



# CARBON RISK REAL ESTATE MONITOR

CRREM: ASSESS, MANAGE & AVOID CARBON RISK

29.04.2020

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PROPERTY VALUES ARE INCREASINGLY  
EXPOSED TO CLIMATE RISK

**'CLIMATE RISK IS INVESTMENT RISK'**  
(BLACKROCK, 2020)

assess, manage & avoid risk with the Carbon Risk Real Estate Monitor

### CRREM pathways

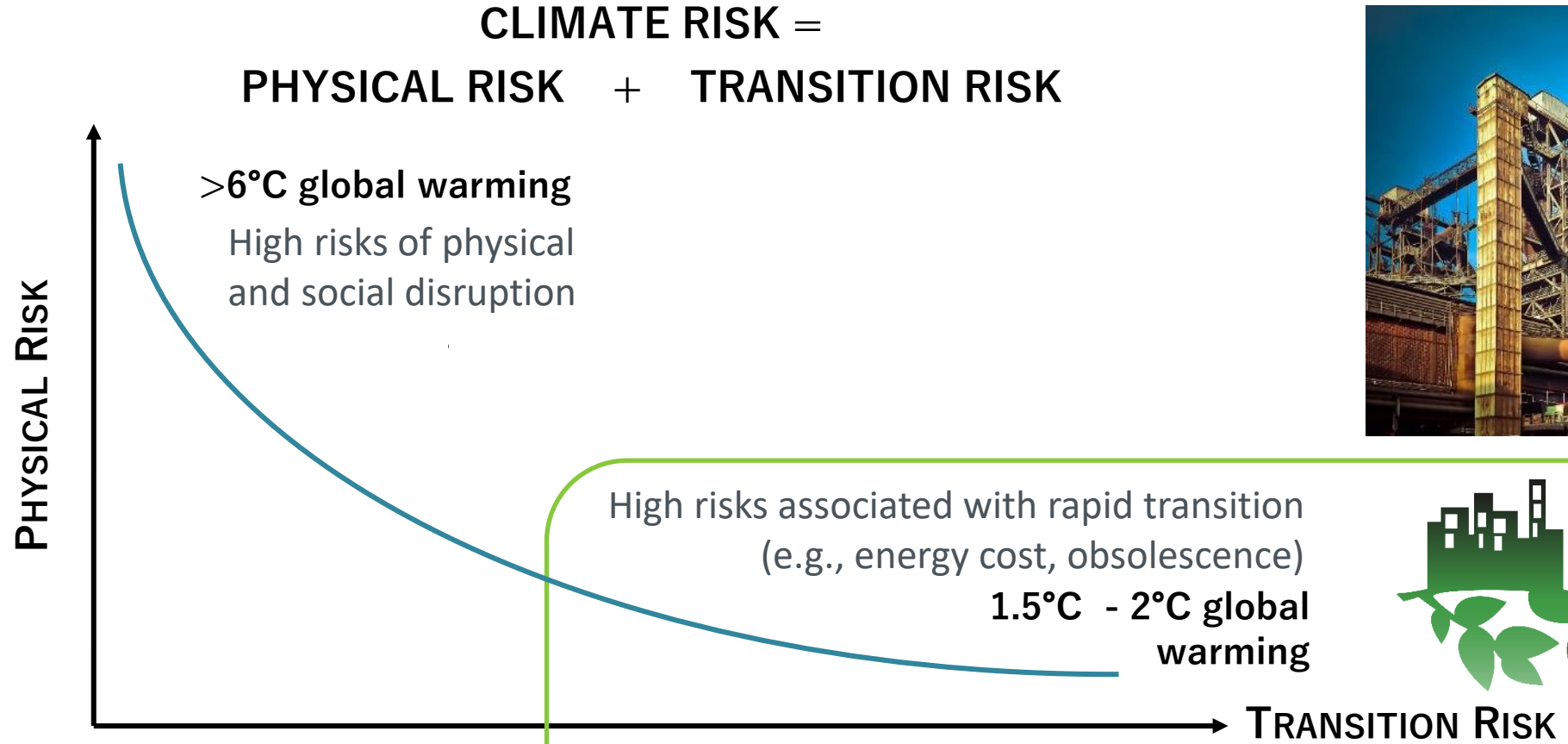
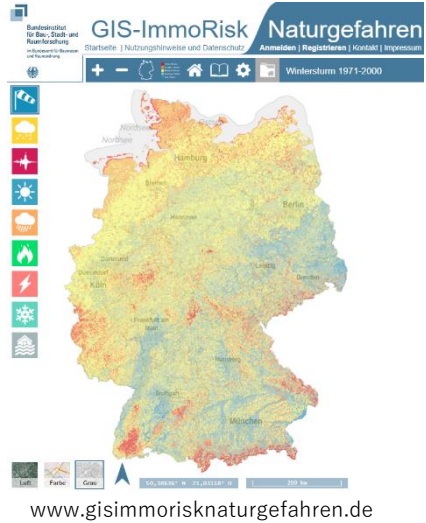
- Paris-aligned decarbonisation & energy reduction pathways
- Per country and building type



### CRREM Tool

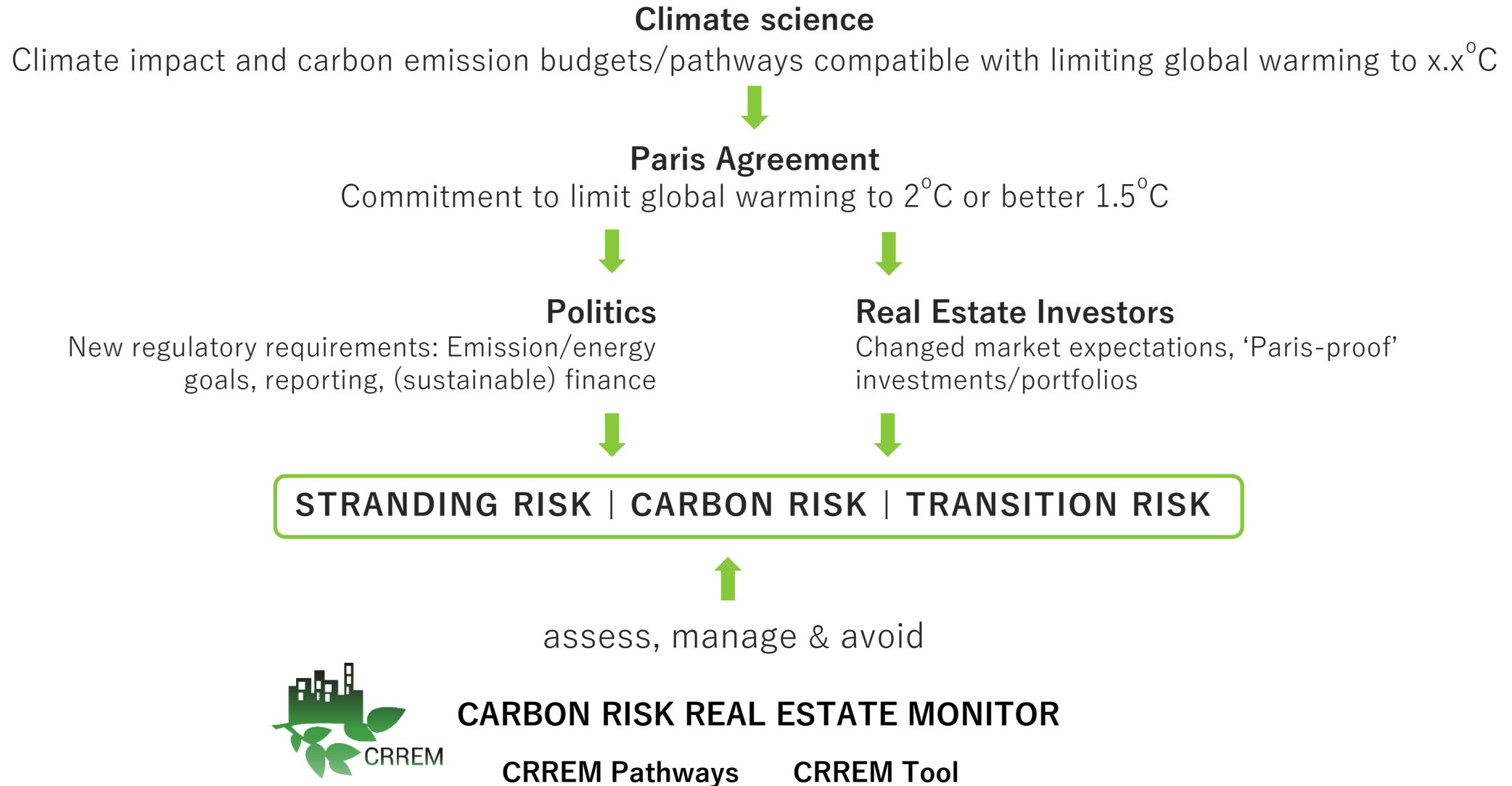
- Assess the carbon and energy performance of buildings and portfolios
- Benchmark against CRREM pathways and peers
- Derive indicators for risk management, reporting, disclosure





**'STRANDED ASSETS'** are properties that will be exposed to the risk of early economic obsolescence due to climate change because they will not meet future regulatory efficiency standards or market expectations.' (CRREM, 2019)

Source: TCFD Technical Supplement, 2017



## PROJECT PARTNERS



IIÖ Institut für Immobilienökonomie  
Coordinator | Austria



TiasNimbas Business School  
Tilburg University | Netherlands



University of Ulster | UK



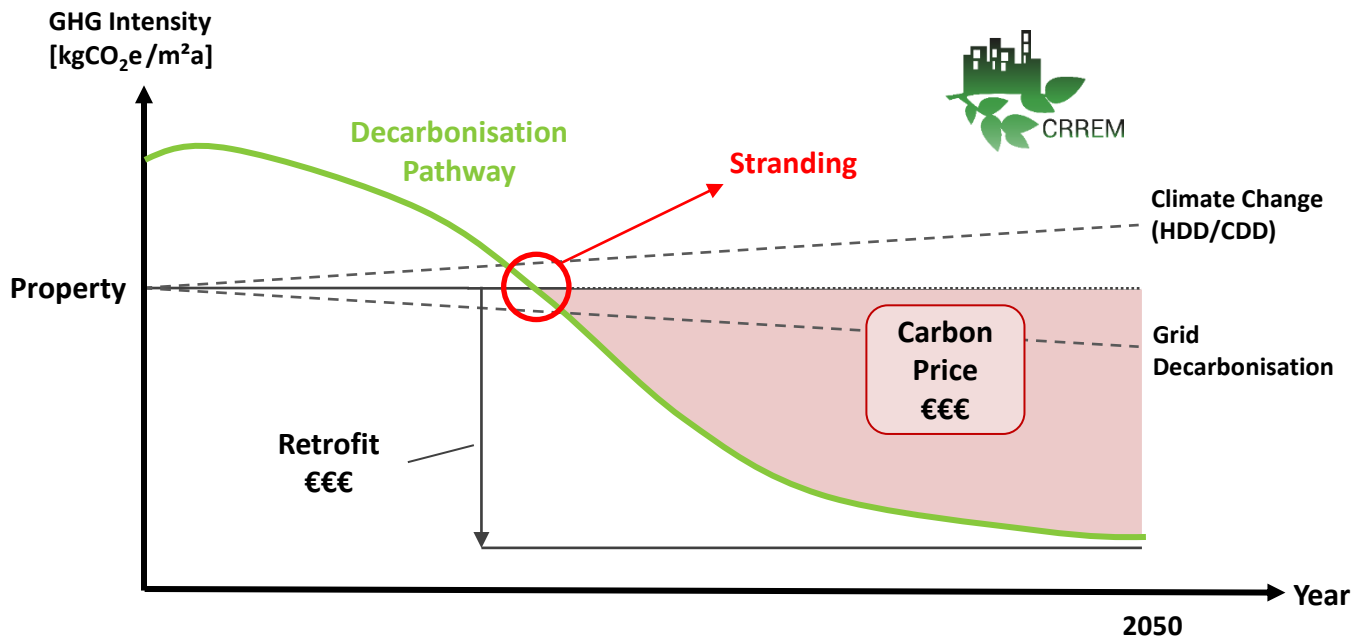
University of Alicante | Spain



GRESB | The ESG Benchmark for Real Assets

## CARBON RISK ASSESSMENT & MANAGEMENT BASED ON QUANTITATIVE PERFORMANCE DATA AND TARGET SETTING

### ASSET LEVEL STRANDING DIAGRAM



### DECARBONISATION PATHWAYS

Aligned with 1.5°C and 2°C global warming, country- and building type specific

+

### BUILDINGS' CARBON PERFORMANCE

Energy consumption, carbon emission factors, grid decarbonisation, changed heating and cooling demand, normalisation..,

=

### CARBON RISK ANALYSIS

Year of stranding, excess emissions, carbon costs, energy costs, benchmarking

## CRREM PATHWAYS: DOWNSCALING FROM GLOBAL EMISSIONS TO CARBON INTENSITY PATHWAYS

Global GHG budget and emissions pathway (consistent with a certain amount of global warming)

Global buildings GHG emission pathway

Global buildings GHG intensity pathway

EU buildings GHG intensity pathway

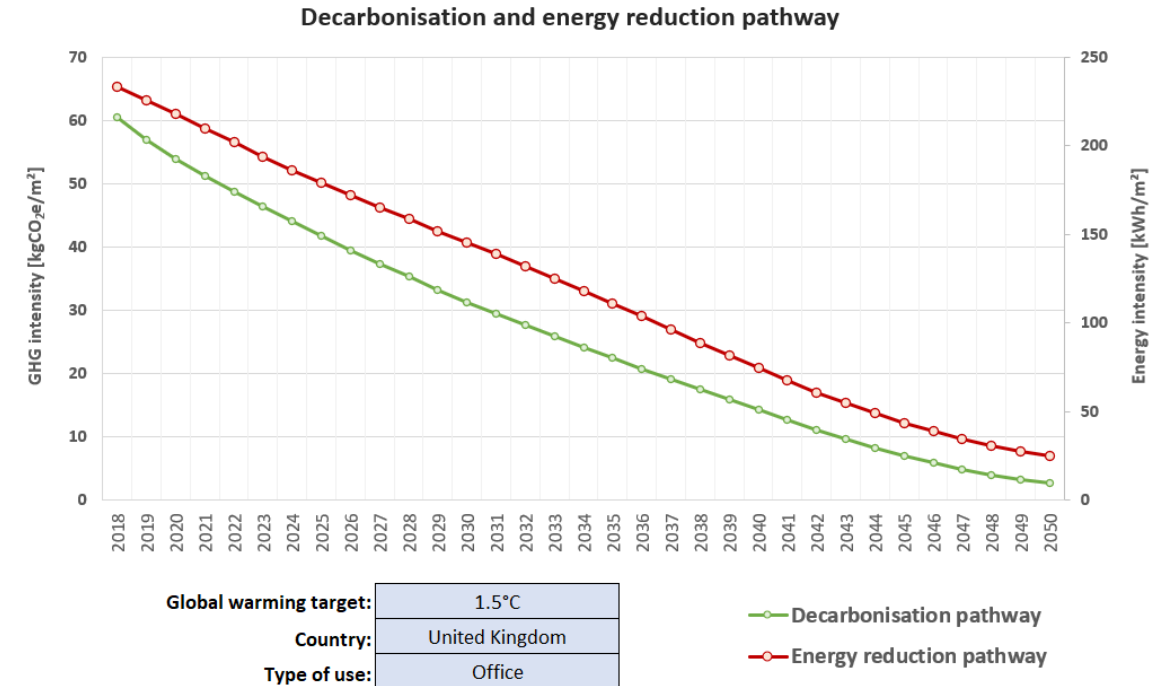
EU commercial real estate (CRE) GHG intensity pathway

Country-specific CRE GHG intensity pathways

Country-specific CRE-subsector GHG intensity pathways

Country-specific CRE-subsector energy intensity pathways

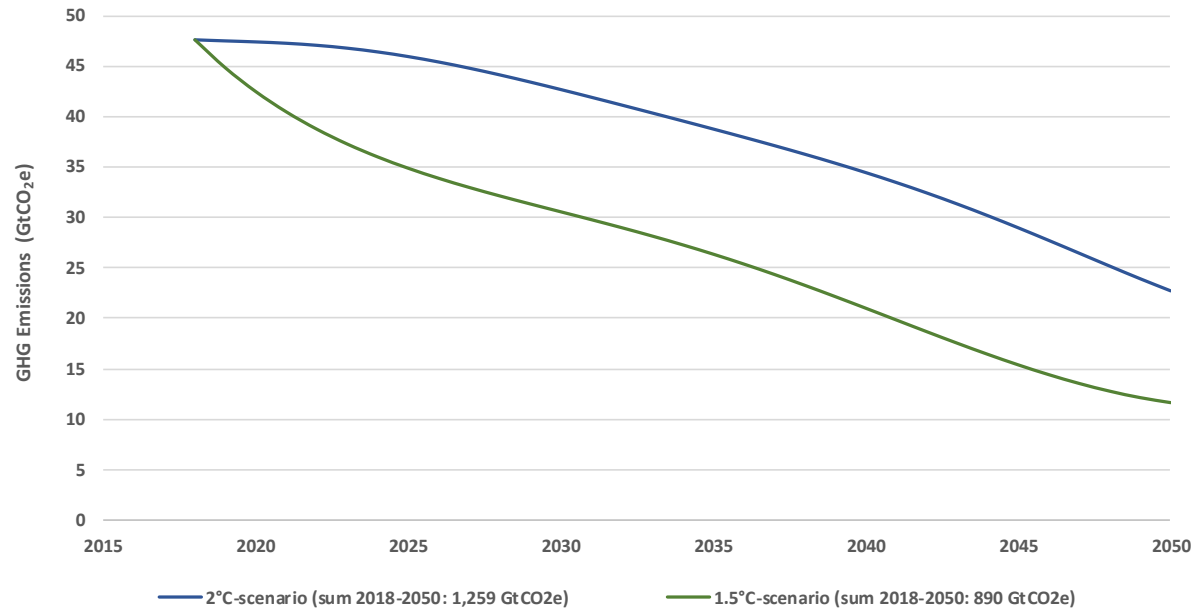
DOWNSCALING



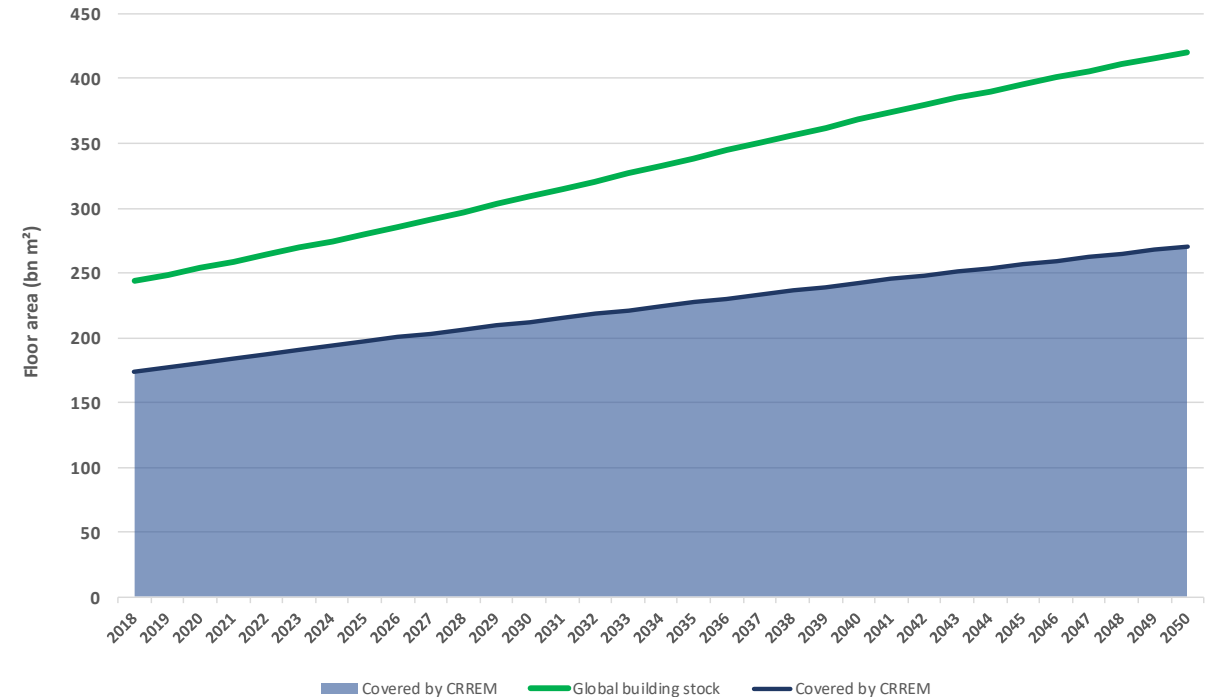
## CRREM PATHWAYS: DOWNSCALING FROM GLOBAL EMISSIONS TO CARBON INTENSITY PATHWAYS

CRREM translates long-term policies (COP21) into clear science-based targets

Global carbon emission pathways (CO<sub>2</sub>e) of 1.5°C and 2°C scenario



Evolution of global building stock (2018-2050) and part covered by CRREM

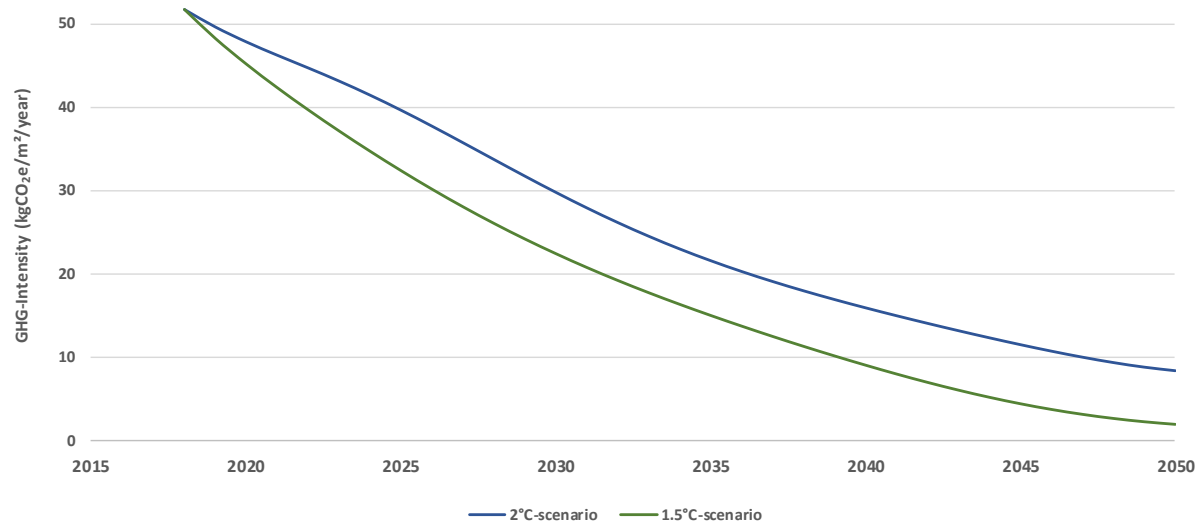




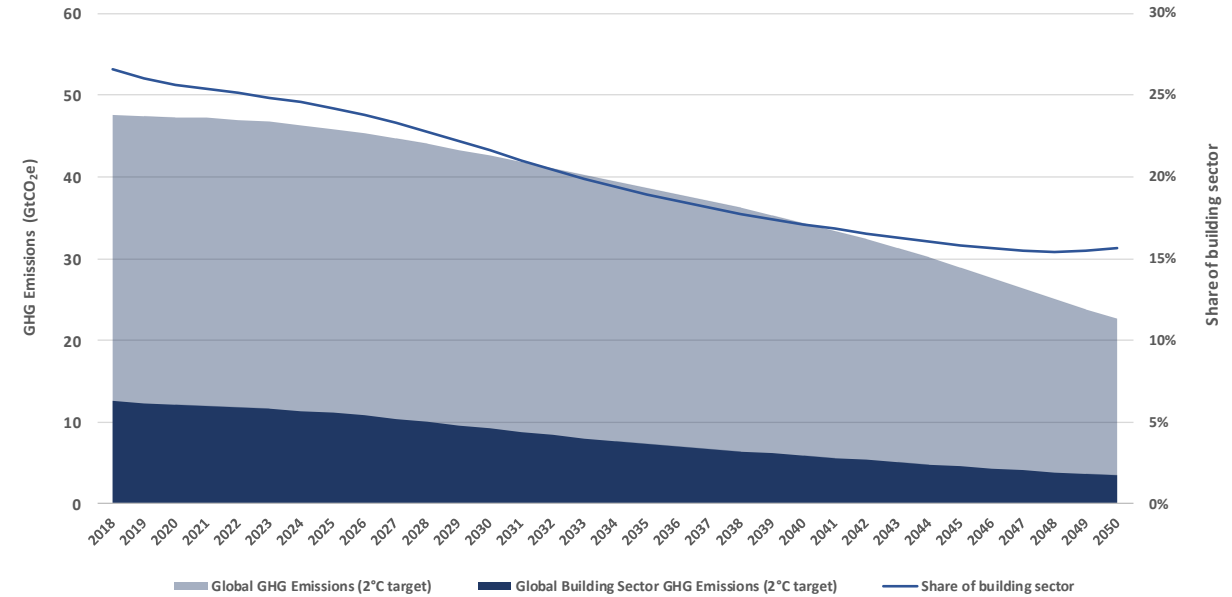
## CRREM PATHWAYS: DOWNSCALING FROM GLOBAL EMISSIONS TO CARBON INTENSITY PATHWAYS

CRREM translates long-term policies (COP21) into clear science-based targets

Global building sector GHG intensity pathway (1.5°C and 2°C target)



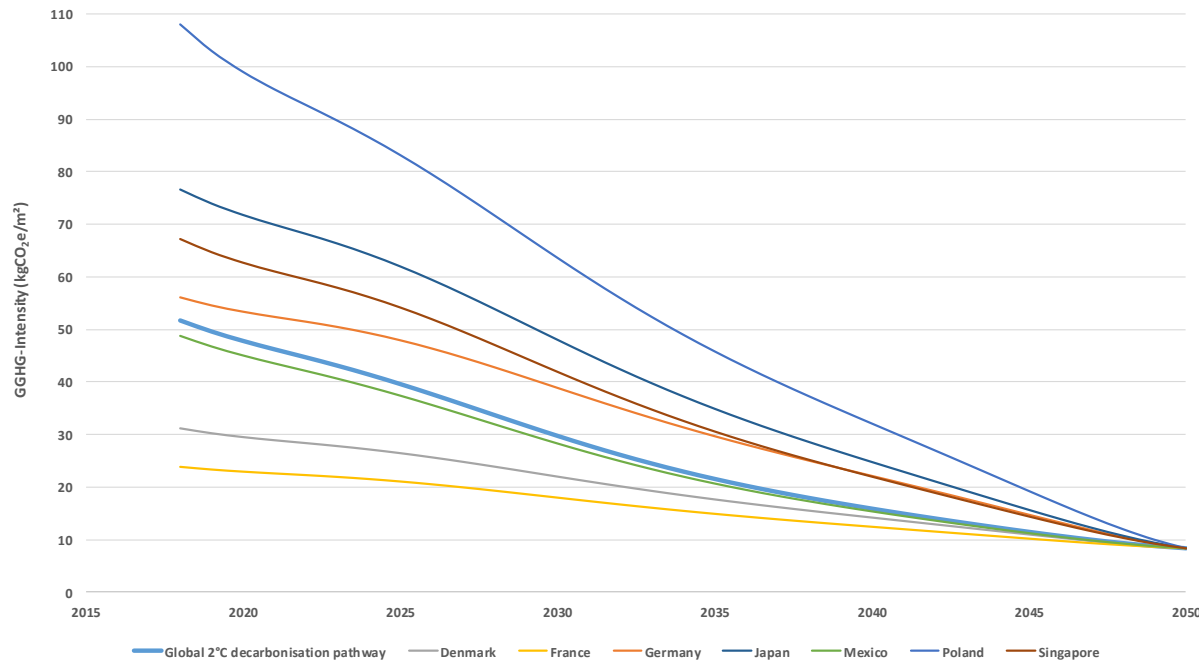
Global carbon emissions (2°C target) of all economic sectors and the building sector



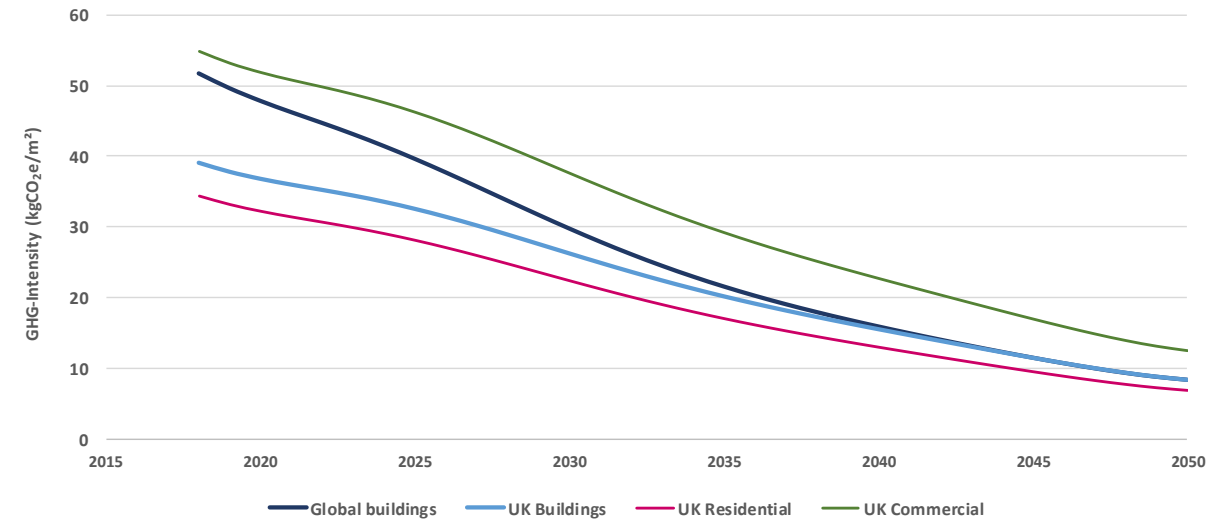
## CRREM PATHWAYS: DOWNSCALING FROM GLOBAL EMISSIONS TO CARBON INTENSITY PATHWAYS

CRREM translates long-term policies (COP21) into clear science-based targets

**National Pathways: Convergence of the carbon intensity pathway of the building sector in individual countries to the global pathway**



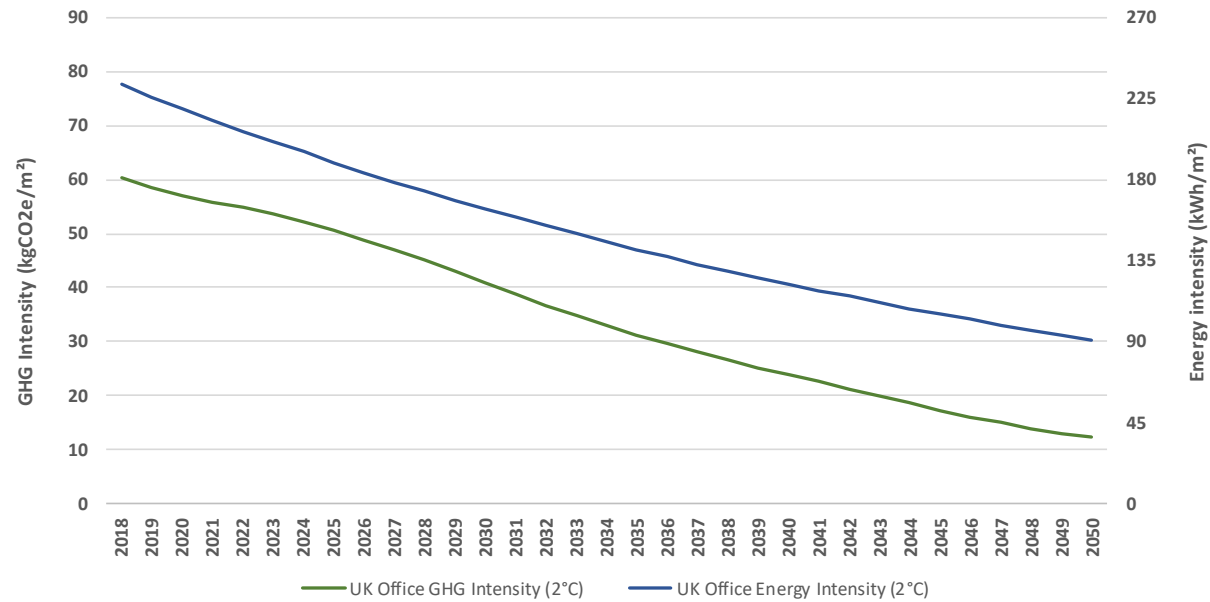
**Residential and Commercial sector: Decarbonisation pathways of global buildings sector, UK buildings sector and UK residential and commercial sector**



## CRREM PATHWAYS: DOWNSCALING FROM GLOBAL EMISSIONS TO CARBON INTENSITY PATHWAYS

CRREM translates long-term policies (COP21) into clear science-based targets

Subsectors of commercial real estate: Decarbonisation and energy reduction pathway for UK office buildings (2°C target)



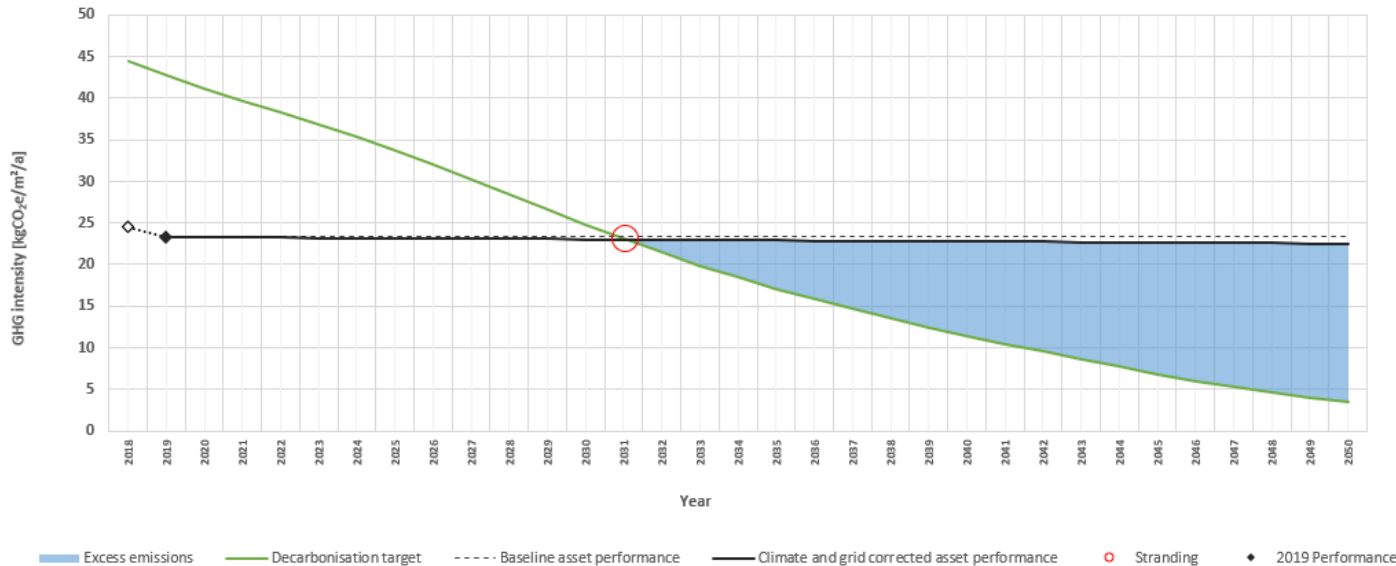
## CARBON RISK ASSESSMENT & MANAGEMENT BASED ON QUANTITATIVE PERFORMANCE DATA AND TARGET SETTING

### CRREM TOOL STRANDING DIAGRAM

#### STRANDING DIAGRAM (Asset #12 - Steinbach Tower)

Based on global warming target: 2°C

Display excess emissions:



Year of stranding: 2032  
Carbon value at Risk: 3.0%

Type of use: Office

Country: Austria  
Change of GHG intensity vs. 2018: -4.9%

### DECARBONISATION PATHWAYS

Aligned with 1.5°C and 2°C global warming, country- and building type specific

+

### BUILDING'S CARBON PERFORMANCE

Energy consumption, carbon emission factors, grid decarbonisation), changed heating and cooling demand, normalisation

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### CARBON RISK ANALYSIS

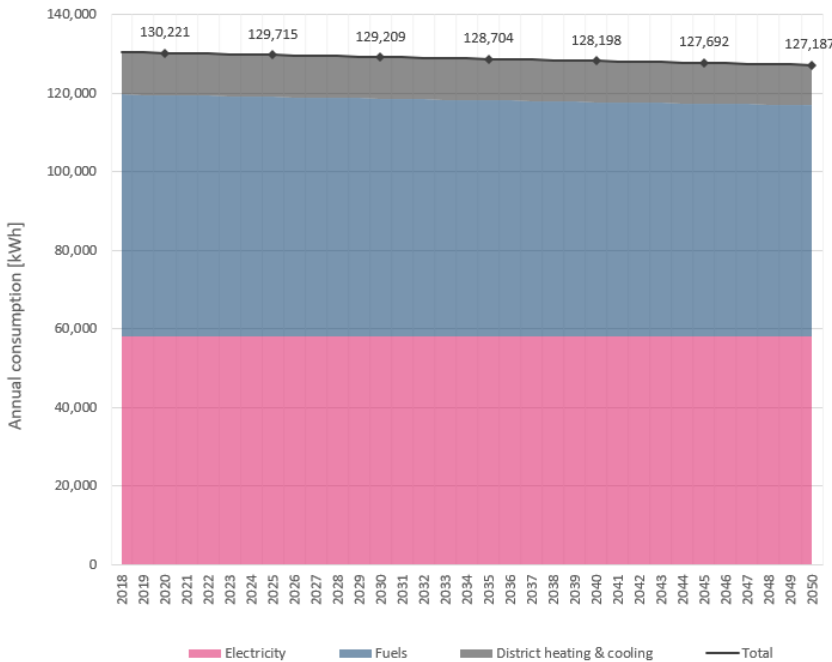
Year of stranding, excess emissions, carbon costs, energy costs, benchmarking



## QUANTITATIVE CARBON PERFORMANCE AND RISK INDICATORS

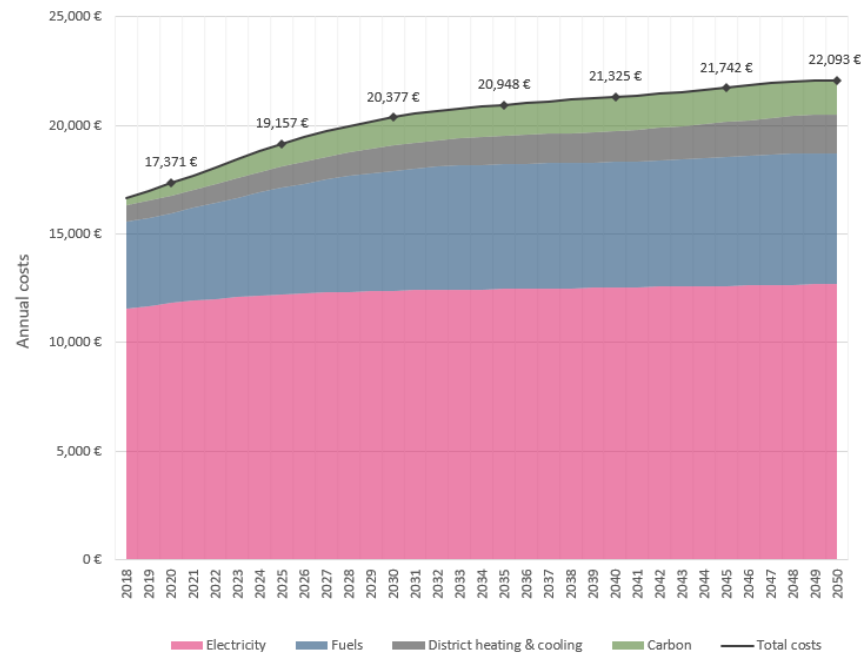
Year of Stranding, Carbon Value at Risk, Year-to-Year Improvement, Costs of Carbon...

### ENERGY CONSUMPTION



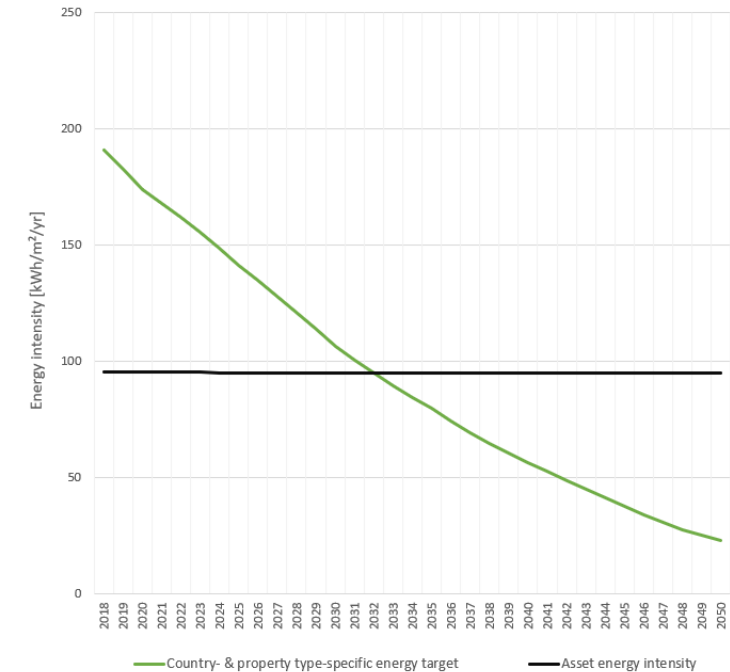
Based on (optionally) normalised baseline consumption and projected data considering changed heating and cooling demand

### COSTS OF ENERGY AND CARBON



Based on energy and carbon price projections (IEA, EU etc.)

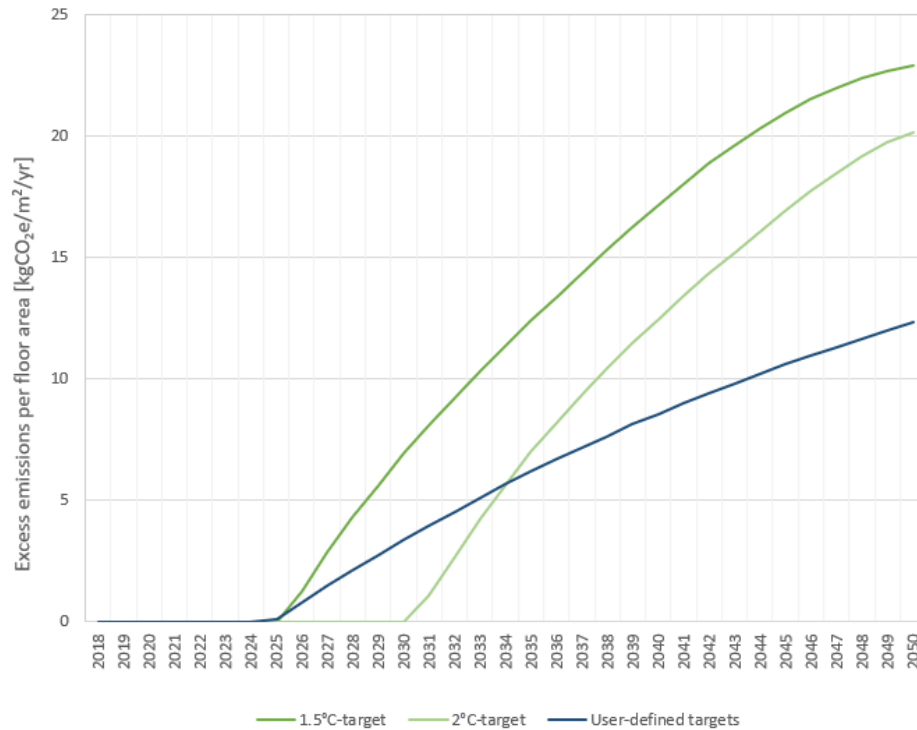
### ENERGY REDUCTION PATHWAYS



Energy targets based on country-specific sector-wide emission factor reflecting energy mix and evolving grid decarbonisation

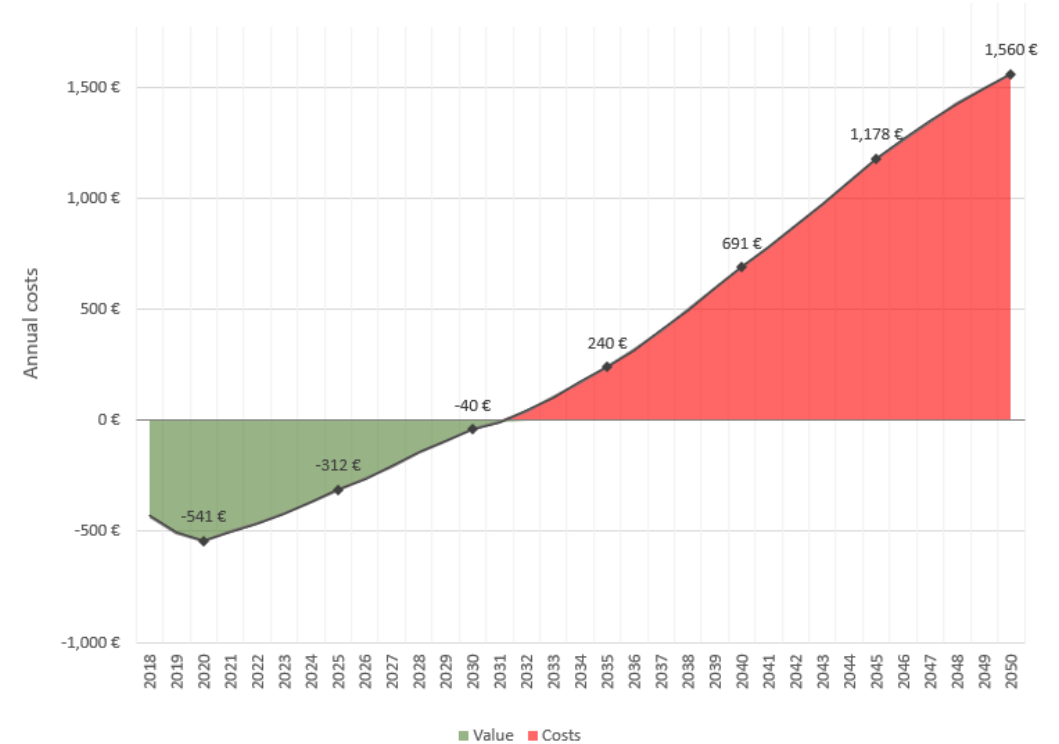
## QUANTITATIVE CARBON PERFORMANCE AND RISK INDICATORS

### EXCESS EMISSIONS PER FLOOR AREA



Cumulative excess emissions until 2050 [kgCO <sub>2</sub> e]:	1.5°C-target	2°C-target	User-defined
	2,149,875	1,463,488	1,088,809

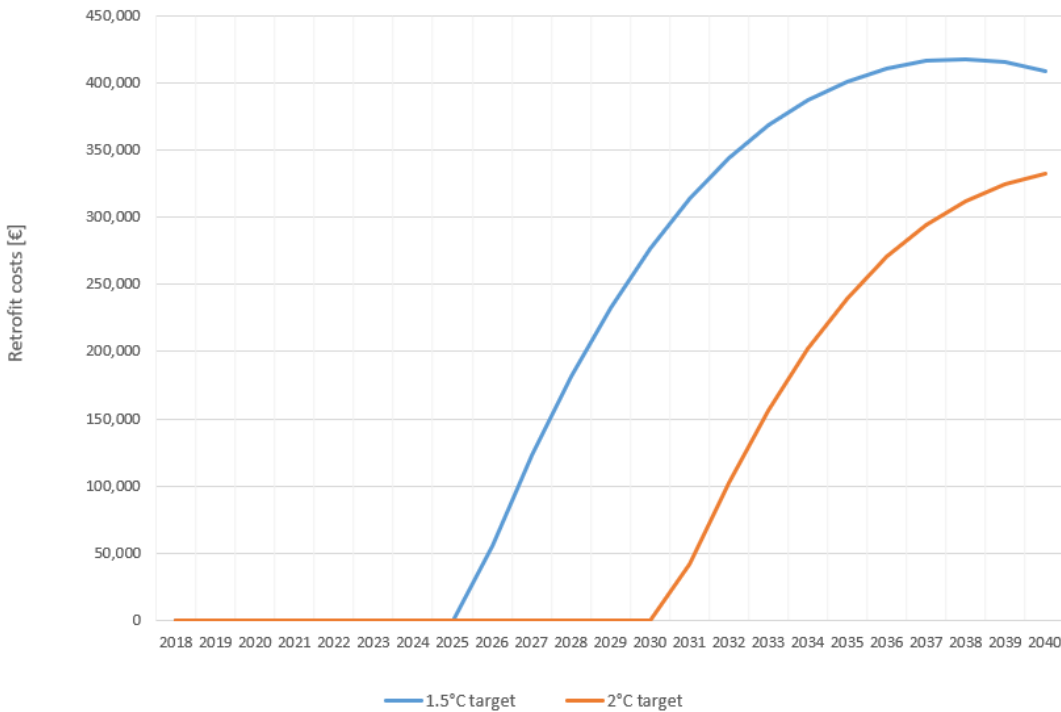
### COSTS OF EXCESS EMISSIONS ABOVE TARGET



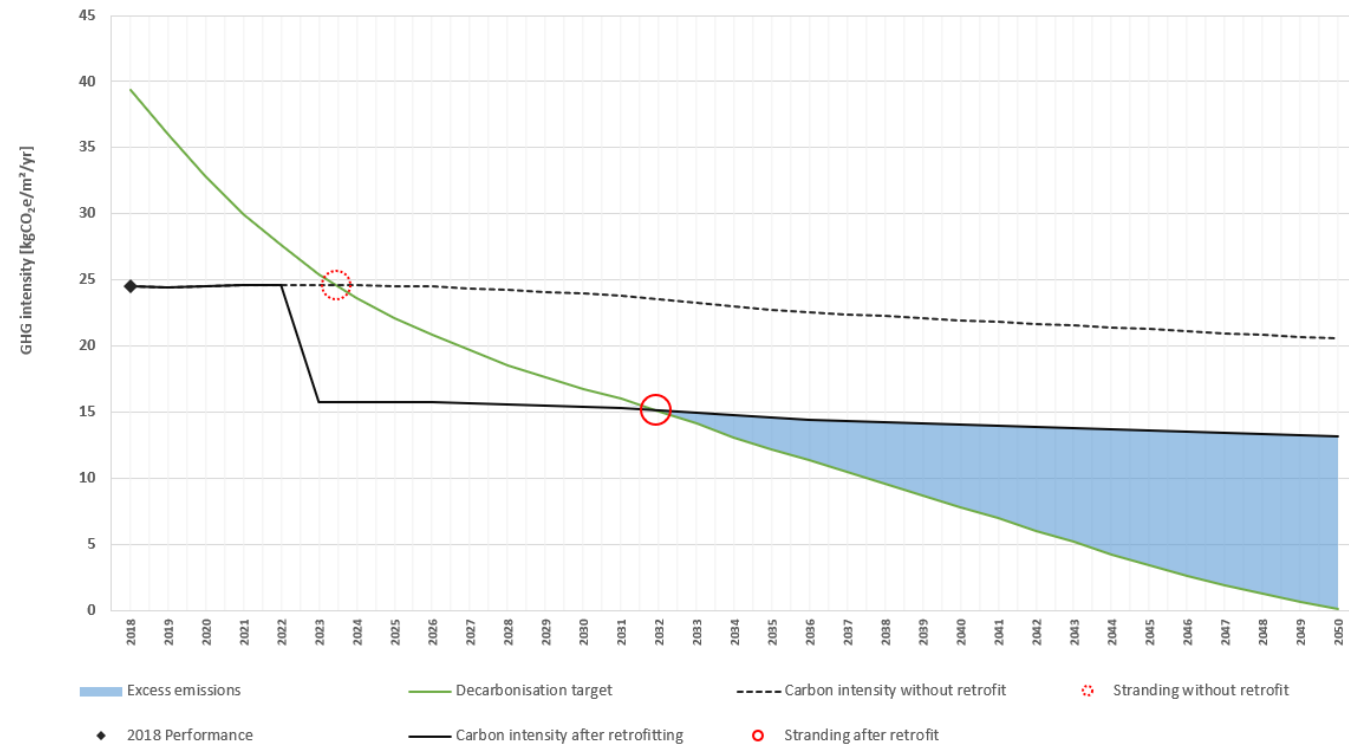
Analogous to the NY City model with penalties for each ton of emission above emission limit (and possibility of trading emission credits)

## QUANTITATIVE CARBON PERFORMANCE AND RISK INDICATORS

### COSTS OF RETROFITTING TO COMPLY WITH CARBON TARGETS



### RETROFIT SIMULATION: STRANDING DIAGRAM WITH & WITHOUT RETROFIT



Simulation of investment in energetic retrofit and its effect on carbon risk indicators (based on marginal abatement costs)

## CARBON RISK IN REAL ESTATE PORTFOLIOS

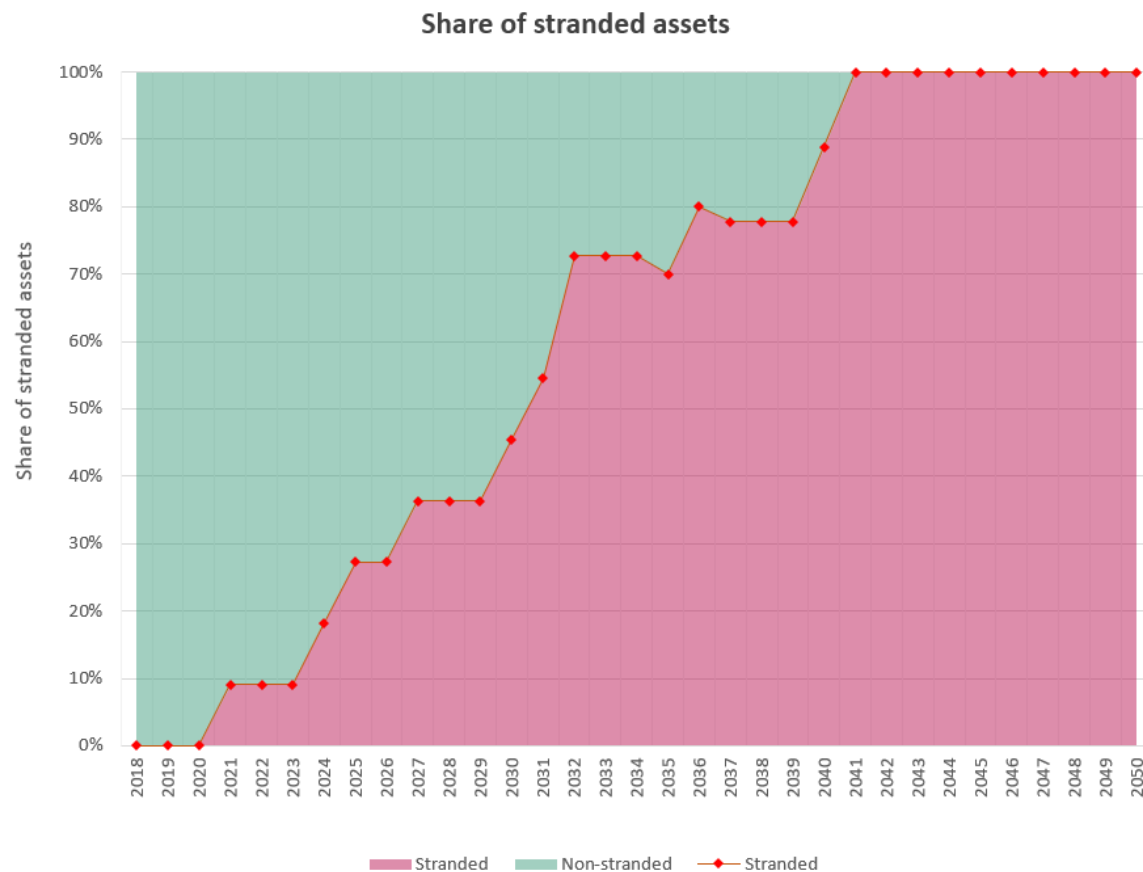
### EVOLUTION OF STRANDING WITHIN PORTFOLIO

Diagrams on the right display the evolution of stranding within your portfolio. Upper graph: Relative share of stranded assets. Lower graph: Absolute figures. Choose whether to display data based on the number of buildings, gross floor area (GFA) or gross asset value (GAV). Choose whether to exclude individual assets or exclude them from a certain year on.

Asset ID	Include	Sell in year
1	Yes	Don't sell
2	Yes	Don't sell
3	Yes	Don't sell
4	Yes	Don't sell
5	Yes	Don't sell
6	Yes	Don't sell
7	Yes	2035
8	Yes	Don't sell
9	Yes	Don't sell
10	Yes	2037
11	Yes	Don't sell

Show shares based on:  
Number of buildings

Climate target:  
2°C



Set filter:

Country: All

Property type: All

Entity/Fund: All

Assessment year: 2018



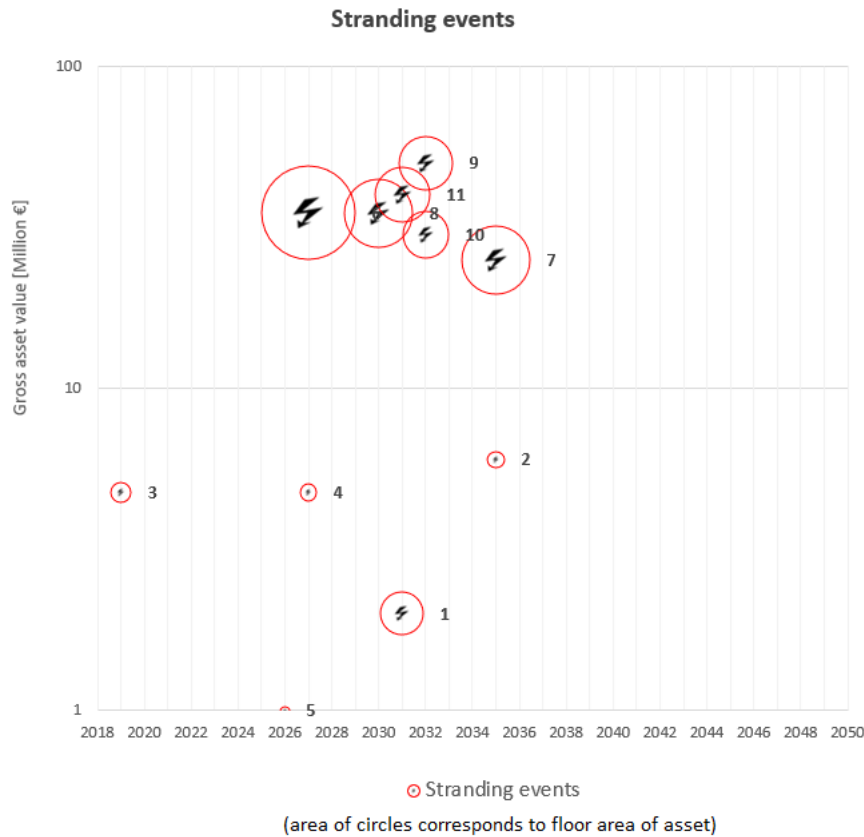
## CARBON RISK IN REAL ESTATE PORTFOLIOS

### STRANDING EVENTS: NEED FOR ACTION?

The graph on the right provides a summary of stranding events in the course of time. Each circle corresponds to one asset not complying with its decarbonisation pathways for the first time. Circle size (floor area) and y-axis (gross asset value) indicate the importance of an asset within the portfolio.

The area of the circles corresponds to the Gross floor area of the stranded asset. Choose below which global warming target to apply. The numbers next to the circles depict the asset ID.

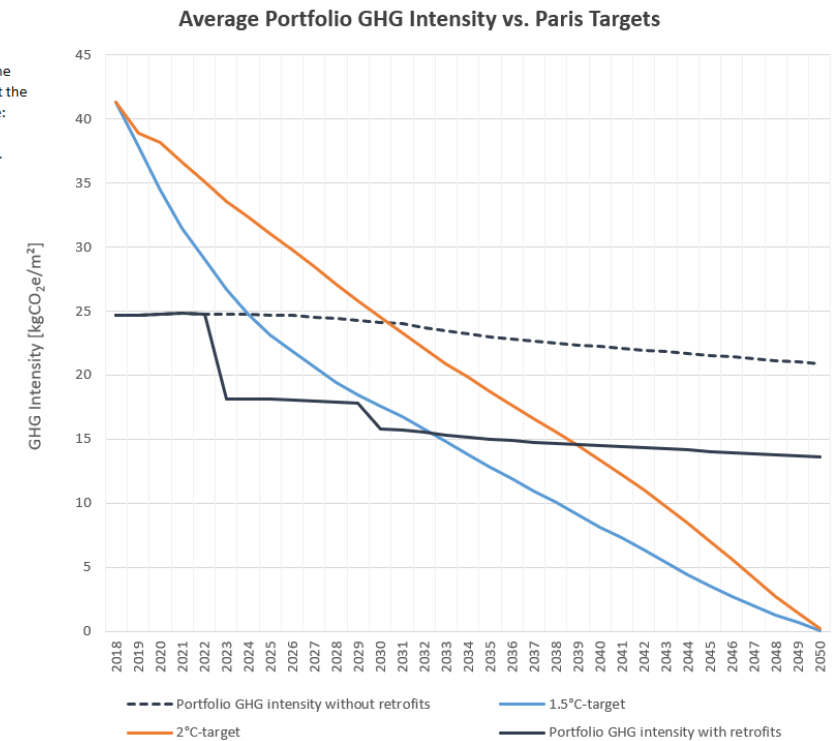
Climate target:



### GHG INTENSITY OF PORTFOLIO vs. 1.5°C- & 2°C-TARGETS

The graph on the right presents the GHG intensity of the selected portfolio (black line), benchmarking it against the floor-area-weighted decarbonisation pathway (orange: 2°C, blue: 1.5°C). Exclude individual assets by means of the table below.

Asset ID	Include
1	Yes
2	Yes
4	Yes

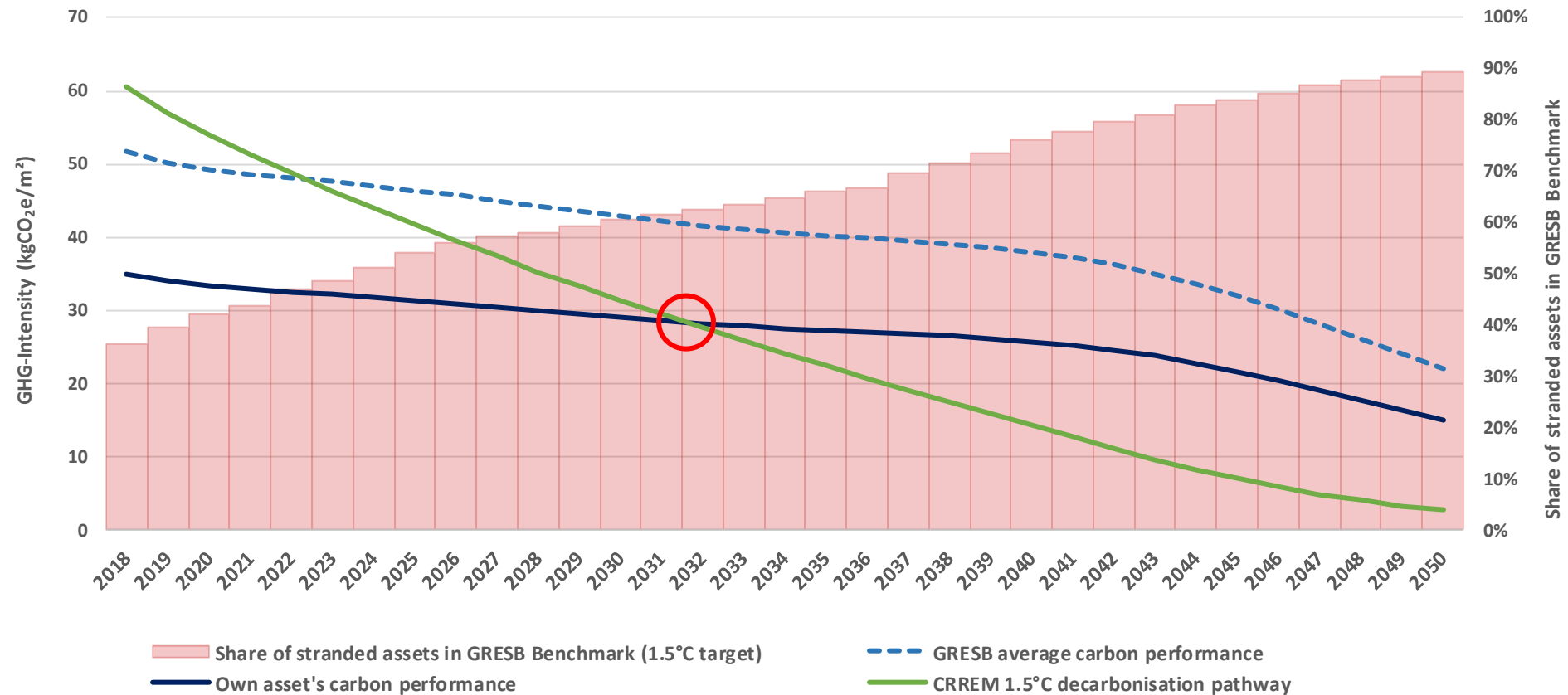


- (1) Download CRREM Risk Assessment Tool pre-filled with data company's GRESB participation
- (2) GRESB participants to receive results of CRREM Risk Analysis within GRESB Portal

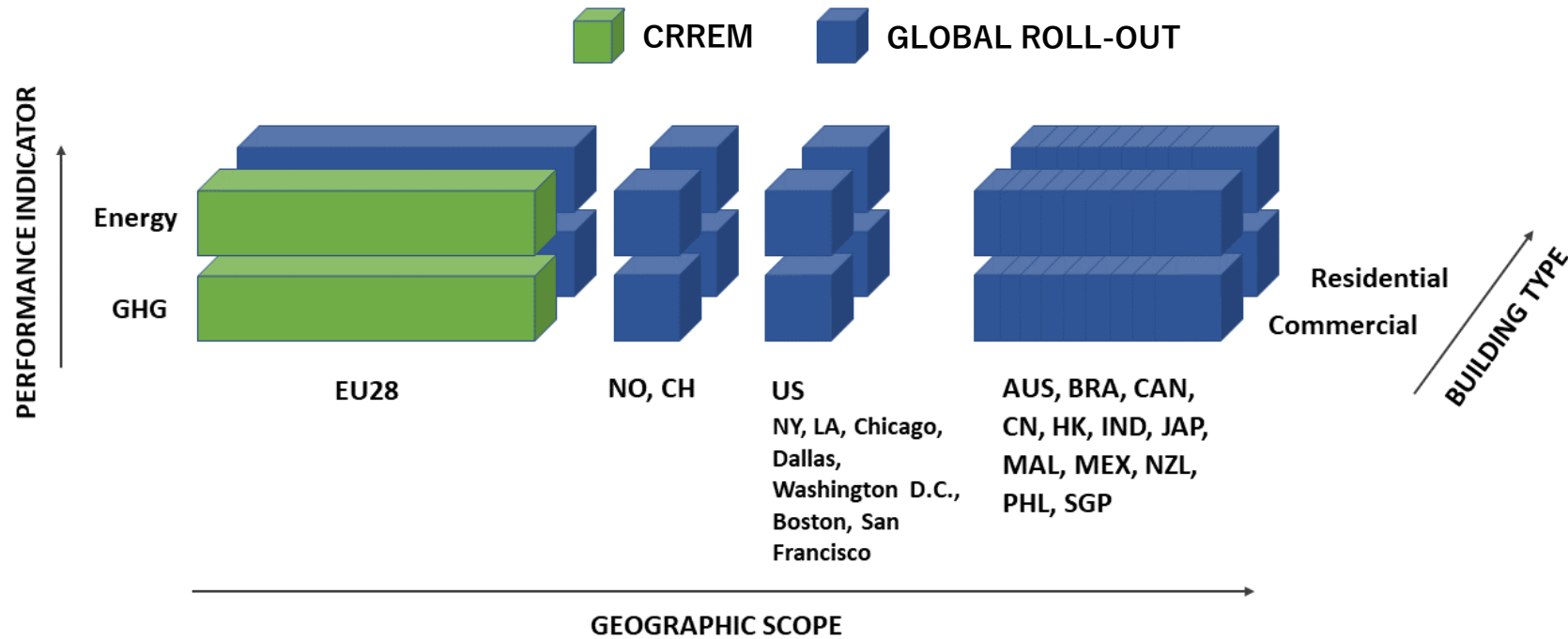
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## Stepwise integration of CRREM Risk Analysis and GRESB

### BENCHMARK YOUR ASSET(S) AGAINST YOUR PEERS



**Extension of CRREM pathways: [www.CRREM.org](http://www.CRREM.org)**  
**INCLUDING RESIDENTIAL BUILDINGS & KEY GLOBAL REAL ESTATE MARKETS**  
**(PUBLICATION OF CRREM GLOBAL PATHWAYS FOR PUBLIC CONSULTATION IN MAY 2020)**



Funded by:





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<b>CDP</b> Alberto Carrillo Pineda ( <i>Director Science Based Targets and Renewable Energy</i> )	<b>ULI Greenprint Center for Building Performance</b> Marta Schantz ( <i>Senior Vice President</i> )
<b>DGNB German Sustainable Building Council</b> Anna Braune ( <i>Director Research and Development</i> )	<b>University of Cambridge</b> Franz Fürst ( <i>Professor of Real Estate and Urban Economics</i> )
<b>DGBC Dutch Green Building Council</b> Martin Mooij ( <i>Head of Certification and Project manager DGBC Deltaplan sustainable renovation</i> )	<b>World Green Building Council</b> Stephen Richardson ( <i>Technical Lead - Energy Efficiency Mortgages</i> )
<b>EPRA European Public Real Estate Association</b> Gloria Duci ( <i>ESG Officer</i> )	<b>ZIA German Property Federation</b> Philipp Matzke ( <i>Consultant Energy and Climate Protection, Facilities Engineering</i> )





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