



CARBON RISK REAL ESTATE MONITOR

DR. JENS HIRSCH

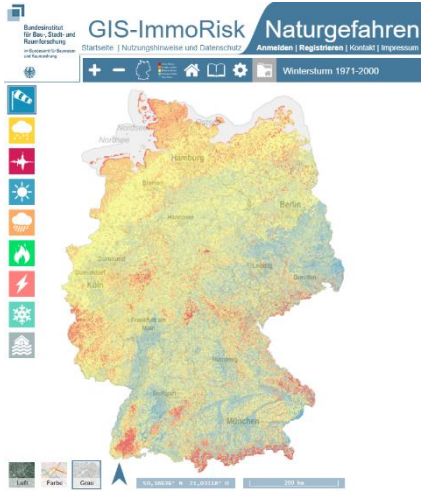
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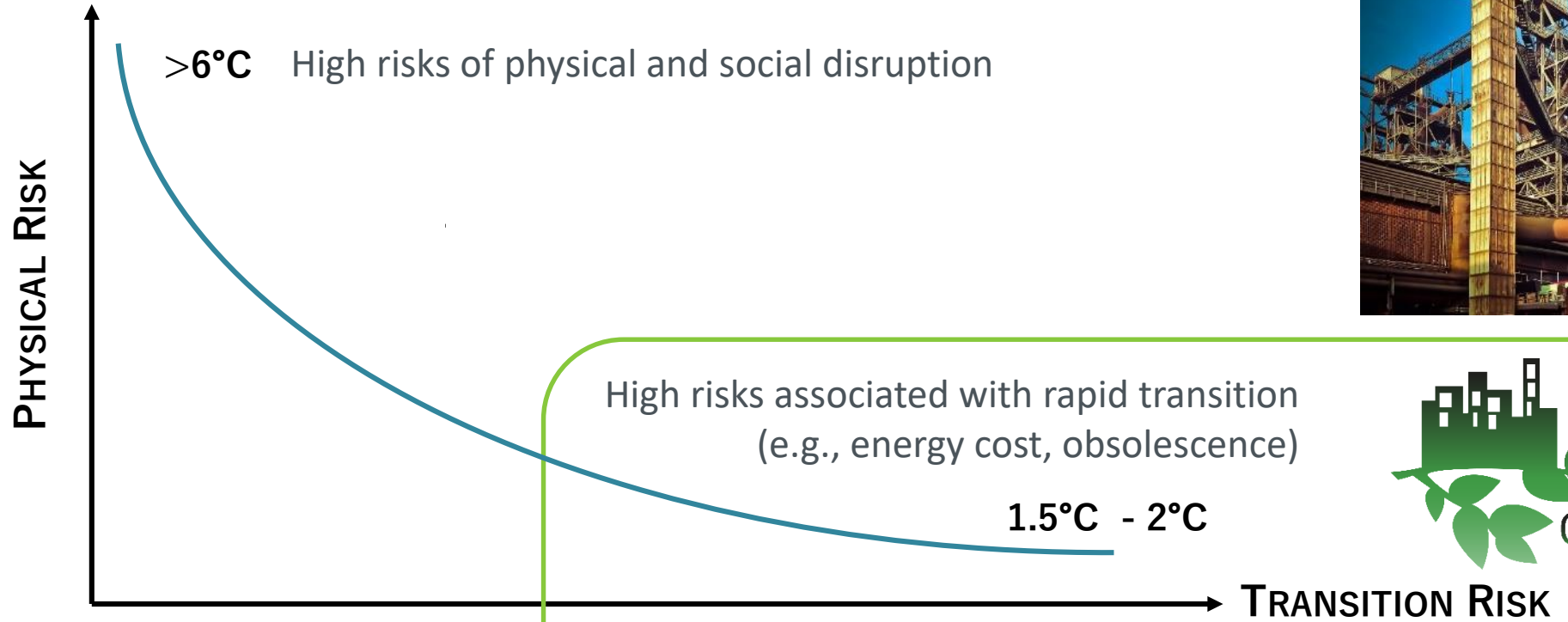
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PHYSICAL RISK + TRANSITION RISK



“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

Climate science: Climate impact and carbon emission budgets/pathways compatible with limiting global warming to $x.x^{\circ}\text{C}$



Politics: Commitment to limit global warming to 2°C or better 1.5°C



New mandatory and voluntary requirements to (sustainable) finance & carbon risk



CARBON RISK REAL ESTATE MONITOR

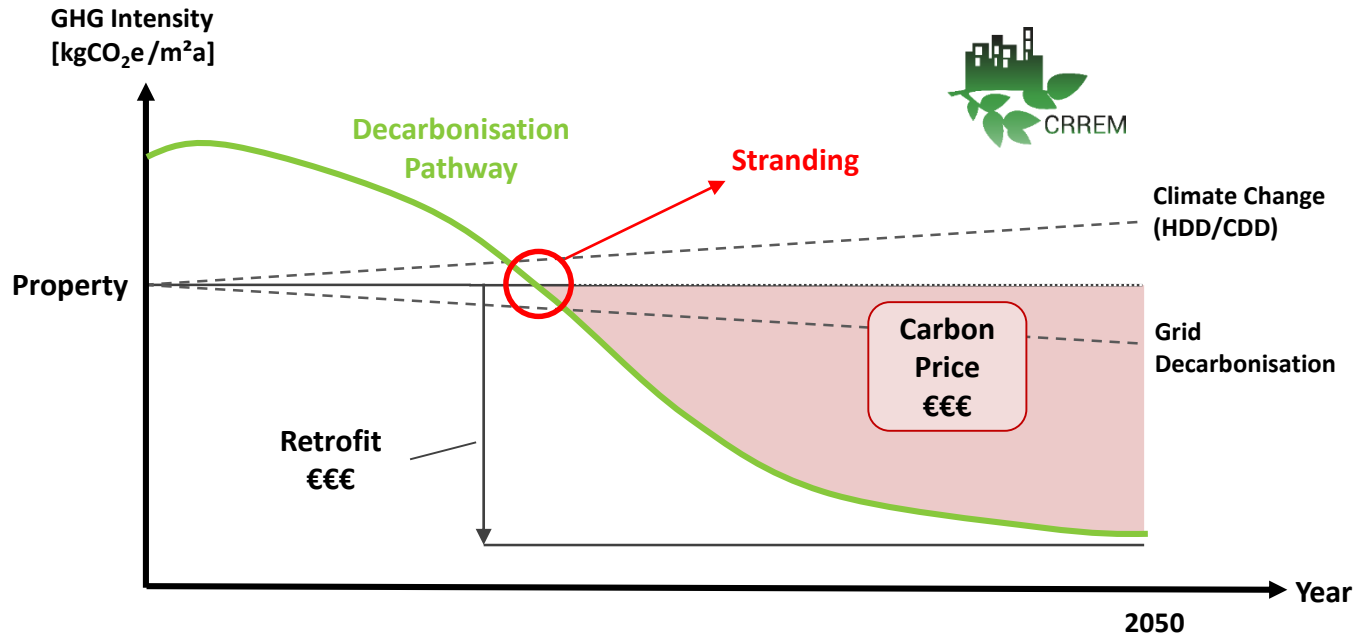
CRREM pathways

- 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

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



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

=

CARBON RISK ANALYSIS

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

CRREM 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



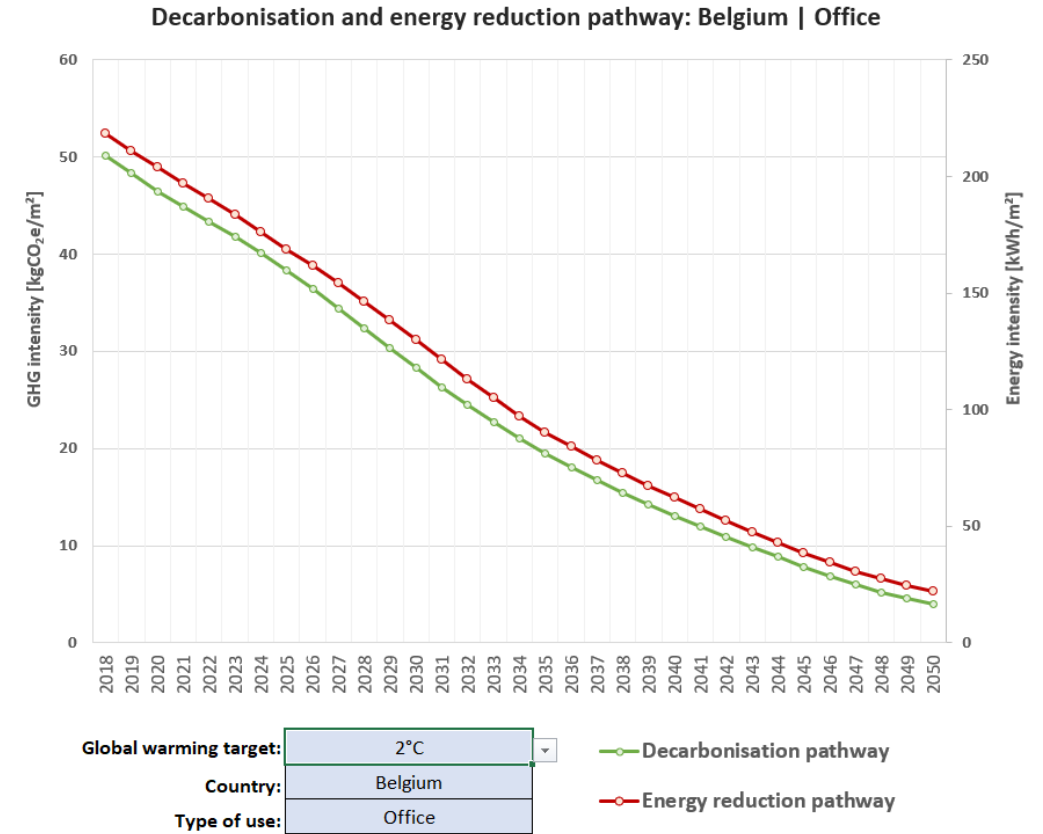
Country-specific CRE GHG intensity pathways



Country-specific CRE-subsector GHG intensity pathways



Country-specific CRE-subsector energy intensity pathways



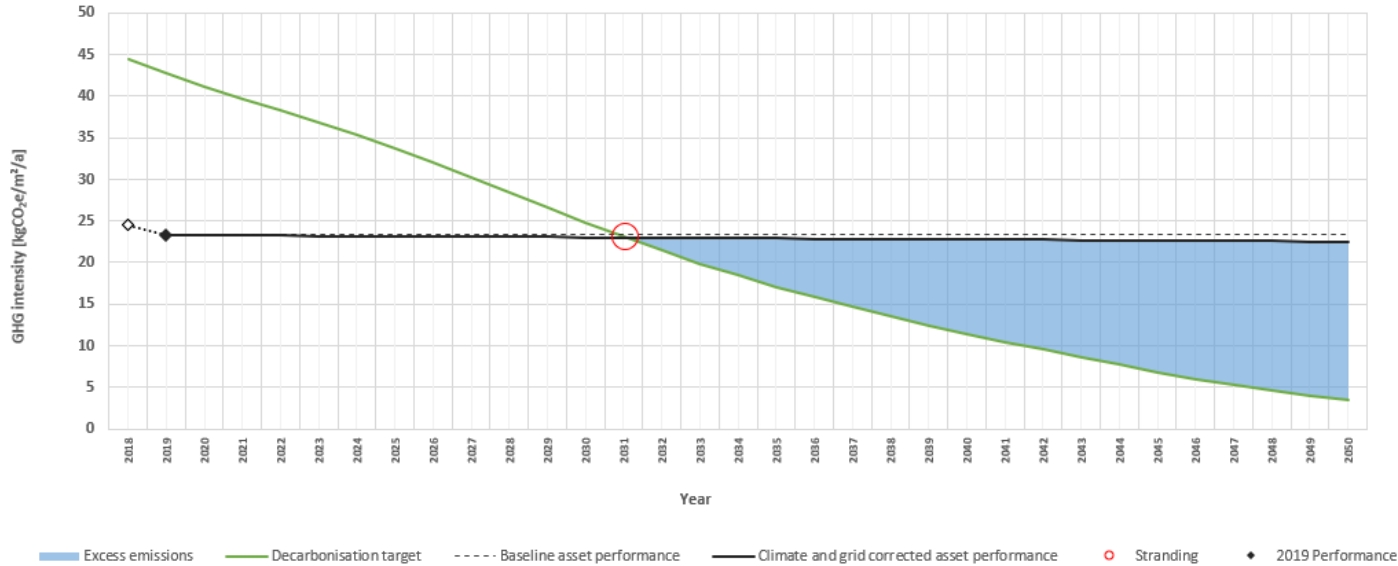
CARBON RISK ASSESSMENT & MANAGEMENT BASED ON QUANTITATIVE PERFORMANCE DATA AND TARGET SETTING

CRREM TOOL STRANDING DIAGRAM

STRANDING DIAGRAM (Asset #12 - Steinbach Tower)

Based on global warming target: 2°C

Display excess emissions: Yes



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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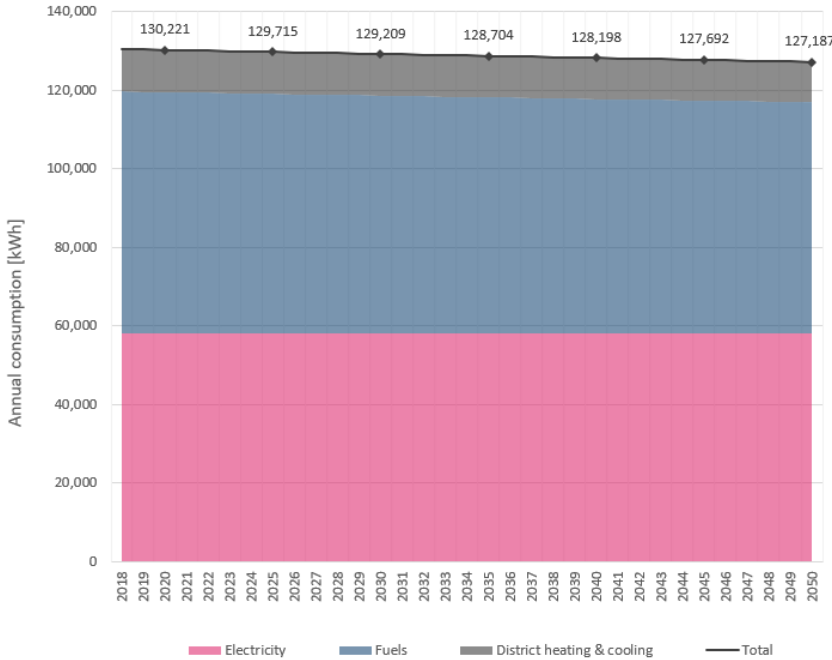
CARBON RISK ANALYSIS

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

QUANTITATIVE CARBON PERFORMANCE AND RISK INDICATORS

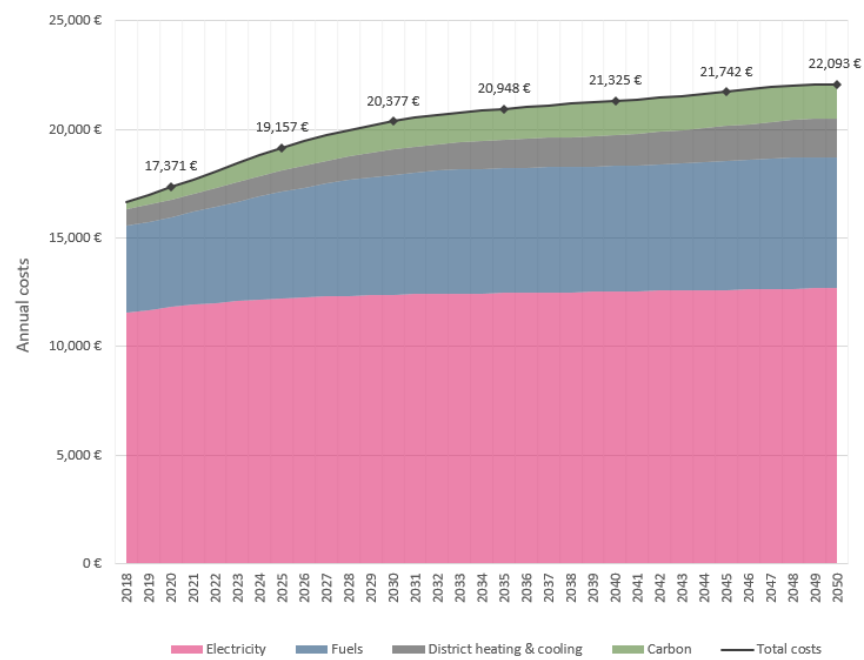
Year of Stranding, Carbon Value at Risk, Year-to-Year Improvement, Costs of Carbon...

ENERGY CONSUMPTION



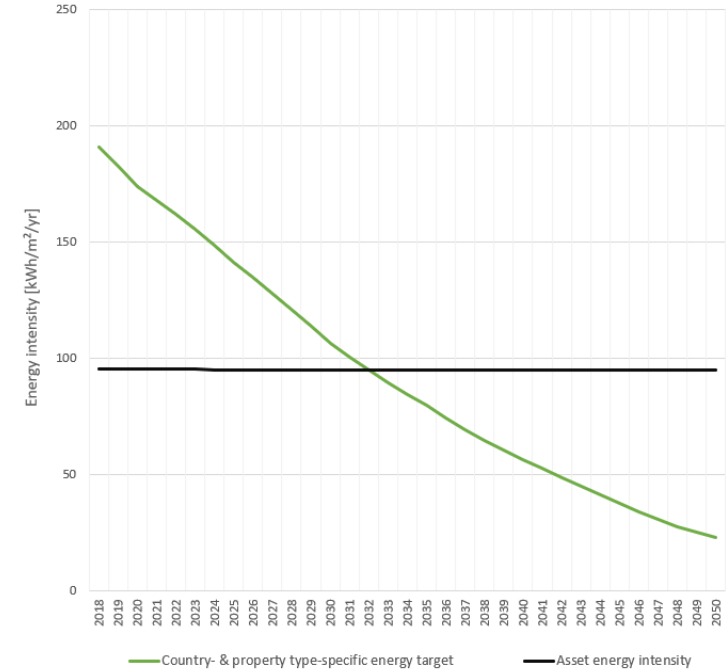
Based on (optionally) normalised baseline consumption and projected data considering changed heating and cooling demand

COSTS OF ENERGY AND CARBON



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

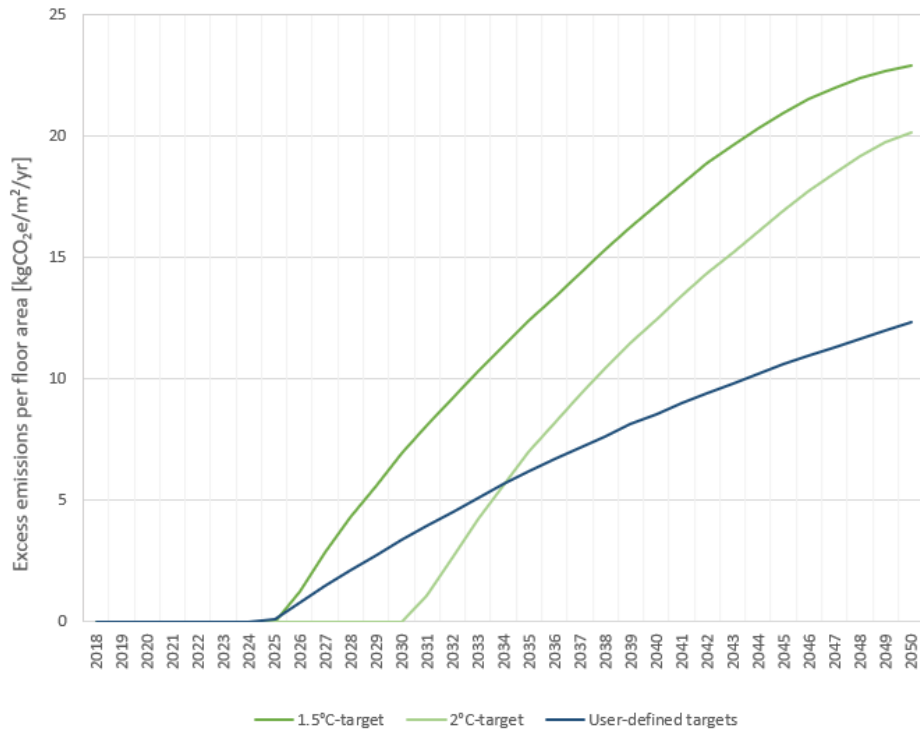
ENERGY REDUCTION PATHWAYS



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

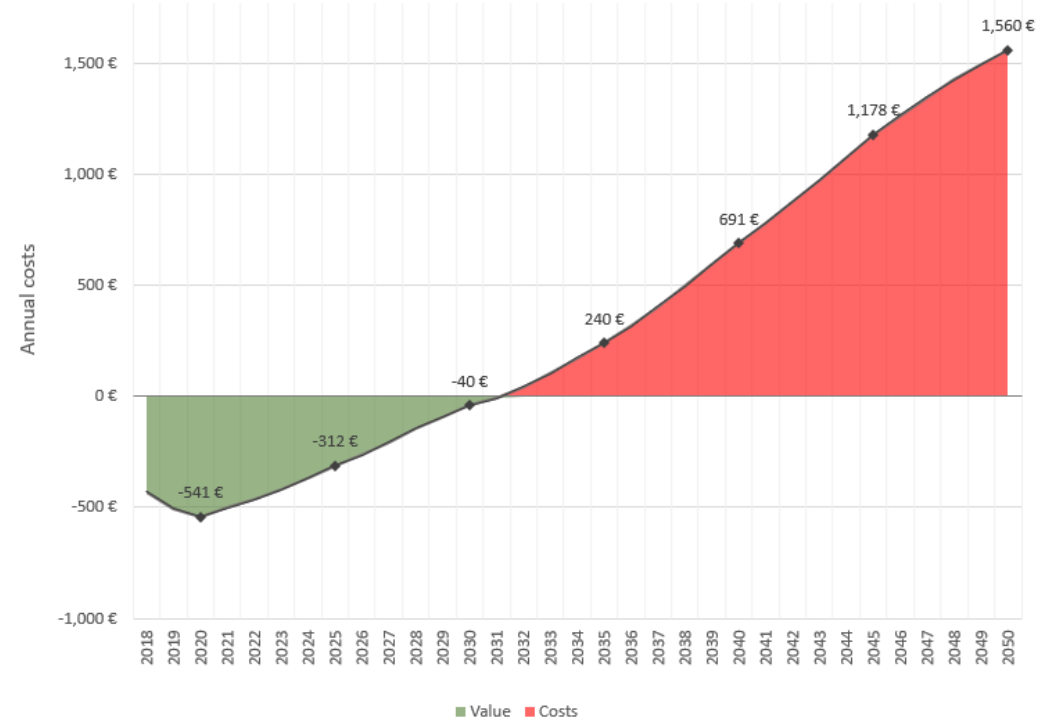
QUANTITATIVE CARBON PERFORMANCE AND RISK INDICATORS

EXCESS EMISSIONS PER FLOOR AREA



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

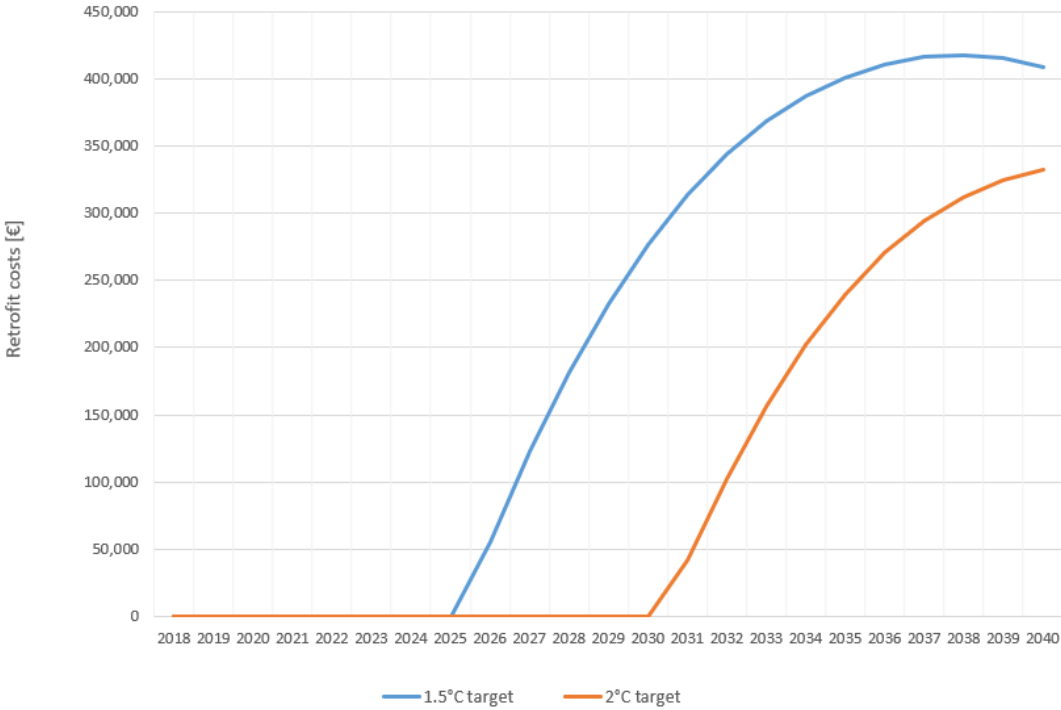
COSTS OF EXCESS EMISSIONS ABOVE TARGET



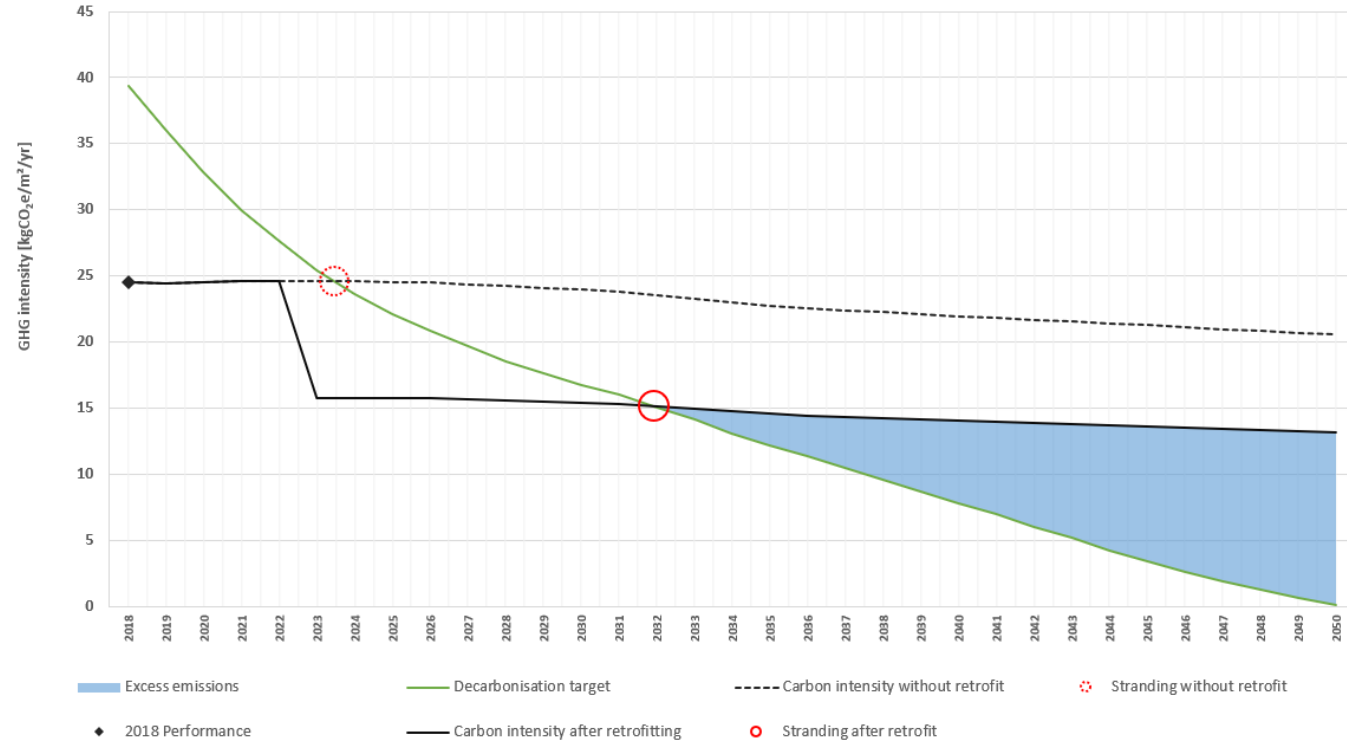
Analogous to the NY City model with penalties for each ton of emission above emission limit (and possibility of trading emission credits)

QUANTITATIVE CARBON PERFORMANCE AND RISK INDICATORS

COSTS OF RETROFITTING TO COMPLY WITH CARBON TARGETS



RETROFIT MODEL: 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

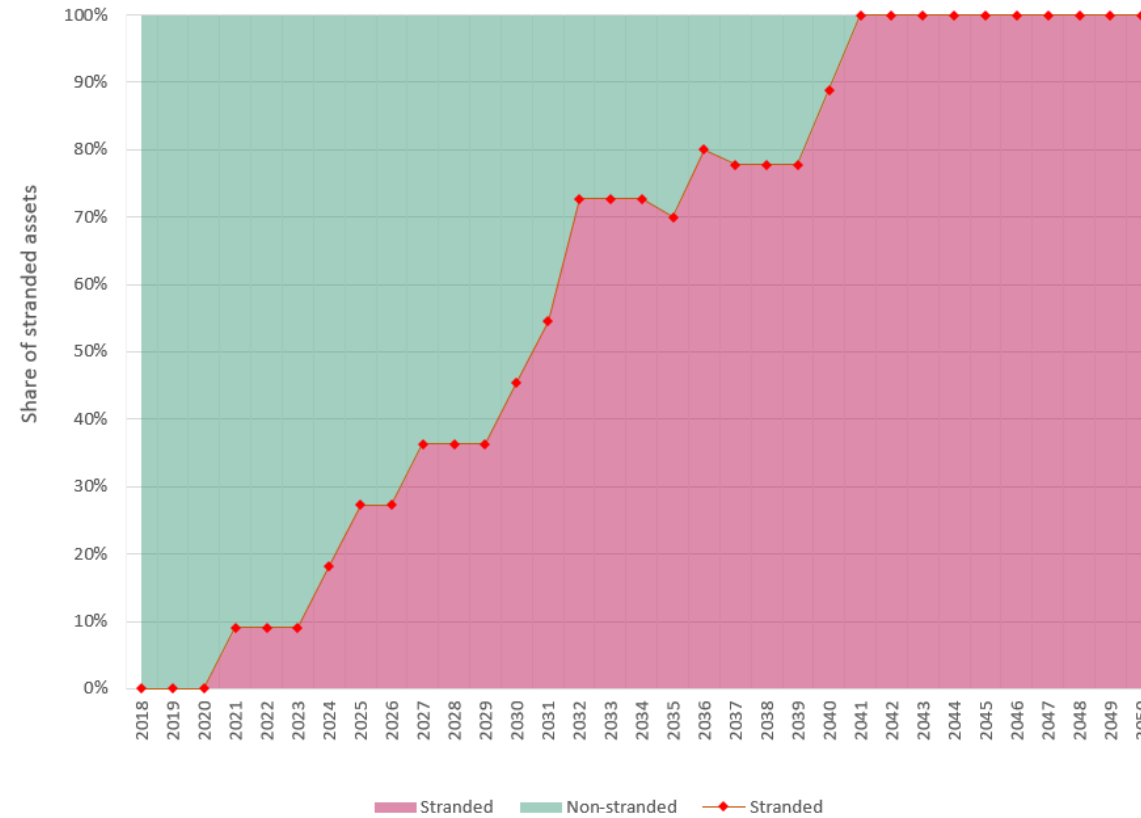
Diagrams on the right display the evolution of stranding within your portfolio. Upper graph: Relative share of stranded assets. Lower graph: Absolute figures. Choose whether to display data based on the number of buildings, gross floor area (GFA) or gross asset value (GAV). Choose whether to exclude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

Climate target:

Share of stranded assets



Set filter:

Country:

Property type:

Entity/Fund:

Assessment year:

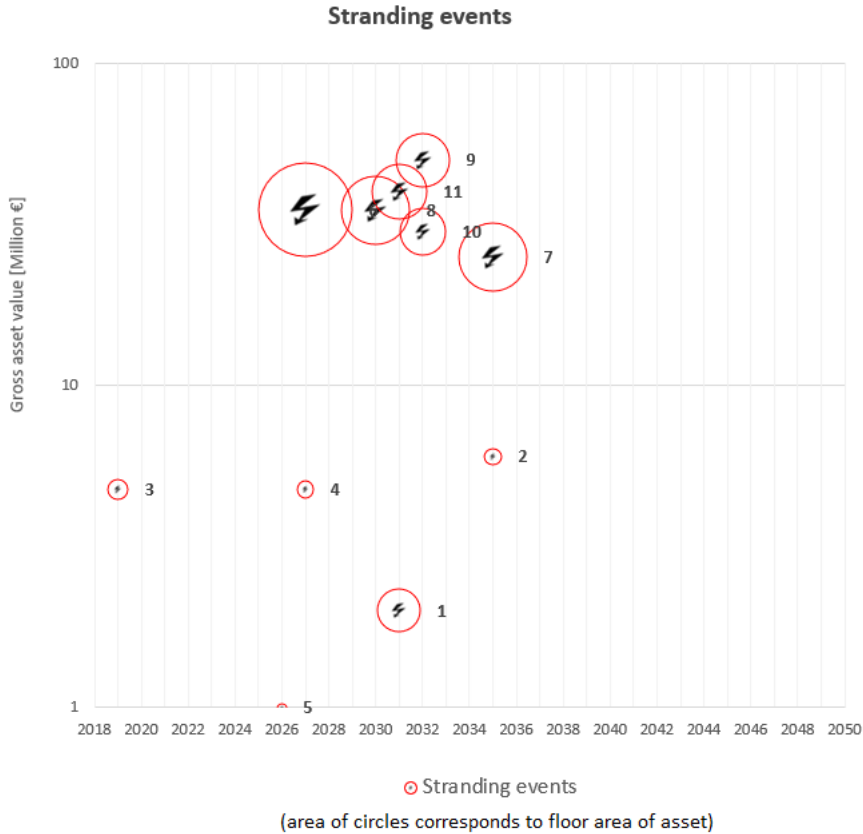
CARBON RISK IN REAL ESTATE PORTFOLIOS

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.

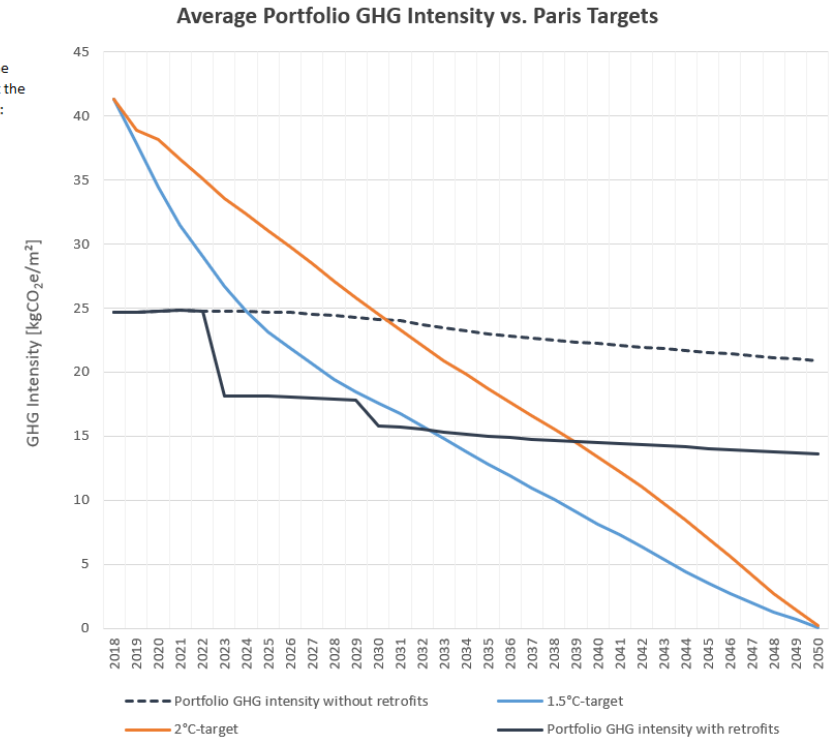
Climate target:



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



Stepwise integration of CRREM Risk Analysis and GRESB

- (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

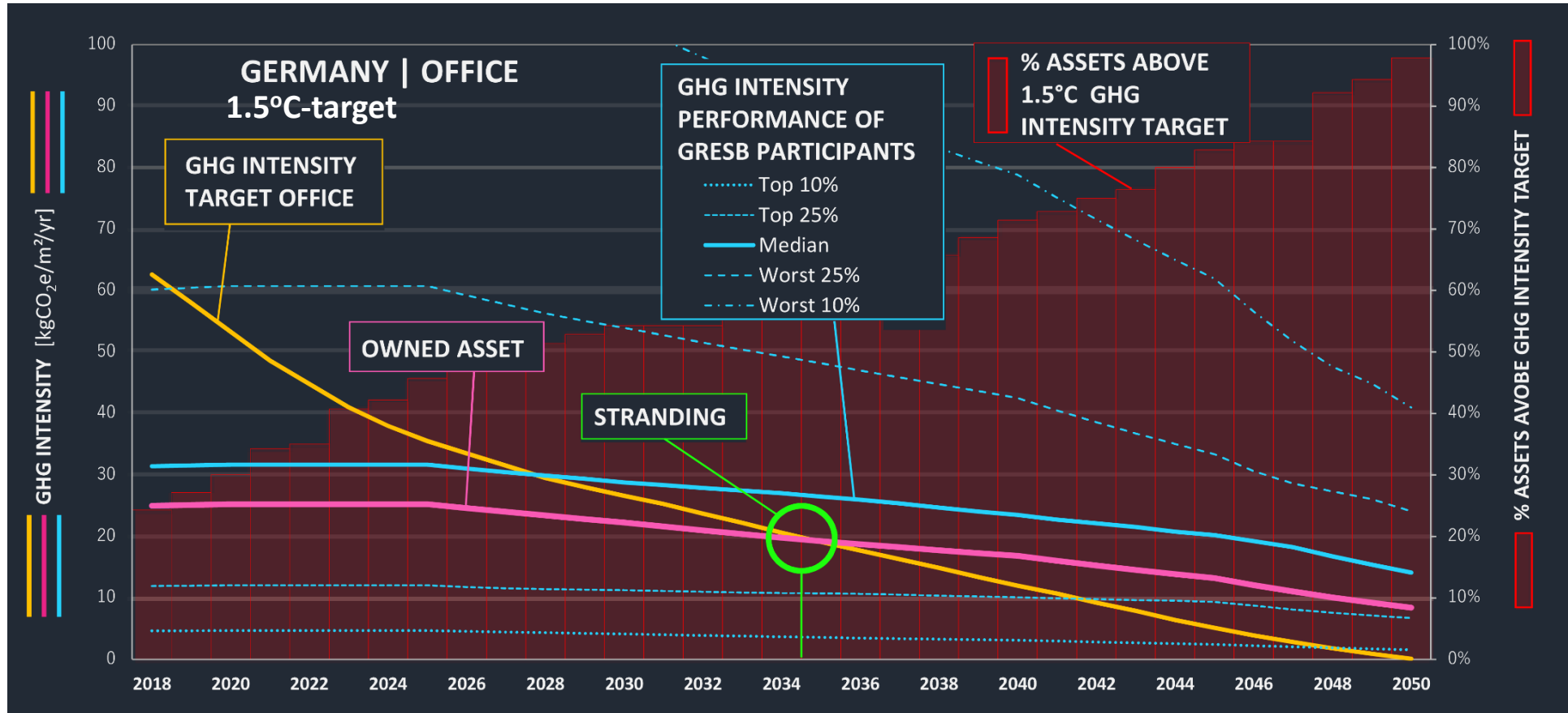


Property types and input parameters are aligned with GRESB ESG Benchmark:

General information									Building characteristics							Energy consumption														Fugitive emissions				Renewable energy												
Area ID	Location	Asset name	Reporting year	Gross Area (GFA)	Reporting period	Entity	Development/tenor of data	Mandatory	Mandatory	Optional (for further harmonization of indicators)	Country	City	IP	Code	Address	Property type	Air conditioning	Area ratio	Total gross internal area (M²G2)	Area maintenance area	Whole building energy consumption Combined energy consumption of Common Areas & Tenant Space Energy used by tenants and base building services to lettable/leasable and common spaces. This should include all energy supplied to the building for the operation of the building and the tenant space except from energy consumed as part of refurbishment measures.														Refrigerant gases / Fugitive emissions Whole building (Cover only by reports of a whole building) Some reporting period or energy consumption data.				Fugitive emissions				Renewable energy			
Pre-filled	Drop-down menu	Text	Year	Text	Text	Text															Drop-down menu	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text	Text
1	Include	Sach Tower	2018	2000000	January	10					Austria	Wien	6300	Shareholder/Property	Office			6,000	2000			Grid Electricity	Material use	Fuel oil	District heating (Excluded)	District cooling (Excluded)	Other energy consumption Type 1	Other energy consumption Type 2	Gas 1	Gas 2																
2	Include	Eden Palace	2018	6000000	January	12	Fund2				Austria	Kufstein	6320	Home/Residential	Mixed Use			5,000	0			Grid Electricity	Material use	Fuel oil	District heating (Excluded)	District cooling (Excluded)	Other energy consumption Type 1	Other energy consumption Type 2	Gas 1	Gas 2																
3	Include	Alfa Romeo	2018	4750000	January	12	Fund2				Netherlands	Amsterdam	2514	Office			1,500	0			Grid Electricity	Material use	Fuel oil	District heating (Excluded)	District cooling (Excluded)	Other energy consumption Type 1	Other energy consumption Type 2	Gas 1	Gas 2																	
4	Include	Avon Eiffel	2018	4750000	January	12	Fund2				France	Paris	78000	Office			5,000	0			Grid Electricity	Material use	Fuel oil	District heating (Excluded)	District cooling (Excluded)	Other energy consumption Type 1	Other energy consumption Type 2	Gas 1	Gas 2																	
5	Include	Alfa Romeo 2	2018	1000000	February	10					Austria	Wien	6300	Retail, High Street			200	0			Grid Electricity	Material use	Fuel oil	District heating (Excluded)	District cooling (Excluded)	Other energy consumption Type 1	Other energy consumption Type 2	Gas 1	Gas 2																	
6	Include	Alfa Romeo 3	2018	3500000	January	10	Fund2				Spain	Madrid	20001	Retail, Shopping Center			20,000	1000			Grid Electricity	Material use	Fuel oil	District heating (Excluded)	District cooling (Excluded)	Other energy consumption Type 1	Other energy consumption Type 2	Gas 1	Gas 2																	
7	Include	Star Center	2018	25000000	February	12	Star Fund				Dominik	Capenhagen	1000	Retail, Shopping Center			15,000	0			Grid Electricity	Material use	Fuel oil	District heating (Excluded)	District cooling (Excluded)	Other energy consumption Type 1	Other energy consumption Type 2	Gas 1	Gas 2																	
8	Include	Vrimarket	2018	3500000	January	12	POF				Spain	Madrid		Hotel			15,000	0			Grid Electricity	Material use	Fuel oil	District heating (Excluded)	District cooling (Excluded)	Other energy consumption Type 1	Other energy consumption Type 2	Gas 1	Gas 2																	
9	Include	Alfa Romeo	2018	5000000	January	12					Poland	Warsaw	00-007	Retail, Shopping Center			5,500	0			Grid Electricity	Material use	Fuel oil	District heating (Excluded)	District cooling (Excluded)	Other energy consumption Type 1	Other energy consumption Type 2	Gas 1	Gas 2																	
10	Include	Alfa Romeo	2018	3000000	January	12					Poland	Warsaw	00-007	Mixed Use			7,000	0			Grid Electricity	Material use	Fuel oil	District heating (Excluded)	District cooling (Excluded)	Other energy consumption Type 1	Other energy consumption Type 2	Gas 1	Gas 2																	

Benchmarking of individual assets or aggregated entities against peers from annual GRESB Benchmarking

- Share of stranded assets in peer group
- Benchmark against average, over- and under-performer

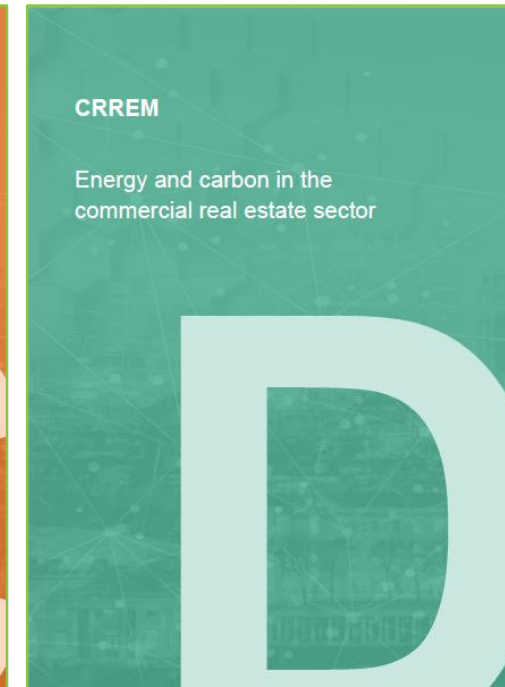
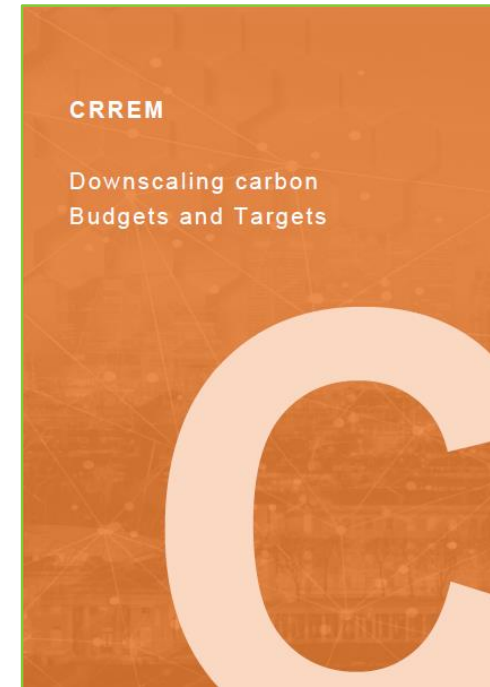
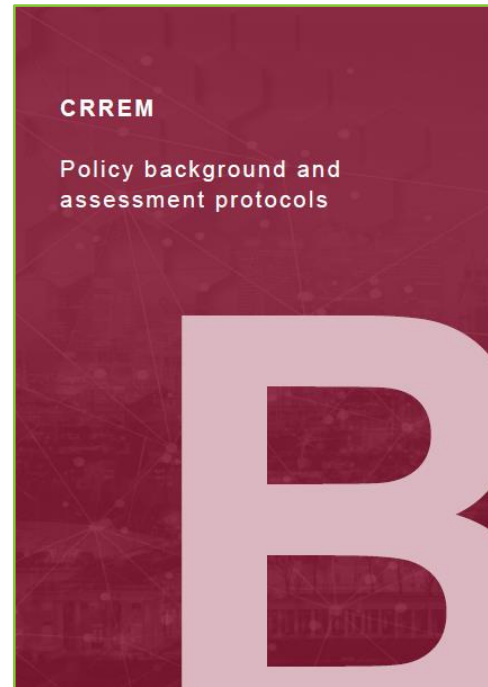
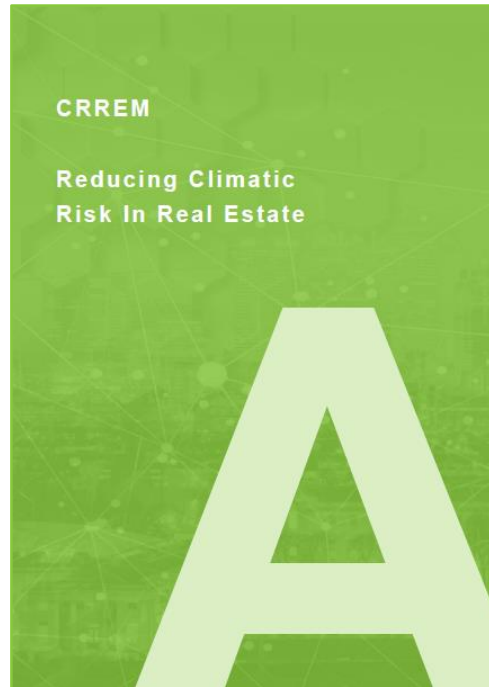


STRANDING RISKS & CARBON

available on
www.CRREM.eu

Science-based decarbonising of the EU commercial real estate sector

available on
www.CRREM.eu





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WWW.CRREM.EU

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ENERGY REDUCTION PATHWAYS: BASED ON NET-ENERGY DEMAND

Net-energy demand

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Procured energy – Exported energy

Consumed energy – (On-site) Generated energy

