ACT

SECTOR METHODOLOGY

Assessing low-Carbon Transition

Building Construction

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ACT | ASSESSING LOW CARBON TRANSITION ®

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1. Introduction

The 2015 United Nations Climate Change Conference (COP21) in Paris further strengthened the global recognition of limiting dangerous climate change. Political agreement was reached on limiting warming to 2 degrees above pre-industrial levels. The project 'Assessing low Carbon Transition' (ACT) measures a company's alignment with a future low-carbon world. The goal is to drive action by companies and encourage businesses to move to a 2-degrees compatible pathway in terms of their climate strategy, business model, investments, operations and GHG emissions management. The general approach of ACT is based on the Sectoral Decarbonization Approach (SDA) developed by the Science Base Target initiative (SBTi) in order to compare company's alignment with a 2-degrees world, the application of which is described in the ACT Methodological Framework document (*Sectoral Decarbonization Approach (SDA): A method for setting corporate emission reduction targets in line with climate science*, 2015).

Nearly 40% of the greenhouse gas (GHG) emissions worldwide are related to the building sector (scope 1, 2 and 3). This proportion is likely to increase due to world population growth, ongoing urbanization and easier access to property in emerging countries which will all contribute to the addition of 230 billion m^2 of new buildings within the next 40 years [1]. In the International Energy Agency (IEA) ETP Reference Technology Scenario (RTS), which considers only countries' existing commitments, global buildings energy consumption is seen to increase by more than 30% in the next 40 years while only by 5% in the 2DS (decrease by 7% in the B2DS) [10]. In terms of CO_2 emissions (including scope 2 energy emissions), this translates to a reduction of 85% by 2060 for the 2DS. To achieve that, energy efficiency measures (e.g. envelope improvement, technology performance, etc.) coupled to a gradual electrification of building end uses and decarbonization of electricity will be essential[1].

The prominent role of the building sector in the fight against climate change reflects the need to assess companies involved in this industry and encourage them to achieve low carbon targets.

The position of the building industry in the economy makes it difficult to grasp the reality of it. Indeed, the sector covers different activities (real estate development, construction work, building management, etc.) operated by diverse companies. Therefore, assessing the building sector emissions requires a life-cycle approach, integrating all parts of the supply chain. This makes the building sector suitable for analysis via a SDA [3] and allows the ACT assessment to focus on quantitative indicators. Nevertheless, due to the complexity of the sector and its economic importance, other qualitative indicators (e.g. business models…), are also highly significant when considering the alignment with a low-carbon future and should not be neglected or underweighted.

In order to better address the variety of issues related to carbon assessment in the building sector, two separate reference methodologies have been implemented to cover all the relevant stakeholders. The Construction methodology focuses on the low-carbon alignment of companies that construct and renovate

[1] **The IEA ETP Reference Technology Scenario refers only to the use of buildings and excludes construction and raw materials emissions.**

buildings; whereas the goal of the Real Estate methodology is to assess firms whose main business is property management.

This present document introduces the ACT construction methodology. Particular emphasis will be placed on the GHG emissions released during the construction phase (including raw materials) and operational emissions caused by the building use, which represents from 43% to 58% of total emissions over a new building's lifetime [4]. More recent French data (2017-2019[2]) show that GHG emissions from in-use energy, considering all end-uses, represent 50% or less of the total GHG emissions of the building life cycle. The assessment methodology also considers factors such as: market share of low-carbon buildings, R&D expenses in Climate Change Mitigation Technologies as well as low carbon transition plan. This information will feed simplified assessment models that aim to quantify the implications of initiatives such as installing smart building systems or taking part in the construction of "exemplary buildings". In addition to business model considerations, other qualitative indicators included are the company's stance on climate change regulations and engagement with the supply chain. An experimentation phase is planned, and will help test the methodology and collect feedbacks to improve it and make it more operational.

[2] According to provisional results drawn from E+C- Observatory in March 2019. For office buildings using electricity as in-use energy, given the low CO_2 intensity of French kWh, the in-use energy related GHG may be only 20% of the total GHG of the building life cycle. See http://www.batiment-energiecarbone.fr/

2. Principles

The selection of principles to be used for the methodology development and implementation is explained in the general Framework. Table 1 recaps the adopted principles that were adhered to when developing the methodology.

TABLE 1: PRINCIPLES FOR IMPLEMENTATION

RELEVANCE - Select the most relevant information (core business and stakeholders) to assess low-carbon transition.
VERIFIABILITY - The data required for the assessment shall be verified or verifiable.
CONSERVATIVENESS - Whenever the use of assumptions is required, the assumption shall err on the side of achieving a 2° maximum global warming.
CONSISTENCY - Whenever time series data is used, it should be comparable over time.
LONG-TERM ORIENTATION - Enables the evaluation of the long-term performance of a company while simultaneously providing insights into short- and medium-term outcomes in alignment with the long-term.

3. Scope

3.1. SCOPE OF THE DOCUMENT

This document presents the ACT assessment methodology for the Building Construction sector. It includes rationales, definitions, indicators and guidance for performance assessment. It focuses on the specific considerations and constraints that need to be considered when assessing the low-carbon alignment of the Building Construction sector.

3.2. SCOPE OF THE BUILDING SECTOR

The present methodology refers to construction companies and not real estate companies. The activities of the Building Construction sector may include:

1. Real Estate Development & Operations (due diligence, land use permitting, leasing marketing)
2. Architectural Engineering (building design, building engineering)
3. New Construction (site management, construction of new structures)
4. Renovation (existing buildings' retrofit)

The scope includes the activities mentioned above as they are all considered within the life cycle assessment of a building.

Companies that provide construction materials and equipment are not specifically assessed by the following assessment methodology. They are not eligible to participate in the assessment. However, their impacts are considered through the LCA approach when assessing the emissions related to materials (see "4. Boundaries").

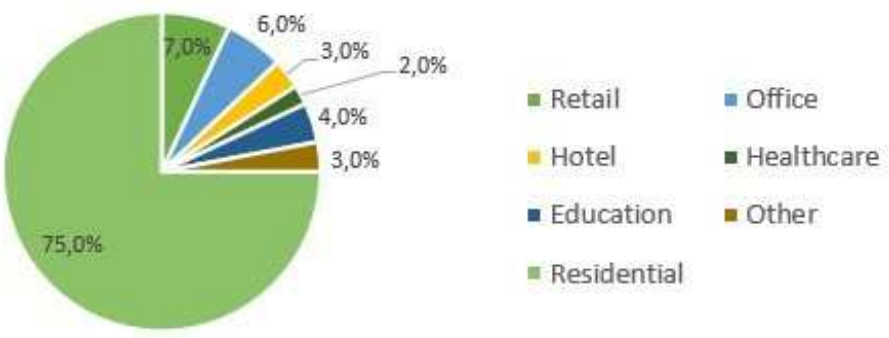
Companies which carry out projects in separate lots (opposed to general contracting) are currently excluded from the scope of the Building Construction Methodology, because the first version of this methodology is not relevant for companies which are only involved in a sub-set of lots. Indeed, it is not possible to consider GHG emissions of materials on a limited number of lots. Nevertheless, background data used for quantitative benchmarks and pathways were produced lot by lot, that might facilitate in a future version the inclusion of companies working in "separate lots"[3]

3.3. BUSINESS SEGMENTS

The buildings delivered by construction companies greatly vary according to their physical characteristics and use. The scope includes different business segments in order to emphasize the specific features of each type of building. These segments are defined based on the building use (i.e. commercial, residential and industrial) and the occupancy. In the case of a mixed-use building (e.g. residential building with commercial stores in the ground floor), the business segment occupying the highest floor space area should be considered. This breakdown represents the reference framework to be used when conceiving the sectoral benchmarks.

Residential buildings represent the clear majority (75%) of floor space in Europe [6]. Retail and offices respectively cover 7% and 6% of total floor area (see figure 1). The specific benchmarks cover those three segments. Furthermore, the methodology provides two specific benchmarks for the residential segment: multi-family and single-family housing; as they are very different in terms of energy consumption and spatial organization. Besides, each of them represents a large part of the total floor space (see figure 2 with the example for France). Given the data availability and methodology simplicity, the rest of the business segments, which represent less significant shares of total floor area, are compared to the sector average. Besides, the adaptation of decarbonization pathways for such segments is very difficult.

FIGURE 1: BREAKDOWN OF FLOOR AREA IN EUROPE. SOURCE: EUROPEAN COMMISSION (2017).

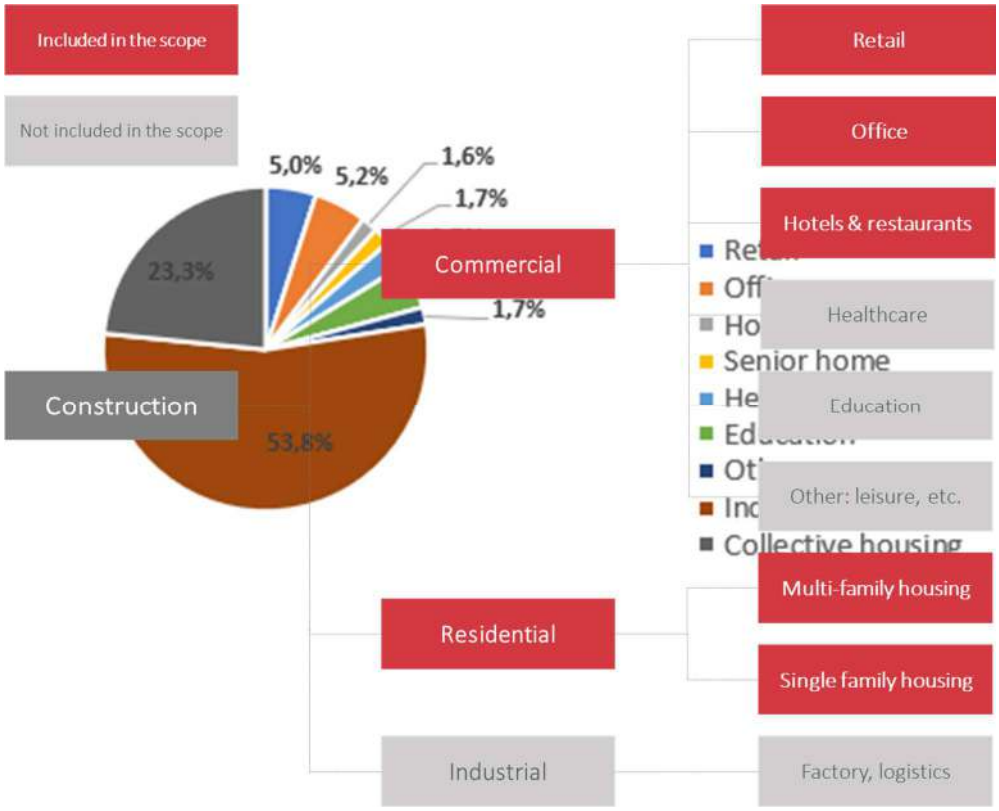


[3] The exclusion of companies working in separate lots will be discussed following the experimentation phase and given the collected feedbacks.

FIGURE 2: BREAKDOWN OF FLOOR AREA IN FRANCE. SOURCE: ADEME (2014).

Figure 3 illustrates the main business segments that constitute the Construction sector and those included in the scope. Under each segment, we don't distinguish prestigious high-tech buildings from standard ones (notably for offices or hotels). It is a methodological choice not to consider such sub-segments. Moreover, it would have been difficult to define benchmarks and adapt decarbonization pathways for each sub-segment.

FIGURE 3: BUSINESS SEGMENTS OF THE CONSTRUCTION SECTOR.



Source: GRESB, RE Developer Reference Guide, 2017.

3.4. GEOGRAPHICAL SCOPE

The ACT methodology aims to assess companies on an international level, covering buildings located in various regions. Those areas display specific characteristics (climate, urbanization model, data availability) and therefore may require to be assessed separately. The methodology thus considers the following geographical areas:

- Europe (and the 28 countries of EU, including UK);
- North America (USA only);
- South America (Brazil only);
- China;
- India;
- Russia;
- ASEAN (ten countries of South East Asia with only global data including Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam);
- Africa (South Africa only).

Table 2 illustrates the main components of regulated and unregulated energy use components.

TABLE 2: COMPONENTS OF REGULATED AND UNREGULATED ENERGY USE.

Regulated Energy use	Unregulated Energy use
Heating	Transportation (elevators…)
Cooling	IT equipment
Ventilation	Catering facilities
Interior lighting	Lab equipment
Hot water	…

Source: ASHRAE Standard 90.1.

4. Boundaries

4.1. REPORTING BOUNDARIES

The methodology should consider:

- Company's own buildings (occupied by the company) ;
- New buildings delivered by the company;
- Renovated buildings delivered by the company.

The most significant sources of emissions for construction companies are those related to the delivered buildings, which include the emissions associated with raw materials, construction works and use phase. The reporting boundaries of the ACT methodology for construction companies focus on the delivered buildings emissions, which are considered as the "products sold" by construction companies. Although GHG emissions related to buildings occupied by the construction companies such as offices are relatively insignificant compared to delivered buildings' emissions, they reflect the companies' willingness to tackle environmental issues within the industry. They should therefore be considered within the reporting boundaries of the construction companies as well..

4.2. TEMPORAL BOUNDARIES – BUILDING'S LIFE-CYCLE ASSESSMENT (LCA)

Buildings' emissions are coming from different phases covered by the LCA:

- Emissions related to production, transformation and transport of materials;
- Emissions released during on-site operations (construction phase);
- Emissions caused by the use of the building (mostly energy consumption). Indeed, the design and construction phases will undeniably have an impact on the emissions occurring during the use phase as well as the consideration of regulated uses;
- Emissions due to the use phase and the rest of the life cycle of the building, considered as an assembly of materials: repair and maintenance, replacement, potential renovation works,

deconstruction, disposal or recycling of residual materials marking the end of the building's life-time (based on average contemporary end-of-life scenarios).

Figure 4 illustrates the different phases involved in a buildings' LCA.

FIGURE 4: BROAD AREAS OF A BUILDING'S LIFE CYCLE.

Source: BIS, 2010.

Theoretically, the assessment should consider the entire temporality of the building through LCA and all materials forming the building, as far as possible. The ideal situation is to have a large national or regional database of EPDs covering the full life-cycle of construction products and equipment. In practice, today it is rarely the case, but the situation is evolving rapidly at least in developed countries, and it is possible to rely on generic or default values were industry specific ones are lacking.

Regarding the buildings' energy consumption, construction companies are required to report only the so-called "regulated" uses of the energy consumption. Nevertheless, as ventilation related energy is included in appliances related energy in IEA data and pathways, and not isolated as such, the "regulated" uses considered here are limited to four main end-uses: space heating, space cooling, hot water and indoor lighting.

Finally, we will consider GHG emissions from three sources (or contributors):

- Sum of LCAs of materials (construction products and equipment)
- On-site construction processes not already included in the previous point (with the help of a default value)
- In-use/operational energy consumption for the four main end-uses

For new buildings, the present methodology requires to include these three sources. For materials, the benchmarks and pathways will include all lots of works, from foundations to finishes, even if we know that some construction companies work in "separate lots", that is on a limited number of lots (structure, HVAC, etc.). Currently the methodology is not relevant for "separate lots" works.

For renovated buildings, only the in-use/operational energy consumption is required. Considering there are many cases of renovation, from renewing only finishes to replace all components excepted the structure, it is impossible to define quantitative benchmarks and pathways for all cases. Deep and thermal renovation is addressed in the present ACT methodology, but in a different way than LCA.

The five business segments selected in the scope are to be associated with specific benchmarks. The rest of the business segments could be compared with the sector average. Each benchmark covers the five geographic areas (see "geographic scope").

4.3. RATIONALE

4.3.1. REPORTING BOUNDARIES

On one hand, use phase emissions represent a significant share of the total emissions in a building's life-time, but less and less with energy-efficient buildings. On the other hand, the share related to materials life-

cycle and on-site processes is increasing in complex, high-rise or high-tech buildings. All these GHG emissions vary considerably depending on the type of building, the technical choices and the location. For instance, for new buildings in France, the construction materials, on their full life-cycle, are responsible for 45% to 75% of the total emissions of a building, the construction phase for 1 to 3% and the in-use energy use phase for 22 to 50% (including all end-uses) whereas in China, the part related to the use phase goes up to 75-86% [5]. Including the different phases is the best approach to capture the specific characteristics of each type of buildings. Besides, assessing the GHG emissions of a building through the LCA requires to include all the phases mentioned in Figure 4.

4.3.2. SCOPE OF THE END-USE OF ENERGY

The energy consumption of a building is multidimensional and needs to be detailed. Even though there is no taxonomy commonly agreed upon worldwide, national and regional initiatives converge towards the identification of two main categories of energy use components. On one hand, the regulated components of energy use (e.g. heating, cooling, etc.) are supposed to be under the control of building sector companies. They are considered in most of the labels developed to assess low-carbon buildings: i.e. BBCA, Minergie label, HQE (FR), LEED (USA), BREEAM (UK), and LIDERa (PT). On the other hand, building companies do not have control on unregulated energy use components which are often in the hands of occupants. Construction companies are not legally required to record them when reporting energy consumption.

Companies are required to report only on the regulated components of the energy use. Asking for this information only is relevant for two reasons. First, companies have little control on unregulated energy use since these components are mostly associated with equipment used by the occupants or tenants. Following the principle of Relevance, the methodology assesses the company's willingness to align with low-carbon scenario only where it has the ability to influence. Finally, since companies do not report on unregulated energy use, data is highly uncertain and largely based on estimates.

5. Construction of the data infrastructure

5.1. DATA SOURCES

In order to carry out a company level assessment, many data points need to be gathered which can be sourced from various locations. Principally, ACT relies on the voluntary provision of data by the participating companies.

Next to this however, external data sources might be consulted where this would streamline the process, ensure fairness, and provide additional value for verification and validation.

5.2. COMPANY DATA REQUEST

The data request will be presented to companies in a comprehensive data collection format.

5.3. PERFORMANCE INDICATORS

The performance indicators have been conceived following the main principles described in 2.

5.3.1. INTENSITY METRIC – FLOOR AREA

The carbon intensity requested to the company which is considered for some indicators (BC 1.1, BC 1.2, BC 1.3, BC 1.4, BC 1.5 and BC 1.6) shall be calculated based on the floor area (m^2).

With the various metric systems per country of type of building, a correction factor is applied to match with CO_2 intensity's benchmark. The floor area considered is the whole building area excluding external, outdoor and parking areas. If data for some operations is unavailable, resulting in a lower coverage, a correction factor shall be applied to the scoring.

Table 3 illustrates the key performance indicators used by Building Construction (BC) companies in ACT sector assessment.

TABLE 2: PERFORMANCE INDICATORS OVERVIEW

		BUILDING CONSTRUCTION		
		PAST	PRESENT	FUTURE
CORE BUSINESS PERFORMANCE		1. TARGETS	BC 1.6 Historic target ambition and company performance	BC 1.1 Alignment of owned buildings reduction targets
				BC 1.2 Alignment of new buildings delivered (use phase) reduction targets
				BC 1.3 Alignment of renovated buildings (use phase) reduction targets
				BC 1.4 Alignment of new buildings delivered (materials) reduction targets
				BC 1.5 Time Horizon of targets
	INVESTMENTS	3.INTANGIBLE INVESTMENT		BC 3.6 R&D in climate change mitigation technologies
		4.SOLD PRODUCTS PERFORMANCE	BC 4.1 Alignment of carbon performance trend for new buildings (use phase)	BC 4.4 Emissions lock-in
			BC 4.2 Low carbon buildings share	
			BC 4.3 Renovated buildings subject to thermal renovation share	
		5.MANAGEMENT	BC 5.1 Oversight of climate change issues	BC 5.3 Low-carbon transition plan
			BC 5.2 Climate change oversight capability	BC 5.5 Climate change scenario testing
			BC 5.4 Climate change management incentives	
INFLUENCE		6.SUPPLIERS	BC 6.2 Activities to influence suppliers to reduce their GHG emissions	BC 6.2 Strategy to influence suppliers to reduce their GHG emissions
		7.CLIENTS	BC 7.2 Activities to influence consumer behaviour to reduce their GHG emissions	BC 7.2 Activities to influence consumer behaviour to reduce their GHG emissions
		8.POLICY ENGAGEMENT	BC 8.1 Company policy on engagement with trade associations	
			BC 8.2 Trade associations supported do not have climate-negative activities or positions	
			BC 8.3 Position on significant climate policies	
		9.BUSINESS MODEL	BC 9.1 Integration of the low-carbon economy in current and future business model	

Table 4 displays how the proposed indicators cover the different GHG emissions scopes identified in the “Scope” and “Boundaries” chapters above, in the consideration of the availability of sectoral benchmark for these scopes, as well as of company data availability.

TABLE 4: INDICATORS AND SCOPE OF GHG EMISSIONS

		Scope of GHG emissions						
		New buildings delivery			Renovated buildings delivery			Own buildings
BC	Indicators	Building Use	Work & logistics	Materials	Building Use	Work & logistics	Materials	Building Use
Sectoral benchmarks availability		✓		✓	✓			✓
1.1	Alignment of owned buildings reduction targets							
1.2	Alignment of new buildings delivered (use phase) reduction targets							
1.3	Alignment of renovated buildings (use phase) reduction targets							
1.4	Alignment of new buildings (materials) reduction targets							
1.5	Time horizon of targets							
1.6	Historic target ambition and company performance							
3.1	R&D in Climate Change mitigation technologies							
4.1	Alignment of carbon performance trend for new buildings (use phase)							
4.2	Low carbon buildings share							
4.3	Renovated buildings subject to thermal renovation share							
4.4	Emissions lock-in							
5.1	Oversight of climate change issues							
5.2	Climate change oversight capability							
5.3	Low carbon transition plan							
5.4	Climate change management incentives							
5.5	Climate change scenario testing							
6.1	Strategy to influence suppliers to reduce their GHG emissions							
6.2	Activities to influence suppliers to reduce their GHG emissions							
7.1	Strategy to influence customer behaviour to reduce their GHG emissions							
7.2	Activities to influence consumer behaviour to reduce their GHG emissions							
8.1	Company policy on engagement with trade associations							
8.2	Trade associations supported do not have climate-negative activities or positions							
8.3	Position on significant climate policies							
9.1	Business model							

TARGETS (WEIGHTING: 15%)

• BC 1.1 ALIGNMENT OF OWNED BUILDINGS REDUCTION TARGETS (WEIGHTING: 1%)

DESCRIPTION & REQUIREMENTS	BC 1.1 ALIGNMENT OF OWNED AND RENTED BUILDINGS REDUCTION TARGETS
SHORT DESCRIPTION OF INDICATOR	A measure of the alignment of the company's own buildings emissions reduction targets with their decarbonization pathway. Buildings owned and rented by the company are considered. The indicator will identify the gap between the company's targets and the decarbonization pathway as a percentage, which is expressed as the company's commitment gap.

DATA REQUIREMENTS

The questions comprising the information request that are relevant to this indicator are:

- - A1: Current internal targets set on carbon performance (kgeCO2/m²)
- - A7: Breakdown of floor areas per business segment and country

The benchmark indicators involved are:

TARGET TYPE	PARAMETER	INTENSITY METRIC	BENCHMARK
Own buildings emissions	CB_{OB}	kgeCO2/sqm	Real-Estate_In-Use-all_Services_Office_"Geo-zone"_"Country" (possibly combination of offices in different zones/countries)

HOW THE ANALYSIS WILL BE DONE

The assessment is based on the difference between the company's target (T_{OB}) and the company benchmark (CB_{OB}) 5 years from the reporting year.

The company target pathway (T_{OB}) is the decarbonization over time, defined by the company's emission reduction target. To compute T, a linear line is drawn between the starting point of the assessment and the company's target endpoint.

The company benchmark (CB_{OB}) pathway is the 'company own buildings decarbonization pathway'. See section 6 for details on the computation of this pathway.

The assessment will compare T_{OB} to CB_{OB}, by assessing the difference between these pathways 5 years after the reporting year. The pathways are expressed in kilograms of CO2 per unit of square meter (intensity measure). Where necessary, targets will be normalized to this unit to enable the comparison. The result of the comparison is the commitment gap.

To assign a score to this indicator, the size of the commitment gap will be compared to the maximum commitment gap, which is defined by the business as usual pathway (BAU_{OB}). BAU_{OB} is defined as an unchanging (horizontal) intensity pathway, whereby the emissions intensity is not reduced at all 5 years after the reporting year.

CALCULATION OF SCORE:

The score is a percentage of the maximum commitment gap. It is calculated by dividing the company's commitment gap by the maximum commitment gap (taking all values 5 years after the reporting year):

$$Commitment\ gap\ [Own\ Buildings] = \frac{T_{OB} - CB_{OB}}{BAU_{OB} - CB_{OB}}$$

$$Score = 1 - Commitment\ gap$$

The score assigned to the indicator is equal to 1 minus the commitment gap and is expressed as a percentage (1 = 100%). Therefore, if $T_{OB} - CB_{OB}$ is equal to zero, and so the company's target is aligned with the sectoral benchmark, the maximum score is achieved.

The aggregation system of the various benchmarks (country, business segment) is based on the proportion of each segment/country represented in average square meter unit.

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Emissions reduction targets related to the company's own buildings are included in the ACT Building Construction (BC) assessment for the following reasons:

- Targets are an indicator of corporate commitment to reduce emissions, and are a meaningful metric of the company's internal planning towards the transition.
- Targets are one of the few metrics that can predict a company's long-term plans beyond that which can be projected in the short-term, satisfying ACT's need for indicators that can provide information on the long-term future of a company.
- Although the company's own buildings emissions are negligible compared to delivered buildings emissions, they have a symbolic value for the construction firm and reflect the willingness of the management to develop sustainable building practices. Even though the companies rent their offices, they can choose the buildings regarding certain criteria such as energy efficiency. Rented buildings are therefore also included in the methodology.

SCORING RATIONALE:

Targets are quantitatively interpreted and directly compared to the low-carbon benchmarks for the sector, using the SDA benchmark, which is further explained in section 6.1.

Targets are compared to the benchmark directly, and the relative gap is calculated compared to the business as usual pathway. The gap method was chosen for its relative simplicity in interpretation and powerful message, which aligns with the UNEP's narrative of the global commitment gap of the UNFCCC Climate Agreements [7]. The simple percentage score also needs no further computation to become meaningful on its own, as well as be useable for aggregation in the performance score.

To ensure comparability of the scores and replicability of the measurement, targets are compared to the benchmark at a fixed point in time, similar to all companies. This is necessary, because the method interprets linear decarbonization pathways from the targets, while the decarbonization pathways are nonlinear. Therefore, the measurement gaps would vary over time if the time of measurement was not constant, and undesired precedent is set for reporting only targets with short-time horizons.

5 years after the reporting year was chosen as the reference for this measurement, as it is far enough in time to make a meaningful measurement of the company's future pathway, while close enough to be able to include the typical short to medium time scale of present-day company targets.

- **BC 1.2 ALIGNMENT OF NEW BUILDINGS DELIVERED (USE PHASE) REDUCTION TARGETS (WEIGHTING: 5%).**

DESCRIPTION & REQUIREMENTS	BC 1.2 ALIGNMENT OF NEW BUILDINGS DELIVERED (USE PHASE) REDUCTION TARGETS
SHORT DESCRIPTION OF INDICATOR	This indicator assesses the company's emissions reduction targets in regard to emissions related to energy consumption and released during the use phase of new delivered buildings. The indicator will identify the gap between the company's target and the decarbonization pathway as a percentage, which is expressed as the company's commitment gap.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A1: Current internal targets set on carbon performance (kgeCO2/m²) ♦ A7: Breakdown of floor areas per business segment and country The benchmark indicators involved are:

TARGET TYPE	PARAMETER	INTENSITY METRIC	BENCHMARK
New buildings use	$CBnbu$	kgCO2/sqm	Construction_In-Use-reg_"Building-type"_"Building-typology"_"Geo-zone"_"Country" (in most cases, combination of several pathways according to shares of buildings typologies and zones/countries)

HOW THE ANALYSIS WILL BE DONE	The assessment of this indicator follows the same general methodology of scoring indicator BC 1.1. Therefore, refer to the assessment of indicator BC 1.1 for more details. A main difference with BC 1.1: here only 4 main end-uses are considered: space heating, space cooling, hot water and indoor lighting. Ventilation is not included in the benchmark.

RATIONALE	BC 1.2 ALIGNMENT OF NEW BUILDINGS DELIVERED (USE PHASE) REDUCTION TARGETS.
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR:** Targets related to new delivered buildings are included in the ACT BC assessment for the following reasons: ♦ Targets are an indicator of corporate commitment to reduce emissions, and are a meaningful metric of the company's internal planning towards the transition. ♦ Targets are one of the few metrics that can predict a company's long-term plans beyond that which can be projected in the short-term, satisfying ACT's need for indicators that can provide information on the long-term future of a company. ♦ The use phase represents a large part of emissions in the building's LCA, depending mainly on the climate, envelope thermal insulation, bioclimatic design, choice of energy sources, share of renewable energy, equipment efficiency and CO2 intensity of electricity. Therefore, this indicator dedicated to the use phase of buildings often captures a large part of total scope of GHG emissions. **SCORING RATIONALE:** The scoring of this indicator follows the same general methodology of scoring indicator BC 1.1. Therefore, refer to the rationale of indicator BC 1.1 for more details.

- **BC 1.3 ALIGNMENT OF RENOVATED BUILDINGS (USE PHASE) REDUCTION TARGETS (WEIGHTING: 3%).**

DESCRIPTION & REQUIREMENTS	BC 1.3 ALIGNMENT OF RENOVATED BUILDINGS (USE PHASE) REDUCTION TARGETS

SHORT DESCRIPTION OF INDICATOR

This indicator assesses the company's emissions reduction targets as regards with the emissions related to energy consumption during the use phase of renovated delivered buildings. The indicator will identify the gap between the company's target and the decarbonization pathway as a percentage, which is expressed as the company's commitment gap.

DATA REQUIREMENTS

The questions comprising the information request that are relevant to this indicator are:

- A1: Current internal targets set on carbon performance (kgeCO2/m2) for renovated and new buildings
- A7: Breakdown of floor areas per business segment and country for renovated and new buildings

The benchmark indicators involved are:

TARGET TYPE	PARAMETER	INTENSITY METRIC	BENCHMARK
Renovated buildings use	*CBrbu*	kgeCO2/sqm	Renovation_In-Use-reg_"Building-type"_"Building-typology"_"Geo-zone"_"Country" (in most cases, combination of several pathways according to shares of buildings typologies and zones/countries)

HOW THE ANALYSIS WILL BE DONE

The assessment of this indicator follows the same general methodology of scoring indicator BC 1.1. Therefore, refer to the assessment of indicator BC 1.1 for more details.

A main difference with BC 1.1: here only 4 main end-uses are considered: space heating, space cooling, hot water and indoor lighting. Ventilation is not included in the benchmark.

RATIONALE	BC 1.3 ALIGNMENT OF RENOVATED BUILDINGS (USE PHASE) REDUCTION TARGETS
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR:** Targets related to the use phase of renovated delivered buildings are included in the ACT BC assessment for the following reasons: ♦ Targets are an indicator of corporate commitment to reduce emissions, and are a meaningful metric of the company's internal planning towards the transition. ♦ Targets are one of the few metrics that can predict a company's long-term plans beyond that which can be projected in the short-term, satisfying ACT's need for indicators that can provide information on the long-term future of a company. ♦ Renovation of existing building stocks is an impactful tool to increase building energy efficiency thus necessary for the energy transition. Although refurbishment works represent a small part of the sales, such targets would reflect the ambition of the company to integrate the whole scope of its activities in its environmental strategy. **SCORING RATIONALE:** The scoring of this indicator follows the same general methodology of scoring indicator BC 1.1. Therefore, refer to the rationale of indicator BC 1.1 for more details. If the company does not operate any renovation as one of its business activities, therefore, this indicator is not assessed and its weighting is transferred to other indicators (BC 1.2 and BC 1.4)

- **BC 1.4 ALIGNMENT OF NEW BUILDINGS (MATERIALS) REDUCTION TARGETS (WEIGHTING: 3%).**

DESCRIPTION & REQUIREMENTS	BC 1.4 ALIGNMENT OF NEW BUILDINGS (MATERIALS) REDUCTION TARGETS
SHORT DESCRIPTION OF INDICATOR	This indicator assesses the company's emissions reduction targets regarding emissions related to materials used for new delivered buildings. The indicator will identify the gap between the company's target and the decarbonization pathway as a percentage, which is expressed as the company's commitment gap. This indicator is related to climate objectives, not the real performance on climate even if both aspects are linked.

DATA REQUIREMENTS

The questions comprising the information request that are relevant to this indicator are:

- A1: Current internal targets set on carbon performance (kgeCO2/m²) for renovated and new buildings
- A7: Breakdown of floor areas per business segment and country for renovated and new buildings

The benchmark indicators involved are:

TARGET TYPE	PARAMETER	INTENSITY METRIC	BENCHMARK
Materials emissions	CBnbm	kgeCO2/sqm	Construction_Materials_"Building-type"_"Building-typology"_"Geo-zone"_"Country"

HOW THE ANALYSIS WILL BE DONE

The assessment of this indicator follows the same general methodology of scoring indicator BC 1.1. Therefore, refer to the assessment of indicator BC 1.1 for more details.

The assessment relies on building LCA. As far as possible, recent EPD datasets should be used, based on the full life-cycle (if not, scenarios have to be defined and GHG emissions estimated), all materials should be included, so as to reach at least 95% of the total impact of the building. In case of lack of data, generic or default values should be used.

Refer to chapter 6.2 for the details on the elaboration of the benchmark and related pathways.

RATIONALE **BC 1.4 ALIGNMENT OF NEW BUILDINGS (MATERIALS) REDUCTION TARGETS**

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Targets related to the materials life cycle of the new delivered buildings are included in the ACT BC assessment for the following reasons:

- Targets are an indicator of corporate commitment to reduce emissions, and are a meaningful metric of the company's internal planning towards the transition.
- Targets are one of the few metrics that can predict a company's long-term plans beyond that which can be projected in the short-term, satisfying ACT's need for indicators that can provide information on the long-term future of a company.
- The materials represent a significant part of a new building's lifetime that is 45% to 75% of the total emissions [12]. They represent a powerful lever for construction firms to reduce their carbon footprint.

- Trying to reduce the impact of construction products and equipment, on their life cycle, or choosing low-carbon products, participates to the efforts towards the climate objectives set in international agreements.

SCORING RATIONALE:

The scoring of this indicator follows the same general methodology of scoring indicator BC 1.1. Therefore, refer to the rationale of indicator BC 1.1 for more details.

Refer to chapter 6.2 for the details on the elaboration of the benchmark and related pathways.

• BC 1.5 TIME HORIZON OF TARGETS (WEIGHTING: 2%)

DESCRIPTION & REQUIREMENTS	BC 1.3 TIME HORIZON OF TARGETS
SHORT DESCRIPTION OF INDICATOR	A measure of the time horizons of company targets for all delivered buildings. The ideal set of targets is forward looking enough to include a long-time horizon that includes the majority of a company's asset lifetimes, but also includes short-term targets that incentivize action in the present.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ - A1: Current internal targets set on carbon performance (kgeCO2/m²)
HOW THE ANALYSIS WILL BE DONE	The analysis has two dimensions: ♦ A comparison of: (a) the longest time horizon of the company's targets, and (b) the long-term point fixed by ACT assessment methodology. ♦ The company has interval targets that ensure both short and long-term targets are in place to incentivize short-term action and communicate long-term commitments.

AGREGATE SCORE: DIMENSION 1: 50%, DIMENSION 2: 50%

DIMENSION 1 - TARGET ENDPOINT: The company's target endpoint (T_e) is compared to the long-term point (LT), which is fixed at 2050 minus the reporting year, aligned with 2°C scenario. The company's target endpoint (T_e) is equal to the longest time horizon among the company's targets, minus the reporting year:

$$T_e = Longest\ target\ time\ horizon - reporting\ year$$

The analysis compares Te to LT. This analysis measures the horizon gap:

$$Horizon\ gap = T_e - H_{ga}$$

The company's target endpoint is compared according the following scoring table:

HORIZON GAP	SCORE
LT - T_e =< 0	50%
LT - T_e =< 10	35%
LT - T_e =< 20	20%
LT - T_e > 20	0%

DIMENSION 2 - INTERMEDIATE HORIZONS: All company targets and their endpoints are calculated and plotted. The ideal scoring company does not have intervals between target endpoints larger than 5 years from the reporting year.

Measurements are done in five-year intervals between the reporting year and LT.

The company's targets are compared according the following scoring table:

INTERMEDIATE TARGET GAP LENGTH	SCORE
All the gaps until LT are equal or less than 5 years	50%
All the gaps until 60% of LT are equal or less than 5 years	35%
All the gaps until 40% of LT are equal or less than 5 years	20%
All the gaps of 5 years or less do not reach 40% of LT or there is no such gaps disclosed by the company	0%

FOR ALL CALCULATIONS:

- The company is asked to report the 'base year' of the targets. The 'base year' will be used for calculations if the company does not report 'year of target establishment'.
- If the company reports 'year of target establishment' in the data request, then the calculations may be redone using this as the baseline instead of the reporting year. The company can attain up to 80% of the maximum score with this alternate calculation. The baseline that results in the higher score will be used for the final score.
- Targets that do not cover > 95%[4] of generation emissions are not preferred in the calculations. If only such targets are available, then the score will be adjusted downwards equal to the % coverage that is missing.
- If the company discloses targets with different time horizons depending on the geographical area or the type of building, the score will be aggregated based on the proportion of each segment/country represented in average square meter unit.

[4] This threshold is in line with other ACT methodology, such as the Auto manufacturing methodology.

RATIONALE	BC 1.3 TIME HORIZON OF TARGETS
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR:** The time horizon of targets is included in the ACT BC assessment for the following reasons: ♦ The target endpoint is an indicator of how forward looking the company's transition strategy is. ♦ The very long expected lifetime of buildings sold means that construction companies 'commit' a large amount of carbon emissions into the future through the delivered buildings today, which requires targets that have time horizons which align with this reality. ♦ Aside from communicating long-term commitments, short-term action needs to be incentivized. This is why short time intervals between targets are needed **SCORING RATIONALE:** The score of this indicator is tied to how the target timeline compares to the lifetimes of the company's delivered buildings. The company has a 'horizon gap' if their targets do not include a significant part of their products sold (buildings). It is however recognized that some products may have lifetimes that exceed beyond meaningful target endpoints.

• BC 1.6 HISTORIC TARGET AMBITION AND COMPANY PERFORMANCE (WEIGHTING: 1%)

DESCRIPTION & REQUIREMENTS	BC 1.6 HISTORIC TARGET AMBITION AND COMPANY PERFORMANCE
SHORT DESCRIPTION OF INDICATOR	A measure of the company's historic target achievements and current progress towards active emission reduction targets. All the scopes of the company are considered. The ambition of the target is qualitatively assessed and is not included in the performance indicators.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A2: Past internal targets set on carbon performance (kgeCO2/m^2) ♦ A3: Average carbon intensity of company's own building in the past 5 years (use phase)

HOW THE ANALYSIS WILL BE DONE

For the performance score, this will assess on two dimensions, whereby companies achieve the maximum score if:

Dimension 1: The company achieved all previous emission reduction targets with a target year in the past.

Dimension 2: The company is currently on track to meet an existing emission reduction target, whereby the ratio between the remaining time period and the level remaining to target achievement (Progress Ratio *p*) is not lower than 0.5:

$$p = \frac{1 - \%\ time}{1 - \%\ complete} \geq 0.5$$

The highest score is attained if *p* is 1 or higher. A percentage score is assigned for any value between 0.5 and 1.

Aggregate score: Dimension 1: 25%, Dimension 2: 75%.

For all calculations:

- Companies who do not have targets in the past but only with target years in the future are receiving a score of 0 on dimension 1, but are assessed on dimension 2.
- Weightings applied to targets that cover only the performance of company's own buildings are lower than those applied to targets covering the performance of delivered buildings.
- If the company has multiple targets in different scopes that can be assessed according to the above criteria, then the score will be an average score based on the progress ratios of all targets assessed.

The performance score does not assess the ambition level of previous targets, and therefore dimension 1 only has a low weight in the final performance score. This information is also qualitatively assessed in the assessment narrative, which will have another look at the following dimensions:

1. Achievement level: To what degree has the company achieved its previously set emission reduction targets.
2. Progress level: To what degree is the company on track to meet its currently active emission reduction targets?
3. Ambition level: What level of ambition do the previously achieved emission reduction targets represent?

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

The historic target ambition and company performance is included in the ACT BC assessment for the following reasons:

- The ACT assessment looks only to the past to the extent where it can inform on the future. This indicator is future-relevant by providing information on the organizational capability to set and meet emission reduction targets. Dimension 1 of this indicator adds credibility to any company claim to commit to a science-based reduction pathway.
- Indicators 1.1, 1.2, 1.3 and 1.4 look at targets in a vacuum. Dimension 2 of this indicator adds value to the assessment of comparison to the company's performance with respect to their targets in the reporting year.

SCORING RATIONALE:

Previous target achievement is not straightforward to interpret quantitatively. Therefore, the performance score makes no judgement of previous target ambition, and leaves it to the assessment narrative for a meaningful judgement on the ambition level of past targets

- Dimension 1 of the performance score will penalize companies who have not met previous targets in the past 5 years, as this means the company has lower credibility when setting ambitious science-based targets.

- Dimension 2 uses a simple ratio sourced from existing CDP data points (CC 3.1e) in order to compare targets. The threshold 0.5 was chosen as it allows companies some flexibility with respect to the implementation of the target, but it does have the ability to flag companies who are definitely not on track towards achievement. When p is lower than 0.5, the company needs to achieve more than twice the reduction per unit of time than the target originally envisioned.

INTANGIBLE INVESTMENT (WEIGHTING: 10%)

- **BC 3.1 R&D IN CLIMATE CHANGE MITIGATION TECHNOLOGIES (WEIGHTING: 10%)**

DESCRIPTION & REQUIREMENTS	BC 3.1 R&D IN CLIMATE CHANGE MITIGATION TECHNOLOGIES
SHORT DESCRIPTION OF INDICATOR	A measure of R&D costs/investments share into mitigation-relevant technologies.
DATA REQUIREMENTS	Relevant and external sources of data used for the assessment of this indicator: ♦ R&D costs/investments in climate change mitigation technologies of the company. ♦ Total R&D costs/investments of the company.
HOW THE ANALYSIS WILL BE DONE	The assessment is based on the share of the company's R&D costs and/or investments in climate change mitigation related technologies. The compa be compared to the maturity matrix developed to guide the scoring and a greater number of points will be allocated for companies indicating a higher le which means a higher share in R&D costs/investments in these technologies. The budget approach is more relevant for large companies and avoids c R&D projects dedicated to climate change mitigation. Feedback regarding this appraoch will be collected during the experimentation phase. The maturity matrix is built on a by default approach. The matrix is provided below :

Question	Basic	Standard	Advanced	Next practice	2' aligned
What is the share of R&D costs/investments in climate change mitigation technologies compared to the total R&D costs/investments?	Below 20%	Between 20% and 40%	Between 40% and 60%	Between 60% and 80%	Above 80%

RATIONALE

BC 3.1 R&D IN CLIMATE CHANGE MITIGATION TECHNOLOGIES

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Trend in past emissions intensity is included in the ACT BC assessment for the following reasons:

- To enable the transition, sectors such as the Building Construction sector rely heavily on the development of low-carbon technologies to replace existing high-emitting materials and equipment. For instance, innovative technologies are crucial to monitor and optimize building's energy consumption. R&D is the principal proactive action to develop these technologies.
- Lastly, the R&D investment of a company into non-mature technologies allows for a direct insight in the company's commitment to alternative technologies that may not currently be part of its main business model.

DEFININD 'MITIGATION R&D':

Research and experimental development (R&D) comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. The term R&D covers three activities:

- Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

R&D covers both formal R&D in R&D units and informal or occasional R&D in other units.

(OECD 2012)

DEFINING 'R&D SCOPE':

The indicator focuses on non-mature technologies or construction and organizational methodologies that mitigate climate change.

Climate mitigation technologies for the Building Construction sector may include:

- - To enable the transition, sectors such as the Building Construction sector rely heavily on the development of low-carbon technologies to replace existing high-emitting materials and equipment. For instance, innovative technologies are crucial to monitor and optimize building's energy consumption. R&D is the principal proactive action to develop these technologies.
- development of new, improved, or more reliable products, processes, or techniques;
- design work for energy efficient projects;
- - integration of renewable energy sources in buildings;
- - custom design work to accommodate visual or structural needs;
- - development of a unique assembly that reduce GHG emissions or construction method or process;
- - experimentation with new building materials with low carbon footprints;
- - energy efficient lighting technologies;
- - energy efficient heating, ventilation or air conditioning;
- - very low-energy consumption circuits for stand-by power;
- - technologies aiming at improving the efficiency of home appliances;
- - energy efficient technologies in elevators, escalators, and moving walkways;
- - information and communication technologies aiming at the reduction of own energy use;
- - technologies for an efficient end-user electric power management and consumption;
- - architectural of constructional elements improving the thermal performance of buildings;

- - enabling technologies or technologies with a potential or indirect contribution to GHG emissions mitigation.

The experimentation phase will allow verifying the completeness of this list.

SOLD PRODUCT PERFORMANCE (WEIGHTING: 30%)

BC 4.1 ALIGNMENT OF CARBON PERFORMANCE TREND FOR NEW BUILDINGS (USE PHASE) (WEIGHTING: 10%)

DESCRIPTION & REQUIREMENTS	BC 4.1 ALIGNMENT OF CARBON PERFORMANCE TREND RELATED TO NEW DELIVERED BUILDINGS (USE PHASE)
SHORT DESCRIPTION OF INDICATOR	This metric assesses the company's reduction in emissions intensity of new delivered buildings (use phase) emissions over the next 5-year period to the reporting year (reporting year plus 5 years) and the past 5-year period (reporting year minus 5 years)
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A7: Breakdown of floor areas per business segment and country ♦ A8: Average carbon intensity of buildings delivered in the past 5 years (use phase)

The benchmark indicators involved are:

TARGET TYPE	PARAMETER	INTENSITY METRIC	BENCHMARK
New buildings use	CBnbu	kgeCO2/sqm	Construction_In-Use-reg_"Building-type"_"Building-typology"_"Geo-zone"_"Country"

The same benchmark is used for the two dimensions (past and future). The data provided in the ACT tool and related files start in 2014 so it is possible to get benchmark data for the 5 years preceding the reporting year

HOW THE ANALYSIS WILL BE DONE

A trend analysis is used to measure the trend in emissions intensity of new delivered buildings over the last five years (dimension 1). A gap analysis is used to calculate the trend of future emission intensity of new delivered buildings over the next 5 years (dimension 2).

Following the principle of future orientation, more weight is placed on the role of future emissions. Dimension 1 has a weight of 40% and dimension 2 has 60%.

Dimension 1: trend in past emission intensity

The analysis is based on the ratio between the company's recent (reporting year minus 5 years) emissions intensity trend gradient ($CR_{nbu\text{-}5\ y}$) for new delivered buildings (use phase) and the company's decarbonization pathway trend gradient ($CB_{nbu\text{-}5\ y}$) in the short-term (reporting year plus 5 years).

$CB_{nbu\text{-}5\ y}$ is the gradient of the linear trend-line of the company benchmark pathway for emissions intensity ($CB_{nbu\text{-}5\ y}$). See section 6.2 for details on the computation of the company specific decarbonization pathway.

The difference between CR and CB will be measured by their ratio (r_{nbu}). This is the 'New buildings use Transition ratio' which is calculated by the following equation, with the symbol 'used to denote gradients:

$$r_{nbu} = \frac{CR'_{nbu-5}}{CB'_{nbu-5}}$$

If the transition ratio is a negative number, it means the company's recent emissions intensity has increased (positive $CR_{nbu\text{-}5}$) and a zero score is awarded by default. If the company's recent emissions intensity has decreased, the transition ratio will be a positive. The value of the ratio is capped to 1, which represents the maximum score. A score is assigned as a percentage value equal to the value of r_{nbu} (1 = 100%).

Dimension 2: trend in future emissions intensity

The assessment is based on the difference between the company's action pathway (A_{nbu}) and the company benchmark (CB_{nbu}) developing from the reporting year to 5 years after.

The company action pathway (A_{nbu}) is the emissions intensity of company's delivered new buildings over time, assuming constant evolution of the business background.

The company benchmark (CB_{nbu}) pathway is the 'company new buildings specific decarbonization pathway'. See section 6.1 for details on the computation of this pathway.

The assessment will compare A_{nbu} to CB_{nbu}, by examining the difference between these pathways in 5 years after the reporting year. The pathways are expressed in kilograms of CO_2 per square meter (intensity measure). The result of the comparison is the action gap.

Calculation of score

To assign a score to this indicator, the size of the action gap will be compared to the maximum action gap, which is defined by the business as usual pathway (BAU_{nbu}). BAU_{nbu} is defined as an unchanging (horizontal) intensity pathway, whereby the emissions intensity is not reduced at all over a period after the reporting year.

$$Future\ emissions\ action\ gap = \frac{A_{nbu} - CB_{nbu}}{BAU_{nbu} - CB_{nbu}}$$

$$Score = 1 - Future\ emissions\ action\ gap$$

The score assigned to the indicator is equal to 1 minus the action gap and is expressed as a percentage (1 = 100%). Therefore, if A_{nbu} - CB_{nbu} is equal to zero, and so the company's target is aligned with the sectoral benchmark, the maximum score is achieved.

Aggregate score: Dimension 1: 40%, Dimension 2: 60%.

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

The carbon performance trend related to new delivered buildings is included in the ACT assessment for the following reasons:

- Recent emissions intensity performance indicates the company's progression towards, or away from, the future emissions intensity necessary for the sector to decarbonize in-line with a low-carbon scenario.
- In the building construction sector, emissions from the use of sold products (i.e. new delivered buildings) outweigh Scope 1+2 emissions.
- This indicator only assesses use phase of delivered buildings because there is not yet available data regarding emissions related to materials and renovation.

SCORING RATIONALE:

Dimension 1

While 'gap' type scoring is preferred for any indicator where possible, this indicator only looks at past emissions, and would therefore require a different baseline in order to generate a gap analysis. Thus, instead of a gap analysis a trend analysis is conducted. An advantage of the trend analysis is that it does not require the use of a 'business as usual' pathway to anchor the data points and aid interpretation, as trends can be compared directly and a score can be directly correlated to the resulting ratio.

Dimension 2

This indicator is where the principal 'action gap' between the company's actions and the benchmark is assessed.

To ensure comparability of the scores and replicability of the measurement, delivered buildings emissions related to use phase are compared to the benchmark at a fixed point in time, similar to all companies. This is necessary, because the method interprets linear trend lines from company data, while the decarbonization pathways from the benchmark are nonlinear. Therefore, the measurement gaps would vary over time if the time of measurement was not constant.

As the reporting year is the most recent year of data, this is the base-year chosen for measurement of the score

- **BC 4.2 LOW CARBON BUILDINGS SHARE (WEIGHTING: 8%)**

DESCRIPTION & REQUIREMENTS	BC 4.2 LOW CARBON BUILDINGS SHARE
SHORT DESCRIPTION OF INDICATOR	A measure of the company's growth in terms of surface of low-carbon buildings as compared with a benchmark. This criterion only applies to new buildings. It considers low carbon buildings which are delivered at reporting year.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ - A9: Surface of low carbon delivered buildings, with breakdown per business segment and country
HOW THE ANALYSIS WILL BE DONE	A low-carbon building is theoretically defined by a carbon intensity threshold including in-use energy-related CO_2 emissions and materials-related CO_2 emissions. These emissions mainly depend on the building segment, the climate, and the electricity mix CO_2 content of the country. The construction company, for each building segment and country, has to determine the share of low-carbon buildings, in comparison with a threshold adapted to each element of the company's activity. Therefore, the analysis is based on the difference between the company's low-carbon buildings surface delivered in the reporting year and the low-carbon buildings surface expected 3 years after the reporting year (e.g. in 2021 if reporting year is 2018). **GAP COMPARISON** The gap comparison follows the methodology of BC 4.1, 'Alignment of carbon performance trend related to new delivered buildings (use phase)'. The difference between the company surface and what the company surface should have been according to the benchmark is computed for the reporting year. For this, the business as usual surface pathway (BAU_{LCB}) is computed, which assumes no growth in Low Carbon Buildings's from the base year (and potentially 5/3 years before the base year onwards). The resulting number is the 'LCB gap'. The anchor point in time from which the pathways (benchmark, company sales, business as usual) can vary is yet to be determined, as it is dependent on data availability and data quality. $$LCB\ gap = \frac{CS_{LCB} - CB_{LCB}}{BAU_{LCB} - CB_{LCB}}$$

Scoring **rationale**

A significant share of construction of low-carbon buildings in the company's activity is a tangible and positive signal that can place the company on a low-carbon transition pathway.

RATIONALE	BC 4.2 LOW CARBON BUILDINGS SHARE
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR:** Fleet emissions lock-in is included in the ACT assessment for the following reasons: ♦ Emissions intensity pathways in the sector cannot be met without a change in building conception, and the sales is the direct 'output measure' that indicates how this change is incorporated in the business model. ♦ Both in-use emissions and material-embodied emissions contribute to a low-carbon transition. **Definition of low-carbon buildings :** The definitions of low-carbon buildings greatly vary according to countries and types of standards. For data availability purposes, ACT assessment defines a threshold for "low carbon" buildings based on Energy Intensity (EI) of new buildings (available data did not allow defining low-carbon buildings and nearly zero carbon buildings by using a carbon indicator). In this first version, the material-embodied energy/emissions are not considered. From the IEA ETP 2017 Building pathways, it was determined, for Europe and by building type (Residential or Services), the Energy Intensity of the different building types in Europe Stock. As all the background data from IEA ETP are not available, assumptions on the share of demolished buildings, the share of new buildings and share and type of renovations were taken to artificially re-build the IEA pathways. These assumptions were taken using predictions for renovation in Europe (Entranze database) and data from current building regulations for new buildings in Europe. From these data a solver was used to minimize the error between the construction of the IEA ETP building type pathways in Europe. The maximum error between this model and the IEA pathways is 7%. Below is presented the buildings evolution (new and renovated buildings) used in the calculations.

FIGURE 5 – NEW BUILDING EVOLUTION BETWEEN 2014 AND 2050 (RESIDENTIAL AND SERVICES)

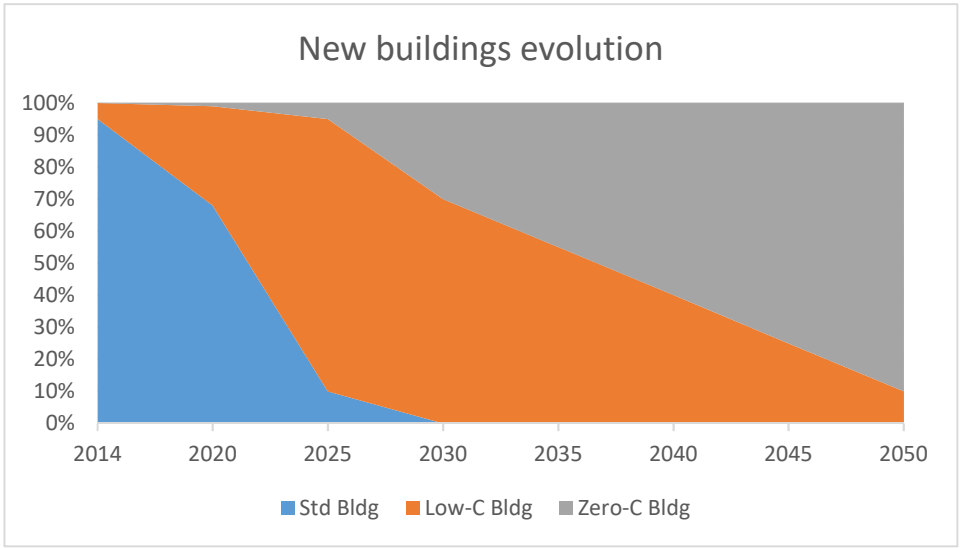


FIGURE 6 – RENOVATION EVOLUTION BY RENOVATION TYPE BETWEEN 2014 AND 2050 (RESIDENTIAL)

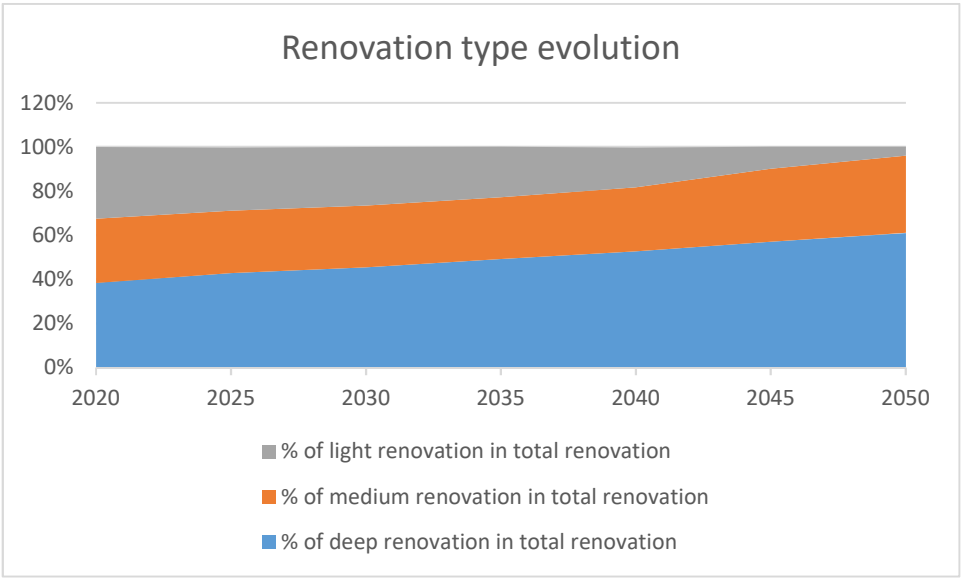
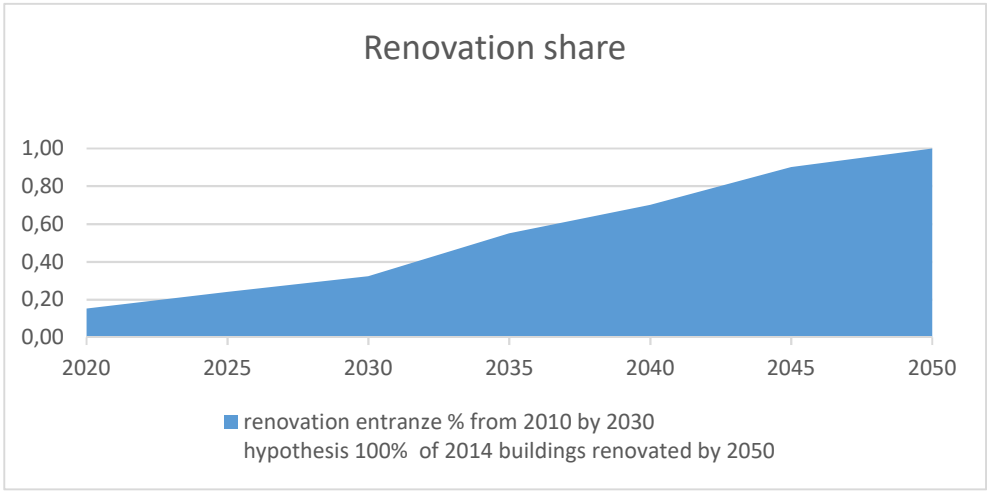


FIGURE 7 – RENOVATION SHARE BETWEEN 2014 AND 2050 (RESIDENTIAL)



The artificial construction of the IEA pathways allows calculating the Energy Intensity for different buildings:

- Renovated Buildings: deep Renovation, medium renovation and light renovation
- New buildings : Current new buildings, Low carbon buildings and nearly-Zero carbon buildings.

The EI values for each type of new and renovated buildings are given in the following table:

TABLE 5 – ENERGY INTENSITIES FOR BUILDINGS IN EUROPE (EXPRESSED IN FINAL ENERGY FOR THE 5-MAIN END-USES)

	Residential buildings EI final energy kWh/m²	Services buildings EI final energy kWh/m²
Deep renovation	**62.0**	**90.0**
Medium renovation	**80.0**	**135.0**
Light renovation	**105.0**	**150.0**
Current New buildings	**45.0**	**65.0**
New Low carbon buildings	**30.0**	**40.0**
New Nearly zero carbon buildings	**22.5**	**30.0**
Existing buildings EI (stock)	*126.9*	*163.9*

These values are representative of European Buildings (Zone level). **The calculation at country level or for other zones is done using a EI ratio. This ratio is defined as : EI(5 end-uses) of the zone or country/ EI(5 end-uses) of Europe.**

What we consider as low-carbon buildings correspond to the two following categories of the table above: new low-carbon buildings and new nearly zero-carbon ones (Residential and Services, with EI thresholds adapted to the zone or country).

In order to reflect the difference of means between OECD countries and non-OECD ones, it may be applied less ambitious requirements, for instance admitting low-carbon buildings with EI thresholds values increased by 20%.

Scoring rationale

A share of 50% corresponds to the best score.

A share of 0% leads to a null score.

• BC 4.3 RENOVATED BUILDINGS SUBJECT TO THERMAL RENOVATION SHARE (WEIGHTING: 6%)

DESCRIPTION & REQUIREMENTS	BC 4.3 RENOVATED BUILDINGS SUBJECT TO THERMAL RENOVATION SHARE
SHORT DESCRIPTION OF INDICATOR	A measure of the company's growth in renovated buildings sales of buildings subject to thermal renovation as compared with a benchmark TBD.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A10: Surface of renovated buildings subject to thermal renovation AU 4.A
HOW THE ANALYSIS WILL BE DONE	The analysis is based on the difference between the company's renovated buildings subject to thermal renovation surface (CS_{RBTR}) delivered in the reporting year and the renovated buildings subject to thermal renovation surface expected 3 years after the reporting year (e.g in 2021 if reporting year is 2018).

GAP COMPARISON

The gap comparison follows the methodology of BC 4.1, 'Alignment of carbon performance trend related to new delivered buildings (use phase)'. The difference between the company low carbon building and what the company low carbon building should have been according to the benchmark is computed for the reporting year. For this, the business as usual pathway (BAU_{RBTR}) is computed, which assumes no growth in renovated buildings subject to thermal renovation from the base year. The resulting number is the 'RBTR gap'. The anchor point in time from which the pathways (benchmark, company surface, business as usual) can vary is yet to be determined, as it is dependent on data availability and data quality.

$$RBTR\ gap = \frac{CS_{RBTR} - CB_{RBTR}}{BAU_{RBTR} - CB_{RBTR}}$$

RATIONALE	BC 4.3 RENOVATED BUILDINGS SUBJECT TO THERMAL RENOVATION SHARE

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Renovated buildings subject to thermal renovation share is included in the ACT BC assessment for the following reasons:

- Emissions intensity pathways in the sector cannot be met without a change in building renovation ambition, and the sales is the direct 'output measure' that indicates how this change is incorporated in the business model.
- It is important to consider both the reduction of in-use energy consumption (energy efficiency is one of the necessary measures to reach CO2 targets) and the reduction of CO2 emissions (also through the CO2 contents per kWh)

Performing deep thermal/energy renovation is a key action towards a global warming limited to 2°C. In France, where 2 thirds of the buildings were constructed before 1975 (date of the 1st thermal regulation), the recent Law for Energy Transition and Green Growth set the following objective: to achieve 100% of the building stock deeply renovated by 2050, in compliance with the low-energy-consumption label "BBC renovation". For residential buildings, the BBC renovation threshold in terms of primary energy for the 5-regulated end-uses is 80 kWhep/m^2.an (central value, modulated by climate zone and altitude).

A recent French study[5] done by Effinergie association in 2018 on more than 500 BBC renovated buildings, residential and non-residential, has shown that:

- the consumption of primary energy was reduced by 70% on average, concerning the 5-regulated end-uses,
- the reduction of envelope thermal losses achieved 60% on average.

Nevertheless, we have to recognize that BBC renovation is of a high level of ambition, probably overpassing what we mean by deep renovation here in ACT methodology.

DEFINITION OF THERMAL RENOVAITON:

Thermal renovation refers to building works that aim to reduce a building's energy consumption. Deep renovation shall result in energy abatement of 40%, and a reduction of 60% of carbon emissions. These two conditions are necessary. This is the result of a consensus between a group of experts and stakeholders.

A lower difference after vs before renovation may be accepted if the energy consumption after renovation is equal or less to 70 kWh/m2.year, this value being adapted for a EU temperate climate around 2500 HDD. The consumption covers the so-called 'regulated' uses and is expressed in final energy.

The 40% reduction of energy consumption applies to the following so-called 'regulated' end-uses: space heating, space cooling, domestic hot water, lighting and – if significant – ventilation.

In order to reflect the difference of means between OECD countries and non-OECD ones, it may be applied less ambitious requirements, leading to -30 % of energy consumption and -40 % of CO2 emissions.

SCORING RATIONALE:

It is important to have a double requirement, on energy efficiency and carbon reduction. Switching from a fossil energy source to a decarbonated one (solar, biomass, district heating network fed by renewable energy…) without improving energy efficiency (ideally acting both on the building envelope and on the HVAC equipment) is not considered as satisfactory.

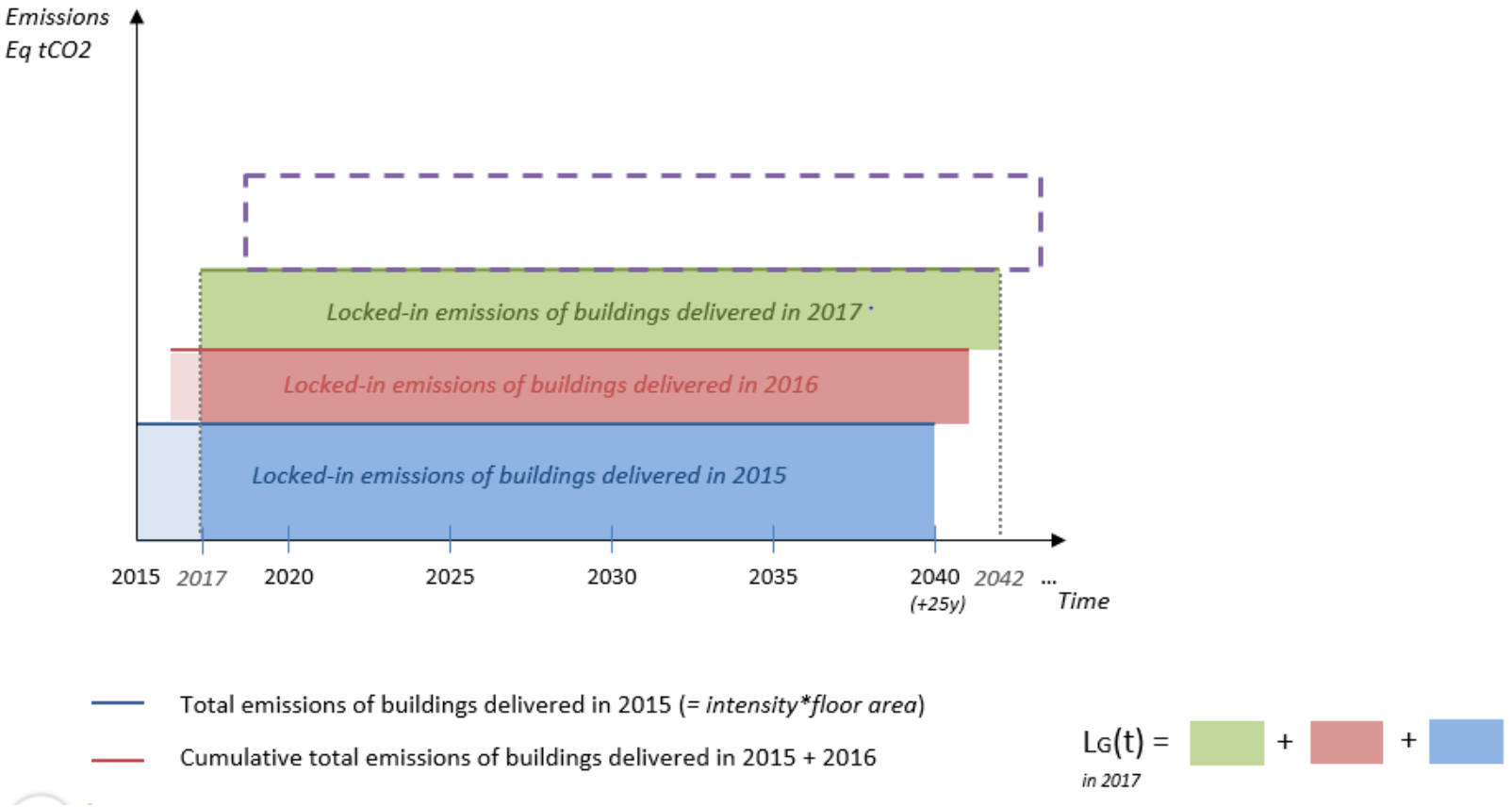
A share of 50% corresponds to the best score.
A share of 0% leads to a zero score.

[5] « Observatoire BBC – Etude sur les bâtiments rénovés à basse consommation », Effinergie, 2018.

• BC 4.4 EMISSIONS LOCK-IN (WEIGHTING: 6%)

DESCRIPTION & REQUIREMENTS	BC 4.4 EMISSIONS LOCK-IN
SHORT DESCRIPTION OF INDICATOR	A measure of the company's cumulative emissions from the reporting year up until 25 years in the future from new delivered buildings. The indicator will compare this to the emissions budget entailed by the company's generation intensity decarbonization pathway and projected generation trends in the sector at the country/regional level.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A8: Average carbon intensity of buildings delivered in the past 5 years (use phase and materials)
HOW THE ANALYSIS WILL BE DONE	The analysis is based on the ratio between the company's new delivered buildings' emissions for the 25 years after the reporting year [L_G *(t)*], and the emissions budget entailed by the company's carbon budget [B_G *(t)*] over the same period of time. Assuming that the lifetime of a building is around 50 years[6], the period until the first deep renovation, which would increase emission intensity, would be 25 years. This period corresponds to the time when emissions are locked-in, until the decrease in emissions caused by first deep renovation. Over the years, the company cumulates the emissions lock-in since the first reporting year until the current reporting year. For each year, the lock-in emissions are the integral of the curve representing the emissions of total building delivered at reporting year for 25 years. *Locked-in emissions for a company at reporting of 2017 with data from 2015*

[6] This assumption is only used for this indicator. The rest of the indicator does not consider a specific figure for the lifetime of a building.



L_G *(t)* is calculated as the total cumulative emissions implied by the lifetimes of new buildings delivered at reporting year.

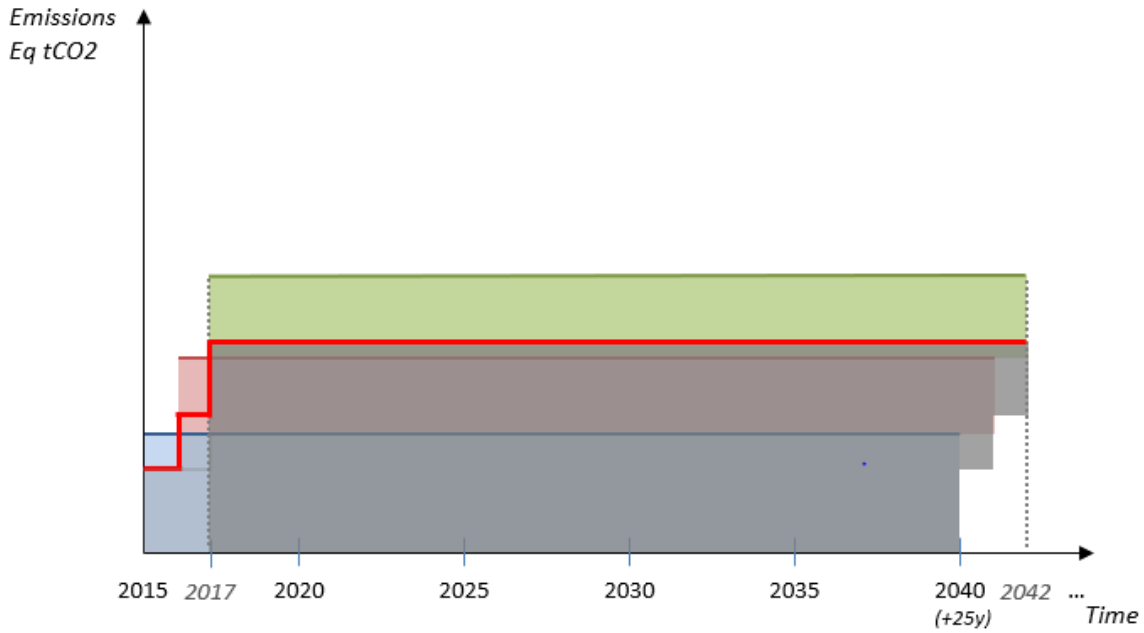
L_G *(t)* is calculated as the company's locked-in carbon commitments, up until the chosen time period t, which is derived by taking the area under the company's future locked-in emissions curve. This curve in turn is derived from the company's intensity pathway, multiplying with floor area emission intensity F_G:

$$L_G(t) = \int_{the\ reporting\ year}^{t} F_G * CA_G$$

B_G *(t)* is calculated as the company's carbon budget up until time t, which is derived by taking the area under the absolute emissions reduction curve. This curve in turn is derived from the company benchmark pathway (CB_G) by multiplying with floor area emission intensity F_G:

$$B_G(t) = \int_{the\ reporting\ year}^{t} F_G * CB_G$$

Carbon budget for a company at reporting of 2017 with data from 2015



Depending on the data availability, the computation of these areas may not be as straightforward as the equations present and will be done by approximation, but the principles will hold.

The locked-in ratio (r_{LB}) is calculated:

$$r_{LB}(t) = \frac{L_G(t)}{B_G(t)}$$

CALCULATION OF SCORE

If r_{LB} is 1 or lower, then the company stays within its carbon budget, and will be assigned the maximum score (100%). If r_{LB} is 1.5 or higher, then the company strongly exceeds its carbon budget, and will be assigned the minimum score (0%). If r_{LB} is between 1 and 1.5, then the company will be assigned a score of 1.5- r_{LB} divided by 50%.

RATIONALE	BC 4.4 EMISSIONS LOCK-IN

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Emissions lock-in is included in the ACT BC assessment for the following reasons:

- Absolute greenhouse gas emissions over time is the most relevant measure of emissions performance for assessing a company's contribution to global warming. The concept of Locked-in emissions allows a judgement to be made about the company's outlook in farther time periods.
- Analyzing a company's locked-in emissions alongside science-based budgets also introduces the means to scrutinize the potential cost of inaction, including the probability of stranded assets.
- Examining absolute emissions, along with recent and short-term emissions intensity trends, forms part of a holistic view of company emissions performance in the past, present, and future.

SCORING RATIONALE:

Unlike the 'gap' and 'trend' comparisons done in all other quantitative indicators, this indicator compares two areas: that of the carbon budget until t and the locked-in emissions until t. It is expected that companies exceed their budget when it is in the short-term future, but will not when it is in the long-term future. However, any short-term exceedance will have to be compensated for in later time periods. This is called carbon budget displacement, which further makes the company's actual decarbonization pathway steeper than the original benchmark. There is a dimension of risk from inaction here.

When the company exceeds its full carbon budget up until 2050, it will not be able to displace enough carbon from farther time periods to nearer, and will be faced with stranded assets when the current lifetime estimates are held up. This is a major problem, and this situation will certainly result in a zero score.

When companies are closer to their carbon budget than others, they will be less flexible in their future strategy as there is more pressure to add renewable capacity whenever a fossil fuel asset is decommissioned. There is also less room for refurbishment to extend the lifetimes of existing assets as this carries the risk of exceeding the carbon budget. Therefore, there is rationale for intermediate scoring levels that magnify this level of risk due of future flexibility in the future.

MANAGEMENT (WEIGHTING: 10%)

• BC 5.1 OVERSIGHT OF CLIMATE CHANGE ISSUES (WEIGHTING: 3%)

DESCRIPTION & REQUIREMENTS	BC 5.1 OVERSIGHT OF CLIMATE CHANGE ISSUES
SHORT DESCRIPTION OF INDICATOR	The company discloses that responsibility for climate change within the company lies at the highest level of decision-making within the company structure.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ - A5: Environmental policy and details regarding governance
HOW THE ANALYSIS WILL BE DONE	The benchmark case is that climate change is managed within the highest decision-making structure within the company. The company situation will be compared to the benchmark case, if it is similar then points will be awarded.

The position at which climate change is managed within the company structure will be determined from the company data submission and accompanying evidence.

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE
What is the position of the employee/ committee with highest responsibility for climate change?	Position of individual(s)/ committee with highest responsibility for climate change	No one in charge of climate change issues	Manager /officer	Senior Manager/ Officer	Senior Manager/Officer closely related to decision-making structure within the company	Board or individual/sub-set of the board or other committee appointed by the board	100%

RATIONALE	BC 5.1 OVERSIGHT OF CLIMATE CHANGE ISSUES
RATIONALE OF THE INDICATOR	Successful change within companies, such as the transition to a low-carbon economy, requires strategic oversight and buy-in from the highest levels of decision-making within the company. For the building sector, a change in strategy and potentially business model will be required and this cannot be achieved at lower levels within an organization. Evidence of how climate change is addressed within the top decision-making structures is a proxy for how seriously the company takes climate change, and how well integrated it is at a strategic level. High-level ownership also increases the likelihood of effective action to address low-carbon transition.

• BC 5.2 CLIMATE CHANGE OVERSIGHT CAPABILITY (WEIGHTING: 3%)

DESCRIPTION & REQUIREMENTS	BC 5.2 CLIMATE CHANGE OVERSIGHT CAPABILITY
SHORT DESCRIPTION OF INDICATOR	Company board or executive management has expertise on the science and economics of climate change, including an understanding of policy, technology and consumption drivers that can disrupt current business.

DATA REQUIREMENTS

The questions comprising the information request that are relevant to this indicator are:

- A5: Environmental policy and details regarding governance

HOW THE ANALYSIS WILL BE DONE

The presence of expertise on topics relevant to climate change and the low-carbon transition at the level of the individual or committee with overall responsibility for it within the company is assessed. The presence of expertise is the condition that must be fulfilled for points to be awarded in the scoring.

The analyst determines if the company has expertise as evidenced through a named expert biography outlining capabilities. The analysis is binary: expertise is evident or not. A cross check is performed against 8.1 on the highest responsibility for climate change, the expertise should exist at the level identified or the relationship between the structures/experts identified should also be evident.

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE
Does this employee/committee have a proven expertise regarding climate change topics	The presence of expertise on relevant topics to climate change and low carbon transition within the individual or committee with overall CC responsibility	Expertise is not evident from assessor's analysis	Expertise is evident from assessor's analysis but the relationship between the structures/experts identified is not evident	Expertise is evident from assessor's analysis and the relationship between the structures/experts identified is evident	Expertise is evident from assessor's analysis and the relationship between the structures/experts identified is evident. Expertise is closely related to decision-making	Expertise is evident from assessor's analysis	100%

RATIONALE **BC 5.2 CLIMATE CHANGE OVERSIGHT CAPABILITY**

RATIONALE OF THE INDICATOR

Effective management of the low-carbon transition requires specific expertise related to climate change and its impacts, and their likely direct and indirect effects on the business. Presence of this capability within or closely related to the decision-making bodies that will implement low-carbon transition both indicates company commitment to that transition and increases the chances of success.

Even if companies are managing climate change at the Board level or equivalent level, a lack of expertise could be a barrier to successful management of low-carbon transition.

• BC 5.3 LOW-CARBON TRANSITION PLAN (WEIGHTING: 2%)

DESCRIPTION & REQUIREMENTS	BC 5.3 LOW-CARBON TRANSITION PLAN
SHORT DESCRIPTION OF INDICATOR	The company has a plan on how to transition the company to a business model compatible with a low-carbon economy.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A5: Environmental policy and details regarding governance
HOW THE ANALYSIS WILL BE DONE	The analyst evaluates the description and evidence of the low-carbon transition plan for the presence of best practice elements and consistency with the other reported management indicators. The company description and evidence are compared to the maturity matrix developed to guide the scoring and a greater number of points are allocated for elements indicating a higher level of maturity. Among the best practice elements identified to date are: ♦ The plan includes financial projections ♦ The plan should include cost estimates or other assessments of financial viability as part of its preparation ♦ The description of the major changes to the business is comprehensive, consistent, aligned with other indicators ♦ Quantitative estimates of how the business will change in the future are included ♦ Costs associated with the plan (e.g. write-downs, site remediation, contract penalties, regulatory costs) are included ♦ Potential “shocks” or stressors (sudden adverse changes) have been taken into consideration ♦ Relevant region-specific considerations are included ♦ The plan’s measure of success is SMART - contains targets or commitments with timescales to implement them, is time-constrained or the actions anticipated are time-constrained ♦ The plan’s measure of success is quantitative ♦ The description of relevant testing/analysis that influenced the transition plan is included ♦ The plan is consistent with reporting against other ACT indicators ♦ The scope should cover entire business, and is specific to that business

- The plan should cover the short, medium and long terms. From now or the near future <5 years, until at least 2035 and preferably beyond (2050)
- The plan contains details of actions the company realistically expects to implement (and these actions are relevant and realistic)
- The plan is approved at the strategic level within the organisation
- Discussions about the potential impacts of a low-carbon transition on the current business have been included
- The company has a publicly-acknowledged 2°C (or beyond) science-based target (SBT)

The maximum score (100%) is assigned if all of these elements are demonstrated.

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE
What is the highest-level approval of low carbon transition plan?	Level of approval within the organization	Not known	Operational level (CSR level)	Upper management level	Board/strategic level	Matches highest level of responsibility as previously reported	20%
How the success of the plan is measured?	Measure of success	No measure of success	Measure of success in mainly qualitative	SMART KPI: specific, measurable, acceptable, realistic, time bound.	Measure of success is SMART. Measure of success contains both qualitative and quantitative targets.	Measure of success is quantitative	20%
Does the plan comprise financial content? If it does, what type of content?	Financial content in plan	No financial content	Financial projections, cost estimates or other estimates of financial viability are described but not quantified	Financial projections, cost estimates or other estimates of financial viability are laid out OR short-term actions to start implementing plan are quantified in more detail	Quantitative estimations of how the business will change in the future are included Costs associated with the plan (e.g. write-downs, site remediation, contract penalties, regulatory costs) are included	Description of the major changes to the business is comprehensive, consistent, aligned with other indicators	8%

To what extent business future considerations are integrated in the plan?	Future considerations	Implications to future business noted but not discussed properly	Contains actions the company expects to implement to make the transition a reality without any details	Contains discussion certain current company elements that need to be changed to make the transition a reality	Contains discussion of the potential portfolio of a future, low-carbon ready company	Contains one or more elaborate outlines of how the far-future company could look like in terms of physical assets and business model	8%
To what extent short term considerations and remedial actions are integrated in the plan?	Current considerations and plans	Short-term considerations and remedial actions can be discussed but are not integrated in the plan	List of short-term considerations and remedial actions integrated in the plan	Contains discussion of the potential impacts of a low-carbon transition on the current business Relevant region-specific considerations are included	Contains details of actions the company realistically expects to implement (and these actions are relevant and realistic)	Consideration of potential short-term "shocks" or stressors (sudden adverse changes) has been made	16%
What is the scope of the plan?	Transition plan scope, consistency, analysis	No clear scope to the plan, no consistency among sections and no analysis presented	The scope covers the entire business.	The scope covers the entire business. Plan is consistent with reporting against other ACT indicators Contains a description of relevant testing/analysis	The scope covers the entire business and is specific to it. Plan is consistent with reporting against other ACT indicators. Contains a description of relevant testing/analysis	Transition covers entire business and is specific to it, with proper scoping, consistency and proper analysis	20%
What is the time horizon of the plan?	Transition timescale	Covers only short-term (< 3 years)	Covers only medium term (2020)	Should cover the short, medium and long term. From now or near future <5 years, until at least 2025 and preferably beyond (2035)	Covers the short, medium and long term. From now until at least 2035	Covers the short, medium and long term. From now and beyond (2050)	8%

RATIONALE	BC 5.3 LOW-CARBON TRANSITION PLAN
RATIONALE OF THE INDICATOR	The Building Construction sector will require substantial changes to their business to align to a low-carbon economy, over the short, medium and long term, whether it is voluntarily following a strategy to do so or is forced to change by regulations and structural changes to the market. It is better for the success of its business and of its transition that these changes occur in a planned and controlled manner.

• BC 5.4 CLIMATE CHANGE MANAGEMENT INCENTIVES (WEIGHTING: 1%)

DESCRIPTION & REQUIREMENTS	BC 5.4 CLIMATE CHANGE MANAGEMENT INCENTIVES
SHORT DESCRIPTION OF INDICATOR	The Board's compensation committee has included metrics for the reduction of GHG emissions in the annual and/or long-term compensation plans of senior executives; the company provides monetary incentives for the management of climate change issues as defined by a series of relevant indicators.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A6 : Management incentives
HOW THE ANALYSIS WILL BE DONE	The analyst verifies if the company has compensation incentives set for senior executive compensation and/or bonuses, that directly and routinely reward specific, measurable reductions of tons of carbon emitted by the company in the preceding year and/or the future attainment of emissions reduction targets, or other metrics related to the company's low-carbon transition plan.

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE
Who is entitled to benefit?	Who is entitled to benefit?	Any other answer		Executive	Senior executive	Board chairman - Board/Executive board - Director on board - Corporate executive team - Chief Executive Officer (CEO) - Chief Operating Officer (COO) - Chief Financial Officer (CFO) - All employees	33%
What is the type of incentives (non-monetary/ monetary)?	Type of incentives	Non-monetary	Recognition (non-monetary)	Other non-monetary reward	Monetary reward	Monetary reward or Other non-monetary reward	33%
*What are the targets related to CC incentives? **	Incentivized performance indicator	No targets incentivized	Behavior change related indicator or other specification	Efficiency project, Efficiency target, Environmental criteria included in purchases, Supply chain engagement, or other specification		Emissions reduction project, Emissions reduction target, Energy reduction project, Energy reduction target, or other specification	33%

RATIONALE **BC 5.4 CLIMATE CHANGE MANAGEMENT INCENTIVES**

RATIONALE OF THE INDICATOR

Executive compensation should be aligned with overall business strategy and priorities. As well as commitments to action the company should ensure that incentives, especially at the executive level, are in place to reward progress towards low-carbon transition. This will improve the likelihood of successful low carbon transition.

Monetary incentives at the executive level are an indication of commitment to successful implementation of a strategy for low carbon transition.

• BC 5.5 CLIMATE CHANGE SCENARIO TESTING (WEIGHTING: 1%)

DESCRIPTION & REQUIREMENTS	BC 5.5 CLIMATE CHANGE SCENARIO TESTING
SHORT DESCRIPTION OF INDICATOR	Testing or analysis relevant to determining the impact of transition to a low-carbon economy on the current and projected business model and/or business s completed, with the results reported to the board or c-suite, the business strategy revised where necessary, and the results publicly reported.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ Scenario testing
HOW THE ANALYSIS WILL BE DONE	The analyst evaluates the description and evidence of the low-carbon economy scenario testing for the presence of best-practice elements and consister reported management indicators. The company description and evidence are compared to the maturity matrix developed to guide the scoring and a greater is allocated for elements indicating a higher level of maturity. Best-practice elements to be identified in the test/analysis include: ♦ entire coverage of the company's boundaries ♦ timescale from present to long-term (2035-2050) ♦ translation of results into value-at-risk or other financial terms ♦ multivariate: a range of different changes in conditions are considered together ♦ changes in conditions that are specific to a low-carbon climate scenario ♦ climate change conditions are combined with other likely future changes in operating conditions over the timescale chosen. Maximum points are awarded if all of these elements are demonstrated.

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE

What is the scope of the scenario testing?	Boundary	Large element[7] not included	Large element included	Small element not included	Small element included	Covers entire boundary of the company	35%
What is the time horizon of the scenario testing?	Timescale	From present to future	From present to 2020	From present to 2025	From present to 2035	From present to 2050	20%
Are the results in qualitative/ quantitative/ financial terms?	Results	Expressed in qualitative terms	Expressed in qualitative terms	Expressed in financial terms	Expressed in financial terms and results are translated into value-at-risk	Expressed as value-at-risk	10%
What are the type of changing conditions considered?	Conditions considered	Considers no particular changing conditions	Considers a narrow range of different changes in conditions.	Considers a range of changing conditions together (multivariate)	Considers changing climate conditions in combination with changes in operating conditions	Considers changing conditions specific for a 2-degree decarbonization scenario	35%

[7] Large elements are defined as business segments that generate more that 30% of the company's total revenues.

RATIONALE	BC 5.5 CLIMATE CHANGE SCENARIO TESTING
RATIONALE OF THE INDICATOR	Changes predicted to occur due to climate change could have a number of consequences for the Building Construction sector, including increased costs, a dramatically changed operating environment and major disruptions to the business. There are a variety of ways of analyzing the potential impacts of climate-related changes on the business, whether these are slow and gradual developments or one-off "shocks". Investors are increasingly calling for techniques such as use of an internal price on carbon, scenario analysis and stress testing to be implemented to enable companies to calculate the value-at-risk that such changes could pose to the business. As this practice is emergent at this time there is currently no comprehensive survey or guidance on specific techniques or tools recommended for the sector. The ACT methodology thus provides a broad definition of types of testing and analysis which can be relevant to this information requirement, to identify both current and best practices and consider them in the analysis. Scenario stress testing is an important management tool for preparing for low-carbon transition. For businesses likely to be strongly affected by climate change impacts (both direct and indirect), it has even greater importance.

SUPPLIER ENGAGEMENT (WEIGHTING: 10%)

- **BC 6.1 STRATEGY TO INFLUENCE SUPPLIERS TO REDUCE THEIR GHG EMISSIONS (WEIGHTING: 5%)**

DESCRIPTION & REQUIREMENTS	BC 6.1 SUPPLIER ENGAGEMENT
SHORT DESCRIPTION OF INDICATOR	This indicator assesses the strategic policy and the process which are formalized and implemented by the company in order to engage its suppliers.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ - A13: List of environmental/CSR contract clauses in purchasing & suppliers' selection process

HOW THE ANALYSIS WILL BE DONE

The assessment will assign a maturity score based on the company's formalized strategy with their suppliers, expressed in a maturity matrix.

A company that is placed in the 'aligned' category will receive the maximum score. Companies who are at lower levels will receive a partial score, with 0 points awarded for having no engagement at all.

This maturity matrix is indicative but does not show all possible options that can result in a particular score. Companies responses will be scrutinized by the assessor and then placed on the level in the matrix where the assessor deems it most appropriate.

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE
To what extent GHG emissions reduction issues are integrated in engagement with suppliers?	Consideration of reduction targets	No consideration	CSR clause included in engagements with suppliers. Means commitment included in contracts	CSR clause with GHG emissions reduction included in engagements with suppliers. Results-driven commitment in contracts	CSR clause with quantified GHG emissions reduction included in engagements with suppliers. Results commitment in contracts. Regular reporting	CSR clause with GHG emissions reduction included as priority in engagements with suppliers. Results-driven commitment in contracts. Regular reporting.	20%
What action levers are used by the company to encourage suppliers to develop low carbon offer?	Use of action levers	No action levers used	Passive approach (suppliers may offer low-carbon product but no specific requirements from the company)	Use of one action lever (awareness campaign, compensation, purchasing rule, etc.)	Use of several action levers (awareness campaign, compensation, purchasing rule, etc.)	Use of several action levers (awareness campaign, compensation, purchasing rule, etc.). Regular audits of the supplier by the purchaser or a representative	30%
What is the scope of the action levers used?	Scope	No strategy applied to any suppliers	Strategy applied to few large suppliers	Strategy applied to most large suppliers	Strategy applied to all large suppliers and few small suppliers	Strategy applied to all of suppliers	20%

To what extent carbon issues are integrated in the selection process of suppliers?	Suppliers selection process	No selection of suppliers based on environmental criteria No change in suppliers' base	Selection of suppliers based on at least one environmental criteria No change in suppliers' base	No change in suppliers' base Selection of suppliers with low carbon alternatives	No change in suppliers' base Selection of suppliers offering low-carbon alternatives	Engaging suppliers over low carbon alternatives	30%

RATIONALE	BC 6.1 STRATEGY TO INFLUENCE SUPPLIERS TO REDUCE THEIR GHG EMISSIONS
RATIONALE OF THE INDICATOR	**RELEVANCE OF THE INDICATOR:** Supplier engagement is included in the ACT BC assessment for the following reasons: ♦ As every part of the building's LCA (materials, management, etc.) has a significant impact in terms of GHG emission, achieving decarbonization of the whole supply chain is also key to reach the ambitious goals in the construction segment. ♦ Engaging suppliers through contract clauses and sales incentives is necessary to take them on board. **SCORING THE INDICATOR:** Because of data availability and complexity, a direct measure of the outcome of such engagement is not very feasible at this time. It is often challenging to quantify the emissions reduction potential and outcome of collaborative activities with the supply chain. Therefore, the approach of a maturity matrix allows the analyst to consider multiple dimensions of supplier engagement and assess them together towards a single score for Supplier Engagement.

• BC 6.2 ACTIVITIES TO INFLUENCE SUPPLIERS TO REDUCE THEIR GHG EMISSIONS (WEIGHTING: 5%)

DESCRIPTION & REQUIREMENTS	BC 6.2 ACTIVITIES TO INFLUENCE SUPPLIERS TO REDUCE THEIR GHG EMISSIONS
SHORT DESCRIPTION OF INDICATOR	This indicator assesses initiatives and the partnerships launched by the company in order to engage its suppliers.

DATA REQUIREMENTS

The questions comprising the information request that are relevant to this indicator are:

- A14: List of initiatives implemented to influence suppliers to reduce their GHG emissions, green purchase policy or track record, supplier code of conduct

HOW THE ANALYSIS WILL BE DONE

The assessment will assign a maturity score based on the company's formalized strategy with their suppliers, expressed in a maturity matrix.

A company that is placed in the 'aligned' category will receive the maximum score. Companies who are at lower levels will receive a partial score, with 0 points awarded for having no engagement at all.

This maturity matrix is indicative but does not show all possible options that can result in a particular score. Companies responses will be scrutinized by the assessor and then placed on the level in the matrix where the assessor deems it most appropriate.

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE
How the company encourage suppliers to reduce their GHG emissions?	Suppliers GHG emissions	No activity	Company requires suppliers to sign a code of conduct (or similar) and/or to provide data regarding their environmental performance (for audited suppliers). Means-driven commitment	Company assists suppliers to reduce their GHG emissions Company monitors GHG emissions along its value chain Provision of documents and tools by the lessor	Company partners with large suppliers to define common GHG emissions reduction plan Provision of documents and tools Multi-party working group with annual meeting at least	Company contributes in GHG emissions reduction along its value chain through close partnerships with suppliers	60%

Does the company develop a low-carbon demand?	Low-carbon offer of suppliers	No green purchase	No green purchase	Company purchases low-carbon products/equipment to reduce its materials and construction phase emissions	Company purchases low-carbon products/equipment to reduce its materials and construction phase emissions Company partners with suppliers to develop low-carbon products	Company purchases low-carbon products/equipment to reduce its materials and construction phase emissions Company partners with suppliers to develop low-carbon products	40%

RATIONALE — **BC 6. 2 ACTIVITIES TO INFLUENCE SUPPLIERS TO REDUCE THEIR GHG EMISSIONS**

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Activities to influence suppliers are included in the ACT BC assessment for the following reasons:

- As each part of the building LCA (materials, management, etc.) has a significant impact in terms of GHG emission decarbonization of the whole supply chain is also key to reach ambitious decarbonization goals in the construction segment.
- Beyond the supplier selection process, construction companies have the capacity to influence suppliers through the development of low-carbon products demand. If companies develop green purchase volume, suppliers would be encouraged to adapt.

SCORING THE INDICATOR:

Because of data availability and complexity, a direct measure of the outcome of such engagement is not very feasible at this time. It is often challenging to quantify the emission reduction potential and outcome of collaborative activities with the supply chain. Therefore, the approach of a maturity matrix allows the assessor to consider multiple dimensions of supplier engagement and assess them together towards a single score for all the activities related to Supplier Engagement.

CLIENT ENGAGEMENT (WEIGHTING: 10%)

• BC 7.1 STRATEGY TO INFLUENCE CUSTOMER BEHAVIOUR TO REDUCE THEIR GHG EMISSIONS (WEIGHTING: 5%)

DESCRIPTION & REQUIREMENTS	BC 7.1 STRATEGY TO INFLUENCE CUSTOMERS TO REDUCE THEIR GHG EMISSION
SHORT DESCRIPTION OF INDICATOR	This indicator assesses the level of engagement that the company has with its clients, based on an assessment of the client policy formalized and implemented by the company..
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A15: Client policy

HOW THE ANALYSIS WILL BE DONE

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE
To what extent GHG emissions reduction issues are integrated in engagement with clients?	Consideration of reduction targets	No strategy	GHG emissions reduction included in engagement with clients Means-driven commitment	Quantified GHG emissions reduction included in engagement with clients	Quantified GHG emissions reduction included in engagement with clients	Quantified GHG emissions reduction included as priority in engagements with clients	40%
What action levers are used by the company to encourage clients to buy low carbon products?	Influence on clients	Company only delivers buildings that meet regulation requirements	Passive approach (offers buildings that go beyond regulation but no incentive for clients to choose energy efficient buildings rather than	Use of one action lever (awareness campaign, compensation, purchasing rule, etc.) Provision of documents and tools by the lessor	Use of several action levers (awareness campaign, compensation, purchasing rule, etc.) Provision of documents and tools Multi-party working group	Use of several action levers (awareness campaign, compensation, purchasing rule, etc.) Contribution to shift demand towards low-carbon buildings	40%

			standard ones)		with annual meeting at least		
What is the scope of the action levers used?	Scope	No clients in the scope		Only large clients	Majority of clients	All clients	20%

RATIONALE	BC 7.1 STRATEGY TO INFLUENCE CUSTOMERS TO REDUCE THEIR GHG EMISSION

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Strategy to influence customers are included in the ACT BC assessment for the following reasons:

- As each part of the building LCA (materials, management, etc.) has a significant impact in terms of GHG emission, decarbonization of the whole supply chain is key to reach ambitious decarbonization goals in the construction segment. Building occupants and building managers have also a key role to play in order to achieve the 2DS.
- Companies who wish to develop low carbon buildings or more sustainable buildings need to be able to market them, and convince their clients to adopt sustainable practices for their new/renovated buildings.

SCORING THE INDICATOR:

Because of data availability and complexity, a direct measure of the outcome of such engagement is not very feasible at this time. It is often challenging to quantify the emission reduction potential and outcome of collaborative activities with the supply chain. Therefore, the approach of a maturity matrix allows the assessor to consider multiple dimensions of supplier engagement and assess them together towards a single score for all the activities related to Client Engagement.

• BC 7.2 ACTIVITIES TO INFLUENCE CUSTOMER BEHAVIOUR TO REDUCE THEIR GHG EMISSIONS (WEIGHTING: 5%)

DESCRIPTION & REQUIREMENTS	BC 7.2 ACTIVITIES TO INFLUENCE CUSTOMERS TO REDUCE THEIR GHG EMISSION
SHORT DESCRIPTION OF INDICATOR	This indicator assesses the level of engagement that the company has with its clients, based on an assessment of previous initiatives that show whether or not the company engages with clients in various ways.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A16: List of initiatives implemented to influence client behavior to reduce their GHG emissions

HOW THE ANALYSIS WILL BE DONE

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE
How the company encourage clients to reduce their GHG emissions?	Clients GHG emissions	No engagement	Company promotes buildings with lower carbon footprint but no data reported Company defines means-driven commitment	Company assists clients to reduce their GHG emissions Provision of documents and tools by the lessor	Company partners with large clients to define common GHG emissions reduction plan Provision of documents and tools Multi-party working group with annual meeting at least	Company contributes in GHG emissions reduction along its value chain through close partnerships with clients	20%

What actions levers are used by the company to encourage buildings users to reduce their GHG emissions?	Users GHG emissions	No action	Passive approach (company implement action in response of specific request of tenants/users)	Company influence building users through awareness campaigns	Company integrates actions within the construction/renovation of buildings (parking for electrical vehicles, bicycle parking, etc.)	Use of several actions levers along the whole life of the building (construction, renovation, management)	80%

RATIONALE **BC 7.2 ACTIVITIES TO INFLUENCE CUSTOMERS TO REDUCE THEIR GHG EMISSION**

RATIONALE OF THE INDICATOR

RELEVANCE OF THE INDICATOR:

Activities to influence customers are included in the ACT BC assessment for the following reasons:

- As each part of the building LCA (materials, management, etc.) has a significant impact in terms of GHG emission, decarbonization of the whole supply chain is also key to reach ambitious decarbonization goals in the construction segment. Building occupants and building managers have also a key role to play in order to achieve the 2DS.
- Construction companies have the capacity to influence their clients when providing support to reduce their GHG emissions (partnership, common action plan, etc.).

SCORING THE INDICATOR:

Because of data availability and complexity, a direct measure of the outcome of such engagement is not very feasible at this time. It is often challenging to quantify the emission reduction potential and outcome of collaborative activities with the supply chain. Therefore, the approach of a maturity matrix allows the assessor to consider multiple dimensions of supplier engagement and assess them together towards a single score for all the activities related to Client Engagement.

POLICY ENGAGEMENT (WEIGHTING: 5%)

• RE 8.1 COMPANY POLICY ON ENGAGEMENT WITH TRADE ASSOCIATIONS (WEIGHTING: 1%)

DESCRIPTION & REQUIREMENTS	BC 8.1 COMPANY POLICY ON ENGAGEMENT WITH TRADE ASSOCIATIONS
SHORT DESCRIPTION OF INDICATOR	The company has a policy on what action to take when industry organisations to which it belongs are found to be opposing "climate-friendly" policies.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A12: Company policy on engagement with trade associations
HOW THE ANALYSIS WILL BE DONE	The analyst will evaluate the description and evidence of the policy on trade associations and climate change for the presence of best practice elements and consistency with the other reported management indicators. The company description and evidence will be compared to the maturity matrix developed to guide the scoring and a greater number of points will be allocated for elements indicating a higher level of maturity. Best practice elements to be identified in the test/analysis include: ♦ Having a publicly available policy in place ♦ The scope of the policy covers the entire company and its activities, and all group memberships and associations ♦ The policy sets out what action is to be taken in the case of inconsistencies ♦ Action includes the option to terminate membership of the association ♦ Action includes the option of publicly opposing or actively countering the association's position ♦ Responsibility for oversight of the policy lies at the top level of the organisation ♦ There is a process to monitor and review trade association positions Maximum points are awarded if all these elements are demonstrated.

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE
What is the scope covered by the engagement policy? Is the policy publicly available?	Transparency and scope	Does not cover entire company or all group memberships. Is not publicly available.	Does not cover entire company or all group memberships. Is publicly available.	Covers the entire company and its activities, and all group memberships and associations, but not publicly available		Covers the entire company and its activities, and all group memberships and associations. Public policy is publicly available	40%
Does the company have a review process of trade associations?	Oversight	No process to review trade associations positions	A process to monitor and review trade association positions exists but is not necessarily implemented	A process to monitor and review trade association positions exists and is well implemented	A process to monitor and review trade association positions exists and is well implemented at a high level of the organization	A process to monitor and review trade associations positions exists. Responsibility for oversight of the policy lies at top level of the organization	40%
Does the plan have an action plan regarding engagement with trade associations?	Action plan	No mention of this element		Sets out what action is to be taken in the case of inconsistencies	Option to terminate membership of the association	Option of publicly opposing or actively countering the association position	20%

RATIONALE **BC 8.1 COMPANY POLICY ON ENGAGEMENT WITH TRADE ASSOCIATIONS**

RATIONALE OF THE INDICATOR

See also the module rationale.

Trade associations are a key instrument by which companies can indirectly influence policy on climate. Thus, when trade associations take positions, which are negative for climate, companies need to take action to ensure that this negative influence is countered or minimized This indicator is consistent with the ACT philosophy , ACT framework and ACT guidelines and common to the other sectoral methodologies.

• BC 8.2 TRADE ASSOCIATIONS SUPPORTED DO NOT HAVE CLIMATE-NEGATIVE ACTIVITIES OR POSITIONS (WEIGHTING: 2%)

DESCRIPTION & REQUIREMENTS	BC 8.2 TRADE ASSOCIATIONS SUPPORTED DO NOT HAVE CLIMATE-NEGATIVE ACTIVITIES OR POSITIONS
SHORT DESCRIPTION OF INDICATOR	The company is not on the board or providing funding beyond membership of any trade associations that have climate-negative activities or positions. It should also be considered if the company is supporting trade associations with climate-positive activities and/or positions.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A12: Company policy on engagement with trade associations
HOW THE ANALYSIS WILL BE DONE	The list of trade associations declared in the CDP data and other external source entries relating to the company (e.g. RepRisk database), is assessed against a list of associations that have climate-negative activities or positions. The results are compared to any policy described in 5.1. If the company is part of trade associations that have climate-positive activities and/or positions, this should be considered for the analysis.

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE
Does the company support trade associations that have climate negative activities/positions?	Membership/funding	Company is on the board or provides funding beyond membership to trade associations that have climate-negative activities or positions.		The company is not on the board or providing funding beyond membership of any trade associations that have climate-negative activities or positions. Company can be member.		Company is not a member of any trade associations that have climate negative activities or positions	100%

RATIONALE	BC 8.2 TRADE ASSOCIATIONS SUPPORTED DO NOT HAVE CLIMATE-NEGATIVE ACTIVITIES OR POSITIONS

RATIONALE OF THE INDICATOR	Trade associations are a key instrument by which companies can indirectly influence policy on climate. Thus participating in trade associations which actively lobby against climate-positive legislation is a negative indicator and likely to obstruct low-carbon transition. However, membership in association that supports climate positive policies should also be considered in the analysis.

• BC 8.3 POSITION ON SIGNIFICANT CLIMATE POLICIES (WEIGHTING: 2%)

DESCRIPTION & REQUIREMENTS	BC 8.3 POSITION ON SIGNIFICANT CLIMATE POLICIES
SHORT DESCRIPTION OF INDICATOR	The company is not opposed to any significant climate relevant policy and/or supports climate friendly policies.
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ - A11: Position of the company on significant climate policies (public statements, etc.).
HOW THE ANALYSIS WILL BE DONE	The analyst evaluates the description and evidence on company position on relevant climate policies for the presence of best practice elements, negative indicators and consistency with the other reported management indicators. The company description and evidence will be compared to the maturity matrix developed to guide the scoring and a greater number of points will be allocated for elements indicating a higher level of maturity. Maturity matrix contents may include (decreasing maturity): **a.** The company publicly supports relevant significant climate policies **b.** No reports of any opposition to climate policy **c.** Reported indirect opposition to climate policy (e.g. via a trade association) **d.** Reported direct opposition to climate policy (third-party claims are found) **e.** The company publicises direct opposition to climate policy (e.g. direct statement issues or given by a company representative in a speech or interview)

QUESTION	SUBDIMENSION	BASIC	STANDARD	ADVANCED	NEXT PRACTICE	2' ALIGNED	SUBSCORE
What is the position of the company on significant climate policies?	climate policy support	Reported direct opposition to climate policy can be found (third-party claims are found)	No reported direct opposition to climate policy	No reported direct opposition to climate policy, but indirect may exist.	No reports of any opposition to climate policy	Publicly supports relevant significant climate policies	100%

RATIONALE **BC 8.3 POSITION ON SIGNIFICANT CLIMATE POLICIES**

RATIONALE OF THE INDICATOR

Private and public stakeholders of the building sectors have been developing initiatives about sustainable building practices that contribute to the transition to a low-carbon economy. Companies should not oppose effective and well-designed regulation in these areas, but should support it. Assessing the position of the company regarding the evolution of the context is thus key to understand the corporate vision in these matters.

BUSINESS MODEL (WEIGHTING: 10%)

• BC 9.1 INTEGRATION OF THE LOW-CARBON ECONOMY IN CURRENT AND FUTURE BUSINESS MODELS

DESCRIPTION & REQUIREMENTS	BC 9.1 INTEGRATION OF THE LOW-CARBON ECONOMY IN CURRENT AND FUTURE BUSINESS MODELS
SHORT DESCRIPTION OF INDICATOR	The company is actively developing business models for a low-carbon future by demonstrating its application of low-carbon business model pathways. The innovative business models that have been identified as being strategic for the company's low-carbon transition are: ♦ Energy performance guarantees and services ♦ Use of circular economy as cost reduction driver ♦ Design and offer multi-purpose and collaborative buildings
DATA REQUIREMENTS	The questions comprising the information request that are relevant to this indicator are: ♦ A17: List and turnover of activities in new businesses related to low carbon buildings ♦ A18: Current position and action plan of the company towards the identified low-carbon business models
HOW THE ANALYSIS WILL BE DONE	The analysis is based on the company's degree of activity in one of the 3 future business model areas used to benchmark. The analyst evaluates the implementation of the future business model pathways through a maturity matrix and the highest level achieved determines the current level of the company. The 3 business model categories, comprising subcategories (non-exhaustive list) are the following ones: 1. Energy performance guarantees and services a. Offer low carbon buildings with energy performance guarantees (if the energy consumption is higher than a fixed threshold set down in the contract, the construction company covers the extra costs) b. Offer renovation services with guaranteed savings (if the savings are less than those set down in the contract, the construction company covers the extra costs) c. Offer low carbon building with energy services (renewable production, electricity storage, …) over 10-15 years d. … 2. Use circular economy as cost reduction driver a. Integrate used material in construction operations to reduce cost of construction b. Upcycle construction materials and waste to optimize construction costs

c. …

3. Design and offer multi-purpose and collaborative buildings
    a. Design of multi-purpose buildings
    b. Design of buildings for collaborative use (coworking, coliving, etc.)
    c. …

In order for companies to align with a low-carbon future and meet the future mobility needs, it is expected that they pursue at least one of these future business model pathways and integrate them into their strategic plans. The analyst evaluates the description and evidence of the company's degree of activity in one of the future business model areas for the presence of best practice elements and consistency with the other reported management indicators. The company description and evidence are compared to the maturity matrix developed to guide the scoring and a greater number of points are allocated for elements indicating a higher level of maturity.

The minimum requirement for points to be awarded is that some level of exploration of one or more of these relevant business areas has started. This could include participation in collaborations, pilot projects, or research funding.

Best practice elements to be identified in the test/analysis include:

- the company has developed a mature business model that integrates one or many of the above elements;
- the business activity is profitable;
- the business activity is of a substantial size;
- the company is planning to expand the business activity;
- expansion will occur on a defined timescale.

Maximum points are awarded if all of these elements are demonstrated.

RATIONALE	BC 9.1 INTEGRATION OF THE LOW-CARBON ECONOMY IN CURRENT AND FUTURE BUSINESS MODELS
RATIONALE OF THE INDICATOR	In addition to developing sustainable building practices, a company may transition its business model to other areas to remain profitable in a low-carbon economy. The company's future business model should enable it to decouple financial results from GHG emissions, in order

to meet the constraints of low-carbon transition while continuing to generate value. The business model shifts identified do not conflict with the changes that are implied by decarbonizing the company's conception and construction of buildings.

This indicator aims to identify both relevant current business activities, and those still at a burgeoning stage. It is recognized that transition to a low carbon economy, with associated change in business models, will take place over a number of years. The assessment will thus seek to identify and reward projects at an early stage as well as more mature business activities, although the latter (i.e. substantially sized, profitable, and/or expanding) business activities will be better rewarded.

The maturity matrix is provided below:

		BASIC	ADVANCED	2° ALIGNED	
	Associated score	0%	50%	100%	**Weight of the indicator in business model score**
9.1	**Profitability of business model**	Non- estimated or in a very early stage of development (research or conception stage)	Mature business model but non- profitable or in a development stage (prototype / demonstration or test)	Mature and profitable business model	25%
9.2	**Size of business model**	Non- estimated	Limited size of business for the company (few FTE or time dedicated, small turnover, few revenues expected, etc.)	Substantial size of market for the company (significant number or FTE or dedicated hours, great turnover, great anticipated profitability, etc.)	25%
9.3	**Growth potential of business model**	Non- estimated or exploration of the business model interrupted	Scheduling next development steps	Scheduling the expansion of the target or size of the business model	25%

9.4	**Deployment schedule of business model**	Non- scheduled	Deployment scheduled with a 2 years horizon or less	Deployment scheduled with a 2 years horizon or more	25%

6. Assessment

6.1. SECTOR BENCHMARK

The fundamental target to achieve for all organizations is to contribute to not exceeding a threshold of 2º global warming compared to pre-industrial temperatures. This target has long been widely accepted as a credible threshold for achieving a reasonable likelihood of avoiding climate instability, while a 1.5ºC rise has been agreed upon as an aspirational target.

Every company shall be benchmarked according to globally and/or nationally acceptable and credible benchmarks that align with spatial boundary of the methodology. If the methodology is only applied to a local country or state, the associated benchmarks shall still be compatible with the IEA low-carbon scenario (2DS) for the geographic zone.

Next, the geographical zone coverage and the reference pathway definition and classification are presented. After, the company benchmark construction is described, and one example of the benchmark construction is given.

• GEOGRAPHICAL COVERAGE

The geographical zones are defined as a large world zone containing similar characteristics. Thus, some countries can be considered as geographical zones.

The external sources and available data used (*IEA ETP 2017,* n.d.) (International Energy Agency, Transition to sustainable buildings, 2013) for the construction of the benchmark cover the following areas:

- Europe;
- USA ;
- Brazil;
- China;
- India;
- Russia;
- ASEAN (ten countries of Southeast Asia with only aggregated data including Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam);
- South Africa.

• REFERENCE PATHWAY CLASSIFICATION

A reference pathway defines the carbon intensity ($kgCO_2/m^2$) pathway from a given geographical zone and/or country, as well as by building type and typology.

For the Construction sub-sector, we must consider two types of pathways (of different nature):

- the “In-Use” part corresponding to carbon intensities linked to predicted operational energy consumption of buildings newly built or renovated by the company (similarities with the methodology developed for the Real-Estate sub-sector, but excluding user’s appliances and some equipment),

- the “Materials” part corresponding to embodied-carbon intensities linked to all the materials (products and equipment) used to build and maintain the new buildings produced by the company (life cycle approach of products, assuming a building conventional service life of 50 years, including replacement of products and end-of-life scenarios).

For the construction of new buildings, as well as for renovation projects, the “In-Use” reference pathway considers the operational energy consumption – and related GHG emissions – from four major end-uses (space heating, space cooling, lighting, hot water heating). These four end-uses correspond to the major part of the energy consumption that can be defined during the design phase and generally addressed by energy performance regulations, at least for new buildings. Since the energy consumption of user’s appliances is not included here, the “In-Use” perimeter is different from the Real-Estate sub-sector. In available data (IEA) ventilation is aggregated with user’s appliances, so ventilation related energy is not considered in the main energy end-uses. Cooking is another end-use that is not included either.

The “Materials” reference pathway is only considered for new buildings, that means it is excluded for renovated projects. This is because in this latter situation the perimeter of materials may vary considerably, and benchmarking the materials part of GHG emissions of the company renovation works would not make sense.

The reference pathway classification is defined considering the five input data parameters:

- Activity: Construction or Renovation
- Part: In-use or Materials
- Building type: Residential or Services
- Building typology:
- Individual housing or multi-family housing (for Residential building type)
- Office, Retail or Hotel (for Services building type)
- Geographical zone: group of countries or individual country
- Country level: Country pathway (e.g. for EU-28) or State pathway for certain countries (e.g. for USA, but it is not developed in this first version).

The generic reference pathway designation is composed as follows:

Pathway_name = “Activity”_”Part”_”Building type”_”Building typology”_”Geographical zone”_”Country”

Example:

Name of the pathway for the materials part of new offices in France = Construction_Materials_Services_Office_Europe_France

• COMPANY BENCHMARK

The company benchmark is a customized benchmark based on the 2°C scenario from the IEA, and on the main features of its works. If the company builds new buildings and renovate existing buildings, three company benchmarks are created: two for new buildings (In-Use part and Materials part) and the 3rd one for renovation (In-Use part only).

If the company business involves only new buildings, then only the two first benchmarks are created.

To build the company benchmark(s) two steps are generally needed:

- First, the company must calculate the different reference pathways for each building typology and country, which was constructed (and/or renovated) for the last 5-year period by the company and the undergoing building construction (new and/or renovation).
- Then, the company benchmarks are built as a weighted (according to floor area of buildings) sum of, one or, a combination of several reference pathways of the same type.

Example:

A company that has no historic in construction and that builds two new office buildings with 1 000 m² and 2 000 m² of floor area respectively in France and Germany.

To determine the company benchmarks two reference pathways are needed:

(Construction_Services_Office_Europe_France and Construction_Services_Office_Europe_Germany), each of them divided into In-Use part and Materials part.

$$\text{Company benchmark} = \frac{\text{Floor_area_office_France}}{Total\ company\ floor_area} * \text{Construction_Services_Office_Europe_France} + \frac{\text{Floor_area_office_Germany}}{Total\ company\ floor_area} * \text{Construction_Services_Office_Europe_Germany}$$

The calculation of the reference pathways needs several information:

Current new and renovated buildings (typology, country, floor area)

Previously built or renovated buildings (in the last five years) (typology, country, floor area)

• AVAILABLE REFERENCE PATHWAYS

To date, more than 400 reference pathways have been generated:

- Geographical Zones available: Europe, USA, China, India, Brazil, Russia, ASEAN and South Africa
- Countries available = France, Germany, Italy, UK, etc. forming the 28 countries of the E.U. (2018)
- Building type available = Residential and Services
- Building typology: Individual housing, Multi-family housing, Office, Retail and Hotel **(Reference pathways for the different building typologies are only available at country level!)**

Since the ACT methodology for Construction sub-sector is meant to be used in any part of the world, the assessment report shall mention when data is unavailable for an area and which "proxy" has been used, with justification, according to the following table:

DESCRIPTION OF THE AREA WITH MISSING DATA COMPARED TO ANOTHER DOCUMENTED AREA	PROXY
Country level data not available	1. If this zone is relatively similar (in terms of GDP/capita, type of energy and industry infrastructure, main features of the building stock…) to another one already documented, consider the same data, 2. If this zone is relatively similar to another one, but differs by climatic conditions, use the same data

	where applying specific climatic coefficients to in-use energy consumption, 3. If this zone is included in a larger zone that is already characterized, then consider the data of the larger zone,

6.2. QUANTITATIVE BENCHMARKS USED FOR INDICATORS

The sector of new buildings construction needs two different benchmarks related to in-use energy consumption and to the materials used in construction. For renovation activities, only in-use consumption benchmark should be considered.

The methodology is divided into two calculations:

- **In-use consumption**:
  - Scope 1 – Building direct emissions
  - Scope 2 – Building indirect emissions due to electricity consumption
- **Construction Materials emissions**
  - two approaches are suggested

• IN-USE CONSUMPTION

SCOPE 1 – BUILDING DIRECT EMISSIONS

IEA ETP 2017 (*IEA ETP 2017*, n.d.) gives the direct CO_2 emissions of the building stock in each geographical zone in $MtCO_2$ from 2014 up to 2060, distinguishing Residential and Services buildings, including demography and related built area growth. Only the end-uses corresponding to space heating, cooling, domestic hot water and lighting are considered here, they correspond to the major part of the energy consumption that can be defined during the design phase by energy performance regulations. Ventilation is not included for the moment, because not identifiable as such in IEA data.

In order to get CO_2 intensities (CO_2 emissions per m^2) of the building stock, zone by zone, we have divided the $MtCO_2$ figures by floor areas forecasts found in a 2013 IEA publication [2].

The **zone Carbon intensity for new buildings** is calculated by applying an Energy intensity ratio.

To calculate the Zone new buildings type pathway, the zone building stock type pathway is multiplied by a ratio between the EI (Energy Intensity) of new buildings type and the EI of building stock. Energy Intensity is used to allocate GHG emissions intensity per country and building types; that is a proxy with associated limitations.

Values for $EI\ for\ new\ buildings$ are calculated considering current new building standards and increase of energy efficiency of 20% every 10 years. For Europe countries the data from current new building standards come from (*ZEBRA2020 - DataTool*, n.d.). The value for the zone Europe new building standards EI, is calculated as a weighted sum of Europe countries.

The new building standard values are defined in primary energy. The conversion into final energy is detailed in the Appendix 1.

$EI\ zone\ building\ stock\ type$ is calculated using values from *IEA ETP 2017*, n.d. and *Transition to sustainable buildings, IEA, 2013*.

The country carbon intensity for new buildings:

$$Country \text{ new } building\ typology\ pathway\ (year) = Zone\ building\ stock\ type\ pathway\ (year) * Ratio\ EI \text{ country new building typology } vs\ EI \text{ zone new building } stock\ type\ (year) \quad (1)$$

For $EI\ Country\ new\ buildings\ typology$, values come from countries building codes (*ZEBRA2020 - DataTool*, n.d.). The conversion of these values to final energy is made using the same methodology as for the zone Carbon intensity for new buildings**.**

SCOPE 2 – BUILDING INDIRECT EMISSIONS DUE TO ELECTRICITY CONSUMPTION

The calculation of the Scope 2 emissions only concerns the electricity consumption. As electricity is the main source of indirect emissions in most countries, commercial heat is not considered. This last point is a limitation of the method, particularly in some Nordic countries where commercial heat is frequent. The data from building type electric consumption by geographical zone can be retrieved in the IEA ETP 2017 data.

Considering:

- $Zone\ building\ type\ electric\ consumption\ (year)$: Electric consumption is calculated from the total electric consumption of the zone building type minus the energy used for cooking and other appliances and miscellaneous. The percentage of electricity used for each end-use is provided by (*EU building database*, 2018) and (*IEA ETP 2017*, n.d.),
- $Zone\ Electricity\ mix\ emissions\ (year)$: data gathered from IEA ETP 2017 data,
- $Zone\ bulding\ type\ floor\ area\ (year)$,

The Zone building type electricity carbon intensity can be calculated from 2014 to 2050**.**

Then, with the help of Country electric mix emissions (year), only available for Europe countries, coming from the scientific paper (Moro and Lonza, 2018), the **Country building typology electricity carbon intensity** can be calculated.

Finally, the carbon pathway for “construction In-Use” is calculated by summing scope 1 and scope 2.

• MATERIALS BENCHMARKS

We have worked according to two approaches:

- the first one based on quantities of different families of materials expressed in kg/m² of building,
- the second one based on building LCAs from the French Energy-Carbon Observatory.

The latter has revealed a better applicability, and a high potential for future development.

Approach # 1:

The needed data for calculating embodied-carbon intensity for building materials are the following:

- Quantities of materials in kg/m² of building:
  - Drawn for a study for ADEME on material consumption for new buildings in France, and trends until 2050 (CSTB for ADEME, 2018),
  - 10 families of materials have been defined, covering most of buildings materials,
  - Replacement coefficient is defined for each family, knowing that the conventional service life of a building is 50 years,
  - Distinction between residential and non-residential buildings.

- Embodied-carbon based on the full life cycle of construction products:
  - Use of INIES French database in order to get a realistic amount of CO_2/kg of each family of materials, representing diverse construction products,

- Calculation of CO2/m2 of building,
- Addition of building-related equipment as HVAC, PV panels, etc. (because not included in the above-mentioned study), using the default values given in the E+C- method,
- Adjustment of the result (CO_2/m^2) so as to correspond to C1 level of E+C- label.

This approach gives the first benchmark point corresponding to a new building in France in 2015.

The benchmark pathway is drawn for the above-mentioned study, where several scenarios based on market shares are suggested. The scenario “pushing” the bio-based buildings was chosen, in terms of market shares, better in line with low-carbon transition than the others. The IEA ETP 2017 industry pathways reflects decarbonation of industry sub-sectors and electricity mix.

The results are then adapted/translated to other countries, taking into account:

- the market share of different types of building structures, as given in GABC 2018 Global Status Report,
- the electricity mix and the 2DS-related IEA pathway.

Approach # 2:

The case studies of new buildings (real and recent projects under design or construction) drawn from the Energy-Carbon Observatory were used in a statistical way. This Observatory included more than 600 buildings (March 2019) modelled with the E+C- method. Most of them are residential ones, both individual and multi-family, and offices. Retail buildings are not correctly documented, and the number of hotels is currently limited. So, the reliability of data is good for offices and residential buildings, acceptable for hotels and not sufficient for retail. But the study for ADEME on material consumption for new buildings in France, and trends until 2050 (CSTB for ADEME, 2018) has been used for the comparison of different typologies of buildings.

The relevance of the E-C Observatory is that LCA data are not organized according to materials (metals, minerals, wood, plastics, etc.) but by ‘lots’ that are technical packages of works corresponding to the skills of the different construction companies (from the foundation and structure of the building until the finishings, and among other partitions, façades, windows, HVAC equipment, etc.). 14 ‘lots’ are defined in the E+C- method, some of them accepting fixed values as for instance electrical internal networks or lifts.

Once unrealistic or suspect data are suppressed from the Observatory, the CO2 indicator of LCA was studied for the different typologies and different structural solutions (concrete, masonry, wood, steel, composite).

This step gives the first benchmark point corresponding to a new building in France in 2018 (as the LCA calculation have been made mostly in 2018).

Knowing the market shares of the structural solutions for new buildings in each large geographical zone (cf. [13] GABC 2018 Global Status Report) the CO2 values are then adjusted for the construction practice of each zone. Finally, the CO2 values are adapted to the CO2 content of the electricity mix of each country (in Europe) or each zone.

The last step consists in applying coefficients of decarbonization of the industry sector until 2050. The 2017 IEA 2DS scenarios of the industry sector have been used [10], distinguishing OECD and non-OECD countries.

The details of the development of these benchmarks and pathways are given in annex 1.

Elaboration of benchmark pathway for each company

Several « elementary » benchmark pathways for new buildings material-related CO_2 intensities are drawn, from 2015 to 2050 with 5 years step (e.g.: office buildings in Italy, hotels in France, etc.)

One or a combination of several elementary pathways according to the real activity of the construction company / developer (average activity on 5-year period) is defined:

- X m² of offices in France → x % (= *France-office pathway weighted by x %)*
- Y m² of collective housing in France → y %
- Z m² of offices in Italy → z %
- W m² of hotels in Italy → w %

Regarding activity evolution over time (according to a company's strategy) until 2050, previous figures are set as constants. The result is a customized benchmark pathway for the "Materials" component, calibrated according to the activity, and its location, of the company.

List of benchmarks

For new and renovated buildings delivered by the company, as well as for the office buildings owned by the company, the following table lists the benchmarks used for the quantitative indicators and their sources:

Benchmark(s)	Parameter	Source	Indicator relevance
Real-Estate_In-Use-all_Services_Office_"Geo-zone"_"Country" (set of several elementary reference pathways) (*Sectoral Decarbonization Approach (SDA): A method for setting corporate emission reduction targets in line with climate science*, 2015)	CB_{OB}	EU Buildings database IEA ETP 2017	BC 1.1
Construction_In-Use-reg_"Building-type"_"Building-typology"_"Geo-zone"_"Country"	CB_{nbu} (value or gradient)	ZEBRA2020 – data tool IEA ETP 2017	BC 1.2 BC 4.1
Renovation_In-Use-reg_"Building-type"_"Building-typology"_"Geo-zone"_"Country"	CB_{rbu}	BBC Observatory (FR)	BC 1.3
Construction_Materials_"Building-type"_"Building-typology"_"Geo-zone"_"Country"	CB_{nbm}	Energy-Carbon Observatory, Ademe study on construction materials trends, INIES database	BC 1.4

List of sources:

MATERIALS

- IEA ETP 2017 (industry and energy sectors)
- INIES database (FR)
- Bilan-GES database (FR)
- Energy-Carbon Observatory (FR) containing several hundreds of building LCAs based on E+C- method and INIES data
- CSTB study for ADEME on resources consumption in the building sector (FR, 2018)
- Arrêté of 2012/11/19 (bio-based buildings)
- Recent documents on neutral carbon policy (European Commission)
- Energy Transitions Commission: reports of Plastics, Steel and Cement industries
- IEA technology roadmap (cement industry) and other IEA industry data
- IEA sub-sectoral information

IN-USE

- IEA ETP 2017
- Global surface projections: Transition to Sustainable Buildings, IEA 2013
- Diverse countries: DDPP
- Europe country surface projections: EU buildings database, http://www.entranze-scenario.enerdata.eu/site/
- United states electricity mix: https://www.eia.gov/
- Europe electricity mix : https://www.eea.europa.eu/data-and-maps/indicators/overview-of-the-electricity-production-2/assessment-4
- CEA Mémento de l'Energie - Energy Handbook (FR, 2018)
- China: scientific articles
- Directive 2006/32/EC, 2006.
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- EU building database, 2018.
- International Energy Agency (Ed.), 2013. Transition to sustainable buildings: strategies and opportunities to 2050. IEA Publ, Paris.
- Moro, A., Lonza, L., 2018. Electricity carbon intensity in European Member States: Impacts on GHG emissions of electric vehicles. Transp. Res. Part Transp. Environ. 64, 5–14. https://doi.org/10.1016/j.trd.2017.07.012
- Sectoral Decarbonization Approach (SDA): A method for setting corporate emission reduction targets in line with climate science, 2015. Science Based Targets Initiative.
- ZEBRA2020 - DataTool, n.d
- « Observatoire BBC – Etude sur les bâtiments rénovés à basse consommation », Effinergie, 2018

6.3. WEIGHTINGS

TABLE 3: PERFORMANCE INDICATOR WEIGHTINGS

AU	MODULE	INDICATOR	MODULE WEIGHT	INDICATOR WEIGHT
1.1	TARGETS	Alignment of owned buildings reduction targets	15%	1,0%
1.2		Alignment of new buildings delivered (use phase) reduction targets		5,0%
1.3		Alignment of renovated buildings (use phase) reduction targets		3,0%
1.4		Alignment of new buildings (materials) reduction targets		3,0%
1.5		Time horizon of targets		2,0%
1.6		Historic target ambition and company performance		1,0%
3.1	INTANGIBLE INVESTMENT	R&D in Climate Change Mitigation Technologies	10%	10%
4.1	SOLD PRODUCT PERFORMANCE	Alignment of carbon performance trend for new buildings (use phase)	30%	10,0%
4.2		Low carbon buildings share		8,0%
4.3		Renovated buildings subject to thermal renovation share		6,0%
4.4		Emissions lock-in		6,0%
5.1	MANAGEMENT	Oversight of climate change issues	10%	3,0%
5.2		Climate change oversight capability		3,0%
5.3		Low carbon transition plan		2,0%
5.4		Climate change management incentives		1,0%
5.5		Climate change scenario testing		1,0%
6.1	SUPPLIER ENGAGEMENT	Strategy to influence suppliers to reduce their GHG emissions	10%	5,0%
6.2		Activities to influence suppliers to reduce their GHG emissions		5,0%
7.1	CLIENTS ENGAGEMENT	Strategy to influence customer behavior to reduce their GHG emissions	10%	5,0%
7.2		Activities to influence consumer behavior to reduce their GHG emissions		5,0%
8.1	POLICY ENGAGEMENT	Company policy on engagement with trade associations	5%	1%
8.2		Trade associations supported do not have climate-negative activities or positions		2%
8.3		Position on significant climate policies		2%
9.1	BUSINESS MODEL	Integration of the low-carbon economy in current and future business model	10%	10%
OVERALL			100%	100%

The quantitatively scored modules (Targets, Intangible investment, Sold product performance) carry 55% of the final weight, and the qualitatively scored modules (Management, Policy engagement, Business model) carry 45%. The indicators within the modules also carry their own weighting.

- **RATIONALE FOR WEIGHTINGS**

The selection of weights for both the modules and the individual indicators was guided by a set of principles (see the ACT framework document for more information). These principles helped define the value of the indicators.

PRINCIPLE	EXPLANATION
Value of information	The value of the information that an indicator gives about a company's outlook for the low-carbon transition is the primary principle for the selection of the weights.
Impact of variation	A high impact of variation in an indicator means that not performing in such an indicator has a large impact on the success of a low-carbon transition, and this makes it more relevant for the assessment.
Future orientation	Indicators that measure the future, or a proxy for the future, are more relevant for the ACT assessment than past & present indicators, which serve only to inform the likelihood and credibility of the transition.
Data quality sensitivity	Indicators that are highly sensitive to expected data quality variations are not recommended for a high weight compared to other indicators, unless there is no other way to measure a particular dimension of the transition.

Targets 15%

The targets module has a relatively large weight of 15%. Most of it is placed on the alignment of reduction targets of new buildings with 8%, compared to 3% for renovated buildings. This dichotomy reflects the revenues breakdown of the building construction company, between renovation and new construction related activities. As for new buildings delivered, an indicator of 5% measures the targets related to the use phase and another one of 3% considers the targets related to materials. This breakdown is similar to the emissions breakdown related to materials and energy use as the result of the life cycle analysis of a new building. 1% scores are attributed to the alignment of reduction targets of company's owned buildings and to the previous achievement indicator, which measures the company's past credentials on target setting and achievement. It is not very important by the principles outlined above, but nonetheless can provide contextual information on the company's experience to meet ambitious targets Finally, the time horizon of targets has a weight of 2%. It is a proxy of how forward-looking the company is, which is very long-term oriented.

Material Investment 0%

This module is not relevant for construction companies since they do not properly hold owned asset base (product lines). The weight of this module is therefore 0%.

Intangible Investment 10%

The R&D in climate change mitigation technologies indicator is focused around the company's intangible investments or financial costs into climate change mitigation technologies. Given the higher amount of environmentally related R&D undertaken by Building Construction companies compared to Real Estate ones, the weight of this indicator and thus the module is heighted to 10% compared to the ACT Real Estate methodology. R&D efforts must be increased in the sector to enable the transition.

Sold product performance 30%

This module carries by far the largest weight out of all the modules. Indeed, it holds most of the information about the company's actions to reduce emissions on its products, i.e. the buildings delivered, where most of the emissions occur. The focus is put on the *alignment of carbon performance trend (past and future) for new buildings* with a weight of 10%. The share of low carbon buildings (weight of 8%) and renovated buildings to thermal renovation (weight of 6%) are also relevant indicators to take into consideration for this module.

Management 10%

Management is a multi-faceted module that makes up 10% of the score, because it incorporates many different smaller indicators that together paint a picture of the company's management and strategic approach to the low-carbon transition. The majority of this weight is placed on the *oversight of climate change issues* and *the climate change oversight capability*, which are weighted 3% each. These two indicators measure the ability of the company to integrate sustainability to its strategy and to embrace the main challenges related to low-carbon transition. Besides, according to the principle of future orientation, the transition plan provides more information on how this company will specifically deal with the transition, and has a weight of 2%.

The other two indicators have a low weight of 1%, as they are contextual indicators whose outcome can strengthen or undermine the company's ability to carry out the transition plan and meet ambitious science-based targets.

Supplier engagement 10%

In order to reduce emissions from the whole lifetime of the buildings, it is imperative that construction companies involve their supply chains. Nonetheless, it is not an indicator that is easy to measure, and relies heavily on data quality to make a proper analysis. Therefore, this indicator has a medium weight of 10%. This indicator focuses on the global strategy and general activities that a construction company has in place with respect to its engagement with suppliers.

Client engagement 10%

The client engagement indicator is focused around the company's efforts to reduce the emissions generated after the buildings have been delivered and to influence customer practices towards low-carbon consumption and circular economy practices. As with the influence on suppliers, it is not an indicator that is easy to measure, and relies heavily on data quality to make a proper analysis. This indicator therefore focuses on the global strategy and general activities that a construction company has in place on their engagement with its customers.

Policy engagement 10%

In line with the rationale for the management indicators of low weight, the policy engagement indicators are also contextual aspects which tell a narrative about the company's stance on climate change and how the company expresses it in their engagement with policy makers and trade associations. The total weight for this module is therefore medium at 5%. The *company policy on engagement with trade associations*, and the *company's position on relevant climate policy* make up the bulk of this, with 2% each. Finally, 1% is allocated to *positions of the company's trade associations that do not have climate-negative activities* as this is a very specific question and concern a minority of companies.

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Business model 10%

The *integration of a low-carbon economy in current and future business model* is a composite indicator that captures many elements and aspects that cannot otherwise be captured in any of the other modules. It includes those aspects that are relevant to the transition but are not directly a part of the primary generation activities. It is future oriented by asking the companies on its narrative on certain future directions that the sector can/has to take to enable the transition.

6.4. DATA REQUEST

Table 6 introduces the list of information which will be requested to companies through a questionnaire, as well as the corresponding indicators.

Number	Data requested to the company	Indicator relevance
A1	Current internal targets set on carbon performance ($kgeCO_2/m2$) for new buildings (in-use, 4 main uses, and materials) and renovated buildings (in-use, 4 main uses)	BC 1.1, BC 1.2, BC 1.3, BC 1.4, BC 1.5
A2	Past internal targets set on carbon performance ($kgeCO_2/m2$)	BC 1.6
A3	Average carbon intensity of company's own building in the past 5 years (use phase)	BC 1.6
A4	R&D detailed expenses	BC 3.1
A5	Environmental policy and details regarding governance	BC 5.1, BC 5.2, BC 5.3
A6	Management incentives	BC 5.4
A7	Breakdown of floor areas per business segment and country for renovated and new buildings	BC 4.1, BC 1.1, BC 1.2, BC 1.3, BC 1.4,
A8	Average carbon intensity of buildings delivered in the past 5 years (use phase and materials)	BC 1.6, BC 4.1
A9	Revenues share of low carbon delivered buildings	BC 4.2
A10	Revenues share of renovated buildings subject to thermal renovation	BC 4.3
A11	Position of the company on significant climate policies (public statements, etc.)	BC 8.2
A12	Company policy on engagement with trade associations	BC 8.1
A13	List of environmental/CSR contract clauses in purchasing & suppliers' selection process	BC 6.1
A14	List of initiatives implemented to influence suppliers to reduce their GHG emissions, green purchase policy or track record, supplier code of conduct	BC 6.2
A15	Client Policy	BC 7.1
A16	List of initiatives implemented to influence client behavior to reduce their GHG emissions	BC 7.2
A17	List and turnover of activities in new businesses (list TBD) related to low carbon buildings	BC 9

7. Rating

The ACT rating shall comprise:

→ A performance score
→ A narrative score
→ A trend score

These pieces of information shall be represented within the ACT rating as follows:

a. **Performance score** as a number from 1 (lowest) to 20 (highest)
b. **Narrative score** as a letter from E (lowest) to A (highest)
c. **Trend score** as either "+" for improving, "-" for worsening, or "=" for stable.

In some situations, trend scoring may reveal itself to be unfeasible depending on data availability. In this case, it should be replaced with a "?".

The highest rating is thus represented as "20A=", the lowest as "1E=" and the midpoint as "10C=".

TABLE 4: LOWEST, HIGHEST AND MIDPOINT FOR EACH ACT SCORE TYPE

LOW SCORES	MID SCORES	HIGH SCORES
1,E,-	10,C,=	20,A,+

See the ACT Framework [1] for general information and methodology on the ACT rating.

7.1. PERFORMANCE SCORING

Performance scoring shall be performed in compliance with the ACT Framework. However, material investment module has a zero weighting since this module is not relevant when it comes to the Construction sector. No other additional sector-specific issue that impact the analysis scoring for the companies of the sector has been identified to date.

7.2. NARRATIVE SCORING

Narrative scoring shall be performed in compliance with the ACT Framework. No other sector-specific issue impacting the narrative scoring for this sector has been identified to date.

7.3. TREND SCORING

Scoring shall be performed in compliance with the ACT Framework.

To apply the trend scoring methodology presented in the ACT Framework, the analyst should identify the trends from the existing data infrastructure based on the data points and/or indicators that can indicate the future direction of change within the company.

The table below includes an overview of which indicators/data points could possibly have valuable information about future directions for the BC sector;

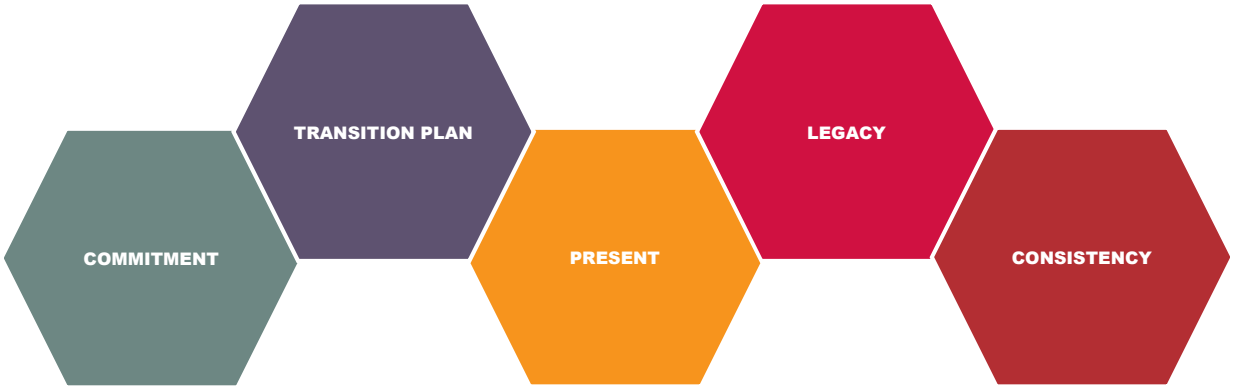
TABLE 5: RELEVANT PERFORMANCE INDICATORS FOR TRENDS IDENTIFICATION FOR THE AU SECTOR

MODULE	INDICATOR
Targets	BC 1.1 Alignment of own buildings reduction targets
	BC 1.2 Alignment of new buildings delivered (use phase) reduction targets
	BC 1.3 Alignment of renovated buildings (use phase) reduction targets
	BC 1.4 Alignment of new buildings (materials) reduction targets
	BC 1.5 Time horizon of targets
Sold product performance	BC 4.1 Alignment of carbon performance trend related to new delivered buildings (use phase)
Management	BC 5.4 Low-carbon transition plan
	BC 5.5 Climate Change Scenario testing

8. Aligned state

The table below presents the response of a low-carbon aligned company of the sector to the 5 questions of ACT:

- → What is the company planning to do? [Commitment]
- → How is the company planning to get there? [Transition Plan]
- → What is the company doing at present? [Present]
- → What has the company done in the recent past? [Legacy]
- → How do all of these plans and actions fit together? [Consistency]



1	2	3	4	5
The company has science-based targets on every dimension of the building: materials, use phase and renovation. These objectives are aligned with a relevant time horizon which reflects the lifetime of a building.	The company discloses a transition plan that details a growing share of low-carbon buildings and operation steps to achieve their objectives.	The company is currently investing in R&D project related to low-carbon technologies and deploying a strategy to increase the sales of low-carbon buildings' research.	A trend is evident of lowering emissions intensity of delivered buildings and developing renovation projects. The company achieved this decrease through deliberate operational decisions.	The company's targets, transition plan, present action and past legacy show a consistent willingness to achieve the goals of low-carbon transition. The company publicly supports more stringent standards and emissions disclosure improvement.

FIGURE 1: ALIGNED STATE FOR COMPANIES IN THE BUILDING SECTOR

9. Sources

[1] Roadmap for transition towards low-GHG and resilient buildings, GABC, 2016.

[2] Transition to Sustainable Buildings, IEA, 2013.

[3] “Sectoral Decarbonization Approach (SDA): A method for setting corporate emission reduction targets in line with climate science,” Science Based Targets Initiative, 2015.

[4] Capitalisation des résultats de l’expérimentation HQE Performance, rapport final. CSTB, 2013.

[5] Life-cycle energy of residential buildings in China, Chang Y., Ries R.J., Wang Y., 2013.

[6] A common EU framework of core sustainability indicators for office and residential buildings, European Commission, 2017. (known as “LEVEL(s)”)

[7] UNEP, “Emissions Gap Report,” 2015

[8] OECD, “Environmental Mitigation Technologies Search Strategy, Modules 4 and 5.” Mar-2015.

[9] OECD, “Environmental Mitigation Technologies Search Strategy.” Mar-2015.

[10] Energy Technology Perspective, IEA, 2017.

[11] BIS, “Estimating the amount of CO2 emissions that the construction industry can influence”. 2010.

[12] French Ministries of Ecological Transition and of territorial cohesion, E+C- methodology, experiment, label and observatory. http://www.batiment-energiecarbone.fr/

[13] GABC (Global Alliance for Buildings and Construction) 2018 global status report

10. Glossary

2 DEGREES (2°C)	A political agreement was reached at COP21 on limiting global warming to 2°C above the pre-industrial level (COP21: Why 2°C?). A 2°C scenario (or 2°C pathway) is a scenario (or pathway) compatible with limiting global warming to 2°C above the pre-industrial level.
ACT	The Assessing low-Carbon Transition (ACT) initiative was jointly developed by ADEME and CDP. ACT assesses how ready an organization is to transition to a low-carbon world using a future-oriented, sector-specific methodology (ACT website).
ACTION GAP	In relation to emissions performance and reduction, the action gap is the difference between what a given company has done in the past plus what it is doing now, and what has to be done. For example, companies with large action gaps have done relatively little in the past, and their current actions point to continuation of past practices.
ACTIVITY DATA	Activity data are defined as data on the magnitude of human activity resulting in emissions or removals taking place during a given period of time (UNFCCC definitions).
ADEME	Agence de l'Environnement et de la Maîtrise de l'Energie; The French Environment and Energy Management Agency (ADEME webpage).
ADVANCED VEHICLE	Advanced vehicles include: ♦ Plug-in hybrid vehicles (PHEV) ♦ Battery electric vehicles (BEV) ♦ Fuel cell electric vehicles (FCEV) ♦ Conventional hybrids ♦ Other high-efficiency ICE vehicles Conventional hybrids and other high-efficiency ICE vehicles are advanced vehicles but they are not low-carbon vehicles.
ALIGNMENT	The ACT project seeks to gather information that will be consolidated into a rating that is intended to provide a general metric of the 2-degree alignment of a given company. The wider goal is to provide companies specific feedback on their general alignment with 2-degrees in the short and long term.
ANALYST	Person in charge of the ACT assessment.

ASSESS	Under the ACT project, to evaluate and determine the low-carbon alignment of a given company. The ACT assessment and rating will be based on consideration of a range of indicators. Indicators may be reported directly from companies. Indicators may also be calculated, modelled or otherwise derived from different data sources supplied by the company. The ACT project will measure 3 gaps (Commitment, Horizon and Action gaps – defined in this glossary) in the GHG emissions performance of companies. This model closely follows the assessment framework presented above. It starts with the future, with the goals companies want to achieve, followed by their plans, current actions and past actions.
ASSET	An item of property owned by a company, regarded as having value and available to meet debts, commitments, or legacies. Tangible assets include 1) fixed assets, such as machinery and buildings, and 2) current assets, such as inventory. Intangible assets are nonphysical such as patents, trademarks, copyrights, goodwill and brand value.
AU	Abbreviation of the 'Automotive' sector
BARRIER	A circumstance or obstacle preventing progress (e.g. lacking information on supplier emissions and hotspots can be a barrier to companies managing and reducing their upstream Scope 3 emissions).
BASE YEAR	According to the GHG Protocol and ISO14064-1, a base year is "a historic datum (a specific year or an average over multiple years) against which a company's emissions are tracked over time". Setting a base year is an essential GHG accounting step that a company must take to be able to observe trends in its emissions information (GHG Protocol Corporate Standard).
BC	Abbreviation of the 'Building Construction' sector
BENCHMARK	A standard, pathway or point of reference against which things may be compared. In the case of pathways for sector methodologies, a sector benchmark is a low-carbon pathway for the sector average value of the emissions intensity indicator(s) driving the sector performance. A company's benchmark is a pathway for the company value of the same indicator(s) that starts at the company performance for the reporting year and converges towards the sector benchmark in 2050, based on a principle of convergence or contraction of emissions intensity.
BOARD	Also the "Board of Directors" or "Executive Board"; the group of persons appointed with joint responsibility for directing and overseeing the affairs of a company.
BUSINESS-AS-USUAL	No proactive action taken for change. In the context of the ACT methodology, the business-as-usual pathway is constant from the initial year onwards. In general,

	the initial year – which is the first year of the pathway/series – is the reporting year (targets indicators) or the reporting year minus 5 years (performance indicators).
BUSINESS MODEL	A plan for the successful operation of a business, identifying sources of revenue, the intended customer base, products, and details of financing. Under ACT, evidence of the business model shall be taken from a range of specific financial metrics relevant to the sector and a conclusion made on its alignment with low-carbon transition and consistency with the other performance indicators reported.
CAPACITY (POWER)	In relation to power generation, nameplate capacity is the power output number, usually expressed in megawatts (MW), and registered with authorities for classifying the power output of a power station.
CAPITAL EXPENDITURE	Money spent by a business or organization on acquiring or maintaining fixed assets, such as land, buildings, and equipment.
CARBON CAPTURE AND STORAGE (CCS)	The process of trapping carbon dioxide produced by burning fossil fuels or other chemical or biological process and storing it in such a way that it is unable to affect the atmosphere.
CDP	Formerly the "Carbon Disclosure Project", CDP is an international, not-for-profit organization providing the only global system for companies and cities to measure, disclose, manage and share vital environmental information. CDP works with market forces, including 827 institutional investors with assets of over US$100 trillion, to motivate companies to disclose their impacts on the environment and natural resources and take action to reduce them. More than 5,500 companies worldwide disclosed environmental information through CDP in 2015. CDP now holds the largest collection globally of primary climate change, water and forest risk commodities information and puts these insights at the heart of strategic business, investment and policy decisions (CDP website).
CLIMATE CHANGE	A change in climate, attributed directly or indirectly to human activity, that alters the composition of the global atmosphere and that is, in addition to natural climate variability, observed over comparable time periods (UNFCCC).
COMPANY	A commercial business.
COMPANY PATHWAY	A company's past emissions intensity performance pathway up until the present.
COMPANY TARGET PATHWAY	The emissions intensity performance pathway that the company has committed to follow from the initial year on until a future year, for which it has set a performance target.

COMMITMENT GAP	In relation to emissions performance, the difference between what a company needs to do and what it says it will do.
CONFIDENTIAL INFORMATION	Any non-public information pertaining to a company's business.
CONSERVATIVENESS	A principle of the ACT project; whenever the use of assumptions is required, the assumption shall err on the side of achieving 2-degrees maximum.
CONSISTENCY	A principle of the ACT project; whenever time series data is used, it should be comparable over time. In addition to internal consistency of the indicators reported by the company, data reported against indicators shall be consistent with other information about the company and its business model and strategy found elsewhere. The analyst shall consider specific, pre-determined pairs of data points and check that these give a consistent measure of performance when measured together.
COP21	The 2015 United Nations Climate Change Conference, held in Paris, France from 30 November to 12 December 2015 (COP21 webpage).
CONVENTIONAL (TECHNOLOGY)	In relation to automobiles and emissions, conventional internal combustion engines (ICE) are those that generate motive power by burning fossil fuels, as opposed to advanced (low-carbon) vehicle engines such as battery electric vehicles or hydrogen fuel cells.
DATA	Facts and statistics collected together for reference and analysis (e.g. the data points requested from companies for assessment under the ACT project indicators).
DECARBONIZATION	A complete or near-complete reduction of greenhouse gas emissions over time (e.g. decarbonization in the electric utilities sector by an increased share of low-carbon power generation sources, as well as emissions mitigating technologies like Carbon Capture and Storage (CCS)).
DECARBONIZATION PATHWAY	Benchmark pathway (See 'Benchmark')
EMISSIONS	The GHG Protocol defines direct GHG emissions as emissions from sources that are owned or controlled by the reporting entity, and indirect GHG emissions as emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity (GHG Protocol).
ENERGY	Power derived from the utilization of physical or chemical resources, especially to provide light and heat or to work machines.

EU	Abbreviation of the 'Electric Utilities' sector.
FLEET	A group of vehicles (e.g. all the automobiles manufactured by an automotive manufacturing company and currently in use by private individuals).
FOSSIL FUEL	A natural fuel such as coal, oil or gas, formed in the geological past from the remains of living organisms.
FUTURE	A period of time following the current moment; time regarded as still to come.
POWER GENERATION	The process of generating electric power from other sources of primary energy.
PRIMARY ENERGY	Primary energy is an energy form found in nature that has not been subjected to any conversion or transformation process. It is energy contained in raw fuels, and other forms of energy received as input to a system. Primary energy can be non-renewable or renewable.
GREENHOUSE GAS (GHG)	Greenhouse gas (e.g. carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and three groups of fluorinated gases (sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs)) which are the major anthropogenic GHGs and are regulated under the Kyoto Protocol. Nitrogen trifluoride (NF_3) is now considered a potent contributor to climate change and is therefore mandated to be included in national inventories under the United Nations Framework Convention on Climate Change (UNFCCC).
GUIDANCE	Documentation defining standards or expectations that are part of a rule or requirement (e.g. CDP reporting guidance for companies).
HORIZON GAP	In relation to emissions performance, the difference between the average lifetime of a company's production assets (particularly carbon intensive) and the time-horizon of its commitments. Companies with large asset-lives and small time horizons do not look far enough into the future to properly consider a transition plan.
INCENTIVE	A thing, for example money, that motivates or encourages someone to do something (e.g. a monetary incentive for company board members to set emissions reduction targets).
INDICATOR	An indicator is a quantitative or qualitative piece of information that, in the context of the ACT project, can provide insight on a company's current and future ability to reduce its carbon intensity. In the ACT project, 3 fundamental types of indicators can be considered: ♦ Key performance indicators (KPIs); ♦ Key narrative indicators (KNIs); and

	♦ Key asset indicators (KAIs).
INTENSITY (EMISSIONS)	The average emissions rate of a given pollutant from a given source relative to the intensity of a specific activity; for example grams of carbon dioxide released per MWh of energy produced by a power plant.
INTERVENTION	Methods available to companies to influence and manage emissions in their value chain, both upstream and downstream, which are out of their direct control (e.g. a retail company may use consumer education as an intervention to influence consumer product choices in a way that reduces emissions from the use of sold products).
LIFETIME	The duration of a thing's existence or usefulness (e.g. a physical asset such as a power plant).
LONG-TERM	Occurring over or relating to a long period of time; under ACT this is taken to mean until the year 2050. The ACT project seeks to enable the evaluation of the long-term performance of a given company while simultaneously providing insights into short- and medium-term outcomes in alignment with the long-term.
LOW-CARBON SCENARIO (OR PATHWAY)	A low-carbon scenario (or pathway) is a 2°C scenario, a well-below 2°C scenario or a scenario with higher decarbonization ambition.
LOW-CARBON TRANSITION	The low-carbon transition is the transition of the economy according to a low-carbon scenario.
LOW-CARBON SOLUTION	A low-carbon solution (e.g. energy, technology, process, product, service, etc.) is a solution whose development will contribute to the low-carbon transition.
LOW-CARBON VEHICLE	Vehicles described as low-carbon (LCV) are defined as vehicles that have a drivetrain that have the potential to operate on non-fossil energy sources for at least > 50% of their common use phase. This includes: ♦ Plug-in hybrid vehicles (PHEV) ♦ Battery electric vehicles (BEV) ♦ Fuel cell electric vehicles (FCEV) Conventional hybrids are excluded from the definition of low-carbon vehicles. Because conventional hybrids do not eschew fossil fuels (aside from the minor addition of biofuels into the fuel mix), they are not qualified for the definition of an LCV.
MANUFACTURE	Making objects on a large scale using machinery.

MATURITY MATRIX	A maturity matrix is essentially a “checklist”, the purpose of which is to evaluate how well advanced a particular process, program or technology is according to specific definitions.
MATURITY PROGRESSION	An analysis tool used in the ACT project that allows both the maturity and development over time to be considered with regards to how effective or advanced a particular intervention is.
MITIGATION (EMISSIONS)	The action of reducing the severity of something (e.g. climate change mitigation through absolute GHG emissions reductions)
MODEL	A program designed to simulate what might or what did happen in a situation (e.g. climate models are systems of differential equations based on the basic laws of physics, fluid motion, and chemistry that are applied through a 3-dimensional grid simulation of the planet Earth).
PATHWAY (EMISSIONS)	A way of achieving a specified result; a course of action (e.g. an emissions reduction pathway).
PERFORMANCE	Measurement of outcomes and results.
PLAN	A detailed proposal for doing or achieving something.
POINT	A mark or unit of scoring awarded for success or performance.
POWER	Energy that is produced by mechanical, electrical, or other means and used to operate a device (e.g. electrical energy supplied to an area, building, etc.).
PROGRESS RATIO	An indicator of target progress, calculated by normalizing the target time percentage completeness by the target emissions or renewable energy percentage completeness.
RT	Abbreviation of the ‘Retail’ sector
RELEVANT / RELEVANCE	In relation to information, the most relevant information (core business and stakeholders) to assess low-carbon transition.
RENEWABLE ENERGY	Energy from a source that is not depleted when used, such as wind or solar power.
REPORTING YEAR	Year under consideration.

RESEARCH AND DEVELOPMENT (R&D)	A general term for activities in connection with innovation; in industry; for example, this could be considered work directed towards the innovation, introduction, and improvement of products and processes.
SCIENCE-BASED TARGET	To meet the challenges that climate change presents, the world's leading climate scientists and governments agree that it is essential to limit the increase in the global average temperature at below 2°C. Companies making this commitment will be working toward this goal by agreeing to set an emissions reduction target that is aligned with climate science and meets the requirements of the Science-Based Targets Initiative.
SCENARIO	The Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) presents the results of an extensive climate modelling effort to make predictions of changes in the global climate based on a range of development/emissions scenarios. Regulation on climate change-related issues may present opportunities for your organization if it is better suited than its competitors to meet those regulations, or more able to help others to do so. Possible scenarios would include a company whose products already meet anticipated standards designed to curb emissions, those whose products will enable its customers to meet mandatory requirements or those companies that provide services assisting others in meeting regulatory requirements.
SCENARIO ANALYSIS	A process of analysing possible future events by considering alternative possible outcomes.
SECTORAL DECARBONIZATION APPROACH (SDA)	To help businesses set targets compatible with 2-degree climate change scenarios, the Sectoral Decarbonization Approach (SDA) was developed. The SDA takes a sector-level approach and employs scientific insight to determine the least-cost pathways of mitigation, and converges all companies in a sector towards a shared emissions target in 2050.
SHORT-TERM	Occurring in or relating to a relatively short period of time in the future.
STRESS TEST	A test designed to assess how well a system functions when subjected to greater than normal amounts of stress or pressure (e.g. a financial stress test to see if an oil & gas company can withstand a low oil price).
SCOPE 1 EMISSIONS	All direct GHG emissions (GHG Protocol Corporate Standard).
SCOPE 2 EMISSIONS	Indirect GHG emissions from consumption of purchased electricity, heat or steam (GHG Protocol Corporate Standard).
SCOPE 3 EMISSIONS	Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled

	by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, etc. (GHG Protocol Corporate Standard).
SECTOR	A classification of companies with similar business activities, e.g. automotive manufacturers, power producers, retailers, etc.
STRATEGY	A plan of action designed to achieve a long-term or overall aim. In business, this is the means by which a company sets out to achieve its desired objectives; long-term business planning.
SUPPLIER	A person or entity that is the source for goods or services (e.g. a company that provides engine components to an automotive manufacturing company).
TANK-TO-WHEEL EMISSIONS (TTW)	Tank-to-wheel emissions refer to the emissions occurring during the combustion of fuel by vehicles.
TARGET	A quantifiable goal (e.g. to reduce GHG emissions). ♦ The following are examples of absolute targets: → metric tonnes CO2e or % reduction from base year → metric tonnes CO2e or % reduction in product use phase relative to base year → metric tonnes CO2e or % reduction in supply chain relative to base year ♦ The following are examples of intensity targets: → metric tonnes CO2e or % reduction per passenger. Kilometre (also per km; per nautical mile) relative to base year → metric tonnes CO2e or % reduction per square foot relative to base → metric tonnes CO2e or % reduction per MWh
TRADE ASSOCIATION	Trade associations (sometimes also referred to as industry associations) are an association of people or companies in a particular business or trade, organized to promote their common interests. Their relevance in this context is that they present an "industry voice" to governments to influence their policy development. The majority of organizations are members of multiple trade associations, many of which take a position on climate change and actively engage with policymakers on the development of policy and legislation on behalf of their members. It is acknowledged that in many cases companies are passive members of trade associations and therefore do not actively take part in their work on climate change (CDP climate change guidance).
TRANSPORT	To take or carry (people or goods) from one place to another by means of a vehicle, aircraft, or ship.

TREND	A general direction in which something (e.g. GHG emissions) is developing or changing.
TECHNOLOGY	The application of scientific knowledge for practical purposes, especially in industry (e.g. low-carbon power generation technologies such as wind and solar power, in the electric power generation sector).
TRANSITION	The process or a period of changing from one state or condition to another (e.g. from an economic system and society largely dependent on fossil fuel-based energy, to one that depends only on low-carbon energy).
VERIFIABLE / VERIFIABILITY	To prove the truth of, as by evidence or testimony; confirm; substantiate. Under the ACT project, the data required for the assessment shall be verified or verifiable.
WEIGHTING	The allowance or adjustment made in order to take account of special circumstances or compensate for a distorting factor.
WELL-TO-TANK EMISSIONS (WTT)	Well-to-Tank emissions are based on attributional life-cycle analysis studies of fossil-derived fuels (e.g. gasoline, diesel, compressed and liquefied natural gas), biofuels and electricity (based on time- and scenario-specific estimated average grid carbon intensity). Energy use and emissions resulting from pipeline transport are accounted for under “Energy industry own use” in the IEA modelling.
WELL-TO-WHEEL EMISSIONS (WTW)	Tank-to-Wheel (TTW) and Well-to-Tank (WTT) make up WTW emissions.

11. APPENDIX

11.1. DETAILS OF THE DEVELOPMENT OF "IN-USE" BENCHMARKS AND PATHWAYS FOR NEW BUILDINGS (DIRECT AND INDIRECT EMISSIONS)

• SCOPE 1: BUILDING DIRECT EMISSIONS

IEA ETP 2017 (*IEA ETP 2017*, n.d.) gives the buildings direct CO2 emissions by geographical zone in MtCO2 from 2014 up to 2060. The timescale chosen for the ACT methodology was 2014-2050. Only the end-uses corresponding to heating, cooling, domestic hot water and lighting, they correspond to the major part of the energy consumption that can be defined during the design phase by energy performance regulations.

From these values and the geographical building floor area(s)(International Energy Agency, 2013) , with a five-year step, we can calculate the **Scope 1 geographical zone Carbon intensity of the building stock**. The calculation is done using the following formula:

$$\textbf{Zone building stock type pathway (year)} = \frac{\textbf{Direct CO2 emissions (year)}}{\textbf{Zone Surface (year)}} \left(\frac{\textbf{kgCO2eq}}{\textbf{m}^2}\right) \quad 2$$

The **zone Carbon intensity for new buildings** is calculated by applying an Energy intensity ratio.

To calculate the Zone new buildings type pathway, the zone building stock type pathway is multiplied by a ratio between the EI (energy intensity) of new buildings type and the stock EI (energy intensity). The stock energy intensity is calculated from IEA ETP 2017 (*IEA ETP 2017*, n.d.), by considering heating, cooling, domestic hot water and lightning end-uses. Ventilation end-use is not considered because it is merged with other appliances in IEA data. Energy Intensity is used to allocate GHG emissions intensity per country and building types and that it is a proxy with associated limitations. The following formula used.

$$\textbf{Zone new building type pathway (year)} = \textbf{Zone building stock type pathway (year)} * \textbf{Ratio EI zone new building type vs EI zone stock building type(year)} \quad 3$$

With,

$$\textbf{Ratio EI zone new building type vs EI zone stock building type (year)} = \frac{\textbf{EI zone new buildings type(year)}}{\textbf{EI zone building stock type(year)}} \quad 4$$

Values for $EI\ for\ new\ buildings$ are calculated considering current new building standards and increase of the energy efficiency of 20% every 10 years. For Europe countries the data from current new building standards come from (*ZEBRA2020 - DataTool*, n.d.). The value for the zone Europe new building standards EI, is calculated as a weighted sum of Europe countries.

The new building standards values are defined in primary energy. To convert to these values into final energy, we consider a Primary Energy Factor (PEF) for electricity equal to 2.5 (Average European reference value of the electricity PEF, 2.50, is given in the (*Directive 2006/32/EC*, 2006)) for each country (all other Fuels (Gaz, oil…) are considered to have a PEF equal to 1). The PEF is then multiplied by the country building stock electricity share, to convert the new building standards primary energy to final energy.

$EI\ zone\ building\ stock\ type$ is calculated using values from (*IEA ETP 2017*, n.d.) and *(Transition to sustainable buildings, IEA, 2013*).

$$\textbf{EI zone building stock (year)} = \frac{\textbf{Zone building type Energy consumption (4 major end-uses) (year)}}{\textbf{Zone building type total floor area (year)}} \quad 5$$

The country carbon intensity for new buildings:

$$Country \text{ new } building\ typology\ pathway\ (year) = Zone\ building\ stock\ type\ pathway\ (year) * Ratio\ EI \text{ country new building typology } vs\ EI \text{ zone new building } stock\ type\ (year) \quad (6)$$

With,

$$\textbf{Ratio EI country new building typology vs EI zone new building stock type (year)} = \frac{\textbf{EI Country new buildings typology}}{\textbf{EI zone building stock type(year)}} \quad 7$$

For $EI\ Country\ new\ buildings\ typology$ values come from countries building codes (*ZEBRA2020 - DataTool*, n.d.). The conversion of these values to final energy is made using the same methodology as for the **zone Carbon intensity for new buildings.**

• SCOPE 2: BUILDING INDIRECT EMISSIONS DUE TO ELECTRICITY CONSUMPTION

The calculation of the Scope 2 emissions only concerns the electricity consumption. As electricity is the main source of indirect emissions in most countries, commercial heat is not considered. The data from building type electric consumption by geographical zone can be retrieved in the IEA ETP 2017 data.

The **Zone building type electricity carbon intensity** is calculated as follows:

$$\textbf{Zone building type electricity carbon intensity (year)} = \frac{\textbf{Zone building type electric consumption (year) x Zone Electricity mix emissions (year)}}{\textbf{Zone Building type surface (year)}} \textbf{(KGCO2/M²)} \quad 8$$

With,

$Zone\ building\ type\ electric\ consumption\ (year)$: Electric consumption is calculated from the total electric consumption of the zone building type minus the energy used for cooking and other appliances and miscellaneous. The percentage of electricity used for each end-use is provided by (*EU building database*, 2018 and *IEA ETP 2017*, n.d.).

$Zone\ Electricity\ mix\ emissions\ (year)$: data gathered from IEA ETP 2017 data.

Country building typology electricity carbon intensity

The calculation at country level are made using the following formula:

$$\textbf{Country building typology electricity carbon intensity (year)} = \frac{\textbf{Zone building type electric consumption (year)}}{\textbf{Zone Building type surface (year)}} \textbf{x}$$

$$\textbf{Ratio EI country new building typology vs EI zone new building stock type (year) x}$$

$$\textbf{country Electricity mix emissions (year)} \quad 9$$

Country electric mix emissions (year):

The electric country mix emissions pathway is calculated by applying the same ratio of electricity decarbonization to the country current emissions, as in its geographical zone (data from IEA ETP 2017).

Country current emissions (Only Europe countries available) come from the scientific paper (Moro and Lonza, 2018). The data in this article is given in kgCO2/kWh_electricity.

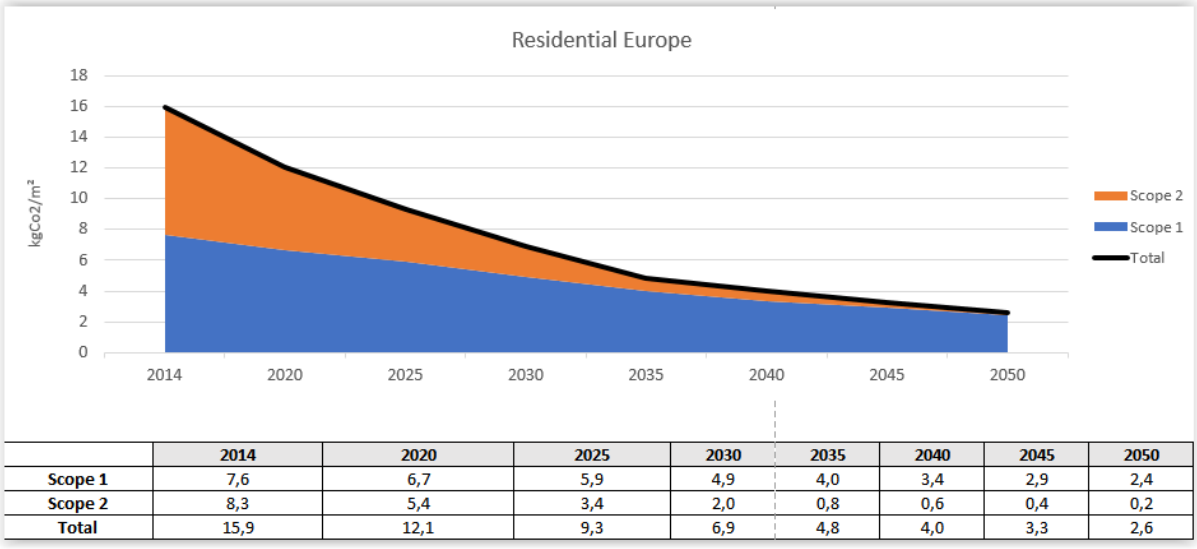
The final carbon pathway for construction In-Use is calculated by doing the sum of scope 1 and 2.

11.2. EXAMPLE OF "IN-USE" PATHWAYS FOR NEW BUILDINGS

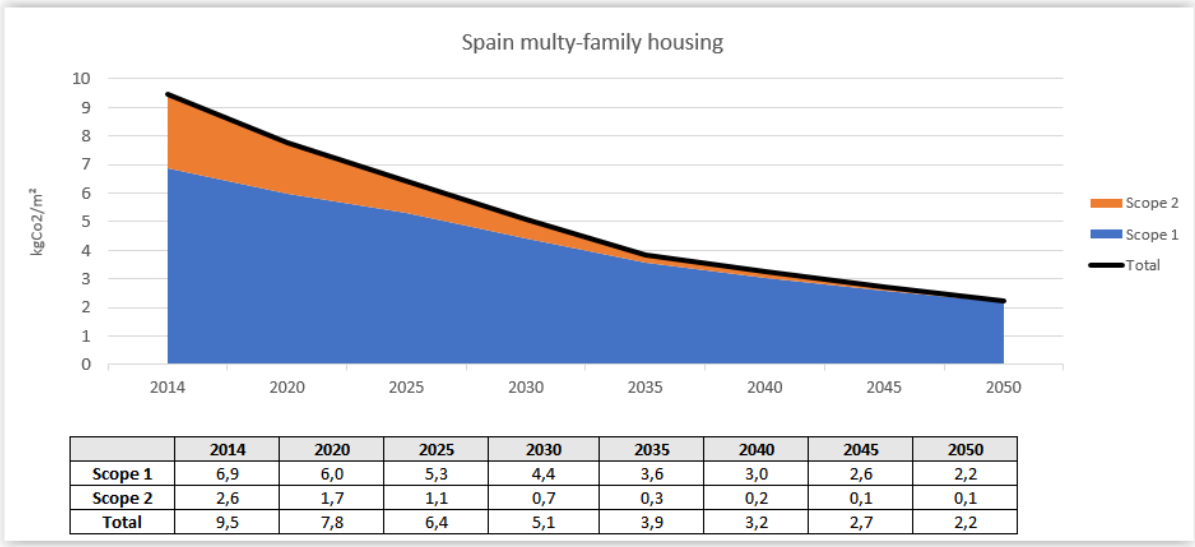
Context:

BUILDING TYPE	TYPOLOGY	GEOGRAPHICAL ZONE	COUNTRY
Residential	Multi-family housing	Europe	Spain

Pathways:



	2014	2020	2025	2030	2035	2040	2045	2050
Scope 1	7,6	6,7	5,9	4,9	4,0	3,4	2,9	2,4
Scope 2	8,3	5,4	3,4	2,0	0,8	0,6	0,4	0,2
Total	15,9	12,1	9,3	6,9	4,8	4,0	3,3	2,6



	2014	2020	2025	2030	2035	2040	2045	2050
Scope 1	6,9	6,0	5,3	4,4	3,6	3,0	2,6	2,2
Scope 2	2,6	1,7	1,1	0,7	0,3	0,2	0,1	0,1
Total	9,5	7,8	6,4	5,1	3,9	3,2	2,7	2,2

11.3. DETAILS OF THE DEVELOPMENT OF "MATERIALS" BENCHMARKS AND PATHWAYS (APPROACH # 2)

The first benchmark point (or pivotal point) is adapted considering country or zone electric mix emissions and the country or zone country Carbon intensity.

$$Benchmark\ point\ Zone\ per\ building\ typology = \left(0.25 * \frac{2}{3} * \frac{Electric\ mix\ Zone}{Electric\ mix\ France} + 0.25 * \frac{1}{3} * \frac{Electric\ mix\ Zone}{Electric\ mix\ Europe} + 0.75 * \frac{Carbon_{intesity_{Zone}}}{Carbon_{intesity_{Europe}}}\right) * Pivot_zone_value\ building - typology$$

$$Benchmark\ point\ Country\ per\ building\ typology = \left(0.25 * \frac{2}{3} * \frac{Electric\ mix\ Country}{Electric\ mix\ France} + 0.25 * \frac{1}{3} * \frac{Electric\ mix\ Zone}{Electric\ mix\ Europe} + 0.75 * \frac{Carbon_{intesity_{Zone}}}{Carbon_{intesity_{Europe}}}\right) * Pivot_{zone}_value\ building - typology$$

**For country level calculations, the Zone values are provided from the zone where the country is located*

With :

$Pivot_zone_value\ building - typology$ – French actual material emissions considering the building typology of the zone or country. This pivot value is calculated using the zone structure in the French scenario. The market share of different types of building structures, is given in GABC 2018 Global Status Report,

Carbon intensity zone - data gathered from IEA industry (kgCO2/kWh)

$Electric\ mix\ Country$: data from IEA ETP 2017 (*IEA ETP 2017*, n.d.)

$Electric\ mix\ Zone$: data from (Moro and Lonza, 2018)

The calculations assume that 25% emissions of the benchmark point come from electricity production. From these 25%, it is considered that 2/3 of Electricity used in the materials come from the country and 1/3 from the zone where the country is located. The 75% of the materials carbon is related to the carbon intensity of the zone.

This value is then extrapolated for each country/zone from 2014 to 2050, by considering the IEA industry carbon intensity 2DS pathway in OCDE and non-OCDE countries (depending on the zone or country being studied).

Example: calculation workflow for materials CO2 benchmark for new Offices in Austria in 2018

The starting value is 1083 Kg CO2/m2 over 50 years, corresponding to materials CO2 benchmark for French new offices in 2018 (from statistical analysis of E+C- observatory).

Considering:

- CO2 content of electricity mix in France = 0,105 kg CO2/kWh
- CO2 content of electricity mix in Austria = 0,334 kg CO2/kWh

The CO2 intensity for Austria = 1083 * [(1 – ¼ * 2/3) + (¼ * 2/3 * 0,334/0,105)]

= 1477 Kg CO2/m2 over 50 years