

Zero: Scaling net zero buildings

Creating the international, comparable dataset
we need to decarbonize global property

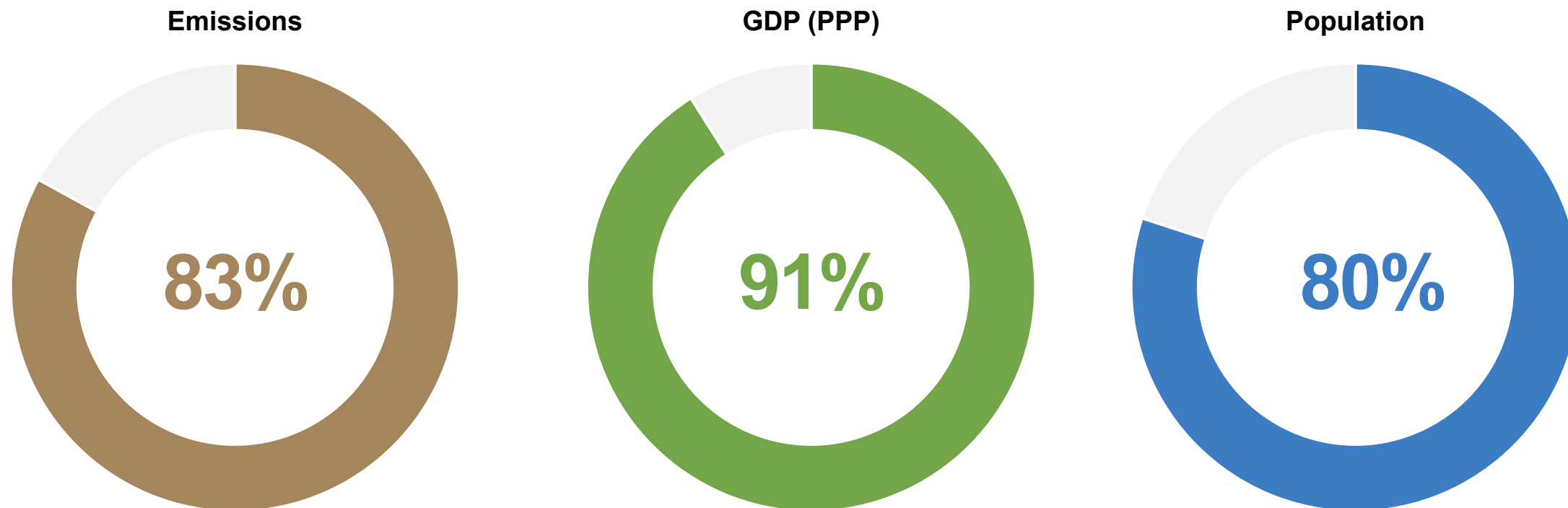
Opportunity for industry
breakthrough - what's missing?

Whole life carbon data

Net zero targets, but not enough action

There is no sign yet of essential rapid scaling of the decarbonization of buildings

Global net zero coverage



Oxford University Net Zero Tracker. Country-level coverage only. We do not include sub-national net zero targets in countries without a target

Net zero targets with widening reach

Regions, cities and private sector organizations are committing to decarbonization

Net zero numbers:

Countries

136

Regions

116

Cities

239

Companies

768

Out of 198 countries, 713 regions, 1,177 cities
and 2,001 companies

Oxford University Net Zero Tracker

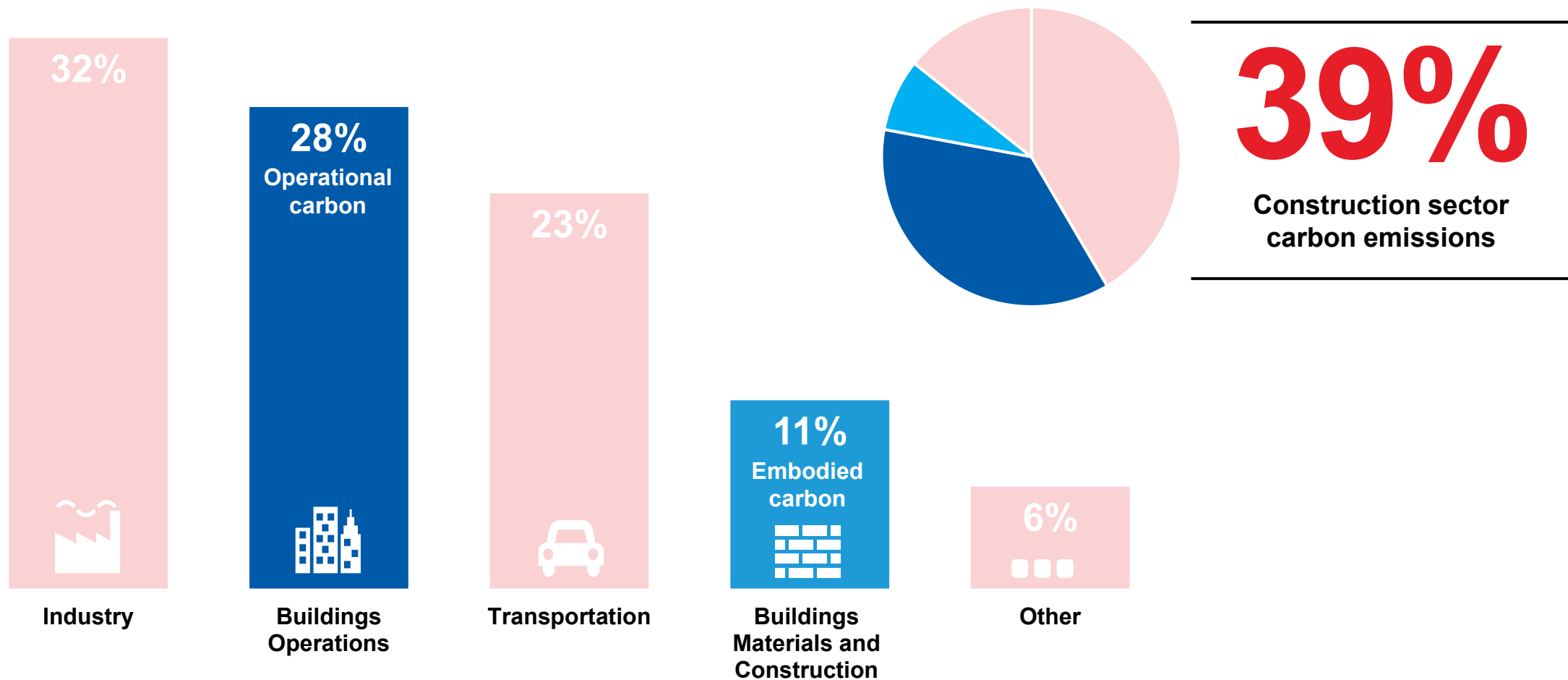
Businesses are committing to net zero

“58%—now say they have a plan to achieve net zero emissions by 2050 or before. That’s up significantly from 36% last year.”

June 2022 Fortune magazine says of Fortune 500 CEOs

Will we decarbonise buildings in time?

The building design, construction and property sectors are fundamental to the fight against climate change



What does this 'decade of action' really mean?

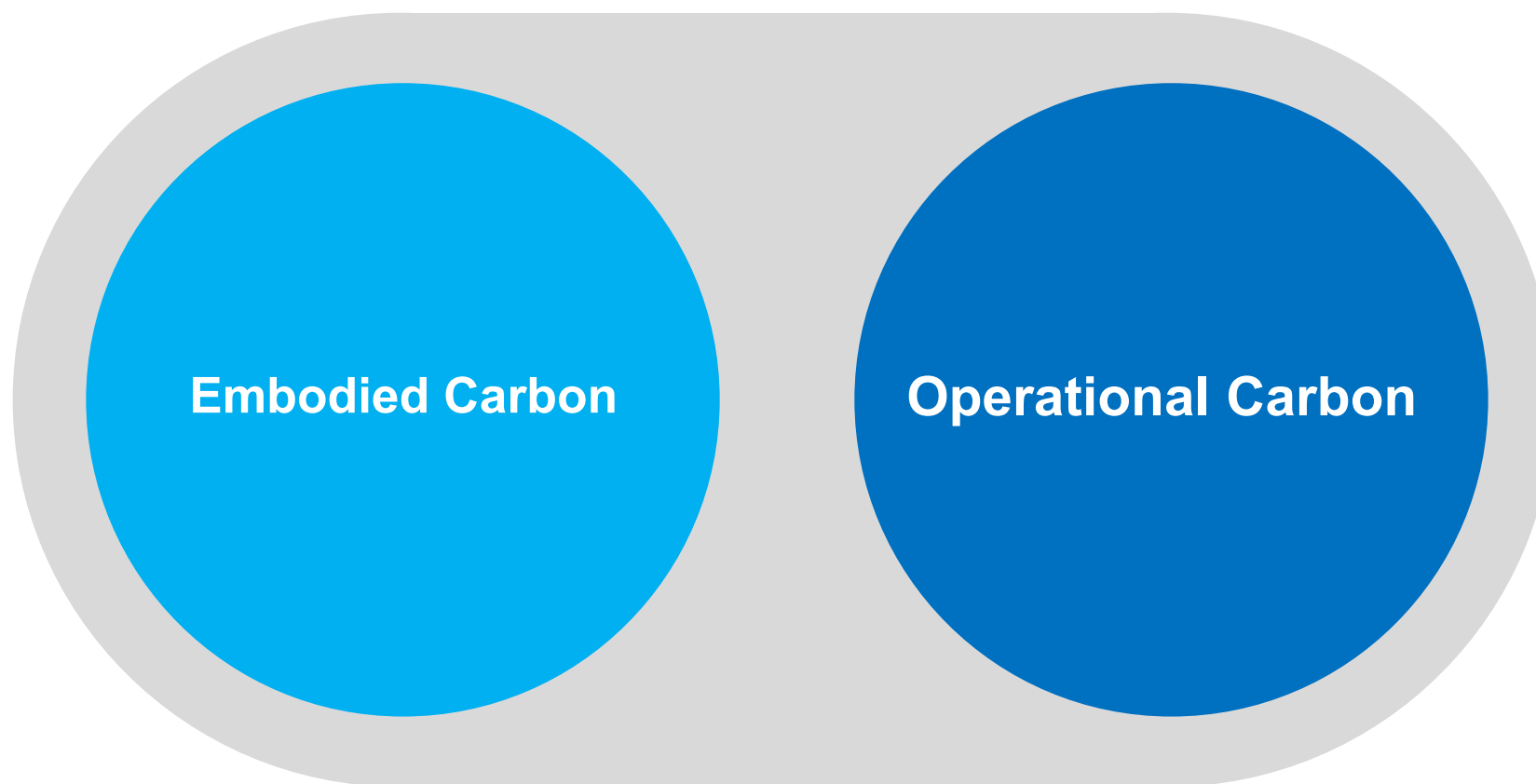
To prevent catastrophic climate change, all economic sectors must take complex action quickly

By 2030 all new and refurbished buildings must:

- be **net zero** in operation
- achieve **40% reduction** in embodied carbon

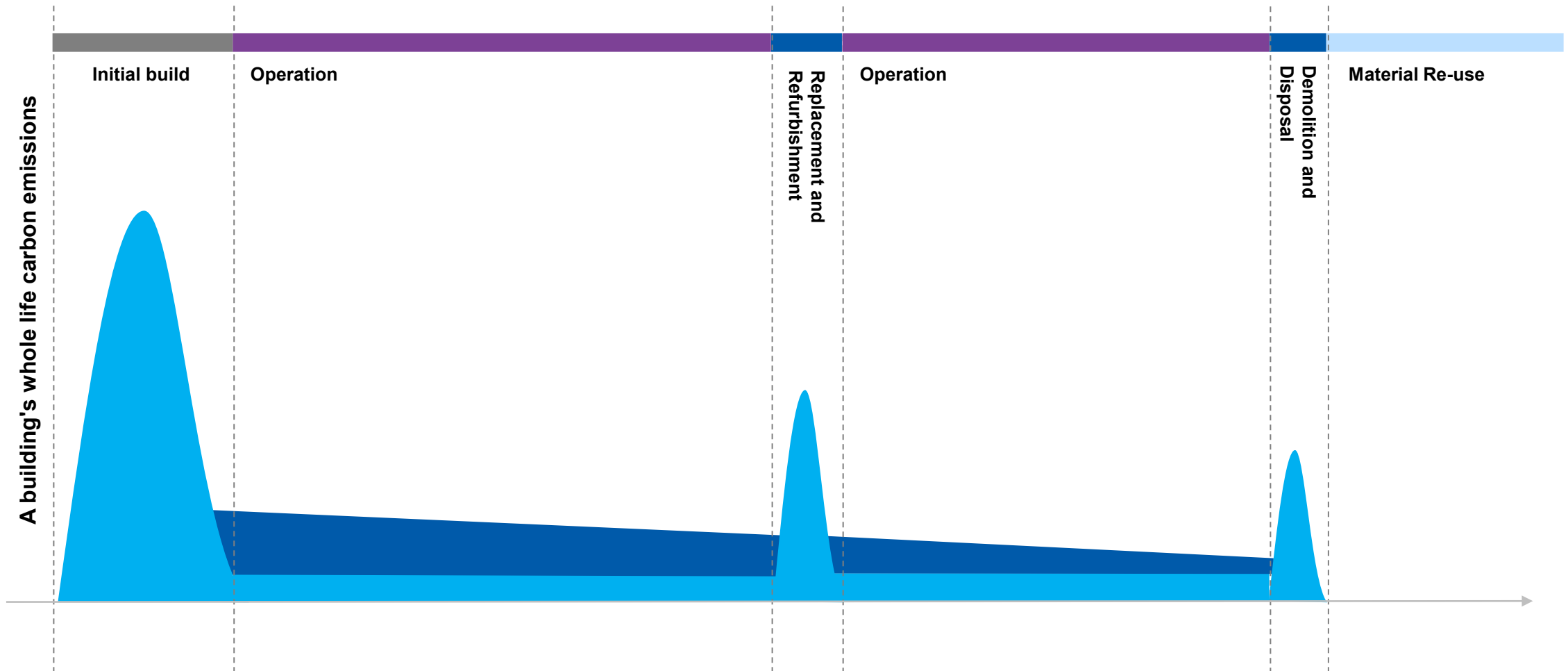
Whole life carbon emissions

The metric that will allow building designers, contractors and asset owners to scale net zero buildings



Accounting for the future

Whole life carbon tracks emissions generated across a building's lifespan



A whole building approach

Whole life carbon accounts for all primary elements of a building

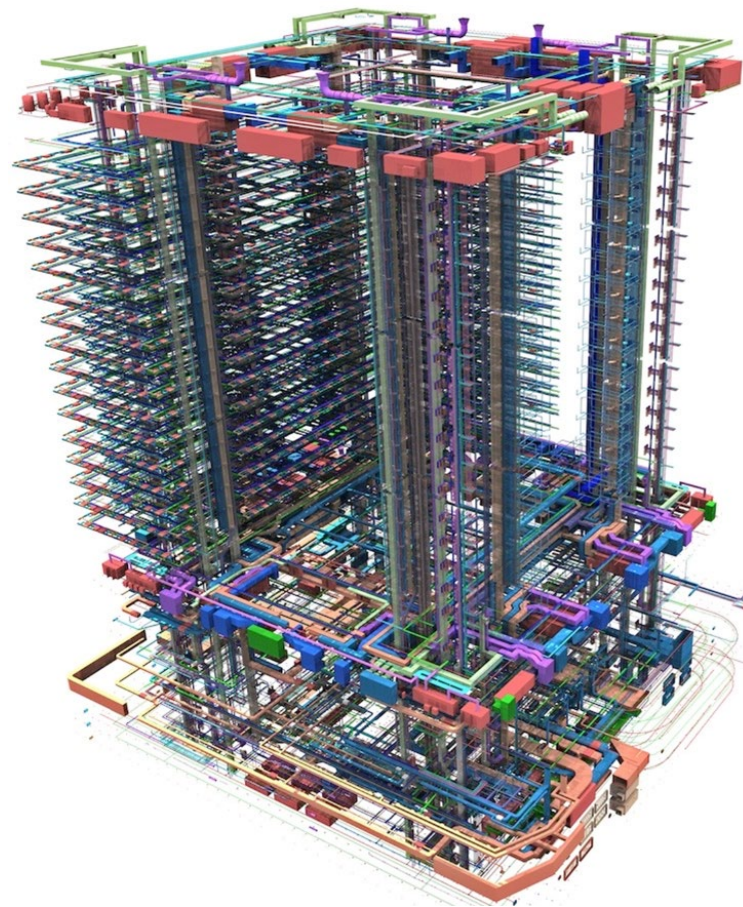
Envelope

MEP

Superstructure

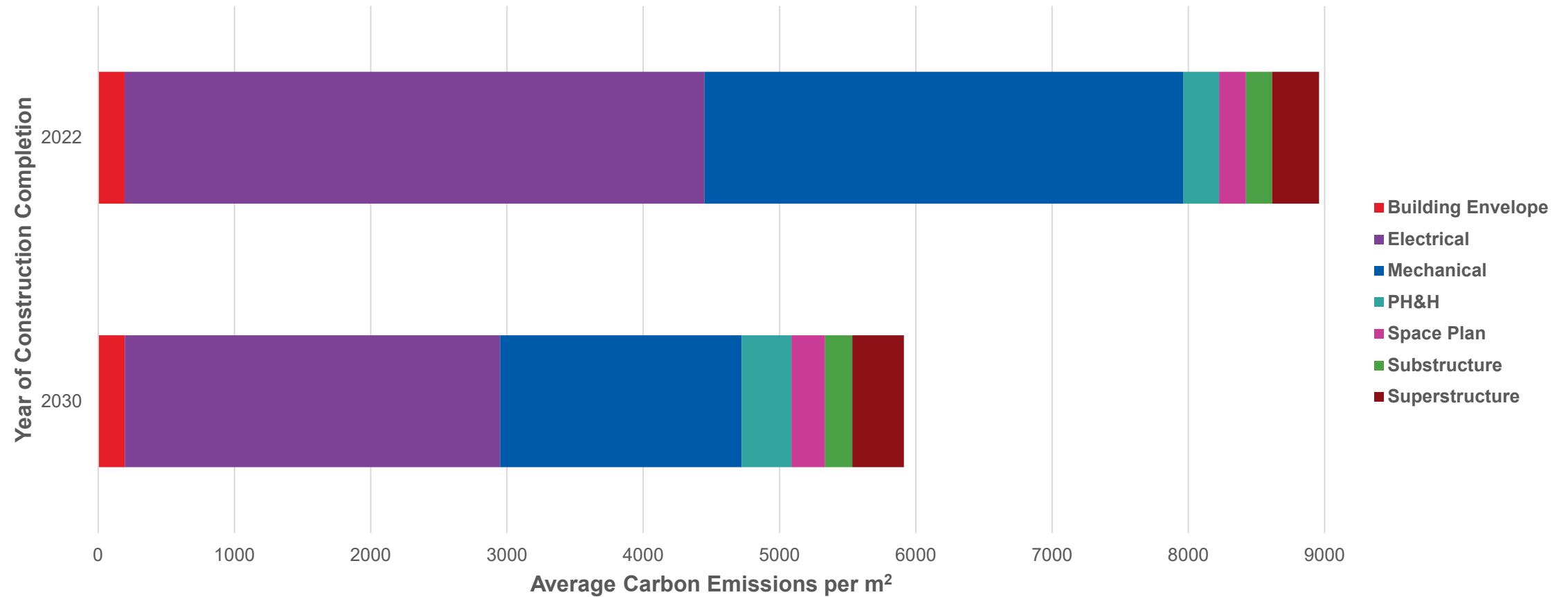
Substructure

FF&E



Whole building emissions

Average carbon emissions per m² by year of construction completion



Grid decarbonization carbon reductions are not incorporated in the data.

Why we built **Zero**:
The world needs
whole life carbon data

Decarbonization begins with reliable data

How to kickstart net zero buildings? Use comparable emissions data to make sound decisions

1

We need data

Removing carbon from existing and new buildings requires us to know when and where emissions are generated, and at what volume. That is what 'whole life carbon' data offers.

2

Absence of global data

Whole life carbon data for buildings remains extremely limited, highly variable in quality, and collected in ways that don't allow comparison. This is what prevents building designers, planners, construction firms, and asset owners from implementing net zero plans rapidly and at scale.

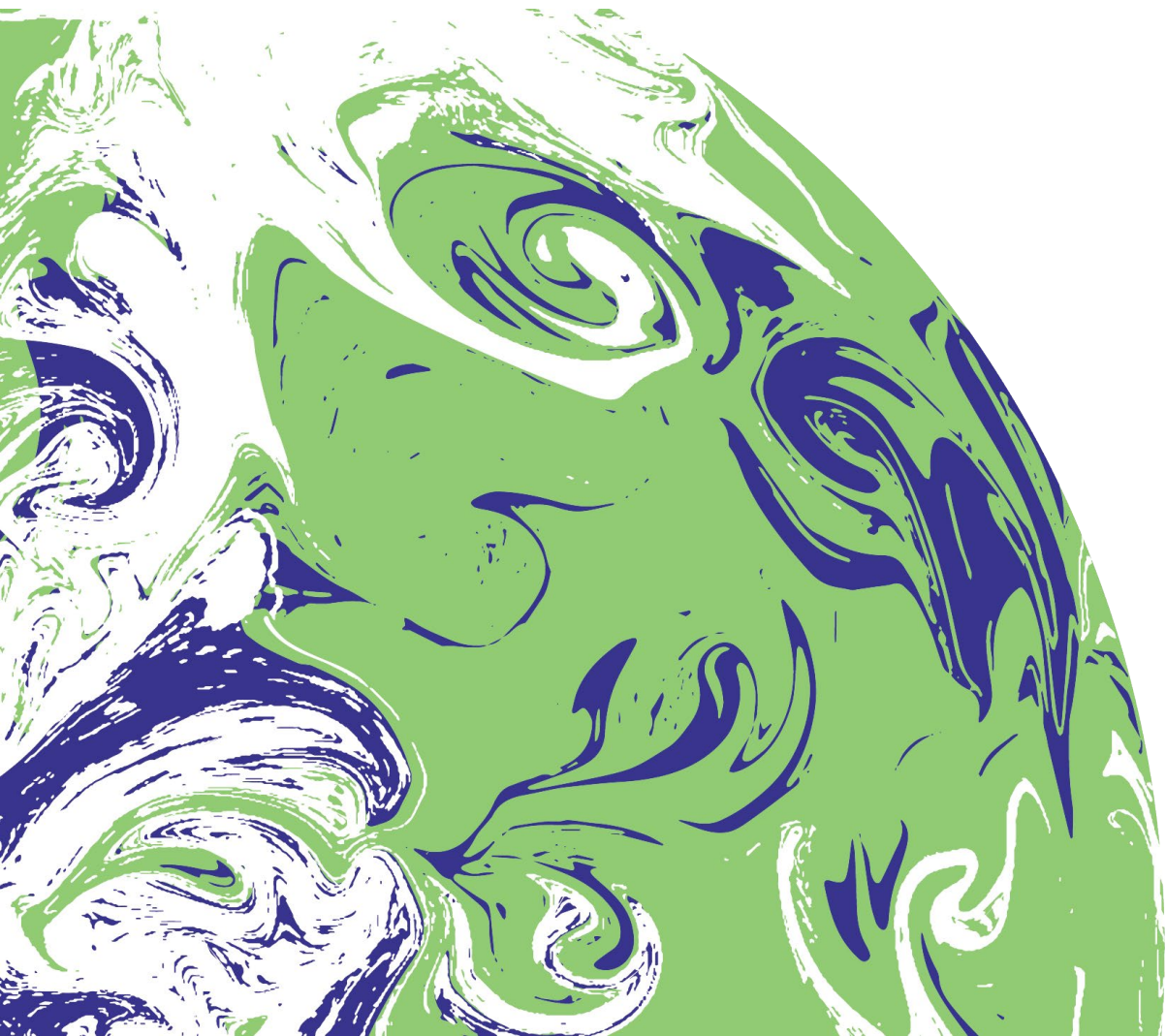
3

Building shared datasets

Large, comparable datasets are the key to enabling net zero carbon buildings to become a reality. Without them, there will be no scaling of net zero buildings. Whole life carbon data will allow us to deliver embodied and in-use carbon efficiencies.

Why Arup committed to whole life carbon

Our COP26 announcement to assess our buildings projects has driven us to innovate



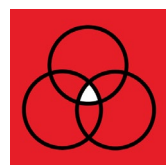
“Arup commits to whole lifecycle carbon assessments for all buildings work and withdrawal from fossil fuels”

www.arup.com

Did we do what we promised?

We built Zero to collect and analyze data about buildings' emissions across their lifespans

Since our commitment in 2021 we have assessed:



950+

Assets



30

Countries



5

Continents



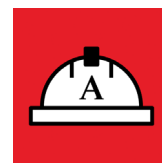
650m

m² gross floor area



16

Building typologies



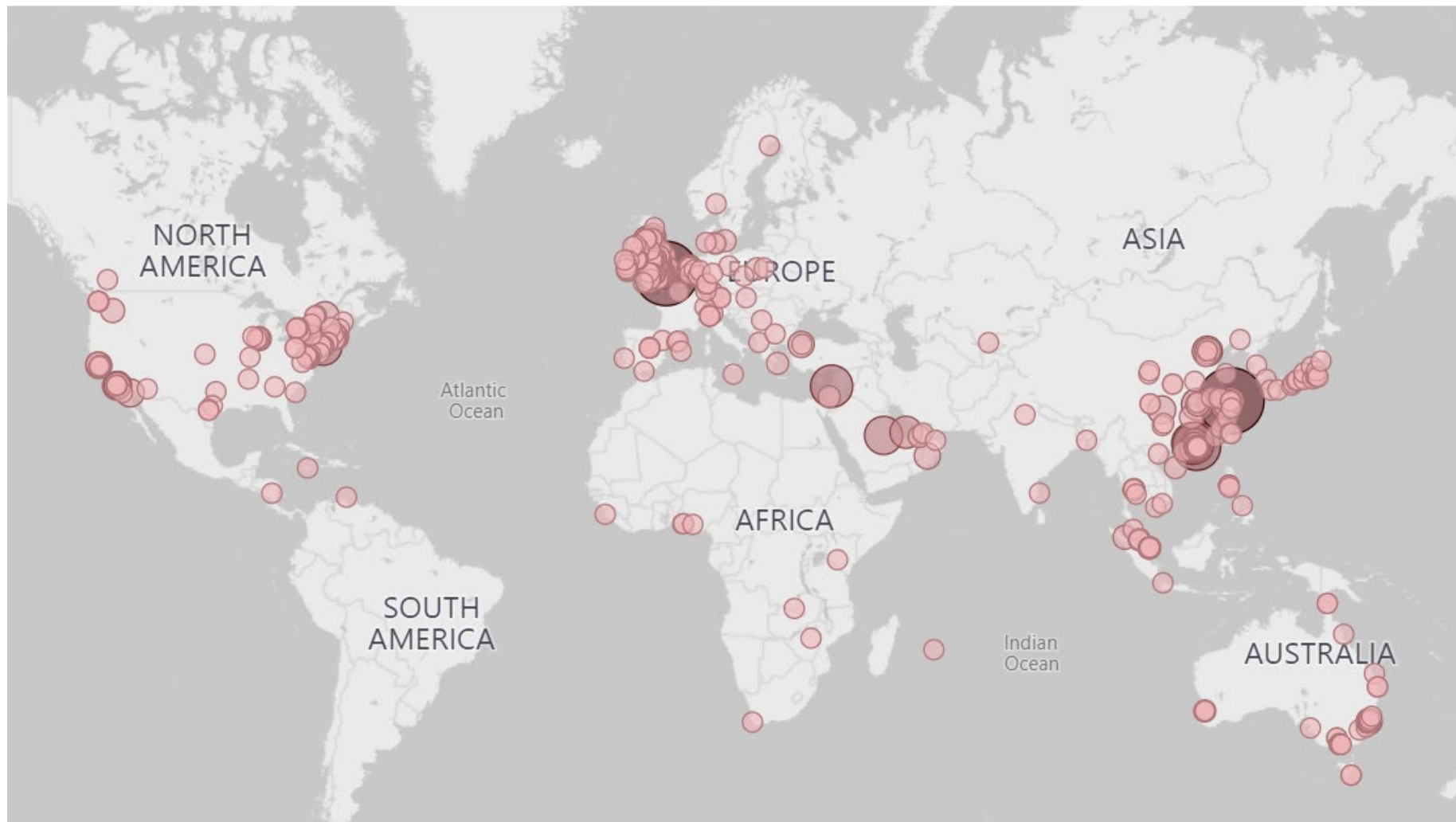
1100+

Arup engineers contributed data

Global spread of our Zero building assets

954

**Assets across
five continents**



Arup engineers' participation in data collection

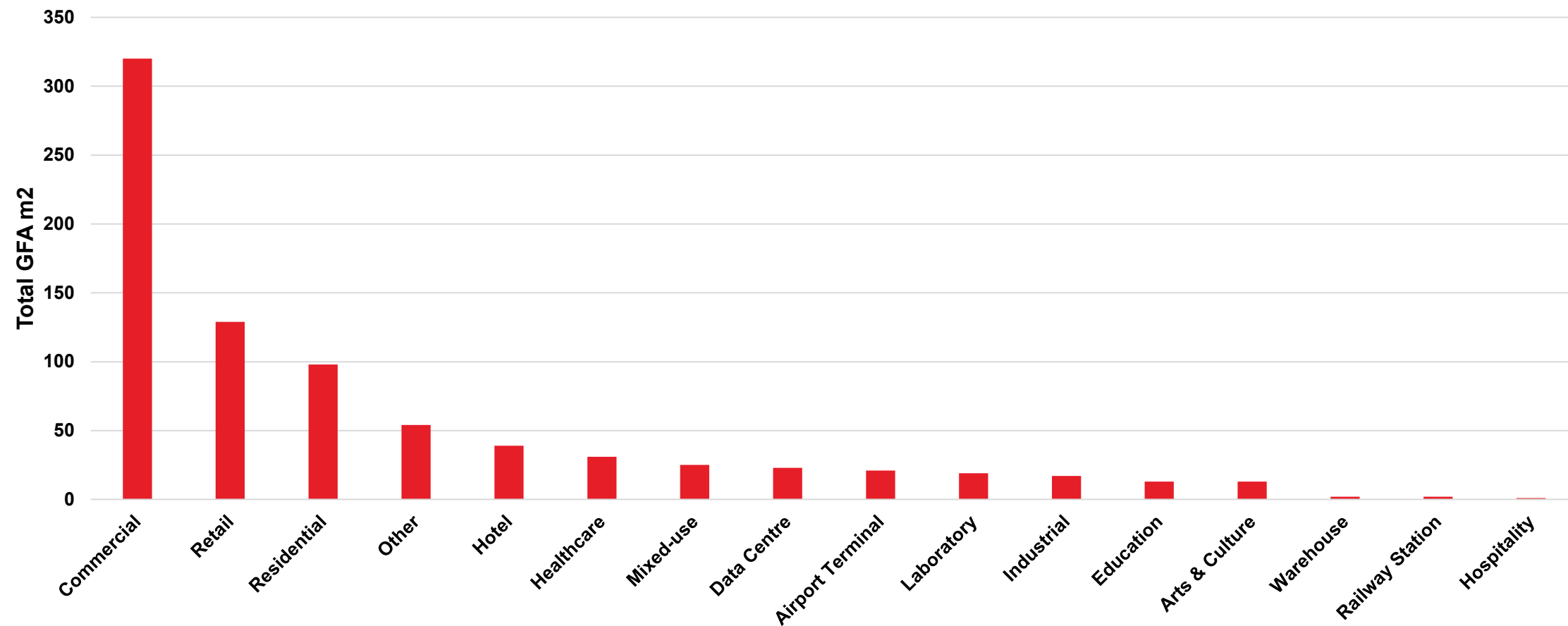
1174

**Project engineers
and design team
members**



Variety of occupancy and functions

Total Gross Floor Area in m² by asset function



Zero: Six things
we learned from our
whole life carbon data

Insight 1: Our carbon handprint

We are beginning to measure the scale of the climate impact of our services

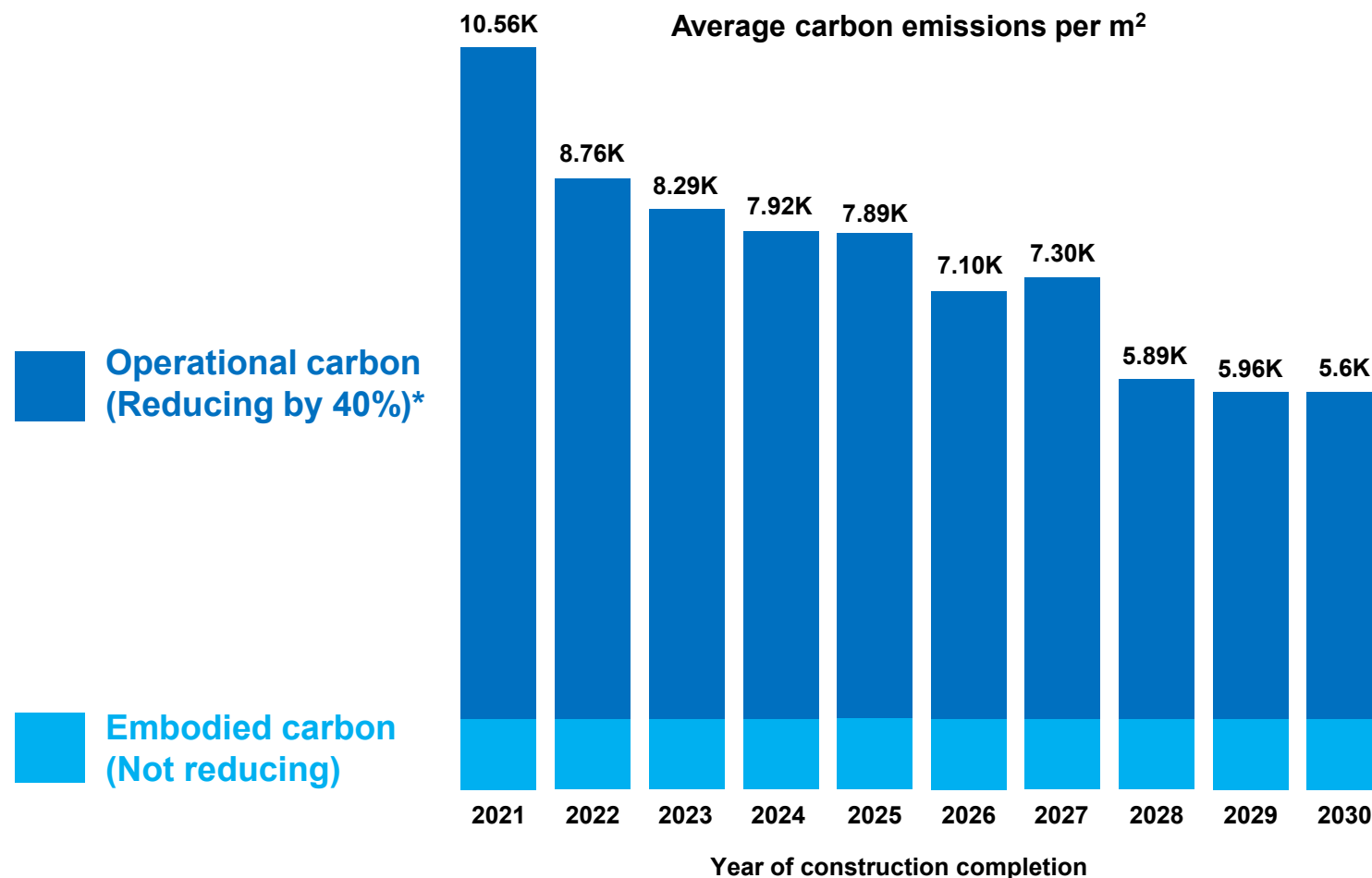
Our carbon footprint
(Scope 1,2,3 emissions)



Our carbon handprint
(Anticipated whole life carbon emissions arising from Arup's scope of works for building designs completing construction 2022)

Insight 2: Our embodied carbon handprint

Available data does not yet allow future embodied carbon reductions to be estimated with accuracy

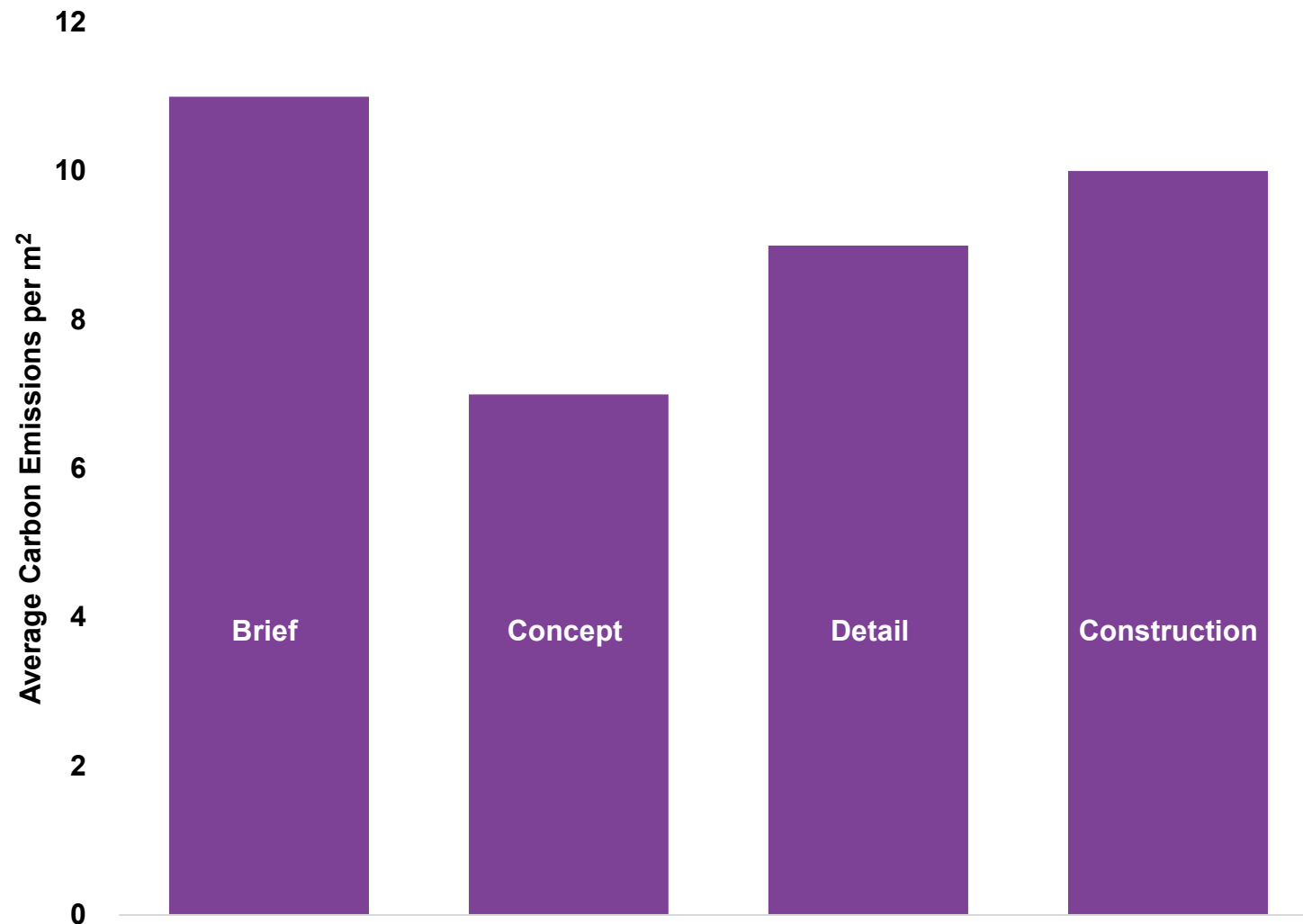


**Note: regionally specific electrical grid decarbonization trajectories are not yet integrated into Zero capability.*

Insight 3: We can see carbon creep

Our data suggests that carbon emissions increase through the design and construction cycle

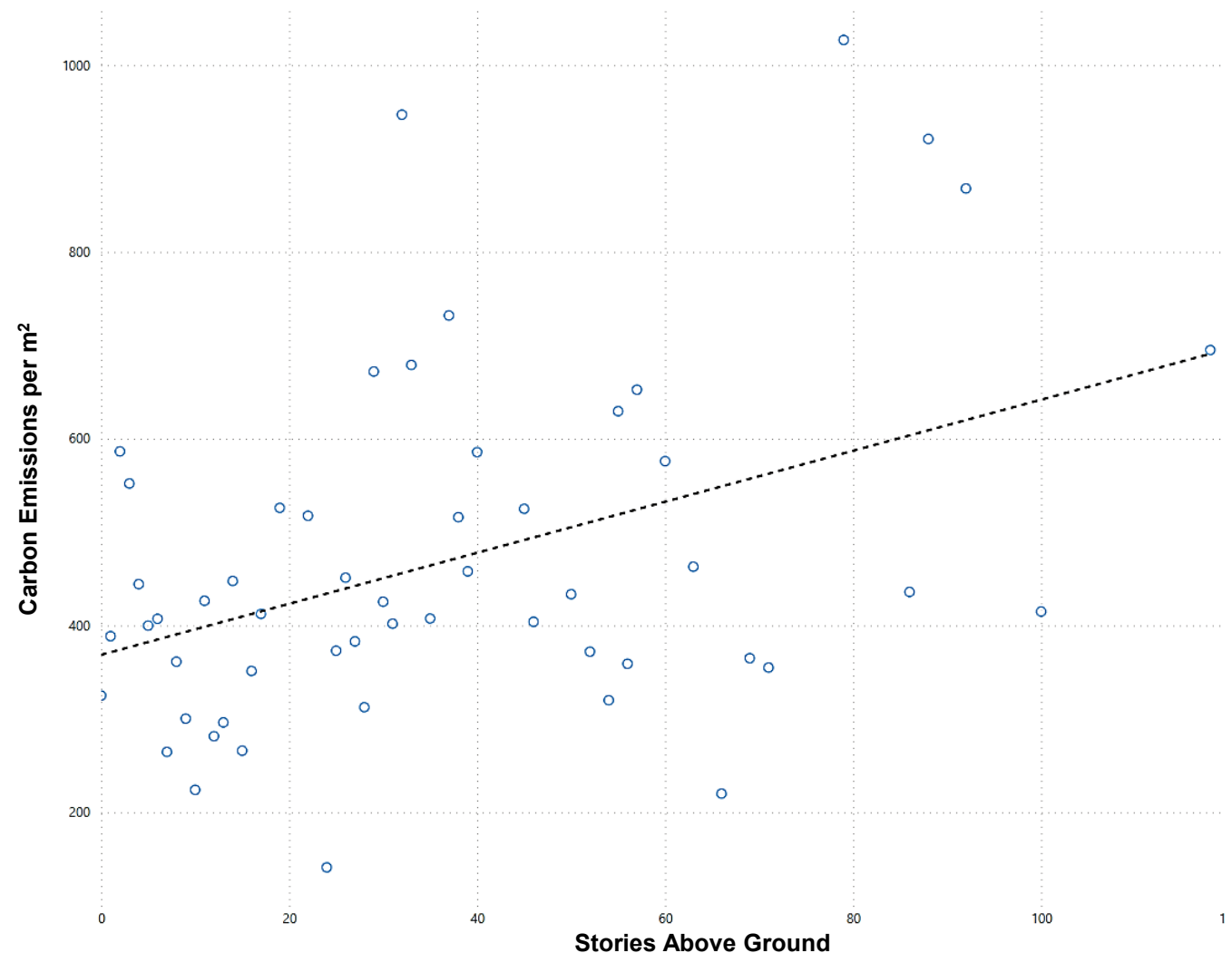
Buildings' whole life carbon is lowest at concept stage, and then creeps up



Insight 4 : We can plot carbon trend lines

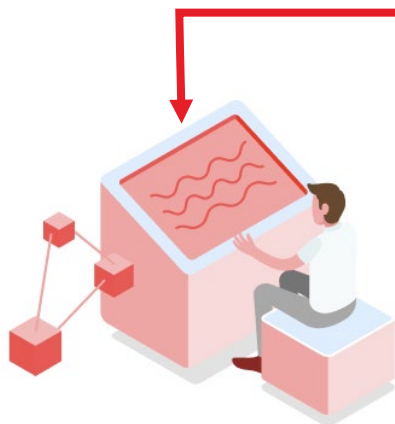
Zero will allow engineers to see if their design is above or below a validated trend line for comparable buildings

Whole life carbon data will allow designers to identify low carbon best practice and to pick out high carbon intensity 'outliers'



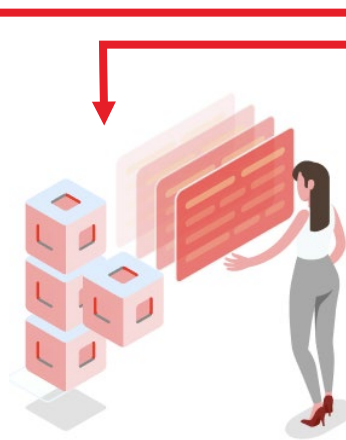
Insight 5: Data for better early-stage decisions

Zero allows detailed data from later stages of projects to build more accurate carbon benchmarks



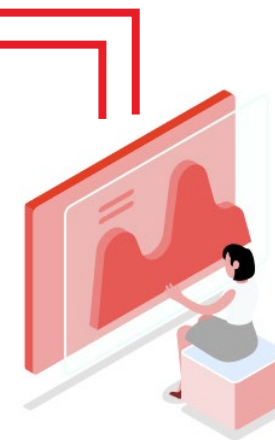
Brief Stage: Benchmark Mapping

Carbon benchmarks are rates of emission per square meter considered to be the minimum to be achieved for assets and systems by region, sector and discipline.



Concept Stage: High Level Assessment

High level whole life carbon assessments built by users selecting representative components and assemblies from libraries. These incorporate typical quantities, materials and emission values for products, systems, materials and utilities based on geography.

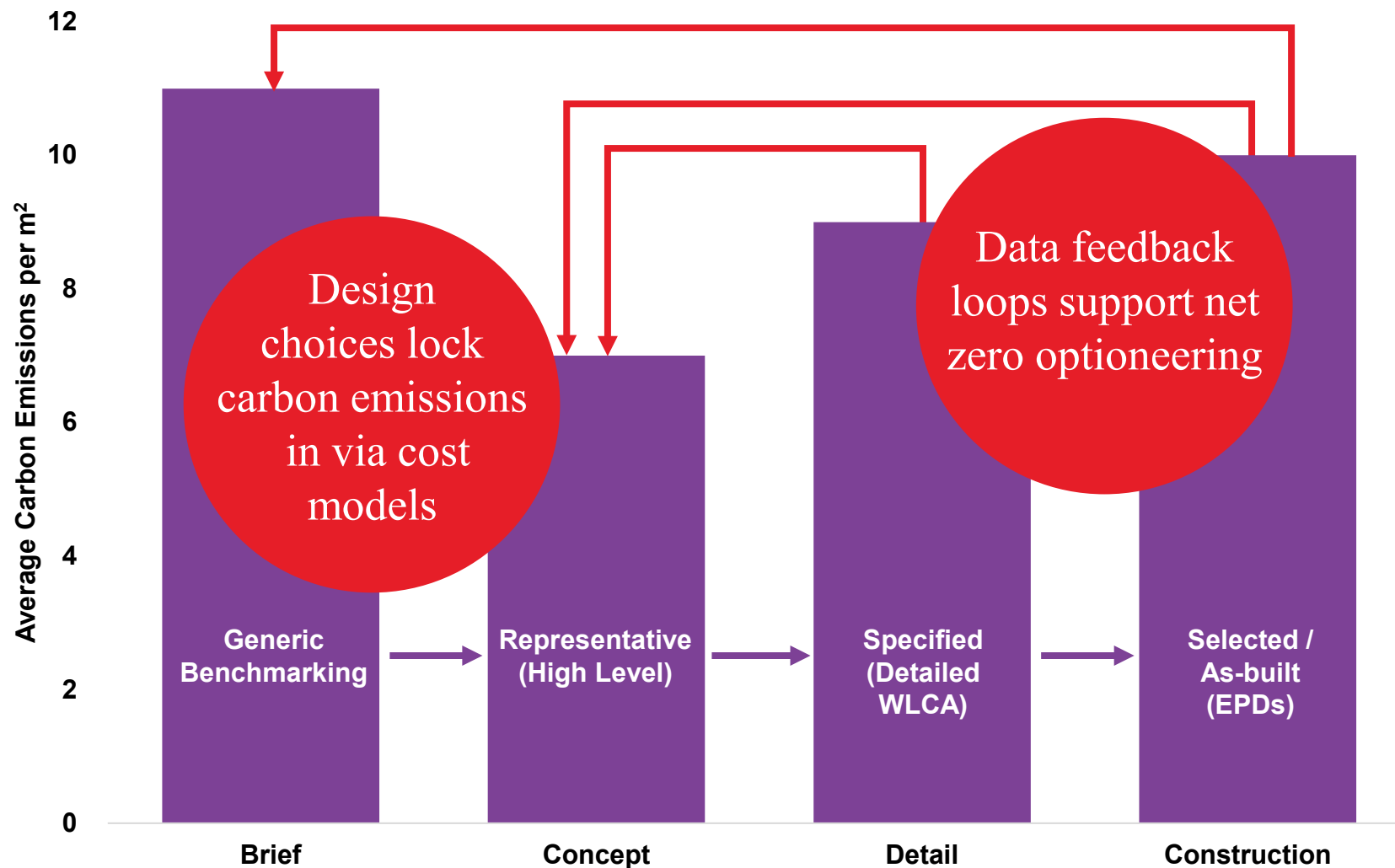


Detailed Design Stage: Detailed Assessment

Zero allows users to upload results of detailed lifecycle assessments once they have been completed by designers or consultants in verified tools at the end of a design phase. This is crucial to setting future benchmarks for the brief stage.

Insight 6: We need more industry data

Early design decisions need to be informed by aggregated data derived from construction stage emissions

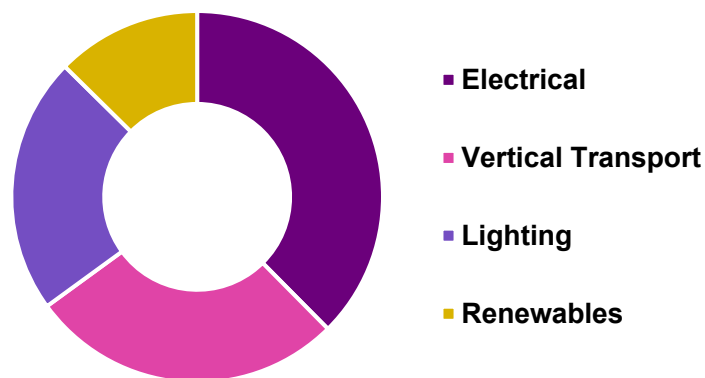


Zero: Two things we've
seen in the data that are
focusing our research

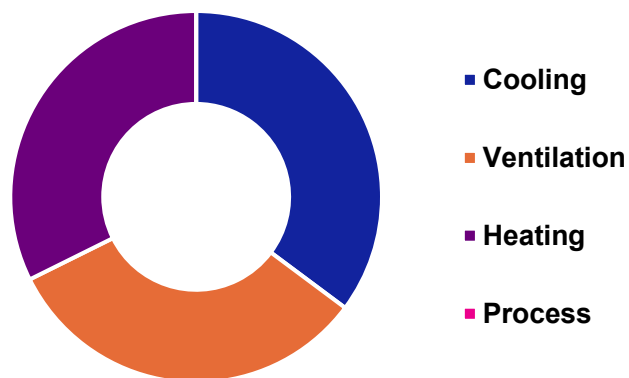
Observation 1: Carbon splits by sub-system

Relative proportions of embodied carbon by building sub-system indicates where to focus future research

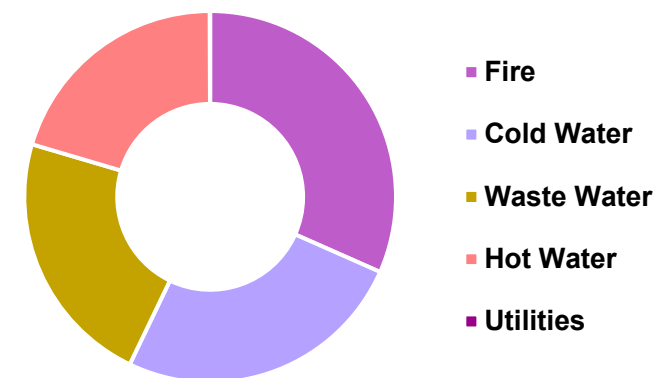
Electrical



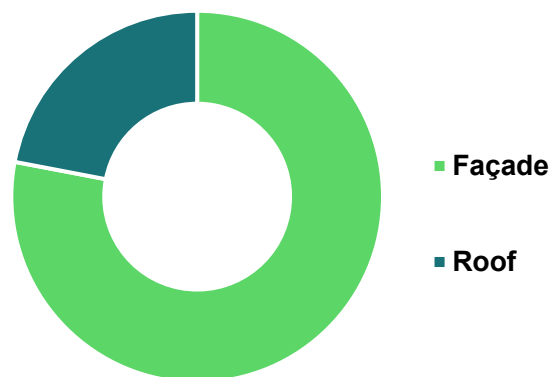
Mechanical



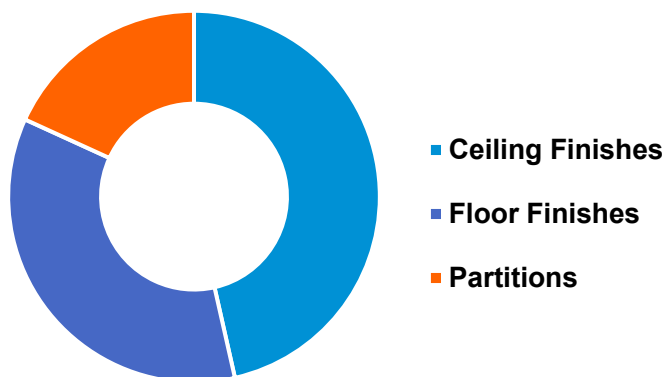
Public Health



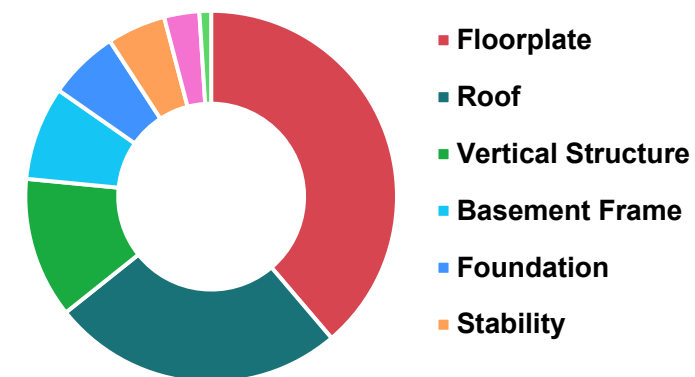
Building Envelope



Architecture

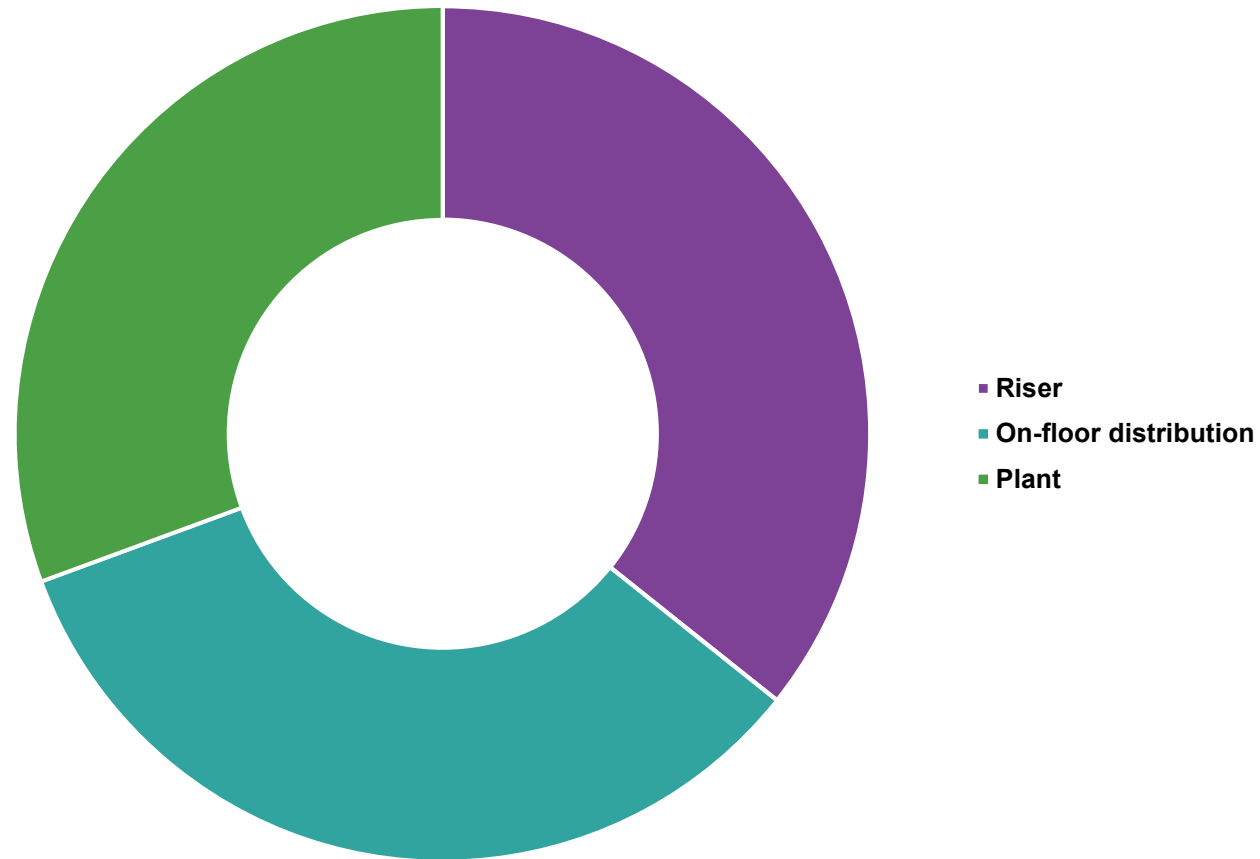


Structural



Observation 2: MEP embodied carbon

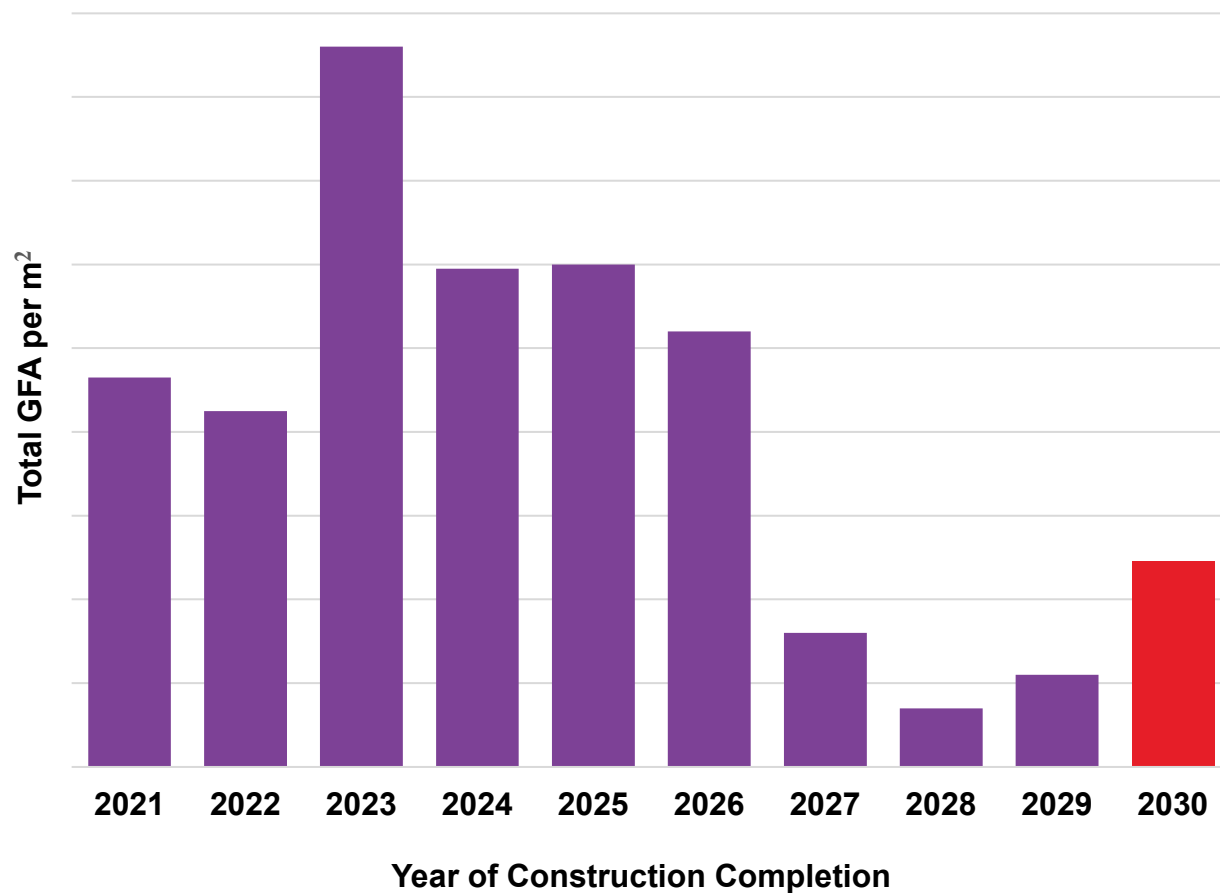
Poor visibility of MEP material data is limiting decarbonization innovation, particularly for distribution



Join us: **Let's create** global,
comparable + open whole
life carbon data for buildings

We're already designing for 2030

There is no time to lose if the building design, construction and property sectors are serious about net zero



We are not alone.
The whole building
design community is
already designing
projects for completion
in 2030

What does this 'decade of action' really mean?

To prevent catastrophic climate change, all economic sectors must take complex action quickly

By 2030 all new and refurbished buildings must:

- be **net zero** in operation
- achieve **40% reduction** in embodied carbon

Contact us

To learn more about our whole life carbon work and Zero please get in touch:

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