules **A0 – A5**, **B1 – B5** and **C1 – C4**, all material related emissions.
- Operational carbon – Modules **B6 – B7**, energy and water use
- User carbon – Module **B8**, user activities
- Whole-life carbon – Modules **A**, **B** and **C.** This is the system boundary for a full carbon assessment over the assets life cycle.

5.1.7 Undertaking WLCA key project phases

As a minimum, a complaint WLCA should be undertaken at the following key project phases:

- Concept design phase
- Technical design phase
- Construction phase

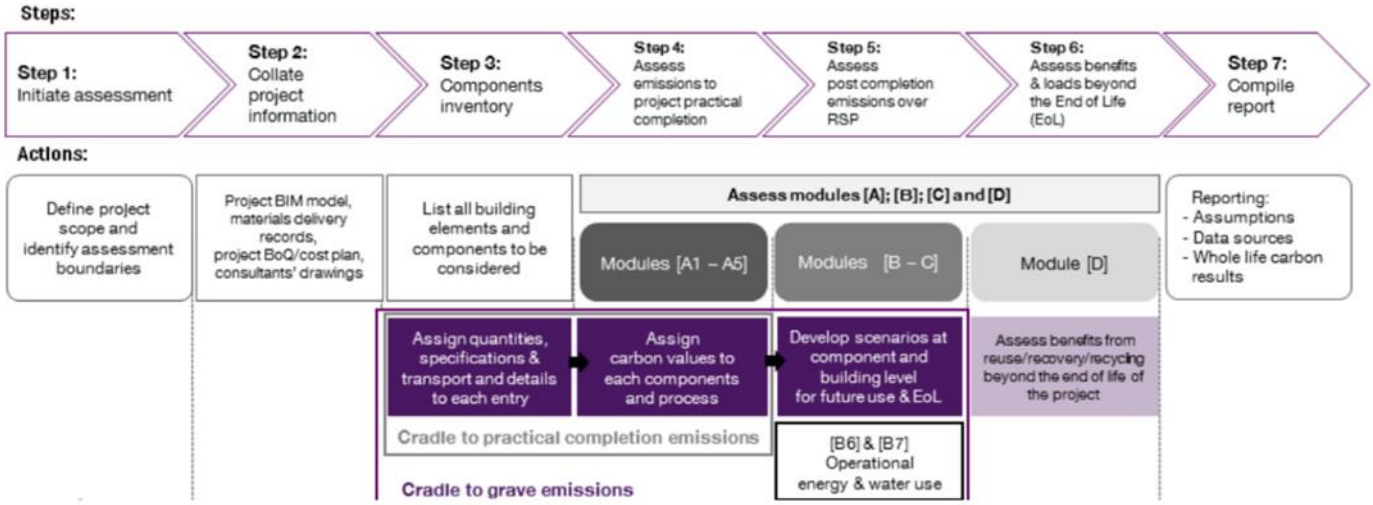
- Post-completion phase (Post completion assessment).
    - For early stage design phase, pre-construction forecasts should be used as the project baseline for ongoing carbon reporting and progress tracking throughout the project.
    - For technical design and construction phases, the pre-construction forecasts should be used to evaluate the evolving design, and the at-tender forecasts should be used to evaluate tenders.
    - For the post-completion stage, it should be used to check the carbon reductions predicted in the pre-construction and at-tender forecasts have been achieved.

Mandatory requirements for complaint WLCAs during project development through to post-completion can be found in ***Appendix C***.

5.1.8 Recommended steps to complete a WLCA[6]

Adapted from Whole Life Carbon Assessment for the Built Environment (RICS II)

Figure 11. Recommended steps to complete a WLCA



5.1.9 Supporting framework for conducting WLCA

- **Spatial boundary:**

  A WLCA should consider all construction works relating to the project, including any demolition or deconstruction, facilitating works and site preparation required for building the asset, and external works within the site boundary. The site boundary should be in line with the intended use of the built asset, including all areas associated with the project that are integral to its operations. A town planning red line can serve as the site boundary where appropriate.

- **Element categories for building assessments:**

  All buildings are made up of building elements, that are grouped into categories such as foundations, superstructure, envelope, and services. Appendix II outlines the building elements that should be covered in the WLCA to ensure consistency of measurement and reporting.

All building elements set out in Appendix II (Appendix C Scope related to building elements, derived from NRM on the RICS guidance).

[6] Whole Life Carbon Assessment for the Built Environment, RICS Professional Standard, 2nd edition - RICS iConsult

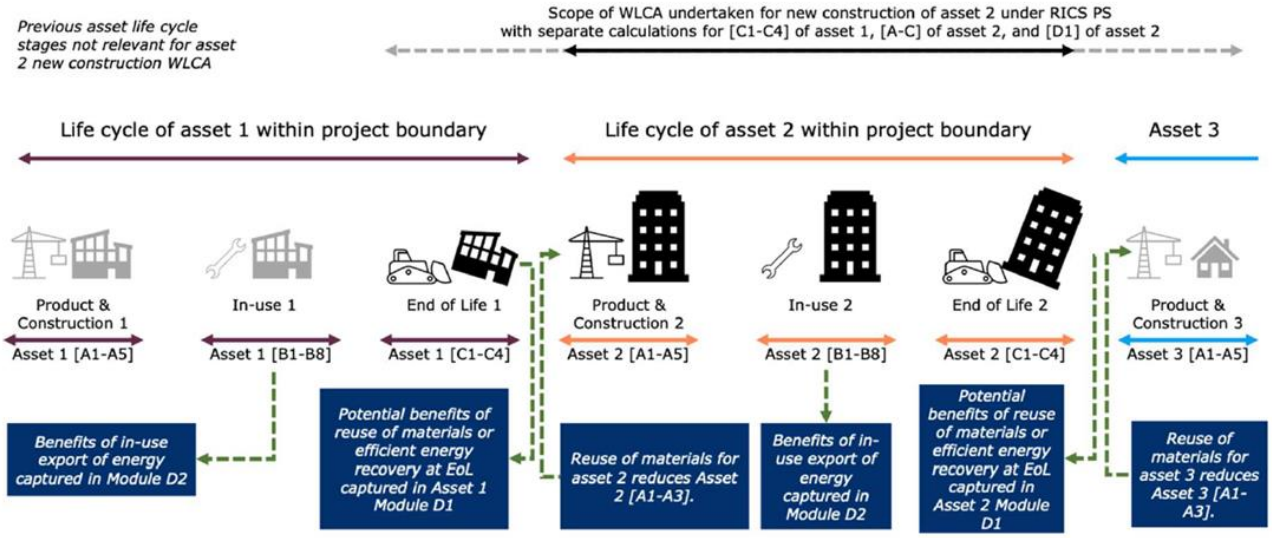
5.1.10 Types of projects included in the Climate Bonds Buildings Criteria

Different project types have different characteristics that may require changes in emphasis when conducting a WLCA. The following identified particularities that relate to the main project type adopted from RICS covering only New Building as per the Climate Bonds refresh criteria.

- New Buildings/new-build assets

  For new build assets, buildings, or infrastructure civil works all life cycle stages must be assessed, including module D, and all building elements or infrastructure elements within the project site boundary must be included in WLCA. This includes any facilitating works and site preparation inside and outside of the asset footprint within the site boundary.

Figure 12: Life cycle stages of an asset



- Demolition, deconstruction, and new construction
  When any full/part demolition or deconstruction of an existing structure is required to facilitate the construction of a new asset within the designated boundary, the emissions associated with that demolition or deconstruction should be included in the WLCA in sub module of module A5.
- Module A5 – Construction and installation process
  The carbon emissions arising from any on-site construction-related activities must be considered in module A5. This includes any investigation works; demolition works associated with refurbishment or redevelopment of existing built assets or sites; temporary works associated with installation processes; energy consumption for site accommodation and plant use; and the impacts associated with any waste generated through the construction process, its treatment and disposal.
- Module A5 should be split and reported as four separate sub-modules:

Figure 13: Sub-modules of module A5

5.2 Area measurement

Floor areas from the following sources must be used and clearly stated in the WLCA, in the following order and/ or subject to availability at different project phases:

- BIM Model
- Bill of Quantities (BOQ) or cost plan
- Consultants drawing

Floor area measurement should be gross internal area (GIA) and should be reported in normalised metrics. The exact approach to measuring GIA should also be provided in a report format. For external works the area must be the works within the project boundary.

The WLCA report must be reported using $kgCO_2e$ or any stated clear metric multiple.

5.3 Material Quantity

A WLCA must cover all the items listed in a projects BOQ, cost plan, or as identified in other records (3D models, drawings or specifications, etc).

Material quantities from the following sources must be used for each phase, and their source clearly stated:

Table 1: Source of material quantities to be used at each phase for WLCA

Project phase	Material quantity source
Early design phase	• BoQs/ cost plan • Estimation from drawings • Cross-reference from BIM/ 3D model, where available
Technical design and construction phases	• BoQs/ cost plan • BIM model data
Post-completion phase	• As-built BIM model • Cross-reference with as-built records, • including material delivery records, concrete • pours, etc. where available

6 Guide to Scope 3 Accounting and Reporting

6.1 Background

6.1.1 What is GHG accounting?

Greenhouse Gas (GHG) accounting is a process of quantifying and reporting GHG emissions and removals associated with human activities. GHG accounting is important because it helps individuals, organisations and governments understand and track their carbon footprint and identifies area where emissions can be reduced. They are also important for ensuring compliance with regulatory requirements and meeting sustainability goals.

The application of GHG accounting is numerous and diverse. It can be used by companies to measure and manage their carbon emissions, identify energy saving opportunities and improve their environmental performance.

It is an essential tool for addressing climate change and achieving a sustainable future. By accurately measuring and reporting GHG emissions, individuals, organizations, and government can work together to reduce emissions and transition to a low carbon economy.

6.1.2 GHG Accounting in the real estate sector

One of the key applications of GHG accounting in the real estate sector is to inform sustainability strategies and set targets for reducing emissions. This includes assessing the energy efficiency of buildings, reducing energy consumption, and promoting the use of renewable energy sources. It can also help real estate companies to identify areas where emissions can be reduced through changes in transportation, waste management (human behaviour) and supply chain practices.

It is increasingly being used to access the environmental performances of real estate investments and to inform investment decisions. This includes evaluating the carbon footprint of buildings and portfolios as well as assessing the potential for carbon pricing and regulatory risks. It is crucial for the real estate sector to manage its environmental impact and meet the sustainability goals, as well as respond to changing the market demands and regulatory requirements.

6.1.3 Corporate GHG protocol standard

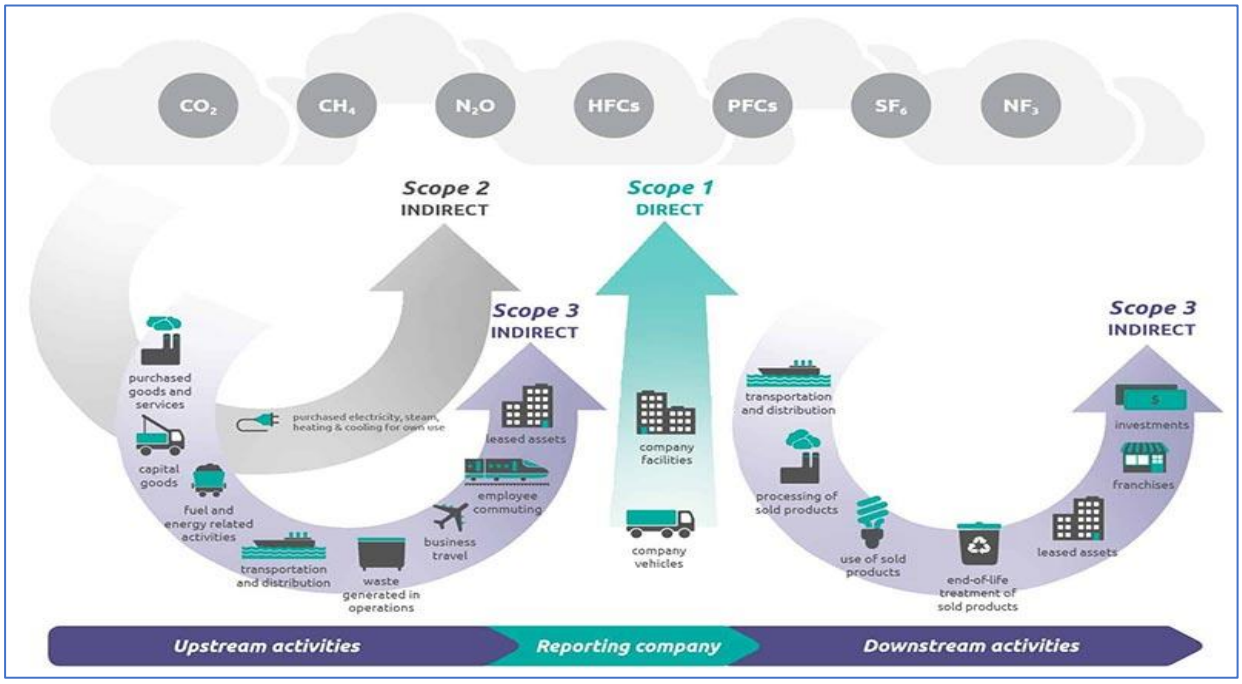
Until recently, companies have focused on emission from their own operations predominantly known as Scope 1 and Scope 2. With the growth in the market, there is an increasing understanding in the importance of accounting of GHG emissions along their value chains and products (known as Scope 3) to manage the GHG-related risks and opportunities.

The GHG Protocol Corporate Value chain (scope 3) Accounting and reporting standard[7] is an internationally recognised method for companies to account for their Scope 3 emissions.

The Corporate Standard classifies a company's direct and indirect emissions into three 'scopes' and requires that companies account for and report on scope 1 emissions (i.e., direct emissions from owned or controlled sources), and all scope 2 (i.e., all indirect emissions from the generation of purchased energy consumed by the reporting company and there is a flexibility in accounting for Scope 3 emissions (i.e., all other indirect emissions that occur in a company's value chain. An overview of the three GHG protocol scopes and categories of scope 3 emissions is provided below.

[7] Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf (ghgprotocol.org)

Figure 14. Overview of GHG protocol scopes and emissions across the value chain



Source: Scope3_Calculation_Guidance_0.pdf (ghgprotocol.org)

This guidance aims to assist companies under the Climate Bonds Low-carbon Buildings Sector to report on Scope 3 emissions and is intended to meet the suggested sector-specific guidance requirements, as set out in the GHG Protocol Corporate Value Chain (Scope 3) accounting and Reporting Standard to promote additional consistency in way of companies accounting and reporting on scope 3 emissions.

This should be used in conjunction with the more detailed Technical Guidance for Calculating Scope 3 emissions document[8] while undertaking the calculations along with the GHG protocol.

[8] Scope3_Calculation_Guidance_0.pdf (ghgprotocol.org)

6.1.4 Overview of Scope 3 categories

The GHG Protocol Corporate Value chain Standard categorizes scope 3 emissions into 15 categories, as listed in figure 10 above and figure 11 along with the description of each of the 15 categories is presented in table 3. The categories are intended to provide companies with a systematic framework to organize, understand and report on the diversity of scope 3 activities within a corporate value chain.

Table 2. Scope 3 Categories (adapted from GHG Protocol)

Upstream or downstream	Scope 3 category
Upstream scope 3 emissions	1 Purchased goods and services 2 Capital goods 3 Fuel- and energy-related activities (not included in Scope 1 and scope 2) 4 Waste generated in operations 5 Business travel 6 Employee commuting 7 Upstream leased assets
Downstream scope 3 emissions	8 Downstream transportation and distribution 9 Processing of sold products 10 Use of sold products 11 End-of-life treatment of sold products 12 Downstream leased assets 13 Franchises 14 investments

Source: Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf (ghgprotocol.org)

Table 3: Description and minimum boundaries

Category	Category description	Minimum boundary
1 Purchased goods and services	• Extraction, production, and transportation of goods and services purchased or acquired by the reporting company in the reporting year, not otherwise included in categories 2 - 8	• All upstream (cradle-to-gate) emissions of purchased goods and services
2 Capital Goods	Extraction, production, and transportation of capital goods purchased or acquired by the reporting company in the reporting year.	All upstream (cradle-to-gate) emissions of purchased capital goods
3 Fuel and energy related activities (not included in scope 1 and 2 emissions)	None	n/a
4 Upstream transportation and distribution	None	n/a
5 Waste generated in operations	None	n/a
6 Business travel	None	n/a
7 Employee commuting	None	n/a

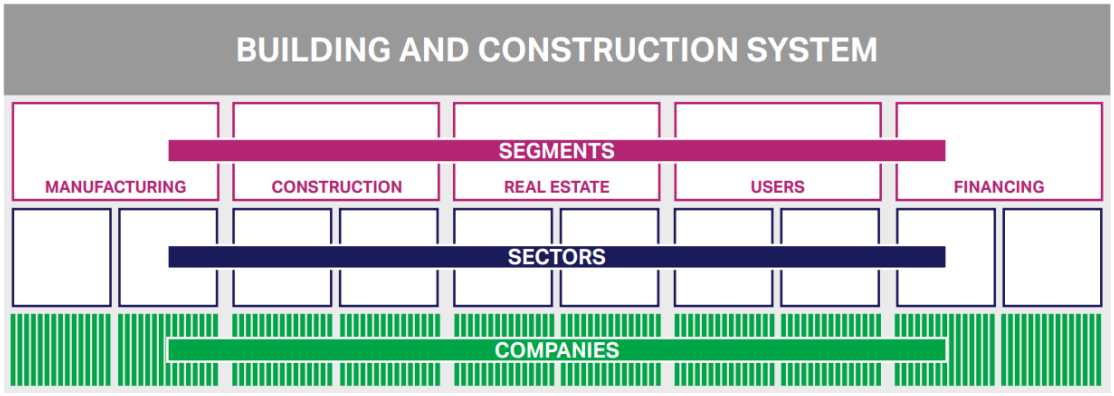
Category		Category description	Minimum boundary
8	Upstream leased assets	None	n/a
9	Downstream transportation and distribution	None	n/a
10	Processing of sold products	Processing of intermediate products sold in the reporting year by downstream companies (e.g., manufacturers)	The scope 1 and scope 2 emissions of downstream companies that occur during processing (e.g., from energy use)
11	Use of sold products	End use of goods and services sold by the reporting company in the reporting year	The direct use-phase emissions of sold products over their expected lifetime (i.e., the scope 1 and scope 2 emissions of end users that occur from the use of: products that directly consume energy (fuels or electricity) during use; fuels and feedstocks; and GHGs and products that contain or form GHGs that are emitted during use) • **Optional**: The indirect use-phase emissions of sold products over their expected lifetime (i.e., emissions from the use of products that indirectly consume energy (fuels or electricity) during use)
12	End-of-life treatment of sold products	Waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life	The scope 1 and scope 2 emissions of waste management companies that occur during disposal or treatment of sold products
13	Downstream leased assets	Operation of assets owned by the reporting company (lessor) and leased to other entities in the reporting year, not included in scope 1 and scope 2 - reported by lessor	The scope 1 and scope 2 emissions of lessees that occur during operation of leased assets (e.g., from energy use). • **Optional**: The life cycle emissions associated with manufacturing or constructing leased assets
14	Franchises	None	n/a
15	Investments	Operation of investments (including equity and debt investments and project finance) in the reporting year, not included in scope 1 or scope 2	

Source: Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf (ghgprotocol.org)

6.2 Defining the categories of the building and construction system

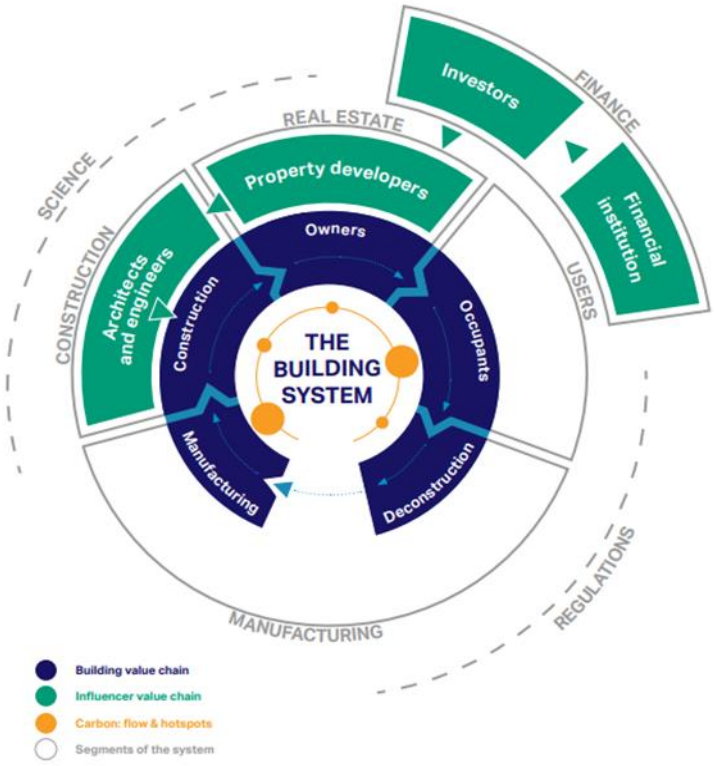
Defining the categories of the building is a key part for reporting and accounting of Scope 3 emissions. This determines who are the key players included in a company's organizational boundary and how emission from each operation is integrated by the reporting company and has been adopted from world business council for sustainable development. Figure 3 explains the categories of the building and construction system while figure 4 shows the value chain inside the building and construction system.

Figure 15. Categories of the building and construction system



Source: The Building System Carbon Framework (wbcsd.org)

Figure 16. Value chain of building and construction system



Source: The Building System Carbon Framework (wbcsd.org)

6.3 Guidance for reporting and accounting under the Climate Bonds Low carbon Buildings Criteria

6.3.1 Building value chain and their intended users

The below table provides the list of building value chain identified from WBCSD and their intended users who are required to report for Scope 3 emissions under the Climate Bonds Low carbon buildings criteria.

Table 4: Alignment of intended users within the Building value chain

Building value chain	Intended users
Manufacturers	Users who are linked with the manufactures (as their products are an essential part of a buildings value chain representing a large portion of embodied carbon).
Construction	• Architecture/engineering firms • Property Developers
Owners/Managers	• Developers • Property/Asset managers • Owner - lessor • Owner - occupier • Financial Institutions (FI) (?) • (Real estate?)
Deconstruction	• Construction firms • Developers • Individual house owners (?)

6.3.2 Intended users and their relevant target categories

The below table provides the list of intended users and their relevant target categories adapted from GHG Protocol Corporate Value chain accounting and reporting standard and Table 4 provides the relation between Life cycle stages (for Whole Life Carbon Assessment) and the corresponding reporting category under the GHG Protocol.

Table 5: Scope categories and target categories

Intended users	Cat 1	Cat 2	Cat 3 to Cat 9	Cat 10	Cat 11	Cat 12	Cat 13	Cat 14	Cat 15
Architecture/engineering firms			n/a	✓	✓	✓			
Property Developers	✓	✓				✓			
Property/Asset managers	✓								
Owner - lessor	✓	✓					✓		
Owner - Occupier	✓	✓					✓		

Table 6: Relation between Life Cycle Stages and GHG Protocol Categories

Life Cycle Stages	Reporting Category
A1 - A5 Includes the Embodied Emissions of a built environment project	• Reported as Scope 3 under Category 1, 2 and/or 4, as applicable. • In the year the project occurred.
B1, B2, B3, B6 - Operational emissions associated with a built environment project B4 and B5 are embodied emissions reported as Scope 3 in the year of replacement or refurbishment	• Category 1, cat 10, cat 13 (in-use embodied emissions for renovation or maintenance)
C1 - C4 Embodied emissions of a build environment project (Reported as Scope 3)	• Category 5 or 12 in the year the materials reach end of life
D emissions are not embodied emissions but can be considered relevant carbon sinks if additional accounting criteria is met.	• n/a

Appendix A: TWG and IWG members

Technical Lead Advisor:	
Ché Wall	Director, Flux Consultants

TWG Members			
Alan Yates	Technical Director - Sustainability, BRE Group	**Panama Bartholomy**	Director, Investor Confidence Project (Environmental Defence Fund)
Alex Rathmell	Director, EEVS Insight	**Paolo Zancanella**	Officer, European Commission (Joint Research Centre)
Annie Degen	Special Adviser Long Term Finance, UNEP Finance Initiative	**Peter Sweatman**	Chief Executive, Climate Strategy & Partners
Ché Wall	Director, Flux Consultants	**Prashant Kapoor**	Principal Industry Specialist, International Finance Corporation
Chris Botten	Programme Manager, Better Buildings Partnership	**Robert Cohen**	Technical Director, Verco
Johannes Kreissig	Vice President Building & Construction, thinkstep	**Simon Brooker**	Executive Director, Clean Energy Finance Corporation (CEFC)
John Dulac	Buildings Sector Lead - Energy Technology and Policy, International Energy Agency (IEA)	**Tatiana Bosteels**	Head of Responsible Property Investment, Hermes Real Estate
Jorge Chapa	Head of Market Transformation, Green Building Council of Australia (GBCA)	**Teun van den Dries**	Founder & CEO, GeoPhy
Loïs Moulas	CEO, Observatoire de l'Immobilier Durable	**Victor Rojas**	Project Lead, Investor Confidence Project (Environmental Defense Fund)
Oliver Rapf	Executive Director, Buildings Performance Institute Europe		

IWG Members			
Grace Tam	Director - Debt markets Clean Energy Finance Corporation (CEFC)	**Hugh Garnett**	IIGCC, UK
Isabelle Schatz	Blkb Switzerland	**Szymon Smolarek**	ING Hipotec, poland
David Sellars	First Mac, Australia	**Alison Chan**	Metrics
Laura Conigliaro	Jupiter AM, UK	**Begum Gursoy**	Sustainalytics , EU
Pip Best	EY, NZ	**Karl Downey**	SBTi, UK
Frans Baas	Vestada, NL		
Jennifer Cooper	Brookfield, aus		