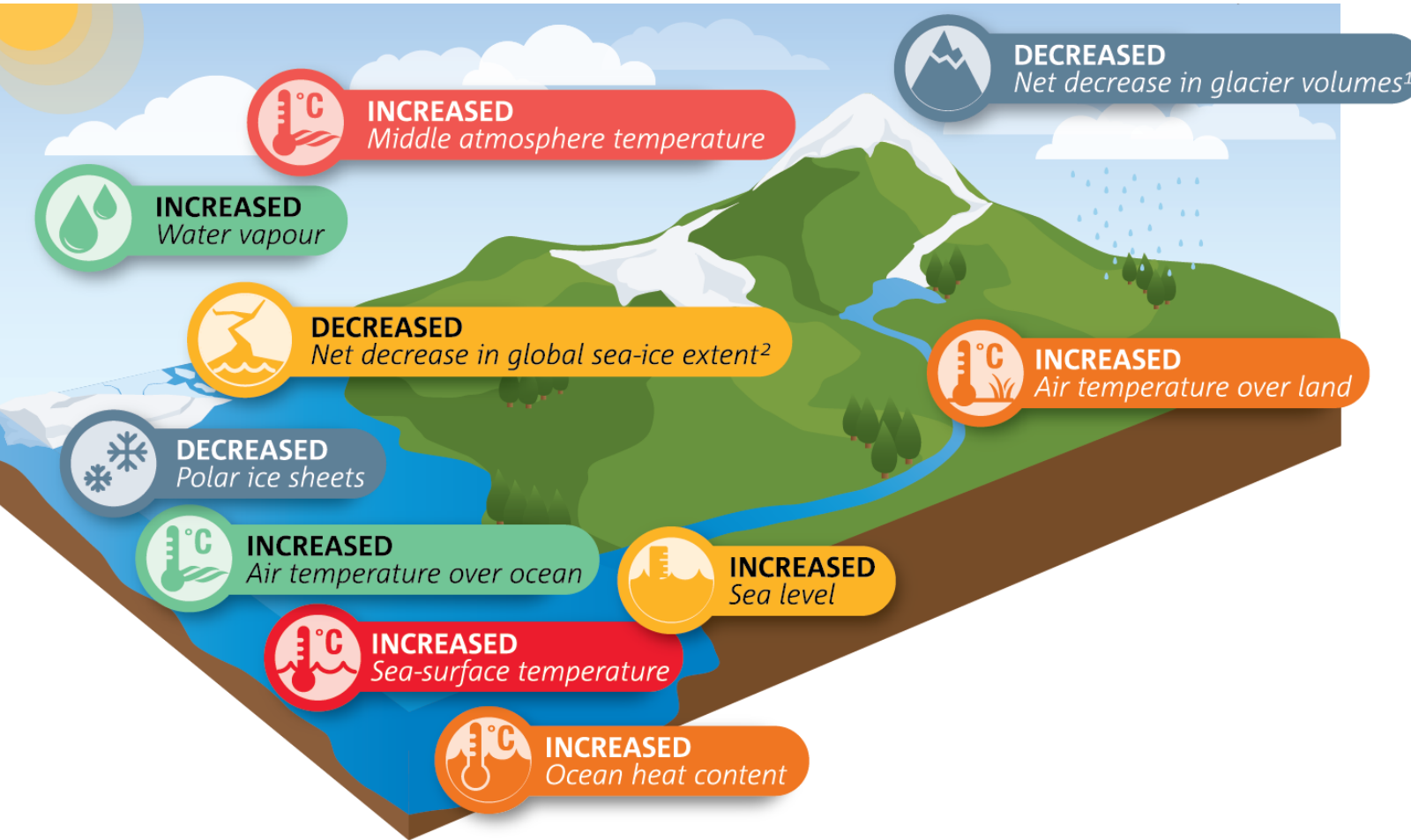




Embodied Carbon Estimation: The Next Evolution of Quantity Surveying

Presented by: Ts. Amirul Izzat

Climate Change



The world is now **warming faster** than at any point in recorded history

Disrupting usual **balance of nature** (United Nations)

CO2 Emissions Today

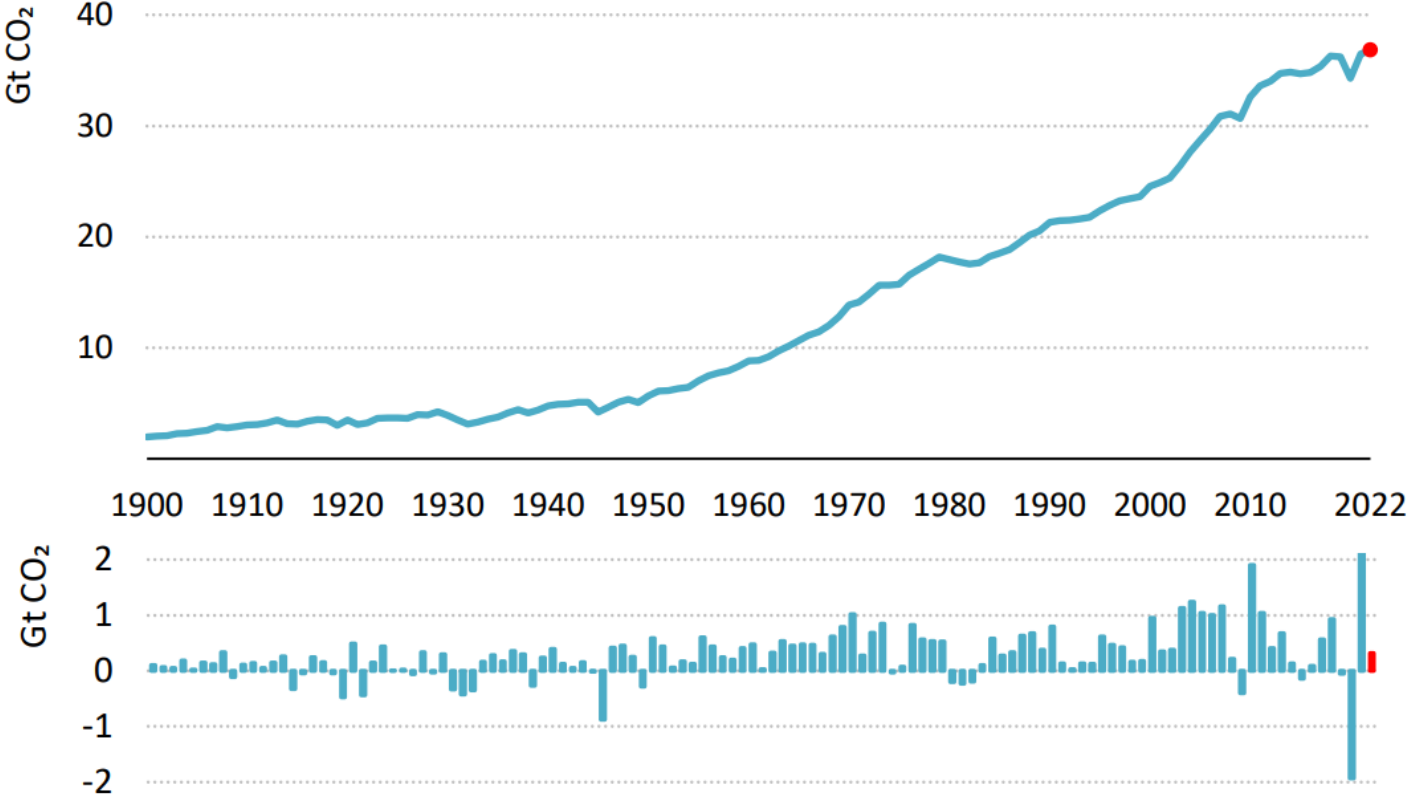
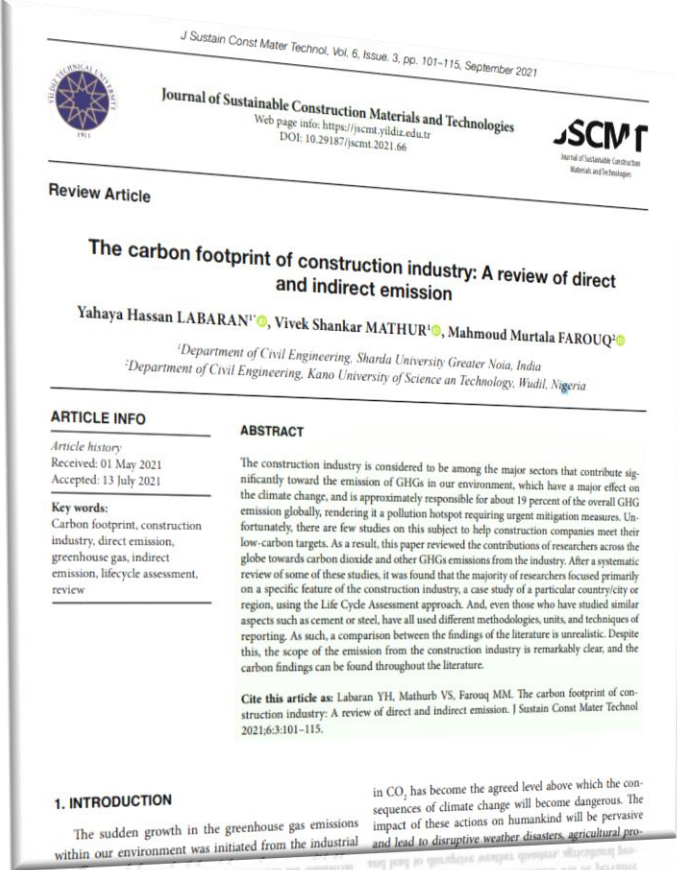


Figure 1: Global CO2 emissions from energy combustion and industrial processes and their annual change, 1900-2022

CO2 Emissions Today



The construction industry is considered to be among the major sectors that contribute significantly towards the emission of GHGs in our environment, which have a major affect on the climate change, and Is approximately **responsible for about 40% of the overall GHG emission globally**, rendering it a pollution hotspot requiring urgent mitigation measures. (Labaran & Mathur et al., 2021)

Y2040, the DISASTER is coming?



The language of climate is evolving, from 'change' to 'catastrophe'

"Climate emergency" was used just 17 times prior to January 2019, but 283 times since.



UN Experts Warn of 'Climate Catastrophe' by 2040 Without 'Rapid' and 'Unprecedented' Global Action

"The climate crisis is here and already impacting the most vulnerable," notes 350.org's program director. "Staying under 1.5°C is now a matter of political will."



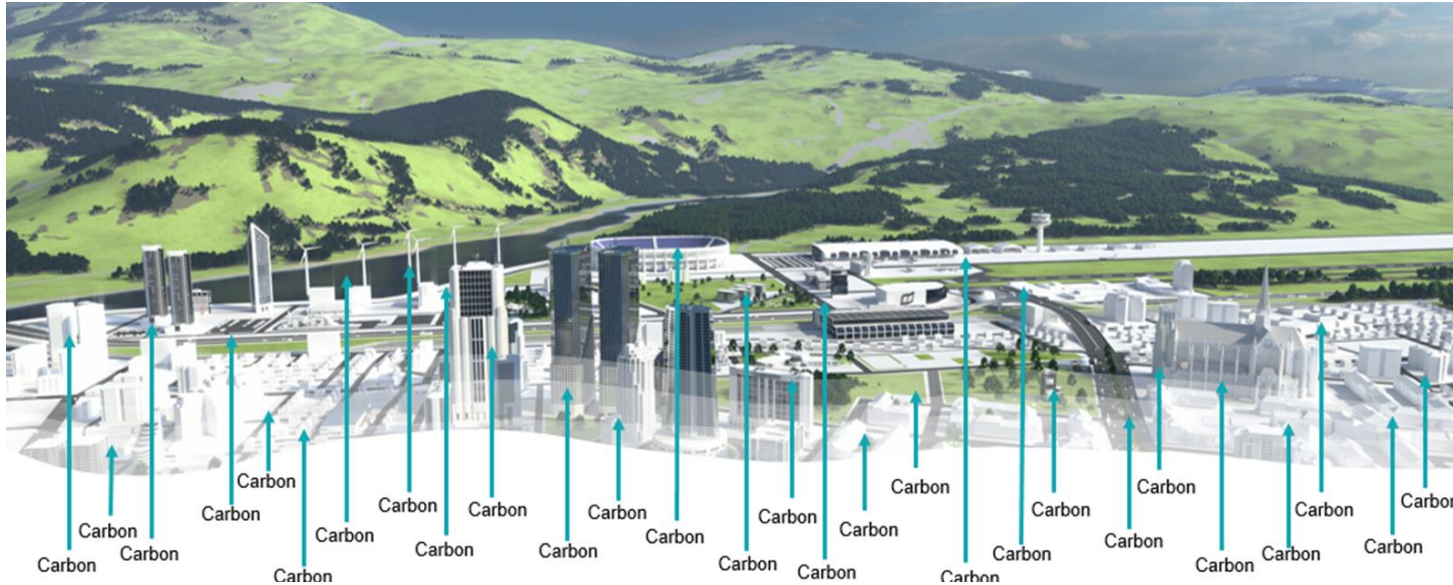
Underscoring the need for "rapid, far-reaching, and unprecedented" changes to life as we know it to combat the global climate crisis, a [new report](#) from the Intergovernmental Panel on Climate Change (IPCC)--the United Nations' leading body for climate science--details what the world

Pemanasan Global | Kiamat iklim 2040, Malaysia tidak terkecuali

Ais semakin mencair, gunung berapi kini mula aktif di Antartika dan suhu di kutub utara bukan membeku, tetapi panas gigitan. Semua petunjuk itu adalah kesan daripada pemanasan global, yang tidak pernah berlaku sebelum ini.

What is Embodied Carbon

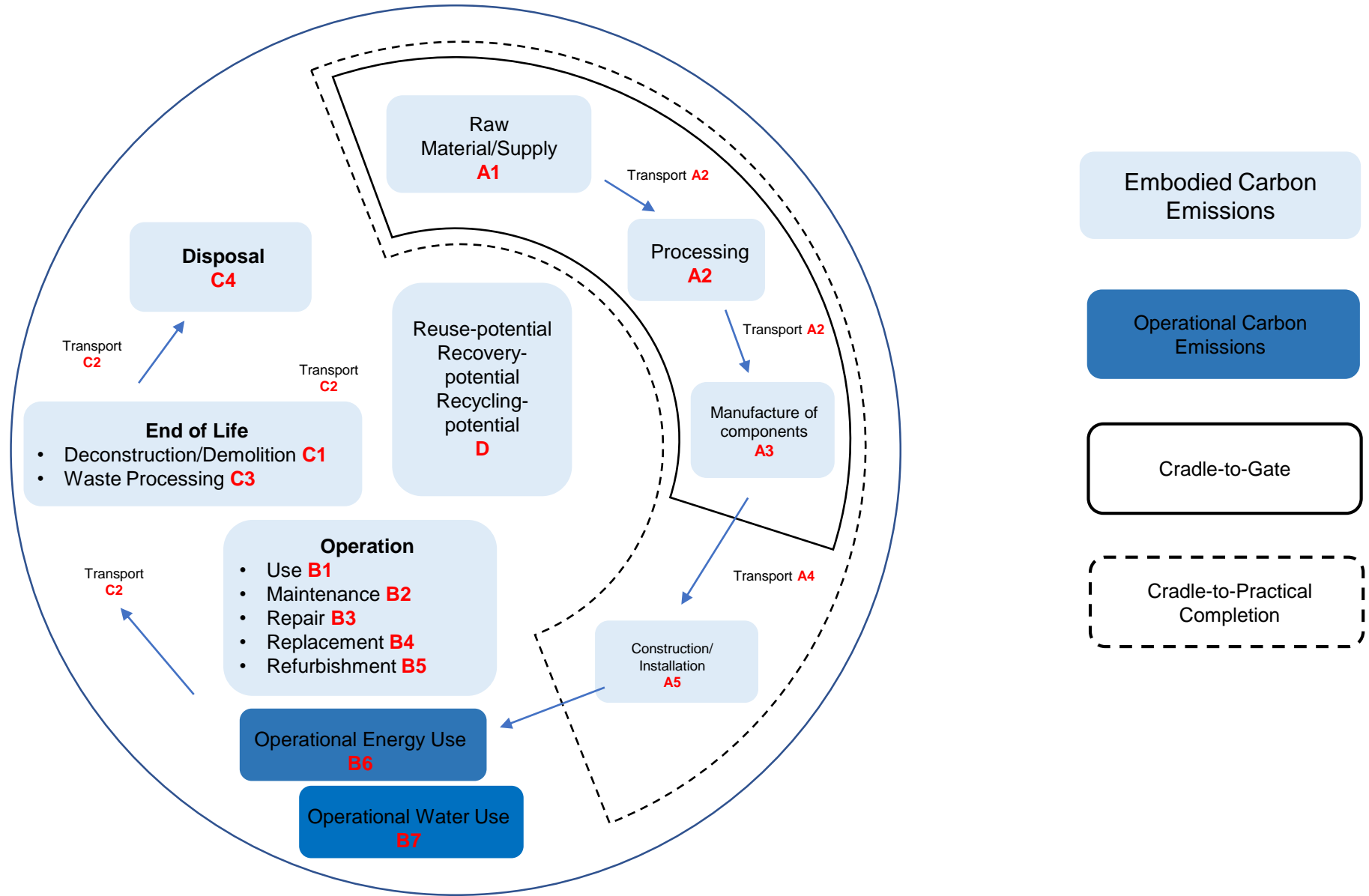
- Refers to **greenhouse gas (GHG)** emission associated with the manufacture and use of product or services



- Associated with **extraction, manufacturing, transporting, installing, maintaining, and disposing** of construction materials and products.
- Embodied carbon regulation is **not fully addressed**.

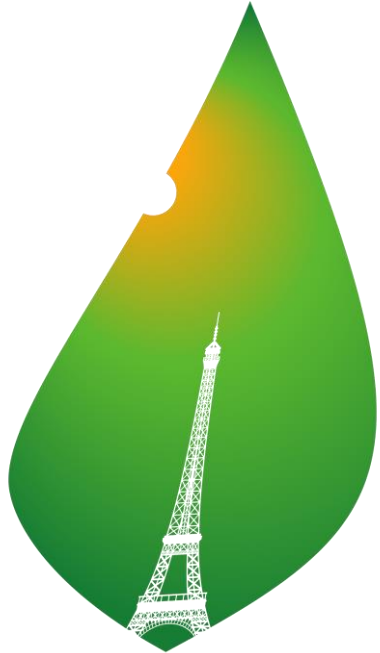
Embodied Carbon Life Cycle

BS EN 15804 Life Cycle Module



How the world respond to it?

Paris Agreement



PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

1.5 degrees below pre-industrial level

Must peak before 2025 at the latest and **decline 43% by 2030**

5 years cycle, each countries will submit **Nationally Determine Contributions (NSCs)**

Long-term low greenhouse gas emission development strategies (LT-LEDS)

Enhance transparency framework (ETF)

Nationally Determine Contributions (NDCs) From several ASEAN Countries



- Increased its mitigation ambition with an unconditional target to cut carbon intensity against GDP by **45%** by 2030 compared to 2005
- Covers seven greenhouse gasses
- To develop **National Adaptation Plan** and **NDC Roadmap**



- **41%** reduction by 2030
- Betting and **land use sector** and the **energy sector** to contribute to the most to the emission reduction target
- **4.1%** of the state budget for emission reduction efforts
- **Visi Indonesia 2045** and Long-Term Strategy on Low Carbon and Climate Resilient Development 2050



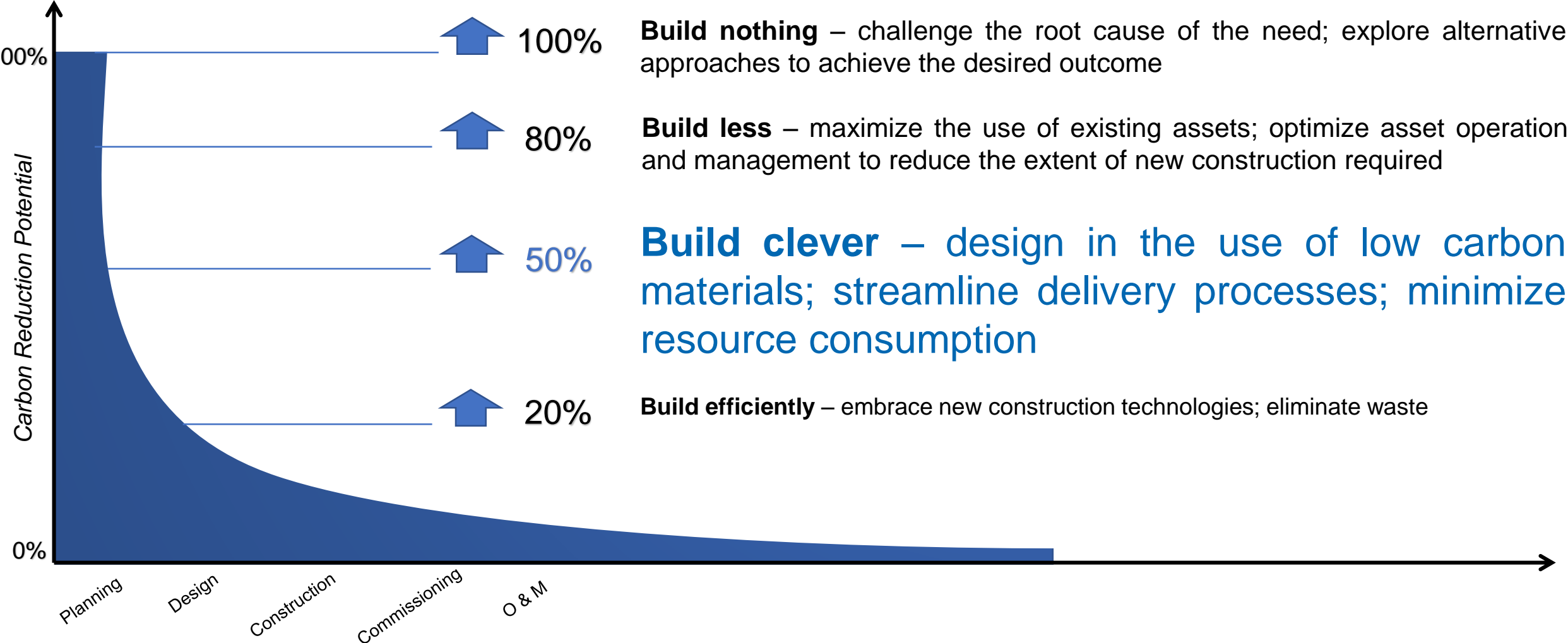
- Enhance **peak emissions at 65MtCO₂e** by 2030
- Achieve **36% reduction** in emissions intensity from 2005 levels by 2030
- **33MtCO₂e by 2050** & Net Zero

Other Organization Involved



How the industry respond to it?

How Industry resolves the problem?



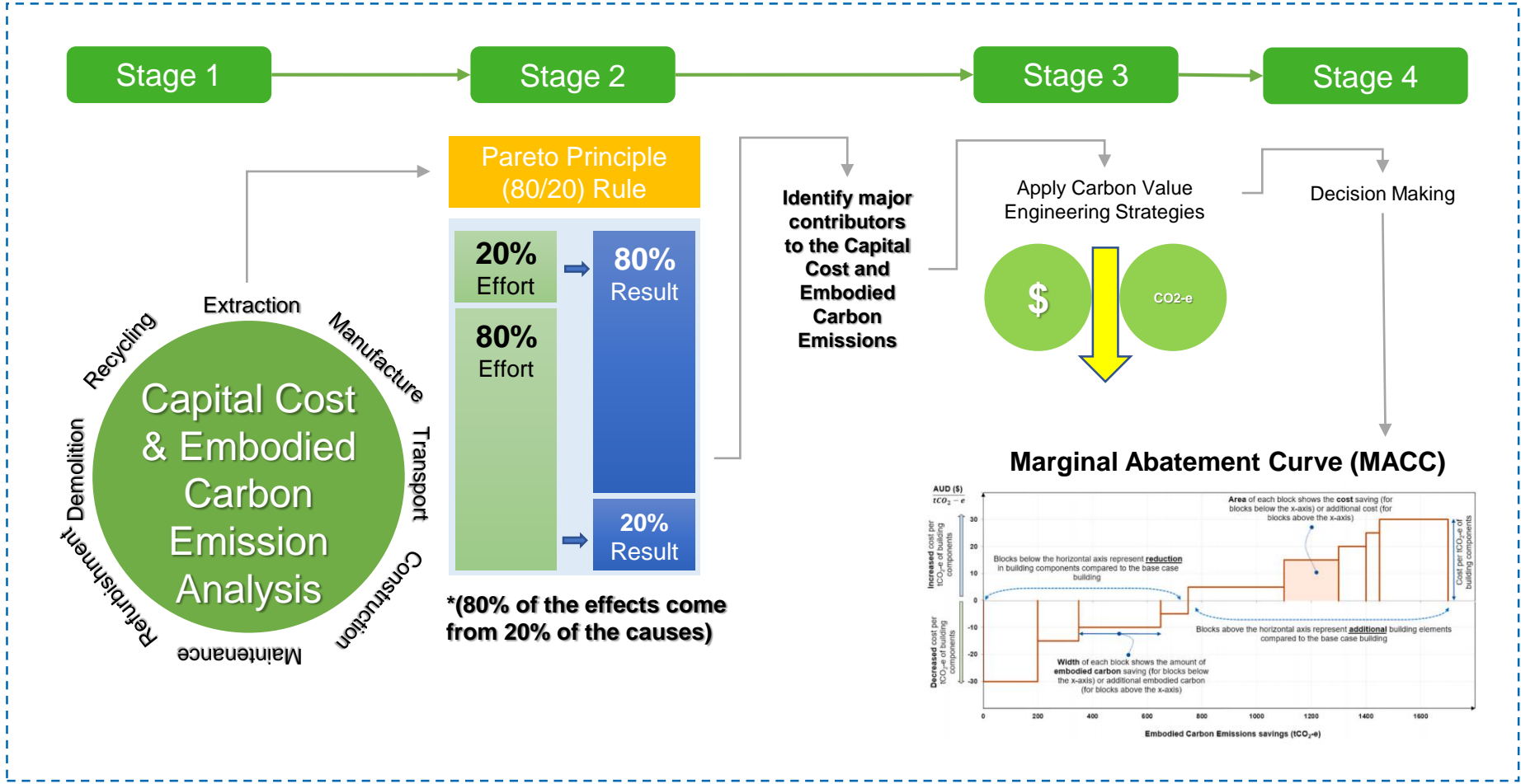
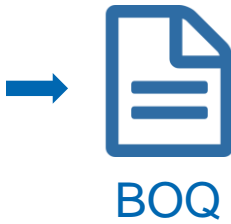
Build nothing – challenge the root cause of the need; explore alternative approaches to achieve the desired outcome

Build less – maximize the use of existing assets; optimize asset operation and management to reduce the extent of new construction required

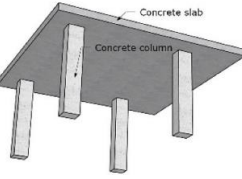
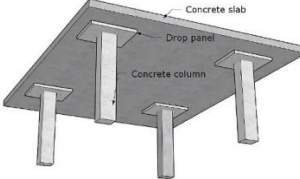
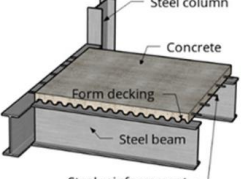
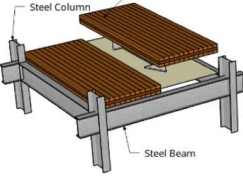
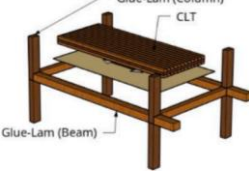
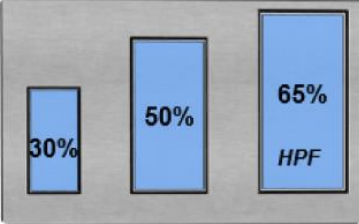
Build clever – design in the use of low carbon materials; streamline delivery processes; minimize resource consumption

Build efficiently – embrace new construction technologies; eliminate waste

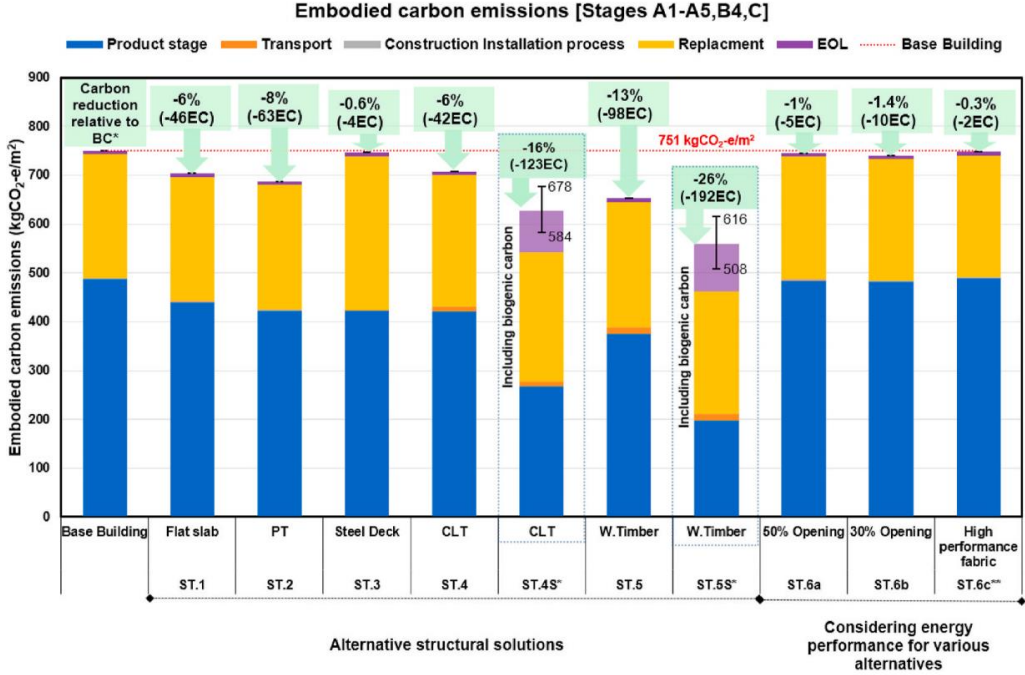
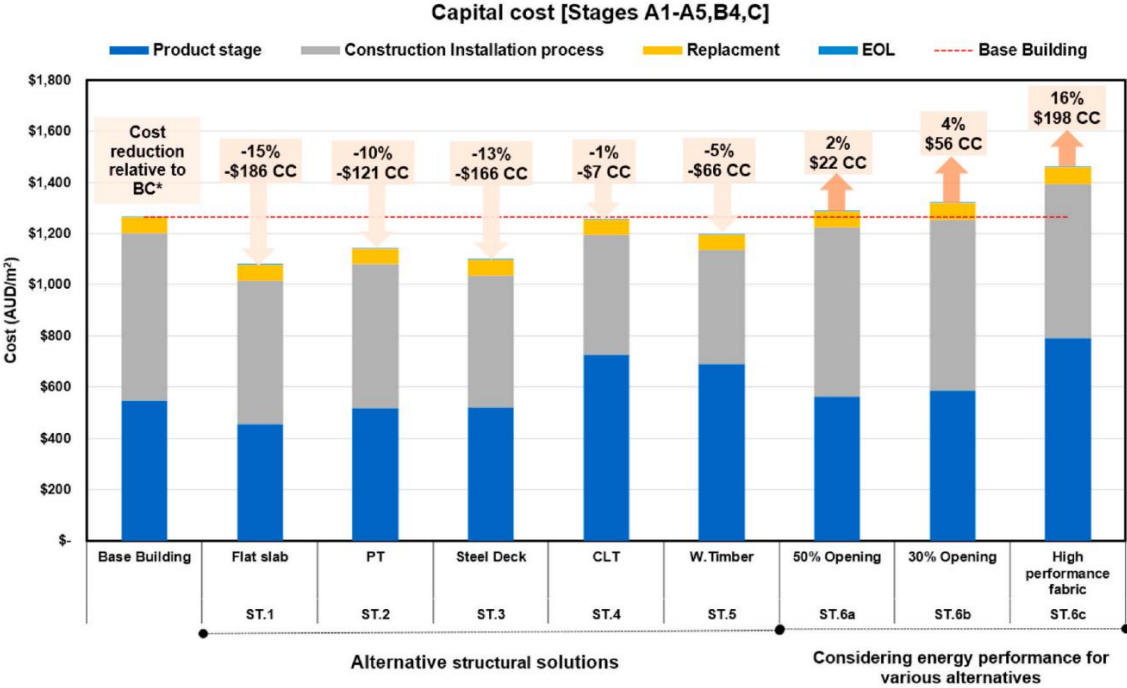
Carbon Value Engineering (CO₂VE) FRAMEWORK (Robati et al.2021)



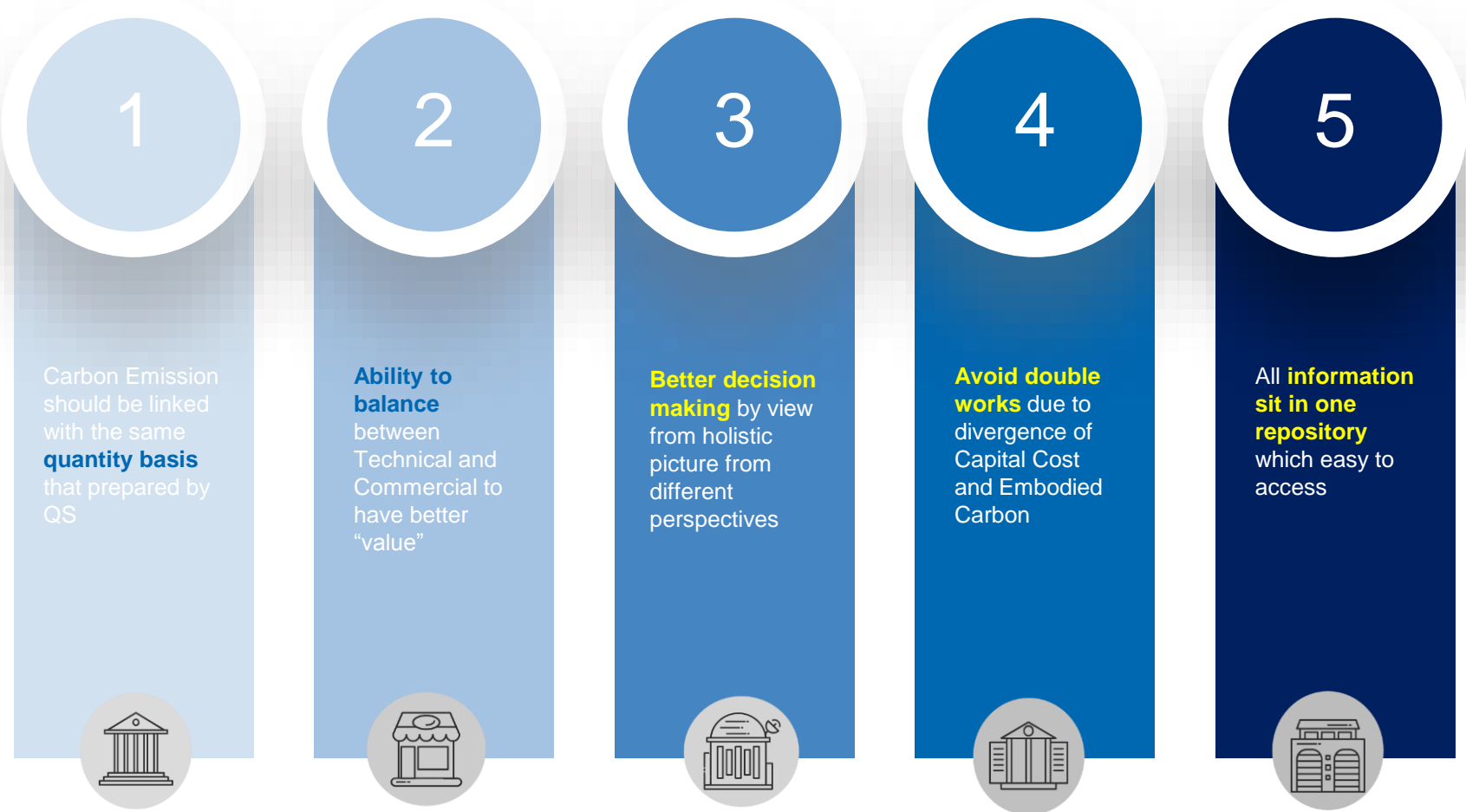
Design Alternatives

								
Base Case Building	ST.1	ST.2	ST.3	ST.4	ST.5	WWR of 50%	WWR of 30%	High Performance Façade
<p>R.C structure with flat plate floor: The base building used a flat plate (FP) concrete structure. Flat plates provide a uniform thickness and a flat soffit which requires a simple formwork system.</p>	<p>R.C structure with flat slab floor: This scenario used a flat slab as the main structural floor system. The flat slab is a two-way system with thickenings at the vertical elements (columns and loadbearing walls) to increase shear capacity and the stiffness of the floor system under vertical loads.</p>	<p>R.C structure with Post-tensioned floor: This scenario uses a post-tensioned (PT) flat slab structural floor system. A PT floor provides the thinnest slab type and tends to be faster on site due to a reduction in concrete and steel reinforcement. A key advantage of a PT slab is that it can reduce the number of columns, increase flexibility for internal planning and minimise the overall height of the building.</p>	<p>Steel structure with steel deck floor: This scenario uses a steel deck floor. The steel deck acts as a permanent formwork which does not require dismantling and also benefits from minimum scaffolding requirements, speeding up the construction process as well as reducing capital costs</p>	<p>Steel structure with Cross laminated timber floor (CLT): This scenario uses a Cross Laminated Timber (CLT) slab and steel frame. CLT is a solid wood construction product consisting of several bonded timber boards (set at 90°). CLT is an innovative structural material and is lighter than R.C resulting in a lower inertia response generated from lateral loads. This means it can potentially reduce the amount of concrete and steel reinforcement used in the structural components.</p>	<p>Whole timber building: This scenario goes beyond conventional practice to propose a mass timber (MT) design with CLT floors and glulam columns, beams and trusses. A growing body of research suggests multi storey buildings with MT structures can benefit from reduced embodied carbon. This is due to timber materials emitting less GHG emissions during phases A1 – A3 than concrete and steel. In addition, as trees sequester carbon dioxide through photosynthesis, timber buildings can provide long-term carbon storage acting as a 'carbon sink' [74,75]. In this instance, due to the height of the building the MT structure is supplemented with a concrete core for lateral stability, while basements also remain concrete.</p>	<p>The same conventional façade as base building, but with a WWR reduced from 65% to 50%</p>	<p>The same conventional façade as base building, but with a WWR reduced from 65% to 30%</p>	<p>The same WWR as the base building (65%), but with triple glazing and increased insulation.</p>

Design Analysis

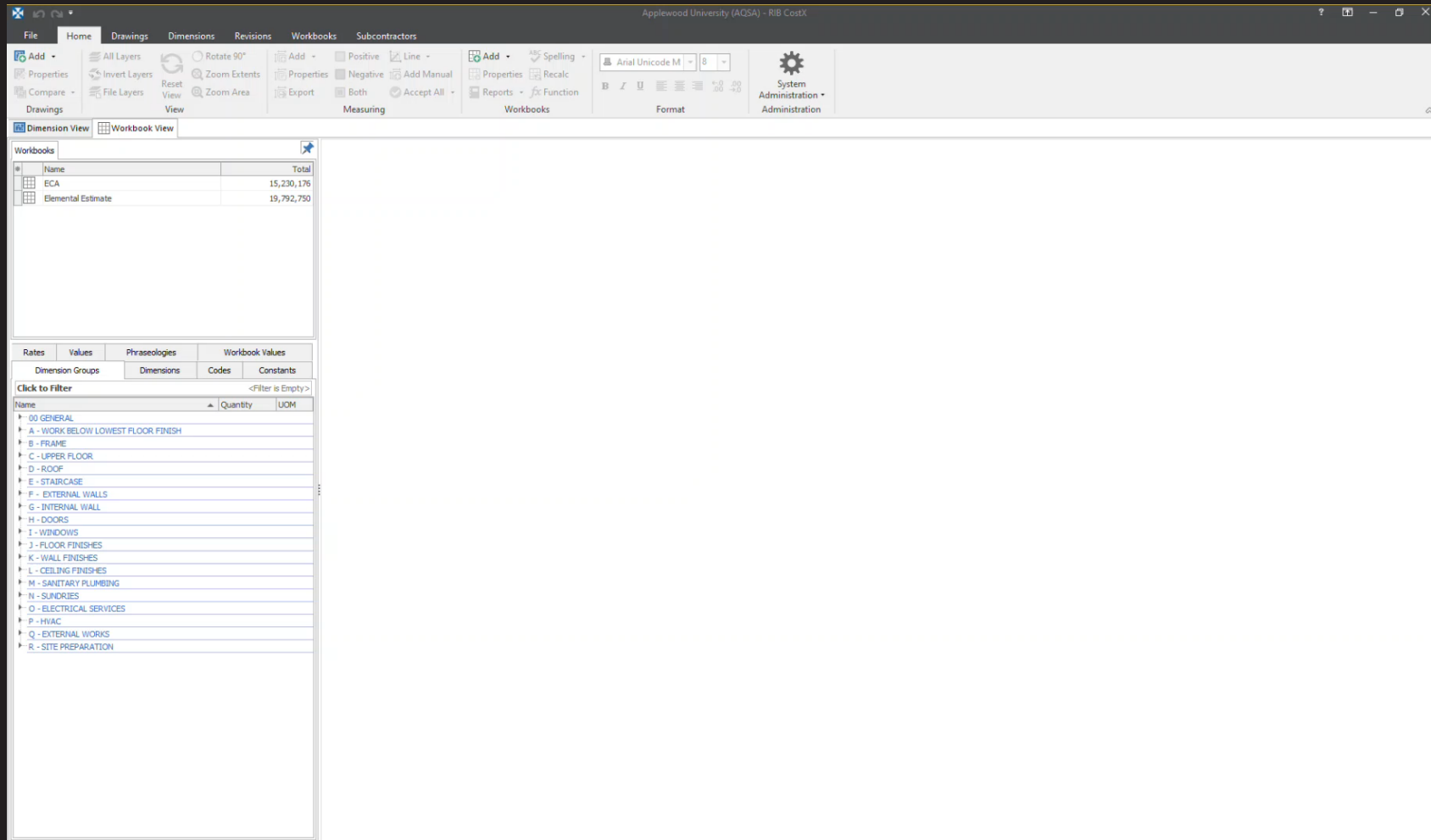


Benefit of QS (approach to Carbon Emission Estimation)



Quantity Surveyor is seen as one profession that can play big role in Carbon Estimation approach

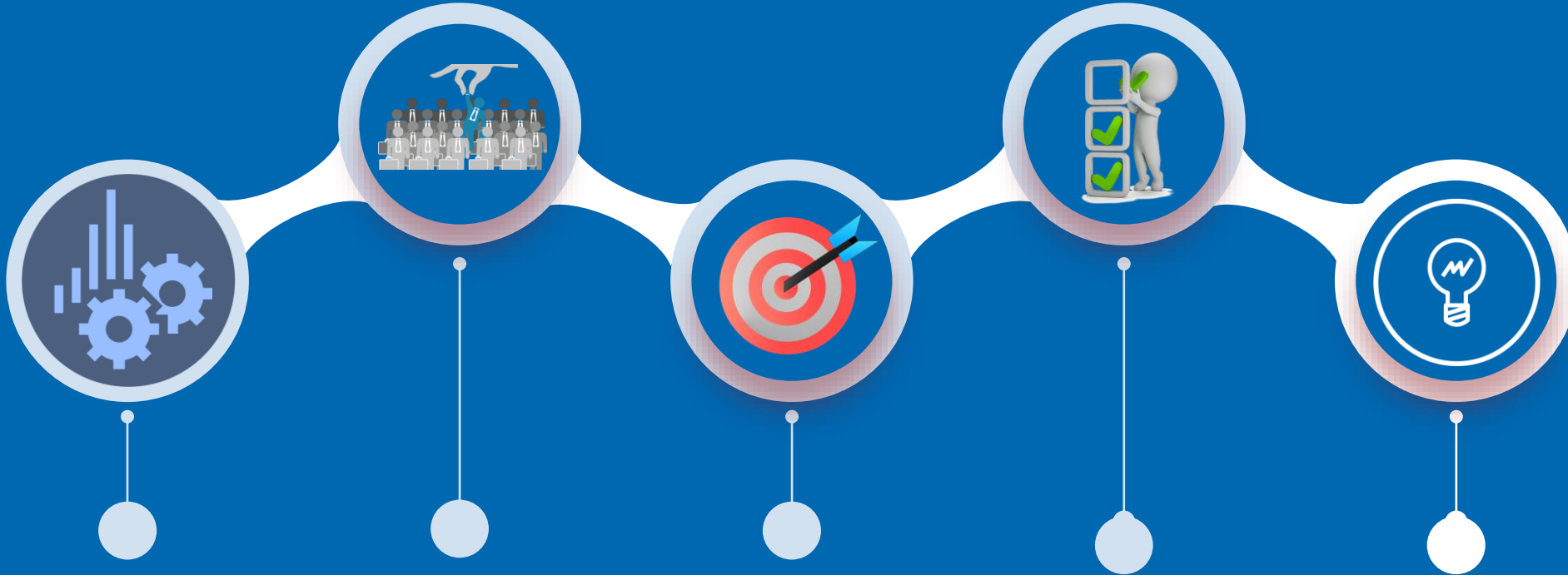




- Integrate Carbon Emission estimations in **CostX** Workbook
- Carbon data repository in **CostX** library
- Projects rates library within the same platform

Summary of Benefits

By implementing CostX solutions in 5D and 6D environment



Avoid Rework

Reducing waste, rework and able to balance between lower carbon builds with delivering profitable projects

Young Talents

Most of the younger generations now aware about green practices. Hence this can attract more youngster to be part of the team

Accuracy

More access to reliable, accurate and up-to-date carbon data

Informed Decision

The process of making decision is derived based on available data hence it can generate more holistic view

Become Leader

Positioning as leaders in practicing sustainable building environment

We are RIB

Choose a global leader in software technology, fit-for-purpose for the AEC industry



WE ARE
INDUSTRY EXPERTS

60 years

of innovative solutions
built on AEC industry
experience

WE ARE
GLOCAL

100+ countries

combining local
expertise with our
global advantage

WE ARE
USER CENTRIC

550k+ users

who remain at the
center of everything
we do

WE ARE
OUR PEOPLE

2,600+ talents

across the globe that
have walked in your
shoes

WE ARE **Schneider**
Electric

12 years

as one of the most
sustainable companies
in the world*

*Recognized by Corporate Knights' Global 100 for the 12th year.

We stay true to our purpose, our mission and our vision

PURPOSE

What we actually do

To make engineering and construction more efficient and sustainable.

MISSION

Our approach to delivering our purpose

We empower engineering and construction professionals around the globe to build more efficiently and sustainably. Our people deliver the world's leading end-to-end lifecycle solutions to our industry. Together with our customers and inspired by our purpose, we drive digital transformation that makes a difference to our customers' lives, our employees' lives and the planet - today and in the future.

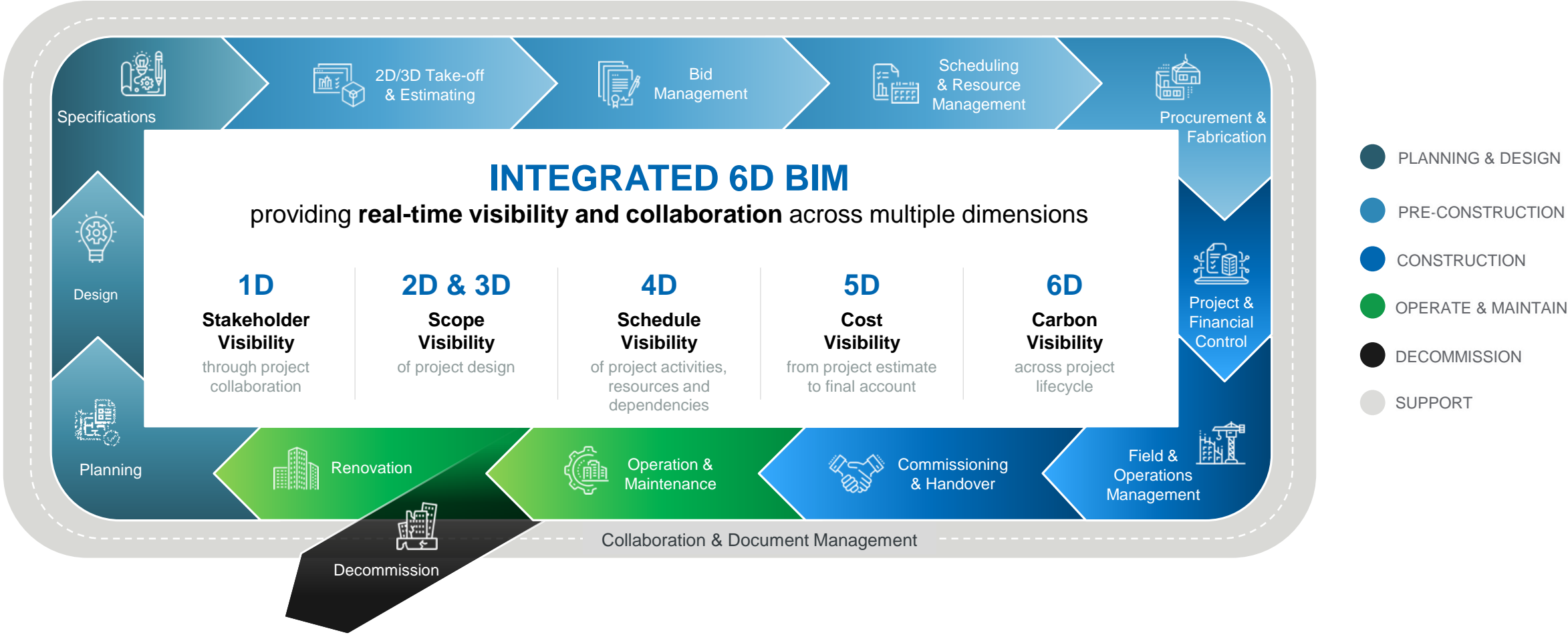
VISION

The outcome we aim to drive

To transform RIB to be the global powerhouse providing innovative software solutions in our markets.

We empower teams to build a digital thread through integrated 6D BIM

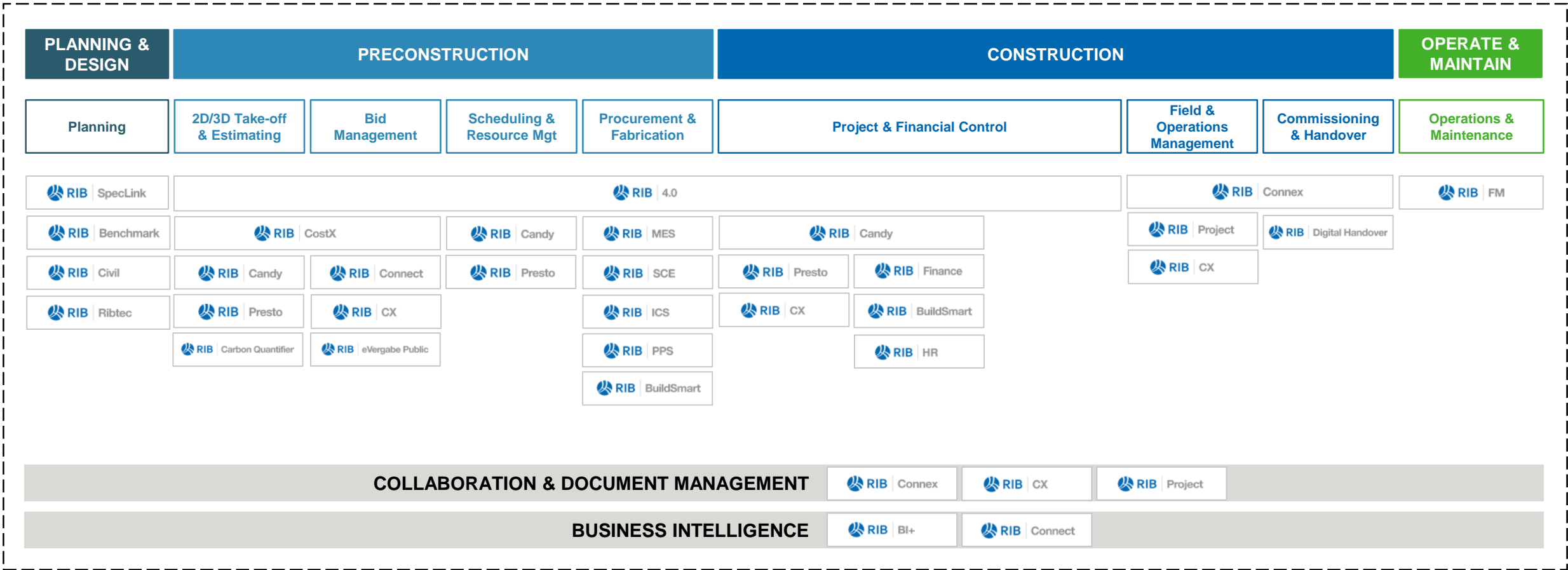
Digitizing every aspect of a building's lifecycle, including its footprint on the environment



Digital Enabler for Construction in All Industries



Through our extensive portfolio of solutions, spanning the building lifecycle



- PLANNING & DESIGN
- PRE-CONSTRUCTION
- CONSTRUCTION
- OPERATE & MAINTAIN
- DECOMMISSION
- SUPPORT

9 out of the top 10 international Companies choose RIB

*ENR Top 250 International Contractors, 2022. Spans entire RIB product portfolio.



Building Better Together