

SBT4buildings

A framework for carbon emissions management along the building and construction value chain

Discussion paper for companies who want to set science-based targets for their own operations while supporting the reduction of full life-cycle carbon emissions of buildings

December 2018



World Business Council for Sustainable Development



WBCSD is a global, CEO-led organization of 200 forward thinking businesses working together to accelerate the transition to a sustainable world.

Our mission is to accelerate the transition to a sustainable world by making more sustainable business more successful.

Our vision is to create a world where more than nine billion people are all living well and within the boundaries of our planet, by 2050.



GLOBAL

Our 200 members span across the globe and all economic sectors.

We have 60+ Global Network partners who engage with sustainable business at a national level.



UNIQUE BUSINESS PLATFORM

Our members enjoy access to a diverse business community across sectors and a safe space to exchange ideas, know-how and information with peers. Together, we develop business solutions to global challenges that no single company can tackle alone.



CEO-LED

WBCSD is oriented towards collective action and led by our member company CEOs.



MARKET-DRIVEN

We consider sustainable development as a strategic business opportunity. We strive to make more member companies more competitive.

SBT4buildings: project overview

Project objective

The SBT4buildings project provides **solutions** for companies of the building and construction who want to:

- **set** carbon reduction targets
- in line with their **own** ambitions and Science-based Targets initiative (SBTi) requirements,
- working to decarbonize the entire **value chain**.

2019 Objective

Develop a guidance based on a common language and framework for the companies in the sector to align their SBTs along the full value chain.



SBT4buildings: **scoping paper**

Project objective: leverage science-based target setting to reduce full life-cycle carbon emissions in buildings to support the decarbonization of the sector

Scoping paper lead questions

Better understanding of the context, challenges and opportunities for the value chain thanks to SBT.



A) Value chain

Understand carbon flow, role and responsibilities across the value chain



B) Common language

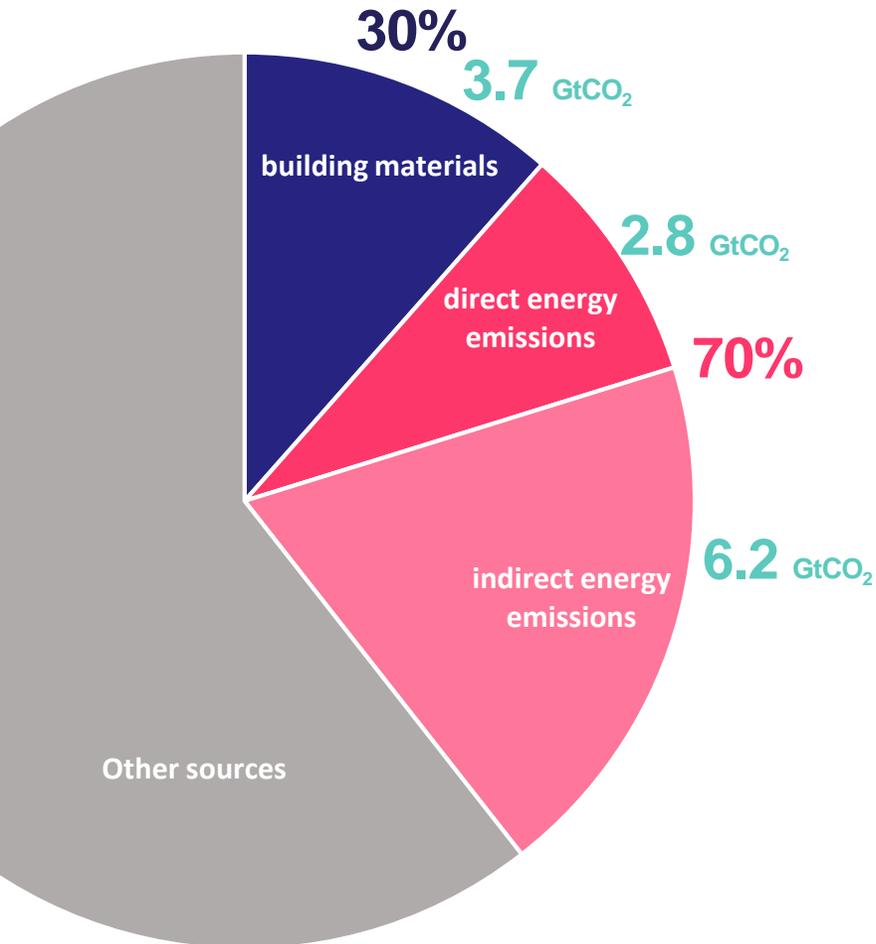
Identify a metric and a common language that can link the whole value chain



C) SBT initiative

Understand SBT challenges and maximize opportunities

Context: the building and construction sector



The building sector represents approx **40% global GHG emissions = 13 GtCO₂**

1/2 of global energy related GHG emissions



Every 5 days
a surface of the size of Paris is built

GlobalABC

-30%
By 2030

-80%
By 2050

WorldGBC
Net 0
in operations
By 2050



Source: Global Status Report 2018, Global Alliance for Building and Construction

Context: Science-based Targets

What are Science-based targets

Science-based targets (SBT) specify how much and how quickly a company needs to reduce its greenhouse gas emissions, in line with the Paris Agreement goals to limit global warming to well below 2°C.

SBT vs NDC

Setting science-based targets (SBT) is for the private sector what Nationally Determined Contributions (NDCs) are for countries

- Public Sector → NDC
- Private Sector → SBT

SBT is the private sector's answer to decarbonization.

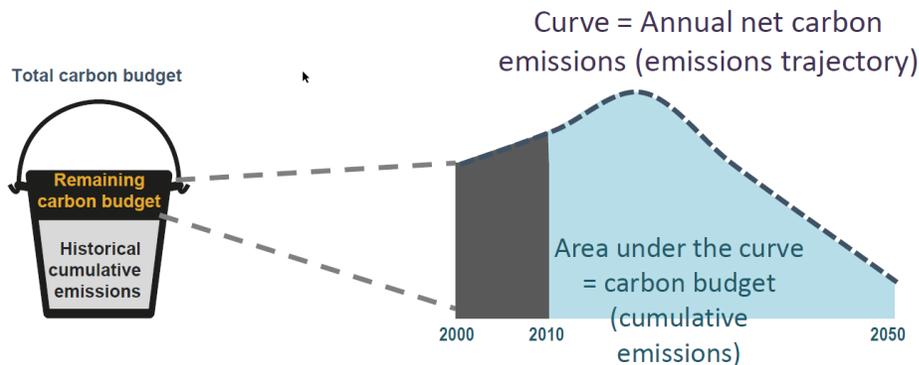


Context: carbon budget

Carbon budget

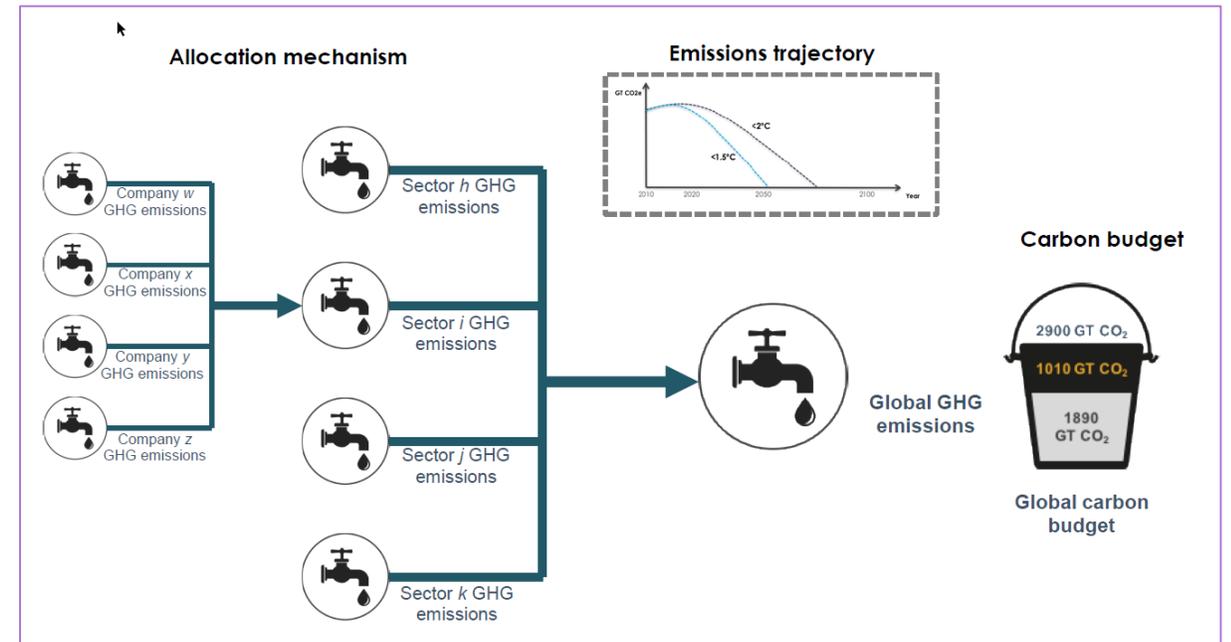
Science-based targets are founded on the carbon budget principle.

The carbon budget is based on the cumulative available budget that we could still emit in order to stay below the desired temperature increase.



Allocation for SBT

The most common budget refers to the available 1000 Gt CO₂ emission which could still be emitted to remain below 2 degrees.



SBT4buildings: SBT for the building sector



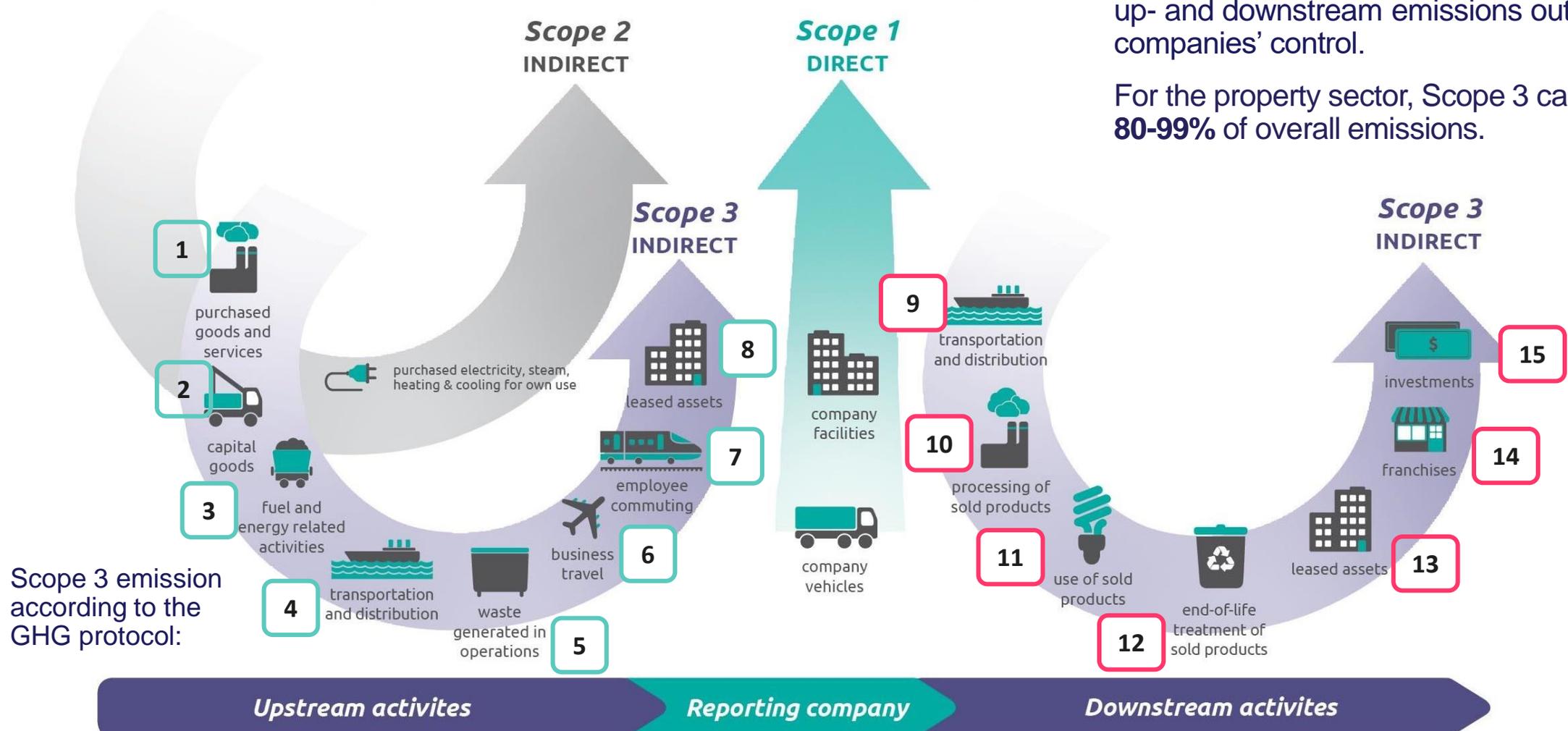
The **SBT** focus on companies efforts to make their fair share of emissions reduction to meet the expected decarbonization (bottom-up approach).

The **SBT4buildings** project aims at ensuring we keep a view to the overall decarbonization of the system and how the most desired combination of measures (top-down approach) helps to achieve this objective.

Scope 3: for the property sector

Scope 3 emission according to the GHG protocol: up- and downstream emissions outside the direct companies' control.

For the property sector, Scope 3 can represent 80-99% of overall emissions.



Scope 3 emission according to the GHG protocol:

Scope 3: example of a challenge

The double glazing example

To better insulate buildings and lower the energy consumption of buildings, windows need to be better performing.

To do this, they need to either have double or triple glazing or other innovative measures which generally are more carbon intense.

This negatively impact the carbon emissions of a glass manufacturing company.



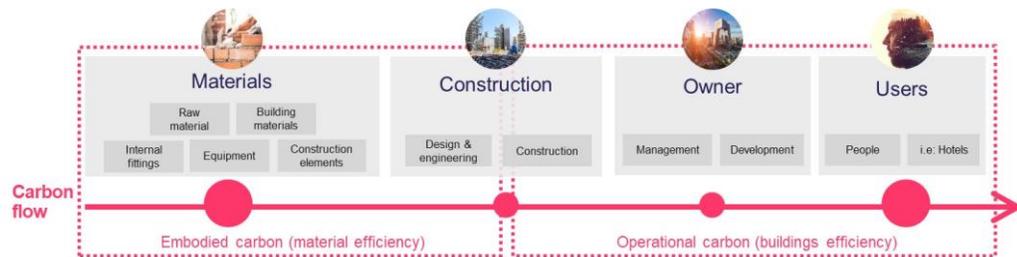
A) Value chain: “action” and “influence”

Explanatory slide, illustration in the next slide.

Buildings and construction is a very diverse and fragmented value chain. In order to list the stakeholders, we have considered presenting two interlinked value chains, the “action” and the “influence” value chain:

“Action” value chain

The “**action**” value chain is represented by actors (purple) directly responsible for the carbon emissions. Emissions (pink bubbles) are generally concentrated in the manufacturing of the building elements (embodied carbon, left box) and in the operation of buildings (operational carbon, right box) due to occupants direct (fossil fuel burning) or indirect (electricity consumption) emissions.



“Influence” value chain

The “**influence**” value chain (turquoise) includes actors having the power to influence decisions. This per se would not have direct emissions related to the value chain but play a major role in steering decision on how buildings are built.

In this representation the influencing flow goes in the opposite direction as the carbon emissions flow. We can also see how “external” actors play a crucial role in influencing the way buildings are constructed.



A) Value chain: “action” and “influence”

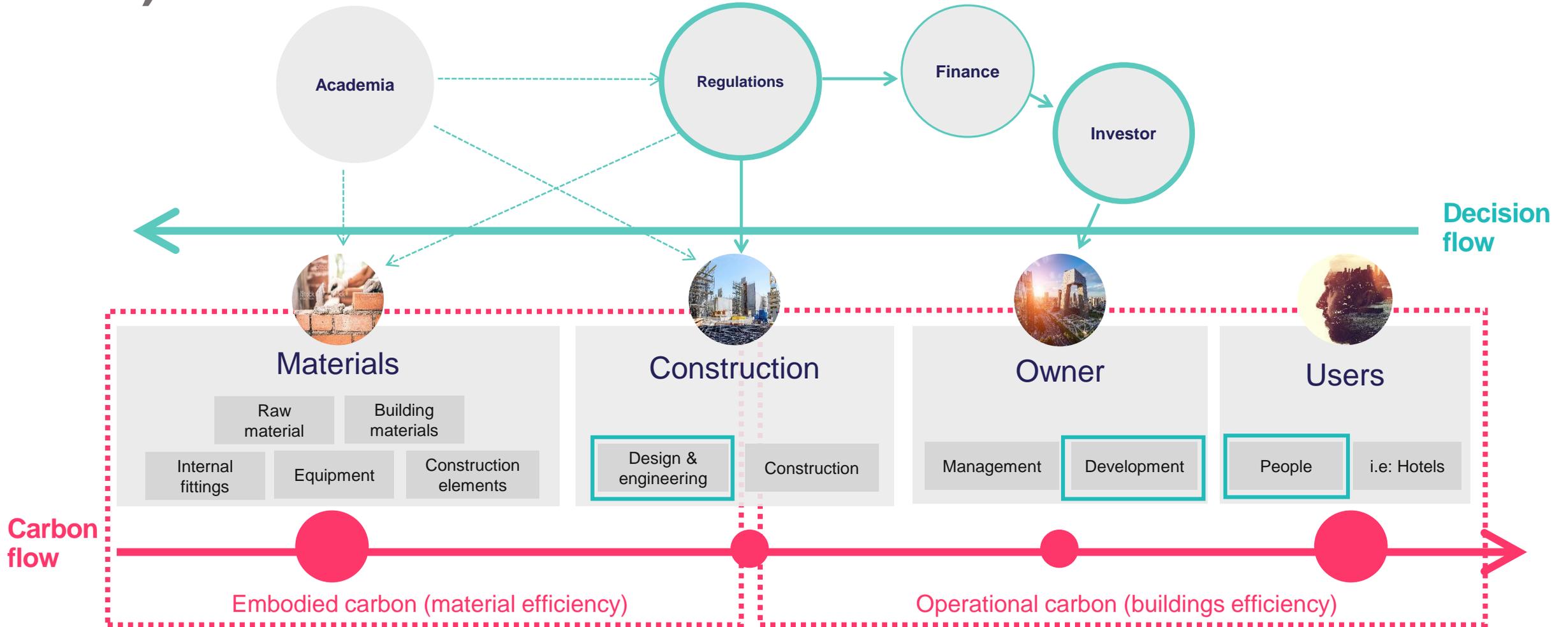
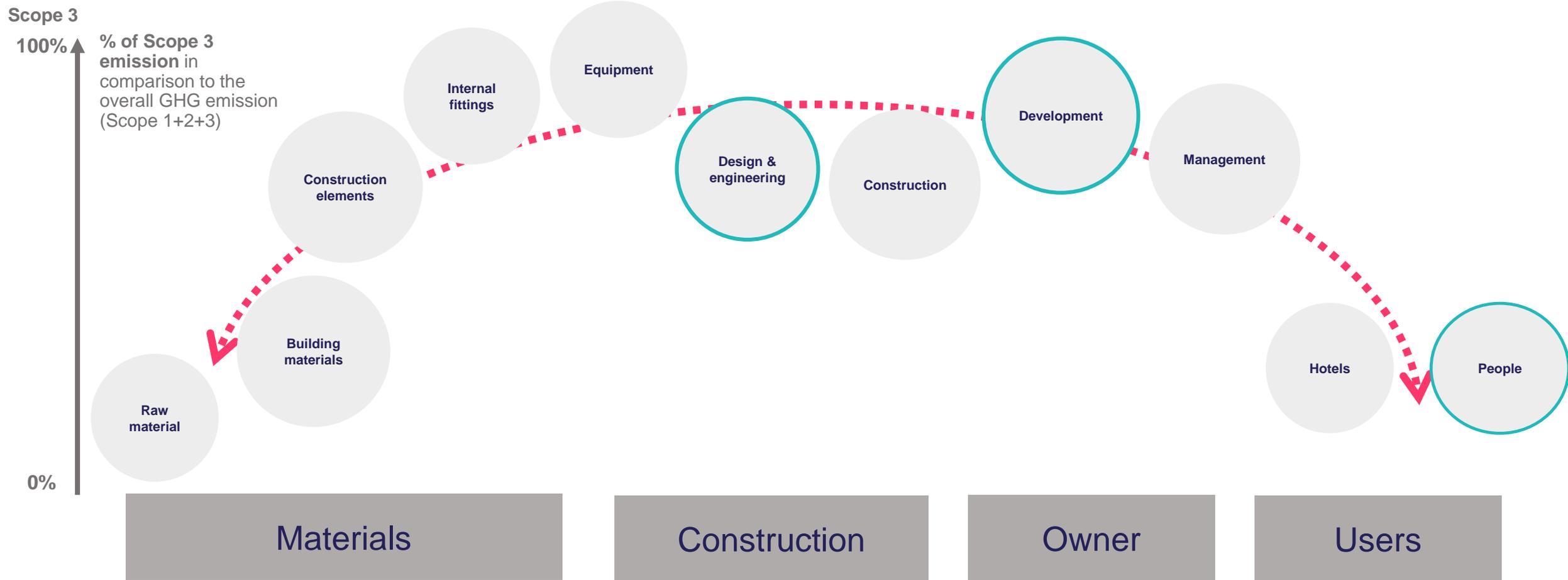


Illustration slide, explanation in the previous slide.

A) Value chain: Scope 3

Across the “**action**” value chain, Scope 3 intensity and relevance increases toward the middle of the value chain. These are also the stakeholders who have the highest **influence** in deciding the way buildings are constructed.



B) Definition: common language

Explanatory slide, illustration in the next slide.

Common metric

A common metric and language are important because it is what matters to all the players of the value chain. Each one plays a role towards the finished product.

The metric identified as most relevant is:

$$\text{kgCO}_2 \text{ eq /m}^2 \text{ (Gross External Area - GEA)}$$

Common language:

The framework is based on the building standards BS EN 15978:2011 for sustainability of construction works and is based on the Whole Life Carbon Assessment for the Built Environment developed by RICS.

This simple but effective frameworks maps the building sector based on the value chain building stages (A to D, horizontal row) and the building's components (vertical column).

Value Chain → stages →	Product			Construction		Use							End of Life				Beyond	Total	Surface		
	A1 Raw material	A2 Transport to Plant	A3 Manufacturing	A4 Transport to site	A5 Construction & install	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy	B7 Water Operation	C1 demolition	C2 Transport	C3 Processing	C4 Disposal				D	kgCO2
↓ Building Elements																					
Substructure																					
Foundations (incl excavation)																					
Basement retaining walls																					
Lowest floor slab																					
Superstructure																					
Frame																					
Lifted floors																					
Roof																					
Stairs and ramps																					
Facades																					
External walls																					
Windows and external doors																					
Fit out																					
Internal walls and partitioning																					
Internal doors																					
Finishes																					
Wall finishes																					
Floor finishes																					
Ceiling finishes																					
Fittings, Furnishings and Equipment																					
Loose furniture																					
Building Service/MEP																					
HVAC																					
Lighting, lifts and escalators																					
Safety, security and communications																					
ICT and specialist services																					
Renewables																					
Total energy (L-RI)																					
TOTAL Carbon Emissions																					

Potential benefits and usages of this framework:

- Map carbon emission across individual building stages and/or specific building elements.
- Companies can assess their specific contribution and impact across the building life cycle.
- Quantify overall carbon emission across the whole building life cycle.

With this figures available, it would be possible to develop trade of for achieving the desired result of maximizing the overall reduction of CO₂ emission.

B) Definition: common language

“Whole building life carbon” framework

Illustration slide, explanation in the previous slide.

Value Chain → Stages →	Product			Construction		Use							End of Life				Beyond	Total	Surface	
	A1 Raw material	A2 Transport to Plant	A3 Manufacturing	A4 Transport to site	A5 Construction & Install	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy Operation	B7 Water Operation	C1 demolition	C2 Transport	C3 Waste Processing	C4 Disposal	D 3R	kgCO2	kgCO2/m2	
↓ Building Elements																				
Substructure																				
Foundations (incl excavation)																				
Basement retaining walls																				
Lowest floor slab																				
Superstructure																				
Frame																				
Upper Floors																				
Roof																				
Staircases and ramps																				
Façades																				
External walls																				
Windows and external doors																				
Fit out																				
internal walls and partitioning																				
internal doors																				
Finishes																				
Wall finishes																				
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Loose furniture																				
Building Service/MEP																				
HVAC																				
Lighting, lifts and escalators																				
Safety, security and communications																				
ICT and specialist services																				
Renewables																				
Total energy (=B6)																				
TOTAL Carbon Emissions																				

**Value chain
(Building stages)**

**Building
elements**

kgCO₂ eq /m² (GEA)

B) Definition: Common language

Commercial building case study

	Product	Construction	Use		End of Life	Emissions	
	A1-A3	A4-A5	B1-B5	B6	C1	kgCO2	kgCO2/m2
Substructure							
Foundations (incl excavation)	α		0				
Basement retaining walls							
Lowest floor slab							
Superstructure							
Frame	β		0				
Upper Floors							
Roof							
Staircases and ramps	γ		$\gamma/2$				
External walls							
Windows and external doors							
internal walls and partitioning	δ		$\delta*2$		ρ		
internal doors							
Finishes							
Wall finishes	δ		$\delta*2$		ρ		
Floor finishes							
Ceiling finishes							
Fittings, Furnishings and Equipment							
Loose furniture							
Building Service/MEP							
HVAC	ϵ		$\epsilon*2$	λ			
Lighting, lifts and escalators							
Safety, security and communications							
ICT and specialist services							
Prefabricated Buildings							
Work to existing Buildings							
External Works	ζ		ζ				
Renewables	η		$\eta*2$				
Total energy (=B6)	UK 2degree			$\lambda/4$			
	Slow Progression			$\lambda/3$			
	No Decarbonization			λ			
End of Life							
TOTAL Carbon Emissions							

On the left, the results of a case study based on a new office building in London from Landsec. Study emphasize the importance and benefits of whole building life cycle assessment.

In the next page explanation of interesting findings:

- Embodied carbon
- Forecasted grid decarbonization

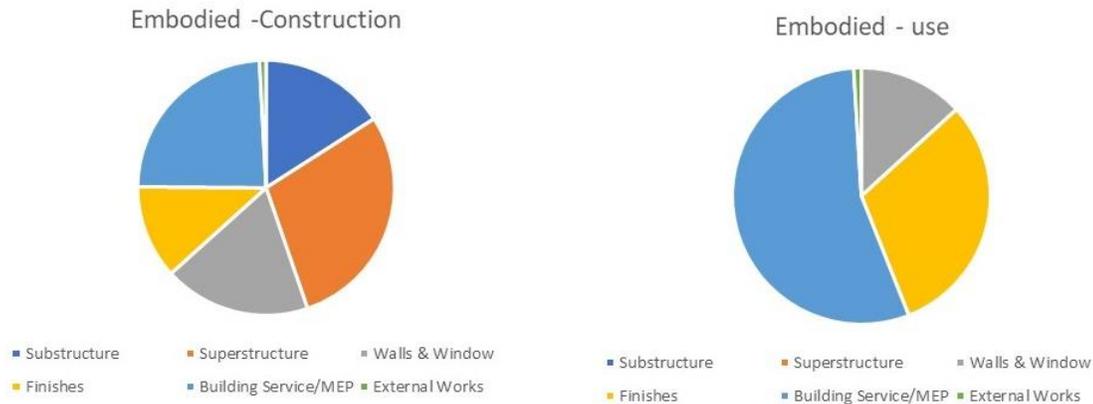


© This example is based on a Landsec case study, *Data and results anonymized for confidential reasons*

B) Definition: common language

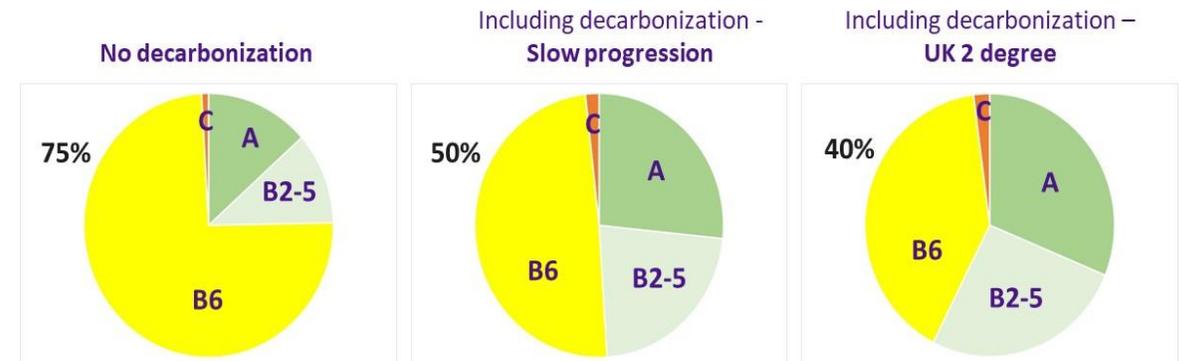
Commercial building case study

Embodied carbon



For the embodied carbon of buildings, it is important to consider not only the construction phase (left) but also the **maintenance/refurbishment** across the life cycle of the building (right). Depending on the replacement rate of building components, this can be considerable and comparable to the construction embodied energy.

Forecasted grid decarbonization



Overall carbon emission for the entire lifecycle (60years). Left: without decarbonization of the grid, middle: expected slow decarbonization of the grid, right: UK 2 degree trajectory expected decarbonization of the grid. Embodied carbon increases in relevance if **expected decarbonization** of the grid is taken into consideration.

SBT4buildings: **next steps**



1 Collect more data

Improve data quantity & quality and understanding application for the identified framework

3 Develop SBT guidance

Development of sector guidance (2019) that align companies, sector and SBTi needs (in collaboration with SBTi)

2 Develop scenarios

Development of building typologies and scenarios for decarbonization to tackle carbon hot spots along the value chain

4 Involve stakeholders

Involve a wider range and number of stakeholders for a diverse representation and validation of the information

SBT4buildings: companies engaged



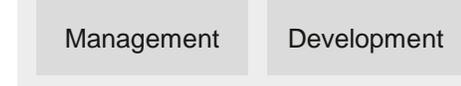
Materials



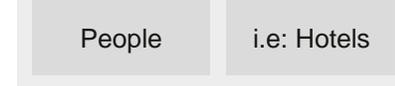
Construction



Owner



Users



In collaboration with:



Global Alliance for Building and Construction

About the GlobalABC

The GlobalABC is a voluntary, international, multi-stakeholder partnership, launched at COP21 in Paris. Its Secretariat is hosted by UN Environment.

Aim: To mobilize all stakeholders to scale up climate actions in the sector.



www.globalabc.org

GlobalABC activities are organized around five different Work Areas:

1. Education and Awareness
2. Public Policies
3. **Market Transformation** (incl: SBT4buildings)
4. Finance
5. Building Measurement, Data and Information



Engage business and other **stakeholders** in the **decarbonization** of the **entire building value chain**;

Provide an opportunity to companies to shape the **dialogue** with national and sub-national policy makers about the **enabling framework for private sector action**.

WBCSD is co-chair of the steering committee and the Work Area 3.

Our contact

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