

# Whose Footprint is that?

## Embodied Carbon and Sustainable Lighting Design

**Nathaniel Jones**

24 May 2022

# Who saves the most carbon?

**Teleconference instead of flying New York to London**

**Adopt a vegan diet**

**Stop driving for one year**

**Reduce embodied carbon in one architect's work for one year by 1%**

# Who saves the most carbon?

**Teleconference instead of  
flying New York to London**

**1,500 kg CO<sub>2</sub>e**

**Adopt a vegan diet**

**2,000 kg CO<sub>2</sub>e**

**Stop driving for one year**

**3,000 kg CO<sub>2</sub>e**

**Reduce embodied carbon in  
one architect's work for one  
year by 1%**

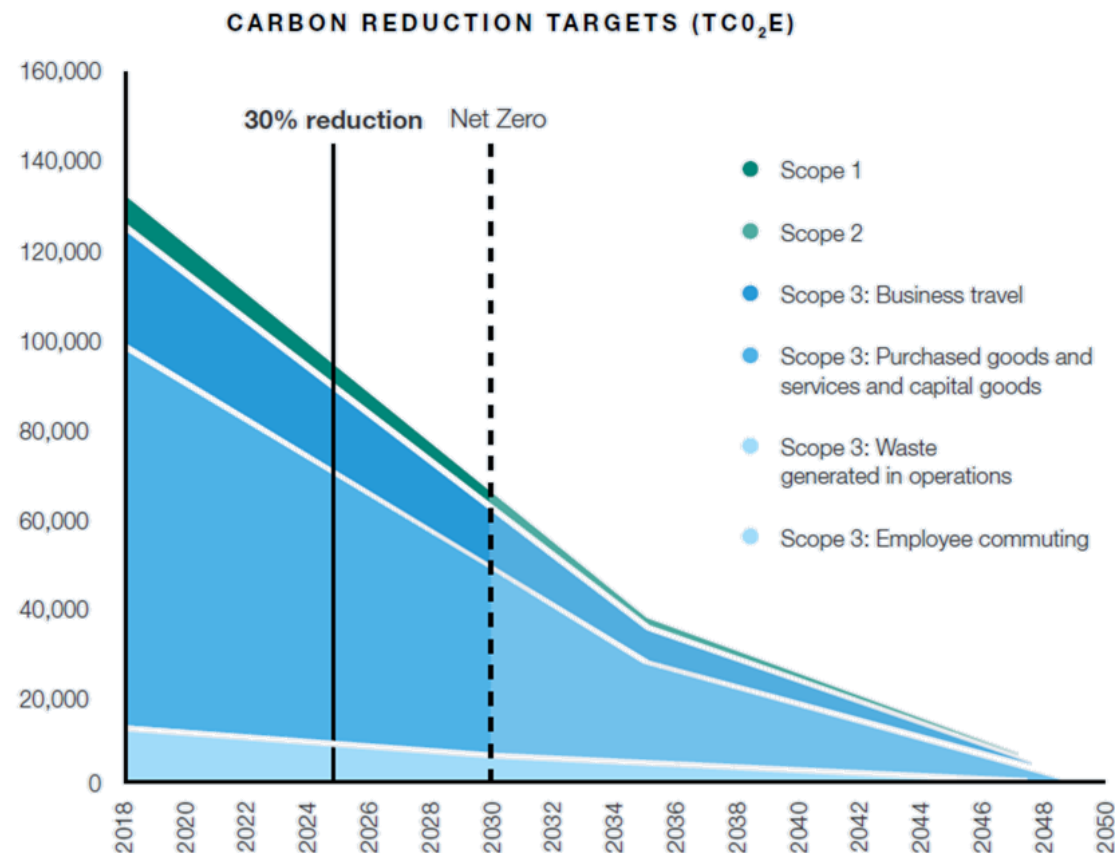
**12,000 kg CO<sub>2</sub>e**

# Our net zero carbon strategy

A better way

At Arup, we aim to reduce our carbon footprint by **30%**

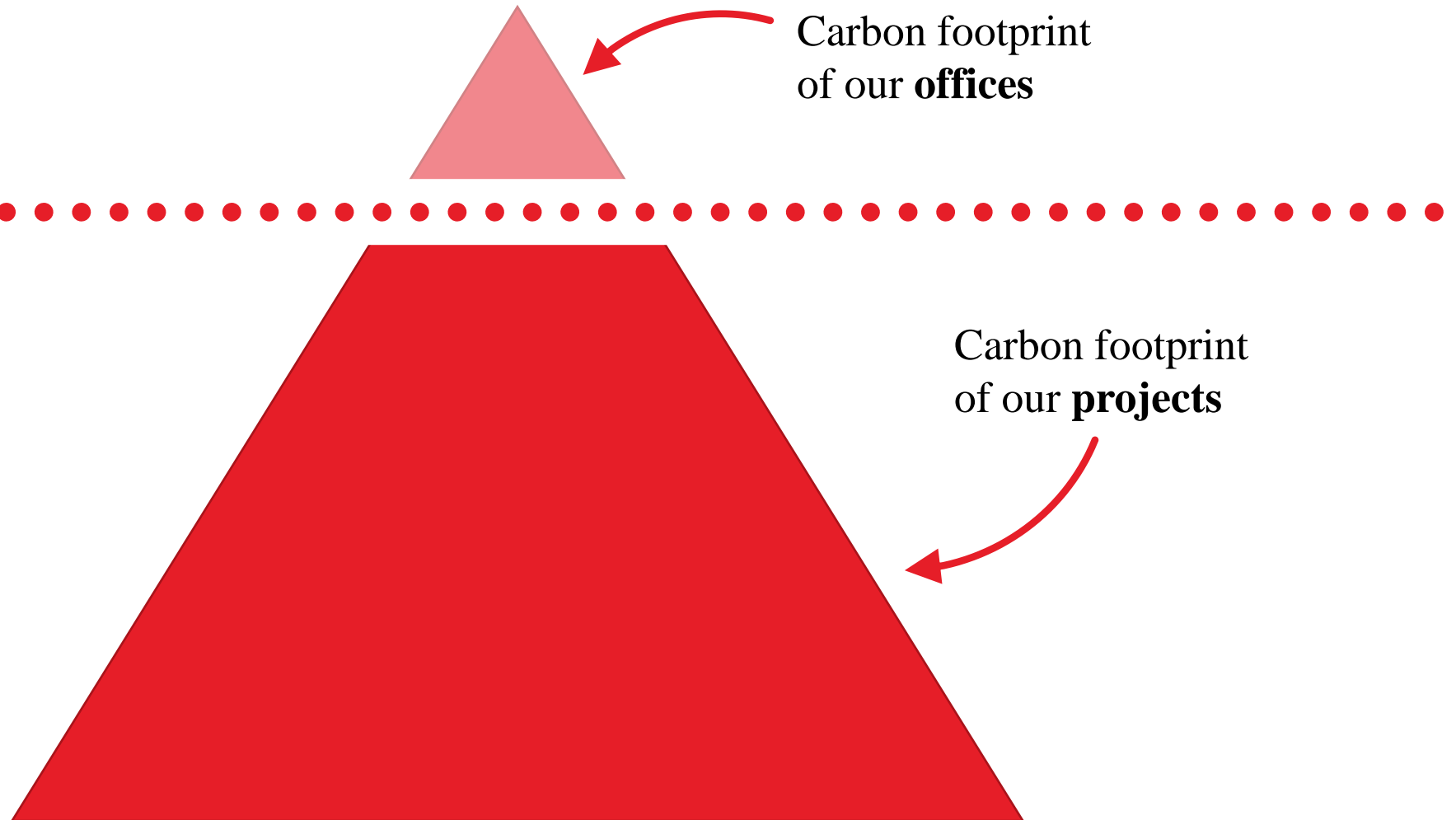
- Reducing purchasing and catering
- Flexible working
- Reduced business travel
- Electric car reliance
- Renewable energy sourcing



# Our reach

Control

Influence



# Arup Zero

## Veracity

Stores non-project information used within the Zero platform

- Benchmarks
- High-level assessment assemblies
- Material factors
- Utility factors
- etc.

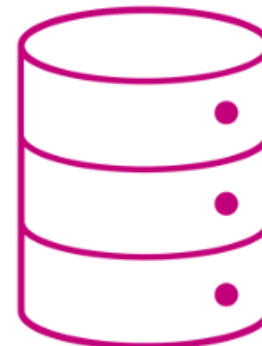


## Zero

UI for carbon data for buildings projects

## Veracity CMS UI

For data owners to manage recommended non-project data

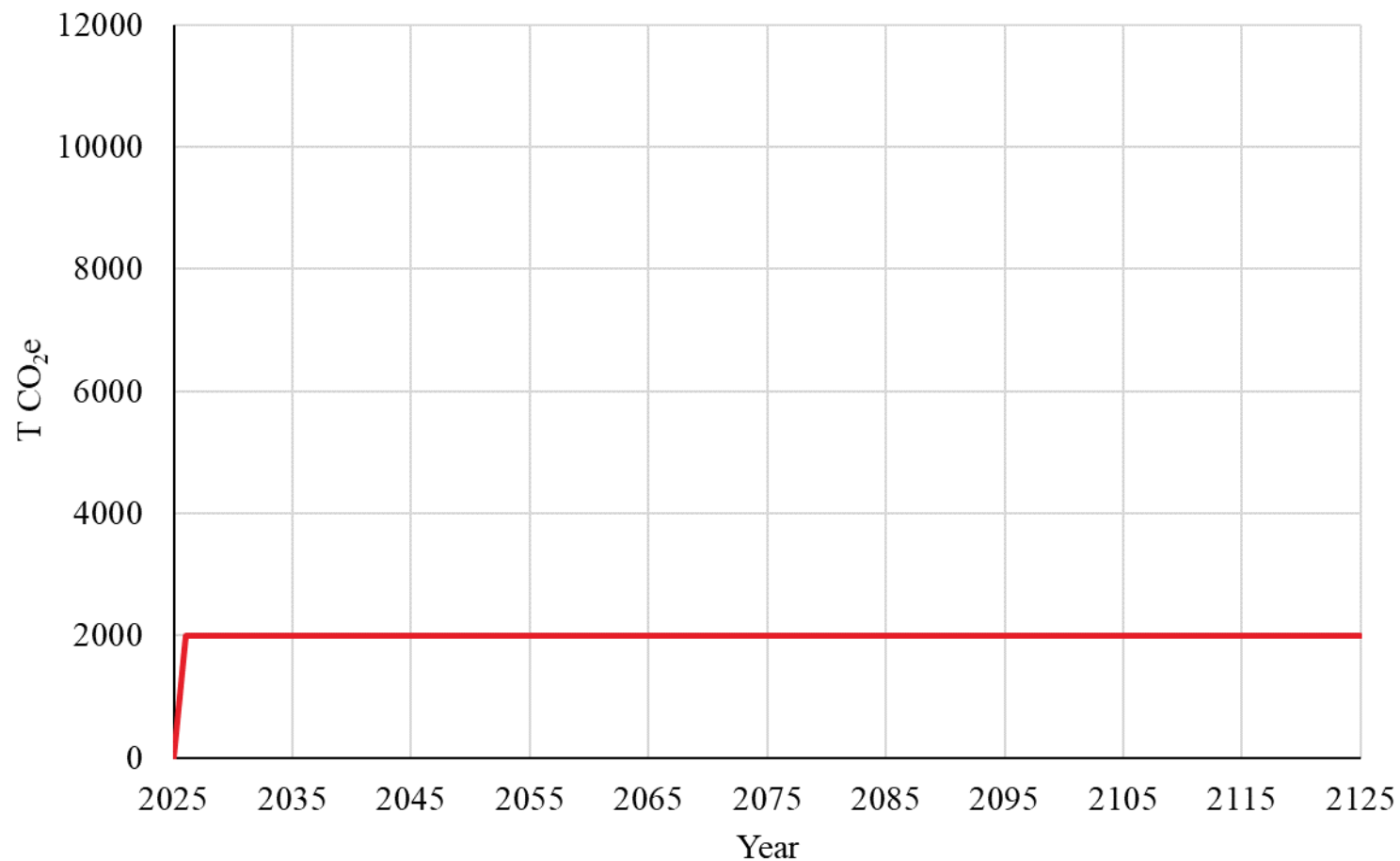


## DDB:

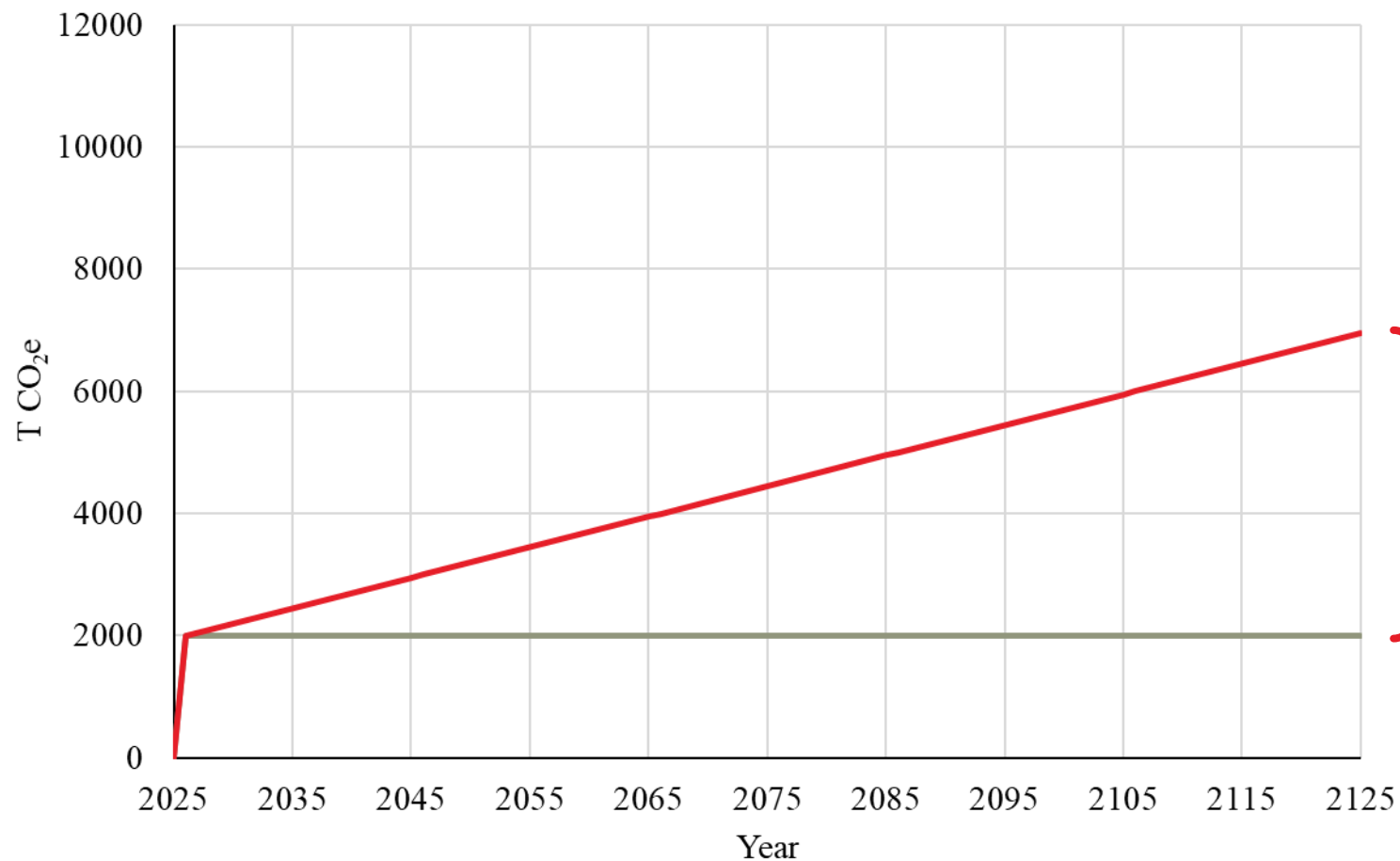
Stores project data created by or submitted through Zero

- Asset structure
- Detailed Assessment output
- High-level assessment output
- Benchmark output
- System meta-data
- etc.

# Life of a building in carbon



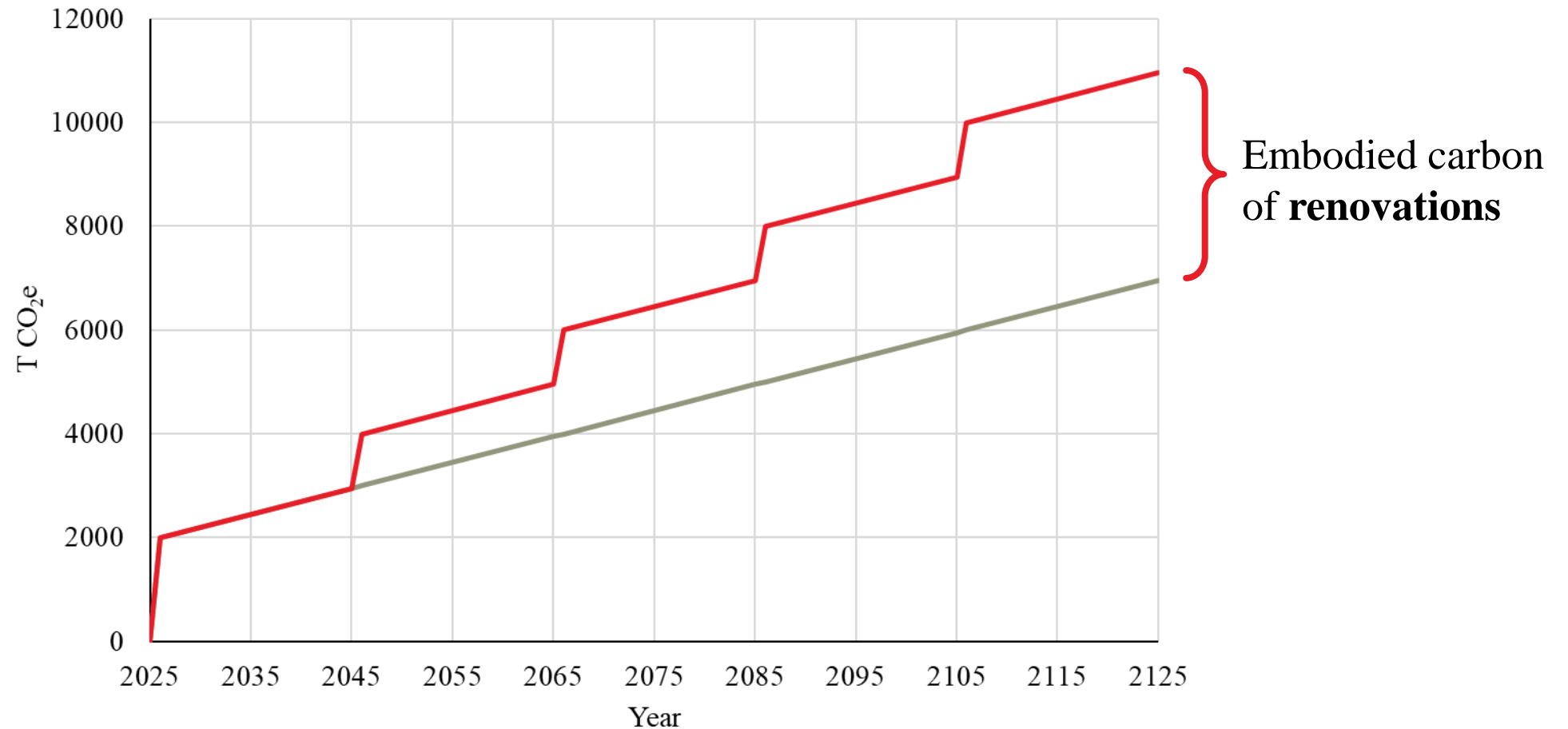
# Life of a building in carbon



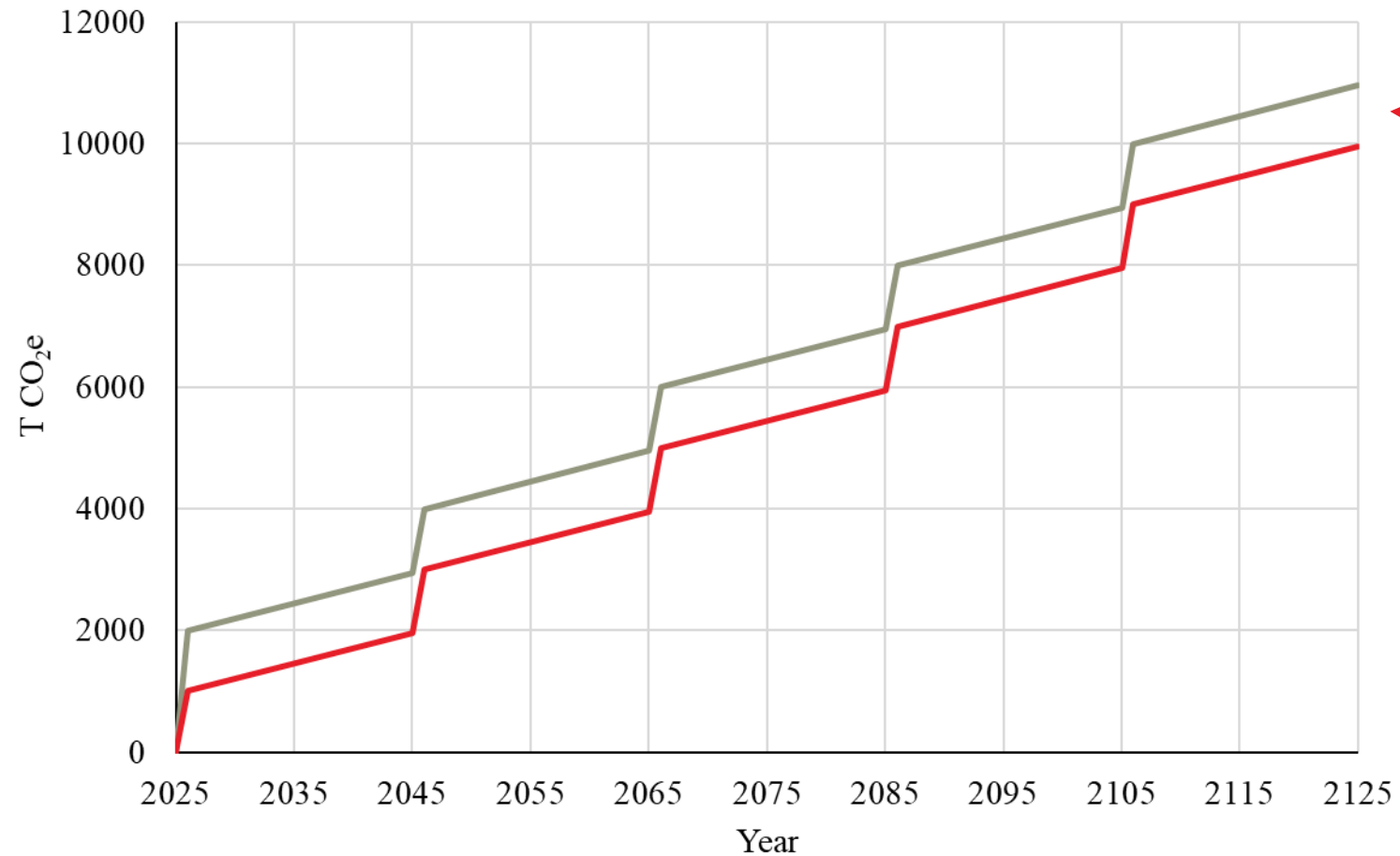
Operational carbon  
accounts for 30 – 70%  
of building's carbon  
emissions



# Life of a building in carbon

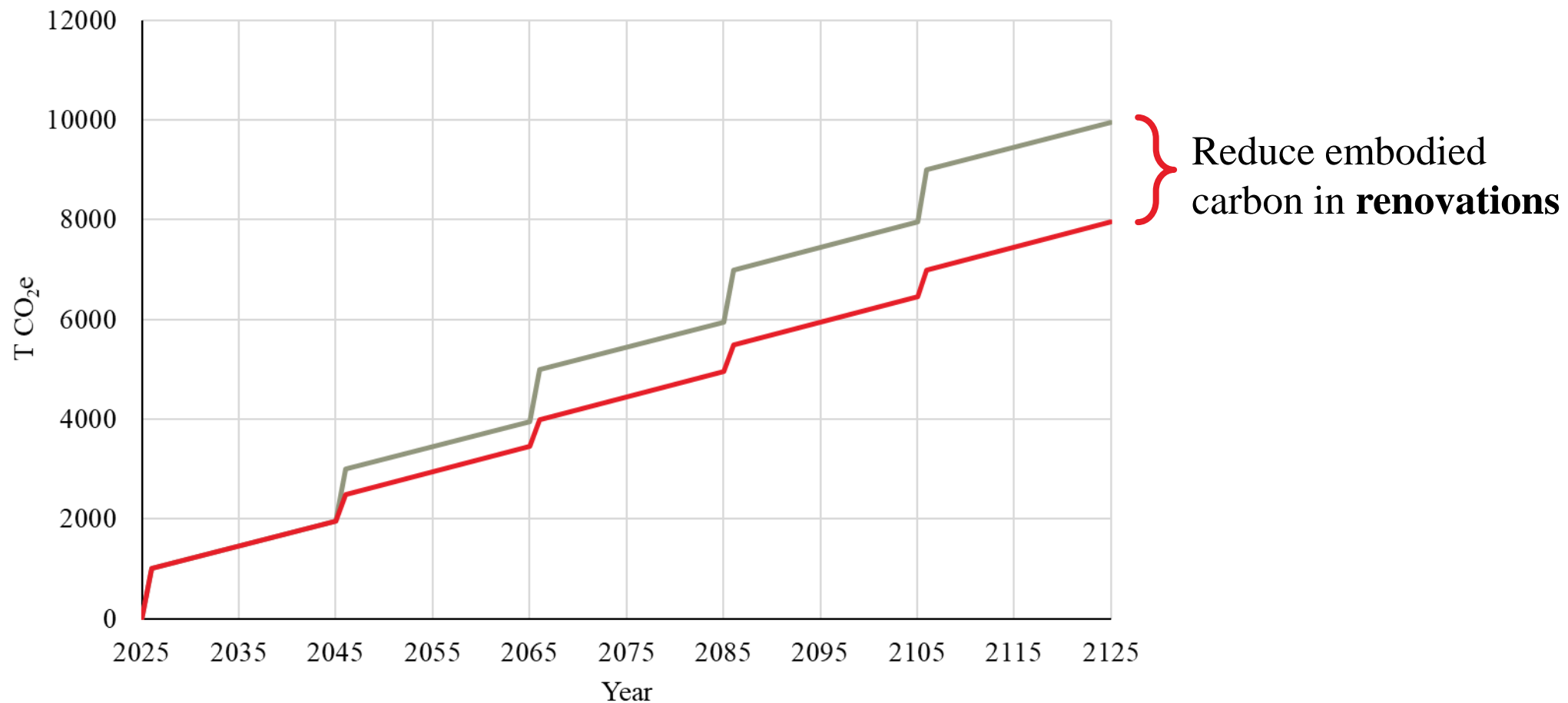


# Life of a building in carbon

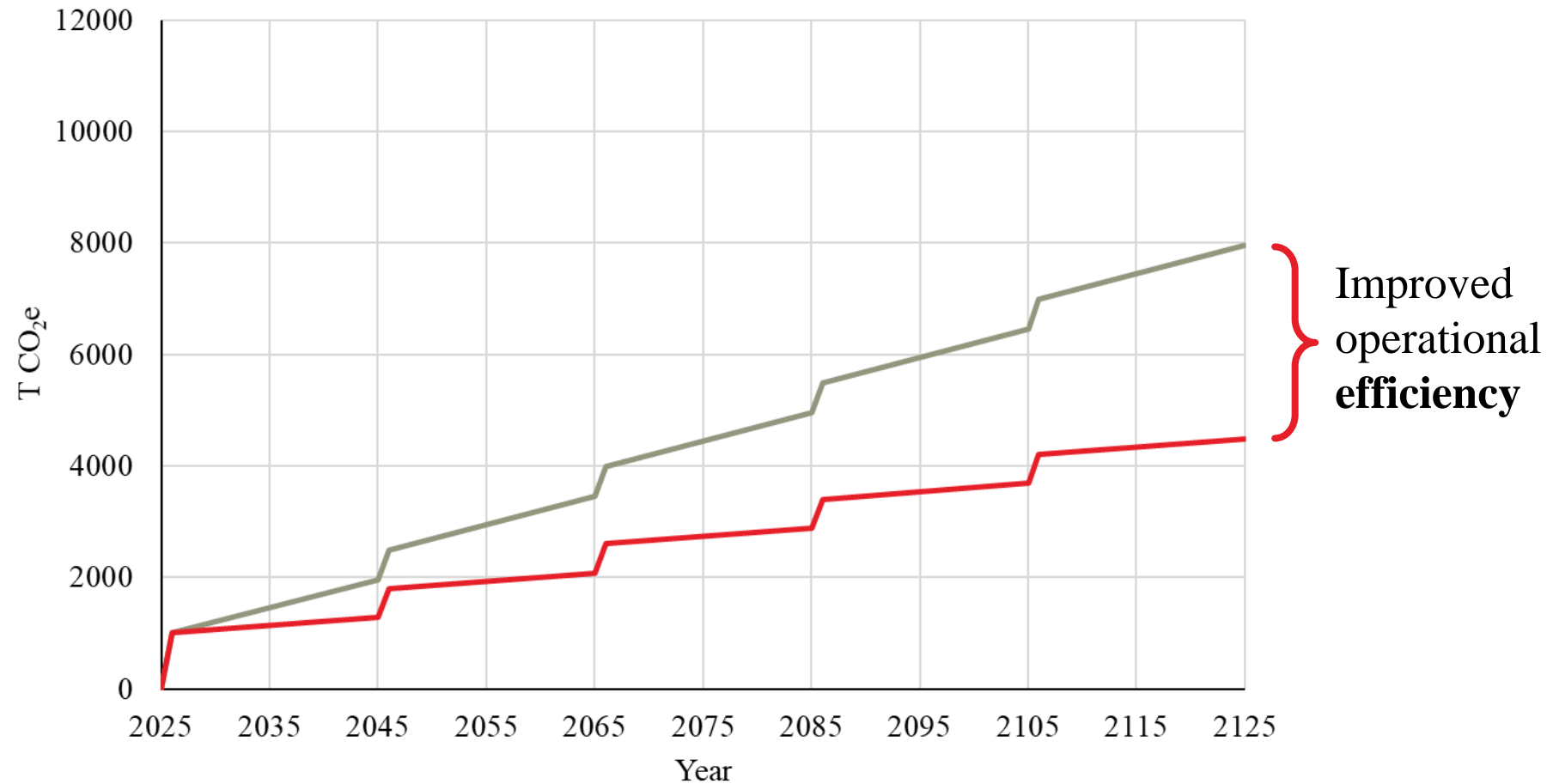


Reduce embodied  
carbon in **construction**

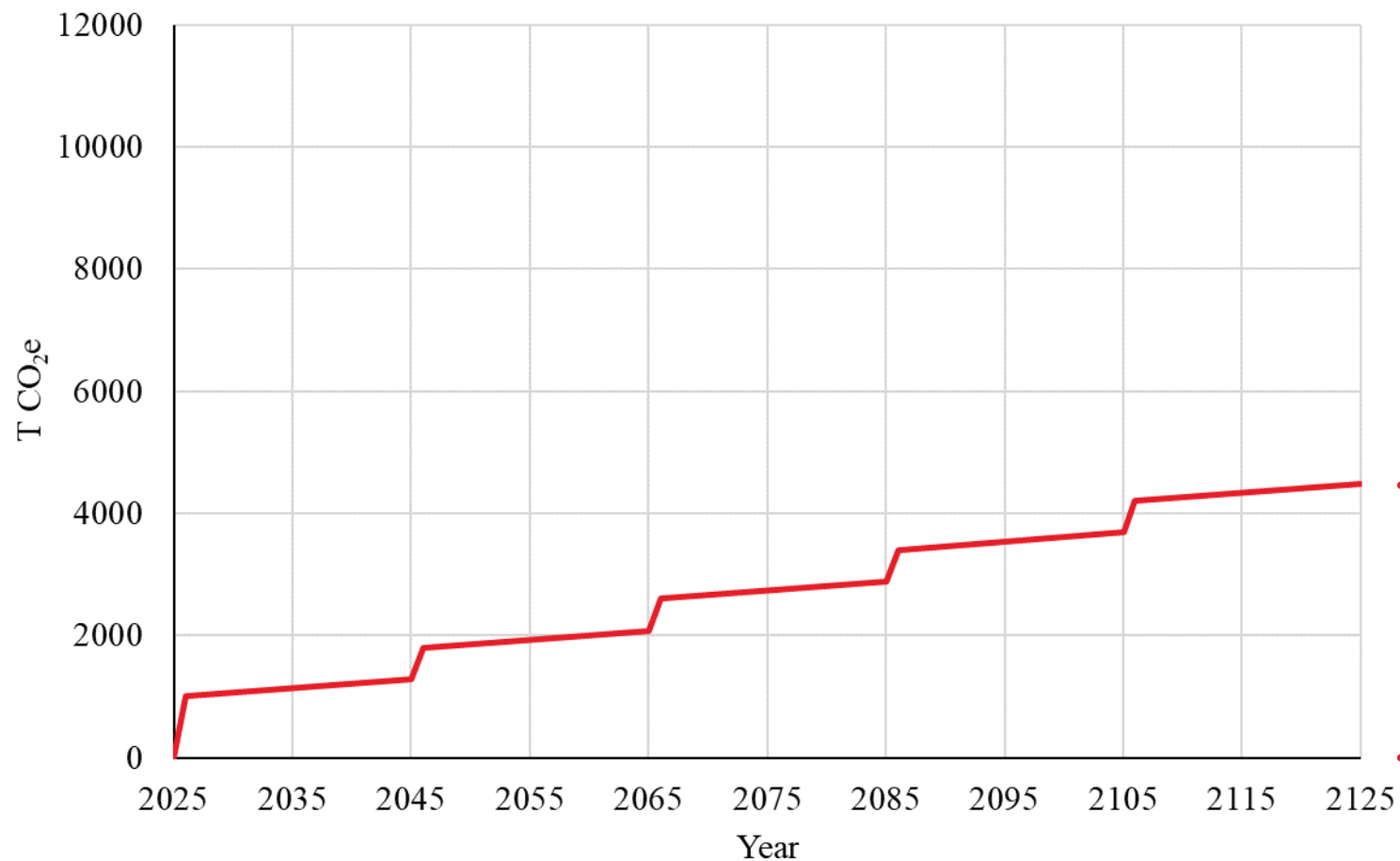
# Life of a building in carbon



# Life of a building in carbon



# Life of a building in carbon



Use **renewables**  
and **carbon offsets**  
to reach **net-zero**

# Circular lighting design principles

## 0. Daylight

Buildings and interiors should be designed for daylight first.



## 1. Circle of lighting materials

Lighting products can be up or down cycled, or, as a last resort, re-cycled.



## 2. An adaptable system

Lighting systems must adapt to changes in layouts, functions and programs.



## 3. Higher flexibility, higher resilience

Lighting must accommodate variable functions and uses throughout the day.

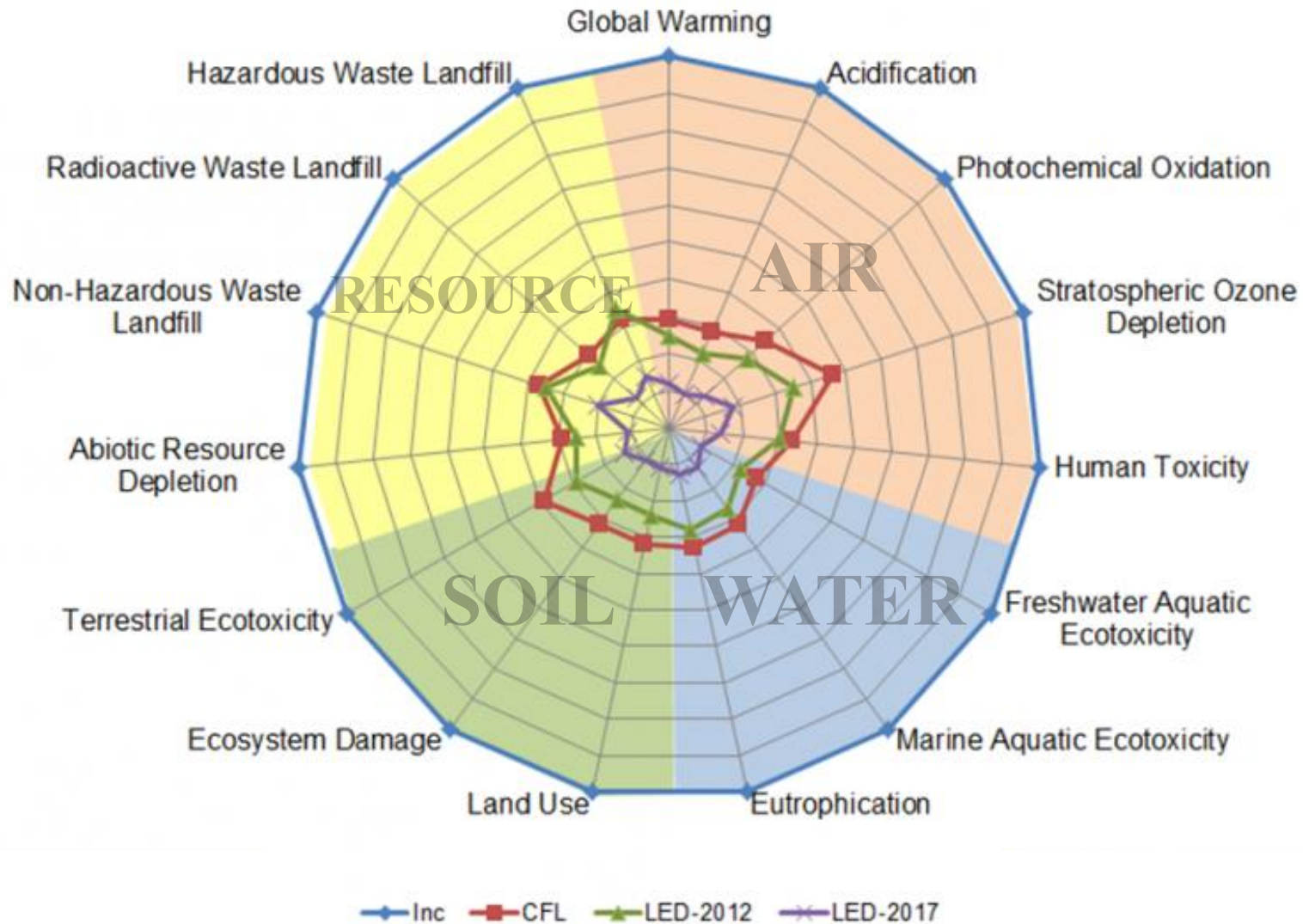


## 4. High quality design

The quality of the lighting design has a significant impact on the longevity of its use.

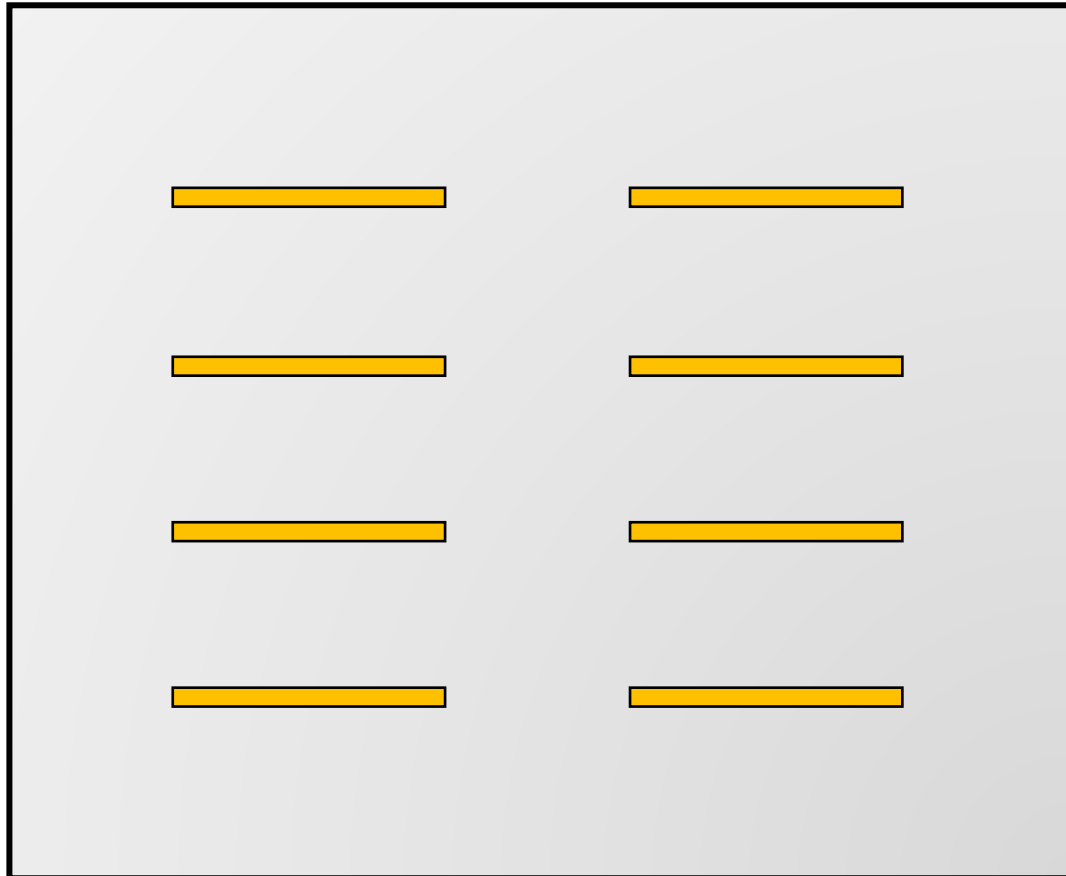


# Why LEDs?

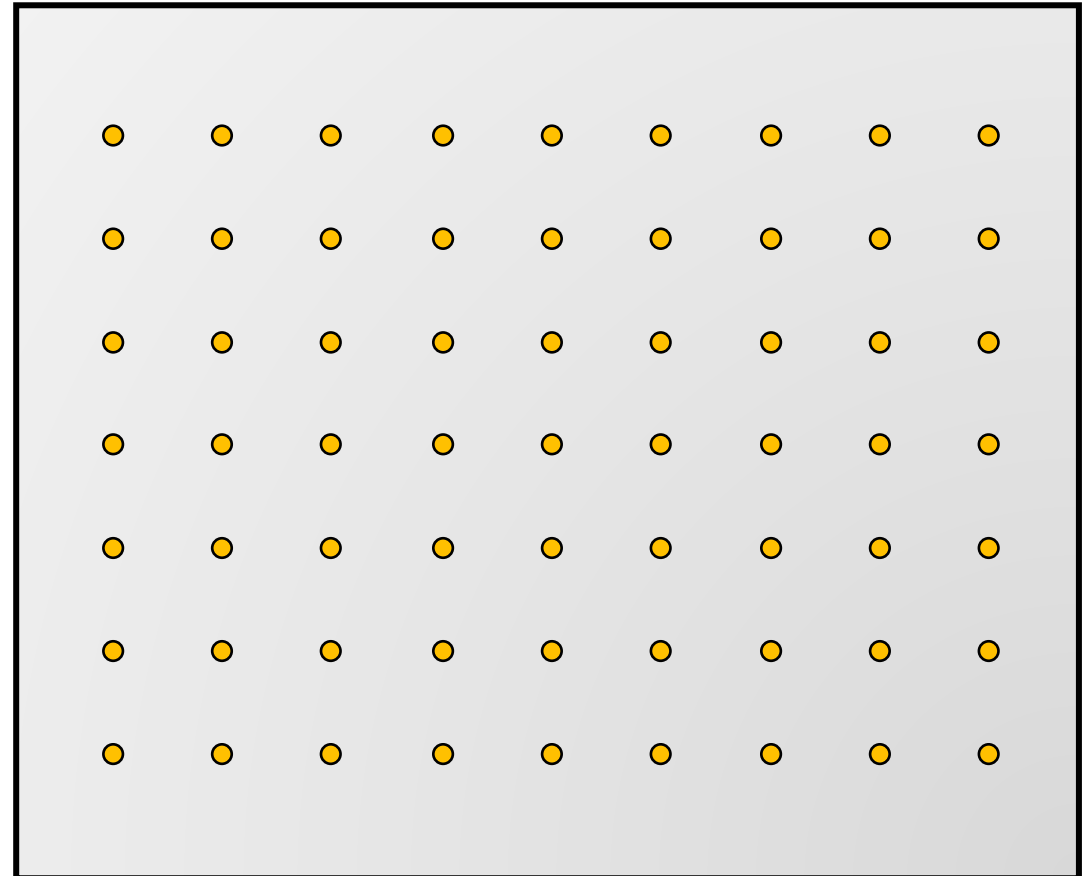


# Fixture selection

## Linear fixtures



## Spot fixtures





# Factory location



# Got an EPD?

Building assessment information (x = included in LCA <b>MND = module not declared</b> )																
Building life cycle information																Supplementary information beyond the building life cycle
Product Stage			Construction Process Stage		Use-stage							End-of-Life Stage			Benefits and loads beyond the system boundary	
Raw material supply	Transport	Manufacturing	Transport to building site	Construction installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Reuse, recovery or recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	<b>MND</b>	<b>MND</b>	<b>MND</b>	X	<b>MND</b>	X	<b>MND</b>	<b>MND</b>	X	X	X	X



# Amorepacific Headquarters

# Development of a modular luminaire system

## Key collaborators

David Chipperfield Architects

## Manufacturer

Viabizzuno

## Key facts

12 different light distributions

30 possible combinations

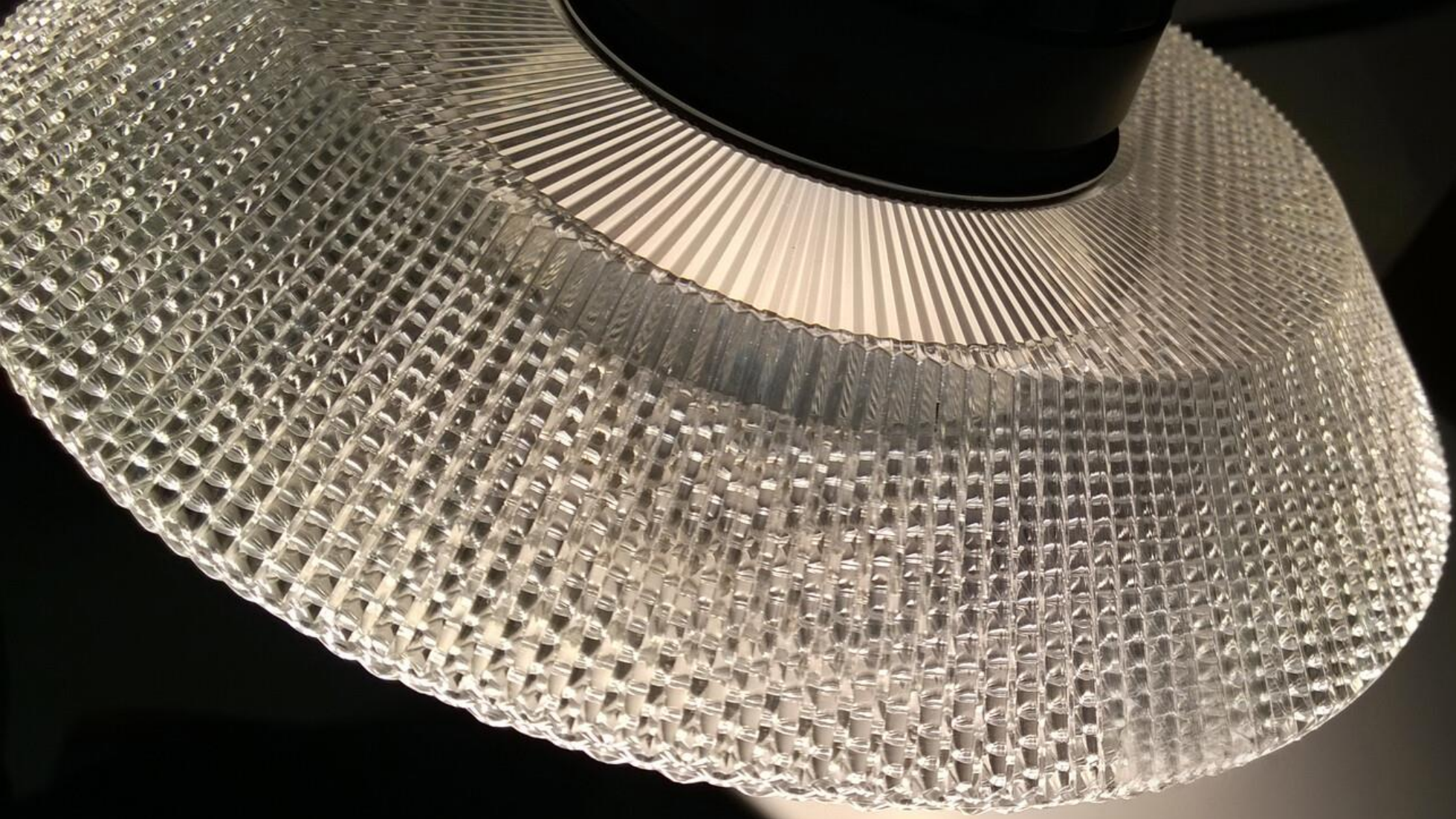
100% replaceable components



ARUP



ARUP



# Design principles in action



## Daylight

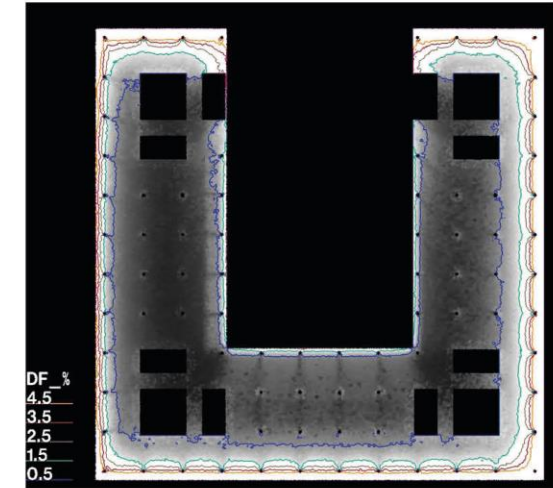
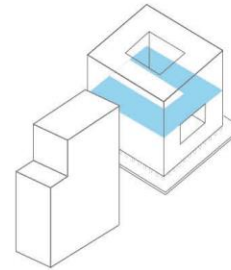
Windows and skylights maximize daylight availability

Three “garden” atria for daylight and natural ventilation

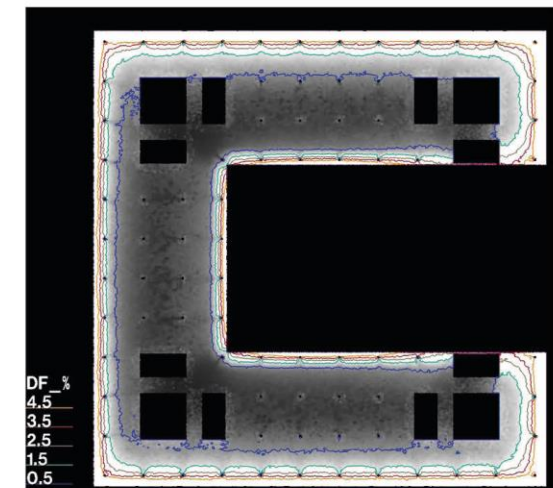
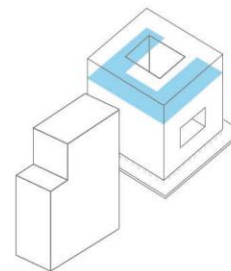
Integrated photovoltaics

LEED Gold rating achieved

11th Floor



17th Floor



# Design principles in action

## Circle of lighting materials



Reduced material quantity  
Replaceable components  
Single manufacturer

## Adaptable system

Swappable parts to achieve different looks  
28 different brands and 7,000 occupants under one roof



## Higher flexibility, higher resilience



Lens adaptable to multiple uses  
Long-lasting LEDs

## High quality design

Multiple “atmospheres” created  
Optics designed for controlled lighting distribution





# Luminaire Broker

Step 1 -  
Create searches



Step 2 -  
Shortlist favourites



Step 3 -  
Choose best match



Luminaire Broker



What are the

Strategies for  
change?





**Contact**

Nathaniel Jones

nathaniel.jones@arup.com

ARUP