Carbon Risk Real Estate Monitor

Carbon Risk Integration in Corporate Strategies within the Real Estate Sector

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HOW TO READ THIS REPORT
The content of this document is comprehensive, but designed to be feasible and accessible to a multidisciplinary readership. The structure permit readers to approach the report as a full document, or alternatively the individual chapters serve as standalone outputs with specific thematic focus.

EXECUTIVE SUMMARY

The document commences with a brief section listing the key outcomes of the research. This section is not intended as a summary of the whole report, but as a structured selection of the most important areas of discussion that the authors would like to highlight to CRREM stakeholders. The executive summary dedicates one page to each of this report’s eight main sections.

MAIN SECTIONS

SECTION A  FROM ‘CARBON RISK’ TO ‘CARBON STRATEGY’

This section provides the introduction to the report and outlines the context and rationale pertaining to the nexus between of carbon risk and corporate strategies. It places carbon risk and the CRREM project in the context of sustainability, CSR and the different other types of risk evident for companies and investors. This section also provides empirical research undertaken by the CRREM consortium to highlight the ongoing challenges.

SECTION B  STRATEGIC MANAGEMENT OF CARBON RISK AT CORPORATE LEVEL

Section B investigates the role of strategic management of carbon risk from a corporate perspective. It provides an overview of the relationships present between CSR and carbon risk, and further presents the challenges and dynamics relating to defining carbon risk for corporate risk management and decision-making and its integration into business planning through various best practice frameworks and guidance tools and methodologies. The section introduces the potential role of the CRREM Tool as a means of carbon risk due diligence. The role of organisational and cultural behaviour pertaining to corporate cultural practices is discussed with key learning outcomes offered.

SECTION C  CARBON RISK INTEGRATION IN REAL ESTATE PORTFOLIOS

This section moves on from the company to the portfolio level. It investigates the ways in which carbon risk is currently integrated into real estate portfolios and how this could be improved in the future. It discusses how carbon risk exposure could be analysed and managed. It demonstrates in detail how such risks can be identified, assessed, aggregated, communicated and eventually eliminated. Besides that, the authors stress how CRREM contributes to all of these aspects of corporate carbon risk management on a portfolio level. This section links the somewhat technical aspects of structural assessment and operational management with the rather more intangible elements of risk perception and reward seeking. It is important to link these elements as without a well-established investment business case and financial infrastructure, the private sector is unlikely to position itself relative to the challenges presented by climate change.
SECTION D  EVIDENCE BASED DECISION-MAKING TO INFORM CORPORATE REAL ESTATE DECARBONISATION STRATEGIES

This section deals with the challenges of data identification across the real estate value chain and the integration of the different types of carbon consumption that need to be considered when evaluating emission thresholds within a real estate portfolio. It delineates the responsibilities for capturing and reporting carbon emissions highlighting the issues and difficulties associated with this given the dis-jointed nature of the commercial real estate value chain. The key distinction between operational and embodied carbon is clearly explained and discussed with specific emphasis centred on the real estate sector. The section addresses key pitfalls and barriers that the industry is facing at present. It identifies the issues associated with determining and monitoring carbon factors and introduces the key role for CRREM in addressing these challenges. This chapter reveals the ongoing operational complexity real estate companies are facing when seeking to derive the true extent of their carbon footprint. The section maps out the pressure points and potential shortcomings in respect of data capture affording insights on why firms struggle to assemble the requisite data to inform and support strategic intervention and robust cost-benefit analysis. Finally, this section demonstrates what real estate owners and investors can and should be doing and presents the respective learning outcomes and instruments to support informed evidence-based asset and portfolio level decisions.

SECTION E  ANALYSING THE IMPACT OF REGULATION ON CORPORATE CARBON STRATEGIES

This section investigates the ways in which national and international policy interface with and impact upon organisational behaviour and corporate decision-making to result in outcomes which are not always optimal. The main constituent of the section is the introduction of the CRREM Policy Analysis Matrix, which is designed to facilitate an analysis of how policies with different attributes will be responded to by organisations in a dynamic context depending on their views and ideologies pertaining to carbon risk and associated mitigation strategies. The chapter explains the rationale for the Matrix and describes the mechanics of its operation. Pertinent policies from a number of EU member states have been populated into the Matrix in order to demonstrate its application.

SECTION F  SUSTAINABLE FINANCE AND THE EU TAXONOMY TECHNICAL REPORT

Based on the results regarding the general impact of policy and regulation emanating from Section E this chapter puts a special focus on EU initiatives. The authors undertake a detailed analysis of the EU Action Plan on Sustainable Finance and the EU Taxonomy on Sustainable Finance detailing its consequences for the real estate sector. This key initiative has the potential to both undermine current business activity and also to foster a much more cohesive and transparent investment and finance ecosystem for sustainable investment in the future. Mainstreaming a sustainable finance system requires less ‘novelty’ and more ‘normalcy’. This section contextualises CRREM with regards to this dynamic regulatory environment and describes how the CRREM Tool and pathways can act as a ‘climate benchmark’ and ‘climate projector’ for real estate assets’ supporting the identification and disclosure of carbon risk as required by the EU.
SECTION G  CORPORATE REAL ESTATE DECARBONISATION STRATEGIES CASE STUDIES AND EXEMPLARS OF BEST PRACTICE

This section presents the results and findings of in-depth interview-based case studies with leading real estate companies who have been amongst the first-movers in responding to the challenges posed by climate change. These examples are important in understanding the nature and scale of the challenges faced and also in seeing the approaches on operational levels that have been and can be applied to accomplish both internal and external decarbonisation targets. The authors also look at lessons which can be learned from other sectors which are arguably more progressive in their journey towards decarbonisation. The problems facing real estate are varied, nuanced and severe, but are not unique. Solving them will require innovation and learning from best practice from both within and beyond the sector. Indeed, the capacity for cross-sectoral analysis and collaborative approaches has the propensity to garner significant impact. This section provides valuable insights and evidence in this regard.

SECTION H  CONCLUSIONS

This chapter presents the conclusions to the report illustrating the key findings emerging from the policy overview and eminent research in the area in conjunction with the current CRREM findings. It is intended to consolidate the findings of the report and the CRREM Project to date.
EXECUTIVE SUMMARY
Given the potential role of the real estate industry in attaining decarbonisation goals both at national and international levels and in order to align more effectively the real estate industry with a science-based decarbonisation approach a key objective of policy makers is to instil more proactive approaches to redressing the carbon consumption levels within existing real estate stock. The fundamental challenge for most financial and real estate corporations is the identification and quantification of risk, and how to specifically manage carbon risk. Certainly, firms are increasingly seeking to understand the implications of a possible price on carbon and make strategic responses accordingly through the identification of strategies that help to manage and reduce these risks. Indeed, this is contingent upon knowledge fostering and policy and regulatory insights, enhanced transparency and science-based emissions assessment and carbon risk indicators. The upcoming EU legislation on a taxonomy for climate-related risks defines minimum disclosure requirements in order for financial activities to be classified as an eligible sustainable investment. The CRREM Tool supports all stakeholders of the real estate industry – including General Partner (GP) and Limited Partner (LP) investors – to comply with the new requirements, create meaningful carbon risk indicators and successfully manage risks.

The real estate industry has not been the most proactive in embracing the decarbonisation agenda. Indeed, in the collective, real estate lags other key sectors of industry in the formation of corporate strategies which serve to embrace the challenges and opportunities and mobilise impactful interventions and actions to reduce carbon emissions. The research undertaken in the compilation of this report infers that, whilst the industry faces a number of ‘unique’ challenges in light of the disparate (and often short-term focus) of its value chain, the sector is evolving and adapting to the challenges of decarbonisation from both a cultural and technical viewpoint.

This report presents an overview of the current standing of the real estate sector and the extent to which it has embarked (and embraced) the journey towards decarbonisation. The views and opinions of the European real estate community are garnered via an online CRREM survey. Further insights on implementing cultural and operational change, mobilising action and developing viable real estate decarbonisation pathways are attained through a series of case studies depicting ‘early adaptors’. Relevance is made to the current mandate and action plan undertaken by the EU which has seen the push for the integration of financial markets and capital aligned to, and integrated with, the green economy. Indeed, the cornerstone of the new sustainable finance agenda is presented along with the EU’s proposed unified classification taxonomy which is considered to be the pathway towards standardising ‘green’ financial products to enhance transparency for financing sustainable growth and investment through low-carbon and climate-resilient activities. The taxonomy will provide a framework that acts as an important interface between policy goals and investors as well as managers of capital. We highlight how the CRREM project can help to identify sustainable finance activities in terms of the taxonomy by contributing to the required disclosure of low carbon-benchmark. The final case studies convey key learning outcomes and the ensuing challenges that the sector must address within the confines of the decarbonisation goals depicted in the Paris Agreement. Additionally, the report includes an exploration of key policy instruments and initiatives which have served to alter the decarbonisation landscape for the European real estate sector. The successes of policy initiatives are considered relative to differing corporate perspectives (proactive through to reluctant compliant) and considers how different approaches have impacted decision-making within the real estate sector.

The research undertaken by CRREM has yielded a series of pertinent learning outcomes and insights affording an evidence base for debate and discussion on the challenges and barriers that the sector is seeking to redress within the confines of decarbonisation. These key findings are distilled out and presented thematically but with the knowledge and understanding that interdependencies exist across the themes and that for the sector to move forward and achieve meaningful impacts with respect to decarbonisation targets, these themes need to be considered in unison rather than in isolation. The exemplary enthusiasm of numerous individuals within the real estate industry fortunately coincides with highly engaged industry associations like EPRA or INREV providing fertile ground for jointly mastering the challenges ahead.
KEY FINDINGS
Implementing and Fostering Cultural Change

The concept of ‘change’ is often divisive within any organisation – the real estate sector is no different in this respect. In compiling this report, we have witnessed various approaches across the real estate sector to the decarbonisation challenge – from early transtainers through to more lagged compliance-based approaches. The increased pertinence of Environmental, Social and Governance (ESG) frameworks within the real estate sector depicts a transformational shift necessitating more equitable balance between the ESG goals and profitability. In essence, profitability should not be at the expense of the environment whilst equally decarbonisation goals should not unduly compromise the financial well-being of the company. That said, without proactive and meaningful impact on decarbonisation, the conventional real estate business model is at risk of obsolescence. The real estate sector is embracing its ESG responsibilities – but pertinently striving to do so within a viable financial and economic framework. The proposed EU taxonomy on sustainable finance activities will transform this framework and set new minimum standards especially regarding the assessment and disclosure of carbon risk. The CRREM Project offers a wide spectrum of methodologies and risk indicators facilitating real estate stakeholders to cope with the requirements.

Strategy recommendation: Whilst decarbonisation is being predominantly viewed as an environmental goal, adaptation to the threats of climate change and the need to address carbon emission is essential to business survival. The evidence from early adopters to the decarbonisation challenge points to the need for strong, visionary leadership as well as continuity in senior management teams in order to conceptualise and implement cultural change and implement actionable intervention on decarbonisation. Cultural adaptation and the mobilisation of action needs to be instilled right across the company and be driven by senior management teams in order to ensure compliance and commitment across the organisation.

Appreciation of Sectoral Interdependencies

Invariably, the real estate sector does not sit in isolation within the confines of the decarbonisation agenda and is very much a constituent within a much wider value chain of related activities across the built environment. As such, the journey towards a more carbon neutral commercial real estate sector cannot be considered in ‘isolation’. Rather it must be positioned relative to transitional change and decarbonisation activity within inter-related sectors of industry such as construction and transportation. Only by acknowledging and understanding these inter-dependencies between sectors impact can be optimised and meaningful, viable solutions be conceptualised and operationalised. Indeed, without such ‘integrated’ solutions there is the real risk of carbon displacement effects between key sectors of industry.

Strategy recommendation: The real estate sector can conceptualise and ‘learn from’ other sectors of industry in terms of their carbon reduction strategies. There is propensity for the real estate sector to adapt/modify these strategies relative to their own sector specific challenges but also (and perhaps more importantly) ensure alignment and a unified vision across the key sectors of industry curtailing the risks of potential ‘displacement’ and negative externalities between sectors. The science-based methodology that was applied to derive decarbonisation target trajectories for the commercial real estate sector in the CRREM Project could set a model for other industries striving to align carbon reduction efforts of assets and economic activities.

‘Greening’ the Real Estate Value Chain

Relative to other sectors of industry, the real estate value chain is fragmented and complex comprising corporate stakeholders with often conflicting environmental, economic and social goals. In additions, stakeholder time horizons (short-term profitability versus long-term investment) and input across the various stages of the real estate cycle vary considerably. In order to attain meaningful impact on decarbonisation, the real estate sector requires a collaborative and integrated approach encompassing the wider corporate value chain. Suppliers (of materials, energy and further
services) as well as consumers (tenants) of real estate assets have a crucial role to play if decarbonisation targets are to be realised. As such owners/investors have a crucial role to play in ‘greening’ the value chain. This holistic approach is closely related to the inevitable inclusion of embodied carbon considerations besides the well-established focus on operational carbon emissions.

**Strategy recommendation:** The decarbonisation challenge requires integrated vision and for different strands of the value chain to work together to attain mutual benefits. From the design of new build, the retrofitting of existing assets through to the mobilisation of tenant action on decarbonisation. To achieve this, the real estate industry must utilise more effectively the experiences and learning outcomes of early adaptors in order to develop viable decarbonisation plans that consider embodied carbon issues and are aligned with science-based target pathways as introduced by the CRREM Project. Decarbonisation of the real estate sector is not a challenge that companies should seek to address in isolation.

**Elongation of Asset Lifecycles**

Traditionally, the viable economic life of commercial real estate assets is deemed to be 25-30 years (if that). Indeed, if we consider much of the analytical frameworks and modelling pertaining to decarbonisation there is very often this in-built assumption. Moreover, if we factor in policy transformation or market-led demands attributable to climate change then the propensity for an asset to become ‘stranded’ could trigger early obsolescence. Historically, the real estate sector has too often focussed on the ‘short-term’ costs of development – rather than the longer-term operation of the asset and associated life cycle costs. If we take into account that 50% of the world’s real estate stock at 2050 has already been constructed, then it poses the question why there is such a lack of emphasis and lack of research and data pertaining to the decarbonisation impacts and associated cost recovery dynamics of green retrofitting commercial property assets. The inherent long-term perspective of real estate assets could help to break what Mark Carney, Governor of the Bank of England, referred to as the ‘Tragedy of the Horizon’, namely that “the catastrophic impacts of climate change will be felt beyond the traditional horizons of most banks, investors and financial policymakers, who do not have the direct incentives to fix them”.

**Strategy recommendation:** The real estate sector needs to employ more sustainable and longer-term horizons pertaining to the ‘useful’ economic life of assets. The property-specific decarbonisation targets of the CRREM Project provide stakeholders with the necessary information enabling a long-term perspective on the future regulatory requirements and proactive planning of investments necessary to comply.

**Upscaling Green Retrofitting**

New build properties are heralded in many quarters as the ‘solution’ to the decarbonisation of the real estate sector. From an operational viewpoint, new buildings offer improved energy efficiency and reduced carbon consumption so by comparing ‘old’ with ‘new’ from a purely operational viewpoint then there is only one winner. By ignoring the embodied carbon associated with the construction of the new building (as well as very often the demolition of an existing building to make way for the new asset) creates an undue bias in favour of new build. In reality, the ‘carbon costs’ attributed to demolition and construction take a significant period of time to recover over the operational life of the asset – making the case for upscaling green retrofitting all the more pertinent. CRREM will provide robust and reliable data on both operational and embodied carbon costs in order to make more informed decisions pertaining to new build versus retrofit.

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1 UNEP FI, 2019.
Strategy recommendation: The real estate sector bias in favour of new build solutions needs to countered by evidence-based justification and business cases to support – or at least ensure due consideration of green retrofitting solutions where appropriate. The relative absence of research and robust economic and environmental modelling on green retrofitting remains a barrier to upscaling within the sector. Moreover, the capitalisation of green retrofitting needs more robust guidance to ensure continuity and consistency in valuation practice. The valuation profession including the Royal Institution of Chartered Surveyors have a crucial role to play in ensuring robust and consistent appraisal guidance. Increasing data transparency and assembling an evidence base to support the capitalisation is essential to upscaling and to enhancing investor confidence in green retrofitting. The CRREM project creates transparency of the evolving regulatory requirements that have to be met by individual assets, clearly communicating the extent of necessary retrofit measures, potential costs and savings as well as potential value premium.

Addressing Data Gaps and Improving Evidence Based Decision-Making

Data provision needs to be addressed to provide a robust and credible evidence base to inform decision-making and to measure carbon-related risks as well as the impacts of retrofit interventions. Property owners, investors, asset managers, consultants and tenants need to work together to improve the quality and accuracy of key datasets pertaining to energy consumption and carbon emissions. Tenants, for example, without sufficient engagement and understanding of data needs and assurances over the use of their data, can easily decline data sharing agreements due to concerns around the security and purpose of data. Without data, the carbon inventory of real estate assets is incomplete leading to inaccurate assumptions. The climate impact of buildings as well as their carbon risk depend on their whole building emissions and tenant data should be included in respective analyses.

The European Public Real Estate Association (EPRA) demonstrated with its Sustainability Best Practices Recommendations how a clearly defined framework of indicators and methods can contribute to the mutual understanding between the diverse stakeholders and bridge data gaps with evidence-based information. Different organisations including the Better Buildings Partnership (BBP) are promoting the implementation of Green leases, which contain binding clauses in relation to the sustainable operation of a building and provisions regarding sharing of data and co-operation on improving environmental performance. The World Green Building Council’s (WGBC) Advancing Net Zero Status also encourages tenants to grant building owners access to energy consumption data to take greater control over consumption, potential improvements, and energy supply contracts. However, our research shows that the disconnect between tenant and landlord/owners remains a key challenge to decarbonisation.

Strategy recommendation: The work of the BBP and the WGBC has advanced the discussions and articulated the justification and need for more integrated data agreements pertaining to the sustainability and operational efficiency of real estate assets. Nonetheless, as this research has shown, the absence of a regulatory framework to define data sharing obligations and to ensure data protection discourages uptake and commitment on the part of tenants. As such, there is a requirement to develop new policies and modify existing ones (e.g. Energy performance of buildings directive, General Data Protection Regulation) to guarantee transparent, safe and sufficient data transfer between tenants and building owners. In the absence of such agreements, organisations may opt to either collect extra information to complete the inventory or report their data gaps into the CRREM tool, which can estimate the missing data with average values for each European country.

Using emissions data for determining carbon risk parameters

The integration of carbon risk in the corporate strategies of core sectors of the economy is receiving increasing attention. The combination of pro-active green government policies and the advancement in technological developments is encouraging the participation of institutional investors to consider carbon risk reduction as a core component of
investment strategy in the selection and managements of portfolio assets. Measuring a company’s carbon footprint is a necessary first step towards the creation and implementation of a broader climate change strategy. Though, the planning of concrete activities to reduce carbon risk makes it necessary to benchmark this carbon footprint against meaningful comparables, science-based reduction targets and in particular the derivation of quantitative risk indicators.

**Strategy recommendation:** Integrating carbon risk as an integral component of corporate strategy will invariably facilitate the transition to a low carbon economy. The introduction of quantitative tools is essential to the creation of an ‘evidence base’ that determines baseline positions in respect of the extent and nature of carbon risk at the asset, portfolio and corporate levels and to measure and monitor the ‘impacts’ of intervention strategies and asset liquidation decisions overtime relative to internal corporate as well as external (ideally science-based) goals. By utilising the CRREM Tool, investors and property owners can construct individual roadmaps for decarbonisation using their own carbon data to develop ‘virtual’ decisions and scenarios regarding acquisition, sale or refurbishment in order to assess the ‘impact’ on their portfolios and carbon risk. This affords investors valuable quantifiable information to define the prioritisation of capital investment or asset disposals relative to both corporate and SBTs and to monitor and assess this relative to ongoing business activities/changes in policy.

**Carbon pricing remains challenging due to political and policy uncertainty**

Assessing and managing carbon risk is made more challenging by the substantial amount of uncertainty about the future direction of public policies on energy and climate change. This is critical in order to more effectively transpose decarbonisation policy into ‘actionable’ outcomes. The upcoming EU taxonomy on sustainable finance – including climate benchmarks and disclosures – demonstrates that politics has begun to translate climate goals to concrete regulation based on a science-based methodology by developing a detailed framework that aligns the activities of investors and managers of capital with the emission reductions required to achieve the Paris climate targets.

**Strategy recommendation:** The financial and real estate sector could play a role in working to reduce this uncertainty through engagement in public policy surrounding the nature and timing of regulation, reporting and disclosure requirements which would greatly enhance the ability to assess and manage carbon risk. The CRREM framework for analysing stranding risks anticipates the upcoming science-based policy targets, creates transparency and supports the screening of potential investment opportunities regarding their eligibility pursuant to the EU taxonomy of sustainable economic activities.
From ‘Carbon risk’ to ‘Carbon strategy’
SECTION A: FROM ‘CARBON RISK’ TO ‘CARBON STRATEGY’

The integration of carbon risk in corporate strategies across key sectors of the economy is receiving increasing prominence in academic research and policy-based literature². The key drivers impacting on the way forward are increased tenant demand for sustainable space, the strengthening of regulatory levers pushing for increased environmental performance in buildings and the increase in Corporate Social Responsibility (CSR) policies by investors and tenants³. CRREM research has highlighted that green government policies in combination with stronger consumer orientation towards more sustainable-products, a higher willingness-to-pay and the advancement in technological developments has encouraged institutional investors to incorporate carbon risk reduction as a core component of their investment strategies. Comparatively high carbon emissions of any particular asset are likely to have a significant negative impact on asset values in the near future. The integration of the results of a carbon risk assessment in devising company targets is increasingly affecting strategic asset allocation (SAA) and the ongoing managements of portfolios (Figure 1). Carbon risk clearly is a multi-faceted issue for any real estate investment. Its definition includes a number of aspects. First of all, properties might face the downside of increasing costs of energy or carbon emissions that have to be factored in any financial assessment. Adding to this aspect market demand is likely to shift more and more towards low-carbon products which in turn might put more pressure on the values of “brown-assets” which are not in line with these market expectations. Also, the ongoing tightening of the regulatory framework (see SECTION E) is posing additional risk on assets with a relatively high carbon footprint. Legislative change could for example lead to restrictions on the letting or sale of buildings that do not comply with certain minimum standards; potentially affecting revenues and expenditures of real estate investors. Against this background carbon risk can be defined as the risk of write-downs due to the transition to a ‘low-carbon economy’ as well as due to physical climate change impacts. Write-downs can affect assets that do not meet future regulatory requirements or market demands, facing premature obsolescence and being denoted as ‘stranded assets’. In its most basic form, carbon risk pertains to the exposure of risk(s) through the impact of climate change on investible assets affecting profitability⁴. Accordingly, the United Nations Environment Programme – Finance Initiative (UNEP FI)⁵, draws on types of risk factors related to carbon risk, making the distinction between how carbon risk factors affect carbon-intensive companies/ operators – ‘operator carbon risk’ and how such risk, depending upon the nature and severity of impact, could affect financial intermediaries and investors that have a financial relationship with these operators – ‘carbon asset risk’. This significant differentiation applies also to operators and (direct and indirect) investors in real estate.

Carbon risk results from legislative and regulatory changes to reduce carbon emissions – namely the establishment of limits, the introduction of emissions allowances schemes or carbon taxes⁶. Corporate strategies applied by real estate investors and asset managers result in certain SAA decisions regarding investment region, asset class and portfolio composition. Consequently, the objective of this report is to develop a deeper and more engrained understanding of the current decision-making processes and strategies pertaining to GHG-emissions⁷ that are presently adopted within the real estate sector. Specifically, the work has been designed to better understand how carbon risk is today assessed and factored in corporate decision making. Findings have reflected the views and opinions of key decision makers from across the European real estate sector attained via an online survey and personal interviews. A key dimension of that survey was the exploration of attitudes within the real estate community to carbon reduction. Understanding today’s stakeholder perspectives is key to determining how to increase

² Wilkinson et al., 2018; Miller and Pogue, 2018.
⁴ Trucost, 2013.
⁵ UNEP FI, 2015.
⁶ Trucost, 2013.
⁷ The term Greenhouse Gas will be used synonymously to “Carbon” in this report.
the decarbonization efforts of the sector and to assessing the policy impacts which can result from the EU Sustainable Finance Action Plan or any other upcoming regulatory intervention (see SECTION E and F).

Under the Paris Agreement, there is a real urgency to keep global warming down to below 2°C and pursuing efforts to limit it to 1.5°C. Global warming can only be limited with a massive cut of GHG emissions and necessitates the combined efforts of all sectors of industry including construction and real estate. Institutional investors and real estate market participants are encouraged to systematically link criteria related to Environmental, Social and Governance (ESG) aspects and climate risk factors into their investment processes and target setting. Addressing ESG risk is also compatible with an investor’s fiduciary duty of addressing due diligence, managing risk and generating long-term value for their clients and stakeholders. The impact of climate change on companies’ revenues and indirectly on dividend payments are one key aspect of carbon risk for investors (see above). According to a study by HSBC, tax incentives and financial returns are still the two key drivers of integrating ESG issues into decision making of issuers and investors – only pension fund and sovereign wealth fund investors attach higher importance to regulation than to tax incentives. Further drivers of ESG-based decision making among investors are stakeholder/shareholder pressure and risk management. The EU Sustainable Finance Action Plan (see SECTION F) will further stress the importance to be aligned or, even better, be ahead of any regulatory intervention in that respect.

Carbon risk integration strategies are becoming increasingly prevalent in the real estate sector. It is estimated that buildings account for some 28% of global carbon emissions, with heating, cooling and lighting making up 60% of usage in buildings with other miscellaneous uses accounting for the remainder. The global expansion of the built environment generates on-going pressures. UN figures estimate that over the next 40 years, buildings with an area equivalent to the size of Paris will be constructed every week. Construction uses an estimated 3 billion tonnes of raw

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9 Caeldecott, 2018.
10 Bentall Kennedy, REALPAC, UNEP FI, 2019.
11 Dietz et al., 2016.
12 HSBC, 2018, p. 7.
materials annually, in addition to being the world's biggest consumer of steel, copper and concrete. These resources are energy and carbon intensive to produce. This makes real estate an important sector to meet important carbon reduction targets. Those buildings that failing to meet carbon reduction targets will inevitably see their asset value and liquidity compromised. Consequently, GHG emissions are seen to be a material consideration in the management of real estate investment strategies. In its latest special report on climate policies, the German Council of Economic Experts demands an expansion of the European Emissions Trading Scheme (ETS) on all economic sectors – including real estate - establishing a common CO₂-price for all economic activities. The CRREM investor survey also highlighted the increased prominence of carbon risk assessments within the real estate sector over the course of the last decade. Perhaps one of the most noteworthy findings of the investigation is that 50% of respondents had already introduced carbon risk assessment tools within their corporate structures. Interestingly, pre-2010 only 19% of the respondents employed carbon risk assessment tools. Presently, carbon risk assessments are commonplace with 33% or respondents confirming their application across the entire real estate portfolio and a further 38% detailing partial application. Somewhat surprisingly, 25% of respondents do not undertake carbon risk assessments. For those undertaking risk assessments these were typically performed on an annual basis with regular updates and reviews being undertaken in line with company strategies.

These findings are consistent with the 2019 Global ESG Real Estate Investment Survey Results, which show that the majority of respondents recognise the importance of including ESG criteria in investment decisions, which in turn unlocks value creation opportunities. When making investment decisions most respondents look at how buildings are benchmarked against established sustainability rating tools or certification schemes (for example LEED, BREEAM, NABERS, CASBEE). The report argues that increasing the stringency of ESG targets across the value chain can accelerate momentum towards carbon reduction targets. The survey results also provide credibility that esg is now core to real estate investment decision-making and driven by institutional capacity for risk management and long-term value creation. Furthermore, the authors indicate that the majority of respondents are experiencing an increase in investor preference for greater sustainability performance disclosure to assist with their portfolio decision-making.

Donovan argues that there is no such thing as climatic risk given that there is no single risk factor that can encapsulate the complexity of global change. The concept of climatic risk applies to two distinct categories of risk which are physical and transitional respectively. The first relates to global warming and the resulting increased risks of extreme weather events, sea-level rise etc. The term transitional risk relates to the shift towards a low-carbon economy. According to the Task Force on Climate-related Financial Disclosures (TCFD), it comprises policy and legal risk, technology risk, market risk and reputation risk. The TCFD recommends a pro-active and scenario-based analysis, disclosure and consideration in strategic decisions of these risks and related opportunities. Green investments involving low carbon infrastructure and clean energy continue to attract a significant rise in investor interest from pension funds, private equity funds, sovereign wealth funds and insurance companies. In other words, carbon risk is part of the transitional risks. Currently, several initiatives like CRREM (focus on transitional risks, stranding, green retrofitting and bottom-up quantitative risk indicators), Carbon Delta (‘Climate Value at Risk’) and many others develop methodologies and tools supporting investors to assess, manage and reduce these risks. A comprehensive summary of methodologies to assess transitions risks can be found in UNEP FI’s investor guide ‘Changing Course’, addressing especially the importance of scenario-based approaches. Figure 2 schematically describes the position of the CRREM approach within the

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14 Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (German Council of Economic Experts), 2019.
15 Bentall Kennedy, REALPAC, UNEP FI, 2019.
16 Bentall Kennedy, REALPAC, UNEP FI, 2019.
17 Donovan, 2018.
18 TCFD, 2017.
19 UNEP FI, 2019.
21 UNEP FI, 2019.
In its most basic form, carbon risk pertains to the exposure of risk(s) through the impact of climate change on investible assets affecting profitability\textsuperscript{22}. Accordingly, the United Nations Environment Programme – Finance Initiative (UNEP FI)\textsuperscript{23}, draws on types of risk factors related to carbon risk, making the distinction between how carbon risk factors affect carbon-intensive companies/ operators – ‘operator carbon risk’ and how such risk, depending upon the nature and severity of impact, could affect financial intermediaries and investors that have a financial relationship with these operators – ‘carbon asset risk’. This significant differentiation applies also to operators of and (direct and indirect) investors in real estate.

\textsuperscript{22} Trucost, 2013.
\textsuperscript{23} UNEP FI, 2015.
Clearly **transitional risks are not static** but are potentially low within a short-term investment (or consumption) horizon and **increasing when focussing on long-term investments**. For example, the emission of carbon dioxide of a flight from Europe to America will cost more or less the same this year or next year. However, booking the same flight in ten years’ time is likely to be impacted severely by carbon taxes/carbon pricing. This very basic example clearly reveals the relevance of addressing carbon risks when focussing on the property industry. **Real estate as a long-term-investment is impacted to a greater extent by transitional risk compared to other industry sectors.** The very recent example of New York demonstrates the growing importance of carbon risk in the real estate sector: In May 2019 the City Council passed a law that establishes evolving GHG emissions limits for existing buildings and imposes a significant fine of $268 for each ton of emitted CO₂ over the building’s limit (based on annual emissions).

The *CRREM* investor survey depicted holding periods of key investment decision makers as an important factor in conceptualising risk assessment ideologies and intervention strategies. The results of the *CRREM* investigation reaffirm the view that real estate is a medium-to-long-term investment. Holding periods of 5-10 years was the most common amongst respondents – although it is noteworthy that more than 19% of respondents deemed their real estate assets to have a useful economic life in excess of 30 years. **Considering the very long holding periods, refurbishment strategies and potential (energetic) retrofits of real estate aligned with decarbonisation-targets should be of high priority.** In contrast, 24% of respondents suggested that they would hold real estate assets for less than five years. A detailed exploration of different holding strategies (long- vs. short-term) related to the results of the carbon risk assessment will be integrated within the *CRREM Tool* in order to reveal the **financial impacts and trade-offs between carbon risk and investments for energetic refurbishments.**

One of the **most significant constraints for investors is access to quality data regarding the financial benefits** (enhanced performance, e.g. higher risk-adjusted returns and portfolio diversification benefits) and the underlying carbon assessments.²⁵ It is also argued that one of the key challenges to increasing investment flows from the financial sector to clean energy and green properties is the provision of a clear and transparent record on the risks and financial returns of potential decarbonisation investment options (Figure 3). Market participants already now clearly prefer high scoring ESG financing and investing products compared to non-green-peers. Such assets are enhancing shareholder and investor engagement, reputation and financial performance.²⁶ Improved data quality, measurement, processing and, finally, disclosure, are among the current key ESG trends,²⁷ and will make an important contribution to the evidence base underpinning ESG issues in the decision-making process.

By providing a clear taxonomy for sustainable investment products, the *EU will define a transparent framework that helps investors to determine whether an economic activity is environmentally sustainable* (see SECTION F). The framework is intended to close the current investment gap by relating carbon emissions to financial indicators and introducing disclosure requirements for low-carbon benchmarks. If the market adopts this framework the requirements as defined in the taxonomy (‘taxonomy-eligible’) will become an indispensable feature for any ESG criteria-based investments. The science-based decarbonisation pathways developed in the *CRREM project provide clear emission reduction pathways for individual assets which are alignment with the goals set out in the Paris Agreement*. The *CRREM Tool* enables investors and asset managers to evaluate the carbon performance of buildings against the target trajectory for a specific use-type in a certain country until 2050. Based on these results users can identify, if and when assets are going to be stranded. Emissions surpassing the Paris-aligned industry-targets (so-called “excess emissions”) combined with a carbon prize can form the basis for any decision-making on energetic-retrofit-measures or even the disposal of

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²⁴ The New York City Council, 2019.
²⁵ Croce and Hindle, 2019.
²⁷ ISS, 2019.
the property if it is not possible to set the asset back on track. Besides measures on property-level investors will also reallocate investments on portfolio and company level accordingly (Figure 3).

**DEFINING KEY TERMS RELATED TO CARBON RISK**

There are several types of climate risk which can impact upon property investment performance in terms of the risk-return profile, diversification potential, valuation of the asset, active management and holding period. The key definitions of climatic risk and its relationship to stranding and transitional risks is outlined as follows:

**Climate Risk:** Climate risks can be defined as downside-risk which can impact any asset class. Climate risks comprise ‘physical risks’ and ‘transitional risk’. Since real estate is a location-bound and a long-term investment, it is highly exposed to both types of risks.

**Physical risks:** The term ‘physical risks’ relates to the direct impacts and losses of climate change on real assets, due to an increased exposure to extreme weather events, sea level rise or an increased demand of heating and/or cooling. Besides these direct impacts, physical risks also extent to potential indirect market impacts of changing climate conditions such as decreased values due to migration tendencies.

**Transitional Risk:** Transitional risk comprises of various key components relating to the corporate as well as to the asset level of the real estate sector. These risk components include a combination of (i) policy and legal risk, (ii) technology risk, (iii) market risk and (iv) corporate reputation risk. Transitional risk is expected to increase considerably across different regions and sectors. Real estate is affected by the tightened regulatory framework on energy consumption and carbon emissions as well as demand shifts towards greener buildings. In order to manage the process, investors are seeking to enhance and apply their understanding of the relationship between financial performance of real estate investments and the potential impacts arising from transitional risk.

**Stranding Risk:** The term ‘stranding risk’ comprises potential write-downs due to physical climate change impacts as well as to the transition to a ‘low-carbon economy’. This report focuses on the aspect of ‘transitional risks’ with regards to assets that do not fulfill future regulatory requirements or market demands. Such assets are denoted as ‘stranded assets’, facing premature obsolescence and significant write-downs. These risks amount to trillions of euros globally and result in a growing liability of company leaders and an increasing fiduciary responsibility of fund managers. In particular, regarding long-term investments, stranding risks require increased board attention. See the first CRREM report “Stranding Risk & Carbon” for further insights to this specific kind of risk.

**Carbon Risk:** The term ‘carbon risk’ refers to the ‘direct’ and ‘indirect’ risks that carbon occupies within a firm’s value chain. The nature and magnitude of risk exposure is dependent upon the nature of the business, the public perception of the firm’s carbon emissions and in the case of real estate firms the ability to actively manage their assets with respect to regulatory and technology changes**.

**Carbon Strategy:** Carbon strategy can also be termed carbon management strategy and refers to the processes, procedures and tools that a company uses to manage its carbon exposure. Effective strategies generally comprise a wide range of activities from establishing the carbon footprint, ongoing measurement and analysis of the carbon emissions through to identifying and implementing a reductions strategy and communicating benefits to key stakeholders


**) Gorgen et al., 2018.
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 785058.

Donovan and Li consider\(^{28}\) the case of whether listed clean energy make financial sense for investors; if a shift towards low-carbon investments could be financially sustainable and to what extent low carbon investments achieve better risk-adjusted returns. The authors evaluate the performance of green-investments relative to other conventional equity benchmarks. It is revealed that low carbon energy investments outperform other asset classes, hence supporting the idea that a stronger focus on low-carbon investments is not only beneficial for the environment but also from a financial point of view. Accordingly, Benedetti et al.\(^{29}\) raise the question concerning the effects of investment risk on optimal portfolio construction in advance of a transition to a low carbon economy which may involve some form of carbon pricing. The authors develop a model to explore the potential effects of carbon pricing on fossil fuel stocks and use it to inform Bayesian portfolio construction methodologies (defined as Smart Carbon Portfolios). The research finds that investors could reduce their exposure to risk by lowering the weighting of carbon-intensive sectors like fossil fuel stocks, with corresponding higher weightings in lower risk fossil fuel stocks and/or in the stocks of companies engaged in the transition to a low-carbon-economy, e.g. energy efficiency markets. In a recent meta-study, MSCI\(^{30}\) has identified the mitigation of tail risks as the best statistically safeguarded effect of ESG characteristics, whereas changes of companies’ ESG ratings (ESG momentum) might be the most influential factor on risk premia,\(^{31}\) again underpinning the importance of a pro-active behaviour.

Carbon risk integration strategies, which can be traced to the practices of CSR, are acquiring increasing significance in the property sector. Research undertaken by Newell and Lee\(^{32}\) enhanced the prominence of incorporating CSR in the real estate valuation process. The drivers and benefits of sustainability from a property investor’s perspective were considered at the individual property level (increased rent, increased value, reduced costs, reduced risks); at corporate level (corporate image); and at the external environment level (legislation, standards, government incentives, environmental costs).

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28 Donovan and Li, 2018.
29 Benedetti et al., 2019.
30 MSCI, 2019a.
Newell and Lee’s research examines the impact of CSR factors and financial factors on the performance of Australian REITs by determining whether CSR components of environment, social and corporate governance are separately priced by REIT investors, compared to the pricing of conventional financial factors, thus adding value to REIT investment performance. The research determines that the CSR dimension are only marginally less influential than the traditional financial factors of size, book-to-market value and gearing in influencing REIT performance.

Research by Ho et al. on green buildings and REIT performance considers whether green developments have an influence on operational and financial performance of listed real estate companies. The research examines variables that measure the greenness of property portfolios, which include the percentage in square metres and an average greenness score. The key findings are that green buildings do have an impact on the operational and financial performance of REITs. The paper also provides evidence that green buildings are better investment options compared to the non-green company option.

The green agenda and green performance in real estate is receiving further traction through linkages to REITs and real estate companies at the European level. Eichholtz et al. investigates the effects of energy efficiency and sustainability of commercial properties on the performance of stocks in US REITs. The key issue, in the Eichholtz et al. paper, concerns the determination of the net benefit yield of green buildings. The paper concludes that there is an insignificant relationship between the greenness of property portfolios and stock returns which suggests that the stock price has already subsumed the cash flows derived from investments into the performance of energy efficient properties/ portfolios. Carbon emissions form an essential part of the green performance of individual buildings and portfolios. As such, reducing the carbon intensity of real estate assets is an extremely important starting point for value enhancement. This also complements the positions of the UNEP FI, CERES INCR, IGCC, HGCC, PRI and RICS who promote and enforce valuation standards globally.

Against the above contextual background, we can conclude that there are four key aspects stressing the urgent need to integrate low-carbon strategies in corporate decision-making within the real estate sector:

1. Carbon reduction or low-carbon-strategies can effectively reduce transitional risks.
2. Long-term investments, such as real estate, are intensively affected by transitional risk.
3. Empirical work indicates that low-carbon investments already pay-off compared to other peers.
4. At the same time, clear guidance and data is needed to differentiate low- from high-carbon investments.

Pertinently, the CRREM Tool provides clear guidance, benchmarks and risk indicators based on carbon intensity metrics (emissions per square metre) for real estate investments in order to enhance transparency and evidence-based decision-making. Especially against the background of tightening regulatory requirements and an increasing importance of disclosure, a pro-active approach towards ESG issues can be regarded as a fiduciary duty.
Consequently, there is the potential to create new business opportunities and enhance returns. At the same time transitional risk can be reduced by putting a stronger focus on decarbonisation (Figure 4). In this context, the Carbon Pricing Corridors Initiative offers an interesting dimension to this debate by providing a benchmark for businesses and investors wishing to make strategic decisions consistent with the low carbon economy but requiring robust data/information concerning the risk-return profile of their investments.\textsuperscript{37} It is inevitable that carbon risk reduction – and the approaches and intervention measures implemented at both asset and portfolio level – will shape strategic decision-making concerning the acquisition, disposal of real estate investments.

Our previous public report provided the theoretical underpinning and illustrated the key data considerations that must be taken into account to facilitate the development of clear benchmarks as well as the gathering of carbon data for ongoing operations and corporate decision-making (see CRREM Report ‘Stranding Risk & Carbon’). Presently, there exists a number of ‘green’ real estate performance indices but to date none of these indices centre on the performance of retrofit assets specifically. Also, the upcoming EU regulations on “Climate Benchmarks and Benchmarks’ ESG Disclosures”\textsuperscript{38} need to be implemented accordingly. Currently there is still a knowledge gap as well as a potential disincentive to retrofit uptake within the commercial real estate sector in Europe – as many investors remain unclear or unconvinced about the strength of interrelationships between energy performance and real estate performance indicators.

\textsuperscript{37} Carbon Pricing Leadership Coalition & We Mean Business Coalition, 2018.

\textsuperscript{38} EU, 2019b.
KEY LEARNING OUTCOMES

- The concept of climatic risk encompasses two distinct categories of risk namely physical and transitional. The first relates to global warming and the resulting increased risks of extreme weather events, sea-level rises etc. Transitional risk or ‘carbon risk’ relates to the shift towards a low-carbon economy and comprises policy and legal risk, technology risk, market risk and reputation risk. Transitional risks are not static but are potentially low within a short-term investment (or consumption) horizon and increasing when focussing on long-term investments such as real estate.

- The specific risk of carbon-intensive companies is referred to as ‘operator carbon risk’, whereas financial intermediaries and investors are having a financial relationship with these operators are exposed to the so-called ‘carbon asset risk’.

- According to the Paris-agreement global warming caused by GHG-emissions should be limited to 55 gigatons by 2030 to meet 2°C scenarios and further reduced to 40 gigatons to attain 1.5°C targets by 2030. Achieving these targets will require global decarbonisation of all economic sectors. Real estate and construction are responsible for 40% of all GHG-Emissions affording considered opportunity for the initiation and development of impactful decarbonisation pathways to be implemented.

- CRREM research has highlighted that green government policies in combination with stronger consumer orientation towards more sustainable products, a higher willingness-to-pay and the advancement in technological developments has encouraged institutional investors to incorporate carbon risk reduction as a core component of their investment strategies.

- For real estate companies the transitional risks to a low-carbon economy are much more pertinent than for many other business sectors. Nonetheless, reducing the carbon footprint of any given real estate portfolio is not only tackling/reducing transitional risks but also creating new business opportunities given the fact that there is a financial pay-off for low-carbon assets.

- Transition to a low-carbon real estate environment addresses not only energetic-retrofit; also strategic asset allocation might be affected. The integration of the results of a carbon risk assessment in devising company targets are increasingly affecting strategic asset allocation (SAA) and the ongoing managements of portfolios.

- Carbon risk identified and evaluated by the respective assessment methods will lead to a carbon strategy that prudent company leaders must develop. The CRREM investor survey highlights that 50% of respondents had already introduced carbon risk assessment tools within their corporate decision-making frameworks. Company leaders addressing carbon risk are not altruists. Besides enhancing performance, they also comply with their fiduciary duty to address any potential threat that might endanger reaching company goals.

- Carbon emissions form an essential part of the green performance of individual buildings and portfolios. As such, reducing the carbon intensity of real estate assets is an extremely important starting point for value enhancement. By contrast, high carbon emissions are likely to have a significant negative impact on asset values in the near future with failure to comply with future regulatory requirements or market demands resulting in premature obsolescence and being denoted as being at risk of becoming ‘stranded’.

- One of the key challenges to increasing investment flows from the financial sector to clean energy and green properties is the provision of a clear and transparent data integrating underlying carbon risk assessments with the financial benefits of potential decarbonisation investment options. The CRREM risk assessment tool focuses on

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transitional risks, stranding, green retrofitting and bottom-up quantitative risk indicators to support investors to assess, manage and reduce these risks.

❖ The Carbon Pricing Corridors Initiative provides a benchmark for businesses and investors wishing to make strategic decisions consistent with the low carbon economy but requiring robust data/information concerning the risk-return profile of their investments.40 However it is noteworthy that whilst there exists a number of ‘green’ real estate performance indices presently none of these indices centre on the performance of retrofit assets specifically. This knowledge gap serves as a potential dis-incentive to retrofit uptake within the commercial real estate sector in Europe – as many investors remain unclear about the strength of impact of green retrofitting on real estate performance indicators.

40 Carbon Pricing Leadership Coalition & We Mean Business Coalition, 2018.
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 785058.
SECTION B STRATEGIC MANAGEMENT OF CARBON RISK AT CORPORATE LEVEL

B.1 CORPORATE SOCIAL RESPONSIBILITY (CSR) AND CARBON RISK

This section provides a comprehensive analysis of a number of topics in carbon reduction on a more generic and company level. It explores how carbon reduction can be achieved through strategic management at senior corporate level. Numerous studies have found that incorporating climate-related goals into organisational strategies has become increasingly common, particularly amongst Listed companies and multinationals. In addition, emphasis is placed on the importance of engaging with suppliers, policy makers and other relevant stakeholders in initiating, maintaining and advancing pro-environmental measures and ‘green performance’ in the workplace and the general business environment. Behavioural and cultural issues in relation to low-carbon activities in the workplace are explored and critically examined with reference to the existing research literature. The section concludes by highlighting a number of critical success factors, as well as barriers, in implementing carbon reduction initiatives/measures in practice.

Over the course of the past decade, there has been a growing interest in enhancing environmental sustainability standards within the commercial real estate sector and other industries. This movement is primarily driven by persistent ecological trends worldwide, negative impacts due to climate change and increased social expectations. Policy makers around the globe are devoting increasingly more resources to deal with challenges arising from climate change. Consequently, companies are endeavouring to move forward in line with the progressively stringent regulatory environment. Nevertheless, a large number of research studies indicate that businesses in general still lack a long-term strategic approach and vision with respect to sustainability and in particular the decarbonisation of their business operations.

Generally speaking, strategic management requires a high degree of integration between long-term company strategies and the actual day-to-day business operations, whereby a unique set of policies is usually chosen by the manager for the company to outperform its industry peers and competitors. In relation to carbon mitigation, studies found that incorporating climate-related goals into organisational strategies has become increasingly common, particularly amongst listed companies and multinationals. In the context of the real estate sector, these targets are often expressed in terms of the percentage of assets within the portfolio that is defined as low-carbon or sustainable, or the absolute amount of carbon emissions that are deemed to be reduced in due course. The absence of uniform rules on how to classify assets as ‘low-carbon’ or ‘sustainable’ results in uncertainty among investors and serves as a barrier to increasing capital flows. In April 2019, the EU adopted its regulation on disclosures relating to sustainable investments and sustainability risks. The upcoming EU taxonomy legislation on sustainable finance will also contribute to this regulation by defining a transparent classification system for sustainable investments (‘taxonomy-eligible’). The adoption of this taxonomy will support investors intending to align their activities with Environmental, Social and Governance (ESG) criteria, increase transparency and, consequently, reduce risk. If, upon reversion, an asset will not be taxonomy-eligible, the current holder is exposed to significant carbon risks. In this regard, the CRREM

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42 Bulkeley and Newell, 2015.
43 Hahn and Kuhnen, 2013; Wilkinson et al., 2018.
44 Heywood, 2018.
46 CDP, 2016.
project will make an important contribution to reducing these risks by providing transparent and science-based decarbonisation targets that are aligned with the climate goals, as set out in the Paris Agreement. The CRREM Tool enables to benchmark the carbon performance of individual buildings against this target trajectory and provides a number of corresponding carbon risk indicators. A comprehensive discussion on the upcoming EU taxonomy and its consequences for investing in real estate and corporate carbon risk management can be found in SECTION F. As previously identified in SECTION A, carbon risk is affecting company performance and needs to be addressed accordingly. By relating this to Porter’s competitive forces model (1979), we can further state that carbon risk can have intensive impact upon the competitive position of a property company (see Figure 5). Hence, addressing carbon risk can strengthen a company’s competitive position. Indeed, many studies proved that a more sustainable orientation of corporate strategies can be linked to greater business success and competitiveness.

*Figure 5: Sustainability and Porter’s Five Forces Analysis (1979)*

The relevance of a more stringent orientation towards sustainability on a company level has led to the advancement of Corporate Social Responsibility (CSR) in corporate business decision-making. CSR is a form of self-regulation by corporate managers in order to ensure that a company’s actions have a constructive influence on the working place of employees and the natural environment\(^\text{48}\) (see Figure 6). CSR has become an integral factor within corporate strategy, influencing all sectors of industry with profit maximisation no longer the one and only objective influencing key business decisions.

With real estate companies facing a growing demand to understand, mitigate and report on environmental impacts of their activities, it can create both challenges and opportunities for sustainable real estate\(^\text{49}\). There has also been a growing connection between CSR and ESG. The ethos of the latter which embodies a tripartite structure comprising of environmental, social and governance is increasingly impacting upon real estate management strategies at global and local levels. In addition, at company level, ESG is an important strand in evaluating corporate behaviour and directing the future financial performance of companies at board level\(^\text{50}\). Real estate company leaders have to tailor low-carbon strategies according to their organisation’s goals, needs and constraints\(^\text{51}\). Non-compliance with recognised ESG criteria

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\(^{48}\) Chadwick, 2013; see Figure B-3.

\(^{49}\) Miller and Pogue, 2018.

\(^{50}\) Wilkinson et al., 2018.

\(^{51}\) Cox et al., 2012.
is increasingly becoming a premise for divestment or the exclusion from investment activities, consequently constituting an increased risk exposure. Figure 6 clearly reveals that carbon risk is an essential part of the corporate CSR agenda affecting a number of different areas simultaneously.

**Figure 6: Corporate Social Responsibility and Carbon Risk**

![Diagram of Corporate Responsibility and Carbon Risk](source)

Source: Adapted from ZIA, 2015.

### B.2 CARBON RISK AND CARBON PRICING

By integrating carbon risk into corporate decision making and stressing the prominent role of carbon and transitional risk within the CSR agenda, it is evident that carbon risk cannot purely be a qualitative assessment. Conversely, the results of any given carbon assessment must be transferred into financial figures. Regardless of the fact that the real estate sector is to date no part of the European emission trading – which is setting a market price for carbon emissions – many market participants are questioning the “price” and potential future impact of their companies’ carbon footprint.

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52 Eurosif, 2018.
Despite the uncontested steering impact of carbon pricing, the OECD found that only around one quarter of all emissions in the 44 covered countries (accounting for around 80% of global GHG emissions), are effectively priced at least with EUR 30 per tonne of CO$_2$ corresponding to the low-end estimation of actual climate costs. Due to the taxation of diesel and gasoline, the carbon pricing gap – representing this discrepancy between carbon prices and the costs of climate change – is lowest in the road sector. It is no surprise, that the carbon pricing gap is equivalently higher for non-road emissions: 82% of these emissions are not taxed at all and only 3% are taxed at EUR 30 per tonne CO$_2$.

Climate change is one of many sources of structural change affecting the financial system. However, the distinctive, diverse and far-reaching characteristics of climate change mean that the risks are non-linear and require differential management across all sectors and geographies. In this regard, macroeconomic models may not be able to accurately predict the economic and financial impact of climate change. Consequently, it is possible that climate-related financial risks are not fully reflected in today's asset valuations which in turn stresses the need to clearly assess any potential stranded risk requiring a latent need for coordinated and universal action. The findings from this research infer the need for valuation professionals to competently upskill in order to factor both carbon risk into their valuations and also to account for the capitalisation impacts of green retrofitting as a means of managing such risks. Whilst the transition to zero carbon presents investment opportunities for the real estate sector, the risk-return profile of companies exposed to climate-related risks are arguably changing. Consequently, there are renewed calls for organisational transparency in terms of their governance structures, strategies, and risk management practices.

The Investment Leaders Group's bottom-up carbon and energy regulatory risk model examines the impact of carbon and energy regulation on company margins. The key findings show that the financial impacts can be significant. However, the underlying purpose of the model is to help the investment industry price-in future risks associated with energy and carbon regulation and to put pressure on industries and companies to pursue mitigating strategies (by upgrading technologies) including engagement between investors and companies. The model outputs can feed into company valuation and cost models to show impacts of climate-related regulations on company profitability. The model can also be used to prioritise actions in response to carbon regulations. The McKinsey report on Business Strategies for Climate Change acknowledged that there is huge value at stake concerning company strategies, and that the winners will be those companies that reposition themselves to benefit from the opportunities of a carbon integration strategy. In essence the medium- to long-term interests and the profitability of real estate companies will depend on the carbon intensity of their assets and products, technology capabilities, market share and geographical scope – with immediate actions required in order to embark upon a more sustainable decarbonisation pathway.

In a paper by Cajias et al., research investigations are undertaken into the effects of the sustainability agenda at a company level including the identification of the accruing financial benefits. The study examined 80 European listed real estate companies selected, on the levels of sustainability intensity at company level. The relationship between a green agenda and a green performance, within the profile companies analysed, show an increasing ability to generate revenues and to reduce stock volatility. The research reveals, that green strategies at property company level, are economy- and finance-driven. The findings of this research also build upon the work undertaken by Cajias and Bienert on the cost/financial benefits of European listed real estate companies influenced by sustainability attributes. The findings clearly show the performance benefits of risk-return profiles on the performance of environmental sustainability at company level.

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53 OECD, 2019.
54 Zhu et al., 2009.
56 NFGS, 2019.
57 TCFD, 2017.
58 Investment Leaders Group, 2016.
60 Cajias et al. 2012.
61 Cajias and Bienert, 2011.
The studies on ‘green-pay-off’ discussed above on portfolio, company and property level stress, that the built environment and the real estate sector have an important role in climatic change and in delivering a sustainable economy. Over the past decade research has focussed primarily on the drivers and benefits of environmentally sustainable buildings. More recent research activity is considering carbon risk integration strategies including enhanced financial performance, healthier working environments, and higher energy efficiencies. Discussions on climate change have progressed to researching the multiple ways in which decarbonised portfolios can be constructed and analysed to show enhanced performance within the real estate sector. Research is showing that for integration with certain style factors (such as quality and growth) the carbon intensity of portfolios can be reduced without compromising the desired target factor exposure.

According to Bumpus, ‘Top-down’ economic approaches to carbon risk theoretically indicate that placing a price on carbon can reduce emissions. This is also acknowledged by Reedman, Graham and Coombes who indicate that Top-down modelling of technology adoption and business responses to carbon pricing has generally been used to guide theoretical discussion and policy decisions on implementing a carbon pricing measure. Indeed, in a recent report, the TCFD identifies internal carbon pricing as a key metric that an organisation can use to assess climate related risks and opportunities in line with its strategy and risk management process. Despite this acknowledgement, responses by firms towards carbon pricing policy remains less well understood and remains critical for understanding the effectiveness of price-based carbon policy. With regards to management strategies, cost limitations and innovation remain key hurdles for adoption towards a low-carbon economy. As Hoffman illustrates, responses to carbon pricing have a tendency to consider it some sort of a compliance cost burden rather than an innovation opportunity.

A key point argued by Bumpus, is that some firms face technological barriers to carbon reduction – namely the investment in new technologies. Whilst acknowledging that enhancing the role of public finance is the obvious key to unlocking a number of these obstacles, a much more important issue concerns the level of uncertainty associated with carbon policy and consequently how companies make decisions on the price of carbon, and the assessment of this risk-return (cost-benefit) trade-off as a result. As Clemens, Bamford and Douglas contend, uncertainty is a key barrier to management decisions, with the uncertainty of climate policy into the future seen as a significant barrier to low-carbon management decisions. This arguably and seemingly introduces a ‘black box’ dimension to company decision-making for carbon governance between the critical interactions of capital (allocation), corporate innovation, and low-carbon transitions. Bumpus contends that this presents challenges to ensure that macro-level policy compliments the wider understanding of carbon policies and finance within firm responses. As mentioned in SECTION A, the level of uncertainty will significantly be reduced once the EU adopts its regulation regarding a taxonomy on sustainable finance products. The taxonomy provides a clear framework based on the emission reduction efforts that are necessary to accomplish the Paris climate goals. The CRREM project has already derived clear decarbonisation trajectories on property level in line with these goals of limiting global warming to 2°C or, better still, 1.5°C. As a result, the CRREM Tool can contribute to reduce uncertainty, identify potential risks of non-compliance and increase capital flows into sustainable assets.

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62 Falkenbach et al., 2010; Dixon et al., 2008; Fuerst and McAllister, 2011.
63 Hao et al., 2018.
64 Bumpus, 2014.
68 Hoffman, 2005.
69 Bumpus, 2014.
70 Clemens, Bamford and Douglas, 2008.
71 Newell and Paterson, 2010.
72 Bumpus, 2014.
As a consequence, companies increasingly try to reduce uncertainty by applying an internal carbon price which has emerged as a powerful approach for assessing and managing carbon related risks and opportunities. A number of companies having already, or are in the process of, developing corporate emissions targets to reduce their carbon footprint and subsequently carbon risk. In this regard, this process necessitates a corporate action plan which allocates a price on carbon to effectively incorporate the cost of carbon into their financial decision-making by introducing a ‘shadow pricing’ as a key component for long-term strategic risk management. Indeed, assigning a monetary value to the cost of carbon emissions is perceived to help companies monitor and adapt their strategies and financial planning to real-time and potential future shifts in the external market, thereby effectively internalising carbon pricing policy signals. CRREM suggests calculating the present value of emissions surpassing defined limits (excess emissions). The CRREM Tool calculates the potential costs of excessive emissions either based on a suggested or self-defined carbon price per tonne.

Moreover, internal carbon prices are being utilised for a number of varying objectives, such as to reveal hidden carbon risks or as a tool to aid the transition towards a low-carbon business model. As highlighted by the UNEP FI three main purposes for internal carbon pricing are outlined below:

- **Manage risks**: Companies internalise the existing, expected or potential price of carbon to assess its risk exposure to regulations that affect the cost of emitting CO$_2$.
- **Reveal opportunities**: Companies also use an internal carbon price as a tool to reveal potential opportunities that may emerge with the transition to the low-carbon economy – given that as policy and legal, market, technological and reputational factors shift, they also present opportunities.
- **Transition tool**: A smaller number of organisations deliberately use an internal carbon price to drive emissions reductions and incentivise low-carbon activities – in order to facilitate a company-wide low-carbon transition.

Allied with this internal carbon pricing, there has also been increasing investor focus on how carbon pricing is being integrated into business planning as a risk mitigation strategy to climate regulations. Indeed, this is evidenced in the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) who suggest that investors should scrutinise corporate disclosure on carbon pricing to establish whether a company can embrace a low-carbon transition and the associated risks (see Section B2.1).

### B.3 THE INTEGRATION OF CARBON RISK INTO COMPANIES’ DECISION-MAKING

This section provides an overview regarding the status quo of carbon management and a snapshot of the perception of the topic within the real estate sector. The findings are based on a survey the CRREM-team initiated with a range of European real estate owners and investors (for more details see CRREM report “Stranding Risk & Carbon” D.8, p. 80ff.). Based on the status quo across the real estate sector, we discuss in more detail the need for climate-related financial disclosure, resulting data requirements and possibilities for integration within corporate structures. A more generic approach for the integration of carbon risk and carbon management is presented. This section concludes with the presentation of a series of detailed steps regarding the practical implementation of carbon risk at corporate level within the real estate sector.
B.3.1 Status-Quo of Carbon Risk Integration

The Sustainable Real Estate Investment Action Framework on Implementing the Paris Climate Agreement\textsuperscript{78} – published by UNEP FI – is designed to assist real estate investment stakeholders identify key drivers and overcome barriers to the integration of ESG and climate change risk into their decision-making process and investment strategy. CRREM survey results nonetheless highlight the need for more ambition to integrate carbon risk within corporate decision making. Whilst the survey illustrates that 50% of respondents have already introduced carbon risk assessment tools within their corporate processes, 38% of the respondents state that they only apply risk assessments on a partial basis – although emphasising when risk assessments were performed these were in line with company strategy. Somewhat surprisingly, 25% of respondents do not undertake carbon risk assessments. In terms of data capture, the survey results further stressed the concerning levels of non-disclosure of climate-related issues within the real estate sector (Figure 7). The results exhibit low reporting across the participant organisations – with the highest reporting reflective of emissions and consumption. A further noteworthy finding is that Life-cycle carbon assessment (LCA) and Whole-life carbon assessment (WLC) is not reported at all by 63% and 73% of the participants respectively. Furthermore, inferior board attention for the topic was a clear outcome of the survey results.

\textit{Figure 7: Capture and Assessment of Carbon Risk-related Data}

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<td>31%</td>
<td>67%</td>
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Source: CRREM, 30 respondents.

\textsuperscript{78} UNEP FI, 2016.
Climate policies and pricing frameworks have direct risk implications for all companies with numerous research studies illustrating that climate change and environmental risks are not adequately accounted for in financial and corporate decision-making\textsuperscript{79}, resulting in increased business risk and the mispricing of assets. This reality has led to a broader discussion about whether companies of various sectors – not only real estate – but also financial intermediaries are thoroughly integrating considerations of carbon risk when evaluating, pricing, and financing carbon assets and companies.

**B.3.2 INTEGRATION OF CLIMATE-RELATED FINANCIAL DISCLOSURE**

The TCFD has developed a standardised framework for climate-related financial disclosure based on a number of principles consistent with internationally accepted frameworks for financial reporting. The basis for this was to help companies by achieving high-quality and decision-useful disclosures that enable users to understand the linkage and impact of climate related issues on organisational governance, strategy, risk management, and metrics and targets\textsuperscript{80}. The TCFD report emphasises the importance of transparency regarding climate risk to support informed and efficient capital-allocation decisions. Consequently, companies should disclose their assumptions applied for managing their carbon risk exposure and the governance principles adopted. Accordingly, it recommended four thematic disclosures that organisations should include within their financial reporting for providing ‘decision-useful’ information for investors (Figure 8). These operational disclosures encompass governance, strategy, risk management, metrics and targets, taking into consideration different climate-related scenarios, including a 2°C or lower scenario. The CRREM project results can support real estate organisations in all four thematic disclosures, and in particular regarding the identification of climate-related risks (‘strategies’) including objective metrics and targets.

\textsuperscript{79} Aisbl, 2014.
\textsuperscript{80} TCFD, 2017:18.
A key recommendation is the need to further embrace ‘Scenario Analysis’ to develop applicable 2°C or lower transition scenarios for evaluation of physical risk by organisations. A further aspect relates to ‘Data Availability and Quality’ to understand and measure how climate-related issues translate into potential financial impacts for organisations and to improve standardised metrics for the financial sector, including better defining carbon-related assets and developing metrics that address a broader range of climate-related risks. The CRREM Tool not only enables users to assess potential financial risks of buildings with poor carbon performance, but also to perform scenario-based impact assessment by modelling different scenarios regarding energy and carbon prices, climate change and investment decisions. The tool further provides a time perspective to risk analysis by providing decarbonisation target trajectories and by modelling the impact of grid decarbonisation and climate change on electricity-, heating- and cooling-related emissions on the future carbon performance of assets.

According to its updated 2018 status report reviewing the current disclosure practice, the TCFD found that (some) companies appear to be integrating the recommendations as a natural part of their risk management and strategic planning processes. Though, the review’s findings also indicate that climate-related financial disclosures remain disparate and incomplete. Interestingly, the TCFD highlights that the majority of companies disclose some climate-
related information usually within sustainability reports, however, it also found that a limited number disclose under different climate-related scenarios. Still, whilst there has been progress and improvements to the availability and quality of climate-related financial information, and despite the increase in disclosures of climate-related financial information, it has not improved across a range of sectors at the rate required to limit the rise in global average temperature and remains largely insufficient for investors. Whilst sustainability and corporate responsibility functions are the primary drivers of TCFD implementation efforts, mainstreaming climate-related issues requires the involvement of multiple functions, particularly the involvement of the risk management and finance functions and executive commitment. 84

Most recently, in April 2019, the Network for Greening the Financial System (NGFS) published a comprehensive report on climate change as a source of financial risk, detailing a number of recommendations for central banks, supervisors, policymakers and financial institutions to enhance their role in the greening of the financial system and the managing of environment and climate-related risks. Their findings and recommendations equally identified and echoed those of the TCFD, namely. 85

- Integrating climate-related risks into financial stability monitoring and micro-supervision by assessing and integrating climate-related financial risks in the financial system and into prudential supervision and setting supervisory expectations to provide guidance to financial firms as understanding evolves.
- Integrating sustainability factors into own-portfolio management by incorporating environmental, social and governance (ESG) aspects into their portfolio management including funds, pension portfolios and monetary policy and exploring the interaction between climate change and central banks’ mandates (beyond financial stability) and the effects of climate-related risks on the monetary policy frameworks, paying due regard to their respective legal mandates.
- Bridging the data gaps by sharing data of relevance to Climate Risk Assessment (CRA) which are publicly available in a data repository and establishing a joint working group to bridge existing data deficiencies.
- Building awareness and intellectual capacity and encouraging technical assistance and knowledge sharing through developing in-house capacity and internal and external collaboration to improve their understanding of how climate-related factors translate into financial risks and opportunities.
- Achieving robust and internationally consistent climate and environment-related disclosure framework through encouraging all companies issuing public debt or equity as well as financial sector institutions to disclose in line with the TCFD recommendations and take further actions to foster a broader adoption of the TCFD recommendations and the development of an internationally consistent environmental disclosure framework.
- Supporting the development of a taxonomy of economic activities through policymakers, stakeholders and experts to enhance the transparency and facilitate financial institutions’ identification, assessment and management of climate and environment-related risks; improve understanding of potential risk differentials between different types of assets; and mobilise capital for green and low-carbon investments consistent with the Paris Agreement.

Corporate evaluation of the carbon risk consists of a multi-criteria decision-making approach identifying risk factors, screening portfolios or new investments for exposure, and evaluation of the potential financial impacts86 generally with respect to different types of financing and investments87. This does however require disclosure of all the relevant information, which thus far remains fragmented88. This is particularly apparent within the real estate sector where commensuration is lacking both on the level of carbon disclosure reporting as well as the more detailed process of carbon accounting. The frequent lack of disclosure regarding the types and meaning as well as boundaries of reported

84 TCFD, 2018.
85 NGFS, 2019.
86 Hsu, Kuo and Chiou, 2014.
87 WRI and UNEP FI, 2015.
88 Kolk, Levy and Pinske, 2008.
emissions data, and of reliability checks (e.g. external assurance), means that it is very difficult to get insight into reported emissions, let alone firms’ actual achievements in serving to mitigate emissions. As a result, a number of questions in terms of risk exposure and understanding the materiality of carbon risk persist.\textsuperscript{89} It must be ensured that the level of carbon disclosure and the more detailed carbon accounting furnish valuable information for investors, NGOs or policy makers in both technical terms as well as in terms of cognitive and value dimensions.\textsuperscript{90}

In that terms, the \textit{CRREM Tool} will support stakeholders in carbon accounting as well as disclosure, contributing to a comprehensive \textbf{carbon risk due diligence}. According to \textit{WRI and UNEP FI}, screening using ‘Exposure Data’ and ‘Risk Factors’ relating to an underlying operator/company is initially employed using a range of qualitative information and quantitative data reported publicly by a company (CSR or sustainability reports or other public disclosures), to provide an evaluation – thereby providing an initial risk outlining for management approaches. At (investment) portfolio level, a \textbf{scenario analysis} can be undertaken in order to assess and calibrate risk factors. This data can then be utilised to drive portfolio-level risk optimisation models that look at diversification, correlation, and risk factors at the portfolio scale\textsuperscript{91}. As described before, the \textit{CRREM Tool} offers such scenario analysis, that are also requested by the \textit{TCFD} in the disclosure of climate risks.

\section*{B.3.3 Implementing Carbon Management on a Corporate Level}

An effective \textbf{carbon risk management} is no steady state but a continuous process and changing boundary conditions require ongoing adaptation. The process is managed top-down but has to involve staff at all company levels. It comprises the development of explicit \textbf{decarbonisation strategies}, including retrofit and investment plans being as detailed and granular as possible. These decarbonisation strategies should be based on an objective \textbf{assessment of carbon risk} using quantitative risk \textbf{indicators} which should in turn rely on science-based \textbf{decarbonisation targets} and a complete \textbf{assessment of carbon emissions} (carbon footprint). A comprehensive multi-level \textbf{monitoring system} has to underpin target achievement. Finally, it is the overall \textbf{corporate ideology} toward both carbon risk and climate protection that represents the connecting piece of the complex task of carbon risk management. Our research has shown that once considered a ‘nebulous risk factor’ and difficult to integrate into financial analysis and corporate decision-making, decarbonisation is now a core topic within the real estate sector. Indeed, our analysis has revealed that increasingly the management and mitigation of carbon risk has become the responsibility of senior management teams and no longer the domain of the ‘sustainability’ team. This has resulted in carbon risk being factored into all aspects and components of the corporate structure and encompassed within all aspects of the business operations. Indeed, for many real estate companies this has resulted in carbon risk and risk management being cascaded throughout the wider value chain.

\textsuperscript{89} Kolk, Levy and Pinkse, 2008:741.
\textsuperscript{90} Kolk, Levy and Pinske, 2008.
\textsuperscript{91} WRI and UNEP FI, 2015.
In our first public report we suggested a general roadmap in order to implement carbon risk management within real estate companies (for more details see CRREM report ‘Stranding Risk & Carbon’, Section D.1). The relevant steps can be summarised as follows:

1. **BELIEFS**
   - Investment ESG policy
   - Corporate targets
   - Strategies

2. **ASSESS CARBON EXPOSURE**
   - Analyse portfolios to identify exposure to carbon risk

3. **MEASURES**
   - Evaluate cost benefit of each implemented action

4. **TRANSPARENCY**
   - Facilitate communication of approach to stakeholders

5. **MONITORING AND REVIEW**
   - Periodic review of beliefs and impact of strategy to meet target

1. **BELIEFS**: Investment beliefs can help guide decision making when there is a high degree of uncertainty. Investors should define their beliefs with respect to climate risks and stranded assets and reflect them in a strong ESG policy. The adoption of science-based carbon reduction targets compliant with **EU commitments to COP21** should be a consequence of this decision, which can respond to different considerations, like economic or moral. In other words, investors need to set corporate carbon objectives and targets. To achieve these goals a clear roadmap with timeline and **carbon strategies** to meet the targets needs to be developed.

2. **ASSESS CARBON EXPOSURE**: Investors are encouraged to measure their carbon exposure across their portfolio. Most of investors already report the direct and indirect carbon emissions that they are responsible for as an organisation. However, for the real estate sector to comply with decarbonisation targets and mitigate carbon risks, the boundary of carbon assessment needs to include other emissions that currently lay outside corporate reporting boundaries.

3. **IMPLEMENTATION OF CARBON RISK MITIGATION MEASURES**: Based on investors’ climate related beliefs, adopted targets, defined strategies to achieve these goals and their current portfolio exposure, an appropriate **carbon reduction plan / roadmap including a timeline** involving a range of carbon risk mitigation options can be selected and implemented.

4. **TRANSPARENCY**: The success of a plan to reduce the exposure to carbon risk largely depends on the disclosure of the assumptions and level of uncertainty inherent to the assessment of risks depending on future, variable parameters. These assumptions need to be regularly updated to ensure the pathway to meet the target – and even the target itself – satisfies the original objective of the corporate strategy. Transparency is therefore twofold: on the one hand transparency regarding the assessed data and the carbon status quo of the asset/portfolio, and on the other hand transparency regarding beliefs, underlying assumptions etc.

5. **MONITORING AND REVIEW**: Carbon risk mitigation plans should incorporate a **regular review process** to assess the effectiveness of the corporate strategy as well as the impact of each implemented carbon risk reduction measures. The evaluation of impact indicators should inform (if required) any modifications to the existing plan to ensure that the target is met and that external changes are taken into account. Besides a clear process also **requires the definition of responsibilities** within the organisation.
There is not a one-fits-all rule when it comes to the mitigation of carbon risk. Tools, methods, assessments etc. need to be aligned with the individual needs and conceptual context the market participant is acting within. The real estate decision maker or company leader must therefore also find an answer to different strategic questions and seek the most compatible alignment.

In any event, the results will lead to changes regarding the companies’ structures (positions, teams and departments) and the corresponding organisational processes and activities. A consistent implementation of carbon management thus manifests itself in the real estate industry, not only with respect to management functions such as auditing, but also in the entire value chain, such as in procurement. For the purposes of implementation, a structured integration of a sustainability orientation is needed in the value and goal catalogue, which ensures the appropriate action programs in various corporate functions, as well as the appropriate operative processes and associated controls which monitor successful implementation within the company. With respect to the implementation, against this background, a differentiation at the normative, strategic and operative levels is promising, because not every enterprise is affected in the same manner by climate risks. From the perspective of the real estate industry, a further differentiation is also useful, namely one that enables a differentiated treatment of the perspectives of building, portfolio and company.

Figure 9 depicts the implementation steps and the individual observation levels whilst the ensuing discussion affords more detailed context and rationalisation.

**Figure 9: Implementation Levels of the Topic Complex “Carbon Risk” for Real Estate Companies**

<table>
<thead>
<tr>
<th>CONTEXT LEVEL &amp; INITIATION</th>
<th>Internal context factors</th>
<th>External context factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis of business units and internal stakeholders with regard to existing CSR and carbon activities</td>
<td>Analysis of external stakeholders (CO₂ footprint), legal framework, general and sector-specific boundary conditions</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>NORMATIVE REFERENCE FRAMEWORK</th>
<th>Company’s mission, guiding principles, basic values</th>
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<tr>
<td>Company goals</td>
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<table>
<thead>
<tr>
<th>STRATEGIC FRAMEWORK</th>
<th>Sustainability goals / decarbonisation targets</th>
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<tr>
<td>Decarbonisation strategies</td>
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<td>Action programme</td>
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<table>
<thead>
<tr>
<th>OPERATIONAL FRAMEWORK</th>
<th>Management functions</th>
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<tr>
<td>Emission inventory</td>
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<tr>
<td>Derivation of carbon risk indicators</td>
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<tr>
<td>Portfolio level decisions (buy, sell, hold)</td>
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<tr>
<td>Asset level decisions (do-nothing, retrofit etc.)</td>
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**Source:** Own presentation, based on ZIA, 2015.
At the first implementation, it is evident that it is either not possible or not productive to proceed without considering the situation of the specific enterprise in question. In other words, there is no panacea. Far more so, the individual, so-called context factors of the specific real estate enterprise are of particular importance. This subsumes primarily the demands and requirements of internal and external stakeholders, as well as the general factors relating to the enterprise and industry environment in the context of sustainability. These define a company-specific analytical framework which needs to be operationalised. Only on this basis of comprehensive information can normative prescriptions be defined and strategic objectives derived for specific goals aimed at decarbonising the entire company.

The factors encompassing a company’s general environment, in addition to economic, ecological and sociocultural aspects, also include particularly the political-legal level. Industry standards and one’s own peer group in relation to its CO₂ footprint also need to be taken into account. After initiating and analysing the context factors, the next step is that of normative positioning. In this respect, the climate risks and particularly the carbon risk at the centre of focus here, are to be included in the sustainability goals of the company. It is important that these goals conform to the overall (superordinate) goals and values of the company.

After determining the normative reference framework, the strategic orientation follows. It is based on the overall company goals to develop strategic plans customised for achieving these goals. The strategic orientation comprises specific goals for decarbonisation and dealing with other climate risks. Passive strategies react in this context, only where there is a compelling need as a result of external factors, such as the passing of new energy-efficiency laws for buildings. By contrast, (pro)active strategies strive to be at the forefront of the movement toward a sustainable real estate sector. Even now, it is evident that climate risks and carbon risks are taken into account by investment analysts and potential investors. The ability of a real estate company to adapt to changing environmental conditions, that is, their ability to learn and to solve problems, is fundamental to developing competitive advantages.

The next step entails the operative implementation of the determined activities within the individual operational fields. In the context of implementation, the sustainable activities are applied through operative measures and action plans with respect to the determined GHG emission-reduction targets. As has been emphasised several times, the measurability of goal attainment and thus the prevalence of an ongoing carbon assessment, constitute a key factor of success. The specified implementation steps can be understood as a process of continuous improvement.²⁹

In the event of deviations, a process of iterative adaptation can proceed.⁹³ In addition to a well-structured process of implementation, the individual components of the organisation as a whole need to be adapted to the nature of sustainable management that is practised.⁹⁴ The anchoring of the company thus follows the normative and strategic directives, and supports their implementation (‘structure follows strategy’).

In SECTION A, we already stressed the diverse nature of carbon risk for real estate investors. Indeed, the increasing emphasis and implementation of new, tighter and stricter emissions targets, coupled with climate change policy will undoubtedly continue to have an impact on aspects like creditworthiness, market capitalisation⁹⁵, profitability and potentially also an increased number of stranded (real estate) assets.⁹⁶ This requires a more tailored and granular bottom-up approach in order to understand carbon risk at a corporate level.⁹⁷ The World Resources Institute (WRI) and UNEP FI developed a conceptual framework to help financial intermediaries and investors, more systematically to identify, assess, evaluate and manage carbon asset risk. According to that framework, there are three core carbon risk factors that are closely aligned and interconnected displaying cascading effects: policy & legal, technology, market & economic – as well as reputational risks (Figure 10).

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⁹³ Seebacher et al., 2006.
⁹⁵ Petkov et al., 2015.
⁹⁷ WRI and UNEP FI, 2015.
Carbon Asset Risk Exposure

Carbon asset risk can be viewed as a mutual process whereby carbon operational risk, which affects operators of carbon assets such as buildings, can translate to ‘carbon asset risk’. Carbon asset risk impacts financial intermediaries and investors as this is a function of the type of financial relationship with the operator. Indeed, during the process of making new financing or investment decisions and when managing existing investment portfolios, as the WRI indicates, assessing exposure relates to the types of carbon risk factors, the identification of carbon risk in sectors and companies and the financial risk relative to the capital structure. In this regard, carbon asset risk can be explicitly tied to the type and ‘tenor’ of the financial relationship with the operator necessitating an appreciation of the make-up of the various aspects of the tenor and the seniority of capital. Indeed, these characteristics determine whether operator carbon risk translates to carbon asset risk for an investor. Consequently, this requires alignment with management strategies for assessing the level of the exposure. As the WRI and UNEP FI stipulate, exposure is also a function of the ‘operator carbon strategy’, which is the ability to manage risk through strategies such as capital expenditure planning, the requirement to retrofit, asset diversification, and operational risk management efforts. Therefore, it is important that carbon-pricing regimes are scrutinised in the context of company characteristics when assessing carbon risk exposure. Ultimately, given these considerations, institutions will need to undertake due-diligence for aligning returns with the sectors, companies, or assets which best represent their business objectives and perspectives on risk.

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98 WRI and UNEP FI, 2015.
99 WRI, 2015.
100 Hsu, Kuo and Chiou, 2014; WRI and UNEP FI, 2015.
101 WRI and UNEP FI, 2015.
102 Yang et al., 2008.
B.4 CORPORATE CULTURE

The fundamental values, visions and guiding principles of a company set the normative framework for concrete sustainability targets and, consequently, the specific dealing with climate risks and decarbonisation. Numerous research findings indicate that senior managers should play an integral role in initiating and maintaining pro-environmental initiatives to promote and encourage low carbon practices and behaviours. The ‘tone from the top of the organisation’ is therefore essential. Their engagement and commitment are essential in order to exert the influence required to ensure successful outcomes and attainment of corporate goals. For small and medium sized enterprises, the owner-manager, usually dominates and shapes the organisational culture, and thus plays an even more dominating role in dictating the course of low-carbon agenda within the company. The personal beliefs and views on environmental issues of an owner/manager tend to have a direct and lasting impact upon the behaviours of the employees and in general the company. There are enablers and barriers to a successful engagement process on the part of the investor, the corporates as well as regarding relational factors connecting both sides (honesty, transparency, continuity, level of commitment, communication and listening capacities, language).

In practice, senior managers in charge of environmental policies should be visibly involved and lead by example and ‘walk the talk’ to demonstrate how their ideas can be executed effectively, thereby employees will follow in their footsteps. More importantly, evidence of senior management’s determination for and commitment to GHG reduction should be manifested in the organisation’s vision, objectives and overall strategy which should in turn be reviewed on a regular basis in order to meet the constantly changing needs of existing and new stakeholders. Low carbon initiatives should be designed and more closely connected to the company’s overall principles and policies pertaining to CSR and public image development - and should not be seen as an ‘isolated activity’ within the business framework. Stakeholder engagement and addressing the legitimate requests and claims put forward by stakeholders is therefore another success factor for carbon strategies.

Increasingly, knowledge management in relation to GHG within the real estate sector has become more developed and crucial for companies and practitioners. Many organisations nowadays have developed an internal knowledge bank that is built on staff’s feedbacks from sustainability-related education and training, experience from daily business operation and ongoing research studies. In addition, the CRREM research highlights a pertinent corporate shift in the prominence afforded to climatic risks and decarbonisation within the board rooms of real estate companies. Increasingly, evaluating the risks and devising impactful mitigation strategies associated with decarbonisation are the remit of CEOs and senior management teams, ensuring a top-down approach which serves to encompass the entire organisation. This top-down prioritisation in tandem with a more knowledge-based approach to decarbonisation not only helps staff at all levels keep up to date with the status of the company with respect to climate policy development and ongoing challenges, but, more importantly, it also keeps them abreast of the most recent industry information, government regulations and technologies applicable and relevant to the business environment in which they operate. The nature of real estate investment comprising the acquisition, disposal and management of assets ensures that organisations have a number of strategies and options available to them in terms of actively managing their carbon risk exposure. The CRREM Risk Assessment Tool enables property owners and investors the opportunity to evaluate individual and portfolio level carbon risks and to devise ‘scenarios’ to evaluate the impacts of ‘actionable outcomes’ – such as disposing, retrofitting an asset – on their overall carbon intensity.

103 Zibarras et al., 2011; Centre for Sustainable Energy, 2009; Chartered Management Institute, 2009; Feasby and Wells, 2011.
105 PRI, 2018.
107 Zibarras et al. 2011; Chartered Management Institute, 2009; Feasby and Wells, 2011.
B.4.1 ORGANISATIONAL CULTURE

Studies have shown that formalising sustainability and decarbonisation practices at the workplace is conducive to creating and strengthening positive norms and organisational cultures. From the actual work environment’s viewpoint, setting targets at a more micro level can improve performance as employees tend to view them as less daunting and more practical\textsuperscript{109}.

A wider set of frameworks and policies at organisational level can be a powerful tool in changing workers’ behaviours. In particular, setting organisational goals and expectations with corresponding policies in place on certain behaviours can help deliver results more effectively and smoothly if the change required is more ambitious and challenging. Implementation of such policies should often be aided with considerations of other social factors such as shared values and beliefs, and organisational culture for the employees to understand the need and importance for change. Regarding and accepting some major change as an organisation-wide responsibility shared by every employee, rather than treating it as a matter of personal choice, can sometimes yield more effective outcomes\textsuperscript{110}.

Organisational culture is usually intangible, it possesses exclusive language that have impacts upon understanding and perception of individuals and imposes norms that are socially pleasant\textsuperscript{111}. One way to exert influence on individual behaviours through organisational culture is by environmental communication, whose success hinges on its quality, means and frequency about the corresponding environmental initiatives to employees. It helps convey more effectively the environmental policies and objectives of the senior echelon of the management to the staff members who might have mistaken beliefs and not been aware of the initiatives taken by the company. Environmental communication hence could improve perceptibility of its environmental infrastructure and sustainability performance with potential gain in motivation amongst staff members\textsuperscript{112}.

All in all, making low-carbon activities part of the overall organisational culture is all the more conducive to their effective implementation in the long run. Staff participation is the key, which helps create a sense of shared commitment and responsibility between different stakeholders involved. A reasonable amount of time should be allocated within the working day so that employees can exchange their ideas and contribute their effort to low-carbon activities. Clearly this is also not a one-off task but an ongoing process. Data needs to be gathered and analysed, goals have to be set and afterwards the impact must be tracked and potentially adjusted.

B.4.2 BEHAVIOURAL PRACTICE

Behavioural practices tend to be more effectively and efficiently implemented when different dimensions in which workplace is operated with respect to carbon consumption are taken into account. In this regard, (i) individual, (ii) social and (iii) material factors must be put into consideration in a coherent and holistic fashion. According to Cox et al.\textsuperscript{113}, individual factors comprise motivations and barriers to change the status quo at personal levels; social factors concern influences which act upon peers in the workplace where people are operating in groups, they consist of implicit attributes such as cultural conventions, social norms and common understandings amongst staff members. They are related to the power of other team members and their networks that exert pressure or influence their peers’ behavioural options; material factors involve physical infrastructure, products, technology, objects and/or other tangible aspects of the built environment where people work. They also encompass the ‘soft’ infrastructure of the organisation such as business policies, frameworks, schedules and institutions. Organisations in pursuit of carbon

\textsuperscript{109}Cox et al., 2012.
\textsuperscript{110}Cox et al., 2012.
\textsuperscript{111}Young et al., 2015.
\textsuperscript{112}Onkila, 2013.
\textsuperscript{113}Cox et al., 2012.
Integral to the successful implementation of low carbon initiatives is the active involvement of staff through a bottom-up approach. One good practice is to proactively seek and adopt suggestions given by front line employees who are more directly exposed to the day to day operation of the business, and hence they are in many ways in a better position to evaluate the feasibility and effectiveness of environmental policies set out by the management. Their views and opinions should be channelled back to the senior managers, who then should provide feedback on the queries and impact of their suggestions on a formalised and regular basis, in addition to the necessary advice, guidance and information about their policies to facilitate communication between different levels of staff members. Numerous research findings emphasise the importance of employees’ contribution to developing sustainability strategies including Boiral and Michailides and Lipsett, which also advised that staff members should be consulted in advance of any change. This serves to improve understanding and mutual trust, which help secure staff support and minimise the likelihood of opposition to changes.

Overall, organisations which actively engage employees with the values, benefits and meaning of the environmental management practices, seem to yield the most fruitful results with respect to the impact on their behaviours. They also tend to be more successful at creating a more environmentally friendly office culture. Companies should not only aim at short-term goals such as the amount of cost saving but should be able to envision the long-term benefits arising from being a ‘green’ corporation sustainably. They should invest in broad-based and long-term educational programmes and activities to help employees understand the embedded benefits and the wider impact of commitments to eco-friendly practices at their workplace. Pertinently, the more member engagement activities, the more likely they trigger and reinforce the development of organisational climate strategies as research evidence indicated.

Achieving environmental sustainability is particularly challenging for larger and multi-site corporations in the sense that it is typically more complex to embed corporate values into decision-making at all levels of stakeholder engagement. The reasons for this are at least threefold: Firstly, corporate values are more often than not expressed as abstract, and sometimes ambiguous principles and ideas. Translating them into behavioural practices for staff members to adopt can be difficult from an operational point of view. Secondly, the larger the size of the organisation, the more remote the staff members generally feel about the goals set and promoted by the head office based in elsewhere. They may not clearly understand how far and wide the values are encapsulated in the organisational activities. Thirdly, low-skilled workers in large organisations tend to be less attached to corporate values and care relatively less about issues such as environmental sustainability since they typically have less sense of identification and connection with their organisation compared to staff members at managerial level. Allocating time for employees to take part in low-carbon activities during the normal working hours may be a policy that is worth pursuing for some organisations. This could help rebalance the cost-and-benefit perceived by the workers. Alternatively, reserving some paid time for organisational activities through which employees can collaborate and contribute to the shared low-carbon endeavour can be a desirable and practical policy.

In relation to setting climate-related targets for portfolio construction, it is not uncommon for asset managers and owners to find themselves ‘locked in’ to low-carbon investments that may be at loggerheads with their financial
objectives or the interests of the overall organisational development. As a result, many of them would prefer to focus on attaining green targets in a more holistic manner with emphasis placed on the overall or average carbon emission of all assets rather than on each individual asset or working unit. On the other hand, some managers may prefer to take a more ambitious approach with each investment satisfying the same pre-determined carbon reduction and risk-return criteria\textsuperscript{121}. The research undertaken in the compilation of this report highlights the need for a ‘holistic’ and integrated approach in order to effectively balance and manage the risks associated with decarbonisation within a viable financial framework. ‘In-action’ will only serve to elongate the magnitude of the necessary financial commitments with the extenuation of the ‘transition’ period serving to heighten the risks of company perform in the medium-long-term.

\textsuperscript{121} Share Action, 2018.
B.5 ENGAGEMENT WITH SUPPLIERS IN THE BUILT ENVIRONMENT

Real estate companies and developers can achieve carbon reduction through engagement with their suppliers (e.g. building material suppliers). Similar to other businesses that involve value chains, greenhouse gas issues in real estate can be to some extent addressed by reducing upstream emissions arising from the purchases of goods or services of suppliers. For developers and companies holding standing investments this is of course also of great importance when selecting designs, make choices for alternative energetic-retrofit options and define standards for new construction.

It is estimated that for most sectors, supply chain greenhouse gas emissions are about four times higher than that of operations. Pertinently, this number increases for companies further down the production chain. Generally speaking, supply chain-related greenhouse gas emissions can be reduced by

- optimising the way in which the company produces goods and services to minimise the use of resources;
- opting for low-carbon products in the procurement decision-making process;
- favouring suppliers with good environmental track records and reputation; and
- engaging with suppliers to lower GHG emissions via collective efforts along the supply chain.

Along the real estate supply chain, it is acknowledged that there are remarkable differences between various sub-sectors which are at different stages of maturity and development in tackling environmental and climate issues. This could potentially diminish the overall effectiveness of the sector’s environmental sustainability efforts.

In practice, it is often considered most effective to target suppliers with the highest levels of greenhouse gas emissions regardless of their position in the supply chain or financial strength. The company should assess a number of factors when dealing with the suppliers such as their desire to collaborate/cooperate, willingness to establish a strategic environmental partnership, risk of not fulfilling the company’s expectations and requirements, and the environmental standards of the supplier’s location of production. The company should thereafter develop a set of engagement strategies and policies and communicate their expectations and requirements to their potential or existing suppliers.

The effectiveness of communication is crucially important in that it determines the level of mutual understanding of the progress towards carbon reduction targets, and the ability of the company to acquire data on supplier carbon footprints.

Collaboration partnership can be formed based on agreements (or less formal arrangements in some cases) between the company and the suppliers. Various types of agreement could be adopted depending on how the company would want to influence the suppliers’ behaviours and attitudes, as well as particular circumstances of the cooperation. For instance, a joint venture agreement is usually more preferable for partnerships with intertwined activities in terms of production location, operation and emission sources. More specifically, the company and its supplier(s) undertake low carbon measures in equal measure that help retain their distinct identities as equal partners. On the other hand, agreements based upon company-set minimum environmental standards are more desirable when their standards are distinctly different from those of the third-parties. A code of environment conduct in relation to greenhouse gas emissions can be stipulated in the contract to exert influence on the supplier’s behaviours by the company. For companies having to engage a large number of suppliers, a rating or scoring system can be utilised to create an environment of competition amongst them based on their relative sustainability performance. For suppliers involving

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122 Farsan et al., 2018.
124 Farsan et al., 2018.
in more complicated business activities, a customised agreement can be formulated to meet specific environmental
requirements and achieve more explicitly defined targets. In order to implement a more sustainable procurement and focus on low-carbon procurement, practitioners can rely on different frameworks and guidance that have already been developed. These green-procurement manuals serve as the basis to ensure that the company also focuses on upstream and downstream processes. Pioneers like the Hochtief AG undertake their subcontractors to implement their “Code of Conduct”, comprising conformity with norms and standards, adequate working conditions and environmental measures, including emissions reductions. There are major shortcomings in how the construction and real estate sector manage upstream activities, being diametrically opposed to its importance regarding the use of resources and ecological costs. The share of upstream to total ecological costs is excessively high in the construction sector with a ratio of 30/70 and even higher in the real estate industry, if compared to an average ration of 40/60 across all sectors. Sustainable asset and property management is only possible if subcontractors are bound to the same internal standards and targets. PRI Association and UNEP FI published a guideline, supporting investors in the selection, contract design and continuous monitoring of asset-management subcontractors according to ESG criteria. This is also discussed further from an operational level in the case studies of this report (see SECTION G).

Research undertaken by CRREM highlights an onus of responsibility on the large real estate companies to initiate and facilitate the greening of the ‘value chain’ by working with suppliers and tenants in a positive and productive manner. In this respect communication and identification of common goals is key, alongside an evidence base to support ‘actionable’ outcomes and intervention strategies. Some significant progress has indeed been made in developing and advocating sustainable procurement methods in the real estate sector in Europe. For instance, a toolkit that examines the requirements in relation to social/societal, sustainable and governance stakes for over 50 categories of occupations that real estate companies call on in their purchasing process has recently been developed by Observatorie de l’immobilier Durable in France. Nevertheless, problems associated with the lack of specialisation and mutual understanding across the stakeholders of the different sub-sectors along the supply chain still pose a great challenge to the real estate sector, rendering the implementation of such new form of procurement practice difficult. In the long run, more persistent engagement from the real estate companies with their suppliers is therefore necessary to co-construct a sustainable procurement policy around sustainability and other CSR objectives that is implementable.

KEY LEARNING OUTCOMES

❖ Carbon management is part of the overall sustainability-agenda of the company and affects various aspects of the CSR.
❖ Low-carbon management practices must be embedded in corporate culture, aligned with overall company targets and result in actions plans, strategies and well-defined measures. There is no “one-fits-all” rule. Therefore, a profound context analysis is needed based on the specific settings of the specific real estate company.
❖ Despite growing awareness of climate change issues, there is a strong risk that climate-related financial risks are not being fully reflected in asset valuations.

125 Farsan et al., 2018.
126 Hochtief AG, 2019.
127 Ernst & Young, 2012.
128 Makower, 2013, S. 38ff.
129PRI Association, 2013.
130GRESB, 2019.
131GRESB, 2019.
A key barrier for companies concerns the level of uncertainty associated with carbon policy and thus how they price carbon – because uncertainty is a key barrier to management decisions. The EU taxonomy on sustainable finance will reduce this uncertainty by clearly relating the term ‘sustainable’ to the alignment with the Paris Agreement climate goals. The decarbonisation targets and climate risk indicators in the CRREM Tool anticipate this development and enable stakeholders to conduct ‘future proof’ investment decisions.

Companies are increasingly using ‘shadow pricing’ – placing a monetary value to the cost of carbon emissions to help them monitor and adapt their strategies, but this is opaque – climate-related financial disclosures remain disparate and incomplete.

Mainstreaming climate-related issues requires the involvement of multiple corporate functions and departments, particularly the involvement of the risk management, controlling and finance functions, as well as a strong commitment by executive management (“tone from the top”).

Whilst distinct core carbon risk factors can be distilled, they are closely aligned and interconnected, displaying cascading effects.

Senior managers should play a key role in initiating and sustaining environmental initiatives in the workplace to promote and encourage low carbon practices and behaviours. Their commitment to carbon reduction should be manifested in the organisation’s vision, objective and overall strategy if sustainability is to be pursued progressively.

Making low-carbon activities part of the overall organisational culture is conducive to their effective implementation in the long run.

Organisations that actively engage employees with the values, benefits and meaning of the environmental management practices tend to yield more fruitful results regarding the impact on their eco-friendly behaviours.

Real estate companies and developers can achieve carbon reduction through engaging with their suppliers (e.g. suppliers of building materials) to reduce upstream emissions arising from the purchases of goods or services. Various guidelines and frameworks have already been developed and fitted to the needs of the real estate sector.
CRREM

Carbon risk Integration in real estate portfolios
C.1 CARBON EFFICIENT AND LOW-CARBON PORTFOLIOS

C.1.1 FRAMEWORK FOR CARBON RISK MANAGEMENT AT PORTFOLIO LEVEL

The increasing trend towards a low carbon economy is also being driven by government regulation based on the compelling need to reduce greenhouse gases. This means that investors need to appreciate that portfolios are being increasingly exposed by virtue of evolving legislative response to climate change. The growing physical effects of climatic change, the increasing economic impacts of climate related regulation, and the associated market and technological shifts towards low carbon, mean that most investors are now pro-actively reviewing their portfolio exposure to carbon risk and also the broader context of increasing climatic risks.

The first fundamental step to measuring carbon exposure at portfolio level is to determine the baseline position and to quantify and evaluate both the extent and nature of carbon risks initially at the individual asset level and to subsequently transpose this into portfolio and corporate level assessment and evaluation. An overview of the complex framework of assessing exposure, evaluating and managing carbon risks is presented in Figure 11. The depicted procedure is based on the four carbon risk factors according to TCFD, starting with a detailed analysis of exposure to carbon risks of individual physical assets, the aggregated exposure on company level and how the exposure propagates to financial assets and portfolios. The CRREM Tool supports the subsequent evaluation of carbon risk by providing clear decarbonisation targets, assessing the year of stranding and calculating potential (carbon) costs of excess emissions in order to select the “right” strategic option. Finally, the analysis of the retrofit costs necessary to meet decarbonisation targets directly supports the management of carbon risks, whether through demonstrating the potential positive impact of a pro-active retrofitting strategy or otherwise.
Although it is becoming progressively more common for real estate companies to publish yearly sustainability reports, only few organisations provide (or indeed are in a position to provide) comprehensive emissions reporting. The disjointed nature of the real estate value chain means that data pertaining to carbon emissions are rarely held by one entity. As such, data integration remains a challenge at the asset and even more so at the portfolio level. It is essential that the ongoing challenges related to the ownership of key datasets must also be overcome if the sector is to achieve the levels of transparency necessary to perform meaningful analyses of carbon risk. The CRREM Project follows a bottom-up approach starting at the emissions and targets trajectory of individual buildings, assessing their specific risk indicators and aggregating to the portfolio level. On this level of granularity, data gaps will be bridged based on statistical models that can, for example, estimate missing tenant data based on the available data for base building energy consumption (depending on building type and further parameters). For further details on how to assess carbon exposure and its underlying drivers, see SECTION D.

The CRREM Tool is supporting an active asset management strategy and enables investors to develop both short- and long-term strategies pertaining to the mitigation of carbon risk exposure. Increased disclosure of carbon emissions and capital expenditure will help to determine both the carbon ‘impacts’ and also the associated pay-back periods – ensuring greater confidence and certainty in respect of green retrofit solutions. Our research shows that real estate companies that have embraced and actively reduced or ‘managed down’ their risk exposures have done so as they deem decarbonisation as a central and core component to the long-term success and indeed the survival of their business. The corporate case studies in this report (see SECTION G) show that by becoming more efficient than their peers, companies such as Grosvenor and Vasakronan have in essence ‘hedged’ their risk to increasing carbon costs whilst affording the companies outperformance premised on higher occupancy rates and lower portfolio operational costs.

### Figure 11: Framework for Assessing Carbon Risk Exposure and Assessing and Managing Carbon Asset Risk

<table>
<thead>
<tr>
<th>Carbon Risk Factors</th>
<th>Exposure to Carbon Risks</th>
<th>Analysis Types</th>
<th>Management Approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy and legal factors</td>
<td>Physical assets</td>
<td>Screening (CRREM Tool)</td>
<td>Avoid the risk: Sell/Divest Avoidance of sector/security, building type, location</td>
</tr>
<tr>
<td>Technology factors</td>
<td>Operators: Carbon risk</td>
<td>Low Exposure: STOP</td>
<td>Manage the risk: Hold, buy Engagement Green retrofitting Disclosure Sectoral policies Due diligence/Risk pricing Diversification</td>
</tr>
<tr>
<td>Market and economic factors</td>
<td>Financial assets: Carbon asset risk</td>
<td>Company/operator: Stress test, valuation, excess emissions</td>
<td>Portfolio: Stress test, risk models, share of stranded assets</td>
</tr>
<tr>
<td>Reputational factors</td>
<td>Lenders</td>
<td>Low Risk: STOP</td>
<td>Financial portfolios</td>
</tr>
</tbody>
</table>

Source: Adapted from WRI and UNEP FI, 2015.
In recent years, carbon risk has moved from discussions concerning climatic change policy to actions whereby large institutions are integrating carbon risk issues into their investment strategies. Aligned to low carbon investing is the adoption of factor-based asset allocation by institutional investors. Hao et al.\textsuperscript{132} argues that a carbon-efficient portfolio will outperform a carbon-inefficient portfolio, including return-based performance benchmarks. Increasingly, studies are being published which analyse the carbon efficiency of companies to identify whether carbon-efficient portfolios are characterised and/or being driven by improved financial returns\textsuperscript{133}. So, most studies to date focus on the risk aspect of portfolio management given that market participants are primarily interested in how carbon-based metrics interact with existing portfolio composition\textsuperscript{134}. Consequently, high factor/quality companies have shown to have financial capability to meet the market obligations of moving to a low carbon economy. Inevitably, high quality companies will therefore seek to generate higher profitability and deliver more stable growth due to capital structure, increased profitability and high earnings, relative to the performance of an average sized company.

C.1.2 Evaluation of Carbon Risk at Portfolio Level

The evaluation of risk factors at the portfolio level must take into account both high and low carbon investments and the expected risk (correlation) premised upon estimations given an assumed scenario. For portfolio level risk assessment, stress (scenario) testing at the overall portfolio level is an essential process for monitoring carbon risk to optimise asset allocation in light of the probabilistic scenario – i.e. potential changes in policy. This level of assessment is generally based on the financial institutions mandate and how they ‘perceive’ climate risk and associated implementation strategies. As such, carbon consumption transcends not only governance frameworks but risk identification at both asset class and sectoral level and the integration of sustainability factors internalised within a company’s risk assessment process\textsuperscript{135}. Indeed, the identification of risk factors such as real assets’ physical risk exposure across a portfolio requires due-diligence regarding sectoral level impacts that asset owners and operators can employ for management purposes. This aspect is a key recommendation in a recent publication by the Network for Greening the Financial System\textsuperscript{136} which stressed the importance of integrating sustainability factors into ‘own’ portfolio management beyond environmental, social and governance (ESG) aspects. As depicted in Figure 12, the portfolio-level risk assessment process comprises the alignment of risk factors to the assessment process.

\textsuperscript{132} Hao et al., 2018.
\textsuperscript{133} Puopolo et al., 2015; In, Park and Monk, 2017.
\textsuperscript{134} Hao et al., 2018.
\textsuperscript{135} WRI and UNEP FI, 2015.
\textsuperscript{136} NFGS, 2019.
As discussed in SECTION B, two analytical approaches can inform this assessment: an individual operator-level and a portfolio approach. As identified by the WRI and UNEP FI\(^{137}\), a risk summary data process within an assessment framework can be, and should be further undertaken to evaluate and determine the financial impacts of carbon asset risk aggregating physical assets up to portfolios or an assessment framework starting at portfolio level and analysing underlying investment types. In both cases, carbon risk exposure data and risk factors (that is, scenario inputs) serve as inputs to valuation and risk assessment models, creating outputs and metrics that summarise impact to investment value (see Figure 13). These analytics are incorporated into portfolio-level risk optimisation models that look at diversification, correlation, and risk factors at the portfolio scale - taking into account both high- and low-carbon investments and the expected risk correlation between them given an assumed scenario.

\(^{137}\) WRI and UNEP FI, 2015.
At corporate and portfolio level carbon risk exposure can also be actively managed through diversification strategies across asset classes or by seeking exposure to different sectors of industry with contrasting carbon risk profiles. Further to this, investors can proactively manage risk exposure, by engaging with companies across the value chain in relation to carbon risk disclosure and management. In this respect, underwriters have an important role to play in the decarbonisation agenda by encouraging thorough disclosure of operator carbon risk in securities-offering documents, and ensuring the pricing of securities incorporates consideration of relevant risks. Our research highlights that carbon risk is not being adequately and consistently priced into investment decision-making across the commercial real estate sector which in part can be attributed to the insufficient disclosure and measurement of operational risks.

### C.1.3 MANAGEMENT OF CARBON RISK AT PORTFOLIO LEVEL

A growing group of investors and investment managers are exploring more profound approaches to find better tools and common standards to help the real estate sector more effectively and proactively manage their individual assets and portfolios in the light of increasing carbon risk in order to derive future-proof portfolio-allocation. These include:

- Assessing carbon risk for current portfolios and potential acquisitions;
- Incorporating carbon risk into due diligence and other investment decision-making processes;
- Incorporating physical adaptation / energetic retrofit and mitigation measures for assets at risk;
- Deriving decarbonisation pathways / trajectories for portfolios and individual assets likewise;
- Benchmarking excess-emissions priced with shadow-carbon-prizes against retrofit cost leading to mitigation and reduced GHG-emissions;

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138 WRI and UNEP FI, 2015.
139 ULI, 2019.
Exploring a broad variety of strategies to mitigate risk, including portfolio diversification and investing directly in the mitigation measures for specific assets;

- Participating in benchmarking initiatives to explore the internal carbon footprint against the carbon intensity of peers.

Ideally, disclosure of a carbon footprint should be accompanied by a carbon risk management strategy. When considering how to reduce carbon risks in real estate investment portfolios, there are broadly three options: divest, engage or hedge. Generally, carbon risk strategies affect existing assets as well as potential acquisitions. The reduction of the carbon footprint of a portfolio can be achieved through either divesting high-risk assets, intervention in the form of green retrofitting in order to de-risk exposure or, depending on the risk appetite of the organisation, to ‘hold’ high-risk assets – this process of carbon-optimisation aiming at achieving a certain target portfolio will be based on self-defined sustainability standards (‘sustainability filter’) affecting individual decisions to buy, hold and sell (see Figure 14).

**Figure 14: Strategies for Repositioning a given Portfolio**

![Diagram showing strategies for repositioning a portfolio](source: ZIA, 2015)

In terms of managing carbon risk at the portfolio level, real estate investors and property owners have a number of options, such as the adjustment of risk premiums for particular assets via targeted green retrofitting actions or changes in operational activity; modification of how the asset is managed and operated in order to reduce carbon consumption. Equally, and depending on the organisation’s views of and commitment to decarbonisation, there is the option to hold and retain assets comprising high carbon risk profiles or indeed to liquidate/dispose of high-risk assets, thereby reducing...
overall portfolio risk. In general, the available pathways for managing carbon risk within the real estate sector differ according to the extent and nature (source/s) of the risk exposure.

As real estate assets are a ‘fixed’ long-term investment asset, the decision-making frameworks pertaining to the management and mitigation of carbon risk at the portfolio level are influenced by ‘interplays’ and ‘trade-offs’ between the individual assets. Factors such as the property location and the individual building characteristics all impact the decision-making process regarding optimal intervention points for green retrofitting, or the decision to sell an asset and reinvest in other properties with a relative low carbon risk (change the SAA). This process is bound to some extent by the typical investment time horizons of the company, the organisational capacity to initiate and implement de-risk measures and add value to the portfolio, as well as the overall corporate view regarding climate mitigation objectives and risk appetite (see SECTION B.3).

Figure 15: Risk Management Options for Financial Actors

<table>
<thead>
<tr>
<th>New investments</th>
<th>Financial Intermediaries (underwriters)</th>
<th>Financial Intermediaries (lenders)</th>
<th>Bond buyers</th>
<th>Shareholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid the risk</td>
<td>Sector/security avoidance</td>
<td>Sector/security avoidance</td>
<td>Sector/security avoidance</td>
<td>Sector/security avoidance</td>
</tr>
<tr>
<td>Manage the risk</td>
<td>&gt; Promote risk disclosure</td>
<td>&gt; Proper risk pricing</td>
<td>&gt; Promote risk disclosure</td>
<td>&gt; Investment with ESG screens</td>
</tr>
<tr>
<td></td>
<td>&gt; Proper risk pricing</td>
<td>&gt; Thorough due diligence (potentially include covenants)</td>
<td>&gt; Due diligence as possible in disclosure</td>
<td>&gt; Diversification</td>
</tr>
<tr>
<td></td>
<td>&gt; Thorough due diligence</td>
<td>&gt; Engage in key areas</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current holdings</th>
<th>Financial Intermediaries (lenders)</th>
<th>Bond buyers</th>
<th>Shareholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid the risk</td>
<td>N/A</td>
<td>Divestment at sector or loan level</td>
<td>Divestment at sector or security level</td>
</tr>
<tr>
<td>Manage the risk</td>
<td>N/A</td>
<td>&gt; Diversification (sector and subsector)</td>
<td>Diversification</td>
</tr>
<tr>
<td></td>
<td>&gt; Engagement to understand risk managements</td>
<td>&gt; Engagement to align risk and return perspectives</td>
<td></td>
</tr>
</tbody>
</table>

Source: Adapted from WRI and UNEP FI, 2015.

As exhibited in Figure 15, there are two distinct points in the real estate investment lifecycle where financial intermediaries and investors have the opportunity to actively manage carbon risk exposure – through the asset acquisition decision-making process; or via active management of an existing portfolio through disinvestments and/or green retrofitting interventions. Invariably, ‘risk appetite’ will be a key factor in the investor decision to buy, sell or retrofit. Alternatively, investors may opt to limit their carbon risk exposure by avoiding types of financing or investments due to the perceived carbon risk. In its latest report ‘Investing in a Time of Climate Change’, Mercer stresses in particular the importance of scenario-analysis for a successful management of carbon risk on a portfolio level.

The World Resources Institute (WRI) and United Nations Environment Programme Finance Initiative (UNEP FI) report on carbon asset risk142 provides further detail on the available carbon risk management options for institutional investors whilst the work of the Portfolio Decarbonisation Coalition (PDC) affords ‘action’ based guidance pertaining to managing risk exposure and the development of decarbonisation actions plans.

The CRREM Project serves to compliment the work of the PDC by developing quantifiable risk assessment modelling and analytics for the real estate assets. The CRREM Tool follows a bottom-up approach of carbon counting and stranding risk analysis on the asset level, which is finally aggregated to a portfolio level enabling companies to report and disclose their overall exposure to carbon risk. As described in the previous CRREM report ‘Stranding Risk & Carbon’144, asset

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140 WRI and UNEP FI, 2015.
141 WRI and UNEP FI, 2015.
142 WRI and UNEP FI, 2015.
143 Weber and Fulton, 2015.
144 Hirsch et al., 2019.
level stranding risk analysis is based on the comparison of science-based decarbonisation targets – that were derived in a top-down approach in line with the global emission reduction efforts required to limit global warming to 1.5°C or 2°C – and a building’s carbon performance – measured in terms of its baseline and estimated future GHG intensity (absolute emissions per floor area). This analysis results in the graphical stranding diagram (see Figure 16 for an example of office real estate in Austria) and number of key carbon risk indicators, such as the year of stranding (when carbon performance does not meet tightening targets anymore), the amount and costs of excess emissions above targets and – on an aggregated portfolio level – the share of stranded assets and its evolvement over time (see Figure 17). In the near future, the eligibility according to the new EU Taxonomy on sustainable finance activities will be another important aspect that portfolio managers will have to consider (see SECTION F).

*Figure 16: CRREM Stranding Diagram showing Carbon Performance Trajectory, Decarbonisation Targets, Year of Stranding and Excess Emissions*
C.10

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 785058.

C.2 CORPORATE MANAGEMENT PRACTICE – INTEGRATING DECARBONISATION AT OPERATIONAL LEVEL

Besides a revision of the strategic asset allocation and well-defined portfolio measures, real estate companies must also ensure that the actions performed on an operational level support the overall portfolio targets regarding decarbonisation. In this chapter we highlight a series of essential aspects, which have been identified as typically having a huge potential impact on the overall sustainability agenda at corporate management levels.

The theme of whole life carbon assessment for the built environment is addressed in detail by the RICS Professional Standards and Guidance, UK. The report highlights the environmental challenges faced by global warming and greenhouse gas emissions. Reducing carbon emissions makes a measured contribution to reversing resource depletion and reducing environmental pollution. Within the context of the built environment the scale of the challenge for carbon reduction is attributable to both the use of built assets and to the construction of the built assets. Operational emissions arise from energy consumption in the running of property assets whereas embodied emissions are generated from the construction and use of the building components. In addition, there are the lifetime emissions generated from the wear and tear of the building product. To establish the built environment's total carbon impact, it is necessary to include the anticipated operational and embodied emission profile over the lifetime of the built asset. The whole life carbon assessment approach is characterised by considering the total emissions over the buildings' life cycle. Whole life carbon needs to be integrated into the sustainability strategy of companies, cities or localities in order to help address a lower carbon future.

Taylor, in considering sustainability and performance measurement in the corporate real estate sector, suggests that cost benefit analysis and life cycle assessment should be employed as a performance tool to inform the decision-

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146 Taylor, 2013.
making process that will ultimately lead to enhanced sustainability at portfolio and corporate level. Research shows that companies do benefit from adopting a structured approach by identifying, assessing, measuring and reporting on environmental impacts, benefits and (carbon) risks. At portfolio level, organisational sustainability benefits could include the following measurable impacts. Firstly, environmental benefits (enhanced biodiversity and ecosystems, improved air and water quality, reduced waste); secondly economic benefits (reduced operating costs, expanded market share for green product and services, improved occupant productivity, optimised economic performance); and thirdly social benefits (enhanced occupant comfort and well-being, heightened aesthetic qualities, improved quality of life). Given the importance of carbon risk integration strategies to financial performance, the real estate sector is well placed to benefit from decarbonisation strategies. For portfolio managers it is therefore important to actively assess and manage asset level emissions in order to enhance the positive impact of reducing the carbon footprint of the portfolio. The first CRREM report ‘Stranding Risk & Carbon’ provides further insights on how to achieve this reduction of portfolios’ carbon footprint, for example by adopting ‘Green Leases’ and a whole life approach to carbon assessment. The Investment Property Forum report titled Greening Leases: The Landlord and Tenant Relationship as a Driver of Sustainability\(^{147}\) considered whether the structure and impact of the commercial lease constitutes a help or a hindrance to more sustainable management practices and if change is required. As the commercial lease is the mechanism through which investors and occupiers interact, it is also the mechanism for promoting change in commercial landlord and tenant relationships.

The research undertaken in the compilation of this report affirms the view that buildings with good environmental characteristics (in terms of energy, waste, water and accessibility management) are likely to be future proofed over time, to remain more attractive to tenants and be more readily saleable in the market place. Interview based discussions with real estate owners point to lower volumes of tenant turnover contributing to more stable cash flows at the asset level whilst also enabling a more ‘active’ and ‘longer-term’ tenant and landlord relationship. That longer-term perspective was seen as ‘key’ to building mutual goals and exploring common benefits of decarbonisation strategies. Good sustainability credentials will provide tenant revenue savings, better working environments, staff productivity and higher building standards. In addition, the increasing acceptance of green lease is dependent on the willingness and acceptance of both parties to commit to sustainability practices and to integrate a memorandum of understanding in order to protect the rights of both landlord and tenant. Conversely, buildings with a poor carbon performance are facing decreasing attractiveness to tenants and will require intense efforts to comply with regulatory requirements. Portfolio managers have to actively identify such buildings, assess their specific carbon risk and choose between the above-mentioned strategies to reduce overall portfolio risk. CRREM decarbonisation pathways and carbon risk indicators facilitate the necessary communication processes between portfolio and facility managers by providing clear targets and a transparent methodology to benchmark individual buildings against these targets.

C.3 INDICES AND TOOLS FOR PORTFOLIO RISK MANAGEMENT

A series of studies have considered various approaches to facilitate and optimise the opportunities afforded by upscaling energy efficiency and retrofitting of existing assets within the commercial real estate sector. Ma et al.\(^{148}\) provide a review of the state-of-the art in retrofitting existing building stock. The authors afforded innovative and robust insights on retrofit options and possibilities at the individual asset level, nonetheless, the building-by-building approach needs

\(^{147}\) Investment Property Forum, 2009.
\(^{148}\) Ma et al., 2012.
to be scaled up to depict the realities of corporate and portfolio-based decision-making. Rockefeller & Deutsche Bank\textsuperscript{149} and Stuart et al.\textsuperscript{150} outline compelling financial justification for upscaling. Both reports do nonetheless recognise that energy performance improvement of a property portfolio is a complex, multi-attribute, decision-making process that requires a structured support mechanism backed by data in order to reduce uncertainties.

Franconi et al.\textsuperscript{151} evaluated a series of new software analysis tools designed to make portfolio-scale energy assessments easier by providing a no- or low-touch approach for opportunity assessment. Employing consistent datasets throughout the evaluation exercise the research assessed the approaches and limitations of six decision support tools including Energy Star Portfolio Manager, FirstView, LEAN, Simuwatt, Retroficiency, and FirstFuel. The authors found that different tools were good for different problems. In particular, the utility of low-touch methods depends on several considerations, including: 1) the uniformity of the characteristics of the buildings within the analysis group, 2) the similarity of the buildings in the analysis group to a standard building, and 3) the building information available for each site in the group. In summation, actuarial approaches work better with building portfolios that are fairly uniform, match expected characteristics, and have a lot of data\textsuperscript{152}.

The report, entitled ‘Building blocks for a low carbon economy’, produced by FTSE Russell\textsuperscript{153} (a global index provider) focuses on the impact of climatic risk on performance of listed real estate assets. The report addresses how investors assess their exposure to climate risk by integrating it into their investment decision-making and ultimately into their investment portfolios. Greening the real estate sector is considered to be as a major challenge in making the transition to a more sustainable low carbon economy.\textsuperscript{154} Consequently, in response to these challenges institutional investors are setting robust sustainability targets across their asset allocations. A lack of data to assess the sustainability performance of property holdings has been a significant constraint facing investors in integrating climate considerations into real estate investment strategies. To help address the data problem FTSE Russell has developed a bottom-up asset-by-asset approach based on a geolocation database and matched to green certification data\textsuperscript{155}. This ‘Greening’ of the real estate sector is dependent upon the growing availability of (portfolio) performance data (such as FTSE Russell and FTSE EPRA Nareit Developed Index) and building energy use (location, age, building type, size) combined with data on local energy markets and energy use to assess carbon intensity\textsuperscript{156}.

In practice however, real estate portfolios are rarely uniform and thus transposing individual asset level characteristics into portfolio and corporate level decision support systems is problematic. In the UK for example, the Better Buildings Partnership (BBP) represents a collaboration of seventeen leading UK commercial property companies in overseeing the development of a number of toolkits to help standardise data capture and management practices. This standardisation process has included guidance on green management, green leases, sustainability benchmarking, better metering, landlord energy ratings, and sustainable retrofits\textsuperscript{157}. As highlighted by Strachan et al.\textsuperscript{158}, the standardisation of data and techniques is helpful because these companies often share clients (who expect some measure of continuity across landlords) and may buy and sell buildings between themselves as well as with other, smaller firms. Indeed, whilst data capture is improving year-on-year, there appears to be a missing link, in a market-wide sense, within the real estate sector around the integration of key datasets and robust scenario constructs to permit more strategic foresight and to communicate clearly the impacts of different adaptation outcomes — certainly at the portfolio and corporate levels.

\textsuperscript{149} Rockefeller & Deutsche Bank, 2012.
\textsuperscript{150} Stuart et al., 2014.
\textsuperscript{151} Franconi et al., 2014.
\textsuperscript{152} Franconi et al., 2014.
\textsuperscript{153} FTSE Russell, 2018.
\textsuperscript{154} Climact, 2018.
\textsuperscript{155} FTSE Russell, 2018.
\textsuperscript{156} FTSE Russell, 2018.
\textsuperscript{157} BBP, 2013a; BBP, 2013b.
\textsuperscript{158} Strachan et al., 2015.
As a complement to risk management methods, environmentally conscious performance indices are becoming increasingly popular tools for carbon risk benchmarking and hedging. There are now a wide range of environmentally conscious indices representing a diverse set of alternative investment strategies which adopt differing approaches to selecting their constituents premised on a carbon risk-return trade-off. The influence of such indices on corporate decision-making within the real estate sector has grown markedly over the course of the last decade. The fact that the EU is on the verge of introducing its own climate benchmarks underscores the growing importance of environmentally oriented indices and will give further impetus to similar initiatives. There is evidence of increased attention being paid at both the institutional investment and corporate level for incorporating active management at asset and portfolio level for strategic applications to carbon reduction. A suite of alternative benchmarks (‘Low-Carbon Indices’) have emerged which are being used to support a range of alternative investment strategies, including those that eliminate fossil fuel securities altogether, tilt the portfolio by sector, or attempt to pick best-in-class securities within specific sectors, while maintaining low tracking error to overall markets to help make a determination about the materiality of risk. In terms of portfolio-level carbon exposure, benchmarking and communicating a portfolio’s carbon footprint has gained currency and provides clarity on the carbon footprint for engagement, manager monitoring, reporting and carbon risk mitigation.

These tools can be integrated in corporate strategic management, being utilised for alignment of their loan book or financial portfolio with energy transition roadmaps. The MSCI ESG Carbon Portfolio Analytics reports for example analyse the ESG characteristics of a portfolio and help identify risks or opportunities that may not be captured by conventional financial analyses. The analytical tools thereby provide an assessment of companies’ exposure to carbon risk, carbon reserves and emissions exposure, the strength of carbon management (efforts to reduce exposure through carbon strategies), investments in clean technology and other relevant metrics, placed into context with the inclusion of relevant benchmark comparisons. Subsequently, institutional investors can use these tools for identification of leaders and laggards in particular sectors, identify potential risks and opportunities in their portfolio by measuring and benchmarking a portfolio’s exposure to energy transition scenarios, developing index and portfolio optimisation tools based on these climate performance metrics, and updating data frameworks in order to implement a best in class strategy.

Our research shows that real estate investors and owners have become increasingly aware of the need to benchmark carbon risk. Pre-2010, only 19% of respondents to the CRREM survey had employed carbon risk assessment tools. Presently, carbon risk assessments are becoming more popular with 33% of respondents confirming their application across the entire real estate portfolio. For the real estate sector, risk assessments are in the main performed on an annual basis with regular updates and reviews being undertaken in line with portfolio level and corporate level strategies. To assess, manage, and mitigate carbon risk, there necessitates a competent understanding of the carbon exposure (footprint) quantified using total GHG emissions. However, as this research has served to demonstrate, obtaining emissions data for real estate assets on a portfolio basis is rather more complex. As our research highlights, assembling the necessary data at sufficient granularity is problematic and necessitates greater collaboration between owners and tenants, and requires the rationale, reasoning and associated benefits of such data sharing frameworks to be clearly comprehended and understood from a risk management perspective.

In addition, there are also a variety of ‘in-house’ best practice approaches, as illuminated in SECTION G, for assessing exposure and the impacts of carbon risk. In 2017, Bosteels and Duguid published a report entitled ‘The low carbon opportunity – and risks of missing out’, premised upon the Hermes Asset Management carbon reduction strategy. The report suggests that as data provision improves, the appraisal and communication of climate-related risk should be prioritised as this would directly improve the understanding and management of the aggregate investment portfolio.

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159 EU, 2019b.
160 WRI and UNEP FI, 2015.
161 WRI and UNEP FI, 2015.
162 Bosteels and Duguid, 2017.
risk. Indeed, since 2015, Hermes has developed a comprehensive formal approach (Figure 18) to manage exposure to carbon risks and access opportunities from the transition to a low-carbon economy combining industry best practice as well as in-house expertise to take account of the specific challenges faced by each investment strategy and different asset classes. Subsequently, an internal working group has also been created to evaluate carbon risk and opportunity management, including 2°C scenario planning. The remit of the working group is to strengthen internal understanding and further analysis of carbon risks monitoring and reporting.

**Figure 18: Portfolio Level Carbon Risk Approach – Hermes Carbon Risk Assessment and Opportunities Model**

- **Awareness**
  - Portfolio managers are aware of the carbon risks in their portfolios, which investments are the largest contributors and what are the associated risks and mitigation strategies.

- **Integration**
  - Portfolio managers integrate carbon risk considerations alongside other value and risk considerations, exploiting green investment opportunities or divesting where carbon risk alongside other factors impacts value.

- **Engagement**
  - We act as engaged stewards of the investments we manage or represent on behalf of our clients. Where we hold assets with significant carbon risk exposure, we will manage directly-owned assets, and engage with public and private companies, to mitigate the carbon risk.

- **Advocacy**
  - We engage with public policymakers and sector organisations, nationally and internationally, to encourage policy or best practice which facilitates the transition to a low-carbon economy.

*Source: Adapted from Bosteels and Duguid, 2015.*

**KEY LEARNING OUTCOMES**

- Carbon-efficient portfolios will outperform carbon-inefficient portfolios, including return-based performance benchmarks. High quality portfolios will seek to generate higher profitability and deliver more stable growth due to enhanced capital structure, increased profitability and high earnings relative to the performance of an average sized company.

- Accordingly, research and practice-based evidence is now showing that buildings with good environmental characteristics, in terms of energy, waste, water and accessibility management, are likely to be carbon-future-proofed over time, to remain more attractive to tenants and be more readily saleable in the market place. This will support carbon-efficient-portfolios.
Research studies tend to focus on the risk aspect of portfolio management given that market participants are primarily interested in how carbon-based metrics interact with existing portfolio composition.

The increasing trend towards a low carbon economy is also being driven by government regulation based on the compelling need to reduce greenhouse gases. This means that real estate investors need to appreciate that portfolio compositions are being increasingly exposed to climatic risk.

High factor/quality companies have shown that they have the financial capability to meet the market obligations of moving to a low-carbon portfolio composition. Most investors are now pro-actively reviewing their portfolio exposure to climatic risk.

Risk identification, measurement, evaluation and finally selecting the best management option to address the carbon risk are all part of a carbon risk management framework at portfolio level.

Sustainability and performance measurement in the corporate real estate sector indicates that cost benefit analysis, green leases, benchmarking with peers and life cycle assessment should be employed to inform the decision-making process that will ultimately lead to enhanced sustainability at portfolio level.

Research indicates that portfolio management should adopt a structured approach by identifying, assessing/measuring, evaluating and managing carbon risk.

A lack of data to assess the sustainability performance of property holdings has been a significant constraint facing real estate investors in integrating climate considerations into real estate investment strategies. CRREM provides relevant risk indicators and enables investors to integrate carbon risk management at portfolio level.

Greening the real estate sector is dependent upon the growing availability to company and portfolio performance data (such as FTSE Russell and FTSE EPRA NAREIT Developed Index, GRESB etc.) and building energy use (location, age, building type, size) combined with data on local energy markets and energy use to assess carbon intensity.

Real estate investors and owners have become increasingly aware of the need to benchmark carbon risk, with decarbonisation now a core thematic within the real estate sector. However, this research shows that obtaining emissions data for real estate assets on a portfolio basis is more complex in practice. Readily available tools to perform the necessary evaluations are very much in their infancy. The CRREM Tool takes an asset level-based bottom-up approach to generate carbon emission data, derive meaningful carbon risk indicators and aggregate these to the portfolio level.

Guidance is now available pertaining to managing risk exposure and the development of decarbonisation actions plans. The CRREM Tool contrasts asset level carbon performance with science-based decarbonisation targets, providing a clear timeline for necessary retrofit actions including required capital investments, supporting the development of decarbonisation strategies.
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 785058.
To accurately quantify and mitigate the stranding risk of commercial real estate assets, investors, managers and owners need to collect a **large amount of information on energy performance and carbon emissions at the individual asset level** before aggregating to meaningful risk indicators. However, the data gathering and management processes often meet both internal and external barriers that can hinder the assessment of the climatic risk and the development of carbon reduction strategies. Accordingly, this section explores the main barriers identified by CRREM and the best practice initiatives available to overcome them.

**BARRIER 1:** Most real estate owners and portfolio managers have adopted strong data collection methodologies to gather information on the carbon emissions within their reporting boundaries, including those of buildings. However, the majority of them have not implemented sufficient data collection mechanisms to gather information on other indirect emissions that their buildings are responsible for. In terms of carbon emissions, building reporting boundaries differ from corporate reporting boundaries and the assessment of the stranding risk of an asset requires information on all carbon emissions emitted within the building boundary.

**D.1.1 BUILDING BOUNDARIES VS CORPORATE REPORTING BOUNDARIES**

The concept of ‘Stranding risk’ is centred on real estate assets: **buildings**. To avoid write-downs of property values and rents, the mitigation of stranding risk requires to address all the emissions released within the building’s boundaries. Data that quantifies all these emissions has to be obtained, analysed and reported to ensure an appropriate mitigation strategy can be developed for each asset or portfolio.

Despite this, current carbon reporting initiatives (and their associated data gathering efforts) focus on carbon emitting **responsibilities** which are associated to carbon emitting organisations. Firstly, these responsibilities are identified and distributed amongst stakeholders depending on their level of control of the emissions. Subsequently, each independent organisation will gather data, account, report and prepare mitigation strategies following their corporate values and policies. In the building context, this approach typically means that the emissions released by buildings are allocated to different stakeholders – usually **tenants and landlords**. Each stakeholder will account and report their emissions using the corporate carbon reporting methodology that is more suitable for their economic activity, which may include emissions from wider activities beyond the building occupation. Notably, within the building limits, **levels of control defined by the reporting standards do not always reflect actual responsibilities**: For example, tenant emissions from the energy consumed to condition their units (heating and air conditioning) largely depends on the quality of the building fabric, which is often the responsibility of the landlord and therefore in some respects is beyond the control of the tenant.

As part of their corporate reporting data collection efforts, investors seeking to evaluate the stranding risk of their portfolios and assets should seek to collect complete energy and carbon data of the buildings within their **ownership**. This requires the quantification and assessment of all carbon emissions released from buildings – irrespective of who has the capacity to control these emissions.
D.1.2 Allocation of Responsibilities: Direct and Indirect Emissions

Corporate reporting standards classify carbon emissions depending on the capacity of the reporting organisation to control them. They are normally classified as direct and indirect emissions:

**Direct emissions:** Emissions from sources the reporting organisation owns or controls. They are released by (1) generation of electricity, heat or steam on site, (2) chemical processing (e.g. cement production), (3) transportation of materials, products, waste and employees in company owned vehicles, and (4) ‘fugitive’ emissions from intentional or unintentional releases (usually leaks). In the context of the built environment, direct emissions occur through fuel burning within the building boundaries (mainly fossil fuels and biomass to generate heat or hot water) and the fugitive emissions caused through leaks during the use of refrigeration and air conditioning equipment.

**Indirect emissions:** Emissions from sources that the company does not own or control. They include the carbon released from the generation of purchased electricity, steam, heat or cooling generated by others, but consumed in the organisation’s owned or controlled equipment or operations. Indirect emissions also include any other emissions released by the reporting organisation’s downstream or upstream activities and emissions. In the context of the built environment, indirect emissions include (1) the purchased electricity and (district) heat or cooling consumed within the building, (2) the embodied carbon emitted during the lifecycle of the building (see D.2 for further information) and (3) the emissions released from leased assets.

The sum of direct and indirect carbon emissions builds the organisation’s carbon inventory. Carbon reporting standards usually request organisations to separately account and report their inventory into three categories: (Scope 1) direct emissions, (Scope 2) indirect emissions from purchased electricity, heat and cooling, and (Scope 3) other indirect emissions. The reporting of ‘other indirect emissions’ is often optional. However, some of these ‘other indirect emissions’ (e.g. energy emitted by tenants) are critical to assess the stranding risk of individual buildings.

**Current status:** Most reporting organisations have adopted strong data collection methodologies to gather information on the carbon emissions within their corporate reporting boundaries: Direct emissions and the indirect emissions from purchased electricity, heat and cooling. Extracting building-related carbon data from these categories is also usually straightforward.

However, many companies, including real estate investors, do not gather enough information on other indirect emissions that their buildings are responsible for (Scope 3). This part of their carbon inventory is often incomplete, impeding a comprehensive assessment of carbon risk. Moreover, investors’ capacity to access and collect this information is usually limited for different reasons, for example if the data is owned and controlled by third parties which may not have the same reporting needs or they may not agree to data sharing.
D.2 EMBODIED CARBON EMISSION

**BARRIER 2:** Data calculation and gathering of embodied carbon emissions is critical to ensure that operational carbon savings achieved by retrofit works do not imply larger carbon emissions elsewhere. However, the current policy framework does not require the reporting and reduction of these emissions and therefore, investors and owners seldom gather data.

Embodied carbon can be defined as the total GHG emissions generated to produce, maintain and dispose a built asset, or any of its components. This, together with operational carbon — direct and indirect emissions related to the energy consumed by building-integrated technical systems during the operation of the building — add up to the whole-life cycle emissions of a building.

Embodied carbon includes emissions related to the extraction, manufacturing, transportation and assembly of every building material used to build an asset. Most reporting frameworks also include maintenance, replacement, retrofits, and disposal/demolition of an asset. These emissions include the downstream and upstream supply chain activities to construct, maintain and deconstruct buildings and all their materials and components throughout the asset’s life. A more detailed discussion of embodied carbon, its relation to carbon risk and potential means to assess and reduce these emissions, can be found in the CRREM report ‘Stranding Risk & Carbon’.

Retrofit measures may target the reductions of operational emissions, but at the same time result in significant amounts of embodied carbon. The proportion between embodied and operational carbon in the life cycle of retrofit measures is often underestimated. Figure 19 illustrates an example of this varying composition between operational and embodied carbon, illustrating the LCA impact (embodied and operational carbon) of four retrofit scenarios in the same building, each with different targets of energy efficiency. The reduction of operational carbon emissions usually compensates the surplus of embodied carbon that can be attributed to the retrofit. Nonetheless, once the operational emissions reach a certain low carbon intensity, the embodied carbon impact of further reducing these emissions can exceed the expected operational benefits. An important factor affecting the final balance is the (economic and technical) ‘lifetime’ of the specific measure. A comprehensive list of LCA tools and databases applicable to the building sector is available in the “Level(s)” documentation of the European Commission.

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163 See CRREM, 2019 (available via www.crrem.eu).
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 785058.

**Current status:** Current carbon reporting and reduction policy frameworks in the EU do not require the compulsory reporting and reduction of embodied carbon, primarily because these emissions are classified as Scope 3 emissions. This however is likely to change in the future to ensure that efforts to reduce relatively small amounts of carbon intensities do not involve larger amounts of emissions elsewhere. Furthermore, most corporate GHG reporting frameworks (GHG Corporate Standard Protocol, EPRA) already encourage the quantification and targeting of these emissions. Similarly, sustainable building accreditation schemes like BREEAM or LEED, are increasingly allocating credits and granting better ratings to projects that quantify and target embodied carbon emissions. In the building sector, EU legislation on climate benchmarks is intended to phase-in Scope 3 emissions including embodied carbon two years after initial implementation.165

The CRREM Tool's assessment of stranding risk of buildings and portfolios is based on decarbonisation pathways for operational emissions. Also, the tool outcomes will involve the definition of carbon reduction strategies and retrofit plans for the assessed portfolios and assets. The CRREM Tool aims to facilitate the comparison between the embodied 'carbon cost' of retrofit actions and the expected operational benefits. The quantification of the embodied carbon impact of any intervention in buildings is a complex analytical exercise currently performed on a project by project basis. The number of variables and the uncertainty of their future development (transportation distance and means of transport, carbon intensity of electricity grids in multiple manufacturing countries, quantities of materials used, design approaches) makes any prediction of the precise embodied carbon of retrofit interventions a very complex task.

Against this background, in order to derive more reliable input, owners are encouraged to acquire data from their suppliers in accordance with ISO 21930: 2017 and EN 15804 standards, which define core rules for environmental product declarations (EPD) within the construction sector. Whilst major retrofit works to reduce operational emissions are usually the responsibility of the landlord, depending on contractual conditions, tenants may also be responsible for maintenance works and ensuring their units are compliant with changing policies. In this situation, they would also be

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165 See EU, 2019b.
responsible for accounting for the embodied carbon emitted through maintenance and minor retrofits, as well as the carbon released by the fit-outs of their units.

D.3 OPERATIONAL CARBON EMISSIONS

**Barrier 3:** Missing critical data on carbon emitted by and energy consumed within buildings can erroneously give the appearance of an efficient building if not appropriately reported. Ensuring that data on all carbon emissions within the building boundaries are collected and analysed, e.g. by means of the CRREM Tool, is critical to accurately assess stranding risk.

The operational carbon data collection gap usually involves two sources: (1) Information on energy consumed and paid for by tenants and (2) data on ‘unregulated carbon emissions’, which largely depend on the use of the building, working culture and user behaviour, rather than on the building fabric characteristics or location. Unregulated emissions can be emitted by any stakeholder within the building boundaries: tenant, landlord or third parties. These two sources overlap and are reported separately in the two subsections below.

**Current status:** CRREM understands that in some circumstances, fund managers, building owners, etc. may not be able to collect all data to complete a full inventory of their asset’s carbon emissions. However, these gaps should be appropriately reported, and if possible, this missing information should be estimated by adopting fair and reasonable assumptions (always consistently referenced). With clear information on data gaps, the CRREM Tool can also estimate the impact of this missing data using performance databases for each type of asset, location, etc. Thus, CRREM can estimate these emissions for the main sources of missing data as described in the following subsections.

**D.3.1 Tenants**

One of the main challenges for collecting data on carbon emissions within the real estate sector pertains to how emissions within investment properties, which are leased to third parties, should be allocated between investors and tenants. This distribution needs to include all energy consumption and carbon emissions released within the building boundaries. However, this distribution between landlords and tenants is not straightforward and depends on the contractual agreements, and consequently, gathering detailed and complete data may be challenging.

**Landlords/Investors** are commonly responsible for the operational carbon emissions of the common areas of a building, which mainly include emissions from lighting and space conditioning (if any), and shared services such as building heating and elevators. Landlords are also responsible for the embodied carbon emissions from repairs, maintenance and retrofits. These tasks are often assigned to asset / property managers. Depending on the type of lease, tenants may take responsibility for the emissions of the common areas, or landlords may also be partially responsible for the energy consumption of tenant units, for example during void periods or if they pay the tenants’ bills. There are also agreements where the owner pays the bill for energy and then claims the amount from the tenant. In that case, the limits between tenant and owner are not clearly defined.

**Tenants/occupants** are usually responsible for all operational carbon emissions within the units they rent or occupy. These emissions largely depend on the type of activity and behavioural decisions, such as opening windows, operating hours and temperature set-points.
When assessing stranding risk, it makes no difference whether any part of carbon emissions related to building operation is allocated to the tenant or the landlord, as long as all emissions are accounted for. The carbon risk of a specific building results from its carbon performance in relation to regulatory requirements and market expectations, no matter how electricity is sub-metered within the building and how respective emissions are allocated. **Data collected to assess the stranding risk of real estate assets should always account for ALL emissions, no matter which stakeholder reports them or how they are reported.** The data management challenge is collecting information outside the assessing organisation, mainly due to data sharing restrictions and lack of agreements.

The restricted data coverage of a building’s total floor area is a very common challenge for carbon assessment. An additional challenge with regard to the assessment of reliable figures on carbon performance results from **vacant spaces**. If a certain proportion of the building’s total floor area is vacant, and the assessed amount of energy consumption and carbon emissions includes only a limited share of the occupied area, calculations on energy and carbon intensity figures must apply only the covered occupied area as denominator during the vacancies, thereby adding complexity to data collection and processing. If available, present and expected future **data on the occupancy of buildings** should be included in the assessment of carbon risk exposure. This approach enables the normalisation of current values to the buildings’ intrinsic carbon performance.\footnote{UNEP, 2009.}
D.3.2 UNREGULATED CARBON EMISSIONS

Operational carbon emissions are normally divided depending on the level of control by building regulations:

**Regulated carbon emissions** are the emissions that depend on building fabric characteristics: thermal characteristics; heating, ventilation and air conditioning (HVAC) and hot water installations; built-in lighting; building design and orientation; and the on-site generation of renewable energy. These predictable emissions are accounted and controlled by EU member states’ building regulations, compliant with the minimum scope set by the *EPBD* in its Annex I\(^{167}\).

**Unregulated carbon** emissions are all other operational carbon emissions released by energy consumption within a building. These emissions usually encompass equipment and lighting and cooking/catering. The amount and source of unregulated carbon emissions can greatly vary depending on the building use, occupant behaviour and culture. In office buildings these usually include IT equipment, small appliances and lighting; in hospitals they involve large medical equipment; and in the industrial sector they may include the energy consumption of any manufacturing process.

The *EPBD* targets the carbon emissions that are dependent on the building fabric and installed equipment before occupation. The rationale for the *EPBD* limiting its scope is because these emissions are easier to model and control during the design stage when projects need to comply with building regulations. However, achieving the decarbonisation targets required to meet *COP21* involves the reduction of both regulated and unregulated emissions, and therefore data compiling total energy consumption (and carbon emissions) within the building boundaries needs to be gathered and reported for effective assessment. The *UK Green Building Council* clearly points out that unregulated emissions should be progressively integrated into any definition of zero (or near-zero) carbon buildings.\(^{168}\) Accordingly, *CRREM* takes a whole building approach to carbon emissions and the applied decarbonisation pathways include regulated as well as unregulated emissions. *CRREM* decarbonisation pathways consider the significantly different amounts of unregulated emissions depending on the building use.

Asset owners can usually collect information or estimate the emissions from sources they own and control, both regulated and unregulated, because this energy demand is usually metered, measurable and paid for. However, they find the same data sharing process more restrictive and a general lack of agreement to collect data from tenants and other stakeholders. The difference between regulated or unregulated emissions is important and there is a need to evaluate alternative sources of information to bridge this gap. One source usually considered are Energy Performance Certificates (EPCs). The implementation of the *EPBD* in all EU member states has made EPCs widely available since they need to be issued for every building sale or rental transaction. The development of the document cannot involve a costly or lengthy process and therefore, all governments have developed their own simplified calculation methodology to develop EPCs and calculate energy performance. As a result, the use of EPCs has extended beyond its original intention – providing a reference to prospective tenants or buyers – to become a widely used tool for investors, asset managers and landlords to assess the energy efficiency of assets and derive performance data of these assets. However, **EPCs only provide estimations of data on regulated carbon emissions** and therefore they are an incomplete source of information for the assessment of carbon risk. Similarly, all data submitted for building regulation compliance only relates to regulated carbon emissions.

The upcoming **EU Taxonomy for sustainable activities** also refers to the *EPBD* and EPCs when it comes to the determination of energy and carbon intensity metrics used to assess eligibility.\(^{169}\) Current or future building regulations in different countries may voluntarily exceed the minimum scope of emissions defined by *EPBD* in their Annex I and

\(^{167}\) European Commission, 2011.

\(^{168}\) UKGBC, 2014.

\(^{169}\) EU, 2019a.
request the calculation and reporting of further emissions. Future recasts of the EPBD may also change this scope. Therefore, understanding the scope of the emissions contained in the gathered information is critical and should be reported appropriately in order for it to be useful for assessment activities, such as in the CRREM Tool. To address this, CRREM has developed databases to bridge many of the data gaps for various building types and locations, to allow the appropriate assessment of the stranding risk of assets and portfolios. Despite these advances, it remains crucial to clearly define any remaining gaps and their boundaries moving forward. As a means of redressing the data performance gaps the TEG advocates utilising the following energy consumption and carbon assessment methodologies: The annual net primary energy demand during the operational phase of the building life-cycle should be calculated according to CEN T350. This should be calculated ex-ante according to the national methodologies for asset design assessment as defined in EN 52000 and expressed as kWh/m² per year. For operational GHG emissions, the annual net carbon-equivalent emission rate (Global Warming Potential – GWP100) arising from energy consumption during the operational phase of the building life-cycle, i.e. ‘Phase B6’ should be assessed according to CEN/TC350. Again, this should be calculated ex-ante for the building ‘as designed’, and expressed as kgCO2e/m² per year. In the case of embodied GHG emissions including the building material production, transportation and construction (modules A1-A5) and end of life (modules C1-C4 and D) calculations should be determined according to CEN/TC350 and expressed as kgCO2e/m².\(^\text{170}\)

**D.4 PERFORMANCE GAP**

**BARRIER 4:** The performance gap between estimated carbon emissions at design stages and actual emissions in the operational phase poses large uncertainty in the evaluation of the stranding risk. No reliable data on energy consumption or carbon emission is available prior to a building’s first occupation. Additionally, existing buildings often show data gaps and require estimations. Pertinently, the performance gap serves to undermine the evaluation of carbon reduction measures and their potential impact on carbon risk.

The performance gap is the difference between the actual situation and the intended situation. In the built environment, the term usually refers to the difference between the estimated energy and carbon performance of a building or project during the design stage and the actual energy consumption after the building or project is completed and occupied. Initiatives like Carbon Buzz\(^\text{171}\) detected a bias towards overly optimistic estimations, meaning that buildings do not perform as well upon completion as originally anticipated when being designed. Even if this performance gap could be traced back to suboptimal user behaviour, if such behaviour is persistent and seems to be the usual case then this should be considered when estimating emissions and offers scope for behavioural intervention measures to reduce emission levels.

When investors or asset managers cannot gather or access enough data to complete the whole carbon inventory of their portfolio (for example, data from their rented units), they should revert to alternative data sources available to them, to at least partially complete the inventory. Some of these data sources may provide data modelled at the design stage (e.g. regulated data modelled to comply with building regulations, EPCs, etc.) or even after occupation – if, for example, other initiatives or projects have required the estimation of this data.

**Current status:** CRREM favours the use of primary data (for example from meter readings) over data modelled using software or simplified calculation methodologies. Nevertheless, even with the uncertainty added by the performance gap, modelled data obtained from building simulation software and calculation models can be used to assess the stranding risks. However, reporting the data collection procedure is critical to add context and evaluate the reliability of such assessment.

\(^{170}\) EU, 2019a pp.367-368.

\(^{171}\) CIBSE, 2018.
D.5 ORGANISATIONAL BARRIERS

D.5.1 GOVERNANCE

**BARRIER 5:** Successful data collection and management requires clarity in defining the methods, strategies and procedures to ensure complete, coherent and comparable data collection, particularly in complex portfolios. These strategies and policies need to address scenarios like potential data gaps or different data collection processes in different geographical locations and asset management approaches. Data collection and management policies should also ensure transparency in disclosing assumptions, calculation methods and reporting standards. The lack of a clear direction at governance level may result in inaccuracies, miscalculations or data reporting gaps.

To reduce asset exposure to stranding risk, real estate investors need to develop a clear risk management strategy supported with strong ESG policies and appropriate carbon reduction commitments (see SECTION B.3). These commitments lead to the development of a carbon risk reduction plan that need to be adopted and implemented by all stakeholders within the organisation.

The success of defining and implementing a plan to reduce the exposure to carbon risk largely depends on coherent data collection and processing as well as the disclosure of assumptions and resulting levels of uncertainty. Transparency is therefore twofold: on the one hand transparency regarding the assessed data and the carbon status quo of the asset/portfolio (gaps, measurement, processes), and on the other hand transparency regarding beliefs, underlying assumptions etc.

Further, carbon risk mitigation plans should incorporate a regular review process to assess and quantify the success of the corporate strategy, as well as the impact of implemented carbon risk reduction measures. The collection and evaluation of impact indicators should inform (if required) any modifications to the existing plan to ensure that the target is met and that external changes are taken into account. Also, a clear process also requires the definition of responsibilities within the organisation.

D.5.2 AWARENESS, KNOWLEDGE, EXPERIENCE AND ATTITUDES

**BARRIER 6:** Implementing new data collection and management procedures will involve the participation of stakeholders with different levels of experience, engagement, willingness and knowledge. Lack of appropriate levels of know-how and engagement will lead to incomplete or low-quality data.

Research undertaken by the World Business Council for Sustainable Development identified four broad attitudinal segments among building professionals (Figure 21) towards sustainability, which can also be applied to the tasks required to collect good energy and carbon data. The segmentation is based on personal know-how and the extent of personal conviction or commitment to sustainable buildings. Each box shows the characteristics of the segment, including the level of awareness of, and involvement in, sustainable buildings including the key requirements to move groups towards the ‘Campaigner’ quadrant.
This study identified the following four main barriers for building professionals. They are described within the data management and gathering tasks perspective:

- **Personal know-how**: whether people understand what data to gather, how to collect and process it and where to go for good advice.
- **Business community acceptance**: whether people think the business community in their market sees their efforts towards achieving sustainable targets as a priority.
- **A supportive corporate environment**: whether people think their company’s leaders and ESG policies fully support the process.
- **Personal commitment**: whether tasks undertaken towards achieving sustainable targets are important personally.

This segmentation analysis approach has also informed the delineation of the **CREM Policy Analysis Matrix** (see SECTION E), as it is important to appreciate that these crucial differences not only affect carbon consumption behaviour, they also affect appetite for and effort made on carbon monitoring and reporting activity. The **behavioural aspect** must therefore be acknowledged and addressed for comprehensive, effective stranding risk assessment.
D.5.3 SMART TECHNOLOGIES

The term ‘Smart technology’ applied to buildings commonly refers to the automatic control and adjustment of building services to ensure both energy efficiency and user comfort. This process is usually performed by a Building Management System (BMS), which remotely monitor and control a range of building systems – heating, air conditioning, lighting, security, etc. The BMS automatically and remotely collects data using wireless sensors and meters, assesses the measured conditions and starts corrective actions to balance comfort and energy efficiency with all actions performed with minimal human input.

**BARRIER 7:** Notwithstanding the evident potential benefits of implementing smart technologies (see below), there are several barriers that prevent its wider adoption. These include:

- **Security:** Smart technologies make buildings vulnerable from external threats unless appropriate data protection measures to prevent access are adopted.
- **Data sharing:** Controlling data access protocols for internal and external stakeholders is critical to ensure data protection rights and preserve the value of the information held.
- **Maturity of technology and system integration:** The fast development of the technology suggests that the sector is in the ‘innovators’ or ‘early adopters’ stage of the technology adoption lifecycle. Potential users may decide to postpone the adoption of the technology, waiting for more robust systems – particularly for integration of different components, protocols and languages – and a stronger and more competitive market.
- **Cost and return on investment (RoI):** The adoption of smart technologies at portfolio level will involve a capital investment that needs to be justified for the life span of the system and all its components, including its maintenance, replacement of parts and future evolution of the technology. The development of a robust business case needs to resolve the uncertainties of future costs, which is typical for a technology in its early stages of development. Furthermore, not all the benefits that the implementation of this technology involves can be easily translated into monetary indicators.

The term ‘smart’ was originally developed within the IT sector as an acronym for ‘Self-Monitoring, Analysis and Reporting Technology’ for self-assessments of hard drives. ‘Smart’ became widely known within the ‘Internet of Things’ (IoT), describing the technologies that will allow objects and buildings to communicate, automatically improve efficiency and even steer human behaviour. This process is made possible by the convergence of two trends: Firstly, the proliferation of cheap, powerful sensors implemented in commonplace objects, which will be able to understand users’ actions, learn from their behaviours, adjust, reprogram priorities and alert of potential problems. Secondly, the evolution of users’ profiles, which facilitate the interaction and communication with such objects. The carbon and economic benefits of smart data collection and management in buildings are:

- **Energy and carbon savings:** Smart technologies optimise the amount of energy used to keep comfortable levels, also saving carbon and operational costs.
- **Data access and storage:** Smart technologies and BMSs can remotely collect detailed data on fuel consumption and carbon emissions and distribute them fairly for each stakeholder. The process of data collection and access from third parties can be significantly simplified.
- **Smart commissioning:** Smart systems can facilitate the handover of buildings, testing the commissioning of the building services after occupation, adjusting the defined strategies to ensure that all areas of a building perform as expected and helping reduce the performance gap.

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172 Based on Carbon Credentials, 2019.
Increase in comfort and employees' productivity: If appropriately designed and commissioned, smart buildings can keep optimum levels of comfort within working areas, improving the productivity of building users.

Maintenance: Early identification of underperformance can reduce the labour costs of facilities management.

Replacement costs: Planned Preventive Maintenance (PPM) programs currently define replacement schedules following the age of the system. Smart technologies can plan replacement based on performance, ensuring that the lifespan of each component is maximised.

D.6 MEASURES AND CONVERSIONS

The calculation of the carbon emissions and carbon risk of buildings requires the selection of specific indicators and conversion factors from a range of available sources. In particular, the estimation of future emissions is subject to numerous uncertainties.

BARRIER 8: Consistency. All the information from assets within the same portfolio should be collected based on consistent surveying and calculation methodologies and data sources. However, this is not always possible or controllable, even with a strong mandate from the ESG policies, particularly with data collected from secondary sources. For example, data on floor area of non-lettable spaces may have been surveyed by previous owners, which may have used a different methodology. The assessment of prospective assets to be purchased may not have allocated resources to check the sources of data, etc.

BARRIER 9: Comparability. To enable reliable benchmarking of assets and portfolios against respective peers, the results of each calculation and survey process should be comparable. However, this is not always possible due to regional differences, multiple sources and a lack of EU-wide standard procedures.

The two main two areas of uncertainty in measures and conversions that CRREM has identified for the estimation of climate risk are the different methodologies to survey floor areas and the selection of present and future carbon emission factors that are used to derive carbon emissions from energy consumption data – particularly the factors related to the expected decarbonisation of the electricity grid. The future evolution of energy demand – and related emissions – is further affected by the regional impact of climate change in terms of increasing or decreasing heating and cooling demand. The CRREM approach takes account of both effects – grid decarbonisation and climate impact – providing users with a reliable carbon trajectory until 2050.

D.6.1 AREA MEASUREMENT

Area measurement: A current operational challenge is the lack of a standardised European floor area measurement system. Even a slight difference in the methodology of calculating floor area will change the denominator intensity value, in turn impacting upon carbon assessment. A widely adopted floor area measurement standard is the 'International Property Measurement Standards (IPMS)'. Amongst others, this standard is recommended by the RICS (Royal Institution of Chartered Surveyors), and the Australian NABERS building rating system, as well as GRESB. Generally, there is limited control on whether the standard is implemented correctly. The CRREM Tool requires the user to enter the applied measurement standard and integrates this information in the final risk reporting sheets. Users are
encouraged to enter IMPS-based data, for example by using the free online IMPS standard conversion tool offered by RICS\textsuperscript{173}.

D.6.2 CARBON EMISSION FACTORS

The conversion of energy consumption and fugitive emissions into carbon emissions require the selection of ‘carbon emission factors’ (or ‘carbon factors’ or ‘carbon intensity factors’). These factors convert data from end-use metered energy consumption, bills, refrigerant refills, etc. into carbon emissions. Carbon factors are expressed in a fraction, usually kgCO\textsubscript{2}e/kWh for most fuels. However, there are several possible variations in both components of the fraction that need to be considered, as well as the source of the factor itself.

**Denominator: Units per fuel type**

For most users and fuel types, the denominator or intensity unit will be expressed in kWh: the amount of energy (gas or electricity) extracted from the fuel and consumed within the building, as read from energy bills or meters. However, this unit can vary depending on the type of meters and fuel, expressing weights or volumes of fuel instead of the amount of energy.

**Numerator: Fuels’ lifecycle emissions**

The climate impact of burning fuels comprises direct and indirect emissions. Carbon factors available in databases usually include both direct and indirect carbon emissions.

**Direct emissions** – Are the emissions released on-site by burning fuel. This process emits a range of gases with specific Global Warming Potentials (GWPs) to the atmosphere. Carbon dioxide (CO\textsubscript{2}) is the most common, but other gases with GWP are also emitted during the process such as: Methane (CH\textsubscript{4}), Nitrous oxide (N\textsubscript{2}O), Sulphur hexafluoride (SF\textsubscript{6}), Nitrogen trifluoride (NF\textsubscript{3}) contributing to climate change. Whilst most of these gases are released in much smaller quantities than carbon dioxide, their GWP is much higher. To simplify the accounting and reporting process, emission quantities and corresponding GWPs of non-CO\textsubscript{2} GHG are converted to ‘carbon dioxide equivalents’ (CO\textsubscript{2}e) expressing which amount of CO\textsubscript{2} (kg) has the same GWP as the considered amount of a certain other GHG.

**Indirect emissions** – The indirect emissions of fuels involve the upstream carbon emissions of fuels, sometimes referred to as Well-to-Tank. They result from the extraction, transport, refining, purification or conversion of primary fuels to fuels for direct use by end-users, as well as the distribution of these fuels. These indirect emissions are usually incorporated in the carbon intensity factors. They change from country to country and even though no large differences should be expected – most of the carbon impact of fuels is generated in the combustion process – they can be proportionally significant in some cases, e.g. biofuels.

**Data source and conversion policy** – Conversion factors vary from country to country (indirect emissions) and in time, particularly for electricity, heat and steam. For other fuels, these factors are more or less constant in time and location, but they can slightly vary depending on factors like fuel quality and associated indirect emissions. Therefore, it is critical that the data conversion process selects a consistent database that is valid for the geographic context of the portfolio. For example, the methodology followed to calculate the ‘UK Government GHG Conversion Factors for Company Reporting’ considers in many cases average values within the EU to estimate upstream emissions\textsuperscript{174} in the calculation of the fuel carbon factors.

**Electricity – Location variability of carbon factor**

The carbon footprints of the electricity grids vary depending on the mix of fuels that it is used for domestic generation and the generation of imported electricity. The carbon footprint of the electricity grid varies over time in both the short

\textsuperscript{173} RICS, 2018.

\textsuperscript{174} Department for Business, Energy and Industrial Strategy (UK), 2018.
and long-term. In order to constantly meet the current demand, electricity providers use fossil fuels and nuclear energy to compensate seasonal and day-to-day fluctuations of maximum renewable electricity generation. In the long-term, local emission factors will vary due to the evolving share of energy sources but also due to changing trade patterns across borders.

EU countries periodically publish the carbon emission factors of their electricity grid at national level. To ensure consistency in the calculation methodology and publishing time, pan-European investors usually use conversion factors from a single data provider, for example the European Environment Agency (EEA)\textsuperscript{175}. However, some investors may choose other national or regional sources, which may be also valid but calculated differently.

**Electricity – Carbon impact calculation method**

Organisations may choose energy providers which only supply renewable energy. Alternatively, they can use available technologies (e.g. batteries) to store less carbon intensive electricity during off-peak times and use it later. To encourage the use of these technologies, the GHG Corporate Standard defines two calculation methods:

(1) The **location-based method** quantifies Scope 2 GHG emissions based on the (annual) average emissions intensity of the electricity grid within which the energy consumption occurs (grid-average emission factor data). Emission factors are often determined based on geographic locations. These can be based on local, or subnational boundaries, but most common are factors on national level (meaning that there is one single electricity emission factor for an entire country, which does not rule out the consideration of effects of cross-border electricity trading).

(2) The **market-based method** quantifies Scope 2 GHG emissions based on the specific fuel mix and related emissions from the supplier from which the entity purchases electricity. The market-based method reflects the GHG emissions associated with the choices an entity makes on its electricity supplier.

Since the 2015 update of the GHG Protocol, companies are recommended to report separately on both location-based and market-based Scope 2 GHG emissions if this is possible. EPRA Sustainability Best Practice Recommendations (sBPR) define the location-based method as the minimum reporting requirement with emission figures based on the market-based method also reported optionally as an ‘additional performance measure’\textsuperscript{176}.

The main reason for the location-based method to be preferred is that the carbon intensity of the electricity used by organisations that do not select low-carbon electricity providers is theoretically higher than the national average (compensating the lower carbon factor of purchasers of low-carbon electricity). Adjusted emission factors would have to consider the amount of low-carbon electricity generated, procured and reported using the market-based method. Without adjusting the emission factors for electricity from the standard grid, aggregated emissions will occur smaller than they actually are.

**Electricity – Evolution of grid decarbonisation**

In the Energy Roadmap 2050, the European Commission (EC) contends that ‘a secure, competitive and decarbonised energy system in 2050 is possible’\textsuperscript{177} and therefore, the EC is promoting the progressive decarbonisation of the electricity grid by 2050. Lower carbon intensity of electricity implies that electricity related indirect carbon emissions will decrease in the future due to the efforts of the energy sector to reduce their direct emissions. This will happen thanks to a less carbon intensive mix of fuels to produce electricity, which will need to include a higher proportion of renewable and potentially also nuclear energy sources.

\textsuperscript{175} European Environment Agency, 2017.
\textsuperscript{176} EPRA, 2017.
\textsuperscript{177} European Commission, 2012.
Users of the CRREM Tool will have the possibility to modify the default emission factors and use alternative factors.

**Electricity emission factor:** The CRREM Tool uses an EU-wide dataset of emission factors based on data from the European Energy Agency (EEA – emission factors of domestic production)\(^{178}\) and data on cross-border trade resulting from entsoe\(^{179}\). This approach enables us to calculate the real carbon emission quantity per unit of end-user energy consumed in a certain country. Applied future emission factors until 2050 are based on this starting point and country-specific rates of change derived from the official EU Reference Scenario EUREF16\(^{180}\).

In spite of the challenges regarding the shortcomings accounting electricity import and export market amongst countries, for consistency and comparability reasons, CRREM uses data collected by the European Environment Agency (EEA)\(^ {181}\), calculated following the recommendations of the IPCC.

In this regard, CRREM promotes the reporting of carbon emissions using the location-based method. Users can report alternative factors to calculate their emissions using the market-based method. Similarly, users may prefer to use carbon intensity factors from other national sources that include the impact of the import-export market. In all cases, results will be reported separately.

**Decarbonisation of the grid:** CRREM calculations of the stranding risk of any asset relies on the projections that the EC estimates for each of the EU member states until 2050\(^{182}\). However, evolution of the energy policies of the EU and each member state may modify these predictions and therefore future re-assessments of the stranding risk will need to update these values. Users may prefer to use other sources depending on their portfolio profile and their ESG policies. In that case, large differences may affect the comparability with peers.

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**KEY LEARNING OUTCOMES**

- Calculation of the stranding risk of any asset relies on these various barriers being successfully addressed. It also relies on the projections that the EC estimates for each of the EU member states until 2050\(^{183}\). However, evolution of the energy policies of the EU and each member state may modify these predictions and therefore, future re-assessments of the stranding risk will need to update these values.

- Users may prefer to use other sources depending on their portfolio profile and their ESG policies. In that case, large differences may affect the comparability with peers. CRREM Processes and Tools will act to standardise these approaches to help overcome the identified barriers and to facilitate the sense making required to allow users to assess their corporate exposure and enact physical, procedural and cultural mitigation measures.

- Users need to develop processes which accurately collect building carbon emission data for all areas, regardless of the occupational status, to ensure accurate assessment of embodied and occupational carbon to facilitate accurate assessment of stranding risk.

- It is important to address both building fabric and user behaviour in order to accurately forecast, manage and mitigate stranding risk.

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\(^{179}\) Moro and Lonza, 2018; entsoe, 2019.

\(^{180}\) E3m-Lab, 2016.


\(^{182}\) European Commission, 2019b.

\(^{183}\) European Commission, 2019a.
Accurate assessment of the embodied carbon implied by refurbishment is vital to ensure that carbon emission from this activity does not exceed the operational savings they are designed to make.

There remain sizeable challenges pertaining to data collection and gathering, particularly on the energy component. Robust and credible performance data is required for investors buy-in. Users need to improve data collection methodologies and put in place mechanisms to collect, and were necessary estimate indirect emissions that their buildings are responsible for.

Building owners and occupiers need to find ‘common ground’ in order to share accurate information on emission performance to accurately compile carbon inventories. This is particularly vital to overcome the problem of assessing unregulated carbon emissions not accounted for or controlled by EPBD.

The performance gap between intended performance of new and refurbished buildings and their actual subsequent operational performance needs to be addressed, explained and overcome.

Organisational cultures need to be examined and where necessary realigned, to overcome knowledge and attitudinal issues which would otherwise hamper progress towards ESG. Organisations need to establish clear definition of responsibilities for these matters.

Action needs to be taken to improve the uptake of SMART approaches. Greater efforts are required to adopt common measurement bases in key areas of performance measurement to ensure consistency and comparability of both inputs and outputs.

The CRREM tool and outputs will make considerable contributions to addressing these issues by providing consistent assessment methodologies adopting best practice approaches.

Data sharing and access between tenants and landlords is still a critical area that hinders the transition to an energy efficient, climate safe built environment. Tenants can easily decline their engagement into data sharing agreements and without data, the carbon inventory of real estate assets is incomplete. Incomplete carbon inventories or optimistic assumptions can give the appearance of an efficient building if not appropriately reported.

Different organisations like the Better Buildings Partnership are promoting the implementation of ‘green leases’, which contain binding clauses in relation to the sustainable operation of a building and provisions regarding sharing of data and co-operation on improving environmental performance. The World Green Building Council’s Advancing Net Zero Status also encourages tenants to grant building owners access to energy consumption data to take greater control over consumption, potential improvements, and energy supply contracts. However, there is not a clear regulatory framework to define data sharing obligations and to ensure data protection.

There is a fundamental requirement to develop new policies and modify existing ones (e.g. Energy performance of buildings directive, General Data Protection Regulation) to guarantee transparent, safe and sufficient data transfer between tenants and building owners.
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 785058.
SECTION E  ANALYSING THE IMPACT OF REGULATION ON CORPORATE CARBON STRATEGIES

E.1  ENGAGEMENT WITH POLICY MAKERS

Carbon reduction is both an organisational and public issue that requires concerted efforts and commitments from a range of stakeholders, including environmental policy makers and legislators. Hence, it is of paramount importance and necessity to recognise the benefits and implications of having a supportive regulatory regime and institutional vehicles in place for facilitating the transition to a low-carbon economy.

It is acknowledged that lobbying on regulation and policy by industry groups has increasingly become one of the major driving forces for shaping the climate agenda, both regionally and globally. This is often achieved through undertaking focused campaigns by industry leaders with the aim to advance progress in policy and regulatory areas, especially around the creation of economic incentives for businesses and individual investors such as through carbon pricing and alignment with international standards in line with, for instance, those stipulated in the Paris Climate Agreement. Against this backdrop, considerable lobbying efforts have recently been made through organisations such as The Institutional Investors Group on Climate Change, Principles for Responsible Investments and Global Investor Coalition on Climate Change, amongst others. Lobbying therefore can be a powerful force for positive ecological changes. This activity is perhaps doubly important given the reality that considerable lobbying activity by other vested interests in industry, agriculture and trade can arguably be claimed to have acted against ecological progress over a considerable time period. Utilising these tactics by presenting the ecological arguments in a compelling way can therefore mitigate the situation.

At technical and operational levels, companies can make a tremendous contribution to the decarbonisation agenda by informing policymakers of the business challenges they face, and the risks and opportunities they identify as well as more generally offering operational insights on environmental issues to facilitate evidence-led policy development. Being at the forefront of environmental initiatives, businesses are often in a strong position to play an active role in terms of evaluating the impact and viability of low-carbon legislation and government programmes. Corporate insights are crucial for policy makers to understand both the immediate impact on industry and secondary the induced impacts on market activity. A classic example is the current taxation differential between conventional high street retailing and online retailing, with the imbalance being one of the key factors contributing to the decline of traditional retailing, with knock on effects which are manifesting themselves across a broad range of policy areas.

These contrasts are of key interest to policy makers and legislators in terms of informing policy development and optimising ‘positive impact attainment’ and ‘desired outcomes’. Understanding stakeholder perspectives is key to determining strategy formulation and to assessing the policy impacts of, for example, incentivised approaches to decarbonisation within the real estate sector versus conformance mandates, or indeed to determine the optimal balance between ‘carrot and stick’ ideologies and how these can be successfully synergised in order to optimise impact attainment.

Carbon disclosure at company level (and to some extent also the attitudes of real estate owners and investors) appears to be significantly associated with governments’ climate change mitigation programmes. A government which has adopted an active carbon mitigation policy environment, either through incentive or conformance-based

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184 Bohmelt, 2013.
188 Kalu et al., 2016.
approaches, by definition influences and impacts corporate strategy. Additionally, Kalu et al.\(^{189}\) highlight that since the extent and content of carbon and environmental information disclosure is low, there is a **quest by governments and policy makers for understanding on how to create an enabling environment to increase proactive corporate carbon mitigation strategies within the real estate sector**. Hence the need for more effective analysis and understanding of the policy and legislative frameworks and the various determinant-factors that serve to motivate voluntary/conformant corporate carbon mitigation strategies is necessary. In addition, it is also valuable for the companies themselves to be able to estimate the likely effects of regulatory and / or corporate level policies on themselves and their sector competitors. Fostering proactive activity also requires the existence and successful operation of organisations who act to benchmark performance and / or provide goods and services to facilitate decarbonisation. In order to address this need for effective communication between industry actors and policy makers, CRREM has developed a Policy Analysis Matrix, which will be described regarding theoretical background and potential application in the next sections.

### E.2 CRREM POLICY MATRIX

In order to conceptualise what a CRREM Policy Matrix might ‘look like’ it was necessary to evaluate the variety of relevant data and evaluate which meaningful results the Policy Matrix should provide. CRREM has undertaken a comprehensive content analysis of policy evaluation matrices as well as exploring the international policy context pertaining to carbon mitigation strategies. This has served to derive enhanced appreciation of the factors and drivers of policy enablement as well as identifying gaps and deficiencies within legislative structures which have served to curtail impact. The overriding aim was to develop a policy evaluation matrix which serves to contextualise the legislative and policy landscape affording an **exploration on how policy mandates and incentive-based strategies impact upon the real estate sector and its approaches to carbon mitigation**.

#### E.2.1 POLICY MATRIX DATA CONSIDERATIONS

The concept of a Policy Matrix necessarily invokes some consideration of the scope and nature of the matrix itself and the granularity of the analysis it is designed to facilitate. It is clear that the **data on both company performance and regulation strategies is extremely heterogeneous**, with a broad range of characteristics in both aspects. Company performance effectively encompasses all organisation types as well as performance measured against both financial and sustainability metrics. Meanwhile, **regulation and / or enabling strategies range from laws, via financial packages to publicity campaigns**. These aspects would ultimately have to be integrated to form the ‘axis’ of any resulting matrix.

#### E.2.2 POLICY ANALYSIS MATRIX

A Policy Analysis Matrix is a method to both cross reference data and also facilitate the application of algorithms to manipulate the data to provide desired analytical outcomes – typically ratios and both additive and multiplicative calculations. An example of a Matrix would be a Body Mass Calculation Matrix (BMI), which relates height and weight, and calculates an outcome which can be related to a variety of additional factors to understand health risks and indicate future mitigation actions. A Health Policy Analysis Matrix may relate the resulting BMI categories to the uptake and outcomes of the mitigation strategies, in order to **evaluate the chances of success of certain strategies**. For example, it may indicate a probable benefit of exercise over dieting for some categories, with the reverse true in others, with a

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\(^{189}\) Kalu et al., 2016.
combination providing an optimum outcome. Clearly comparing every individual with every mitigation strategy would require granular precision data capture and ‘big data’ analytics. Alternatively, analysing data allocated to broad representative groupings, in an appropriate number of broad categories, may provide robust and useful outcomes. Of course, this ‘categorisation’ approach is very common to the real estate sphere, and in many ways underpins much of the way market participants perceive and make sense of the sector. Despite the fact that both properties themselves and their locations are extremely heterogenous, broad categorisations are often used for sense-making purposes. Property types which probably exist in a form of use type continuum are ‘bluntly’ allocated to a small number of use ‘categories’: retail, office, industrial and residential, with location classified as: prime, secondary, and tertiary. Individual cities may have a ‘downtown, midtown’ type classification. Against these broad groupings, averaged metrics like ‘prime midtown office yields are at 6%’, or ‘Prime Zone A rent is EUR 250 per square metre’ may be applied. When such generalised rent and yield information is applied to these generic property types and locations, a sense of the market emerges, which is strongly informative. It is acknowledged that these classifications are strong in the ‘centre’ of their groupings and weaker at the fringes – a retailer with some food offer on the edge of the prime pitch for example – but this does not overly detract from the strength of the approach, which lies in the behavioural requirement of humans to generalise and simplify complex granular data.

CRREM policy matrix methodology

This Policy Analysis Matrix methodology has been adopted to create a matrix which compares end user (or organisational) characteristics with policy characteristics intending to shed light on how these factors combine to produce a policy performance outcome. The matrix has been designed using an Excel architecture (Figure 22) and seeks to represent the key behaviour drivers of organisations into several broad yet representative categories and the key policy characteristics into several broad categories that represent the ways policy will be experienced by end users. We decided to limit the measurement metrics to three options per category. Whilst many more gradations could be used, the ability to accurately allocate to these would be debateable.

For the implementation of any strategy the relevance / materiality and external context factors need to be analysed in order to ‘fit’ target-setting and the corresponding strategies to accomplish the defined company goals. In this context, one common approach for assessing the specific relevance of any potential business activity or reporting issue like carbon risk, is to assets its economic, ecological and social impacts in relation the potential impact on stakeholders’ opinions and decisions (see Figure 23).
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 785058.

**Figure 22: CRREM Decarbonisation Analysis Matrix – End User Characteristics**

<table>
<thead>
<tr>
<th>Firm / Company Performance Characteristics</th>
<th>Attitude Score</th>
<th>Cost sensitivity Score</th>
<th>Risk Appetite Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSR Focus</td>
<td>3</td>
<td>Cost Critical 1</td>
<td>Risk Taking 3</td>
</tr>
<tr>
<td>Risk Management</td>
<td>2</td>
<td>Cost Neutral 2</td>
<td>Risk Management 2</td>
</tr>
<tr>
<td>Minimum Compliance</td>
<td>1</td>
<td>Cost Benign 3</td>
<td>Risk Averse 1</td>
</tr>
</tbody>
</table>

Drawn from a combination of primary and secondary information sources, including surveys and Firms own stated objectives (or lack of)

A ‘fuzzy set’ of ordinal variables to categorise relative interest or commitment towards incurring cost

Firms own stated Environmental objectives (or lack of) Compliance

A ‘fuzzy set’ of ordinal variables to categorise relative interest in incurring risk

Source: CRREM Policy Matrix.
User Characteristics

After testing several versions with end user feedback, the matrix has been established with three user characteristics:

❖ **Attitude**: This seeks to represent the organisation’s basic approach to sustainability matters. The metrics are CSR Focus, Risk Management and Minimum Compliance.

❖ **Cost Sensitivity**: This seeks to measure the extent to which cost is a main driver of action. The metrics are Cost Critical, Cost Neutral and Cost Benign.

❖ **Risk Appetite**: This seeks to measure the risk-taking attitude of the organisation. The metrics are Risk Taking, Risk Management and Risk Averse.

These three categories allow a broad classification of organisations, which can be identified on an individual basis by self-declaration or by the analysis of reports and actions. The categories can also be used more generally to identify the implications of an organisation having such characteristics. For this type of general analysis, we have grouped organisations into three broad classifications for ‘scenario’ type analysis (other classifications are available) – these are:

❖ **Reluctant Laggards**: Characterised by scoring lowest in each of the three categories – these firms are perhaps least interested and motivated by the green agenda, very cost sensitive and reluctant to take risk in this area of activity. They are the least likely to act and latest to respond to incentives and pressure to adopt greener practices.
Pragmatic Adopters: Characterised by a general ‘middle of the road’ score in each of the categories – these firms are generally neutral to green issues but will move in line with policies and public opinion, particularly when the business case becomes financially reasonable.

Green ‘Unicorns’: Characterised by scoring highest in each of the three categories – these firms are the most motivated to undertake green actions – first adopters of new technology and prepared to undertake such activity in advance of a proven business case rationale.

Of course, most firms would be a combination of the scores but these represent what might otherwise be characterised as ‘pessimistic / worst case’, ‘realistic / expected case’ and ‘optimistic / best case’ scenarios. The matrix can be used to ‘profile’ particular organisations or sectors, against these three key characteristics, based on information derived from company and sector reports and insights. These attributes represent a MINIMUM level of characterisation to allow meaningful analysis of likely policy response.

Matrix policy considerations

The Matrix also contains four broad policy attributes, to characterise policies or groups of policies in four attribute areas:

Approach: This seeks to depict the broad way that the policy works – whether it takes the form of an incentive, a sanction or something else.

Application: This seeks to assess the extent of compulsion / enforcement. The metrics are Strong, Neutral and Weak. Strong application is where there is a significant statutory support for the policy – such as a legal requirement, which is adequately enforced. Weak application may be where the policy relies upon aspects such as sentiment and goodwill.

Cost: This seeks to assess the relative expense of compliance. The metrics are Low Cost, Moderate Cost and High Cost. ‘Low cost’ is where, relative to the overall activity involved, there is an insignificant or low level of cost involved, presenting little cost-based risk to the end user making the decision. This may be due to low or no upfront charges and / or low recurrent impact on revenues and / or outgoings. ‘High cost’ implications are associated with significant capital expenditure and / or recurrent impact on revenues and / or costs, requiring hard business choices to be made.

Accessibility: This seeks to establish a measure of the ease of compliance. The metrics are Transparent, Neutral and Opaque. ‘Transparent’ is where compliance is relatively easy e.g. simply clicking on an option box in an energy account to ‘prefer’ green energy generation sources, or accessing a boiler scrappage scheme with information easily digestible. Opaque is where more complex bureaucracy is involved or where there is little or no publicity, or where it is difficult to know how to comply, such as in the case of certain zero carbon home schemes which are subject to expensive and uncertain post build assessments.

The scores are again kept to 3 broad categories to avoid artificially granular scoring where there is limited data precision (see Figure 24).
Policy Analysis matrix

Whilst these are all relatively broad categories, with a limited set of metrics for each, this provides a 3\(^7\) Matrix, allowing 2,187 discrete input options. This provides a rich and sophisticated platform for investigating the nuanced interaction between organisational motivations and policy characteristics. In terms of modelling the options, the tool utilises Excel functionality to allow each option for each attribute to be selected, using simple pull-down lists.

Using the Matrix

The Matrix utilises a robust linear additive model. Selecting the various options produces a Policy Analysis score between 7 and 21. These scores are categorised into the familiar Red Amber Green (RAG) format. Scores in the range of 7 and 11 are categorised as Red, with the Policy Analysis cell turning red, as a visual warning that such policies will not be effective for organisations with the selected attributes. Scores in the range of 12 and 16 are categorised as Amber, indicating that they are problematic. Scores in the range of 17 and 21 are categorised as Green, indicating positive policies that should work with the organisation profile selected (see Figure 25). As an additional risk recognition function, if any two of the policy attributes of Application, Cost or Accessibility record a score of 1, the Policy Status will indicate Red, acknowledging the likely significance of poor scores in these attributes. The Policy Analysis Matrix can be used to model the likely performance of different policy ‘prescriptions’ for different organisational types and to carry out ‘what if’ type policy analysis.

In the accompanying excel-based CRREM Policy Analysis Matrix two examples have been depicted (see Figure 26). The first one is the French Tax incentive scheme designed to encourage organisations to comply with and even exceed building code energy efficiency standards. The Policy Analysis Matrix provides a relatively positive outlook on this policy, with a score in the upper end of the ‘Amber’ category, moving into the ‘Green’ category at best. Since refurbishment measures aiming at reducing energy consumption and carbon emissions play a pivotal role in CRREM’s approach to carbon risk, the second application example examines the refurbishment schemes of Green Building certificates as exemplified by LEED, BREEAM and EnergyStar. As can be seen, the Policy Analysis Matrix provides a relatively marbled outlook on these schemes, with an amber outlook for green unicorns but an overall score in the ‘Red’ category.
The CRREM Policy Analysis Matrix supports policy makers in identifying how and why certain initiatives or instruments underperform. It aims at rectifying potential shortcomings by pointing towards actions which could be undertaken to improve effectiveness. The current EU initiative aiming to develop a uniform taxonomy for sustainable finance activities (as detailed later in the report; see SECTION F) is another key policy activity which could be investigated from a number of angles with the Matrix. Indeed, any government, corporate policy or initiative can be explored using the Matrix. In essence, a structured analysis of the regulatory European and national framework regarding carbon-related policies, directives etc. is essential for companies.

**Figure 25: CRREM Decarbonisation Policy Analysis Matrix Evaluative Outcomes**

*Source: CRREM Policy Matrix.*
KEY LEARNING OUTCOMES

❖ Carbon reduction requires concerted efforts and commitments from a range of stakeholders, including environmental policy makers and legislators. Hence, it is of paramount importance and necessity to recognise the benefits and implications of having a supportive regulatory regime and institutional vehicles in place for facilitating the process of low-carbon-transition.

❖ CRREM has undertaken an investigation into the policy drivers and obstacles in terms of positive industry response to environmental policy making.

❖ Companies can make a tremendous contribution to the decarbonisation agenda by informing policymakers of the technical and operational business challenges and the environmental risks and opportunities they face to facilitate evidence-led policy development.

❖ Corporate insights are crucial for policy makers to understand both the immediate and secondary impact on market activity of environmental policy (or a lack of policy).
A Policy Analysis Matrix methodology has been adopted to create a matrix which compares end user (or organisational) characteristics with policy characteristics. This is developed with the intention of identifying how these factors combine to produce a policy performance outcome.

The CRREM Policy Analysis Matrix can be used to model the likely performance of different policy ‘prescriptions’ for different organisational ‘types’ and to carry out ‘what if’ type policy analysis.
Sustainable finance and the EU taxonomy technical report: implications for the real estate sector
SUSTAINABLE FINANCE AND THE EU “TAXONOMY” FOR SUSTAINABLE FINANCE

F.1 SUSTAINABLE FINANCIAL GROWTH – FUNDAMENTALS OF THE EU ‘ACTION PLAN’

The relationship between financial (capital) markets and carbon abatement has been subject to some intense discussions and has featured in a number of publications undertaken by the European Commission over the past decade. This trajectory has seen the EU strongly supporting the transition to a low-carbon, more resource-efficient and sustainable economy leading to efforts to build a financial system that supports sustainable and climate-resilient growth by directing financial flows towards low-carbon activities. Whilst the EU has provided stimulus and initiatives to attract investment such as the European Fund for Strategic Investments, there has been widespread acknowledgement that the scale of the investment challenge is beyond the capacity of current delivery vehicles. Since it is incontrovertible that public funding will not suffice for the required fundamental restructuring of the economic system, the financial sector plays a pivotal role in generating and directing the required capital flows. Despite the tremendous growth of private capital flows to sustainable and responsible investments in the last decade, the annual EU-wide gap in investment required to achieve EU climate targets is estimated to amount to EUR 180 bn.

It has therefore become of pressing concern that the financial sector aligns and tailors investment and financial growth towards more sustainable technologies and businesses over the long-term in order to contribute to the creation of a low-carbon, climate resilient and circular economy. In light of this objective, the role of what is considered ‘sustainable finance’ has emerged as a principal objective by the EU Commission and EU Parliament with a series of measures implemented via its newly formed ‘Action Plan: Financing Sustainable Growth’ facilitated by an EU Technical Expert Group (Hereinafter TEG). Indeed, the EU foresees sustainable finance as the provision of capital to investments under consideration of environmental, social and governance concerns to support economic growth whilst reducing pressures on the environment, addressing greenhouse gas emissions and tackling pollution, minimising waste and improving efficiency in the use of natural resources. The recent increase in efforts in these fields is the logically coherent and overdue next step of the EU in meeting its obligations under the Paris Accord as well as the 17 UN Sustainable Development Goals (SDG).

The action plan also encompasses increasing awareness of, and transparency on, any risks which may impact the sustainability of the financial system. Climate risks, carbon risk and the stranding risk of assets are therefore integral to the efforts of the EU Commission. In this regard, the EU deems it as being fundamental for financial and corporate actors to mitigate such risks through appropriate governance structures to channel private capital towards sustainable projects. The action plan was presented in March 2018 by the EU Commission addressing the EU Parliament and all relevant stakeholders. Although the initial focus lay on environmental aspects, the action plan also set the direction towards a sustainable finance system and defined a clear pathway for necessary implementation measures.

190 EU, 2019a.
191 See BAFU, 2015.
192 See Eurosif, 2018.
193 European Commission, 2019d.
194 EU, 2019a.
196 European Commission, 2019a.
comprehensive package of measures implementing partial steps of the action plan was adopted by the EU Commission in May 2018. Accordingly, the overall action plan envisaged by the EU sets out a comprehensive strategy to further integrate finance with sustainability, which encompasses three key actions:

- “A proposal for a regulation on the establishment of a framework to facilitate sustainable investment. This regulation establishes the conditions and the framework to gradually create a unified classification system (‘taxonomy’) on what can be considered an environmentally sustainable economic activity. This is a first and essential step in the efforts to channel investments into sustainable activities.” (Brussels, 24.5.2018, COM (2018) 353 final;)

- “A proposal for a regulation on disclosures relating to sustainable investments and sustainability risks and amending Directive (EU) 2016/2341. This regulation introduces disclosure obligations on how institutional investors and asset managers integrate environmental, social and governance (ESG) factors in their risk processes. Requirements to integrate ESG factors in investment decision-making processes, as part of their duties towards investors and beneficiaries, will be further specified through delegated acts.” (Brussels, 24.5.2018, COM (2018) 354 final; and

- “A proposal for a regulation amending the benchmark regulation. The proposed amendment will create a new category of benchmarks comprising low-carbon and positive carbon impact benchmarks, which will provide investors with better information on the carbon footprint of their investments.” (Brussels, 24.5.2018, COM (2018) 355 final)\(^2\)

These regulatory proposals will complement existing and establish new regulations or directives. In February 2019, the EU Commission, the EU Parliament and the EU Council of Finance Ministers agreed on the legal text for low-carbon investments, and in March 2019 on increased sustainability transparency requirements for financial institutions. In the course of implementing the action plan, the EU Commission established the ‘High Level Expert Group’ with the mission to evaluate the key requirements of a sustainable finance system. Many of the central demands outlined in the expert group’s final report (published in January 2018) have been incorporated in the action plan, especially regarding the development of an EU-level strategy on sustainable finance, as proposed in the ‘Sustainable Finance Report’. On the basis on the action plan, the EU Commission established another expert group in July 2018 assigned to elaborate the subsequent implementation steps and legal regulations. This ‘Technical Expert Group on Sustainable Finance’ (TEG) mainly supports the EU Commission in the development of the Sustainable Finance Taxonomy, the EU Green Bond Standard and EU Climate Benchmarks and Benchmarks’ ESG Disclosures. The following sections present the TEG’s reports on the Taxonomy and Climate Benchmarks with specific focus on their relevance for the real estate sector.

F.2 EU CLIMATE BENCHMARKS AND CRREM DECARBONISATION PATHWAYS

The *Benchmarks Working Group of the TEG* proposed in June 2019 two ‘climate benchmarks’\(^\text{203}\) The benchmarks are differentiated with respect to their level of scope and ambition, defining standards for the assessment of climate related risks, enabling investors to align their investment decisions with science-based decarbonisation targets and serving as a common ground for administrators of climate risk-related benchmarks. Benchmarks and the taxonomy act as a framework or nexus between policy goals (*Paris Agreement*) and the economic activities of investors and managers of capital, with the intention to influence activities and decisions of corporations and other entities.\(^\text{204}\)

The *EU Paris-aligned Benchmark (EU PAB)* sets slightly more ambitious requirements than the *EU Climate Transition Benchmark (EU CTB)*. Benchmark administrators face certain minimum requirements such as the integration of Scope 3 emissions (see *SECTION D*) and carbon intensity reduction thresholds of 50% (*EU PAB*) or 30% (*EU CTB*) compared to the respective investable universe. It is further required to indicate precisely the underlying climate scenario according to the *IPCC* and how climate data has been processed within the framework of a provided benchmark. Due to the pivotal role of the building sector in achieving *EU* climate targets (‘critical cross-cutting issue’), the derivation of decarbonisation targets should build upon a particularly stringent and transparent methodology taking account of the sector’s very specific characteristics. *CRREM* has already derived a consistent carbon assessment methodology and has established decarbonisation pathways until 2050 for the *EU* commercial real estate sector. Decarbonisation targets are differentiated by country and building type, forming a sound basis for potential benchmarks.

In a broader sense, *CRREM* can be regarded as an ‘investment performance barometer for GHG emission-related strategies within the commercial real estate sector’\(^\text{205}\) and serves as an evidence base to inform *specific objectives related to greenhouse gas (GHG) emission reductions and the transition to a low-carbon economy – based on the scientific evidence of the IPCC – through the selection and weighting of underlying constituents*. The *CRREM* methodology enables investors to identify outperforming assets as well as those with a poor carbon performance / high carbon footprint. The long-term decarbonisation target pathway until 2050 can be visualised in combination with the projected performance of individual assets or portfolios, highlighting challenges to target achievement, potential (transition) risks and – thanks to the integration of industry performance data from *GRESB* – the current and projected future position compared with peers (based on country and building type – see *Figure 27*).
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 785058.

Figure 27: CRREM Stranding Risk Analysis and Climate Benchmarking with GRESB Peer-Group Data (German Offices)

Source: Own presentation based on CRREM (2019) and data provided by GRESB.
The TEG further defined clear criteria for the disclosure of ESG factors including climate risk by investors and benchmark administrators. The carbon assessment methodology, decarbonisation pathways and risk assessment integrated in the CRREM Tool facilitate the derivation of relevant ESG and risk indicators required to comply with disclosure requirements. Furthermore, the identification of sustainable (‘taxonomy-eligible’) assets with the CRREM Tool can be regarded as a risk-reducing measure in itself, since non-conformance with the taxonomy presents a new risk factor influencing an asset’s attractiveness to investors.

By utilising the CRREM Tool, investors and benchmark providers fulfil the requirement to disclose information on how climate-related factors are reflected in their sustainability benchmarking according to Regulation (EU) 2016/1011. The CRREM decarbonisation pathways also fully comply with Article 27 of the Regulation amending Regulation (EU) 2016/2011 requiring the ‘Paris Alignment’ of benchmarks, covering the 1.5°C as well as the 2°C scenario. The first CRREM report ‘Stranding Risk & Carbon’ provides the required information regarding details on the top-down methodology and scenarios used to determine decarbonisation targets ensuring consistency and comparability. Furthermore, the multifarious output parameters of the CRREM stranding risk analysis (year of stranding, absolute and relative amount and costs of excess emissions etc.) can constitute an essential part of the ‘Average Environmental rating of index (E component of ESG rating)’ that has to be disclosed for equity benchmarks.

F.3 EU TAXONOMY AND CRREM CARBON RISK ASSESSMENT

F.3.1 FUNDAMENTAL PRINCIPLES OF THE TAXONOMY

The EU Taxonomy serves as a coherent higher-level classification system for sustainable finance and constitutes the basis and valuation standard in developing further legislation and instruments, for example Green Bonds and (low-carbon) climate benchmarks. Given the long-term nature of real estate as an investment class, the proposed taxonomy will have profound implications for investors. In particular, the taxonomy and climate benchmarks will impact the risk-reward decision-making framework pertaining to real estate assets. Indeed, our CRREM investor survey results have shown that the decarbonisation agenda is serving very much as a ‘game changer’ in terms of both risk perception and opportunity analysis. Uncertainty is prevalent across the sector in terms of impact assessment and the development of ‘actionable’ decarbonisation strategies which mitigate risk and affect financial performance.

The ‘Taxonomy Technical Report’ of the TEG showcases the rationale for the universal taxonomy approach from both a policy and investment perspective, technical screening criteria for climate change mitigation objectives, a taxonomy user, use case analysis and list of technical screening criteria for each macro-sector. As highlighted in the report206, the objectives encompass:

- Establishing a clear and detailed EU classification system – or taxonomy – for sustainable activities. This will create a common language for all actors in the financial system.
- Establishing EU labels for green financial products. This will help investors to easily identify products that comply with green or low-carbon criteria.
- Introducing measures to clarify asset managers’ and institutional investors’ duties regarding sustainability.
- Strengthening the transparency of companies on their environmental, social and governance (ESG) policies. The EU Commission will evaluate the current reporting requirements for issuers to make sure they provide the right information to investors.

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Introducing a ‘green supporting factor’ in the EU prudential rules for banks and insurance companies. This means incorporating climate risks into banks’ risk management policies and supporting financial institutions that contribute to fund sustainable projects and benchmarks.

The increased level of transparency enables investors to easily identify sustainable assets and compare them with other assets based on a consistent set of indicators.

An economic activity can be classified as taxonomy-eligible if it is decarbonised in itself or if it contributes to the decarbonisation of other activities in the same or in other sectors. Both aspects are necessary to support the upcoming economic transformation process. The TEG uses the terms ‘Greening of’ activities and ‘Greening by’ activities:

- **‘Greening of’ activities**: Focussing on the environmental performance of an economic activity itself. A near-zero energy building would be considered eligible within the Taxonomy since its environmental performance is consistent with the technical screening criteria (EU TEG Report on Sustainable Finance, 2019, P.29).
- **‘Greening by’ activities**: Focussing on improving the environmental performance of other activities (in the building sector, all retrofit measures fall in this category). Production or installing of a high-efficiency gas boiler is considered Taxonomy-eligible since it improves the environmental performance of a certain building. Expenditures of the property manager as well as the revenue of the installing company are considered Taxonomy-eligible – irrespective of whether or not the building itself (‘target economic activity’) complies with the screening criteria with the new boiler (EU TEG Report on Sustainable Finance, 2019, P.29).

The core remit of the taxonomy pertains to defining which economic activities can be considered environmentally sustainable. The TEG has identified six macro-sectors207 for climate change mitigation based on GHG emissions, and has identified priority activities within each sector. Buildings were identified as a critical cross-cutting issue, given their high contribution to CO₂ emissions in the EU208. In essence, this serves to showcase the interdependencies across different sectors of industry and reinforces the need for a holistic and integrated approach to decarbonisation in order to avoid displacement and negative (if unintended outcomes) between sectors. The Taxonomy differentiates the following groups of building-related activities including separate metrics and thresholds: (i) Construction of new buildings, (ii) Renovation of existing buildings, (iii) Individual renovation measures, installation of renewables on-site and professional, scientific and technical activities, and (iv) Acquisition of buildings (see Section F.4 for more details).

The pertinence of ‘value chain’-based approaches to decarbonisation was prominent throughout our stakeholder interviews in the compilation of this report and thus is emphasised within the confines of the Grosvenor GBI case study in SECTION G.

Technical screening criteria have three components: Principles define basic framework conditions (reduce emissions / do not significant harm), metrics define on which parameters or indicators the decision on eligibility shall be based on (energy and GHG intensity), and thresholds set specific quantitative limits that have to be fulfilled (specific targets on a year-by-year basis). The setting of thresholds can be based on certain peer-group benchmarks (the top 15% performance of all buildings of the same use type within one country) or derived on the basis of objective criteria (such as the amount of emissions that is consistent with achieving certain climate goals). A comprehensive discussion of the metrics and thresholds proposed by the TEG, and the potential role of CRREM decarbonisation targets in complementing the proposed Taxonomy can be found in Section F.4.

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207 Agriculture, forestry and fishing; Manufacturing; Electricity, gas, steam and air conditioning supply; Water, sewerage, waste and remediation; Transportation and storage; Information and Communication Technologies (ICT); Buildings (Construction and real estate activities, with application to other sectors where appropriate).

208 European Commission, 2019c. Note that emissions from buildings are considered across NACE codes. Emissions from domestic buildings are typically excluded from NACE codes as domestic occupation is not considered an economic activity. Nonetheless, activities to reduce emissions from the residential sector should be considered in the taxonomy.
F.3.2 TAXONOMY RATIONALE

The rationale for establishing a European wide common classification system (taxonomy) is that it is perceived as the most viable approach to provide signals to corporations and investors regarding future economic trends, investment opportunities and risks, through a common language and reference point for markets to enhance transparency for financing sustainable growth. Indeed, as illustrated in SECTION B of this report, challenges remain with regards to aligning corporate visions with risk management and reporting mechanisms (data) to influence the decisions taken by corporations within the financial and real estate sector. Moreover, large real estate companies also have the propensity to influence suppliers and tenants within their value chain. Our research shows that this ability to initiate and stimulate transitional change both internally and externally serves to drive greater ‘impact’ and the implementation and realisation of more sustainable goals through co-ordination and alignment of corporate vision across the value chain. The fixed nature of real estate allied with the multifaceted nature of the real estate value chain necessitates collaboration and integration, with our research demonstrating a willingness on the part of large real estate companies to undertake an active role in driving change from both a financial and environmental perspective. Specifically, in terms of financial capital and investment, the taxonomy is seen as a fundamental component for re-engineering the financial system, re-orientating capital flows to promote truly sustainable development from an economic, social and environmental perspective. This implies finding ways to integrate sustainability into the EU’s regulatory and financial policy framework and to mobilise and orient more private capital flows towards sustainable investments.

As outlined in the TEG’s taxonomy technical report, to date, there remains some ambiguity with regards to the criteria an economic activity must meet to qualify as positively contributing to EU sustainability objectives – resulting in a number of existing market-based practices not being aligned with EU environmental and sustainability policy objectives. These findings are consistent with the results of the CRREM survey which detailed contrasting levels of knowledge and competence across the real estate sector pertaining to the development of quantifiable risk assessment models, the establishment of baseline positions pertaining to carbon emissions and the measurement and monitoring of intervention strategies. The CRREM research has shown that whilst decarbonisation is high on the corporate agenda within the real estate sector, the capacity to communicate quantifiable carbon data remains a challenge and as such inhibits the sector in communicating key information to both existing and prospective investors.

This regulation therefore forms the basis of the requirements for financial market participants to provide information pertaining to financial products targeting sustainability objectives. This further outlines a number of fundamental principles and delegated acts to meet the definition of environmentally sustainable economic activities which if not satisfied, cannot be eligible for the taxonomy. TEG has outlined a number of additional parameters in order to guide its decision-making approach towards inclusionary criteria for financial products within the taxonomy. These additional parameters cut across a number of potential areas such as usability, flexible quantitative criteria, incentivised mitigation criteria and adaptation actions for supporting investment decisions.

The TEG recommends the development of absolute thresholds and to include GHG emissions as eligibility criteria. Regarding operational GHG emissions, CRREM has already set such absolute thresholds, in line with the requirements of the taxonomy and the EU climate benchmarks. Furthermore, any savings of operational GHG emissions related to retrofit measures will be contrasted with the embodied carbon of such measures, providing the life cycle perspective requested by the TEG. CRREM decarbonisation targets differentiate between a number of commercial building types such as office, hotels, different types of retail building and others going beyond the suggested differentiation of residential and non-residential buildings. As proposed by the TEG, CRREM decarbonisation targets consider local climate conditions.

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209 EU, 2019a:11.
210 EU, 2019a.
211 EU, 2019a:15.
212 EU, 2019a.
conditions and provide transparent targets for operational emissions of existing buildings as well as new construction, in both cases also considering the inherent uncertainty of modelled energy and GHG data.

**F.3.3 Targeted Taxonomy Users**

The taxonomy can be applied, on a voluntary basis, by investors, local authorities and a wide range of company types from the real estate sector. Although many metrics and thresholds refer to existing European legislation like the *EPBD*, application is not limited to the *EU* since the Taxonomy explicitly mentions the possibility to apply alternative schemes ‘provided that they are considered a suitable proxy for the required performance and investor reporting/benchmarking schemes’\(^\text{213}\). Potential applications of selected user groups comprise inter alia:

- Banks can apply the Taxonomy to Green mortgages, project finance, and consumer credit related to low-carbon activities.
- International investors can apply the Taxonomy on their domestic markets, using the ambitious *EU-standards* as a benchmark for local activities. If elaborated sustainability assessment systems are missing in certain markets, the *EU* Taxonomy can serve as a yardstick for investment decisions.
- Private companies and local authorities can make use of the Taxonomy to promote sustainable investment opportunities they are offering on the market.

Within the *EU* Taxonomy technical report\(^\text{214}\), there is also provision of a potential user’s guidance reference of the taxonomy with accompanying case study analysis which showcases initial practitioner feedback obtained on the usability of the taxonomy\(^\text{215}\). With regards to the potential economic implications of a taxonomy, feedback received covered intentional and unintentional economic and financial consequences of creating a taxonomy\(^\text{216}\).

**F.3.4 Do-No-Significant-Harm Criteria**

Furthermore, in line with carbon risk and corporate strategy, it is considered by the TEG – in line with the *OECD Responsible business conduct for institutional investors*\(^\text{217}\) – that *investors using the taxonomy would use a due diligence-like process for reviewing the performance of underlying investments* such as; identifying actual and potential adverse impacts; preventing or mitigating adverse impacts; and accounting for how adverse impacts are addressed by both tracking performance and communicating results. Figure 27 describes how investors can make use of the taxonomy, following a step-wise approach including due diligence and final disclosure of alignment at an investment product level:

\(^{213}\) EU, 2019a, p. 369.

\(^{214}\) EU, 2019a.

\(^{215}\) This is premised on feedback between December 2018 and February 2019, with 205 responses received on the usability of the taxonomy based on six usability questions.

\(^{216}\) Over 1,200 technical comments on activity criteria from 244 respondents were received. The TEG has worked to understand the implications in terms of overarching methodologies, individual criteria and the long-term application and usability of the Taxonomy.

\(^{217}\) OECD, 2017, Responsible business conduct for institutional investors: Key considerations for due diligence under the OECD Guidelines for Multinational Enterprises.
This incorporation of the ‘do no significant harm’ (DNSH) assessment is considered by the TEG to add a layer of due diligence within the ESG process as few investors integrate the principle of ‘do no significant harm’ in a systematic way beyond classic risk management assessments. Indeed, it is the view that the taxonomy can support investors by providing scientifically assessed key potential adverse impacts and provides clear guidance on how and when they should be managed (Figure 29).

The DNSH-principle as articulated by the TEG is to ensure that any climate mitigation measure does not result in significant impairment with regards to adaptation (and vice versa) or any other environmental objective. There is the concern that an energetic retrofit measure might have significant negative impact on the objective of ‘transition to a circular economy, waste prevention and recycling’, causing a series of GHG emissions (embodied carbon) and possibly increasing vulnerability to physical hazards (impairing adaptation efforts; e.g. insulation-systems vs. hail storms). Regarding the aspect of embodied carbon – which contradicts the results of retrofit measures – the CRREM research to date has shown that it is important to extent the DNSH-principle beyond a mere operational perspective on carbon emissions.

The TEG indicates that the foremost (potential) significant harm to the other environmental objectives from the construction of new buildings are determined by:

(i) The building siting: impacts on ecosystems if built on greenfield and especially if in a conservation area or high biodiversity value area; impacts on local air pollution and ecosystems if the building use entails large road transport demand.

(ii) The actual economic life span of the building and of its components/materials: the environmental impacts from producing the building materials and components can be minimised by increasing the building life span, adopting design solutions for adaptability and by maximising the future potential of building material reuse and recycling, adopting design solutions for ease of deconstruction as well as through careful selection of components/materials that prioritises recyclable materials and avoids hazardous substances.

There are opportunities and challenges for implementation. The technical data needed to screen compliance with the thresholds for transitional activities, such as CO₂ emissions, is more difficult to obtain for commercial real estate assets, with limited standardisation on private companies’ disclosures on sustainability-related data as well as challenges of data ownership (between tenant and landlord). The TEG illustrates that in order to standardise the disclosure of ESG-related information by private real estate and infrastructure companies, organisations such as GRESB have developed frameworks for standardised ESG reporting focused on private companies. The taxonomy aligns with these frameworks.
and can play an important role in streamlining what type of data, and for which activities, companies in the environmental private equity space should prioritise collecting and reporting to fund managers. The CRREM Tool will contribute to the availability of relevant information enabling identification of sustainable finance activities and will supplement GRESB results regarding carbon emissions due to the close alignment of both initiatives.

Figure 29: Due diligence process for assessing company's DNSH activities

Source: Adapted from EU, 2019a.
F.3.5 DATA AVAILABILITY AND REPORTING

The TEG Taxonomy report highlighted issues pertaining to data quality and availability, namely that companies do not currently provide the necessary information to enable investors to disclose their taxonomy obligations, and that provision of this data in future will be a particular barrier for smaller and non-European companies, a key issue highlighted in SECTION B pertaining to data disclosure. The real estate sector faces ‘unique’ challenges in respect of data provision. Unlike many other sectors of industry, the potential sources and origins of data are not ‘centralised’. Indeed, key datasets pertaining to the decarbonisation agenda often sit outside investors and owners of real estate assets – with asset managers or tenants for example. Our research highlights how this creates challenges regarding formatting and compatibility of data as well as prompting challenges regarding ownership rights, usage consent, accessibility and storage.

In terms of project and corporate financing, whilst data was considered more readily available, it was emphasised that data verification and accuracy, and whether proxies or estimated data would be accepted for eligibility were key issues. The acceptance and credibility of ‘proxies’ or ‘reasoned assumptions’ within the investment community is of particular pertinence to the design and development of the CRREM tool. Our research shows that many real estate companies presently do not have the data to allow for robust internal assessment of analysis of their portfolios. Whilst data is improving year-on-year, in the short to medium term and as part of the transitional process for the real estate sector, tools such as CRREM will be required in the absence of ‘real data’ at both asset and portfolio level to allow organisations to make some scientifically robust and credible assumptions. The CRREM Tool applies sophisticated statistical models to bridge data gaps especially with regards to missing tenant data. Further to this, the case studies detailed in SECTION G served to showcase the specific challenges facing the real estate industry when it comes to the monitoring and evaluation of carbon emissions data. The real estate sector tends to be dis-jointed, comprising large numbers of consultants, sub-contractors and occupiers. Aligning this entire ‘value chain’ to ensure consistency and reliability of key data provision remains one of the key barriers to evaluating the performance of intervention strategies and for making meaningful inference about the economic-environmental trade-off and if indeed this is ‘positive’ or ‘negative’. Even for the most sustainably focussed real estate companies their decarbonisation interventions need to be conceptualised within a viable financial framework.

The case study interviews conducted for this report (see SECTION F) suggest that a fundamental difference in terms of disclosure in line with current practice within the real estate sector is that in order to disclose investments in taxonomy-eligible activities, the requirement (emphasis) is placed on investors for examining the economic activities conducted by an investee which may warrant the assembly of new sources or types of collated and reported data at a level below the aggregate company performance (e.g. on greenhouse gas emissions). CRREM research has highlighted that this will require financial actors to update or modify their databases and internal processes – something which remains a fundamental challenge for the real estate sector. Further, as the TEG states, for successful implementation throughout financial markets and integration into the workflow of capital allocators, the nomenclature and codification must be incorporated into the data, operational and reporting systems. This is a challenge, as there is limited integration or standardisation of data at present, thus the role of data providers for real estate will be essential to help progress reporting and disclosure clarifications. As such, the CRREM research has shown that a first necessary step for the real estate and construction sectors is to develop a standardised methodology for the assessment of buildings’ energy consumption and carbon emissions to ensure a consistent rating of carbon risk in accordance with respective national regulatory definitions. This will help to provide users and investors/owners with comparable and transparent information on costs and benefits of investments into energy efficiency, resulting in a reduction of investment barriers. There is an onus on professional bodies within the real estate and constructions sectors to work together more.

NOTE: CRREM research has highlighted that this will require financial actors to update or modify their databases and internal processes – something which remains a fundamental challenge for the real estate sector. Further, as the TEG states, for successful implementation throughout financial markets and integration into the workflow of capital allocators, the nomenclature and codification must be incorporated into the data, operational and reporting systems. This is a challenge, as there is limited integration or standardisation of data at present, thus the role of data providers for real estate will be essential to help progress reporting and disclosure clarifications. As such, the CRREM research has shown that a first necessary step for the real estate and construction sectors is to develop a standardised methodology for the assessment of buildings’ energy consumption and carbon emissions to ensure a consistent rating of carbon risk in accordance with respective national regulatory definitions. This will help to provide users and investors/owners with comparable and transparent information on costs and benefits of investments into energy efficiency, resulting in a reduction of investment barriers. There is an onus on professional bodies within the real estate and constructions sectors to work together more.

218 EU, 2019a.
effectively to drive change – as all sectors of the real estate value chain require mobilisation. In order to facilitate this, CRREM input and output parameters have been aligned with well-established industry standards like GRESB and EPRA.

**F.3.6.1 Carbon risk data requirements**

With regards to Carbon risk data requirements, the TEG technical report has undertaken a review of data analysis and reporting measures needed to establish the core challenges for investors and financial practitioners alike for implementing the necessary data in line with taxonomy eligibility. Despite highlighting the data requirements, the technical report does accept that very few companies furnish information on green revenues in line with any recognised framework, with most merely collating information or estimating a companies’ exposure to green activities\(^\text{219}\). Moreover, whilst one of the most common metrics used as technical criteria for the taxonomy is carbon intensity, this is acknowledged to be difficult to obtain – despite the fact that all companies who participate in the EU ETS submit information about their verified emissions. A further challenge is that disclosure on climate-related and environmental metrics can vary significantly from company to company. Pertinently, as of 2019, no real estate companies participate in any CO\(_2\)-trading like EU ETS.

In this report we showcase a series of real estate case studies from across Europe and whilst the companies are deemed to be pioneers in advancing the response of the sector to the decarbonisation challenge, they serve to highlight the inconsistencies in reporting standards for corporate governance and the overall challenges which the sector must address in order to achieve more robust and granular understanding of their entire business operations and the related environmental implications. As the case studies serve to highlight - the challenges pertain not only to the company, but also the wider value chain within which a real estate company is positioned.

The TEG climate-related disclosure guidelines are intended to supplement existing guidelines under the Non-Financial Reporting Directive (NFRD) and encourage companies to provide their turnover broken down according to the taxonomy’s classification\(^\text{220}\). Importantly, these guidelines also recommend that companies disclose their investments and/or expenditures (CAPEX/OPEX) for assets or processes that support products or services associated with taxonomy activities. Whilst it is acknowledged that this inclusionary step will form the basis of a forward-looking indicator to aid investors better assess companies’ future performance, the implementation of the taxonomy cannot be achieved without improved reporting from companies, coupled with better use of other data sources\(^\text{221}\). This is consistent with CRREM research which shows that whilst most large real estate companies publish annual reports on their environmental, societal and governance frameworks, very few publish delineated asset level performance and any impact that ‘greening’ their portfolio has had on financial performance benchmarks. Indeed, as CRREM has shown to date, the relative absence of a performance index which allows for asset level integration of energy and financial performance data remains a barrier to objective and ‘conclusive’ evidence of the extent/existence of so-called ‘green premiums’ – or indeed if this now merely constitutes a ‘proxy for prime’ within the confines of the real estate sector. Distilling out the ‘green’ contribution to the overall performance at both asset and portfolio level remains elusive. Initiatives like the EU taxonomy, climate benchmarks and the carbon risk indicators in the CRREM Tool will contribute to making ‘green value’ tangible and transparent.

In this regard, the TEG sees the role of investors and real estate owners as fundamental for establishing a ‘sea-of-change mentality’ in order for the taxonomy to be successfully implemented by financial firms. Accordingly, the real estate sector (including the wider value chain) must begin to provide transparency around their taxonomy-aligned activities through reporting in widely distributed, publicly available documents that are linked to sustainability performance and meaningful, comparable and quality information about companies’ activities and their performance in managing environmental risks\(^\text{222}\). This will arguably translate into cheaper and better access to capital for green and greening.

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\(^{219}\) EU, 2019a.  
\(^{220}\) EU, 2019a.  
\(^{221}\) EU, 2019a.  
\(^{222}\) EU, 2019a.
activities. Within the confines of the real estate sector the findings from CRREM related research infer that the shift towards decarbonisation – whilst lagging other sectors of industry initially – is now gathering momentum. SECTION F.4 contains detailed information on metrics and thresholds as set out in the Taxonomy for assessing the eligibility of real estate related activities.

F.3.6.2 Role of data providers

A key dimension of ensuring taxonomy implementation pertains to the role of data providers in standardising information from different sources and jurisdictions to provide financial institutions with comparable global datasets for capital allocation decisions. As the TEG report outlines, whilst financial providers such as Bloomberg and Thomson Reuters have developed services that provide information on listed companies’ revenues relating to sustainability and environmental utility, these remain ‘in-house’ and bespoke data models mostly based on ‘high-confidence’ or ‘low-carbon’ sectors. As recognised by the TEG, for the proposed taxonomy to be adopted successfully throughout financial markets and integrated into the workflow of capital allocators, the proprietary data models used by data providers need to be updated to capture mitigation thresholds where applicable, for high-confidence or low-carbon sectors, and must be widened to cover all additional sectors included in the taxonomy. This includes the DNSH screening, which does not refer to an economic sector but to how a specific business carries out its economic activities. This process can require significant resource allocation, business planning and development time, thus data providers will require time to provide investors with the data they need to comply with future taxonomy regulations. Moreover, for many real estate companies across Europe, being in a position to provide the raw data to support such a vision will serve as an evolutionary journey – but at least some early adopters and exemplars of best practice serve to demonstrate viable pathways towards achieving such a reality.

The CRREM project will initiate proactive steps and outcomes to redress the data gaps that exist within the real estate community. The CRREM Tool allows investors to utilise combinations of their own data and where necessary complement this with ‘reasoned’ assumptions pertaining to their asset and portfolio characteristics. Moreover, the CRREM consortium has initiated discussions with a number of key data providers with the view to the development of a European Green commercial real estate performance index. These discussions are in the exploratory stage and centre on the interface compatibility and potential to integrate key data from presently disparate data sets. Whilst the benefits of such data collaboration would yield real, meaningful and impactful outcomes for the real estate sector in terms of the decarbonisation agenda, getting to the stage of prototype index construction will require further dialogue and legal insight pertaining to data usage.

There is an obvious and clear incentive for data providers to adapt their questionnaires and systems to provide investors with the information they need to implement the taxonomy. The most streamlined way to accomplish this, short of mandating companies, would be for data providers to use the taxonomy criteria or to build taxonomy compliant systems that would show what reporting is needed. For the real estate sector, the CRREM research undertaken to date has shown that it is clear that change is being mobilised from within, rather than being driven by policy. It is becoming increasingly obvious that real estate companies view the shift towards zero carbon as essential to the medium- to long-term sustainability of their business operations – with failure to adapt undermining the entire viability of their business models. In this respect there is a case for real estate companies to put an onus on data providers – with whom they furnish asset level data, to collaborate more effectively in order to create the indices and benchmarks that will form a necessary part of the investment landscape going forward.

223 EU, 2019a.
224 EU, 2019a.
225 EU, 2019a.
226 EU, 2019a.
F.4 TAXONOMY: TECHNICAL SCREENING CRITERIA FOR REAL ESTATE AND CONSTRUCTION

Part F of the TEG report provides a Technical screening Annex which outlines the sector and economic activity-specific technical screening criteria and rationale for climate change mitigation (per NACE macro-sector). The TEG acknowledges that it is necessary to look at both energy demand and GHG emissions as metrics to evaluate a building’s performance. The TEG note that feedback received through consultation with financial institutions and developers has shown that, in practice, the majority are not ready to use GHG emissions metrics to assess the performance of their activities and assets. Therefore, and against this background, the TEG have adopted a transitional approach based on the initial decision to use energy metrics, which will be extended to include GHG emissions once sufficient data for the latter is available. Pertinently, in their scoping findings, the TEG acknowledges that sector emissions are not only caused throughout a building’s operational phase but that significant emissions are generated throughout the gestation of the construction process and through the end-of-life demolition process. As a consequence of the lack of current whole life-cycle GHG emissions data constraints, the TEG have chosen to focus on the operational phase, and recommends the establishment of additional GHG emissions thresholds once more robust data becomes available. The CRREM Tool establishes a clear and easy to use methodology enabling asset managers to create GHG intensity figures and derived risk indicators at a building level and anticipates the TEG recommendation for GHG-based threshold/targets. CRREM goes beyond the disclosure of current carbon intensity figures by providing information on their potential future development (due to climate change and grid decarbonisation) and provides benchmarking against clearly defined targets. By combining science-based decarbonisation pathways and the effects of climate change scenarios on future GHG emissions, the CRREM Tool enables its users to make well-informed portfolio decisions, thereby bridging another gap highlighted by the TEG.

The TEG has outlined four individual economic activities within the real estate macro-sector, enabling the taxonomy to establish mitigation criteria that are consistent with and relevant to a large group of real estate market participants, in order to maximise investment flows to mitigation actions within the sector. The consistency of the criteria across the four activities should be maintained (once absolute thresholds are established) to enable investments to be taxonomy eligible and compliant. The economic activities are:

- **Construction of new buildings**: This activity covers real estate development and enables accounting of project capital expenditures of construction clients and the equity/revenues of developers and construction companies as eligible under the taxonomy (EU TEG Report on Sustainable Finance, 2019, p. 366).

- **Renovation of existing buildings**: This activity includes both relative improvements (30% against baselines) and comprehensive interventions on buildings and enables accounting of project capital expenditure of renovation clients (including renovation costs unrelated to energy efficiency measures) and the equity/revenues of renovation companies as eligible under the taxonomy (EU TEG Report on Sustainable Finance, 2019, p. 372).

- **Individual renovation measures, installation of renewables on-site and professional, scientific and technical activities**: This activity covers a) single technical interventions, enabling the accounting of project capital expenditure of clients (including only costs related to the eligible measures) and the equity/revenues of installation companies; and b) services functional to building performance improvement, enabling the accounting of project capital expenditure of clients and the equity/revenues of companies offering such services as eligible under the taxonomy (EU TEG Report on Sustainable Finance, 2019, p. 377).

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227 EU, 2019a.
In terms of criteria and threshold setting, as a principle, the TEG agreed that the taxonomy should recognise energy- and resource-efficient and low-GHG emission buildings as eligible under the mitigation criteria, **considering as a minimum benchmark the top performing 15% of the stock as representative of the best level of energy and resource efficiency that can be achieved in a local context**228. Indeed, the TEG note that in order to reflect the level of ambition for the taxonomy, the target figure will subsequently be tightened to set the sector on a net-zero carbon trajectory by 2050. Of pertinence, CRREM has defined clear decarbonisation target pathways until 2050 at a property level, that are aligned with the Paris climate targets and define the upper limit above which investment cannot be regarded as sustainable finance. The 15%-top-runner-approach proposed by the TEG enables the benchmarking of new buildings against the best performing buildings in the local stock. Stranding risk analysis in the CRREM framework is based on local (country-level) average GHG emission figures, that are consistent with the Paris climate targets. Due to the inherent long-term perspective of the CRREM stranding risk analysis, buildings with GHG intensity metric not significantly better than the average will be stranded within a few years (see Figure 16). A building might not be stranded in the baseline year, but if it gets stranded within five years, investors cannot regard it as a ‘sustainable investment’. Apart from any ‘official’ eligibility, the decisions whether to regard such a building as (economically) sustainable is finally up to the user of the CRREM tool and subjective rating of the resulting quantitative risk indicators. The tool will provide the user with a range of significant risk indicators (figures and diagrams), representing the net present value of carbon costs of GHG emissions above the decarbonisation target line (see recent New York legislation) or the evolving costs of retrofit measures necessary to comply with the decarbonisation targets. Using such indicators and depending on its own risk awareness, an investor will finally decide on the sustainability of a building that becomes stranded within the next few years. To achieve the highest possible relevance for its users, the CRREM Tool will also provide baseline benchmarking figures of relevant peer groups based on the large data pool of GRESB and other initiatives like the Better Buildings Partnership BBP.

The TEG has further illustrated that it faces and will continue to face several challenges in terms of setting criteria for the buildings sector. They highlight that this is a consequence of:

- **The lack of consistent data across countries for benchmarking building stock performance and for setting suitable thresholds for the ‘best in class’ top performing layer of the stock.**

- The inherent difficulty of creating a level playing field across countries with different climates and degrees of market readiness.

- Barriers to the establishment of transitional thresholds that will work across member states, cognisant of varying levels of ambition and rigor regarding the implementation of NZEBs and EPCs.

- The need to find a compromise between ambition and the desire to build upon already existing ‘green’ financing instruments.

- The current inability of significant parts of the market to operate with GHG emission metrics.

Cited according to EU TEG Report on Sustainable Finance: EU, 2019a, p. 364.

The CRREM Project addresses most of these challenges and proposes country-specific decarbonisation targets (threshold trajectories) based on the international climate commitments as set out in the Paris Agreement. Generally, the CRREM approach with pathways starting at the current emission intensity level of each building type is comparable

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228 EU, 2019a.
to the approach of the Science Based Targets initiative but on a more granular level. The CRREM Tool combines this approach with a benchmarking perspective by comparing the targets with the current and estimated future carbon performance of an asset, enabling a profound and objective basis for the assessment of carbon risk.

The TEG has adopted existing EU policy instruments as proxies for thresholds and metrics which are the subject of ongoing review. As highlighted previously, in terms of the practical implications in demonstrating taxonomy eligibility, DNSH criteria have been established to ensure minimum safeguards across the building life cycle by adopting EU and international standards. The TEG stresses that the market introduction of the taxonomy will have both beneficial and adverse effects on the sector, through enabling owners and developers to access dedicated ‘green’ financial instruments. The taxonomy will stimulate much needed investment in construction and the acquisition of new efficient buildings as well as the renovation of buildings with lower levels of performance. Consequently, it is envisaged that the failure of market participants to upgrade their practices in line with the taxonomy criteria may result in a loss of their competitive edge and ability to brand their economic activities and products as ‘green’. The TEG acknowledges the risk of creating stranded assets but indicates that sufficient safeguards have been included in the criteria to adequately manage this possibility. Vice versa, assets that are actually sustainable on an objective basis currently face the risk of not being acknowledged as sustainable and investors face the risk of not knowing whether a certain asset branded as ‘green’ really lives up to that promise.

Notably, the CRREM Tool goes some way in providing a scientific approach for meeting these challenges. Interview based discussions undertaken for this report point to the need for reform in respect of addressing the positive bias towards ‘new build’ as the most viable pathway towards decarbonisation within the real estate sector. Indeed, it was highlighted that within the real estate sector many models and frameworks only evaluate carbon consumption at the operational phase of an asset’s lifecycle which invariably fails to take account of the embodied carbon costs attributed to the construction (and indeed demolition) phases of the lifecycle. Moreover, the CRREM research depicts the need for greater emphasis to be placed on the retrofitting of existing assets and for the planning and design of new buildings to be much more flexible in an effort to extend their ‘useful economic life’. The view of commercial real estate assets as having a life span of 20-25 years before needing to be retrofitted and replaced needs to be revised. Many of the assets that will constitute the commercial property stock across Europe in 2050 have already been constructed – emphasising the need for retrofitting and upgrading of existing buildings.

In terms of implementation costs, the introduction of the taxonomy is considered to affect market participants differently as the taxonomy eligibility of new construction, renovation and acquisitions can result in additional costs in comparison to business-as-usual practices. Market participants may incur further costs due to the process required to demonstrate eligibility with the taxonomy thresholds, especially when the latter are based on several technical parameters. However, according to the TEG, during the transitional period several taxonomy requirements will be de facto requirements in EU member states and will therefore not induce additional costs. The technical report does however outline that once absolute thresholds are established by benchmarking the top 15% of the local stock in terms of best-in-class energy and GHG emissions performance (Top-runner-approach), ancillary costs associated with achieving and demonstrating eligibility may increase. Overall, the TEG views the importance of ensuring high standards in new construction and the renovation of existing buildings as crucial in achieving positive environmental and social impacts. The TEG stipulates that to advance the taxonomy, future steps include the development of the absolute thresholds for primary operational energy, followed by operational GHG emissions and then eventually embodied GHG emissions and the development of additional criteria for the inclusion of operational management of buildings. The CRREM Tool enables market participants to be one step ahead of the regulatory process and align buildings’ operational GHG emissions as well as embodied carbon of retrofits with clear targets that are based on the

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229 EU, 2019a.
230 EU, 2019a.
231 EU, 2019a.
232 EU, 2019a.
*Paris* pledges helping to anticipate and meet potential future *EU* requirements to sustainable finance. Once, the 15% taxonomy targets are publicly available, they will be integrated in the *CRREM Tool*, enabling users to evaluate the carbon performance of buildings towards their taxonomy-eligibility.

### F.4.1 Construction of New Building Taxonomy Screening Criteria

As per the *EU* technical report\(^\text{233}\), the construction of new buildings economic activity taxonomy screening criteria is based on the rationale and principles reflective of identifying economic activities which contribute substantially to climate change mitigation. This recognises that the construction sector is responsible for significant GHG emissions, although a large share of these emissions occur during the operational phase of the product (i.e. the building) and can be considered to fall within Scope 3 from the perspective of construction activities. Thus, to minimise future operational emissions, new buildings must be designed to ensure the lowest possible energy demand, therefore only new buildings designed to achieve the highest performance, taking into account local climate and market conditions, are eligible for the taxonomy.

With regards to metrics, the TEG stipulates that the taxonomy does not specify or define any single or specific metrics, as the thresholds rely on requirements set in the applicable regulation and building codes transposing the *EPBD* in each member state, which are based on the calculated operational primary energy demand as a metric for the assessment of building performance. Given that this is determined by building codes, there is a case to suggest that the *CRREM* ‘localised’ guidance could be used to *inform the development of building codes* for example. As present there is an absence of data informing national strategies relative to local climatic conditions.

A fundamental finding observed by the TEG consultation phase illustrated that large components of the construction and financial sectors are *not currently in a position to use GHG emissions as a building performance metric given the dearth of data and shared data collection methodologies*. The recommendations of the TEG do however point towards future inclusion of GHG emissions performance in alignment with future *EU* policies. On the back of this, the taxonomy will consider, as eligible, the top performing new buildings defined on the basis of:

- Initially, their calculated operational primary energy performance,
- After a transitional period, also their GHG emissions performance during the use phase, and later
- Their GHG emissions performance over the whole life cycle (i.e. including embodied GHG emissions).

Based on the specific characteristics of energy consumption of a certain building (higher share of electricity or gas) and its location (affecting the electricity emission factor), the *CRREM Tool* will provide the user with information on the required energy savings that would be necessary to achieve the specific GHG intensity target in a certain year. In order to align the assessment method with the rest of the taxonomy and climate change reporting practice, the TEG recommends that the following metrics are considered:

- Operational primary energy metric: The annual net primary energy demand during the operational phase of the building life-cycle, ‘Phase B6’ according to *CEN/TC350*, calculated ex-ante by applying the national methodologies for asset design assessment as defined in *EN 52000*, expressed as kWh/m\(^2\) per year
- Operational GHG emissions metric: The annual net carbon-equivalent emission rate (Global Warming Potential – GWP100) arising from energy consumption during the operational phase of the building life-cycle, e. ‘Phase B6’ according to *CEN/TC350*, calculated ex-ante for the building ‘as designed’, and expressed as kgCO\(_2\)e/m\(^2\) per year.

\(^{233}\) EU, 2019a.
Thresholds and benchmarking

Consideration of benchmarking performance is noted by the TEG to be challenging given that performance levels are largely dependent on building type and climatic conditions. Recognising that whilst a number of datasets exist, a substantial amount of work is necessary in order ‘to establish a detailed methodology, collect sufficient data and produce consistent figures to benchmark the highest performance of different building types across different locations’. In recognition of this, the TEG points towards continuing to adopt the existing EU policy framework based on EPC ratings and NZEB requirements to provide thresholds for eligibility. This is despite the awareness that they are established differently and do not necessarily represent comparable levels of ambition. Specifically, in relation to embodied GHG emissions, the TEG notes that for highly-efficient new buildings, GHG emissions embodied in building materials and in construction and demolition processes represent a significant share of the total carbon emitted along the building lifecycle (as observed in each respective screening criteria). Despite this, they do highlight that a number of issues need to be addressed before a future iteration of the taxonomy can include embodied GHG emissions in the criteria for building performance assessment.

Accordingly, the TEG analysed the application of the building bill of materials (kg) as a proxy, however this does not adequately account for embodied carbon or reflect possible choices for less GHG emission-intensive building materials. This aspect is discussed within the confines of this report in SECTION D. In addition, the TEG acknowledge that whilst international standard methodologies to assess building lifecycle emissions exist, and the Level(s) initiative is working to define a shared methodology for EU member states, there is only limited data that could be used to establish reliable benchmarks for different building typologies. More pertinently, whilst current Environmental Product Declarations provide figures for GHG emissions embodied in building materials based on Life Cycle Analysis (LCA), and whilst these can be combined to produce whole building assessment, the TEG stresses that differences in assessment methods and output formats among EPD issuers pose a significant limitation to the reliability and usability of these certificates. Accordingly, and against this background, the TEG recommends that for future iterations of the taxonomy, thresholds for embodied GHG emissions for different building typologies based on standardised LCA must be defined. Importantly, this recommendation fits precisely within the intention of the CRREM Tool to assess at least the amount of embodied carbon.

In terms of eligibility within the taxonomy, mitigation criteria outside of the EU, alternative schemes or national regulations and standards can be used as alternative means to demonstrate eligibility with the mitigation criteria - provided that they are considered a suitable proxy for the required performance and investor reporting/benchmarking schemes. The TEG recommends the introduction of an accreditation procedure that is open to all schemes (EU and non-EU based) providing a ‘level-playing field’.

Cited according to EU TEG Report on Sustainable Finance: EU, 2019a, p. 368.
EU TAXONOMY ON SUSTAINABLE FINANCE: THE TEG TAXONOMY TECHNICAL REPORT CRITERIA FOR ELIGIBILITY OF CONSTRUCTION OF NEW BUILDINGS

**Description:** Construction of new buildings. This relates primarily to activities under NACE codes ‘F41.1 - Development of building projects’ and ‘F41.2 - Construction of residential and non-residential buildings’, but includes also activities under NACE code ‘F43 - Specialised construction activities’.

**Principle:** Construction of energy and resource efficient and low-GHG emission new buildings can make a substantial contribution to climate change mitigation by reducing GHG emissions from the operational and construction phase of the building lifecycle and this should be measured by appropriate indicators of primary energy and GHG emissions both in the operational phase and along the lifecycle (including embodied emissions). The Taxonomy takes a transitional approach by relying on requirements set in current EU policies but with an intention to develop and start using, as soon as possible, absolute thresholds for energy and carbon performance. These thresholds will be based on ambitious performance benchmarks set by building type. It will be ensured that the criteria are always at least as ambitious, as a minimum, as the level of performance of the top 15% of the local building stock and projected to progressively decline to net zero energy and GHG emissions by 2050.

**Metric:** There is no single specific metrics defined, as the thresholds rely on requirements set in the national regulation and building codes for NZEB transposing the EPBD in each member state. The calculation methodology for the measurement of floor area (m²) shall be disclosed with clear definition of what is within boundary

**Threshold:** A new building is eligible when it meets national requirements for NZEB and has a level of energy performance equivalent to the EPC rating of B (or above). The appropriateness of such thresholds will be subject to review after publication of a DG ENER study in the autumn of 2019 and further work on the development of absolute thresholds. To avoid lock-in and undermining of the climate mitigation objective, the construction of new buildings for the purpose of occupation by fossil fuel extraction, transporting transport of fossil fuels or manufacturing of fossil fuels activities (either for actual extraction, transporting, manufacturing and/or administrative purpose) are excluded. If an alternative scheme, such as a commercial sustainability certification scheme or a similar national regulation or requirement in countries outside EU proves the respective scheme meets the performance criteria set in the taxonomy in a defined location, eligibility for the alternative scheme is accepted as a means to prove eligibility for the taxonomy criteria.

Source: EU, 2019a.

F.4.2 RENOVATION OF EXISTING BUILDINGS TAXONOMY SCREENING CRITERIA

With regards to Renovation of existing buildings, this principle reflects the fundamental taxonomy aim of identifying economic activities that contribute substantially to climate change mitigation. The TEG infers that in light of existing buildings being responsible for significant GHG emissions (falling within Scope 3 from the perspective of renovation activities), in order to minimise future operational emissions, a considerable increase in building renovation rates is needed to accomplish climate change targets. It identifies that renovation rates in the EU remain very low (averaging around 1% per year) due to technical and financial obstacles\(^\text{235}\). Furthermore, the TEG acknowledges that the market for major renovation needs to be stimulated and that establishing criteria that are too strict may pose the risk of excluding large shares of this market and missing the opportunity to realise energy and GHG emissions savings.

\(^{235}\) EU, 2019a.
**Metric and thresholds**

The TEG permits any renovation complying with major renovation requirements in each member state to be deemed eligible as the requirements are premised on cost-optimal measures defined in the national regulation transposing the revised EPBD, thereby representing feasible levels of improvements within the local context, taking into consideration climate, building stock and market conditions. The TEG recognises that absolute requirements have been determined differently by each member state, and therefore do not necessarily represent a consistent level of ambition across countries. A considered issue by the TEG is the selection of an alternative threshold which is based on the delivery of ‘relative’ improvement in energy performance through eligibility for the renovation of buildings to be pursued in locations outside EU member states and for renovations in the EU where the intervention might not meet the requirements for major renovation but would still deliver at least 30% in energy savings calculated in terms of net primary energy demand. Finally, the thresholds rely on either the respective metrics set in the applicable building regulation and building codes or, in the case of relative improvements, on energy savings calculated in terms of net primary energy demand during the operational phase expressed as kWh/m² per year.

The CRREM Tool will indicate retrofit measures as ‘Taxonomy-eligible’ if they result in a 30% reduction of operational GHG emissions, provided that the amount of embodied carbon of the retrofit measure does not fully compensate operational savings along its lifecycle. The latter requirement anticipates the TEG’s intention to include embodied carbon of renovations along with that of new construction in the future. By integrating the embodied carbon of retrofit measures, the CRREM Tool also prevents the risk of ‘greenwashing’ as mentioned in the TEG report on climate benchmarks and disclosures, since an overall reduction in Scope 1+2 emissions will be measured against the occurring Scope 3 emissions.

**Eligibility of alternative schemes and recommendations**

As ‘absolute’ thresholds are yet to be definitively defined, both EPC and NZEB thresholds are applicable only within EU member states. For renovations beyond EU borders, alternative pathways are available to demonstrate eligibility with the mitigation criteria, albeit they must be considered a suitable proxy for the required performance and investor reporting/benchmarking schemes. The TEG recommends the introduction of an accreditation procedure that is open to all schemes (EU and non-EU based) in order to create a level-playing field, of which the burden of proof of taxonomy eligibility is attributed to certification bodies who determine if their respective certification criteria fulfil the taxonomy mitigation criteria for a defined location236.

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236 EU, 2019a.
EU TAXONOMY ON SUSTAINABLE FINANCE: THE TEG TAXONOMY TECHNICAL REPORT CRITERIA FOR ELIGIBILITY OF NEW CONSTRUCTION

Description: Renovation of existing buildings (residential and non-residential). This relates to activities under NACE codes ‘F41.1 - Development of building projects’, ‘F41.2 - Construction of residential and non-residential buildings’ and ‘F43 - Specialised construction activities’.

Principle: Renovation of existing buildings makes a substantial contribution to climate change mitigation by reducing energy use and GHG emissions for the remaining operational phase of the buildings as well as by avoiding emissions that would occur through the construction of new buildings.

Metric: The thresholds rely on either the respective metrics set in the applicable building regulation and building codes for major renovations transposing the EPBD, or, in the case of relative improvements, on energy savings calculated in terms of net primary energy demand during the operational phase of the building life-cycle, i.e. ‘Phase B6’ according to CEN T350, expressed as kWh/m² per year. The calculation methodology for the measurement of floor area (m²) shall be disclosed with clear definition of what is within boundary.

Threshold: A renovation is eligible when it meets either of the following criteria:

a) ‘The renovation is compliant with energy performance standards set in the applicable building regulations for major renovations transposing the Energy Performance of Buildings Directive (EPBD)’; or,

b) The renovation achieves energy savings of at least 30% in comparison to the baseline performance of the building before the renovation.

The baseline performance and predicted improvement shall be based on a specialised building survey and be validated by an accredited energy auditor. To avoid lock-in and undermining of the climate mitigation objective, the renovation of buildings for the purpose of occupation by fossil fuel extraction, transporting transport of fossil fuels or manufacturing of fossil fuels activities (either for actual extraction, transporting, manufacturing and/or administrative purpose) are excluded.

Eligibility of alternative schemes acting as proxies If an alternative scheme, such as a commercial sustainability certification scheme or a similar national regulation or requirement in countries outside EU proves the respective scheme meets the performance criteria set in the taxonomy in a defined location, eligible for the alternative scheme is accepted as a means to prove eligibility with the criteria.

Source: EU, 2019a.

F.4.3 INDIVIDUAL RENOVATION MEASURES, INSTALLATION OF RENEWABLES SCREENING CRITERIA

There is also guidance within the TEG report on individual renovation measures, installation of renewables on-site and professional, scientific and technical activities. The rationale for this is the inclusion of activities that support mitigation in building renovation as eligible under the taxonomy which are considered as an enabling mechanism. The requirements for individual renovation measures are based on cost-optimal measures defined in the applicable regulation transposing the revised EPBD. As such, they represent feasible levels of improvements within the local context, taking into consideration climate, building stock and market conditions. However, the TEG recognises that these requirements have been determined differently by each member state, and therefore do not necessarily
represent a consistent level of ambition across countries\textsuperscript{237}. This list of eligible measures is to be continuously updated by the Sustainable Finance Platform. Professional and technical services, such as energy audits, are included as eligible as they play a central role in supporting and validating building renovation efforts.

Overall CRREM has a significant role to play in embracing the EU action plan and allowing organisations to properly establish the embodied carbon implications of their retrofitting activities. This will allow more clarity and certainty that planned activities will fall within the taxonomy criteria. The CRREM Tool will improve the consistency of data used and the development of a CRREM Index will improve knowledge of the investment benefits of such activities. Demonstrating the potential of deep retrofitting, from both a decarbonisation and a financial perspective, has the ability to improve transparency, remove risk and thus encourage such activities. Improving the real estate sector in this way will also facilitate the expansion of existing green financing activity and improve the investment landscape for the development of new green finance products and services.

\textsuperscript{237} EU, 2019a.
EU Taxonomy on Sustainable Finance: The TEG Taxonomy Technical Report: Criteria for Eligibility of Renovations

Description: Renovation of existing buildings (residential and non-residential). This relates to activities under NACE codes ‘F41.1 - Development of building projects’, ‘F41.2 - Construction of residential and non-residential buildings’ and ‘F43 - Specialised construction activities’.

Principle: Individual renovation measures and the installation of renewables on-site make a contribution to climate change mitigation by reducing GHG emissions for the remaining operational phase of the buildings. Professional, scientific and technical activities are a necessary support and validation mechanism for building renovation.

Metric: The following on-site renewable energy installations are eligible:
- Installation of solar photovoltaic modules (and the ancillary technical equipment)
- Installation of solar hot water panels (and the ancillary technical equipment)
- Installation of ground-source heat pumps using a refrigerant with GWP<10, calculated following Annex IV of Regulation (EU) No 517/2014 (F-gas Regulation), (and the ancillary technical equipment)
- Installation of wind turbines (and the ancillary technical equipment)
- Installation of solar transpired collectors (and the ancillary technical equipment)
- Installation of thermal or electric energy storage units (and the ancillary technical equipment).

The following individual building renovation measures are eligible if compliant with the energy performance standards set for individual components and systems in the applicable building regulations transposing EPBD:
- Addition of insulation to the existing envelope components, such as external walls, roofs (including green roofs), lofts, basements and ground floors (including measures to ensure air-tightness, measures to reduce the effects of thermal bridges and scaffolding) and products for the application of the insulation to the building envelope (mechanical fixings, adhesive, etc.).
- Replacement of existing windows with new energy efficient windows
- Replacement of existing external doors with new energy efficient doors
- Installation of façade and roofing elements with a solar shading or solar control function, including those that support the growing of vegetation.
- Installation and updating of HVAC and domestic hot water systems, including equipment related to district heating service
- Installation of efficient lighting appliances and systems
- Installation of low-flow kitchen and sanitary water fittings
- Installation of third-generation smart meters for electricity load monitoring
- Installation of zoned thermostats, smart thermostat systems and sensing equipment, e.g. motion and daylight control
- Installation of Building Management Systems (BMS). Accredited professional, scientific and technical activities to support mitigation in building renovation, for example provision of services such as energy audits to enable building renovation, are eligible.

Source: EU, 2019a.
KEY LEARNING OUTCOMES

❖ To develop a truly integrated sustainable financial system with a pathway towards low-carbon and climate-resilient activity, the EU devised action plan outlines a comprehensive strategy for enhancing regulation on the establishment of a framework to facilitate sustainable investment, and pertinent, a proposed EU classification system for environmentally sustainable economic activities to provide signals to corporations and investors to enhance transparency for financing sustainable growth.

❖ There remains some ambiguity with regards to the criteria an economic activity must meet to contribute to EU sustainability objectives resulting in a number of existing market-based practices not being aligned with EU environmental and sustainability policy objectives.

❖ The classification of buildings is identified as a critical cross-cutting issue showcasing the interdependencies across different sectors of industry and reinforces the need for a holistic and integrated approach to decarbonisation.

❖ Investors should adopt both the ‘greening of’ and ‘greening by’ activities in consideration of economic activities eligible for finance and different types of investment to identify contribution to mitigation objectives.

❖ There are a number of limitations which the current sectoral frameworks cannot address, such as location, context specific considerations and sufficient granularity to enable the full evaluation of compliance with environmental objectives.

❖ A key concern relates to data capture, quality, usability and availability. It is highlighted that companies do not currently provide the necessary information to enable investors to disclose potential taxonomy obligations. Moreover, aligning the data value chain to ensure consistency and reliability of key data provision remains one of the key barriers to evaluating the performance of intervention strategies.

❖ A fundamental difference for taxonomy compliance with current disclosure is that it requires the assemblage of new sources or types of collated and reported data at a level below the aggregate company performance. This requires financial actors to update or modify their databases and internal processes.

❖ A foremost challenge is the identification of the percentage of revenues or turnover derived from taxonomy-eligible activities and, in some cases, to verify the technical criteria for those activities which may require collaborative and corroborative calculations which may be costly and time consuming.

❖ For compliance with the taxonomy, three types of information are needed; Revenue or turnover or expenditure allocation by each taxonomy-related activity; Performance against the technical screening criteria, or environmental management data and; Management data on social issues including labour rights policies, management systems, audits and reporting.

❖ A foremost challenge the application of the taxonomy faces is that very few companies break out information on green revenues in line with any recognised framework of reporting, standardisation and accessibility.

❖ Increased disclosure on climate-related and environmental metrics, such as carbon intensity varies significantly from company to company. The role of companies is critical for establishing a ‘sea-of-change mentality’ in order to provide transparency around their taxonomy-aligned activities through reporting in widely distributed, publicly available documents. The CRREM Tool will support in generating the required metrics based on already existing data, providing meaningful carbon risk indicators that can be used to disclose information, as well as to identify sustainable investments (opportunities) and assets that might face stranding (risks).
The EU taxonomy has a strong focus on new build and renovation. According to the proposed EU climate benchmarks, compliant investments need to achieve operational energy savings of 30% in terms of kWh/m². CRREM adopts this approach. The taxonomy proclaims a ‘net zero target’ for 2050, whereas the EU climate benchmarks allow for lower emission targets – consistent with the CRREM methodology.

Data providers can play an important role by standardising information from different sources and jurisdictions to provide financial institutions with comparable global datasets for capital allocation decisions.

In practice, the majority of real estate investors are not ready to use GHG emissions metrics to assess the performance of their activities and assets. Currently there is a lack of whole life-cycle GHG emissions data and consistent data for benchmarking building stock performance. This is a constraint in terms of creating a level playing field across countries with different climates and degrees of market readiness.

There is a lack of uptake for ‘green’ financing instruments and the current inability of significant parts of the market to operate with GHG emission metrics will tend to exacerbate this going forward.
Corporate Real Estate Decarbonisation strategies: Case studies and exemplars of best practice
Increased awareness of the risks posed by carbon emissions on the environment and societal well-being has prompted the commercial real estate sector to become more aware of its obligations and responsibilities culminating in the introduction of a series of measures and interventions aimed at reducing the sector’s negative impact on the environment. Active efforts relating to heating, ventilation and insulation have already led to major reductions in emissions, and as more and more older buildings are either deep retrofitted or replaced with newly built, climate-smart properties, the carbon impact will fall even further. For many real estate companies, the challenges posed by carbon reduction targets will prove a steep learning curve and necessitate wholesale changes to business operations and organisational culture. Nonetheless, there are a number of prominent European real estate companies who had long since recognised the need for the sector to be pro-active in its determination to reduce carbon emissions from both an environmental viewpoint and in terms of the sustainability of their business operations. What follows is two case studies of real estate companies namely Grosvenor (United Kingdom) and Vasakronan (Sweden). The companies serve as innovators and exemplars of best practice on the basis of their pro-active stance to reducing carbon consumption within the sector and in developing practical market facing solutions within viable financial frameworks – in essence showcasing that being a sustainable and environmentally focussed real estate company does not necessitate compromise of financial and investment performance and in many instances actually contributes towards competitive advantage. The case studies depict a series of key learning outcomes and showcase the journey each of the three companies has undertaken to successfully align and integrate their environmental goals with their corporate strategies and mainstream business operations.
G.2 GROSVENOR CASE STUDY

Grosvenor Britain and Ireland (GBI) has a diverse property development, management and investment portfolio which includes its historic London estate of Mayfair and Belgravia. In addition, it is bringing forward a pipeline of 15,000 new homes in London, Oxfordshire and Cambridgeshire. GBI has developed a series of ambitious environmental goals which aim to position the company at the forefront of tackling the threats and challenges of climate change and their impact on society and the environment.

An interview with Victoria Herring, Director of Refurbishment and Retrofit served to highlight the somewhat unique composition of Grosvenor’s real estate portfolio and the specific challenges this represented in terms of their decarbonisation goals. GBI is somewhat unique in that the company has always had a ‘sustainability’ focus – with many of the properties in the portfolio over three-hundred years old. Indeed, as Victoria highlighted “one of the problems we face as a company with decarbonisation and sustainability in general is that a large volume of the data analysis and modelling is based on assumptions that the viable economic life of a real estate asset is circa 30 years – but many of our properties are over 300 years old”.

Grosvenor’s Decarbonisation Journey

In the early 2000s GBI observed that their ambitions for more sustainable development were falling down at the final stages of design and in determining financial viability – so when it came to ‘cost management’ of new developments invariably the energy efficiency specifications were ‘scaled back’ – schemes were still going forward to a high specification but the sustainability focus was seemingly constantly being subjected to review and ultimately revision. To address this ‘financial gap’ between ‘green’ specification and conventional building regulatory standards GBI set up an internal fund. Development projects could access this fund in order to improve the sustainability and energy efficiency of proposed schemes. This prompted a ‘momentum’ shift within the company in terms of actually delivering a more sustainable product very much aligned with the ethos and thinking of the company in terms of its societal and environmental goals.

““One of the key dimensions of a company’s success in transitioning towards a decarbonised business model is continuity of staff to deliver the company’s vision. The fact that sustainability is now fully integrated within the GBI10-year plan is also critically important.” (Victoria Herring)

Grosvenor’s Decarbonisation Journey

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““As a sector we should not be constructing assets that we will have to demolish in 20-25 years’ time – if we evaluate this in terms of the embodied carbon costs it does not make sense.” (Victoria Herring)

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238 The views and opinions shared in this case study are premised on the Grosvenor Great Britain and Ireland (GBI) portfolio. GBI is part of the Global Grosvenor Group – one of the world’s largest privately-owned property businesses with portfolios encompassing more than 60 cities around the world.
Mainstreaming Sustainability within the Corporate Structure

“Our focus on decarbonisation has not been driven by legislation – it’s about adhering to the company’s sustainability goals. Climate change poses on the biggest challenges to our business model – being proactive on decarbonisation is critical to future proofing our business model.” (Victoria Herring)

Responsibility for sustainability within GBI has transitioned over the course of the last decade — sustainability has become a core pillar of the organisational structure and has been engrained throughout the company. Sustainability of the GBI real estate portfolio is now a key responsibility of the senior management team — and it is their duty to devise the corporate approaches and strategies pertaining to sustainability and decarbonisation and to ensure that these are infused within the company culture and associated stakeholder networks.

In 2013, Grosvenor introduced a ten-year plan detailing the company’s ambition to reduce the level of carbon emissions by 50% by 2023. These ambitions have subsequently been extenuated with environmental goals depicted under three key pillars encompassing a commitment to zero carbon by 2030, a commitment to zero waste by 2030 in properties and developments within its direct control and a commitment to achieving a significant net biodiversity gain across its portfolio by 2030 including an aspiration to be water neutral by 2050. Within the confines of the decarbonisation target, this constitutes a commitment to achieving net zero carbon operational emissions from all directly managed buildings, including historic listed buildings. GBI has also committed to report on, and seek to significantly reduce, its embodied carbon emissions - carbon created through associated supply chain and tenant activities.

The Grosvenor Britain and Ireland’s zero carbon commitments:

❖ By 2030, GBI will achieve net zero carbon operational emissions from all its directly managed buildings, including listed buildings.
❖ GBI will report on, and seek to significantly reduce, the carbon emissions embodied in its supply chain, developments and tenant activity by 2030.
❖ The business’ portfolio, including approx. 600,000 m² of public realm on its London estate, will aspire to be climate positive by 2050.

Decarbonisation Impact Monitoring: Establishing a Baseline Position and Data Challenges

Victoria highlighted that a key objective thing for GBI “was to establish a baseline position on the existing carbon footprint of the portfolio and how the business operations contributed to it”. Carbon measurement and monitoring is more complex for the real estate industry than others as it is unusual for companies to have ownership of all the data that they need in terms of energy consumption, embodied carbon measurements etc. GBI recognised that it was only by establishing the baseline position that they could then put in place meaningful and measurable targets for decarbonisation. Pertinently, GBI has not signed up to or committed to any specific SBTs at this point. Victoria suggested “that GBI is focussed on alignment with internal goals and targets relative to the 10-year plan. As we move forward with the attainment of those targets that will enable us to meaningfully and confidently align ourselves with SBTs”.

Internal Data Challenges

The issues and challenges around the creation of a robust and credible data repository which would serve as an evidence base to inform decarbonisation strategies and the potential impacts of retrofit interventions are considerable. At the property level - different parts of the business collect data in different formats. Victoria suggested that “one of the big advantages of the sustainability and decarbonisation strategies becoming the responsibility of the senior management...
team has been improved data sharing as well as greater consistency and enhanced compatibility across prospective sources of data”.

External Data Challenges

As landlords, GBI is not always privy to tenant’s energy consumption data and associated behaviours and yet this is an essential component in being able to monitor carbon consumption across their real estate portfolio. One key challenge centre on data ownership, accessibility and how the data is used and stored. Victoria highlights how this has become even more complex following the initiation of General Data Privacy regulation (GDPR). Victoria highlights that “from a practical point of view, it could take as much as £5k per property to fit out the necessary equipment and technology to robustly monitor and track energy consumption and to measure carbon emissions. Then collating that data is a further cost – even when we factor in smart meters and the improvements in digitisation – it is still a significant resource commitment to get all the key data attributes captured”. Victoria suggested that as an industry “the real estate sector needs to work collaboratively across the value chain to address the data gaps and challenges, with the propensity for impact much more pronounced via a collaborative approach” – a mantra which serves as the foundation for GBI’s Supply Chain Charter (SCC).

Supply Chain Charter

GBI has more than 1,800 suppliers, many of whom are long-standing suppliers of more than 15 years. GBI believes that it is important to have the value chain all pulling in the same direction to attain their zero carbon targets. GBI values its suppliers and wants to maintain those relationships, ensuring that the supply chain evolves together to tackle carbon emissions. To facilitate a more integrated approach, GBI launched its Supply Chain Charter, which commits the business together, with its suppliers, to higher environmental and ethical standards.

*Figure 30: Supplier Charter Mitigating and Adapting to Climate Change*

During interview-based discussions Victoria highlighted that “the purpose of the charter was to put in place a framework which served as a pathway for the company and its suppliers to transition towards carbon neutrality. In essence, the SCC serves as the platform for GBI’s ambitions to be carbon neutral by 2030”.

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**Our commitment**

We recognise that bold leadership from the built environment sector is needed to tackle climate change.

By 2025, we will have halved carbon emissions from our directly managed buildings. By 2030, we will achieve net zero carbon operational emissions from our directly managed buildings.* We will also aim to reduce and report on the associated embedded carbon emissions in the built environments within our control. Before 2050, we will achieve climate-positive emissions for our portfolio and public realm.

* We will adopt the UK GBC Advancing Net Zero Carbon Framework and its definitions within the type setting to net zero carbon emissions and net zero carbon in existing buildings.

**Standard requirements**

All suppliers are expected to meet the following entry-level standards for mitigating and adapting to climate change:

- Design, construct, refurbish and maintain our buildings to ensure climate resilience;
- Design and deliver facilities that reflect the lowest possible whole life carbon.

**Advanced expectations**

Suppliers should aspire to achieve the following standards:

- Design and offer innovative solutions that support our journey to achieve zero-carbon operational emissions by 2030;
- Design and offer innovative solutions to enable us to achieve climate positive emissions before 2050 for our portfolio and public realm;
- Develop and implement a carbon reduction plan that is aligned to climate science.

Source: Grosvenor Supply Chain Charter, 2019
The Delivery Plan: Progress Towards Decarbonisation Targets

In line with the UK Government National targets on decarbonisation, Grosvenor Britain and Ireland has committed to halving the estate’s carbon emissions in the period 2013-2023. The company is on track to realise this target by refurbishing properties at lease ends, renovating newly-purchased properties to meet their ‘stretching environmental standards’, and retrofitting buildings to raise energy efficiency. The five-year rolling retrofit programme has tackled over 300 properties and so far, has reduced the GBI portfolio carbon footprint by around 4,000 tonnes in total.

Victoria explained that the delivery plan centred on “getting our own house in order first”. As such, the 2030 targets are very much centred on GBI and its own business operations. The 2050 targets centre more on the wider value chain and the need to foster collaboration and partnership base ideologies in order to optimise impact. Victoria acknowledged that the process has not been without challenges – tenant engagement and ‘active’ commitment to the zero-carbon vision has not been at the level anticipated – particularly amongst the residential tenants. Victoria confirmed that the lack of engagement “has been somewhat disappointing particularly if you analyse how the company went about decarbonisation of the portfolio – starting by targeting the affordable housing stock – as we felt tenants here had the most to gain from green retrofitting and the associated reductions in their energy bills”. Engagement with the corporate tenants across the retail and office sectors has been more of a two-way process and centres on exploring mutual wins that can be realised. Victoria highlighted that the GBI was “very much focussed on listening to the tenants and trying to accommodate their needs and expectations in line with the companies zero carbon targets”.

“Stranded assets is a term we use to describe assets that do not conform with policy requirements or assets that the market no longer wants… increasingly the concept of ‘stranded risk’ is being driven by energy efficiency and the levels of carbon emission – both on the policy side and in terms of occupier demand. Large corporate tenants want to be in sustainable buildings.” (Victoria Herring)
GBI seeks to align its strategic corporate plan and long-term sustainability goals. As Victoria explains “what we design today is premised on occupier needs in 10-15 years’ time. Increasingly, commercial building designs are more adaptable. This sits in line with the increased flexibility demands of tenants and affords a much more sustainable focus to our development projects”. The real estate sector tends to think of property assets as having a useful economic life of 25-30 years. Many assets within the GBI portfolio are over 300 years old, and given the strategic locations continue to command significant demand. By employing a more adaptive design framework, GBI is enhancing the long-term usability of the asset and in tandem with life-cycle maintenance scheduling is serving to extend the life of the asset – thereby managing the risks of ‘stranding’. In the case of ‘greening existing assets’, GBI builds the energy-based retrofit into the normal refurbishment cycle. This ensures the asset is not out of commission for any longer than would be the case in a normal refurb and refit. This makes sound business sense and in turn, ensures sitting tenants are not adversely impacted.

A ‘Live’ Laboratory for Green Retrofitting in Heritage Buildings: 119 Ebury Street London

The subject property at 119 Ebury Street was originally a hotel in very poor condition, requiring substantial retrofit. In 2013, GBI received Listed Building Consent for a pilot retrofit of the property. Grosvenor chose the project to investigate the extent to which listed, heritage buildings can be made more environmentally sustainable. The project utilised the latest environmental technologies to achieve an 80% carbon reduction while maintaining the historic fabric of the Grade II listed Georgian property. The project presented challenges from a planning perspective and required close collaboration with Westminster City Council and Historic England to convey the message that the heritage features of the original building would not be lost or damaged. The key challenge of the project was to achieve the high quality of finish expected. This involved trailing new and innovative materials whilst retaining and working with the existing building fabric.

The Retrofit Solution

Construction took place from 2014 to 2016 and saw the property refurbished from the old hotel into three residential apartments. The building now incorporates a rainwater harvesting system, whilst high levels of insulation and glazing specification contribute to the energy efficiency of the building. The use of phase change material allows the building to retain heat during the day and release it at night. The scheme also incorporates photovoltaic panels on the roof and mechanical heat ventilation and recovery (MVHR) systems. A fully integrated building management system has been installed to enable the residents to monitor their energy usage, whilst encouraging energy efficient behaviour, for example by shutting off the heating system if a window is opened.

“To attain our zero-carbon ambition requires bold leadership, innovation and collaboration across our value chain from suppliers to tenants. It is only by working together can we achieve our goals.” (Victoria Herring)

“Many of the tools and technologies needed to help us meet our decarbonisation targets are yet to be developed and tested. To be successful, our commitments will require us to work collaboratively with our entire supply chain and to continue to embrace technical innovation and to improve data provision.” (Victoria Herring)

“Carbon neutral buildings do not have to be new build properties. We have a number of EPC rated A and B listed assets that are highly sustainable but retain their period character – the best of two worlds really.” (Victoria Herring)
The Benefits

The property offers tenants a 46% lower energy bill per annum and a 58% reduced carbon footprint. The building’s carbon emissions have been reduced from 29 tonnes per year, to 6 tonnes. Pollinator-friendly planting on the balconies and terraces in the garden have also enhanced the biodiversity of the project. Following the design stage assessment, 119 Ebury Street became the first listed building to achieve a BREEAM ’Outstanding’ rating. It also won the 2015 Best Global BREEAM Residential Refurbishment Award. However, the trial aspect of the project has enabled Grosvenor to demonstrate that sustainable technologies can be successfully used in historic buildings. The 119 Ebury Street development will now be subjected to a two-year monitoring period against 125 Ebury Street using real-time data, allowing Grosvenor to better understand the cost-saving benefits. Grosvenor hopes the research will give other developers the confidence and insights to implement sustainable elements of the project in other listed buildings.

Accelerating Commitment to Retrofit Decarbonisation in Heritage Buildings

Ebury Street is a crucial project for the future of Grosvenor’s overarching sustainability strategy which will see the continued roll-out of our leading-edge, technology-driven retrofit programme. The completion of 119 Ebury Street follows Grosvenor’s delivery of other sustainably retrofitted properties across the estate, including London’s first properties to achieve the ‘EnerPHit Passivhaus’ accolade. Grosvenor hopes to build upon the 300 homes retrofitted since 2013, which have already saved 4000 tonnes of carbon equivalent.
KEY LEARNING OUTCOMES (GROSVENOR)

❖ Decision-making within the real estate sector is focussed on the ‘short-term’ costs of development – rather than the longer-term operational and associated life cycle costs. The real estate industry has a propensity to think of assets as having a circa 30-year life – this is simply not the case. The sector needs to employ a more sustainable and longer-term horizons pertaining to the ‘useful’ economic life of an asset. If we take into account that 50% of the world’s real estate stock at 2050 has already been constructed, then it poses the question why there is such a lack of emphasis and lack of research and data pertaining to the retrofitting of commercial property assets.

❖ The decarbonisation of the real estate sector requires a collaborative and integrated approach encompassing the wider corporate value chain. Suppliers and consumers (tenants) of real estate assets have a crucial role to play if decarbonisation targets are to be realised. It is important to have an integrated vision across the value chain and to work together to attain mutual benefits.

❖ Data provision needs to be addressed to provide a robust and credible evidence base to inform decision-making and to measure the impacts of retrofit interventions. Property owners, investors, asset managers, consultants and tenants need to work together to improve the quality and accuracy of key datasets pertaining to energy consumption and carbon emissions.

❖ The capitalisation of green retrofitting needs more robust guidance to ensure continuity and consistency in valuation practice. Asset valuation needs to more accurately capture the impacts of retro fit interventions and also reflect the implications of reduced energy costs on the valuation process.
G.3 VASAKRONAN CASE STUDY

Vasakronan is Sweden’s largest property company with portfolios in four major regions namely, Stockholm, Uppsala, Gothenburg and Öresund. Vasakronan own, manage and develop centrally located office and retail properties. The company’s real estate portfolio comprises 180 properties with a total area of 2.4 million square metres, valued at circa EUR 12.65 bn at 30 June 2018. Vasakronan is jointly owned by four Swedish National Pension Funds and employs over 300 staff. The company’s business model is depicted within their vision of futureproof cities where all individuals thrive and companies develop.

Anna Denell, Head of CSR at Vasakronan identifies digitisation, expanding e-commerce and new patterns of demand for offices as the three primary trends affecting the real estate market in Sweden. In parallel with these three key trends, the sector is also affected by a greater focus on sustainability topics, first and foremost driven by the increasingly obvious effects of ongoing climate change. Anna highlights that “Vasakronan have been aware of the implications of climate change for a long period of time and had the foresight to anticipate the potential implications for the real estate sector. In many respects that early awareness and appreciation has served the company well”.

Vasakronan produced its first climate report in 2006 – one of only a small number of real estate companies to do so at that time. Anna highlights that as a company “we recognised carbon emissions as a viable and credible risk both to the environment and to our business model”. According to Anna, Vasakronan position as a ‘market leader’ when it comes to decarbonisation “is a source of pride and affords the company a competitive advantage in the real estate market”. Vasakronan manage all their assets in-house – the company feels that this permits greater control of the assets as well as allowing more considered approaches when it comes to implementing decarbonisation goals and targets. Anna suggests that this is an important aspect of the business model and ensures “there is no conflicts of interest in how the asset is managed”.

In terms of competitive advantage, Vasakronan see four key dynamics of their sustainable approach:

❖ Managing energy costs – minimising the costs of energy consumption by reducing the amounts of energy purchased – moving from being solely a consumer of energy to be also a ‘producer’ of energy. Amidst rising energy costs (at points in the economic cycle) this protects the company from ‘cost spikes’.

❖ Tennant demands and expectations – Low carbon buildings are more desired by tenants – this contributes to lower volumes of tenant turnover relative to the wider market. Occupancy levels are also higher than many of our market peers. Tenants recognise the Vasakronan brand and what it means in terms of environmental protection and innovation.

❖ Investment market – Green buildings are more liquid than conventional real estate assets – Vasakronan has an active secondary market for assets that they decide to liquidate.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 785058.
Impact attainment – the repute which the company has built up over the years and the impact made in terms of the environmental contribution, as well as the quality of product, means that investors achieve a good return on their capital. Vasakronan’s environmental focus and reputation is also beneficial in terms of access to and associated costs of finance.

G.3.1 Carbon Risk Integration in Corporate Strategies: The Vasakronan Journey

Anna affirms the view that “as ‘early adaptors’ to sustainable real estate and to the environmental threats and challenges posed to the sector, it was important that the company established its culture and ideology and that this was infused within the entire organisation”. In essence Vasakronan needed to develop a ‘branding’ that encompassed the company’s ideologies, which employees as well as external stakeholders could relate to.

Anna details the Vasakronan journey and challenges with embedding that sustainability culture and ethos. “Not all employees were solely motivated by profitability – and recognised the societal and environmental onus of responsibility that the company had. That said, we had investors and other stakeholders that needed to be convinced that such a ‘sustainable’ focus would offer the company some form of ‘competitive advantage’ or would distinguish Vasakronan from the market – at the very least they did not want to see profits ‘unduly’ compromised”.

In the early days Vasakronan relied heavily on a few research and academic studies that green buildings had the propensity to ‘outperform’. Anna highlights that “this was early 2000s – so the volume of ‘robust studies’ and evidence was limited at that point. But we had belief in our principles and our vision for the company. In the early days the role of the CEO was critically important in the development of the company’s vision”.

The current CEO of the company, Fredrik Wirdenius was appointed in 2008. From the outset Fredrick was convinced about the impacts of environmental change and how this would impact on profitability within the real estate sector. During the course of the interview Anna highlights that “in the beginning not everyone completely shared his vision, so like any new CEO, he had to overcome some scepticism. But such was his commitment and determination in the vision that he soon had everyone ‘believing’”. An example of this strong leadership was evident when Vasakronan introduced green leases to the Sweden property market for the first time. Prior to deployment the company analysed all aspects of the green lease structure frameworks in the UK and US. Vasakronan didn’t want to reinvent the wheel, but recognised that Sweden was a different market. So, the company used the UK and US green lease structures as a ‘framework’ and then modified and adapted it for its own portfolio. Anna highlighted how the CEO "drove the introduction of green leases and was insistent that rather than devise the ‘perfect’ green lease, that we moved ahead and deployed it – even if it was not perfect, as this in his mind was a crucial step in the company’s evolution”. The Vasakronan green lease model has subsequently been utilised by the Property Federation of Sweden as an example of best practice. Anna details how the “early days required certain leaps of faith and to have the confidence

In late 2018, Vasakronan’s climate targets were analysed and approved by the Science-based Targets Initiative. This approval testifies that the company’s climate targets are enough to achieve the goal of the Paris climate agreement to keep the average global temperature rise well below 2°C.

Vasakronan has reduced its direct GHG emissions by some 98% since 2006. This reduction in energy consumption has also led to considerable improvements in net operating income and increased property values.
to see through our vision. However, now the company has established sustainability credentials, we are able to show investors the outperformance and enhanced cash flows we can drive through the business model, including the reduced energy costs”.

In late 2018, Vasakronan’s climate targets were analysed and approved by the Science-based Targets Initiative (SBTI). This approval testifies that the company’s climate targets are enough to achieve the goal of the Paris climate agreement to keep the average global temperature rise well below 2°C. Vasakronan was also named Europe’s most sustainable office company and the ninth most sustainable in the world in the eminent international Global Real Estate Sustainability Benchmark (GRESB). During the year Vasakronan revised and broadened its framework for green financing and supplemented its bond programme with green commercial paper. For the very first time, Vasakronan also obtained a rating from the credit rating agency Moody’s. Anna highlights that this “gives the company access to sources of financing from across the globe and creates the conditions for more cost-effective borrowing with longer tenors, as well as financing that helps us reach our goal of achieving entirely green borrowing in the longer term”.

**Tenant Incentives**

Office tenants are continuing to demand ever-smaller spaces. This trend is becoming more pronounced and Vasakronan has seen examples where office space has been cut by half following the renegotiation of a lease. Anna highlights that competition for labour has intensified during this extended economic boom and modern premises in central locations have become increasingly important in terms of attracting the most sought-after employees. However, despite the fact that rent levels calculated per square metre have increased for several years in a row, many tenants currently have a lower rent per employee, thanks to efficient use of space and smart IT solutions. “Vasakronan pass through the energy cost savings of the buildings – this is much more of an incentive for our tenants than any differential cost of rents.

Rents typically constitute less than 10% of our tenants operating costs, so the savings derived through reduced energy costs is much more attractive”. Further to this, Vasakronan expect energy costs to rise going forward – so the incentives will be even greater in this scenario. Anna accepted that “it’s difficult to show rental agreement uplifts (rental premium) but what we can show is higher levels of tenant retention as well as the ability to attract new tenants who now aspire to occupy a Vasakronan property. We have a very high occupancy rate relative to the wider market”.

**Key Sectoral Trends and Impacts on Demand for Real Estate**

Several major and parallel trends are influencing demand for real estate and this will invariably impact on the decarbonisation agenda – either directly or indirectly. Vasakronan has witnessed, for example, tenants are no longer requesting offices with long leases, rather new types of offices that can be quickly adapted to higher or lower numbers of employees and new forms of collaboration. These market trends affect Vasakronan and mean the company has to consistently reassess and renew its offering. Anna highlights that these “structural changes present risks for the company – with short term leases, for example, are not always conducive to our determination to reduce carbon emissions. We also try and build long-term relationships with our tenants and integrate them into the sustainability value chain - this is more difficult when thinking is focused on short term goals. But we understand that tenants must also de-risk their operations and evolve in order to survive and proposer – so we must also adapt”.

When it comes to developing office environments Vasakronan are pioneers in designing activity-based offices. A few years ago, the company introduced the “Smart & klart” concept, which offers tenants the opportunity to move in to completed and fully furnished office premises at very short notice. Meanwhile, the new “Vasakronan Arena” concept offers tenants a co-working alternative that places the focus on efficiency and productivity with the highest standards in IT, ergonomics and ventilation.
Key Considerations for The Real Estate Sector Moving Forward

In Sweden, Vasakronan has one of the highest levels of occupancy in terms of Grade A occupation. Yet, analysis of the wider office market shows that no company has more than 80% of its Grade A office space occupied. Indeed, more delineated analysis undertaken by Vasakronan, would suggest that the overall level of occupancy within the Swedish office market is somewhere in the region of 30-50%. This is based on ‘normal’ office hours. Anna highlights that “if we factor in evenings and weekends – then the overall level of occupancy of office space falls to circa 10%. Whilst offices invariably consume much less energy in the evening and at weekends with security staff, auxiliary staff etc still on site they are still ‘energy consumers’”.

The levels of ‘true’ occupancy are startling and as companies move to increasingly flexible working practices the question that invariably needs to be asked is - how the sector can become more sustainable in terms of future office provision and to legislate for future demand trends. Anna details that “this will not only be driven by environmental goals but as companies evaluate overhead costs and the extent of their real estate footprint, then there is potential for major transformation of the real estate sector and its conventional business models. We have already witnessed a ‘transformatic’ shift within the retail sector – is it inconceivable that the future of office provision could also undergo radical transformation going forward – driven to some extent by ESG mandates”.

The occupancy level data collated in-house by Vasakronan suggests that at the very least, there is a case for reviewing the sustainability of proposed new development pipelines. Whilst the aspiration of LEED excellent new buildings is advocated as a ‘solution’ to the decarbonisation of the commercial real estate sector there is a need to acknowledge the embodied carbon footprint that this creates. Further to this, Anna suggests that the real estate sector “should place greater emphasis upon the redevelopment and refurbishment of existing assets – rather than always choosing new build. Again however, this will be very much a ‘trade-off’ between financial viability rather than being carbon driven in most board rooms”.

Importance of the ‘Integrated’ Value Chain

The electricity grid in Sweden is still very nuclear dependent – with circa 40% of power coming from renewable sources. But as nuclear is phased out it presents the challenge to increase the volumes of renewable energy. Vasakronan is already designing its buildings to reflect both societal shifts as well as how we will consume energy - with electric car charging points now being integrated into all buildings, for example. Anna highlights that “we are ultimately trying to move away from car dependency and to encourage tenants to utilise ‘greener’ forms of transport – we do this by acquiring or developing buildings adjacent to key transport nodes and critical infrastructure – to be more carbon conscious is not just what we do with our buildings but also about how we support and encourage our tenants in terms of their choices also – it has to be about the entire value chain rather than ‘isolated’ interventions. For example, 10 years ago we were a very
car dependent society and one of the big asks from our tenants was for corporate parking spaces – this is no longer the case and many of our car parks are now half empty as the demand for corporate parking has dissipated – so as a real estate company we are required to constantly evolve and change – both in terms of policy but also in terms of how corporate strategies evolve (not just within our own organisation) but also in terms of the others companies that we interact and engage with in terms of our business operations”.

G.3.2 LEARNING FROM OTHER SECTORS

Vasakronan has taken on board lessons from other sectors of industry. Anna highlights that the company “has learned from other sectors in terms of their risk analysis and what climatic warming will mean for the continuity of their business operations. Elements of these risk models can be easily mapped and reconfigured relative to the real estate sector. Meanwhile, we have taken on board a number of lessons from the Netherlands real estate sector, as we see that market as being the most sophisticated when it comes to understanding embodied carbon. The Netherlands affords greater credibility and transparency in respect of embodied carbon data, which is key to making informed decisions at both asset and portfolio levels”.

The company has also learned extensively from the UK and US markets in respect to green leases. “In essence, we have imported the UK green lease framework and applied it to the Swedish context. In terms of learning outcomes from the US – the emphasis has not so much centred on their corporate strategies around carbon neutralisation – as this is not as well developed in the US – but more in terms of the marketing and promoting of green leases for example. We were probably doing much more than many US real estate corporates but we were not promoting it as effectively” (Anna Denell, Head of CSR at Vasakronan).

Vaskaronan Noteworthy Achievements Towards a Decarbonisation Pathway

❖ First LEED certified building in Sweden.
❖ World First Corporate Green Bond.
❖ Corporate Green Commercial Paper.
❖ Introduced Green Leases in Sweden.
❖ Ranked the most sustainable office company in Europe as well as number nine globally by the Global Real Estate Sustainability Benchmark (GRESB).

“The real estate sector does not exist within a ‘vacuum’, as such actions and intervention strategies by the real estate sector will also impact others sectors of industry (as many are occupiers of buildings owned by the real estate investment sector).” (Anna Denell)
KEY LEARNING OUTCOMES

❖ Strong, decisive leadership which depicted a clear vision and recognised the interaction between the environmental and profitability for the real estate sector.

❖ Developing a strong sense of identity and culture within the organisation which encapsulated the company’s environmental ideology and ensuring that all staff were embrace of and committed to the vision.

❖ Doubters to Believers - Using robust and credible research and data to convince investors that pursuing a sustainable and carbon neutral investment strategy would not compromise returns and that an environmental focus would serve to bolster profitability rather than detract from it. This is easy when you have achieved this and can show the enhanced cash flows but in early days’ research was crucial to convincing investors to take the ‘leap of faith’.

❖ Working with the tenants and other stakeholders within the ‘real estate value chain’ to extract ‘mutual benefits’ of renewable energy production within our buildings and the pathway towards a carbon neutral environment. Not all initiatives will be a success or will receive ‘buy-in’ but there are a range of dual incentives that we have in place that work for both ourselves as owners and the occupiers of our property. The low rate of turnover is testament to tenant satisfaction.
CRREM

Conclusions
SECTION H  CONCLUSIONS

The CRREM survey details increased awareness and appreciation of the risks that climate change poses to the conventional real estate model amongst property investors and asset managers from all over Europe. The research also depicts a momentum shift within the confines of the real estate decarbonisation agenda with strong and visionary leadership serving to transform corporate decision-making and conventional business thinking. Decarbonisation of the real estate sector necessitates both technical appreciation and analytical interpretation of the nature and extent of the carbon risk challenge – both on asset- and portfolio-level but also on the corporate-level. Decarbonisation further requires cultural adaptation as well as changes in behavioural standards and work practices. As the case studies in this report demonstrated, the technical and cultural challenges presented by decarbonisation must be entwined in order to attain meaningful and sustainable impact.

The consensus amongst contributors to this research is that the decarbonisation of the asset class will render conventional real estate models obsolete and as such change is the only option for ensuring business survival – putting carbon risk high on the agenda. One key finding from our research is perhaps the need not to become ‘fixed’ on individual asset level decarbonisation. Whilst this is important, and indeed essential to determining key baselines, it is important nonetheless to look at the entire business operational model – including suppliers and ‘customers’ within the value chain in order to fully comprehend and contextualise both risks and opportunities. Besides making transition risks more transparent to investors, the CRREM Tool highlights investment opportunities by quantifying the positive effects of retrofit measures. The real estate sector offers unique decarbonisation challenges. Therefore, it is important that inter-linkages and interdependencies within the value chain are understood and the impacts of intervention measures and strategies aimed at reducing carbon emissions are evaluated relative to the entire value chain. Such an approach is essential to counter potential for displacement or negative externalities.

Findings from the CRREM survey convey an appetite and perhaps more pertinently an active commitment to embrace change across the real estate value chain. It is clear nonetheless, that competence, proficiency and understanding of the risks attributable to changing regulatory requirements differ greatly. The research reaffirms the growing interest in low-carbon investments reflected in the growth in low-carbon products, services and technology. This is underpinned by increased levels of interest in investment solutions that not only account for climate risks but also tap into opportunities. Indeed, respondents to both the online survey and case studies determined that their strong sustainability principles and early adaptation to the decarbonisation challenge serves as a value-added proposition when evaluating performance relative to their market peers. Nonetheless, the research also highlighted that more work needs to be done in terms of risk analysis encompassing systematic and non-systematic transition and stranding risks at asset-, portfolio- and corporate-levels.

The Policy Analysis undertaken here has identified the key role of the industry-policy-interface area – the way in which policy attributes interface with company attributes to produce market (and environmental) outcomes. The analysis confirms that the way a policy is both designed and delivered will have a significant impact on the way it is perceived and applied. Furthermore, there will be different policy outcomes, depending upon which market ‘segment’ is examined. It does matter how a company is oriented towards green issues, as well as how it perceives risks and costs. CRREM has designed a Policy Analysis Matrix, allowing to independently investigate the way different combinations of factors can integrate, compensate, aggregate and thus finally affect a policy outcome.

The case-study-based interviews conducted for this report infer that the tools to analyse the investment level decarbonisation risks are not yet established, highlighting the need for further research in order to improve data transparency. These findings are consistent with previous research\textsuperscript{239} which affirmed that the barriers to portfolio analysis stem from deficiencies associated with data availability including a mechanism for deep insight into energy

\textsuperscript{239} Strachan, 2013; Strachan et al., 2015.
performance data, an efficient decision support mechanism for optimum investment strategy determination and an effective means of evaluation and feedback on green retrofit investments. Indeed, the inability to derive meaningful carbon risk indicators from available energy performance data within a credible analytical framework was highlighted over the course of this research as a key data deficiency when it comes to the monitoring and evaluating the performance of green real estate investment. Our research highlights the need for key data providers and benchmarking institutions such as MSCI and GRESB to collaborate to redress these key data gaps and provide the investment evidence base necessary to support upscaling of green retrofitting.

The CRREM survey results reaffirmed the view that uptake in green retrofitting within the European commercial real estate sector remains a key challenge in order to meet national and international carbon emission reduction targets. Our research points out the need for an evolution in conventional thinking and the premise that new build offers the most viable pathway for the sector to attain its decarbonisation obligations. Indeed, we highlight that modelling and evaluating of carbon risks and associated intervention measures need to be extend beyond the common 25- to 30-year time horizon in order to garner meaningful results and impact indicators. Moreover, it is imperative that the decision to retrofit relative to demolish and construct a new build encompasses both environmental and economic appraisal. Pertinently, environmental appraisals need to consider the entire asset life cycle (not just the operational phase) and the associated embodied carbon costs of both retrofit and new build propositions. Further to this, we highlight the need for the valuation profession to ensure consistent interpretation of the value implications of green retrofit solutions and to determine the impacts of reduced running costs and improved efficiency on key capitalisation indicators.

Finally, we show that data capture within the real estate sector is improving year-on-year but there remains an obligation for landlords and tenants to work collaboratively to facilitate more robust and detailed analysis of the impacts of intervention strategies and retrofit solutions. The integration of key energy and financial performance datasets and robust scenarios permit more strategic foresight and enables to communicate the impacts of different retrofit measures across the commercial real estate sector. In practice, real estate portfolios are rarely uniform and thus transposing individual asset-level characteristics into portfolio- and corporate-level decision support systems is problematic. In this respect the ‘live’ experiment by Grosvenor on its London real estate will serve to provide more engrained operational performance data and afford greater transparency and confidence to the real estate sector moving forward. However, in the immediate absence of collaborative landlord-tenant data sharing agreements, real estate owners and investors may opt to report their data gaps into the CRREM tool, which can estimate the missing data with average values for each European country.
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CRREM - Carbon Risk Real Estate Monitor


## ACRONYMS AND ABBREVIATIONS

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<th>ABBREVIATION</th>
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<tbody>
<tr>
<td>ACWI</td>
<td>All Country World Index (MSCI)</td>
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<td>AlFs</td>
<td>Alternative Investment Funds</td>
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<td>BBP</td>
<td>Better Building Partnership</td>
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<td>BMI</td>
<td>Building Mass Calculation Matrix</td>
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<td>BMS</td>
<td>Building management system</td>
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<td>BPR</td>
<td>Best Practice Recommendations</td>
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<td>BREEAM</td>
<td>Building Research Establish Environmental Assessment Method</td>
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<td>CAPEX</td>
<td>Capital expense</td>
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<td>CASBEE</td>
<td>Comprehensive Assessment System for Built Environment Efficiency</td>
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<td>CEN</td>
<td>European Committee for Standardisation</td>
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<td>CEN/TC</td>
<td>CEN Technical Committee</td>
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<td>CEN/TC350</td>
<td>CEN Technical Committee 350</td>
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<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
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<tr>
<td>CH₄</td>
<td>Methane</td>
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<td>CO₂</td>
<td>Carbon dioxide</td>
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<td>CO₂e(q)</td>
<td>Carbon dioxide equivalent. The unit is used to make the Global Warming Potential (GWP) of Green House Gases (GHG) comparable to the GWP of CO₂.</td>
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<tr>
<td>COP</td>
<td>Conference of the Parties der UNFCCC</td>
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<td>COP21</td>
<td>The 21st Conference of the Parties der UNFCCC</td>
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<td>CRREM</td>
<td>Carbon Risk Real Estate Monitor</td>
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<td>CSR</td>
<td>Corporate Social Responsibility</td>
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<td>DG ENER</td>
<td>The Directorate-General for Energy</td>
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<td>DNSH</td>
<td>Doing No Significant Harm</td>
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<td>EC</td>
<td>European Commission</td>
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<td>EEA</td>
<td>European Environment Agency</td>
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<td>EMS</td>
<td>Environmental Management System</td>
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<td>EN</td>
<td>European Norm / European Standard</td>
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<td>EPA</td>
<td>United States Environmental Protection Agency</td>
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<td>EPBD</td>
<td>Energy Performance Building Directive</td>
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<td>EPC</td>
<td>Energy Performance Certificate</td>
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<td>EPD</td>
<td>Environmental Product Declaration</td>
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<td>EPRA</td>
<td>European Public Real Estate Association</td>
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<td>EPRA Nareit</td>
<td>European Public Real Estate Association/ National Association of Real Estate Investment Trusts</td>
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<tr>
<td>ESG</td>
<td>Environmental, Social and Governance</td>
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<tr>
<td>ETF</td>
<td>Exchange-Traded Fund</td>
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<td>ETS</td>
<td>Emission Trading System</td>
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<td>EU</td>
<td>European Union</td>
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<td>EU-ETS</td>
<td>European Union Emission Trading System</td>
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<td>Acronym</td>
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<td>EUR</td>
<td>Euros</td>
</tr>
<tr>
<td>FSC</td>
<td>Forest Stewardship Council</td>
</tr>
<tr>
<td>FTEs</td>
<td>Full time equivalent</td>
</tr>
<tr>
<td>FTSE</td>
<td>The Financial Times Stock Exchange</td>
</tr>
<tr>
<td>GBI</td>
<td>Grosvenor Great Britain and Ireland</td>
</tr>
<tr>
<td>GDPR</td>
<td>General Data Protection Regulation</td>
</tr>
<tr>
<td>GEVA</td>
<td>Green House Gas Emissions per Value Added</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse gas</td>
</tr>
<tr>
<td>GICS</td>
<td>Global Industry Classification Standard</td>
</tr>
<tr>
<td>GRESB</td>
<td>Global Real Estate Sustainability Benchmark</td>
</tr>
<tr>
<td>GWP</td>
<td>Global Warming Potential. GWP is used to measure the extent to which a certain Green House Gas (GHG) contributes to the heating of Earth’s atmosphere in comparison with CO₂</td>
</tr>
<tr>
<td>HLEG</td>
<td>High-level Expert Group</td>
</tr>
<tr>
<td>HVAC</td>
<td>Heating, Ventilation and Air Conditioning</td>
</tr>
<tr>
<td>IBIP</td>
<td>Insurance-based products</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and communication technologies</td>
</tr>
<tr>
<td>IIÖ/IIO</td>
<td>Institut für Immobilienökonomie / Institute for Real Estate Economics</td>
</tr>
<tr>
<td>INREV</td>
<td>European Association for Investors in Non-Listed Real Estate Vehicles</td>
</tr>
<tr>
<td>IoT</td>
<td>Internet of things</td>
</tr>
<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>IPF</td>
<td>Investment Property Forum</td>
</tr>
<tr>
<td>IPMS</td>
<td>International Property Measurement Standards</td>
</tr>
<tr>
<td>IRR</td>
<td>Internal rate of return</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organisation for Standardisation</td>
</tr>
<tr>
<td>IUCN</td>
<td>The International Union for Conservation of Nature</td>
</tr>
<tr>
<td>IVA</td>
<td>Intangible value assessment</td>
</tr>
<tr>
<td>kbas</td>
<td>Key biodiversity areas</td>
</tr>
<tr>
<td>KPIs</td>
<td>Key Performance Indicators</td>
</tr>
<tr>
<td>kWh</td>
<td>Kilowatt hour</td>
</tr>
<tr>
<td>LCA</td>
<td>Life Cycle Assessment</td>
</tr>
<tr>
<td>LEED</td>
<td>Leadership in Energy and Environmental Design</td>
</tr>
<tr>
<td>LULUCF</td>
<td>Land Use, Land-Use Change and Forestry</td>
</tr>
<tr>
<td>m²</td>
<td>Square meter</td>
</tr>
<tr>
<td>MSCI</td>
<td>Morgan Stanley Capital International</td>
</tr>
<tr>
<td>MHVR</td>
<td>Mechanical heat ventilation recovery</td>
</tr>
<tr>
<td>N₂O</td>
<td>Nitrous oxide</td>
</tr>
<tr>
<td>NABERS</td>
<td>National Australian Built Environment Rating System</td>
</tr>
<tr>
<td>NACE</td>
<td>Nomenclature des Activités Économiques dans la Communauté Européenne</td>
</tr>
<tr>
<td>NF₃</td>
<td>Nitrogen trifluoride</td>
</tr>
<tr>
<td>NFRD</td>
<td>Non-financial Reporting Directive</td>
</tr>
<tr>
<td>NPV</td>
<td>Net present value</td>
</tr>
<tr>
<td>NZEB</td>
<td>Nearly Zero Energy Building</td>
</tr>
<tr>
<td>NZZ</td>
<td>Neue Zürcher Zeitung</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>--------------</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
</tr>
<tr>
<td>OPEX</td>
<td>Operating Expense</td>
</tr>
<tr>
<td>PDC</td>
<td>Portfolio Decarbonisation Coalition</td>
</tr>
<tr>
<td>PEFC</td>
<td>Programme for Endorsement of Forest Certification Schemes</td>
</tr>
<tr>
<td>PPM</td>
<td>Planned Preventive Maintenance</td>
</tr>
<tr>
<td>RAG</td>
<td>Red Amber Green</td>
</tr>
<tr>
<td>REIT</td>
<td>Real Estate Investment Trust</td>
</tr>
<tr>
<td>RICS</td>
<td>Royal Institution of Chartered Surveyors</td>
</tr>
<tr>
<td>ROI</td>
<td>Return of Investment</td>
</tr>
<tr>
<td>sBPR</td>
<td>Sustainability Best Practice Recommendations</td>
</tr>
<tr>
<td>SBT</td>
<td>Science Based Targets</td>
</tr>
<tr>
<td>SBTi</td>
<td>Science Based Targets Initiative</td>
</tr>
<tr>
<td>SCC</td>
<td>Supply chain Charter (GBI)</td>
</tr>
<tr>
<td>SF₆</td>
<td>Sulphur hexafluoride</td>
</tr>
<tr>
<td>SME</td>
<td>Small to medium enterprise</td>
</tr>
<tr>
<td>TCFD</td>
<td>Task Force on Climate-related Financial Disclosures</td>
</tr>
<tr>
<td>TEG</td>
<td>Technical Expert Group</td>
</tr>
<tr>
<td>TU</td>
<td>Tilburg University</td>
</tr>
<tr>
<td>UA</td>
<td>University of Alicante</td>
</tr>
<tr>
<td>UCITs</td>
<td>The Undertakings for the Collective Investment in Transferable Securities</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>ULI</td>
<td>Urban Land Institute</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
</tr>
<tr>
<td>UNEP FI</td>
<td>United Nations Environment Programme Finance Initiative</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>UU</td>
<td>University of Ulster</td>
</tr>
<tr>
<td>WGBC</td>
<td>World Green Building Council</td>
</tr>
<tr>
<td>WLC</td>
<td>Whole-Life Carbon</td>
</tr>
<tr>
<td>ZIA</td>
<td>ZIA German Property Federation</td>
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</tbody>
</table>