Patricia Kuczynska

Presentation on Climate-related Disclosures to Real Estate Industry with the main focus on Transition and Physical Risks, Buildings Energy Consumption and Emissions, Building Energy Efficiency, Risk Assessment and Sustainability in Property Market Analysis and Valuation.

Content: https://www.youtube.com/watch?v=jQTidJhIWsc

Climate-related Risks and Opportunities

The core idea of climate-related disclosures including climate-related risks and opportunities is that:

"**Incorporating climate change risks into the existing risk management framework is likely to be the best way to ensure that the impact of climate change is properly considered in decision making**." Parker Fitzgerald/Accenture

This is the case whether climate-related risks are viewed as stand-alone risks or drivers of existing risks. Recognizing these unique characteristics is important for understanding how climate-related risks may affect a company; and integrating climate-related risks into existing risk management processes often requires adjusting existing processes to ensure these unique characteristics are reflected. TCFD Guidance on Risk Management

When an entity is describing its processes for identifying and assessing climate-related risks, (…) additional information should be provided for primary users.

›› **The tools and methods used**: for example, an entity may be using scenario analysis, hazard maps, horizon scanning, or could use a desk top assessment based on an existing risk pipeline.

›› **The time horizons considered**: because climate-related issues often manifest over the medium to longer term, assessing climate-related risk does require consideration of time frames.

›› **The value chain stages covered**: when considering exposure to climate-related risks, an entity should consider the exposure of its value chain as well. While some entities will be looking across the entire value chain, others may not yet be able to look as broadly. It is useful for an entity to provide information on the parts of the value chain covered to primary users. XRB Governance and Risk Management Consultation Document NZ CS1

Identifying, measuring and disclosing information related to significant climate-related risks and opportunities associated with Real Estate industry and Valuation profession

- The Real Estate Services industry is composed of companies that provide a range of services to real estate owners, tenants, investors, and developers. Primary services include property management, brokerage, valuation, and information services for real estate owners. Property management services may include leasing, tenant relations, building maintenance, and building security. Many companies also provide brokerage services, facilitating sales and leasing transactions. Property valuation and other advisory or information services are other specialised services that are commonly provided to clients. Companies in the real estate industry play important roles in the real estate value chain, which is a substantial part of the global economy. https://www.ifrs.org/content/dam/ifrs/project/climate-related-disclosures/industry/issb-exposure-draft-2022-2-b37-real-estate-services.pdf
- The role of the property specialist is to advise on how environmental considerations translate into material effects on real estate. The added value of the property professional is the ability to coordinate and use advice provided by other experts and apply this to a property activity.
- Property professionals are often centrally placed to guide a client with regard to a property asset at a particular time.
- The role of the property specialist often bridges the gap between the world of environmental science and policy and the marketplace. They can explain how environmental considerations may impact real estate interests. https://www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/land/environmental-risks-and-global-real-estate-1st-edition-november-2018.pdf

Climate Related Disclosures for Real Estate

Real estate assets consume significant amounts of energy, primarily related to space heating, ventilating, air conditioning, water heating, lighting, and the use of equipment and appliances.

Buildings consume significant amounts of water in their operations, through water fixtures, building equipment, appliances, and irrigation.

Real estate assets generate significant sustainability impacts, including resource consumption—namely energy and water—waste generation, and impacts on occupant health through indoor environmental quality.

Climate change affects companies in the industry via frequent or high-impact extreme weather events, changing climate patterns and transition impacts.

https://www.ifrs.org/content/dam/ifrs/project/climate-related-disclosures/industry/issb-exposure-draft-2022-2-b36-real-estate.pdf

Energy Management

- Real estate assets consume significant amounts of energy, primarily related to space heating, ventilating, air conditioning, water heating, lighting, and the use of equipment and appliances. The type of energy used, magnitude of consumption, and strategies for energy management are highly dependent on the real estate asset class, among other factors. Generally, grid electricity consumption is the predominant form of consumed energy, though on-site fuel combustion and renewable energy production also serve an important roles. Energy costs may be borne by companies in the industry and/or the property occupants; either way, energy management is a significant industry issue. To the extent that the real estate owner assumes direct responsibility for energy costs, such costs often represent significant operating costs, inherently indicating the importance of energy management. Energy pricing volatility and a general trend of electricity price increases, energy-related regulations, wide variations in energy performance across the existing building stock, and opportunities for efficiency improvements through economically attractive capital investments all further point to the importance of energy management. Energy costs assumed by occupants, either in whole or in part, are nonetheless likely to significantly impact companies in the industry, albeit through differing channels. Building energy performance is a notable driver of tenant demand, as it allows them to control operating costs, mitigate the environmental impacts of operations, and, often just as importantly, maintain a reputation for resource conservation. Additionally, real estate owners may be exposed to energy-related regulations even when energy costs are the responsibility of occupants.
- Overall, companies in the industry that effectively manage the energy performance of their assets may see reduced operating costs and regulatory risks, as well as increased tenant demand, rental rates, and occupancy rates—all of which drive revenue and asset value appreciation. Improving the energy performance of assets is highly dependent on property type and location, target tenant market, local building codes, physical and legal opportunities to deploy distributed renewable energy, ability to measure consumption, and performance of existing building stock, among other factors. https://www.ifrs.org/content/dam/ifrs/project/climate-related-disclosures/industry/issb-exposure-draft-2022-2-b36-real-estate.pdf https://www.ifrs.org/projects/work-plan/climate-related-disclosures/appendix-b-industry-based-disclosure-requirements/

Metrics:

1) The percentage of its portfolio, based on total gross floor area, with complete energy consumption data coverage.

2) Energy consumption data coverage separately for each property type in its portfolio.

3) The comprehensiveness of data coverage if there are coverage variations by energy type. IFRS

Water Management

- Buildings consume significant amounts of water in their operations, through water fixtures, building equipment, appliances, and irrigation. Operating costs resulting from water consumption may represent significant costs depending on property type, tenant operations, geographical locations, and other factors. Companies in the industry can be responsible for a building's water costs, or common area water costs, though it is common to allocate all, or a portion, of these costs to occupants. In these arrangements, water management continues to play an important role through tenant demand and regulatory exposure. Tenants may assess the water efficiency of real estate assets in an effort to control operating costs, mitigate environmental impacts of operations, and, often just as importantly, develop a reputation for resource conservation. Additionally, real estate owners may be exposed to water-related regulations even when water costs are the responsibility of occupants. Overall, companies in the industry that effectively manage water efficiency of assets, even when they don't face direct exposure to water costs, may see reduced operating costs and regulatory exposure, as well as increased tenant demand, rental rates, and occupancy rates—all of which drive revenue and asset value appreciation. Long-term historic increases in the costs of water—and expectations of continued increases due to overconsumption and constrained supplies resulting from population growth and shifts, pollution, and climate change—indicate the heightened importance of water management.
- The ability to improve asset water efficiency is highly dependent on the property type, locational water availability, target tenant market, local building codes, the ability to measure consumption, and the level of current efficiency of existing building stock, among other factors. https://www.ifrs.org/content/dam/ifrs/project/climate-related-disclosures/industry/issb-exposure-draft-2022-2-b36-real-estate.pdf

Metrics:

1) The percentage of its portfolio, based on total gross floor area, with complete water withdrawal data coverage.

2) The percentage of its portfolio, based on gross floor area, located in regions classified as High (40–80 percent) or Extremely High (>80 percent) Baseline Water Stress with complete water withdrawal data coverage.

3) Water withdrawal data coverage, and (2) the percentage of water withdrawal data coverage in regions with High or Extremely High Baseline Water Stress, separately for each property type in its portfolio where properties are classified into sectors. IFRS

Management of Tenant Sustainability Impacts

- Real estate assets generate significant sustainability impacts, including resource consumption—namely energy and water—waste generation, and impacts on occupant health through indoor environmental quality. While companies in the industry own real estate assets, it is the tenant operations of such assets that is a dominant driver of sustainability impacts produced by the built environment. Tenants may design and construct leased spaces according to their operating needs. In turn, their operations consume significant amounts of energy and water, generate waste, and impact the health of those living, working, shopping, or visiting the properties. While these sustainability impacts are often generated by tenant operations and activities, real estate owners have an important role in influencing tenant sustainability impacts. The manner in which companies in the industry structure their agreements, contracts, and relationships with tenants is instrumental in effectively managing the sustainability impacts of their tenants, and ultimately, the impacts of their assets. Managing tenant sustainability impacts may include mitigating the problem of split incentives by aligning both parties' financial interests with sustainability outcomes, establishing systematic measurement and communication of resource consumption data, creating shared performance goals, and mandating minimum sustainability performance or design requirements, among other strategies.
- Effective management of tenant sustainability impacts, particularly related to energy, water, and indoor environmental quality, may drive asset value appreciation, increase tenant demand and satisfaction, decrease direct operating costs, and/or decrease risks related to building codes and regulations. https://www.ifrs.org/content/dam/ifrs/project/climate-related-disclosures/industry/issb-exposure-draft-2022-2-b36-real-estate.pdf

Metrics:

1) The percentage of new leases that contain a cost recovery clause for resource efficiency-related capital improvements.
2) The percentage shall be calculated as the portfolio newly leased floor area associated with leases that contain a cost recovery clause for resource efficiency-related capital improvements divided by total portfolio newly leased floor area.
3) The leased floor area, in square metres, associated with new leases that contain a cost recovery clause for resource efficiency-related capital improvements.
4) The scope of disclosure includes all of the properties in the entity's portfolio that were newly leased during any part of the reporting period, and for which the associated lease was executed between the entity and the tenant. IFRS

Climate Change Adaptation

- Climate change affects companies in the industry via frequent or high-impact extreme weather events and changing climate patterns. The manner in which a company's business model is structured to incorporate ongoing assessments of climate change risks, and the adaptation to such risks, is likely to be increasingly connected to company value over the long term. More specifically, investment strategies with assets located on floodplains and in coastal regions that are exposed to inclement weather may have increased needs around risk mitigation and business model adaptation to climate change over the long term. These strategies are especially important in light of the long-term challenges associated with flood insurance rates, the financial stability of governmentsubsidized flood insurance programs, and financing stipulations or other creditor concerns. Besides insurance, other risk mitigation measures include improvements to physical asset resiliency and lease terms that transfer risk to tenants, although these measures can create their own costs and risks for real estate companies.
- To ensure long-term growth and protection of shareholder value, companies need to implement climate change adaptation strategies that are comprehensive, account for trade-offs between various risk mitigation strategies, and integrate consideration of all projected costs and benefits over the long term. https://www.ifrs.org/content/dam/ifrs/project/climate-related-disclosures/industry/issb-exposure-draft-2022-2-b36-real-estate.pdf

Metrics:

1) The total leasable floor area, in square metres, of properties in the entity's portfolio that are located in 100-year flood zones.

2) The scope of disclosure shall include all of the entity's properties that are located in 100-year flood zones, regardless of the country of their location.

3) The entity shall disclose the total leasable floor area of properties that are located in 100-year flood zones separately for each property type in its portfolio where properties are classified into sectors. IFRS

Climate Related Disclosures Four-Pillar Framework

TCFD

THE TASK FORCE ON CLIMATERELATED FINANCIAL DISCLOSURES TCFD UNPRI

In its 2017 report, the Task Force (TCFD) made four recommendations on climate-related financial disclosures. the Task Force's recommendations related to governance, strategy, and metrics and targets ask companies to disclose specific information on their climate-related risks and climate-related opportunities, while the recommendation on risk management focuses on climate-related risks.

Climate-related opportunities may arise as part of the development of responses to specific climate-related risks — for example operational and restructuring efficiencies and development of new products, services, and markets. 2021-TCFD-Implementing_Guidance

Figure 2: Core elements of recommended climate-related financial disclosures. Source: TCFD

XRB

EXTERNAL REPORTING BOARD XRB

Governance	Strategy	Risk Management	Metrics and Targets
Disclose the organization's governance around climate-related risks and opportunities	Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material.	Disclose how the organization identifies, assesses, and manages climate-related risks.	Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.
Recommended Disclosures	**Recommended Disclosures**	**Recommended Disclosures**	**Recommended Disclosures**
a. Describe the board's oversight of climate-related risks and opportunities.	a. Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.	a. Describe the organization's processes for identifying and assessing climate-related risks.	a. Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.
b. Describe management's role in assessing and managing climate-related risks and opportunities	b. Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning.	b. Describe the organization's processes for managing climate-related risks.	b. Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 greenhouse gas (GHG) emissions and the related risks.
	c. Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	c. Describe how processes for identifying, assessing, and managing climated-related risks are integrated into the organization's overall risk management.	c. Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.

Climate change is increasingly material for all investors, including those in real assets. Real assets, whether properties, infrastructure assets or forestry and farmland, face a range of impacts from the physical effects of climate change, and from regulatory actions designed to reduce emissions and influence consumer behaviour. Moreover, real assets investors, whether asset owners or investment managers, increasingly face client, public and regulatory pressure to take a systematic approach to address climate risk and communicate it effectively. UNPRI

GOVERNANCE

- Raise climate awareness throughout the organisation
  - Conduct training and awareness-raising across organisation on climate change
  - Participate in cross-industry initiatives on climate incorporation
- Develop a governance system to manage climate-related risks
  - Define climate oversight responsibilities at board and executive level
  - Define assessment and management responsibilities for climate-related issues in strategy-building and investment process

STRATEGY

- Develop a strategy for identifying and addressing climate risks and opportunities
  - Develop/select a range of climate change scenarios (qualitative and/or quantitative)
  - Integrate scenario analysis outcomes into investment strategy and business plan
  - Test resilience of investments and portfolios to selected scenarios

RISK MANAGEMENT

- Fully integrate climate risks and opportunities into investment processes
  - Assess the materiality of climate-related impacts and opportunities using sector and scenario analysis
  - Introduce climate component within pre-acquisition due diligence, and in vendor reports prior to exit
  - Identify assets with the highest exposure and conduct in-depth climate analysis
  - Define and support implementation of action plan to strengthen climate resilience at asset level

METRICS AND TARGETS

- Define clear climate targets and select key metrics used to monitor progress towards those objectives on a regular basis.
  - Define targets for key climate risks and opportunities
  - Identify core climate metrics to assess progress towards targets, the achievement of risk management plans, and the success of the overall strategy

Case Study Climate-related Financial Disclosures

PFi Property For Industry - the industrial property investment and management company

CLIMATE-RELATED DISCLOSURES 2020 has been a challenging year globally, and provided an insight to the scale of effort that will be required to respond to climate change.

PFI recognises that we need to proactively manage the risks and opportunities that arise from climate change, just like we manage all other risks and opportunities facing our business.

This report provides information about the actions that we are taking to identify and manage climate change risks and opportunities. The following disclosures have been prepared in accordance with the recommendations of the Task force on Climate-related Financial Disclosures (TCFD) which provides a framework for climate-related financial disclosures across four core elements: governance, strategy, risk management and metrics and targets.

This is PFI's first report in line with the TCFD recommended disclosures. We are pleased with the progress that we have made during 2020 to strengthen our understanding of, and response to, our climate-related risks and opportunities. However, we acknowledge that we have further work to do, in particular:

- understanding the resilience of individual assets in PFI's portfolio to climate change in different climate change transition pathways; and
- introducing additional metrics and targets to provide a more complete measure of our performance.

We are also cognisant that we are still in the early stages of understanding how these risks will develop over time. We intend to evolve and expand on our TCFD disclosures as our depth of understanding and management of these risks matures.

We are committed to continue progressing our response to climate change during 2021 and beyond, and to report our progress to our stakeholders each year.

(Full Report: https://www.propertyforindustry.co.nz/assets/Uploads/Sustainability/PFI-Climate-related-disclosures.pdf)

Case Study CBRE Global Investors’ TCFD Alignment Project

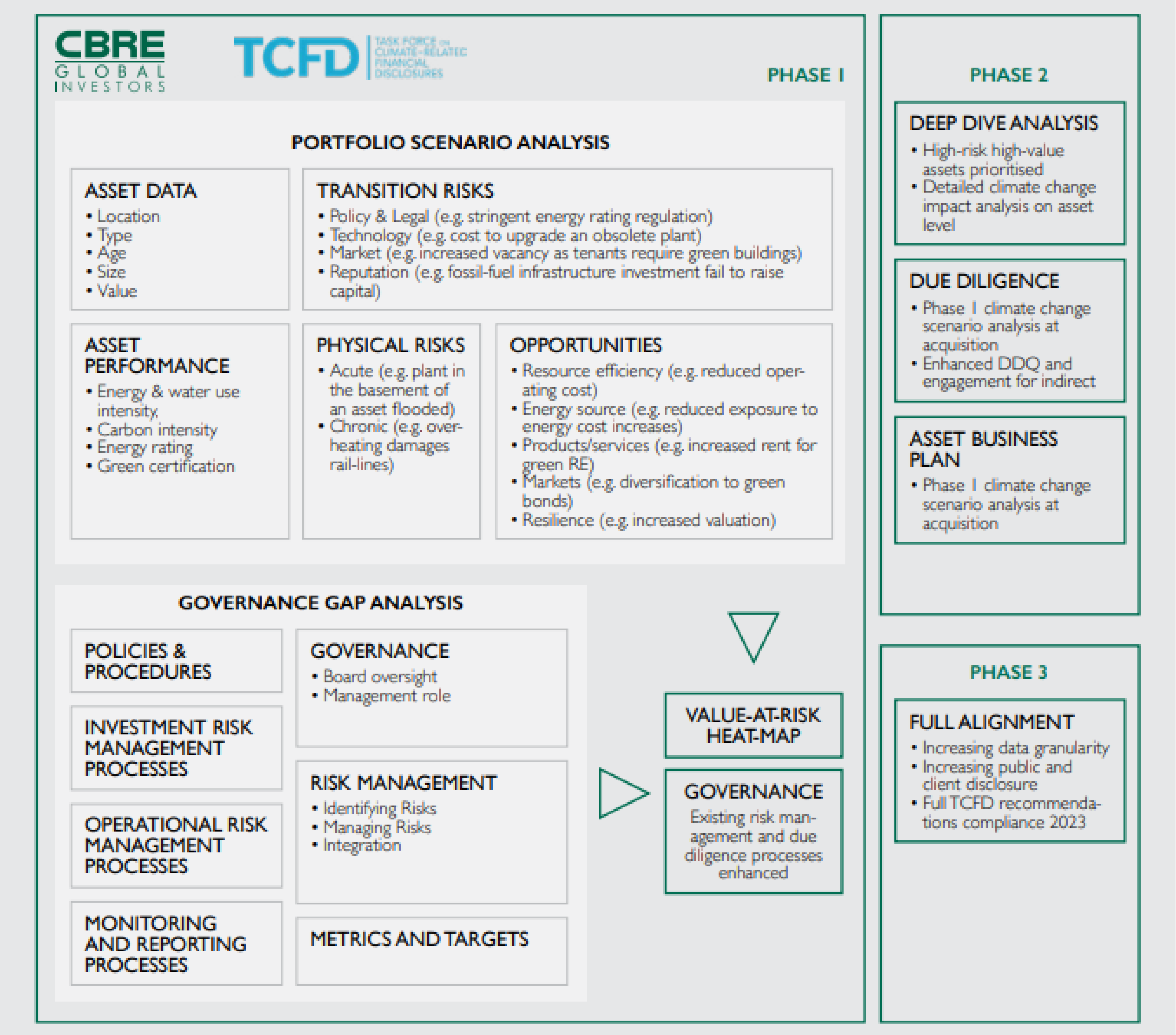


Figure 25: CBRE Global Investors TCFD alignment project

(Full report: [UNEPFI/TCFD-Real-Estate]())

Metrics and Targets

GHG Emissions

- The Kyoto Protocol, agreed in 1997, is linked to the United Nations Framework Convention on Climate Change (UNFCCC). It commits developed country parties to reducing **GHG emissions** and covers seven **gases**: **CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3**. Then, the Montreal Protocol, agreed in 1987, includes **chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrobromofluorocarbons (HBFCs), methyl bromide, carbon tetrachloride, methyl chloroform and halons**. New Zealand prohibits imports of CFCs and HCFCs as part of implementation of the protocol.
- The 2015 Paris Agreement commits parties to put forward their best efforts to limit global temperature rise through nationally determined contributions (NDCs), and to strengthen these efforts over time.
- **GHGs** can trap differing amounts of heat in the atmosphere, meaning they have different relative impacts on climate change. These are known as **global warming potentials (GWPs)**. To enable a meaningful comparison between the seven gas types, GHG emissions are commonly expressed as carbon dioxide equivalent or CO_2-e.
- **An emission factor** allows the estimation of GHG emissions from a unit of available activity data (eg, litres of fuel used).
- **A GHG inventory** contains all applicable emissions for an organisation within a defined boundary during a set period. A GHG inventory is key to measuring emissions.
- **A GHG report** expands on the inventory with context about the organisation, as well as analysis and progress over time. A GHG report is key to reporting emissions. Environment.govt.nz

Scopes

The GHG Protocol gives description and context around what to do to produce an inventory.

The GHG Protocol standards provide comprehensive guidance on the core issues of GHG monitoring and reporting at an organisational level.

The GHG Protocol places emission sources into Scope 1, Scope 2 and Scope 3 activities.

- **Scope 1:** Direct GHG emissions from sources owned or controlled by the company (i.e., within the organisational boundary). For example, emissions from combustion of fuel in vehicles owned or controlled by the organisation.
- **Scope 2:** Indirect GHG emissions from the generation of purchased energy (in the form of electricity, heat or steam) that the organisation uses.
- **Scope 3:** Other indirect GHG emissions occurring because of the activities of the organisation but generated from sources that it does not own or control (e.g., air travel, purchased goods and services, capital goods, upstream and downstream leased assets, franchises, investments (financed emissions fall into this category)). XRB Environment.govt.nz

New Zealand projections of greenhouse gas emissions as published on 10 March 2022

New Zealand has several greenhouse gas emissions reduction targets. They include both domestic and international targets up to the year 2050.

Projections update:

- With existing measures only, gross emissions are projected to gradually decrease from 79.7 million tonnes of carbon dioxide equivalent (Mt CO_2-e) in 2020 to 66.6 Mt CO_2-e in 2050. This is 2.3 per cent above previous calculations of 1990 levels or 19.1 per cent below 2019 levels (see the methodological updates used in the projections).
- **New Zealand's net emissions are projected to decrease from** 54.4 Mt CO_2-e in 2020 to 35.0 Mt CO_2-e in 2050, a **35.6 per cent reduction on 2020 levels by 2050**.
- New Zealand's target accounting emissions are projected to decrease from 71.4 Mt CO_2-e in 2020 to 41.9 Mt CO_2-e in 2050, a 41.3 per cent reduction on 2020 levels by 2050.

Reasons for the gradual decline in gross emissions:

- Reduced energy use.
- Land-use change from agriculture to forestry.
- The further shift to low carbon renewables in stationary energy.
- Increasing energy efficiency and electrification in transport.

Gross emissions include emissions from all sectors of the New Zealand economy excluding forestry and land-use emissions/removals.

Net emissions - these are gross emissions, plus emissions and removals from land use, land-use change and forestry, and our target accounting emissions. These are used for our United Nations Framework Convention on Climate Change reporting.

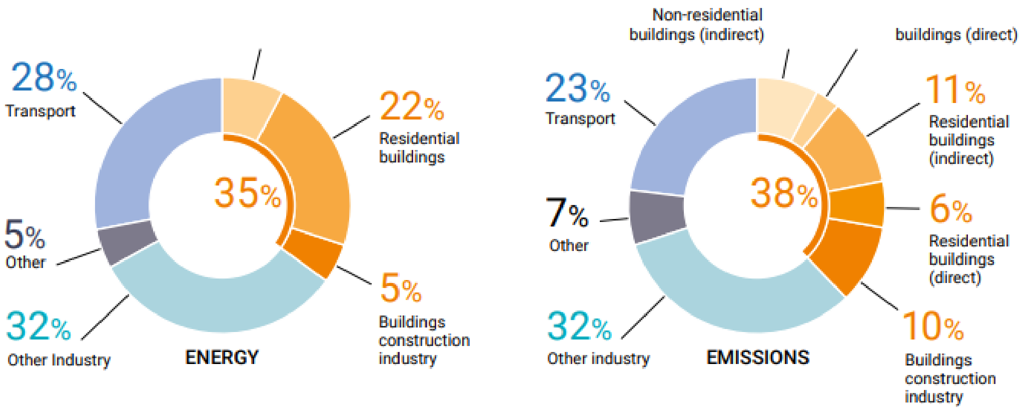
Target accounting emissions – these include gross emissions, with a subset of our forestry and land-use emissions and removals. These count towards our 2021-2030 Paris target.

The projections assume only existing policies, including a carbon price of $35 per tonne of CO_2-e in the Emissions Trading Scheme.

Environment.govt.nz

BUILDINGS AND CONSTRUCTION ENERGY CONSUMPTION AND EMISSIONS GLOBALY

Figure 2 - Global share of buildings and construction final energy and emissions, 2019



Notes: Buildings construction industry is the portion (estimated) of overall industry devoted to manufacturing building construction materials such as steel, cement and glass. Indirect emissions are emissions from power generation for electricity and commercial heat.

Sources: (IEA 2020d; IEA 2020b). All rights reserved. Adapted from "IEA World Energy Statistics and Balances" and "Energy Technology Perspectives".

- **The buildings sector emission increase is due to a continued use of coal, oil and natural gas for heating and cooking combined with higher activity levels in regions where electricity remains carbon-intensive, resulting in a steady level of direct emissions but growing indirect emissions (i.e. electricity). Electricity consumption in building operations represents nearly 55% of global electricity consumption.**
- Building construction and operations in 2019 accounted for the largest share of global total final energy consumption (35%) and energy-related CO2 emissions (38%) in 2019 (Figure 2).
- Across the globe, buildings energy use remains a significant proportion of overall energy demand.
- Global final energy consumption for buildings operation was approximately 130 EJ (Figure 3), which is around 30% of total final consumption, and a further 21 EJ for buildings and construction or 5% of total demand. Electricity consumption in buildings now represents around 55% of global electricity consumption (IEA 2020b). globalabc
- **In 2020, the falling of CO_2 emissions was mostly a result of the Covid-19 pandemic and the decarbonisation of power generation. Reduced service sector activity (resulting from teleworking, closed schools and empty hotels and restaurants) was the main reason why service buildings registered the largest-ever drop in energy demand. In parallel, increased renewable energy generation combined with lower total electricity demand made electricity lower-carbon in 2020 relative to 2019. As activity resumes, and electricity demand rebounds, consumption and emissions could rise again in 2021.**
- **Noticeable advances in energy efficiency (minimum performance standards are tightening, heat pump and renewable equipment deployment is accelerating and the power sector is continuing to decarbonise) in the past year have boosted progress in decoupling energy consumption from buildings sector floor area growth. The fastest-increasing end uses of energy in buildings – for space cooling, appliances and electric plug-loads – drive buildings sector electricity demand growth.** iea

Sources/sinks and greenhouse gases effected by a building code policy

Source category	Description	Examples of emitting equipment or entity	Relevant greenhouse gases
Buildings	Fuel combustion to meet energy requirement of building	Residential equipment that combusts fuels; electric grid that supplies electricity	CO_2, CH_4, N_2O
Manufacturing units	Industrial processes	Industrial facilities	CO_2, CH_4, N_2O, HFCs
Power generation units	Fuel combustion	Power plants	CO_2, CH_4, N_2O

GHGProtocol

CONCEPT OF NET ZERO CARBON BUILDING

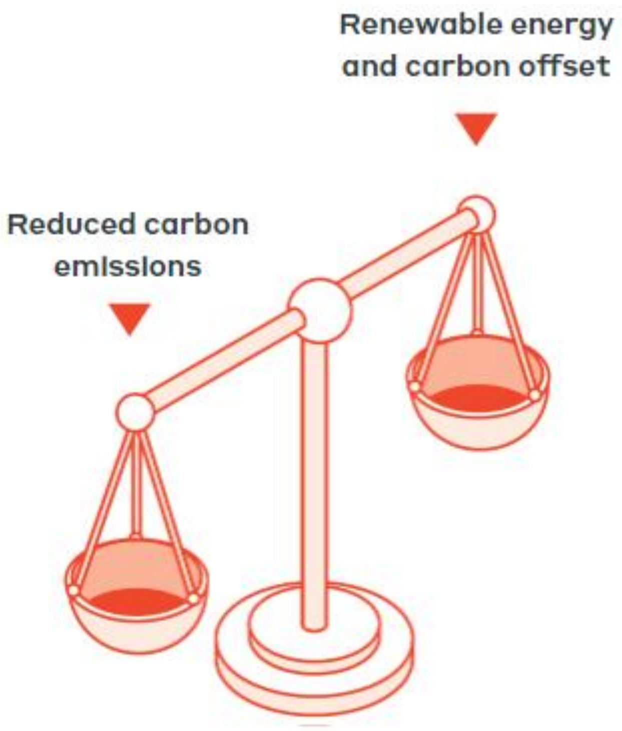
A **net zero building** is simply a building that has no net carbon emissions during its construction and operation. Emissions are reduced and what's leftover is balanced by renewable energy or carbon offsets.

Here are the three main categories that will be assessed to evaluate the operational and embodied carbon emissions of a building.

- **Net zero in operation** - For the operational carbon emissions of a building to be zero, it must be highly energy efficient and powered by renewable energy either on or off-site, with any remaining annual carbon emissions offset.
- **Net zero in construction** - For a building to be net zero in construction (embodied carbon), the carbon emissions associated with the building's product and construction stages up to practical completion, needs to be offset through the net export of onsite renewable energy or by offsetting the emissions.
- **Net zero in whole life carbon** - A truly net zero building must achieve net zero in whole life carbon, this means that the building operation and embodied carbon over its lifetime, including its disposal, are zero or negative. WSP

The World Green Building Council Commitment requires that by 2030:

- **Existing buildings** reduce their energy consumption and eliminate emissions from energy and refrigerants removing fossil fuel use as fast as practicable (where applicable). Where necessary, compensate for residual emissions.
- **New developments and major renovations** are built to be highly efficient, powered by renewables, with a maximum reduction in embodied carbon and compensation of all residual upfront emissions.



Building Carbon Emissions

- As the world's population approaches 10 billion (approx. 2050's), the global building stock is expected to double in size.
- Without drastic changes to the way building and construction sector operates, this growth will consume vast amounts of natural resources, contributing to an expected doubling of the total global consumption of raw materials by around the middle of the century, significantly increasing the sector's emissions and climate impact.
- Carbon emissions are released not only during operational life but also during the manufacturing, transportation, construction and end of life phases of all built assets – buildings and infrastructure. These emissions, commonly referred to as embodied carbon. WorldGBC

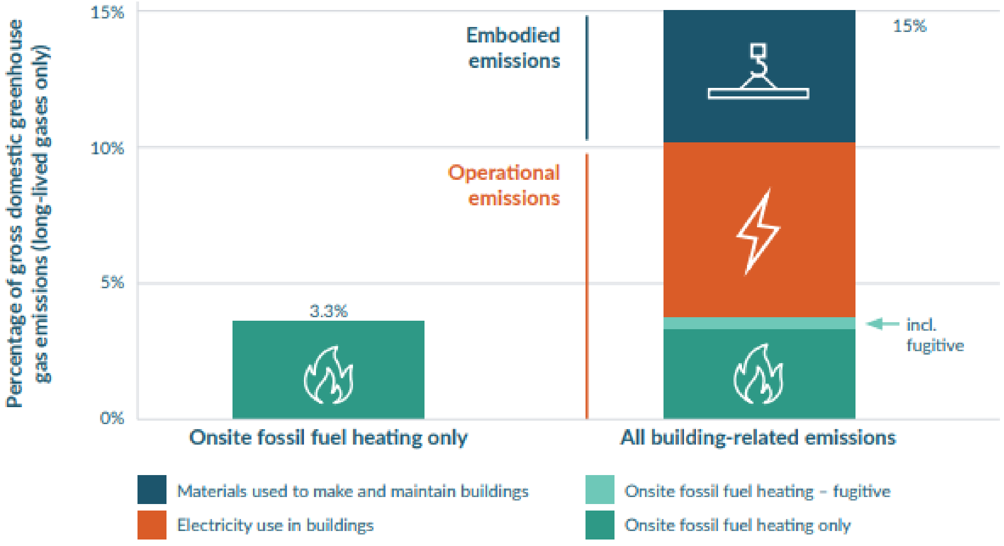
Buildings and houses are long lived, and the amount of energy used to heat, cool, light and maintain them is affected by their original design and construction

- Emissions directly from buildings, such as fossil fuels used for space and water heating, are only one part of the emissions for which buildings are responsible. They also drive emissions that are accounted for in the energy, industry, waste and transport sectors.
- The consumption approach includes the impact of two types of building-related emissions.

➢ **Operational carbon emissions** – from the energy and other resources used for operating the building.

➢ **Embodied carbon emissions** – from the manufacture and use of the materials and products in buildings across their lifespan, from construction to deconstruction. These include emissions from the production, transportation and disposal of building materials.

Figure 12.1. Building- and construction-related emissions as a proportion of Aotearoa New Zealand's gross greenhouse gas emissions (excluding biogenic methane) in 2018[4]



New Zealand First Emissions Reduction Plan for Embodied Carbon

A few focus areas:

- Consult in late 2022 on introducing whole-of-life embodied carbon requirements to the Building Code.
- Establish a sector advisory group to help develop proposals for reporting and measurement of whole-of-life embodied carbon emissions and expand the sector's understanding of embodied carbon.
- Identify real and perceived financial barriers to low-emissions buildings and explore options to reduce barriers, such as financial incentives, green bonds or green loans.
- Recognise and showcase low-emissions buildings to highlight practices the sector can adopt.
- The implementation of Rule 20 of the Government Procurement Rules and the Procurement Guide to Reducing Carbon Emissions in Building and Construction. https://www.procurement.govt.nz/broader-outcomes/reducing-emissions-and-waste/reducing-government-fleet-emissions/

https://environment.govt.nz/assets/publications/Aotearoa-New-Zealands-first-emissions-reduction-plan.pdf

New Zealand First Emissions Reduction Plan for Operational Emissions

A few focus areas:

- Improve building energy efficiency (The building regulatory system largely focuses on the performance of new buildings.) https://www.building.govt.nz/getting-started/building-for-climate-change/
- The Operational Emissions Cap and Water Use Cap https://www.mbie.govt.nz/dmsdocument/11793-transforming-operational-efficiency
- Implement amendments to Building Code Clause H1 (energy efficiency) compliance pathways plus introduce new requirements for operational efficiency. https://www.building.govt.nz/building-code-compliance/annual-building-code-updates/2021-building-code-update/
- Encourage and enable emissions reduction from existing buildings:
  - Introduce mandatory energy performance certificates for buildings. Initially, they could apply to government, commercial and large residential buildings and potentially expand to other residential buildings in future.
  - Shift energy use from fossil fuels - Fossil fuel use in buildings will be reduced .
  - Change behaviours of households and the sector: Develop and implement a programme to raise awareness, reduce barriers, and encourage action to reduce the climate impact of the building and construction sector. This will support action by households, building owners, producers (sector and supply chains) and building-consent authorities.

https://environment.govt.nz/assets/publications/Aotearoa-New-Zealands-first-emissions-reduction-plan.pdf

Energy Efficiency for Buildings

Strategic choices for the whole-building energy efficient design approach include:

- The Design and Building Process – Building Envelope, Cost-effective technologies and Quality & Environment Friendly Building Materials (suitable for long-lived assets).
- High-Efficiency HVAC – Heating Ventilation and Air-conditioning.
- Maximal Use of Sunlight – the optimal use of natural light.
- Strategic Lighting Methods – energy efficient lightning systems (e.g. LED), task lightning etc.
- Rational use of water resources – mainly include rain water collection, gray water treatment and water saving appliances.
- Application of renewable resources – solar, geothermal and wind energy.
- Intelligent control systems - automatically adjusted the temperature, humidity, lighting, and other parameters of various facilities.

Sustainable and Efficient Power Usage results in lower operational costs and lower carbon emissions.

Rating Systems
(incl. Energy modelling & Life Cycle Assessment (LCA))

There are a number of points based rating systems that consider a wide range of factors to assess the overall environmental impact of a building.

The rating systems typically allow building owners to select a mix of features that can contribute to a score or rating to demonstrate the overall performance.

Some of these systems include components that can be used for assessing the whole of life embodied carbon or operational carbon generated for different options being considered for a project.

[Procurement]

		Focus areas		
System or tool	Type	Overall sustainability performance	Whole of life embodied carbon	Operational efficiency (Operational Carbon)
Green Star	Rating tool (non-residential)	✓	✓	✓
Homestar	Rating tool (residential)	✓	✓	✓
NABERSNZ	Rating tool (office buildings)			✓
Passive House	Energy Performance Standard			✓
Living Building Challenge (International Living Future Institute)	Rating tool	✓		
Zero Carbon Certification (International Living Future Institute)	Rating tool		✓	✓
eTool	LCA tool		✓	✓
LCAQuick	LCA tool		✓	✓
One Click LCA	LCA tool		✓	✓
EC3	LCA tool		✓	
Tally	LCA tool		✓	

Transition Risks and Opportunities

The transition to a low carbon economy carries both risk and opportunity and could unfold gradually over time or through sudden shocks.

- **Transition risks** refers to an entity's financial loss that can result, directly or indirectly, from the process of adjustment towards a lower-carbon and more environmentally sustainable economy. Triggered by a adoption of climate and environmental policies, technological progress or changes in market sentiment and preferences.
- **Transition opportunities** include those driven by resource efficiency, cost savings and the development of new technologies, products and services, which could capture new markets and sources of funding.

These risks and opportunities vary across geographies, sectors, time horizons and in line with government and business commitments to limit global temperature rises.

Companies use scenarios to test a variety of alternative views of the market. This ensures a robust future investment strategy. These scenarios provide plausible alternative views on how the transition to a lower carbon economy could evolve over time, including a more rapid, disorderly transition.

In a 2°C scenario are expected:
- more aggressive government policies
- more rapid changes in technology and,
- markets move the global economy away from business-as-usual to limit as far as possible global temperature rise.

Consequently, investors will be under increasing pressure to enhance their capabilities to manage transition risks and capture opportunities from the transition to a low carbon economy.

Transition risk is becoming a material factor with development of reporting standards to merge climate-related risks with financial information

Real-estate owners and investors will need to improve their climate intelligence to understand the potential impact of revenue, operating costs, capital costs, and capitalisation rate on assets. This includes developing the analytical capabilities to consistently assess both physical and transition risks. Mckinsey

Physical and transition risks have direct and indirect implications for revenue, operating and capital costs, and capitalization rate.

Implications of transition and physical risks, by direct and indirect effects

	Transition risks Include changes in the economy, regulation, consumer behavior, technology, and other human responses to climate change		**Physical risks** Hazards caused by a changing climate, from floods, fires, and storms to rising sea levels and changing average temperatures	
	Direct effect	**Indirect effect**	**Direct effect**	**Indirect effect**
Revenue	Unattractiveness of a carbon-intensive asset to an occupier that has made a climate commitment	Decline in a sector or local economy resulting in lower local real-estate demand/occupancy	Disruptions to an asset's operations from severe or repeated physical-hazard events (eg, major floods)	Reduced real-estate demand in a local market given disruptions to surrounding transportation or other infrastructure
Operating costs	Increased utility costs given carbon-intensive building systems	Carbon charges on an asset given local regulations	Increased maintenance costs as physical risks increase	Increased insurance costs as insurers recognize physical risks and adjust underwriting models
Capital costs	Significant capital investment required to meet local energy efficiency/emissions standards or tenant demands (eg, early retrofit of heating/cooling systems), increased need to purchase lower-emissions building materials (eg, steel, cement, timber)	Increased financing costs as investors and lenders price in market-level transition risks (eg, in economies dependent upon carbon-intensive industries)	Investment required to improve the resilience of building to increasing physical risks (eg, elevating lobby, green roofs, protecting electric and mechanical systems)	Increased capital investments (eg, development fees) required to protect broader communities from climate risks (eg, floodwalls, green infrastructure for heat mitigation)
Capitalization rate	Changes in capitalization rate due to perceptions of both physical and transition risks by market participants			

Mckinsey

Examples of financial drivers impacted by transition risk

Financial drivers

Financial drivers are identified by analysis of the typical inputs for the financial model of that asset type. Impacts on future asset revenues and costs are defined by: market and technology shifts, emerging policy and legal requirements, and mounting reputational pressures and investor sentiment as defined by the transition scenarios and outlined in the TCFD framework.

Financial impacts	Transition risk	Financial drivers
Revenue	Market and technology shifts	Consumer and market demand (eg number of cars on the road)
CapEx	Emerging policy and legal requirements/ Mounting reputational pressures	Property, plant or equipment related costs (eg emission reduction technologies)
OpEx	Emerging policy and legal requirements	Regulatory and compliance costs (eg emissions monitoring, carbon pricing)

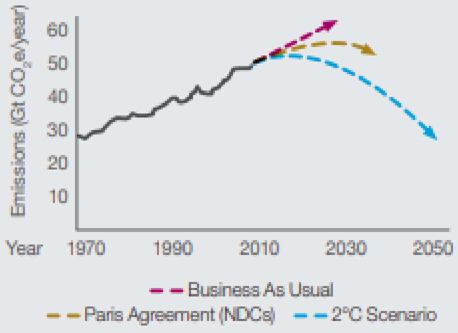
Figure 4: Examples of financial drivers of financial impacts

The financial cost and revenue drivers (e.g. typical inputs for the financial model of that asset type) are identified and assessed for any potential impact from transition risks.

Financial drivers are identified by analysis of the typical inputs for the financial model of that asset type. Impacts on future asset revenues and costs are defined by: market and technology shifts, emerging policy and legal requirements, and mounting reputational pressures and investor sentiment as defined by the transition scenarios.

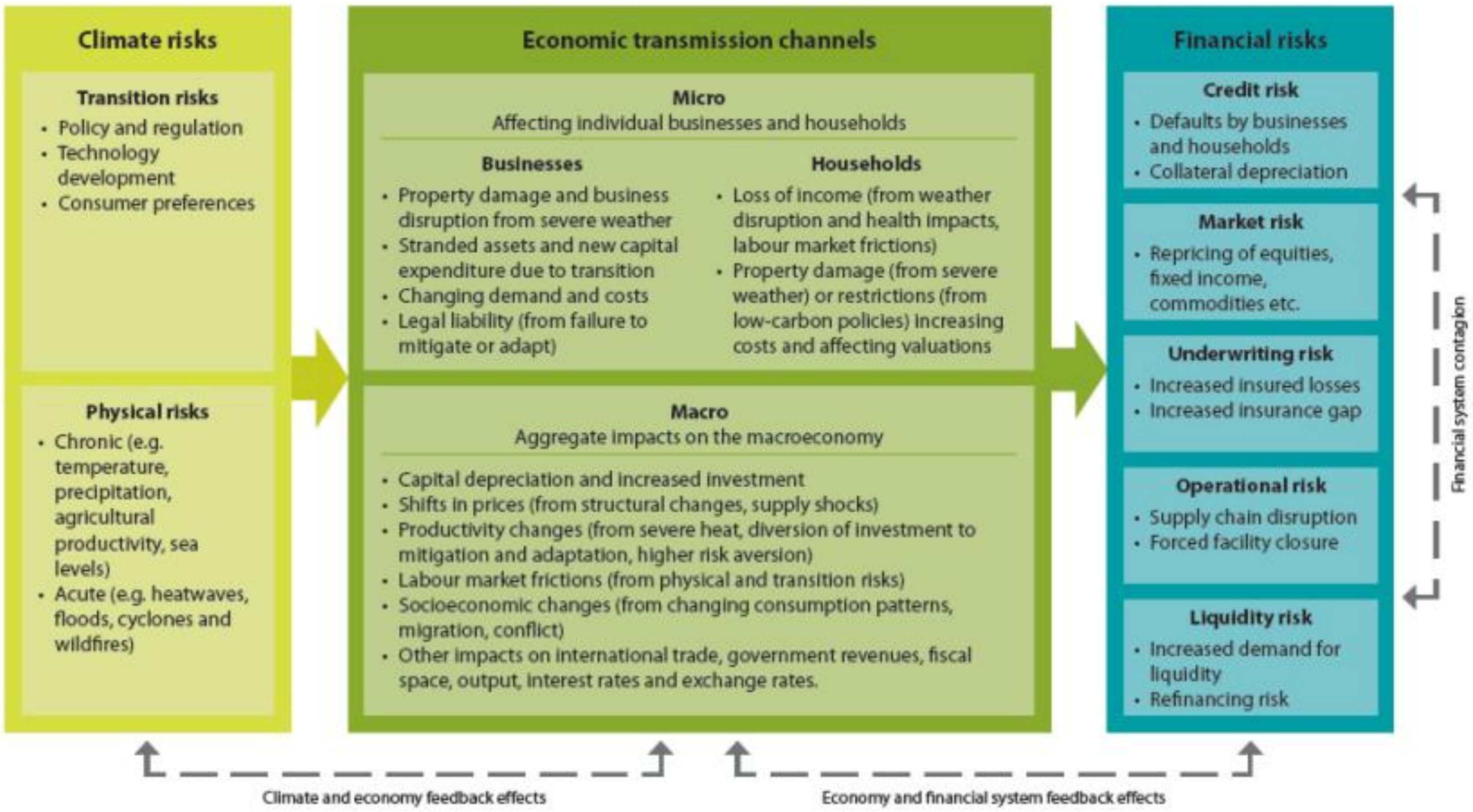
A **scenario-based approach** helps to assess the potential financial impacts transition risk may have for an asset's financial drivers and future financial performance.

Transition scenarios and base case
Business-as-Usual Trajectory to compare against the low carbon transition scenarios (3.7C)
Paris Agreement Pathway consistent with the nationally determined contributions from signatory countries (2.7C)
2C scenario Constrains energy-related emissions within a 50% chance limiting global warming to 2C



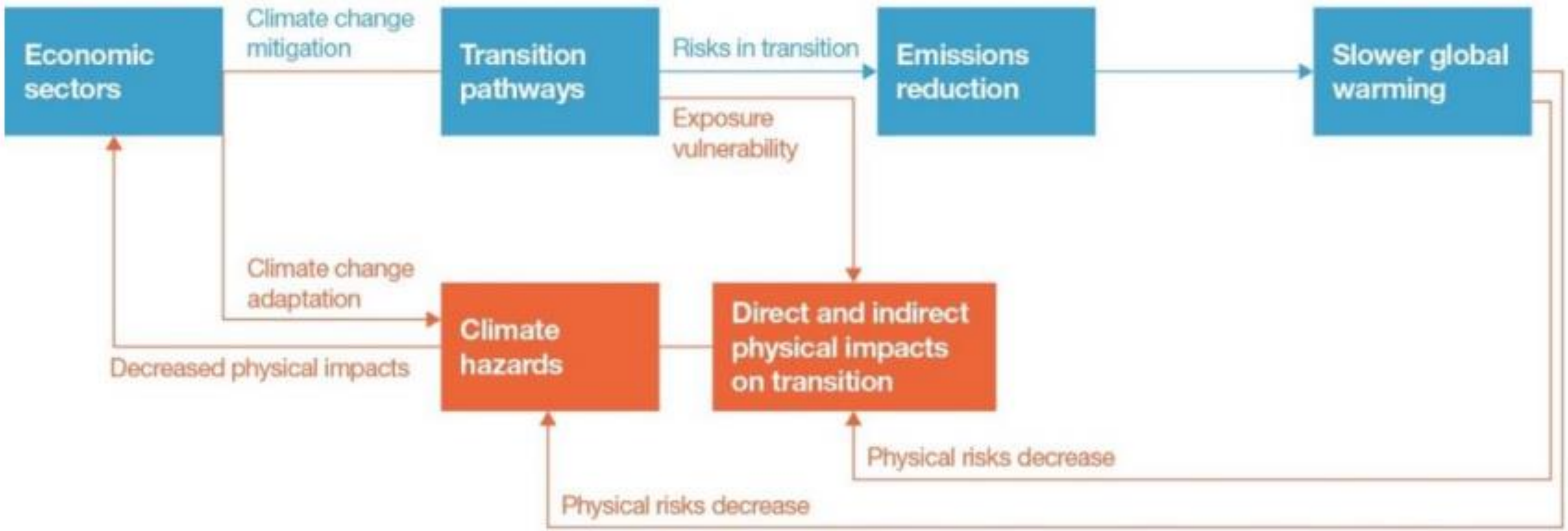
Source: ClimateWise Transition risk framework. Managing the impacts of the low carbon transition on infrastructure investments. University of Cambridge

Transition Channels
Climate Risks to Financial Risks



Source: ClimateWise Climate Tango: Principles for integrating physical and transition climate risk assessment with sector examples. University of Cambridge

With market shifts, advanced decarbonisation technology and more stringent policy and regulatory measures, the transition risks for a specific subsector on the transition pathway may be high. Physical risks, on the contrary, decrease due to the resulting emission reduction and consequent slower temperature rise. Thus, it is critical to understand the amount of transition-induced emission reduction and its implication for global temperature rise.



Source: ClimateWise Climate Tango: Principles for integrating physical and transition climate risk assessment with sector examples. University of Cambridge

CASE STUDY FOR QUANTIFYING THE TRANSITION IMPACT ON FINANCIAL DRIVERS

Source: ClimateWise Transition risk framework. Practitioners' Step-by-Step Guide. University of Cambridge

Quantify financial drivers and estimate impact on asset type

Once the financial drivers have been identified, the impact on the particular asset type can be assessed following the methodology outlined below.

Risk impact			Region	Trend		
Financial category	Financial driver	Methodology	Scenario indicator & data set	2020	2030	2040
Revenue	Plant utilisation	(1) Quantify changes in coal-fired power demand (IEA Paris Agreement (PA) vs BAU scenarios) to determine macro risk	Coal-fired power demand (IEA WEO NP vs CP) decreases by more than 25% by 2040, as coal is squeezed by continuing strong demand for natural gas and increasing uptake of renewables and nuclear			

Figure 5: Quantifying the transition impact on financial drivers

1. Assess the potential impact on each asset type's financial driver (eg one revenue driver for a coal-fired power plant is plant utilisation) by calculating the difference in the trajectory between a business-as-usual baseline and the low carbon transition scenarios using the scenario indicators and data sets as illustrated in Figure 5.

2. Define the scale of positive/negative impact on each financial driver, based on changes to the scenario indicator (eg coal-fired power demand in a region or country):

   Low carbon scenario vs business-as-usual impact on scenario indicator

   - High negative impact on the financial driver
   - Medium negative impact on the financial driver
   - Low negative impact on the financial driver
   - Minimal impact on the financial driver
   - Low positive impact on the financial driver
   - Medium positive impact on the financial driver
   - High positive impact on the financial driver

3. Assign risk weighting on the estimated relative contribution of each financial driver to the financial performance of each asset type:

   Financial driver contribution to asset financial performance:

   - High
   - Medium
   - Low

   Note: The risk weighting used in the Infrastructure Risk Exposure Matrix represents an initial view of the importance of the financial driver to the overall asset financial performance, based on a simplified financial model for a generic asset. Therefore, the weightings have to be validated once Step 3 of the framework – Interpolate financial drivers in the model – is completed.

4. Classify the overall exposure from transition risks and opportunities on the asset financial performance, based on cumulative net impact of the drivers associated with each asset type, for each region, scenario and timeline.

   Risk/Opp

   - High Opp
   - Medium Opp
   - Low Opp
   - Minimal
   - Low Risk
   - Med Risk
   - High Risk

Transition risk for the real estate sector can result from rising costs due to the pricing-in of carbon emissions and other factors such as high energy costs, stringent building codes, shifts in market expectations (public attention, decreasing demand for assets with high energy consumption and poor GHG performance, etc.) (UNEP FI 2020). In addition, other risks, such as competition, reputational and legal risks, may also arise for firms.

The term **'stranding risk'** implies potential write-downs due to direct climate change impacts and devaluations related to the transition to a low-carbon economy.

To limit climate-related risks, all sectors, including real estate, need to decarbonise. Buildings no longer compliant with the decarbonisation requirements will be increasingly exposed to transition risks and may even become **'stranded assets'**.

Stranded assets face higher retrofitting costs to put them back on track for decarbonization.

Table 1: Examples of transition risk and impacts on real estate

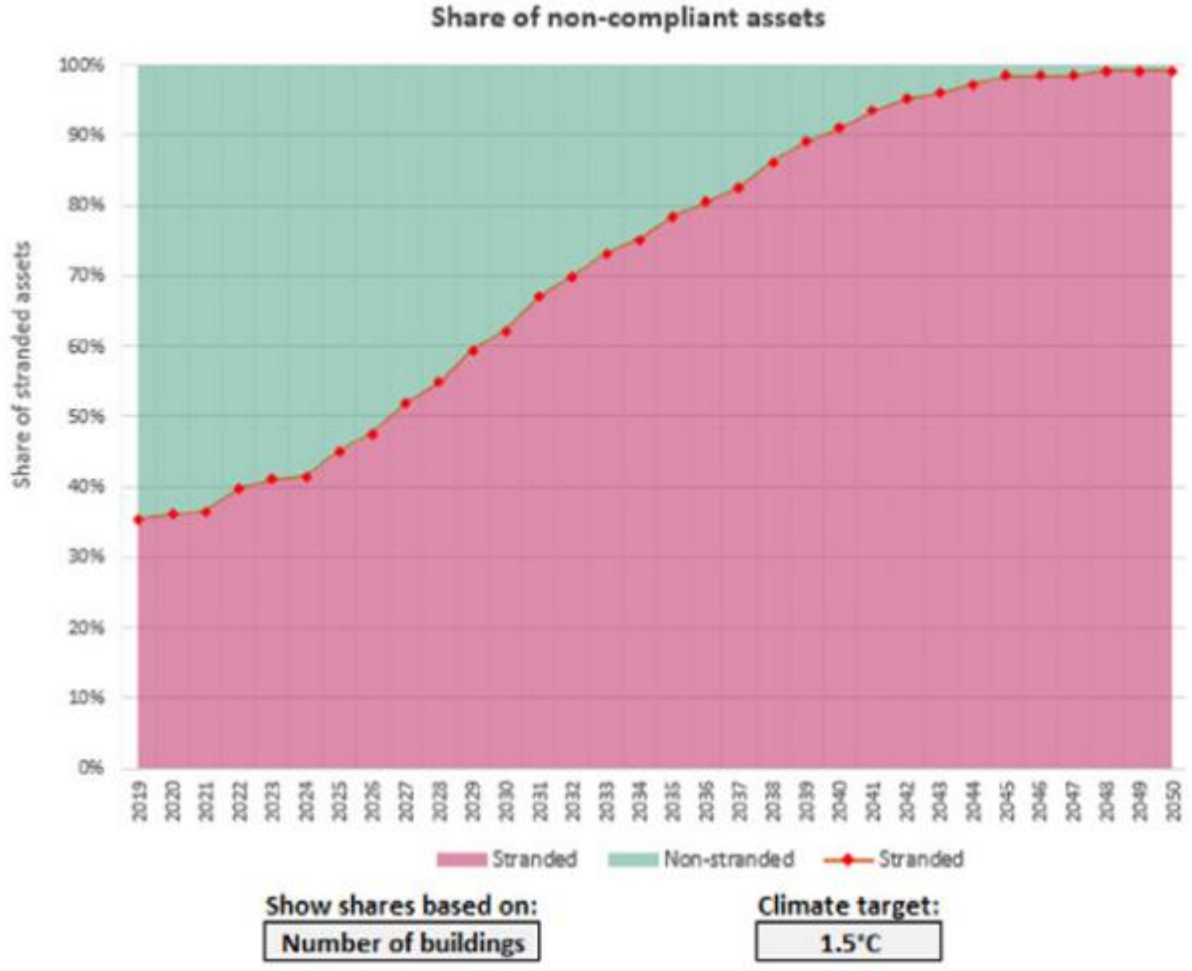
Transition Risk	Impact on Real Estate
Declining market attractiveness Declining attractiveness of submarkets due to increased vulnerability and exposure to higher costs	▪ Lower demand (investor and tenants) ▪ Lower competitive advantage by increasing energy costs for properties with high-energy intensities] ▪ Reduced asset values may lead to a depressed market environment ▪ Decreasing market values
Increasing regulation Legislation focused on climate change—e.g., disclosure of climate risks, stricter building standards, CO_2 pricing, carbon credits, etc.	▪ Tax increases, e.g. CO_2 tax ▪ Decrease in subsidies for certain technologies ▪ Additional costs from reporting requirements ▪ Additional investment costs to bring the real estate portfolio in line with national laws ▪ Enforced rules that properties can only be rented if they meet a certain energy standard
Risks to reputation and market positioning Stakeholder demand for real estate companies where climate risks are included in the investment calculation	▪ Loss of reputation if action is too late or if no action is taken ▪ Reputational risks for companies, that do not sufficiently consider ESG topics in their strategy

Source: CRREM 2022.

UNEPFI/managing-transition-risk-in-real-estate/ CRREM

Asia-Pacific Sub-Portfolio Analysis
Evolution of stranding within the portfolio (Asia-Pacific)

In the baseline year, the majority (65%) of the assets in the Asia-Pacific sub-portfolio complied with the threshold for the 1.5°C Paris-compliant target in terms of their GHG intensity. However, by 2050, only around 1% of all assets included in the Asia-Pacific sub-sample will be Paris-compliant. (Data comes from CRREM Carbon Risk Real Estate Monitor)

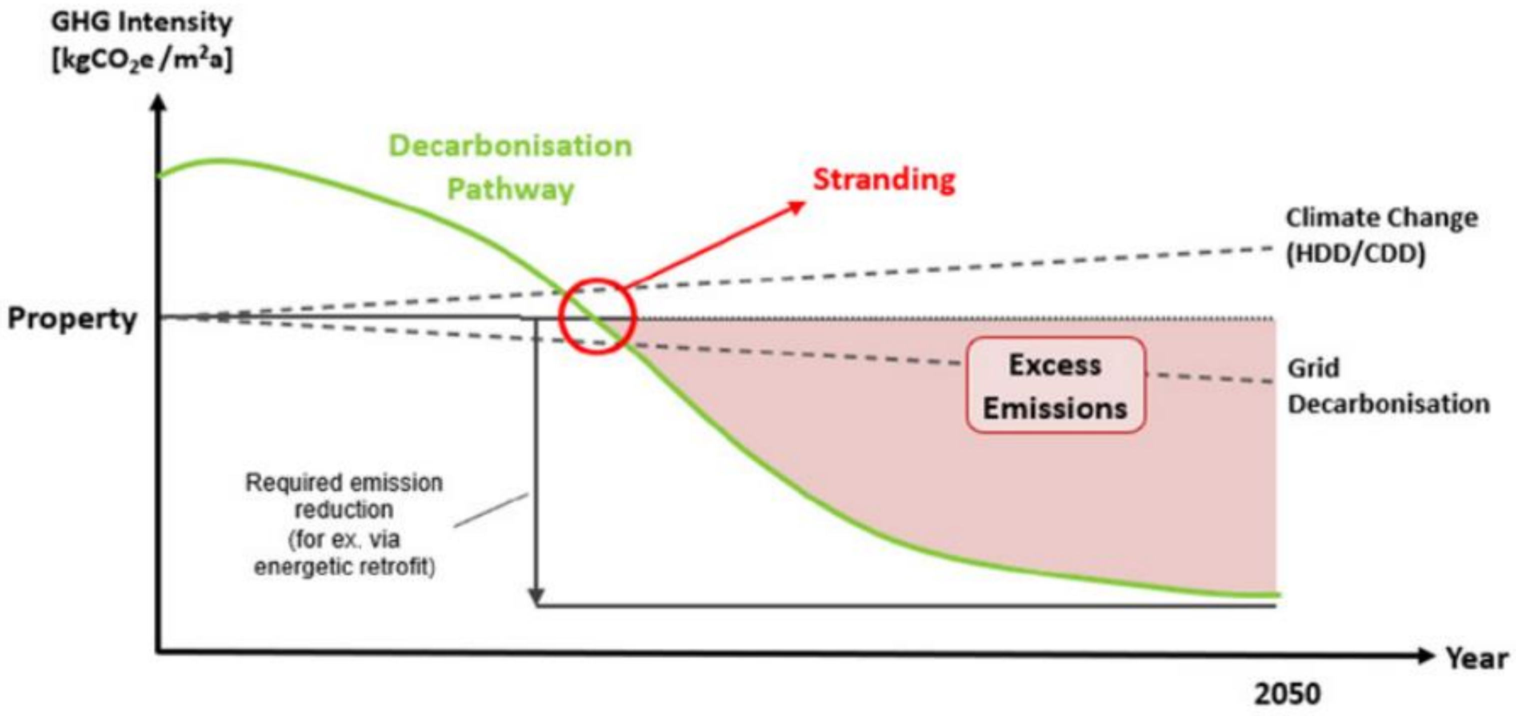


Source: CRREM tool output 2021.

UNEPFI/managing-transition-risk-in-real-estate/ CRREM

Addressing transition risk with the CRREM Risk Assessment Tool
Portfolio-Level Analysis

Figure 22: Stranding of real estate assets

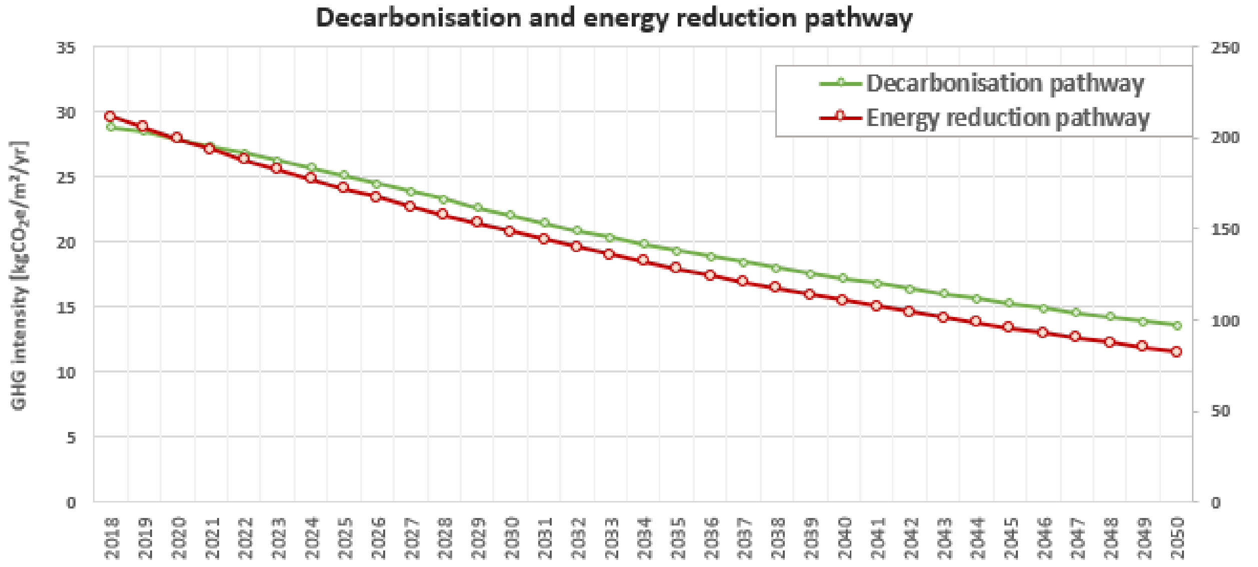


Source: CRREM 2022.

[UNEPFI/managing-transition-risk-in-real-estate/](#) [CRREM](#)

DECARBONISATION TARGET TOOL FOR BUILDING PORTFOLIO

The CRREM Decarbonisation Target Tool offers the possibility to assess country- and building-type-specific GHG intensity and energy reduction pathways aligned to limiting global warming to 1.5°C or 2°C.



Global warming target:	2°C
Country:	New Zealand
Type of use:	Office

Whole building GHG intensity pathway:

Year	kgCO₂e/m²/yr	Year	kgCO₂e/m²/yr
2018:	28.8	2035:	19.4
2019:	28.5	2036:	18.9
2020:	27.9	2037:	18.4
2021:	27.3	2038:	18.0
2022:	26.8	2039:	17.6
2023:	26.3	2040:	17.2
2024:	25.7	2041:	16.8
2025:	25.1	2042:	16.4
2026:	24.5	2043:	16.0
2027:	23.9	2044:	15.6
2028:	23.3	2045:	15.3
2029:	22.6	2046:	14.9
2030:	22.0	2047:	14.6
2031:	21.5	2048:	14.2
2032:	20.9	2049:	13.9
2033:	20.4	2050:	13.6
2034:	19.8		

Whole building energy intensity pathway:

Year	kWh/m²/yr	Year	kWh/m²/yr
2018:	211.6	2035:	128.3
2019:	205.5	2036:	124.6
2020:	199.5	2037:	121.0
2021:	193.8	2038:	117.5
2022:	188.1	2039:	114.1
2023:	182.7	2040:	110.8
2024:	177.4	2041:	107.6
2025:	172.2	2042:	104.4
2026:	167.2	2043:	101.4
2027:	162.4	2044:	98.5
2028:	157.7	2045:	95.6
2029:	153.1	2046:	92.8
2030:	148.7	2047:	90.2
2031:	144.4	2048:	87.5
2032:	140.2	2049:	85.0
2033:	136.1	2050:	82.5
2034:	132.2		

Working with CRREM I have adjusted their Risk Assessment Tool to New Zealand environment implementing CRREM GHG and Building intensity pathways for NZ with 1.5 °C or 2.0°C targets for different types of commercial buildings plus Emission Factor and Electricity Costs projection.

Case Study Example: 700sqm Office/Retail Building (two level) with Heat Pump Heating & Cooling, Electric Water Heating plus Ventilation and Lightning Systems.
Satisfying Building Performance aligned to 1.5 °C and 2.0°C targets.

General information

Asset Name	Reporting year	Gross Asset Value (GAV)	Reporting period: Starting month	Reporting period: Months of data	Entity
	Mandatory	Optional (required for calculating certain risk indicators)	Mandatory	Mandatory	Optional (for further possibilities of aggregation)
Text	Year	[I]	Drop-down	Number of Months	Text
NAME	AS.YR	GAV	AS.MON	AS.LENG	ENT
SGHU Valuations	2018	1,950,000	January	12	SGHU
SGHU Valuations	2019	2,075,000	January	12	SGHU
SGHU Valuations	2020	2,125,000	January	12	SGHU

Building characteristics

Location: Country	Location: City	Location: Zip Code / HDD & CDD	Location: Address	Property type	Floor area share of different property types in mixed use buildings: Office	Retail, High Street	Retail, Shopping Center	Retail, Warehouse	Industrial, Distribution Warehouse	Hotel	Healthcare	Lodging, Leisure & Recreation	Residential	Check if floor area shares sum up to 100%	Air conditioning	Asset size: Total gross internal area (IPMS 2)	Asset size: Average annual vacant area
Mandatory	Optional (only to be displayed in results)	Mandatory	Optional (only to be displayed in results)	Mandatory	Mandatory if Property type - Mixed Use	Mandatory if Property type - Mixed Use	Mandatory if Property type - Mixed Use	Mandatory if Property type - Mixed Use	Mandatory if Property type - Mixed Use	Mandatory if Property type - Mixed Use	Mandatory if Property type - Mixed Use	Mandatory if Property type - Mixed Use	Mandatory if Property type - Mixed Use		Optional	Mandatory	Mandatory
Drop-down	Text	Text/Numbers	Text	Type of use	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]		Drop-down	[m²]	[m²]
COUN	CITY	ZIP /HDD/CDD Code	Address	AS.TY										MX.100	AC.YN	TO.FL	BSR_OC.AN
New Zealand	Hamilton	3204	433 Victoria Street	Office											Yes	700	-
New Zealand	Hamilton	3204	433 Victoria Street	Office											Yes	700	-
New Zealand	Hamilton	3204	433 Victoria Street	Office											Yes	700	-

Total energy procurement

Energy procured by tenants – Grid Electricity: Usage	Data Coverage	Maximum Coverage
	Mandatory if usage ≠ 0	Mandatory if usage ≠ 0
[kWh]	[-]	[-]
EL.GRID	EL.DC	EL.MC
34,000	700	700
32,000	700	700
30,000	700	700

Select an asset (ID) to see results: 1

Global warming target: 2°C

Click here to define own targets ('Settings' sheet)

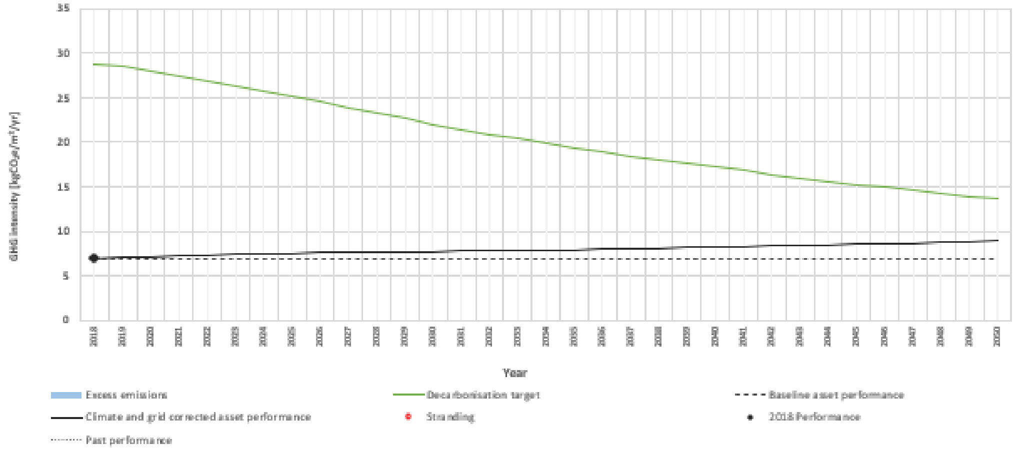
Click to see further tabular results for the selected

Click here to see calculation parameters (default or user-defined for selected asset

STRANDING DIAGRAM (Asset #1 – SGHU Valuations)

Based on global warming target: 2°C

Display excess emissions: Yes



Year of stranding: 2°C-ready

Type of use: Office

Country: New Zealand

Carbon value at Risk: -0.84%

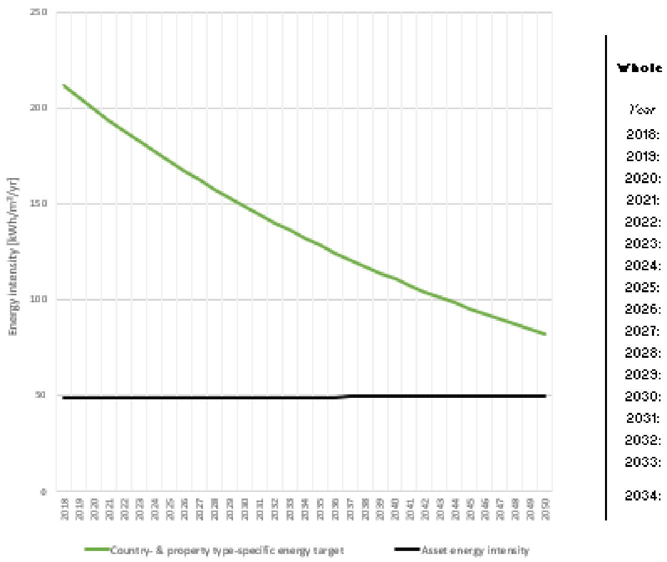
Baseline GHG Intensity: 7. $kgCO_2e/m^2$

Whole building GHG intensity targets 2°C-targ

Year	$kgCO_2e/m^2/yr$	Year	$kgCO_2e/m^2/yr$
2018:	28.8	2035:	19.4
2019:	28.5	2036:	18.9
2020:	27.9	2037:	18.4
2021:	27.3	2038:	18.0
2022:	26.8	2039:	17.6
2023:	26.3	2040:	17.2
2024:	25.7	2041:	16.8
2025:	25.1	2042:	16.4
2026:	24.5	2043:	16.0
2027:	23.9	2044:	15.6
2028:	23.3	2045:	15.3
2029:	22.6	2046:	14.9
2030:	22.0	2047:	14.6
2031:	21.5	2048:	14.2
2032:	20.9	2049:	13.9
2033:	20.4	2050:	13.6
2034:	19.8		

ENERGY REDUTION PATHWAY (Asset #1 – SGHU Valuations)

Based on net energy = procured energy - exported energy = consumed energy - on-site generated energy

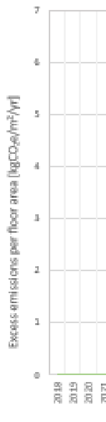


Year of exceedance: exceedance

Whole building energy reduction pathway [kWh/m²/yr]

Year	Target	Year	Target
2018:	212	2035:	128
2019:	206	2036:	125
2020:	200	2037:	121
2021:	194	2038:	117
2022:	188	2039:	114
2023:	183	2040:	111
2024:	177	2041:	108
2025:	172	2042:	104
2026:	167	2043:	101
2027:	162	2044:	98
2028:	158	2045:	96
2029:	153	2046:	93
2030:	149	2047:	90
2031:	144	2048:	88
2032:	140	2049:	85
2033:	136	2050:	83
2034:	132		

XCESS EMISS



Cumul emissi [t

Summary of individual assets:

Asset ID	Asset name	Entity	Click on 'edit' to modify your input for the specific asset	Click on 'User-defined settings' to change assumptions individually	Total GHG emissions in reporting year [tCO_2e/yr]	Whole building GHG intensity in reporting year [$kgCO_2e/m^2/yr$]	Whole building direct emissions intensity in reporting year [$kgCO_2e/m^2/yr$]	Whole building indirect GHG intensity in reporting year [$kgCO_2e/m^2/yr$]	1.5°C-target cumulative excess emissions until 2050 [tCO_2e]	2°C-target cumulative excess emissions until 2050 [tCO_2e]	Cumulative emissions until 2050 [tCO_2e]	1.5°C-target emission budget until 2050 [tCO_2e]	2°C-target emission budget until 2050 [tCO_2e]	Total costs of energy consumption including carbon price in reporting year [€/yr]	Total costs of energy consumption including carbon price per floor area in reporting year [€/m²/yr]	Market- vs. Location-based method	Country	ZIP Code	City	Address	Property type	NUTS3 region (if ZIP Code is geocoded)	GHG intensity targets (1.5°C target)	2018 [$kgCO_2e/m^2$]	2019 [$kgCO_2e/m^2$]	2020 [$kgCO_2e/m^2$]	2021 [$kgCO_2e/m^2$]
1	SGHU Valuations	SGHU	Edit asset input	User-defined settings	4.876	6.966	0.0	7.0	32	0	184	282	473	7,233	10	Location-based	New Zealand	3204	Hamilton	433 Victoria Street	Office	-		28.8	27.3	25.6	24.0
2	SGHU Valuations	SGHU	Edit asset input	User-defined settings	5	6.556	0.0	6.6	27	0	173	282	473	6,807	10	Location-based	New Zealand	3204	Hamilton	433 Victoria Street	Office	-		28.8	27.3	25.6	24.0
3	SGHU Valuations	SGHU	Edit asset input	User-defined settings	4	6.1	0.0	6.2	23	0	162	282	473	6,382	9	Location-based	New Zealand	3204	Hamilton	433 Victoria Street	Office	-		28.8	27.3	25.6	24.0

GHG intensity targets (1.5°C target)

2018 [kgCO2e/m²]	2019 [kgCO2e/m²]	2020 [kgCO2e/m²]	2021 [kgCO2e/m²]	2022 [kgCO2e/m²]	2023 [kgCO2e/m²]	2024 [kgCO2e/m²]	2025 [kgCO2e/m²]	2026 [kgCO2e/m²]	2027 [kgCO2e/m²]	2028 [kgCO2e/m²]	2029 [kgCO2e/m²]	2030 [kgCO2e/m²]	2031 [kgCO2e/m²]	2032 [kgCO2e/m²]	2033 [kgCO2e/m²]	2034 [kgCO2e/m²]
28.8	27.3	25.6	24.0	22.6	21.2	19.9	18.7	17.5	16.4	15.4	14.4	13.5	12.6	11.8	11.1	10.3
28.8	27.3	25.6	24.0	22.6	21.2	19.9	18.7	17.5	16.4	15.4	14.4	13.5	12.6	11.8	11.1	10.3
28.8	27.3	25.6	24.0	22.6	21.2	19.9	18.7	17.5	16.4	15.4	14.4	13.5	12.6	11.8	11.1	10.3

2035 [kgCO2e/m²]	2036 [kgCO2e/m²]	2037 [kgCO2e/m²]	2038 [kgCO2e/m²]	2039 [kgCO2e/m²]	2040 [kgCO2e/m²]	2041 [kgCO2e/m²]	2042 [kgCO2e/m²]	2043 [kgCO2e/m²]	2044 [kgCO2e/m²]	2045 [kgCO2e/m²]	2046 [kgCO2e/m²]	2047 [kgCO2e/m²]	2048 [kgCO2e/m²]	2049 [kgCO2e/m²]	2050 [kgCO2e/m²]	GHG intensity targets (1.5°C tar
9.6	9.0	8.4	7.8	7.2	6.6	6.1	5.6	5.2	4.7	4.4	4.0	3.7	3.5	3.3	3.1	
9.6	9.0	8.4	7.8	7.2	6.6	6.1	5.6	5.2	4.7	4.4	4.0	3.7	3.5	3.3	3.1	
9.6	9.0	8.4	7.8	7.2	6.6	6.1	5.6	5.2	4.7	4.4	4.0	3.7	3.5	3.3	3.1	

GHG intensity targets (2°C target)

2018 [kgCO2e/m²]	2019 [kgCO2e/m²]	2020 [kgCO2e/m²]	2021 [kgCO2e/m²]	2022 [kgCO2e/m²]	2023 [kgCO2e/m²]	2024 [kgCO2e/m²]	2025 [kgCO2e/m²]	2026 [kgCO2e/m²]	2027 [kgCO2e/m²]	2028 [kgCO2e/m²]	2029 [kgCO2e/m²]	2030 [kgCO2e/m²]	2031 [kgCO2e/m²]	2032 [kgCO2e/m²]	2033 [kgCO2e/m²]	2034 [kgCO2e/m²]
28.8	28.5	27.9	27.3	26.8	26.3	25.7	25.1	24.5	23.9	23.3	22.6	22.0	21.5	20.9	20.4	19.8
28.8	28.5	27.9	27.3	26.8	26.3	25.7	25.1	24.5	23.9	23.3	22.6	22.0	21.5	20.9	20.4	19.8
28.8	28.5	27.9	27.3	26.8	26.3	25.7	25.1	24.5	23.9	23.3	22.6	22.0	21.5	20.9	20.4	19.8

2035 [kgCO2e/m²]	2036 [kgCO2e/m²]	2037 [kgCO2e/m²]	2038 [kgCO2e/m²]	2039 [kgCO2e/m²]	2040 [kgCO2e/m²]	2041 [kgCO2e/m²]	2042 [kgCO2e/m²]	2043 [kgCO2e/m²]	2044 [kgCO2e/m²]	2045 [kgCO2e/m²]	2046 [kgCO2e/m²]	2047 [kgCO2e/m²]	2048 [kgCO2e/m²]	2049 [kgCO2e/m²]	2050 [kgCO2e/m²]	GHG intensity targets (2°C targe
19.4	18.9	18.4	18.0	17.6	17.2	16.8	16.4	16.0	15.6	15.3	14.9	14.6	14.2	13.9	13.6	
19.4	18.9	18.4	18.0	17.6	17.2	16.8	16.4	16.0	15.6	15.3	14.9	14.6	14.2	13.9	13.6	
19.4	18.9	18.4	18.0	17.6	17.2	16.8	16.4	16.0	15.6	15.3	14.9	14.6	14.2	13.9	13.6	

PORTFOLIO SUMMARY

Asset ID (click on an Asset ID to change input data)	Year of Stranding		Discounted costs of excess emissions (incl. value of emissions below pathway, red: costs > value - green: value ≥ costs)				Cumulated excess emissions until 2050				GHG-Intensity baseline year [kgCO₂e/m²/yr]	Cumulative emissions baseline year-2050 [tCO₂e]	Emission budget baseline year-2050 [tCO₂e] (red: budget < cum. emissions - green: budget ≥ cum. Emissions)	
			Carbon value at Risk (costs per GAV)		Absolute [$]		Absolute [kgCO₂e]		Per GFA [kgCO₂e/m²]					
			Set discount rate: 3%											
	1.5°C-target	2°C-target	1.5°C-target	2°C-target	1.5°C-target	2°C-target	1.5°C-target	2°C-target	1.5°C-target	2°C-target			1.5°C-target	2°C-target
3	2039	2°C-ready	-0.2%	-0.7%	- 4,713	- 15,123	23,009	-	33	-	6	162	282	473
Σ			-0.2%	-0.7%	- 4,713	- 15,123	23,009	-	33	-	6	162	282	473

Evaluation of Direct Climate Risks

Elements at risk, Exposure, and Vulnerability

We assess direct climate risks by looking at:

- the elements at risk: environmental processes and resources, infrastructure, or economic assets
- their exposure to the climate hazard
- their vulnerability which comprises sensitivity and adaptive capacity.

environment.govt.nz/climate-risk-assessment-guide

Exposure rating	Qualitative definition	Quantitative definition
Extreme	Significant and widespread exposure of elements to the hazard	>75% of sector or element is exposed to the hazard
High	High exposure of elements to the hazard	50–75% of sector or element is exposed to the hazard
Moderate	Moderate exposure of elements to the hazard	25–50% of sector or element is exposed to the hazard
Low	Isolated elements are exposed to the hazard	5–25% of sector or element is exposed to the hazard

Vulnerability rating	Definition
Extreme	Extremely likely to be adversely affected, because the element or asset is highly sensitive to a given hazard and has a low capacity to adapt.
High	Highly likely to be adversely affected, because the element or asset is highly sensitive to a given hazard and has a low capacity to adapt.
Moderate	Moderately likely to be adversely affected, because the element is moderately sensitive to a given hazard and has a low or moderate capacity to adapt.
Low	Low likelihood of being adversely affected, because the element has low sensitivity to a given hazard and a high capacity to adapt.

Table 11: Risk matrix (combining vulnerability and exposure)

		Exposure			
		Low (L)	Moderate (M)	High (H)	Extreme (E)
Vulnerability	Extreme (4)	Moderate	High	Extreme	Extreme
	High (3)	Low	Moderate	High	Extreme
	Moderate (2)	Low	Moderate	Moderate	High
	Low (1)	Low	Low	Moderate	High

https://environment.govt.nz/assets/publications/climate-risk-assessment-guide.pdf

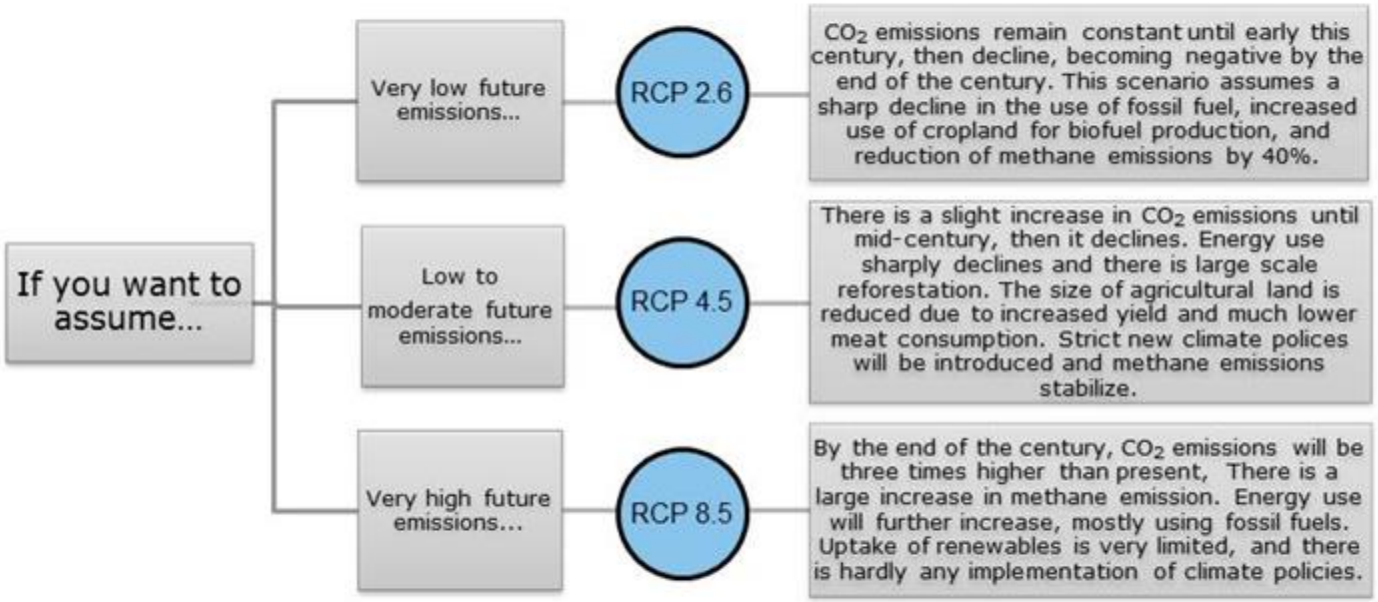
Example of Risk Rating Table For Infrastructure

Table 12: Example of risk rating table (infrastructure)

Risks		Risk rating				
#	Risk statement	Present	2050 RCP4.5	2050 RCP8.5	2100 RCP4.5	2100 RCP8.5
A	Risk to road infrastructure due to increasing landslides	High	High	High	Extreme	Extreme
B	Risk to rail infrastructure due to coastal hazards	High	High	High	Extreme	Extreme
C	Risk to buried three waters infrastructure due to sea-level and groundwater rise	Moderate	High	High	Extreme	Extreme
D	Risk to wastewater treatment plants due to coastal inundation	Moderate	High	High	Extreme	Extreme
E	Risk to drainage infrastructure due to increased rainfall	Moderate	High	High	High	Extreme

Environment.govt.nz/climate-risk-assessment-guide

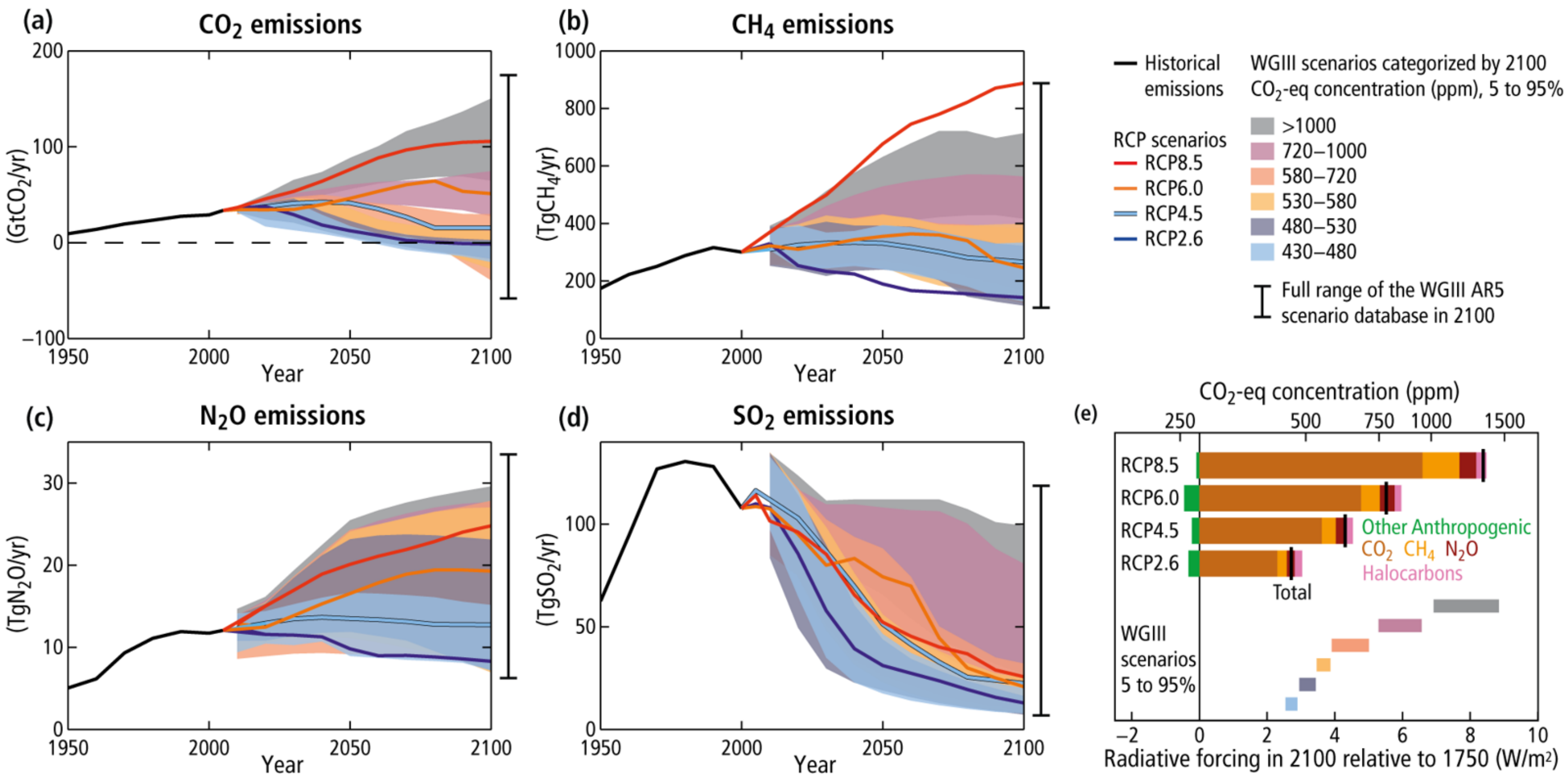
Risks are rated against Emissions Scenarios (RCPs):



climateinformation.org.

IPCC - The Representative Concentration Pathways (RCPs) / Emissions Scenarios

The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change. RCPs are identified by their approximate total (accumulated) radiative forcing at 2100 relative to 1750. They quantify future greenhouse gas concentrations and the radiative forcing (additional energy taken up by the Earth system), due to increases in climate change pollution.



[IPCC - ar5-syr.ipcc.ch/topic_futurechanges.php](ar5-syr.ipcc.ch/topic_futurechanges.php) climateinformation.org.

Considerations for real estate-focused research and valuation analysis

- The size and longevity of pricing effects of climate events and risks on commercial real estate.
- The impact of climate events on income and income growth.
- The potential costs and benefits of resilience expenditure on existing stock.
- The required and possible response of insurers and lenders to support of ‘at-risk’ assets.

https://www.unepfi.org/wordpress/wp-content/uploads/2021/08/Climate-risk-and-real-estate-value_Aug2021.pdf

Basis of Value

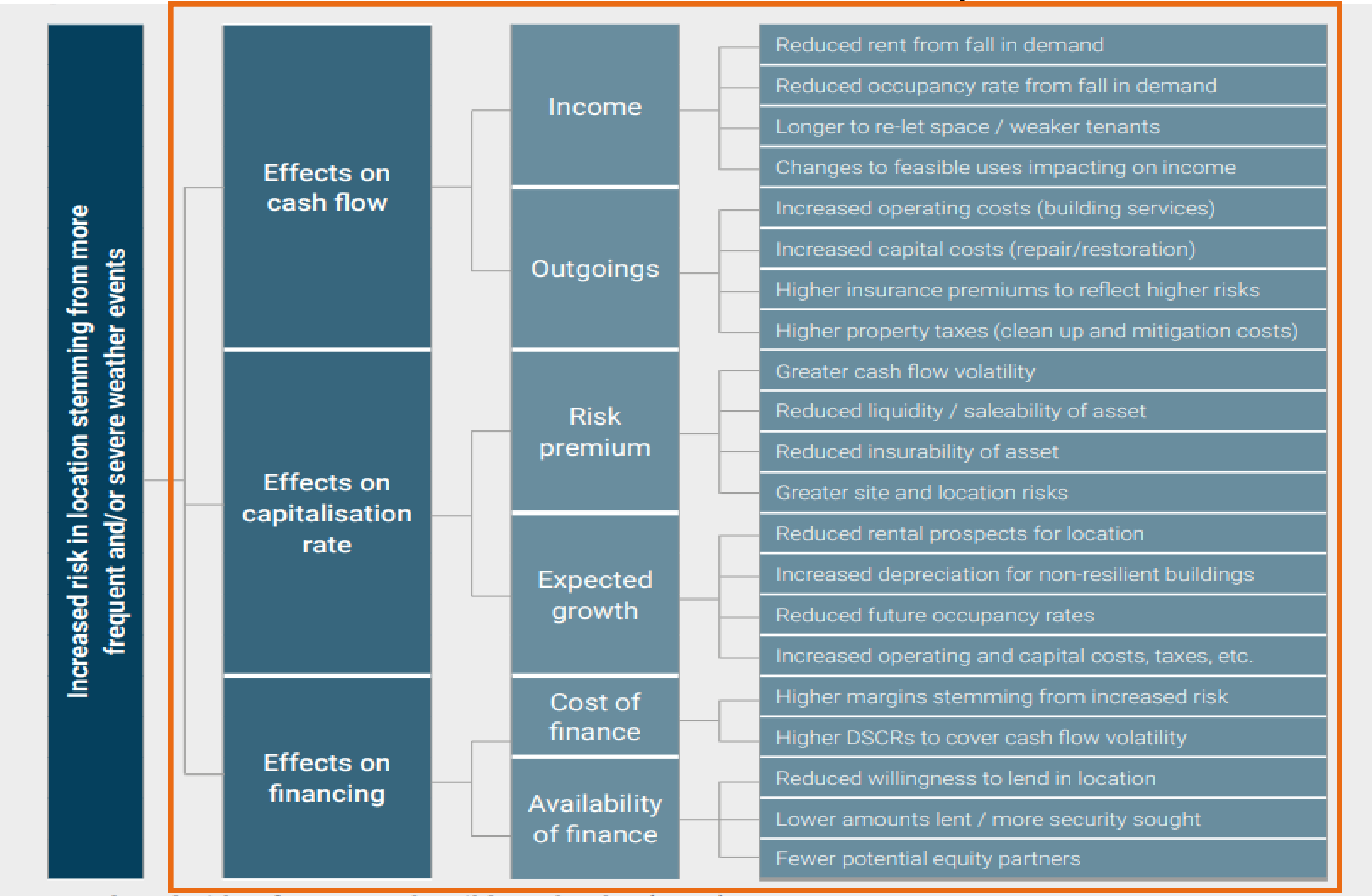
The most common instruction for valuations is on the basis of Market Value or Fair Value. A client may also instruct a valuation on the basis of Investment Value (Worth) in order to make decisions related to the value of an asset for their specific needs.

Sustainability and ESG factors may be of varying levels of interest to valuation stakeholders subject to their own requirements, those of other relevant market participants, and regulation and statute relevant to the jurisdiction.

Market Value may not be reflective of an individual client’s requirements or sustainability needs; these may instead reflect Investment Value (Worth) – although this should not be assumed to be the case, with sustainability and ESG a key concern across markets.

https://www.rics.org/globalassets/rics-website/media/upholding-professional-standards/regulation/valuation/sustainability-and-esg-guidance-note_december-2021_v1.pdf

Anticipated effects of increased exposure to climate risk on commercial real estate asset performance



Developed with reference to de Wilde and Coley (2011)

UNEPFI/Climate-risk-and-real-estate-value

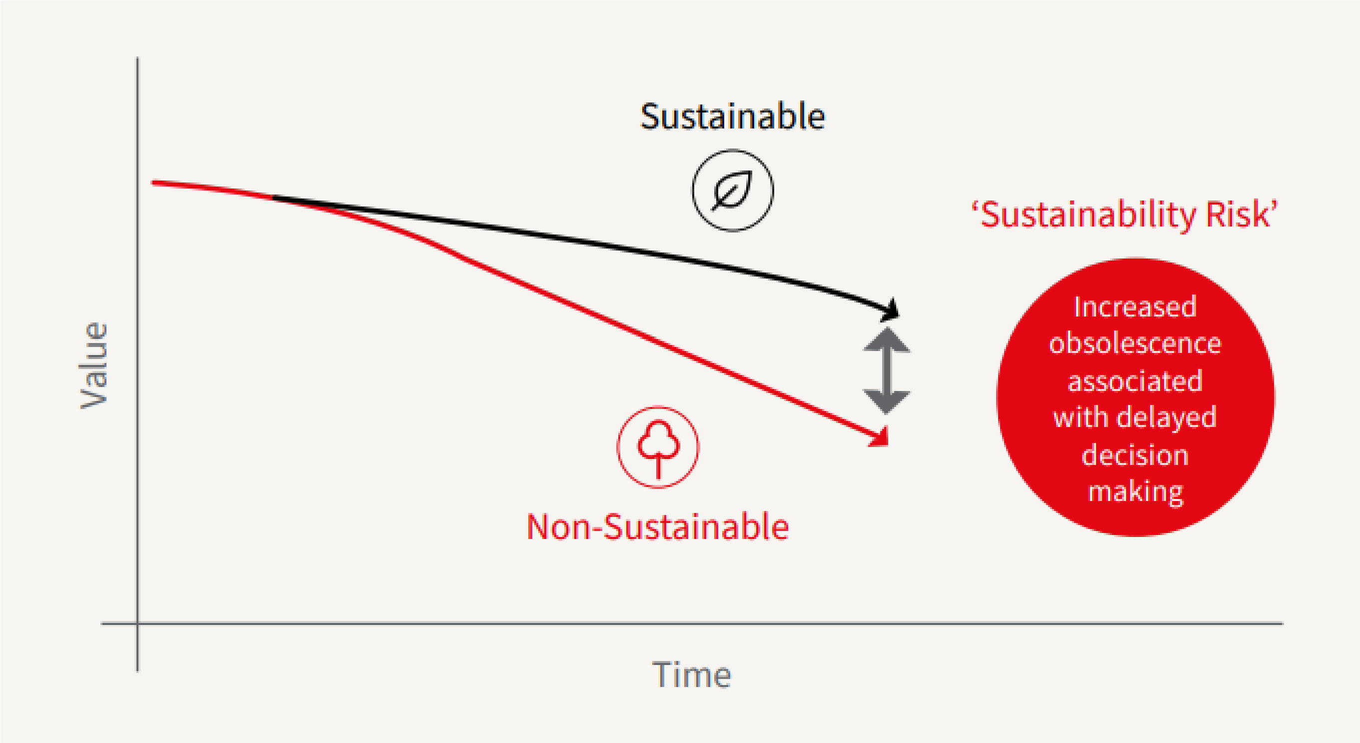
It is becoming evident that a property's economic value also depends on the building's capability to create and protect environmental, social and cultural values UNEPFI and also,
that the use of financial performance indicators should be linked to non-financial performance indicators of buildings.

(Sustainability and property valuetion
Lorenz, Lützkendorf et al., 2011)

The Market Value of a property asset is of interest for almost all actors. Its development or stability respectively is one of the key financial performance indicators. The Market Value figure of an asset is always based on an assessment made by professional valuers. Assessment of the Market Value is a difficult exercise which is made even more difficult due to the challenges imposed by sustainable development. UNEPFI

The consideration of ESG factors into the valuation is in an early stage, however several factors are already measured by professional valuers into valuation analysis (e.g. explicit DCF models / specific risk premium to the discount rate). An important point of attention is avoiding to double count such ESG valuation impacts. ESG criteria & metrics should therefore be discussed and further developed to include ESG risk measuring and pricing.

Increased obsolescence of properties that do not meet market and legislative sustainability standards



Valuing net zero & ESG for offices (jll.co.uk)

Thank You For Your Attention

Image: Tecnovino

World Environment Day (5th June)