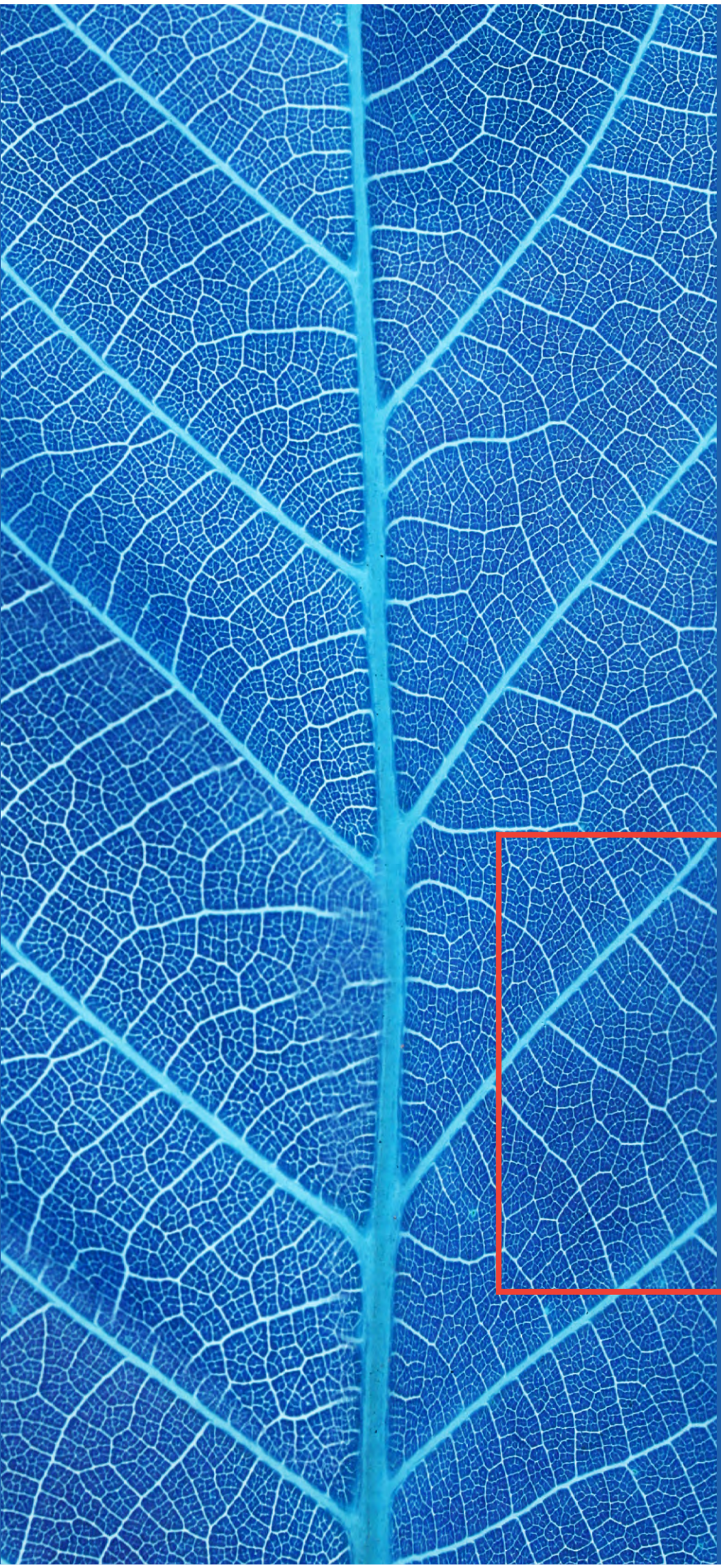

UOB

Forging our net zero future

Forging our net zero future

UOB's commitment to building a sustainable ASEAN

October 2022

With support from
OliverWyman

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Foreword

The global call for stronger and coordinated climate action is getting louder and more urgent. Increasingly, countries and companies are pledging their commitment to net zero emissions, and are setting measurable goals and planning tangible actions to support the global transition. We cannot pass the responsibility to future generations; we must address the transition with urgency today.

Financial institutions have a key role to play in supporting the transition to a net zero economy that will no longer be reliant on fossil fuels.

The global transition requires huge investments in new technologies, revamps of supply chains and changes in business models. But these events will not be equal in pace across the world. The hard work ahead of us is to chart decarbonisation paths that are relevant to diverse economies while achieving the goal of net zero.

In Asia and particularly Southeast Asia, socioeconomic challenges must be carefully considered alongside net zero ambitions. There must be an orderly and just transition across the region to ensure that the lives and livelihoods can continue to improve. Public-private partnerships and financing are critical to drive the region's progress in this area so that emerging markets can decarbonise in tandem with social and economic development.

At UOB, our promise is to do right by our customers and our stakeholders. As a responsible steward, we have a role to help channel the resources needed to the relevant parties on this journey to reach global net zero. We pledge to work closely with policymakers, peers and clients to reach our common goal.

We are mindful to balance growth with responsibility as we develop our net zero commitment and pathways. Our targets are ambitious, meeting the global goals of net zero within a regional context. We have also focused on sectors that are most material to our business and where we believe we can best support our clients and their transition. These sectors are interconnected and there are synergies in their positive impact as they make the shift together.

There will inevitably be challenges on the path towards achieving our collective net zero goals while ensuring a just transition. Effective collaboration is critical and UOB remains steadfast in our ongoing engagement with global and regional stakeholders. Through coordinated efforts with our clients and the wider communities, we will be able to achieve a multiplier effect as we strive to build a sustainable future for the people and businesses within ASEAN, and those connecting with the region.

Wee Ee Cheong
Deputy Chairman and Chief Executive Officer
UOB
31 October 2022

Forging our net zero future

UOB's commitment to building a sustainable ASEAN

Achieve net zero emissions by mid-century to limit global temperature rise

Fossil fuel-heavy economies in Southeast Asia

Intensifying weather events expected to disrupt economic activities globally

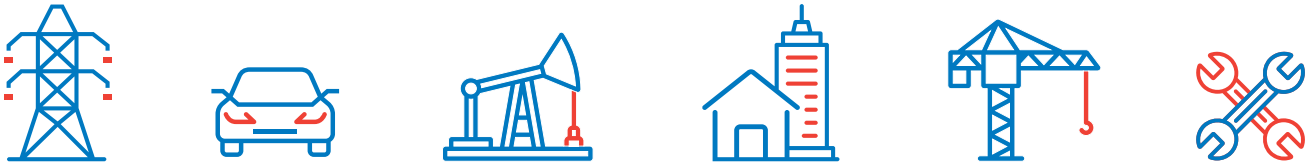
Balancing economic growth with decarbonisation

35% Projected decline in ASEAN's GDP by 2050 with inaction

Increasing energy access and maintaining security

UOB's commitment to net zero demonstrates our strong belief in a just transition that continues to support economic growth and improve energy access across the diverse economies in the region.

Net zero targets and commitments for six sectors



Power | Automotive | Oil & Gas (O&G) | Real Estate | Construction | Steel

Cover ~60% of our corporate lending portfolio

Energy ecosystem

73%

Global CO_2 emissions contributed by burning of fossil fuels[1]

Reducing emissions from the burning of fossil fuels is critical.

We need to reduce the supply and demand.

38%

Projected increase in energy consumption from 2020 to 2030[2]

Economic expansion, housing and mobility needs of a growing middle class will increase the demand for energy in Southeast Asia.

Largest users of fossil fuels

Power

Emissions intensity target:

-61% by 2030

-98% by 2050

We will work with power generation companies and equipment manufacturers to:

support our clients' in adopting decarbonisation targets

increase financing for new renewable energy

Automotive

Emissions intensity target:

-58% by 2030

-100% by 2050

We will work with equipment manufacturers, dealers, and financial leasing companies to:

support our clients in securing electric vehicle (EV) supply chains

finance EV-focused businesses & activities

Supply of fossil fuels

O&G

Sectoral commitment:

No new project financing for upstream O&G projects approved for development after 2022

We will support our clients' under our Transition Finance Framework to finance:

renewable energy, low emissions fuel alternatives, emissions reduction technologies and efficiency improvements in refining and other processes

generation and use of carbon credits

Thermal Coal

Exit financing for the thermal coal sector by 2039

[1] Source: GFANZ, *Guidance on Use of Sectoral Pathways for Financial Institutions*, June 2022.

[2] Source: International Energy Agency (IEA), *World Energy Outlook*, October 2021.

Built Environment ecosystem

39%

Global energy-related CO_2 emissions contributed by built environment[1]

The built environment ecosystem is a key consumer of the world's carbon budget.

40%

World Green Building Council's 2030 reduction target for embodied carbon[2]

In Southeast Asia, population growth and accelerated urbanisation have given rise to the demand for new buildings and increase in energy use.

Operational emissions

Real Estate

Emissions intensity target:

-36% by 2030

-97% by 2050

We will work with property developers, operators, investment companies and REITs to:

encourage the adoption of energy efficiency standards for buildings

finance more energy efficient buildings

finance installation of renewable energy and energy efficiency retrofits in buildings

Emissions during construction process

Construction

Emissions intensity target:

-31% by 2030

-85% by 2050

We will work with companies engaged in construction and demolition to:

encourage the deployment of low carbon construction processes

improve their emissions intensity profile

finance installation of on-site renewable energy

Building materials manufacturing

Steel

Emissions intensity target:

-20% by 2030

-92% by 2050

We will work with crude steel and fabricated metal producers, and traders to:

encourage the shift towards electric arc furnace production method

support research and development of new technologies

finance improvements in plant efficiency

[1] Source: World Green Building Council, *Bringing Embodied Carbon Upfront*, September 2019.

[2] Source: World Green Building Council, *WorldGBC Net Zero Carbon Buildings Commitment - Introduction: Businesses & Organisations*, September 2021.

Introduction

Climate change is intensifying with global greenhouse gas (GHG) emissions continuing to rise. If global warming continues to increase at the current rate, global temperatures are likely to exceed 1.5°C above pre-industrial levels between 2030 and 2052[1]. Unabated GHG emissions will have profound negative implications across the global community and economy.

Southeast Asia, a region with almost 700 million in population, is UOB's home ground and where our strategic focus is. Also one of the most vulnerable regions to climate change, Southeast Asia is facing stark consequences – rising sea levels, heat waves, droughts and increasingly severe rainstorms and floods. Heavy rain events will intensify by 7% for each degree of global warming, exacerbating the danger of flooding. Rising waters are expected to cost the region's major cities billions in protection and damages this decade. These climate events affect Southeast Asia's key sectors such as agriculture, fishing and tourism, with the region facing a risk of losing more than 35% of its gross domestic product (GDP) by 2050[2].

With climate change repeatedly being identified as a critical issue at ASEAN summits, countries in the region recognise this intensifying crisis. In the lead-up to the UN Climate Change Conference (COP26) in 2021, several countries in Southeast Asia had already stepped up their national commitments to achieve net zero and to reduce reliance on coal-fired power. Indonesia, Southeast Asia's largest economy and eighth in world emissions[3], committed to net zero emissions by 2060, while Thailand's target is to achieve carbon neutrality by 2065.

The priority now is to deliver environmental commitments that incorporate energy security, as well as economic and social equity and equality. Southeast Asia has been reliant on fossil fuels such as thermal coal to drive massive economic expansion, urbanisation and industrialisation in the past two decades, and the shift towards decarbonisation can result in trade-offs with real-life consequences.

Decisions to invest in higher-cost, lower-carbon alternatives in emerging economies may risk leaving parts of the population behind in poverty. Recent geopolitical events have also entrenched many countries' desire for national energy security, given the disruptions in energy supplies and resultant price increases. The spotlight is placed squarely on the multi-dimensional considerations of the decarbonisation equation.

Annual green finance flows towards clean energy technologies such as solar and wind between 2016 and 2020 were estimated at just US$28 billion[4], a fraction of what is needed for regional decarbonisation. As a financial intermediary, UOB plays a vital role in the provision and channelling of capital to facilitate continued investments in sectors that are critical to the energy transition, including power, real estate and automotive.

[1] Source: Intergovermental Panel on Climate Change (IPCC), *Sixth Assessment Report*, 2021.
[2] Source: UK Government, UK-Singapore COP26 ASEAN Climate Policy Report Series, *Adaptation and Resilience in ASEAN: Managing Disaster Risks from Natural Hazards*, 2021. The report is part of an overarching project developed in collaboration with the COP26 Universities Network and the British High Commission to Singapore.
[3] Source: Johannes Friedrich, Mengpin Ge and Andrew Pickens, World Resources Institute, "This Interactive Chart Shows Changes in the World's Top 10 Emitters", 10 December 2020.
[4] Source: International Energy Agency (IEA), *Southeast Asia Energy Outlook*, May 2022

As the demand for sustainable finance continues to grow, UOB has the responsibility to support the transition of the real economy and play a role as an enabler to help industries and companies in their pathways to net zero.

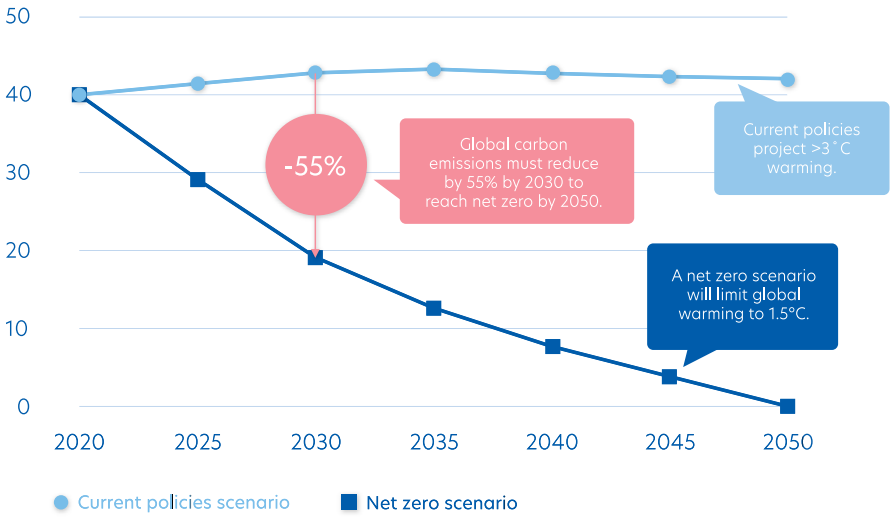
Net zero and its importance

Net zero refers to the cutting of GHG emissions to as close to zero as possible. Net zero emissions are achieved when man-made emissions of GHG to the atmosphere are balanced by removals over a specified period. Following a net zero pathway will help limit the rise in global temperatures to 1.5°C and avert the most severe effects of climate change.

Global carbon dioxide emissions projections

(NGFS REMIND)

$GtCO_2$ / year, 2020 - 2050



Source: IEA, International Institute for Applied Systems Analysis' Network for Greening the Financial System (NGFS) Scenario Explorer, IPCC, Oliver Wyman analysis

The Paris Agreement calls for countries' collective action to keep global warming 'well below' 2°C, and to 'make efforts' to keep it to 1.5°C. According to research by the Intergovernmental Panel on Climate Change (IPCC), to achieve the 1.5°C target, the world needs to reach net zero by around 2050, an exceptionally ambitious target. The scale and pace of transformation required is unprecedented in human history. Countries and businesses will need to be bold in their aspirations and to speed up implementation of their commitments, which currently fall short of what is required.

Given the diversity of economic progress in Asia, some countries, particularly those that are more reliant on fossil fuel resources, are likely to experience greater challenges on the net zero journey. These economies are managing the need for decarbonisation alongside sustaining economic growth, increasing energy access and maintaining energy security.

At UOB, we have grounded our net zero commitment in the realities of the region in which we operate, especially within our key markets of Singapore, Indonesia, Malaysia, Thailand, Vietnam and Greater China. While we are guided by the science in setting our net zero targets and aligning with global net zero models, we have stayed pragmatic and where possible, extracted regional pathways that represent the fair contributions of our key markets.

As a commercial bank, we believe in our role as a catalyst and enabler to influence the real economy towards net zero. This paper outlines UOB's net zero targets and pathways for key sectors in our corporate lending portfolio and which are critical for global decarbonisation. With the announcement of our net zero targets, UOB will redouble our efforts to support our clients with transition financing. Our targets will be embedded in our business strategies and operations as we actively engage our clients across the region in the collective transition.

UOB's commitment to net zero by 2050

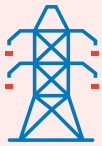
Integrating a just transition into our net zero targets

UOB's commitment to net zero demonstrates our strong belief in a just transition that continues to support economic growth and improve energy access across the diverse economies in the region. We recognise that while the region will benefit from technological advances and solutions on the decarbonisation journey, cost may be a limiting factor on widespread adoption.

As such, we have based our targets on regional pathways described by internationally-recognised climate models or through constructing regionally-representative, bottom-up reference pathways using these models.

Focus sectors

Energy



Power

Reduce emissions intensity by 61% by 2030 and 98% by 2050

Automotive

Reduce emissions intensity by 58% by 2030 and net zero by 2050

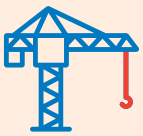
Oil and gas

No new project financing for upstream oil and gas projects approved for development after 2022

Built Environment

Real estate

Reduce emissions intensity by 36% by 2030 and 97% by 2050



Construction

Reduce emissions intensity by 31% by 2030 and 85% by 2050

Steel

Reduce emissions intensity by 20% by 2030 and 92% by 2050

We cover two key emitting ecosystems, namely energy and the built environment, which span six focus sectors that are material contributors to GHG emissions regionally and to UOB's corporate lending portfolio.

The selected sectors and the construction of our respective targets reflect the need for a concurrent shift in both the demand for and supply of fossil fuels across the value chain of economic activities, as well as our ambition to facilitate this change end to end.

Key design principles

Science-based targets

We use outputs of Integrated Assessment Models (IAMs)[5], which are climate science models that predict the factors required globally for a 2050 net zero-aligned scenario.

Sectoral targets

The climate transition will not be uniform as sectors and companies decarbonise at different rates. As such, we have set targets that better reflect our economic operating landscape. We will step up our support of the transition of existing clients and build relationships with new clients who are aligned to our net zero ambition.

Just transition for our region

In our key markets within Asia, economies range from more developed (Singapore) to middle-income and emerging economies (such as Indonesia and Thailand). While every country has an important part to play in the climate transition, there is a need for a just transition that continues to support economic growth, improve energy access and keep the costs of technology adoption low. We have, where possible, based our targets on regional pathways that best reflect the realities and fair contributions of our key markets.

Interim targets by 2030

While our goal is to have our portfolio aligned to net zero by 2050, we recognise the urgency of the climate transition and the need for immediate action. Consequently, we have set interim 2030 targets for each sector and will channel our efforts to shape our portfolio accordingly over the next decade. The 2030 targets are chosen to reflect the necessary and possible development on the path to net zero in the near term, as determined by the climate science models that guide our 2050 targets.

Alignment with global standards

Our approach is in line with the guidance from the Glasgow Financial Alliance for Net Zero (GFANZ) on how financial institutions should set targets and use sectoral pathways[6]. We have applied standards by the Partnership for Carbon Accounting Financials (PCAF)[7] to account for the GHG emissions associated with our financed portfolio. Our data selection priority is also in line with PCAF's guidance, with limited deviations where necessary to reflect the reality of emissions data availability.

Financing coverage

We cover all aspects of our wholesale financing, from lending to debt capital market activities, so that we can influence and help our corporate clients achieve their climate ambitions.

We will look to expand the scope of our targets to include new sectors and sub-sectors as data and climate scenarios become available.

[5] The IAMs, which are trusted by the climate science community, are maintained by research institutions, such as the Joint Global Change Research Institute, Potsdam Institute for Climate Impact Research, or global industry organisations, such as the IEA and Mission Possible Partnership (MPP).

[6] Source: GFANZ, *Guidance on Use of Sectoral Pathways for Financial Institutions*, June 2022.

[7] PCAF is a global partnership of financial institutions that work together to develop and implement a harmonised approach to assess and disclose the GHG emissions associated with their loans and investments.

Our approach

Selection of sectors

In determining our net zero commitment, we have focused on specific sectors, with different targets set for each. This approach is in line with GFANZ's guidance on target-setting within the finance sector. It also reflects UOB's resolve in standing together with the global community to combat climate change and the strength of our belief in supporting the region's decarbonisation journey.

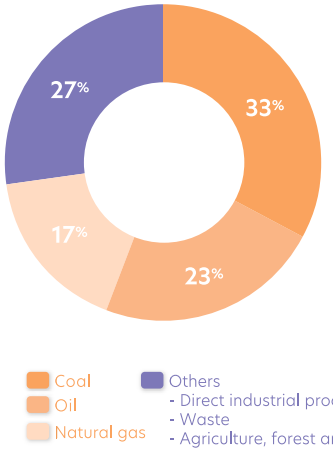
Further, instead of simply exiting carbon-intensive sectors, we believe the right approach to creating greater positive impact is through our support for our clients in their difficult task of transitioning their business models and reducing carbon emissions intensities. This is in line with guidance from regulators such as that from the Monetary Authority of Singapore in cautioning against premature withdrawal in financing that would deprive firms of the opportunity to transition[8].

Our prioritisation of the six focus sectors was based on the following considerations:

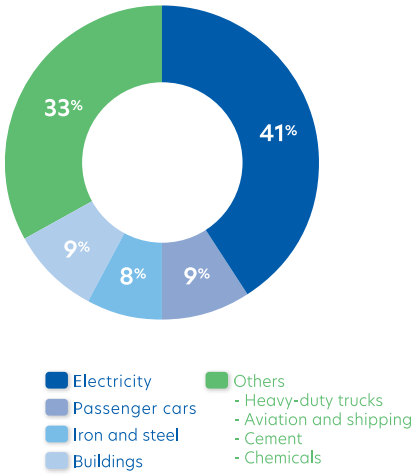
Significance

The six sectors in the two broad categories are among the most important and interconnected sectors in the path to net zero. In particular, oil, gas and coal, which are the supply of fossil fuels, are responsible for 73% of direct emissions globally, while the power, automotive, real estate and steel sectors, through end-usage of electricity, passenger cars, iron and steel and buildings, account for 67% of the emissions arising from fossil fuel combustion.

Breakdown of emissions by sector globally 2019



Breakdown of fossil fuel combustion emissions by end-usage globally 2020



Source: Our World in Data (www.ourworldindata.org) and IEA

[8] Source: Monetary Authority of Singapore, *Information Paper on Environmental Risk Management (Banks)*, May 2022.

Fossil fuels are burned for power generation, transportation and in industrial processes to create key materials such as steel. Power and raw materials generated by those fossil fuels are then used to construct and operate buildings and other industries. To achieve net zero, this generation process must be accounted for, either by capturing the emissions from fossil fuels or using alternatives to fossil fuels. This also means limiting the supply of fossil fuels to ensure that alternatives can compete on a fair price basis.

Exposure and impact

The six sectors form ~60% of our corporate lending portfolio and majority of our financed emissions.

The six sectors reflect where UOB's financing can make a positive impact. In the power and automotive sectors, many low carbon technologies are already commercially viable but require investments to scale up. Within real estate, industry players continue to improve buildings' energy efficiency through low-energy designs and equipment. In addition, many operators are installing solar panels to generate renewable energy for their own use.

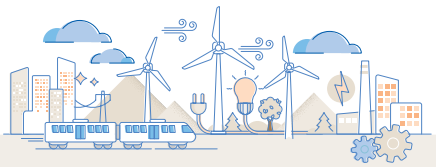
While emissions of the steel and construction sectors are harder to abate, they are material to the built environment industry. We have included them as our focus sectors in support of our real estate clients in their decarbonisation efforts across all sources of emissions.

Accessibility and availability of methodology and data

Climate science is a new and evolving field with data limitations. We have kept our scope of decarbonisation commitments within sectors where we are able to obtain meaningful emissions data across entities or where the data methodology is more established. We intend to update our methodology and sector coverage as data coverage increases and improves.

Dependencies and interdependencies

Achieving net zero by 2050 requires collective efforts from multiple stakeholders. It involves reversing a long-term trend of economic growth that is built largely on fossil fuels. It also relies on major behavioural change, mass adoption of lower carbon-emitting technologies, as well as new technologies to be discovered, made commercially viable and scaled in a short period of time. Further to action by corporates, consumers' demand for lower carbon solutions will also drive the push towards net zero.



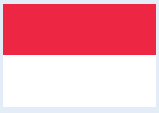
Needed for net zero

- Strong policy responses and sectoral decarbonisation strategies or roadmaps from countries
- Incentives and investments from governments
- Financing support from the private sector
- Technological solutions from the scientific and research community
- Credible decarbonisation commitments from corporates
- Demand for low carbon solutions from consumers

In Asia, where we operate and where a majority of countries are emerging markets, our clients face a range of structural challenges, primary of which is the diversity of economic and energy situations. In several countries, the need for decarbonisation is competing with the goal to extend energy access to parts of the population to enable economic development and alleviate poverty. The desire for energy security has to be achieved through self-sufficiency, where reliable and affordable access is paramount.

China

GDP per capita	US$12,556
TES per capita	101 Gigajoules (GJ)
Net energy import	2,948 Terajoules (TJ) (net importer)
World Energy Trilemma Index grade	Energy security B; Energy equity B; Environmental sustainability D



Indonesia

GDP per capita	US$4,292
TES per capita	37 GJ
Net energy import	-9,648 TJ (net exporter)
World Energy Trilemma Index grade	Energy security A; Energy equity C; Environmental sustainability C

Malaysia

GDP per capita	US$11,371
TES per capita	121 GJ
Net energy import	-120 TJ (net exporter)
World Energy Trilemma Index grade	Energy security B; Energy equity B; Environmental sustainability C

Singapore

GDP per capita	US$72,794
TES per capita	253 GJ
Net energy import	3,694 TJ (net importer)
World Energy Trilemma Index grade	Energy security D; Energy equity A; Environmental sustainability B

Thailand

GDP per capita	US$7,233
TES per capita	83 GJ
Net energy import	32,839 TJ (net importer)
World Energy Trilemma Index grade	Energy security C; Energy equity C; Environmental sustainability C

Vietnam

GDP per capita	US$3,694
TES per capita	40 GJ
Net energy import	1,484 TJ (net importer)
World Energy Trilemma Index grade	Energy security B; Energy equity C; Environmental sustainability D

TES: Total energy supply, which represents the quantity of energy necessary to satisfy domestic energy demands.
The World Energy Trilemma Index by the World Energy Council ranks countries on their ability to provide sustainable energy through three dimensions and highlights how well a country manages the trade-offs of the trilemma, with "A" being the best grade and 'D' being the worst.

Source: World Bank, World Development Indicators, 2021; IEA, Energy Statistics Data Browser, 2019; and World Energy Council, Energy Trilemma Index, 2021.

Further, our focus sectors are interdependent in the pursuit of zero GHG emissions. Greening the energy system is a key enabler to decarbonising sectors such as automotive, real estate, construction and steel, alongside catalysing the development and uptake of lower-emitting technologies within the respective sectors.

Cross-cutting dependency

Power

Transformation of energy infrastructure to scale up the use of renewables to support decarbonisation in other sectors.

Investments and technology innovation needed for renewable energy projects to address supply intermittencies (for instance deployment of energy storage technologies and upgrading of transmission and distribution infrastructure).

Key sectoral dependencies

Automotive

Regulatory push to scale up charging infrastructure for electric vehicles (EVs).

Availability of low-carbon electricity in lieu of fossil fuels.

Real Estate

Development and adoption of standards to address embodied emissions generated from building materials and construction process.

Continued efforts of our clients to improve the energy efficiency of their buildings.

Construction

Availability of electric- powered equipment, such as alternatives to heavy-duty trucks and diesel generators.

Greening of power supply for off-grid construction projects.

Steel

Industry-wide breakthroughs and regulatory push to scale up and reduce the cost of lower-emitting technologies.

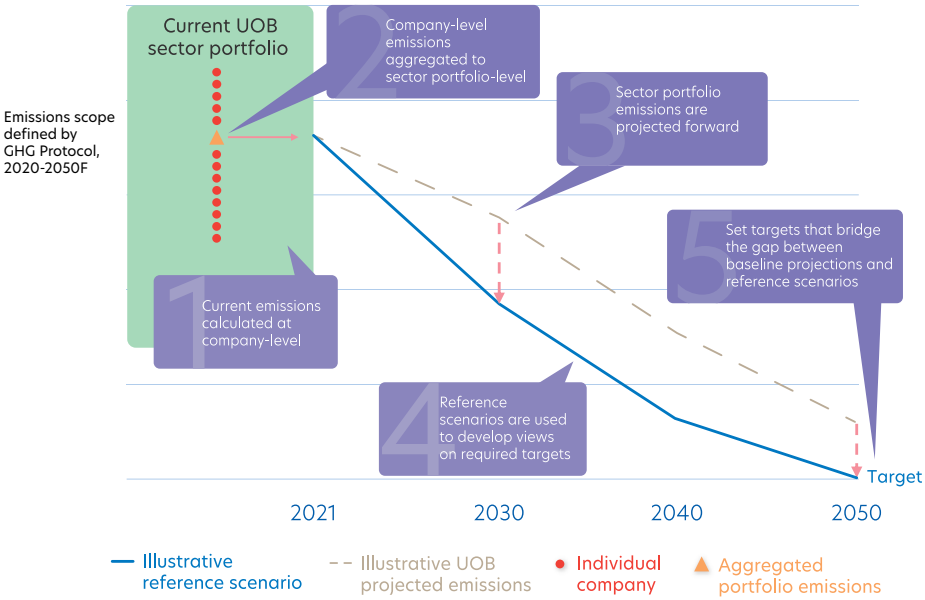
In consideration of structural differences across our key markets, we have set some targets according to regional pathways and integrated science-based models of the path to net zero, with the view to ensure a just transition.

These regional pathways will not require every country to move at the same speed; those that are well-positioned technologically and financially should move faster than those with other pressing priorities and limited means.

As we operationalise our net zero commitment, we will use our influence to bring interested parties together for coordinated cross-sector efforts.

Target-setting

UOB's five-step approach to setting net zero targets



For our focus sectors, we:

1. Calculated emissions at the **company-level** for each of our clients;
2. **Aggregated** our clients' emissions to create a UOB sector average weighted by our exposure to each of those clients;
3. **Projected** those emissions, taking into account the company's plans, national commitments and possible technological developments;
4. **Established reference scenarios** with a science-based pathway to net zero by 2050; and
5. **Set targets for 2030 and 2050** that bridge the gap between our projections and the reference scenario after quantifying the set of portfolio actions we will need to take.

As planning cycles and business decisions are necessarily considerably shorter than 30 years, we aim to converge our portfolio emissions intensity to the science-based pathway by 2030, and for it to stay on or below that line to 2050.

Our decarbonisation commitment is contingent on the following:

- Our clients will achieve fully their decarbonisation strategies and transition plans as announced;
- Industries will evolve to meet full-stated government plans, such as the adoption of EVs and phase-out of internal combustion engines (ICEs) and;
- Power grid decarbonisation will occur in line with national energy plans, which will have an impact on Scope 2 emissions in other sectors, especially real estate.

We will play our part in supporting our clients on setting their net zero plans or on making their existing net zero plans more ambitious. We will also direct more financing towards green projects and activities, and away from those that emit the most carbon.

Design of net zero targets across sectors

	ENERGY			BUILT ENVIRONMENT		
Sector	**Power**	**Automotive**	**Oil and gas (fossil fuels)**	**Real estate**	**Construction**	**Steel**
Type of target	Quantitative	Quantitative	Sectoral commitments[i]	Quantitative	Quantitative	Quantitative
Metric	Physical emissions intensity Measured in kilograms of carbon dioxide produced per megawatt-hour of energy ($kgCO_2$/MWh)	Physical emissions intensity Measured in grams of carbon dioxide produced per kilometre travelled (gCO_2/vehicle-km)	–	Physical emissions intensity Measured in kilograms of carbon dioxide produced per square metre of floor space ($kgCO_2/m^2$)	Economic emissions intensity Measured in tonnes of carbon dioxide produced per million-Singapore dollar of revenue (tCO_2/S$ million)	Physical emissions intensity Measured in tonnes of carbon dioxide produced per tonne of crude steel (tCO_2/tonne)
Value chain inclusion	• Generation companies • Equipment manufacturers	• Manufacturers • Dealers • Financial leasing companies	–	• Investment companies • Real estate investment trusts (REITs) • Developers • Operators	• Construction companies (general, real estate, demolition)	• Crude steel producers and wholesalers • Fabricated metal producers and wholesalers
Emissions scope	• Scope 1 for generation companies • Scope 3 for equipment manufacturers[ii]	• Scope 3 - (tailpipe emissions)	–	• Scope 1 and 2 (operational emissions)	• Scope 1 and 2	• Scope 1 and 2 for crude steel producers • Scope 3 for others[iii]
Reference pathway	Regional - NGFS Regional Model of Investment and Model Development (REMIND)	Global - IEA Net Zero Emissions by 2050 (NZE)	–	Regional - Carbon Risk Real Estate Monitor (CRREM)	Regional - NGFS Global Change Assessment Model (GCAM)	Global - MPP Tech Moratorium

i. The justification for sectoral commitments can be found on page 34.
ii. Limited to downstream Scope 3 emissions from power generation.
iii. Limited to upstream Scope 3 emissions from crude steel manufacturing.

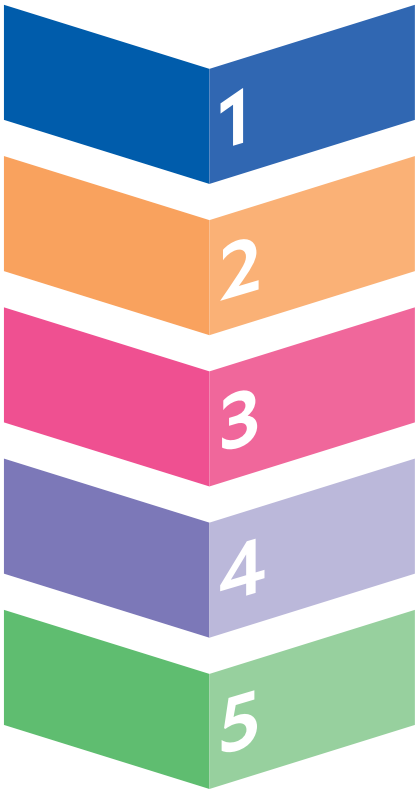
Data collection

Setting a baseline and tracking our progress requires the measurement and estimation of our clients' emissions and/or emissions intensity.

In practice, this is challenging. While standards for carbon accounting and disclosure, such as that introduced by the Task Force on Climate-related Financial Disclosures (TCFD)[9], are significantly increasing the prevalence, quality and consistency of reporting, they are still relatively nascent.

As a result, a significant number of our clients, especially small- and medium-sized enterprises, currently do not report this information directly. This is further complicated by the nature of our clients' operations. Many of them operate across multiple countries and business lines and we support their businesses at both the headquarters/corporate level (where reporting is more commonly found) and in specific geographies and activities (where data is very rarely reported). Simply taking the headquarters/corporate-level numbers may materially misrepresent the activity that we are financing.

We address this issue by considering a combination of additional data sources in order of priority:



Based on PCAF's guidance[10], our selection of data sources gives preference to company-reported data and asset-level calculations, while providing a hierarchy for different fallbacks. We also generally prefer physical-based proxies to economic-based proxies.

[9] The TCFD was created in 2015 by the Financial Stability Board (FSB) to develop consistent climate-related financial risk disclosures for use by companies, banks and investors in providing information to stakeholders.

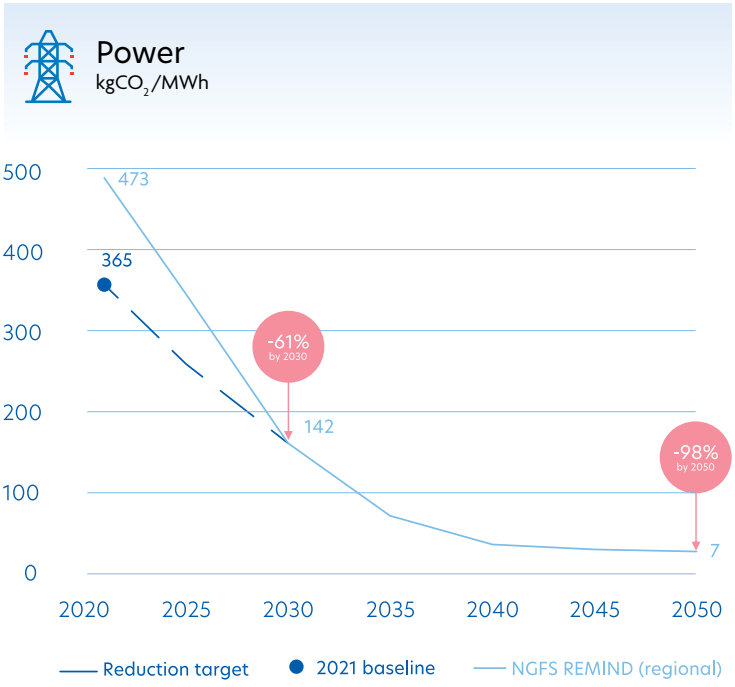
[10] Source: PCAF, *The Global GHG Accounting and Reporting Standard for the Financial Industry*, November 2020. The paper provides detailed methodological guidance to measure and disclose financed GHG emissions.

We believe our approach presents the most accurate estimate of the emissions or emissions intensity of our clients amid current limitations. We will continue to work with our clients to encourage improvements in emissions reporting and to validate the estimates made. As we review and finetune our processes, we may have to restate our baselines, leading to increases or decreases in our financed emissions or emissions intensity.

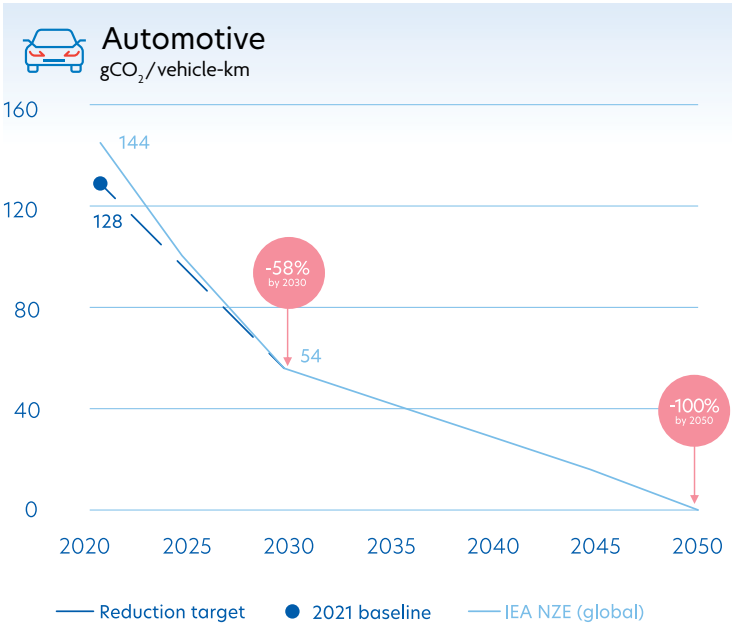
Such changes may not be a result of our clients' decarbonisation or changes to our portfolio. However, if these changes prove to be significant or material, there may be a need for a recalibration of our targets.

Energy ecosystem

Largest users of fossil fuels



The decarbonisation of the power sector is especially critical to the success of every downstream sector, including automotive, real estate and construction. We aim to reduce emissions intensity by 61% by 2030 through financing more renewable energy generation.



We target to cut emissions intensity by 58% by phasing out gradually our support of highly-emitting ICE vehicles and promoting the switch to EVs.

Supply of fossil fuels

Oil and gas (O&G)

We commit to prohibiting new project financing for upstream O&G projects approved for development after 2022.

Coal

We commit to exit financing for the thermal coal sector by 2039, as an enhancement to our existing prohibitions on new project financing of greenfield or expansion of coal-fired power plants and thermal coal mines.

Fossil fuels are currently a central pillar of the global economy because they are a low-cost and productive way of generating energy. The burning of fossil fuels represents 73% of all carbon dioxide emissions globally[11] and reducing these emissions is critical to addressing climate change. The contraction of both supply and demand is key to ensure an orderly transition and to prevent the risk of supply exceeding demand, which will lead to price compression and contrary incentives for the continued use of fossil fuels. This is why groups modelling the pathways to net zero, such as the IEA, have called for a moratorium on new exploration and development of new sources of oil and gas.

UOB's net zero targets cover the largest and most addressable sectoral users of fossil fuels - power and automotive, and include a policy to limit the expansion of fossil fuel supply through O&G and coal.

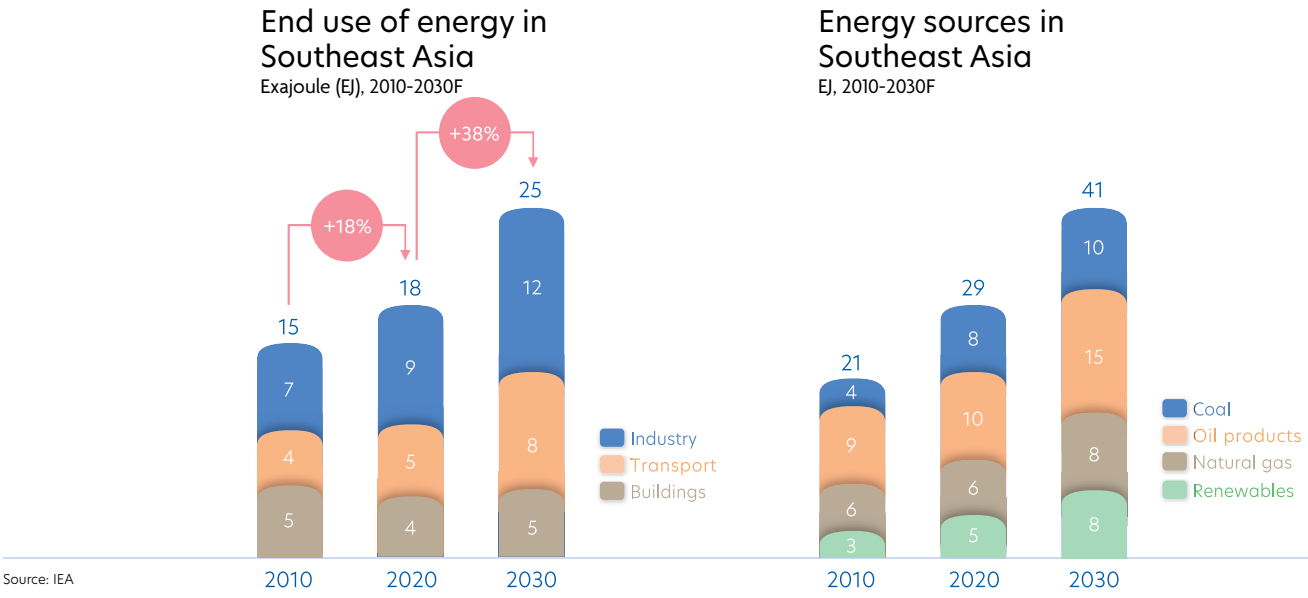
[11] Source: GFANZ, *Guidance on Use of Sectoral Pathways for Financial Institutions*, June 2022.

The Southeast Asia context

Southeast Asia is classified by the World Bank as a middle-income region, with GDP per capita of between US$2,551 and US$11,371[12] (Singapore is a notable exception to this definition). The region is an important producer of fossil fuels, with rich reserves of coal and significant reserves of oil and gas.

These and other commodities have fuelled a significant part of the region's growth and in turn, the region's developing economies and large middle-class populations are continuing to drive the demand for energy for industry, transportation and housing.

The IEA has projected that total energy consumption will rise by 38% between 2020 and 2030 based on current national policies, while energy supply will continue to be met primarily by fossil fuels, especially coal and natural gas, through to 2030.



Source: IEA

As such, a move towards net zero, which implies a swift and dramatic global reduction in fossil fuel usage, is a significant change in direction for Southeast Asia where the development of and access to renewable energy is still low.

Southeast Asia faces significant viability challenges in renewable energy. While the region enjoys abundant sunlight, it has low access to technically exploitable wind power. A high level of tectonic activity creates the intriguing long-term prospect of geothermal power, but also presents engineering challenges in developing offshore wind or nuclear power stations. Immature and fragmented power grids make problems of intermittency especially acute, making any move away from fossil fuels a significant challenge of energy security. In Singapore, the small land area and geographic limitations restrict the replacement of predominantly gas-generated power with renewables.

[12] Source: World Bank, "GDP per capita (current US$)", 2022.

These challenges are reflected in the region's net zero plans and are recognised by climate scientists in differential expectations for decarbonisation across these countries.

Country	Interim 2030 target	Net zero target
Singapore[13]	Reduce emissions to around 60 $MTCO_2e$	Reach net zero emissions by 2050
Indonesia[14]	Reduce GHG emissions by 29% with domestic efforts or 41% with international support	Reach net zero emissions by 2060 or sooner
Malaysia[15]	Reduce GHG intensity of GDP by 45% from 2005 levels	Reach net zero emissions by 2050
Thailand[16]	Reduce GHG emissions by 40% from business-as-usual levels	Reach carbon neutrality by 2050 and net zero emissions by 2065
Vietnam[17]	Reduce GHG emissions by 43% from business-as-usual levels	Reach net zero emissions by 2050

Power

Power generation accounts for approximately 41% of all global GHG emissions[18]. Yet the path to net zero is dependent on a dramatic increase in renewable electricity generation, as renewable electricity replaces the direct burning of fossil fuels in other processes.

Consequently, the single highest priority for arriving at net zero is the decarbonisation of power generation. This means reducing power generation's emissions intensity – generating power in a way that produces lower emissions for the same amount of electricity.

Power is generated primarily in power plants through the burning of coal and natural gas, or through renewable energy sources such as wind, hydropower and solar. The decarbonisation of power generation will rely on the retirement of conventional power plants and a significant growth in the capacity available from renewable energy sources.

We have chosen the regional NGFS (REMIND) reference pathway for the decarbonisation of our power sector portfolio. The 2021 baseline of our portfolio's emissions intensity is 365 $kgCO_2/MWh$, which is below the region's average of 473 $kgCO_2/MWh$. This shows that the current shape of our portfolio is weighted towards lower-emitting power sources. In line with the reference pathway, we target a decline of 61% in emissions intensity to 142 $kgCO_2/MWh$ by 2030, and 98% by 2050.

[13] Source: SG Press Centre, "Singapore Commits to Achieve Net Zero Emissions by 2050 and to a Revised 2030 Nationally Determined Contribution; Public Sector and Jurong Lake District to Lead The Way with Net Zero Targets", 25 October 2022.

[14] Source: Ministry of Energy and Mineral Resources, Republic of Indonesia, "Speaking at COP26, Energy Minister Gives Indonesia's Commitment to Net Zero Emission", 2 November 2021.

[15] Source: Prime Minister's Office of Malaysia, *"Kenyataan Media Berkaitan Komitmen Malaysia Dalam Menerajui Agenda Perubahan Iklim Negara* (Media Statement on Malaysia's Commitment in Leading the National Climate Change Agenda)", 11 October 2021.

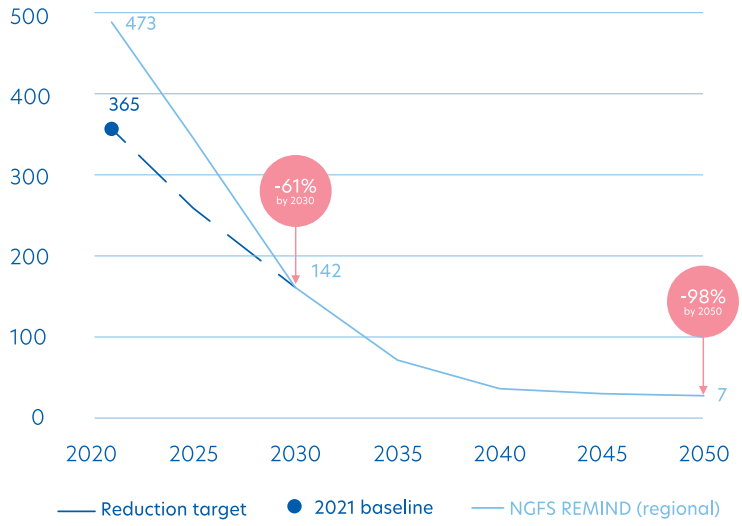
[16] Source: National News Bureau of Thailand, "Thailand Urges World to Fulfill Climate Change Pledges", 7 August 2022.

[17] Source: Department of Climate Change, Ministry of Natural Resources and Environment, *"Chiến lược quốc gia về biến đổi khí hậu giai đoạn đến năm 2050* (National Strategy on Climate Change to 2050)", 30 July 2022.

[18] Source: IEA, *Net Zero by 2050 – A Roadmap for the Global Energy Sector*, May 2021.

Power sector emissions baseline and targets

kgCO_2/MWh

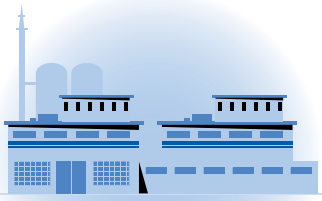


	2020	2030	2050
Reference scenario - NGFS REMIND (regional)	473	142	7
Emissions intensity reduction target		-61%	-98%

Scope of companies and emissions

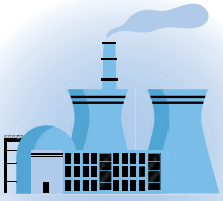
Power sector value chain

Equipment manufacturers



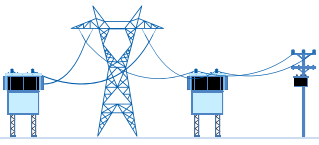
- Examples: turbines, solar panels, wind turbine manufacturers
- Primary impact on emissions arises from the support of different types of electricity generation

Power generators



- Examples: power plants, wind farms
- Primary source of emissions from the value chain

Transmitters and distributors



- Running of national grid infrastructure
- Responsible for procuring different sources of power and ensuring efficiency through minimising leakage and intermittency

Retail, wholesale and trading

- Link between power generation and end-consumers
- Responsible for procuring energy from different sources

Excluded from target calculation

Coverage of our targets

- Scope 1 emissions of power generators, which are responsible for the majority of the sector's emissions.
- Scope 3 downstream emissions from equipment manufacturers, to reflect the importance of solar panel and wind turbine manufacturers, both as providers of equipment to power plants and directly to consumers. This supports the trend of power generation being increasingly distributed via solutions such as rooftop solar panels in homes and industrial buildings.

For renewable energy to be a viable alternative to fossil fuels, there must be efficient storage and distribution of that energy. Electricity retailers are integral to the procurement of power from renewable sources and making renewable energy available and accessible to end consumers. While transmission, distribution and retail/wholesale trade are also critical to decarbonisation, we have excluded companies in these value chain components. This is because the key industry levers to decarbonisation are primarily upstream. In addition, data limitations make it impossible to accurately assess the sources of energy procured by retailers, and methodologies for assessing the impact of grid infrastructure are not yet fully developed.

As we progress on our net zero journey, we will continue to engage with the power industry players and aim to expand our coverage of the whole value chain in our targets in due course.

Establishing baseline emissions intensity

Power companies typically own multiple assets, with a mix of conventional and renewables. While the sector is seeing new entrants focused solely on renewables, the majority of the energy transition will be delivered by the transition of conventional and hybrid power companies.

UOB is supporting such companies in making this transition – our clients are investing in new renewables capacity as they seek to phase out their conventional power assets. We seek to support our clients through:

- financing companies that are transitioning at a Group level;
- financing the subsidiaries of companies that are focused purely on renewables; and
- financing specific renewables assets and offering loans that require the use of proceeds focused only on renewables capacity building.

We calculate our emissions intensity, measured in kilograms of carbon dioxide produced per megawatt-hour of energy ($kgCO_2$/MWh), by determining the emissions intensity of assets we finance through collecting baseline data at an asset level to reflect our financing. This provides us with better insights into the actions our clients are taking and the specific impact of our financing. We adopted a similar approach for equipment manufacturers with Scope 3 downstream emissions intensity that is determined based on the type of power generation assets manufactured.

We collected the 2021 emissions intensities of each of our clients in our portfolio, and established our baseline emissions intensity by taking the average intensity weighted by our exposure to the clients, achieving an outcome of 365 $kgCO_2$/MWh.

Selecting pathways and setting targets

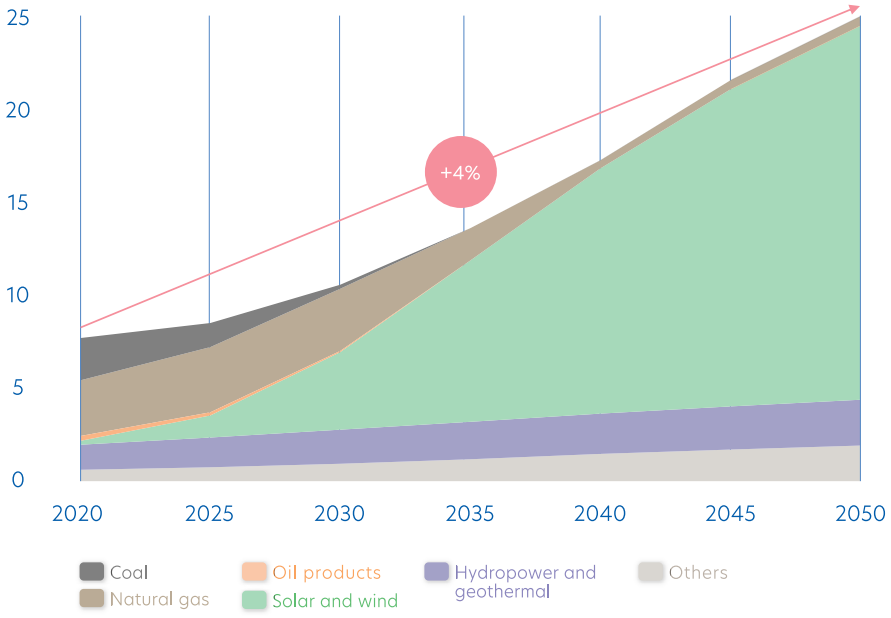
All the major Integrated Assessment Models (IAMs) have at their core a view on the decarbonisation of the power sector. We have adopted a pathway from the NGFS REMIND[19] model, aligning to 1.5 ℃ warming at the end of the century, with limited risk of overshoot.

In this scenario, the NGFS REMIND model assumes electricity production in Southeast Asia to triple, of which growth will be driven largely by renewables such as solar and wind. The share of fossil fuels (oil, gas and coal) used for electricity production in the region is likely to decrease from 72% in 2020 to a mere 2% in 2050.

Under this pathway, there will be significant economic growth which is in line with UOB's expectation of inclusive and sustainable economic development in the region. To support the activities which come along with economic expansion, energy production is expected to increase at a rate of 4% per annum.

NGFS REMIND scenario – Electricity production by source in Southeast Asia

EJ, 2020-2050F

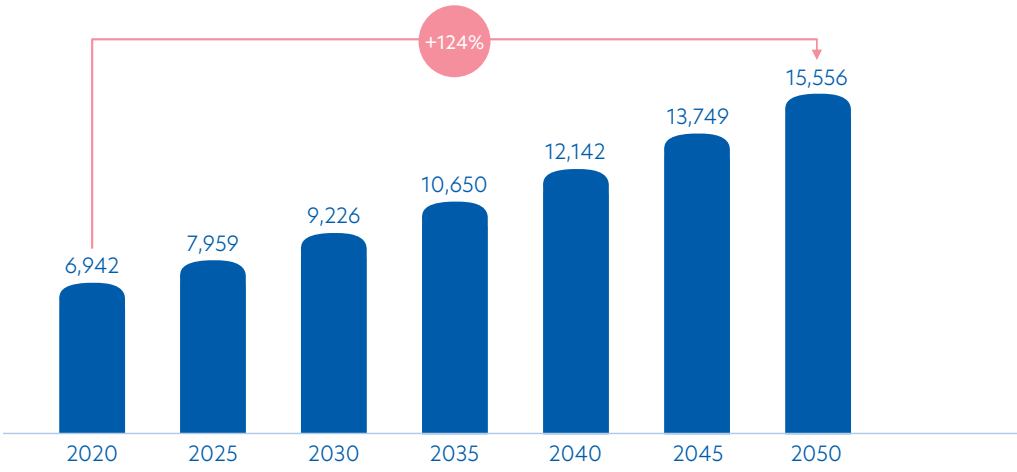


Source: NGFS REMIND

[19] NGFS REMIND is an energy-economy general equilibrium model linking a macroeconomic growth model with a bottom-up engineering-based energy system model. The goal of the REMIND model is to find the welfare-optimal mix of investments in the economy and the energy sectors of each model region. It also accounts for regional trade characteristics on goods, energy fuels, and emissions allowances. All GHG emissions due to human activities are represented in the model.

NGFS REMIND scenario – GDP per capita in Southeast Asia

(in purchasing power parity terms)
US$, 2020-2050F



Source: NGFS REMIND

On the back of these model assumptions, we aim to reduce our emissions intensity in the power sector at 9% per annum on average to achieve our target of 61% by 2030 to 142 kgCO_2/MWh and nearly net zero by 2050.

To reach our targets, we are dependent on country commitments to phase out fossil fuels in electricity generation (such as Singapore's push for the use of solar and regional power grid to transform its electricity generation sources[20]), as well as our clients' achievement of their net zero targets.

Renewable power generation commitments of selected Southeast Asian countries[21]

Singapore	**2 gigawatts (GW) in solar photovoltaic (PV) installed capacity by 2030**
Indonesia	**52% share of renewables in electricity capacity additions from 2021 to 2030**
Malaysia	**31% share of renewables installed capacity by 2025**
Thailand	**36% share of renewables-based capacity and 20% share of generation by 2037**
Vietnam	**31 to 38 GW in solar PV and wind installed capacity by 2030; 4 GW in offshore wind installed capacity by 2030 and 36 GW by 2045**

[20] Source: Energy Market Authority of Singapore, "About Singapore's Energy Story", 2022.
[21] Source: IEA, *Southeast Asia Energy Outlook 2022*, May 2022.

The investments into energy infrastructure are key to support decarbonisation across multiple sectors. We will:

- encourage and strengthen support of our clients with more ambitious decarbonisation targets in the switch towards renewables;
- increase our financing of renewable energy, both to specialised renewable energy providers and through use of proceeds and green financing to the renewable energy investments of diversified power companies; and
- deliver our commitment to exit thermal coal by 2039, and not finance any new developments.

We recognise that the power transition will be more gradual in emerging economies such as Indonesia, and faster in developed countries such as Singapore. We will continue to support our power clients in setting and achieving diversification goals for their businesses through structured engagement and our transition finance framework.

The power transition can be a positive catalyst in creating a more secure and ultimately cheaper source of energy. However, we are cognisant that countries with an overall energy shortage will take time to move away from existing cheap and reliable sources of energy.

Automotive

Emissions released from passenger road transport are responsible for 9% of total emissions globally[22], generated over the course of automotive manufacturing, assembly and end-use. Tailpipe emissions from the burning of diesel and gasoline when the vehicles are driven contribute the largest emissions share of 84%[23].

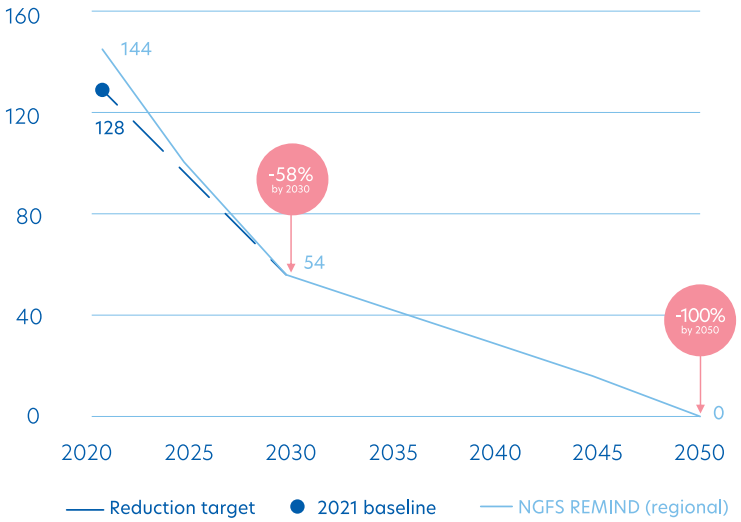
As both the largest consumer of oil and with electric engines as a widely-adopted, mature technological alternative, the automotive sector's transition to net zero can and should be aggressive. This is increasingly recognised by governments, which are putting in place policies to phase out the sale of ICE vehicles and to support wider production and sales of EVs.

We have selected the global IEA Net Zero Emissions (NZE) by 2050[24] scenario as our reference pathway for the automotive sector. From our 2021 baseline of 128 gCO_2/vehicle-km in emissions intensity, compared with the pathway's 144 gCO_2/vehicle-km, we aim to achieve 58% reduction by 2030 and net zero in 2050.

[22] Source: IEA, *Net Zero by 2050 – A Roadmap for the Global Energy Sector*, May 2021.
[23] CDP, *CDP Technical Note: Relevance of Scope 3 Categories by Sector*, April 2022.
[24] The IEA NZE scenario is consistent with limiting the global temperature rise to 1.5°C without overshoot and in line with reductions assessed in IPCC's *Global Warming of 1.5°C* special report, published in 2018. The global energy sector will achieve net zero emissions by 2050, with advanced economies reaching net zero in advance of others.

Automotive sector emissions baseline and targets

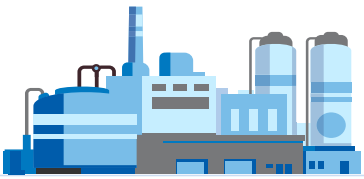
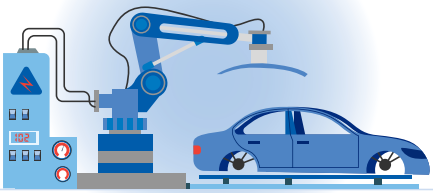
g CO_2/vehicle-km



	2020	2030	2050
Reference scenario - IEA NZE (global)	144	54	0
Emissions intensity reduction target		-58%	-100%

Scope of companies and emissions

Automotive sector value chain

Upstream: Parts manufacturers	Midstream: Original equipment manufacturers	Downstream: Dealers and financial leasing companies
		
» Manufacturing of automotive vehicle parts and accessories such as tyres and engines » Minimal emissions released from manufacturing process, limited control on end-vehicle types	» Manufacturing and assembly of automotive vehicles » Minimal emissions released from manufacturing process but significant influence on end-vehicle types	» Retail distribution and financial leasing of automotive vehicles » Minimal emissions released during distribution / financing process but moderate influence on vehicle purchase decisions

Excluded from target calculation

The reduction of tailpipe emissions requires a shift by companies and consumers. Companies in the sector will need to change the type of cars that they manufacture, finance and distribute, which will in turn help drive greater adoption of more efficient vehicles, including EVs by consumers.

To this end, our targets for the sector include manufacturers, dealers and financial leasing companies, covering the majority of our lending to the sector.

As we are not able to track the activities and emissions of automotive parts manufacturers in a consistent manner based on current existing data, we have excluded these upstream players in our scope. Nonetheless, we will continue to engage with them on their sustainability efforts and aim to include a wider scope in future iterations of our targets.

Establishing baseline emissions intensity

With the demand for transportation expected to grow with economic progress, the path to net zero requires a material reduction in the emissions intensity of automotive travel that also supports economic prosperity. In this regard, our target is to reduce physical emissions intensity, measured as grams of carbon dioxide emitted produced per kilometre travelled (gCO_2/vehicle-km).

To calculate emissions intensity, we have analysed local car production or sales by engine type and size, and cross-referenced the emissions factors of respective car brands. Where client data is not available, a reality in the region in which we operate, we have relied heavily on country-level production or sales proxies to supplement data gaps.

We collected the 2021 emissions intensities of each of our clients in our portfolio, and established our baseline emissions intensity by taking the average intensity weighted by our exposure to the clients, achieving an outcome of 128 gCO_2/vehicle-km.

The measurement and reporting of carbon emissions for automotive players are still at a nascent stage, especially among dealers that make up a majority of our portfolio. We will continue to engage and support our clients in their emissions reporting. We expect data coverage to improve in the future as industry standards and guidelines strengthen within the region. However, this may lead to volatility in our future emissions baseline given our current heavy reliance on proxies.

Selecting pathways and setting targets

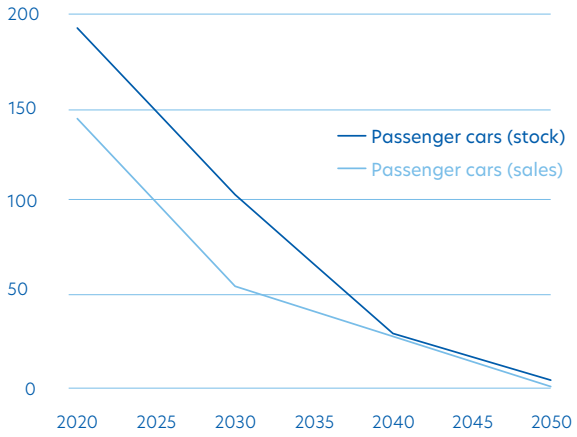
We have used the global IEA NZE scenario, which specifies the decarbonisation pathway for the passenger vehicle segment. Our targets reflect the intensity of tailpipe emissions of passenger vehicle sales, instead of the stock of vehicles on the road, in consideration of our clients' activities in producing, financing and selling new cars.

This scenario prescribes a fast decarbonisation in order to be on track for net zero by 2050, requiring 65% of all new cars sold to be electric by 2030 from 4% in 2020[25].

[25] Source: IEA, *Net Zero by 2050 – A Roadmap for the Global Energy Sector*, May 2021.

IEA NZE scenario - Passenger cars, stock versus sales

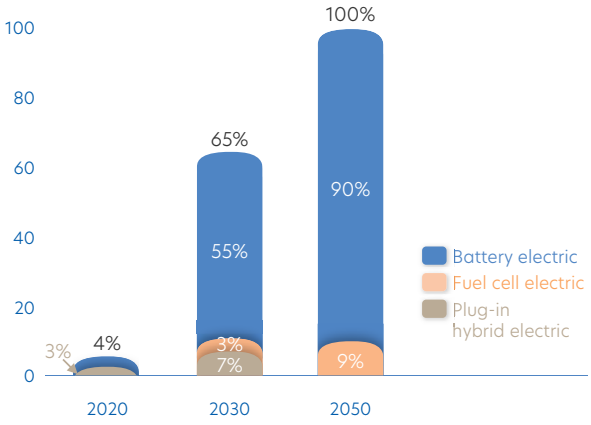
gCO_2/vehicle-km , 2020-2050F



Vehicle-km is derived by dividing passenger-km by vehicle passenger occupancy rate
Source: IEA NZE

IEA NZE scenario – Sales of light passenger EVs against total vehicle sales

2020-2050F



Source: IEA NZE

The global IEA scenario currently does not reflect regional differences nor allow for a regional split. Nonetheless, we have adopted this scenario to reflect both the global nature of many of our original equipment manufacturer (OEM) clients, as well as the progressive moves taken in Southeast Asia to move towards EVs. For instance, the Singapore Green Plan 2030 has an ambitious target to achieve 100% cleaner energy vehicles by 2040. When a suitable regional reference scenario is available, we will finetune our reference scenario and reflect the nature of our geographic footprint.

Transportation commitments of selected Southeast Asian countries[26 27 28]

Singapore	60,000 EV charging points by 2030; 100% of vehicles to run on cleaner energy in 2040; 80% reduction in peak land transport emissions
Indonesia	EVs to make up 20% of vehicles by 2025; 600,000 electric cars and buses by 2030
Malaysia	9,000 AC (standard) charging points and 1,000 DC (fast) charging points by 2025
Thailand	1.2 million EVs and 690 charging stations by 2036

Based on our models, we are aligning our 2030 automotive sector target with the global IEA NZE scenario, and staying in line with this pathway through to 2050. In this regard, we aim to reduce emissions intensity by 58% to 54 gCO_2/vehicle-km by 2030 and to net zero emissions by 2050.

Our fulfilment of these targets will be dependent on the net zero commitments of our automotive clients to increase EV production and sales, and more importantly on policy mechanisms to incentivise the use of EVs in countries in which our clients operate. These include investments in the setup of EV charging infrastructure, deploying purchase subsidies for EVs and scaling up of sustainable battery manufacturing.

The transition of our portfolio will also be contingent on the pace at which the grid decarbonises, as well as a wider push and maturity of the ecosystem towards encouraging EV adoption. We will strengthen our support of our clients to address their financial needs in the transition by:

- encouraging a broader set of our clients to adopt net zero targets, adapt their businesses and secure EV supply chains, including smaller dealers and leasing companies; and
- channelling part of our financing exclusively to EV-focused businesses and activities, which will in turn grow our portfolio.

[26] Source: IEA, *Southeast Asia Energy Outlook 2022*, May 2022.
[27] Source: Singapore Land Transport Authority, "Electric Vehicles", 2022.
[28] Source: Cabinet Secretariat of the Republic of Indonesia, "Indonesia Ready to Welcome EV Era, Minister Says", February 2022.

Oil, gas and coal

Oil and gas (O&G) and coal are key energy sources in Southeast Asia with energy security, access and affordability being critical considerations for the region. Energy demand has increased on average 3% year on year over the past two decades, while Southeast Asian economies have doubled in size since 2000. Three-quarters of the projected increase of energy demand by 2030 would be met via fossil fuels if energy supplies remain status quo[29]. This makes decarbonisation of the region in parallel with economic development and supporting livelihoods a complex task.

Given the highly regional nature of UOB's O&G portfolio, we believe that current decarbonisation pathways are not realistic in their reflection of critical aspects of a just transition. In addition, current views on the region's just contribution to fossil fuel reduction vary widely across models, with several pathways showing an aggregate increase to 2030. This reflects the complexity of the region's energy demands and fuel supply mix.

Nonetheless, we take guidance from groups such as the IPCC, IEA and NGFS that the world must live on existing fossil fuel resources without developing new sources. Therefore, we are committing to help limit the supply of fossil fuels to the main economy, preventing an over-abundance of cheap fuels and supporting an orderly transition, while balancing the need for socioeconomic growth in Southeast Asia.

O&G sectoral commitment

We commit to no new project financing for upstream O&G projects approved for development after 2022.

We welcome further work and collaboration across stakeholders to establish a credible regional pathway for decarbonisation in the O&G sector. We will look to review our commitment when there is an established pathway that reflects the social and economic context of Southeast Asia, while contributing to the global net zero ambition.

In support of our O&G clients as they play their part in the energy transition and to help accelerate the decarbonisation of these hard-to-abate sectors, we will continue to provide financing under the UOB Transition Finance Framework. We will support:

- the development of renewable energy capacity and infrastructure such as EV charging points, as O&G companies ramp up their diversification and investments in renewables;
- the development of low-emissions fuel alternatives, including biofuels and hydrogen, and which are essential to decarbonising hard-to-abate sectors, including shipping, aviation, steel and cement;
- the development of technologies and/or equipment that help contribute to climate change mitigation and emissions reduction;
- the reduction of Scope 1 and Scope 2 emissions from the extraction and processing of crude oil, through more efficient refining and reducing methane flaring;
- the appropriate use of carbon offsets to address residual carbon emissions; projects that generate voluntary carbon credits; and
- the efficient storage, high quality servicing, trading and refining of oil and gas products, which will help facilitate an orderly transition.

[29] Source: IEA, *Southeast Asia Energy Outlook 2022*, May 2022.

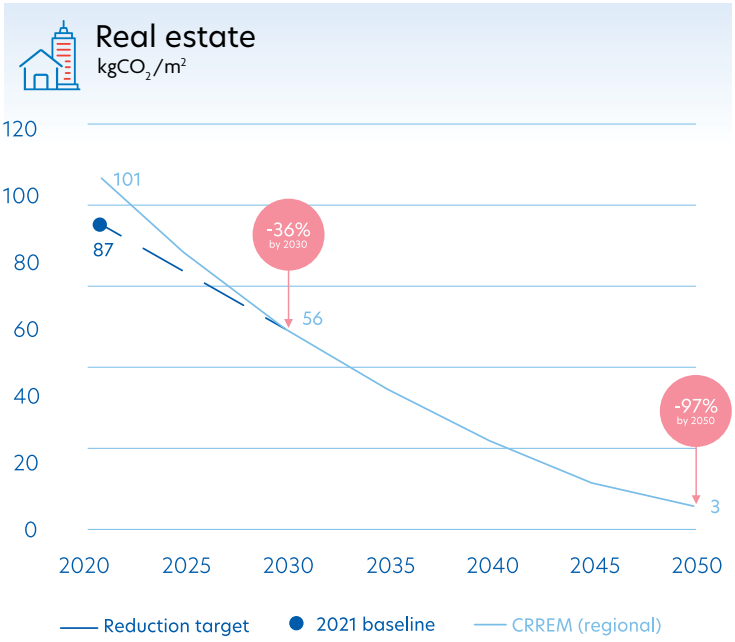
We also recognise the need to limit the supply of coal as a fossil fuel and the need to exit from the use of unabated coal-fired power plants by 2039[30] in non-OECD countries to reach net zero.

Thermal coal commitment

We commit to exit financing for the thermal coal sector by 2039, as an enhancement to our existing prohibitions on new project financing of greenfield or expansion of coal-fired power plants and thermal coal mines.

Built Environment ecosystem

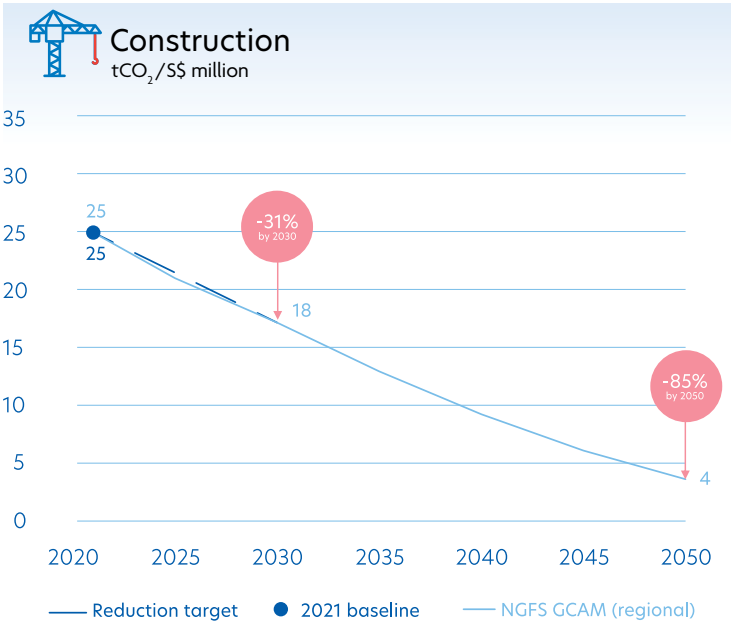
Operational emissions



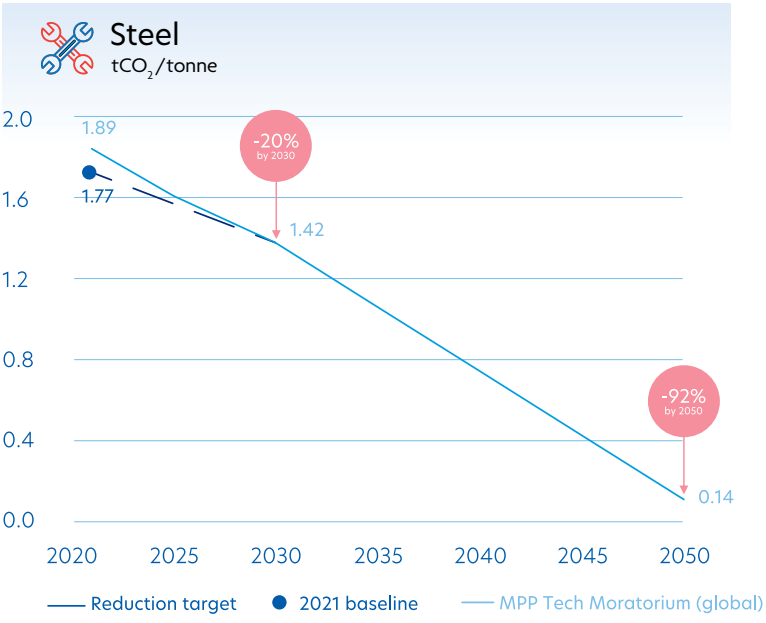
We target to reduce the operating emissions intensity of the buildings we finance (both directly and indirectly) by 36% by 2030.

[30] Source: IEA, *Net Zero by 2050 - A Roadmap for the Global Energy Sector*, May 2021.

Embodied emissions of buildings



We target a 31% reduction in emissions intensity, measured as the direct emissions of the construction process relative to revenue, across all construction sectors by 2030.



We target a 20% reduction in emissions intensity for steel, which is responsible for Scope 3 emissions from building materials, by 2030.

The end-to-end built environment ecosystem is a key consumer of the world's carbon budget, responsible for 39% of global energy-related carbon emissions, of which 28% originates from operational emissions and 11% from materials and construction[31].

Carbon emissions are released not only during the operational life of buildings but also during the materials manufacturing and transportation processes, as well as during construction – the latter also collectively known as the embodied carbon emissions of buildings.

Buildings are among the biggest consumers of steel and cement, which are in turn the two main materials used in building construction. Both materials are highly intensive in emissions given process emissions (such as in the production of clinker for cement and in the production of steel through blast furnaces).

In addition, steel and cement have been consistently recognised as hard-to-abate sectors that heavily rely on technological advancements, such as carbon capture, utilisation and storage and green hydrogen. Such technologies have yet to achieve scale and commercial viability.

Building construction also requires transportation of materials via heavy-duty trucks that primarily run on diesel and the use of electricity. This electricity is sourced either from the power grid or directly from diesel generators. Emissions can be reduced through value engineering, as well as process optimisation and digitalisation.

There is increasing acknowledgment on the need to tackle embodied carbon alongside operational emissions for the built environment to be truly net zero. The World Green Building Council has a vision to reduce at least 40% embodied carbon of all new buildings, infrastructure and renovation by 2030, and to achieve net zero embodied carbon by 2050[32]. Singapore's Building and Construction Authority (BCA) has also revamped its green building rating system, the Green Mark certification scheme, in 2021 to include whole life carbon[33].

To reflect the extent of our efforts in supporting the decarbonisation of the end-to-end built environment, we have set separate sectoral targets across real estate, construction and steel. While we explored the possibility of incorporating embodied carbon emissions as part of our target-setting, current data limitations have prohibited us from doing so at this point.

[31] Source: World Green Building Council, *Bringing Embodied Carbon Upfront*, September 2019.
[32] Source: World Green Building Council, *WorldGBC Net Zero Carbon Buildings Commitment - Introduction: Businesses & Organisations*, September 2021.
[33] Source: BCA, *Green Mark 2021 Whole Life Carbon*, September 2021.

The Southeast Asia context

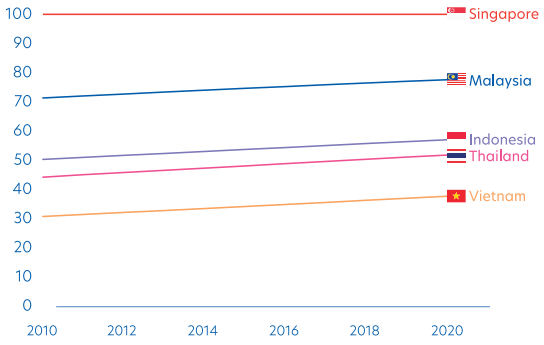
Southeast Asia's population has grown rapidly. The total number of people living in ASEAN countries rose 1.3% on average per year from 1980 to 2020[34] and has reached almost 700 million today. The urban population jumped about 2.7 times over the same period, with more than 400 million expected to live in cities by 2030. This number is likely to grow to more than 520 million by 2050[35].

Population growth and accelerated urbanisation in Southeast Asia have given rise to the demand for new buildings and corresponding energy use. Consequently, the demand for electricity as a share of energy demand in buildings increased in the past decade. Rising household income, which also translates into higher appliance ownership and demand for cooling, is projected to increase energy demand by 15% by 2030 and 60% by 2050 based on current policies scenario[36].

Current regulations, policies and incentives have been focused on improving the energy efficiency of buildings. In particular, more stringent minimum energy performance standards (MEPS) for appliances, especially for cooling equipment, have been introduced to limit energy consumption. Almost all Southeast Asian countries are developing or have developed mandatory MEPS for appliances and voluntary green certifications for buildings to drive efficiency improvements and emissions reductions in buildings.

Urban population in selected Southeast Asian countries

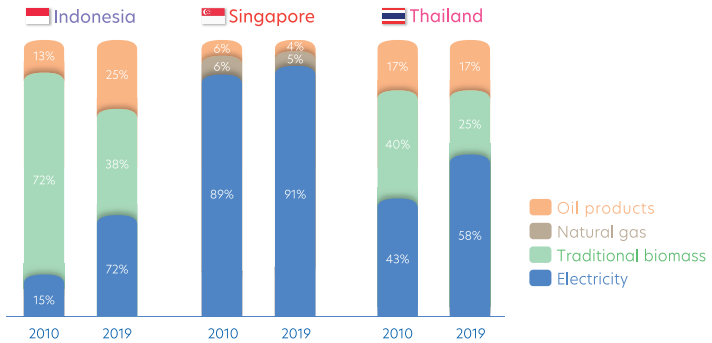
% of total population, 2010-2020



Source: World Bank

Energy demand in buildings by source in selected Southeast Asian countries

2010-2019



Source: IEA

[34] Source: ASEAN Secretariat, *ASEAN Key Figures 2021*, December 2021.

[35] Source: United Nations Department of Economic and Social Affairs Population Division, *World Urbanization Prospects - The 2018 Revision*, 2019.

[36] Source: IEA, *Southeast Asia Energy Outlook 2022*, May 2022.

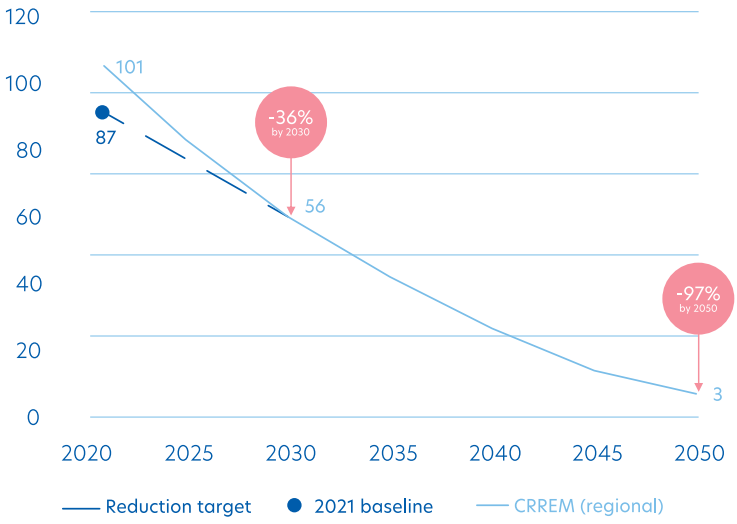
Real estate

Buildings generate emissions either directly, through the burning of fossil fuels, or indirectly through the use of electricity. For the real estate sector, we estimate the operational emissions of the buildings managed by our clients.

Comparing our real estate sector portfolio against the chosen regional CRREM[37] reference pathway, UOB's 2021 baseline, which is measured as kilograms of carbon dioxide produced per square metre of floor space ($kgCO_2/m^2$), is 87 $kgCO_2/m^2$ and is below the regional pathway's 101 $kgCO_2/m^2$. In line with the pathway, we target to reduce our emissions intensity by 36% and 97% by 2030 and 2050 respectively.

Real estate sector emissions baseline and targets

$kgCO_2/m^2$



	2020	2030	2050
Reference scenario - CRREM (regional)	101	56	3
Emissions intensity reduction target		-36%	-97%

Scope of companies and emissions

The clients in UOB's real estate portfolio include:

- property developers, which build, sell and/or lease commercial and industrial buildings, as well as residential properties;
- operators, which provide property management services, as well as own-operate serviced residences such as hotels and serviced apartments;
- investment companies, which own and operate buildings through special purpose vehicles; and
- REITs, which own and operate buildings, receiving rents from commercial tenants and distributing profits as dividends to their investors.

[37] The CRREM pathway is a science-based decarbonisation pathway aligned with the Paris Agreement climate goals to limit the global temperature rise to 1.5°C.

Our clients own a wide variety of buildings, including residential, offices, shopping malls, hotels, factories and warehouses. While these properties are located all over the world, our geographical footprint is mainly concentrated in Asia. Property type and geographical location are key factors that determine different energy requirements, thereby affecting the emissions intensity of buildings.

- Residential buildings tend to be lower in emissions intensity than commercial buildings (such as offices, hotels and hospitals) as the latter generally have higher energy use to support lighting appliances and space cooling critical for their operations.
- Buildings in temperate climates (such as Europe) generally have higher energy demand for space heating, while buildings in tropical climates (such as Southeast Asia) have higher energy demand for space cooling.

In addition to the property types in our real estate financing portfolio, we have included other property types where there are available benchmarks[38], covering 28 countries in total.

Establishing baseline emissions intensity

We calculate our portfolio's emissions intensity by taking the average of the estimated emissions of all our clients weighted by our exposure to them. On this basis, our 2021 baseline portfolio emissions intensity is 87 $kgCO_2/m^2$.

Essential to our calculation is our clients' emissions and the floor space of the buildings operated. Wherever possible, we have obtained the companies' own reported emissions and floor space data directly from their sustainability reports. However, we found that the coverage of company-reported emissions data is not comprehensive, and have thus used supplementary data points, including building standards assessments of national building authorities such as Singapore's BCA.

Such national-level data sources are increasingly important. Particularly, the Green Mark certifications provided to buildings by the BCA reflect directly the buildings' energy intensity. This means that with these standards, we, our clients and their tenants are able to verify the emissions intensity levels of the buildings.

BCA's Green Mark certifications and corresponding energy intensity levels[39]

Rating	Description	Energy intensity (kWh/m^2)		
		Office buildings[40]	Hotel	Retail malls
Gold^{PLUS}	Buildings that achieve at least 50% energy savings	145	205	240
Platinum	Buildings that achieve at least 55% energy savings	130	190	210
Super Low Energy	Buildings that achieve at least 60% energy savings	108	165	160
Zero Energy	Super Low Energy buildings with all energy consumption supplied from renewable energy sources	0	0	0
Positive Energy	Super Low Energy buildings with 115% of all energy consumption supplied from on-site renewable energy sources	0	0	0

[38] Includes all property types except data centres, which are high-emitting buildings but a relatively small part of our portfolio. When a suitable benchmark for data centres becomes available, we will consider including the property type in our targets.

[39] Energy savings should be compared against 2005 building codes which are used as the anchor reference for Green Mark energy savings. Source: BCA, *Green Mark 2021 Energy Efficiency Technical Guide*, September 2021.

[40] Taken as the average of large and small buildings.

Where building standards assessments are also not available, especially outside of Singapore, we have relied on industry averages based on the property type and geographic location, as provided by government agencies, such as the Energy Efficiency Office in Hong Kong, or the CRREM benchmark. In cases where only energy intensity data is available to us, we adopted the latest grid emissions factor published by the IEA to derive a corresponding emissions intensity.

Selecting pathways and setting targets

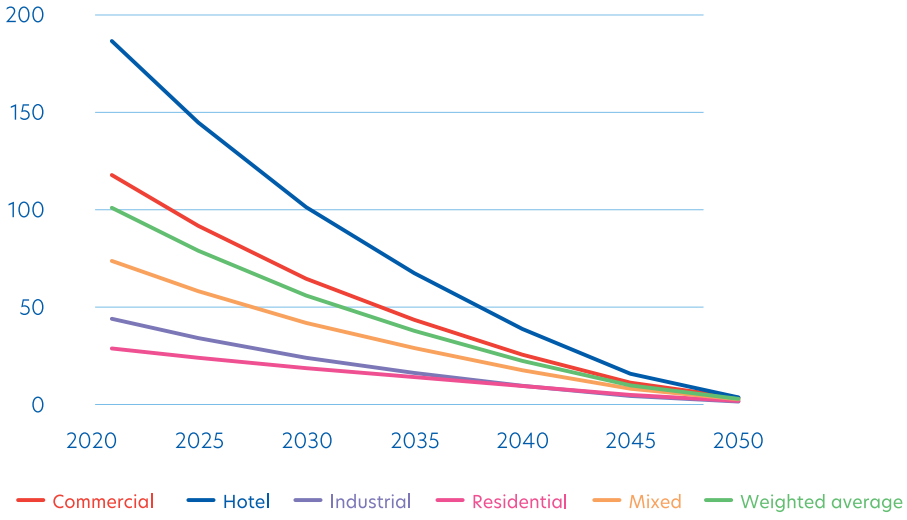
We have referenced a regional pathway from the CRREM model based on a 1.5°C warming scenario. Vis-à-vis other IAMs that do not differentiate emissions intensity by property type, the CRREM model provides both granular starting points and a pathway to 2050 at a property type and country level.

The CRREM model also assumes a global carbon budget in 2050 that is in line with a 1.5°C warming scenario by 2100. The global carbon budget is first allocated to the global real estate sector and split across national sectoral pathways for residential and commercial properties. Each national pathway represents the 'fair share' of carbon that each country could emit from the real estate sector based on use types. Further segregation in the pathway for non-residential properties takes into consideration the relative differences in energy profiles of building activities, as well as the different pathways to net zero.

Against CRREM's regional pathway, we then weighted our exposure based on property type and geographic location to create our own reference pathway.

CRREM reference scenario — Carbon budget across building types weighted based on UOB's regional exposure

$kgCO_2/m^2$, 2020-2050F



Source: CRREM

On the back of these model assumptions, we target to cut our emissions intensity at a rate of 5% per annum to achieve 36% reduction to 56 $kgCO_2/m^2$ by 2030 and to reach nearly net zero by 2050.

The real estate sector has two main levers:

- improvement in buildings' energy efficiency with lower energy used per square metre; and
- decarbonisation of energy buildings consume, either directly through actions such as installing rooftop solar panels or indirectly through the decarbonisation of power through the respective national grids.

Our clients and the countries in which they operate are adopting ambitious plans to improve the energy efficiency of their buildings. These include attaining higher energy efficiency standards for new buildings, retrofitting existing buildings and using of smart technologies to minimise wasted electricity usage.

Buildings built to these standards are achieving impressive results. Buildings in Singapore that are certified BCA Green Mark Platinum already consume at least 55% less electricity than the average level of buildings in 2005.

The pressure for energy efficiency is mounting as building tenants too are demanding more efficient buildings as they themselves develop net zero plans. With rising demand coupled with lower operating costs, buildings that are more energy efficient simply make good business sense. For owners/operators, there may also be a certain degree of protection against periods of very high energy prices as experienced in 2022.

UOB's ability to achieve our targets is reliant on both the reduced emissions intensity of electricity provided to buildings, as well as the continued efforts of our real estate clients to improve the energy efficiency of their buildings. In support of our clients' decarbonisation, we:

- consider the energy efficiency of their buildings in our financing processes, referencing green building certification schemes such as BCA's Green Mark or LEED, a widely used rating system globally; and
- actively assist them as they look to develop more energy-efficient buildings or install renewable energy capacity such as rooftop solar panels.

Beyond operating buildings, our property developer clients are playing a critical role in determining the standards to which buildings are developed, the materials used in construction, and selection of the construction company for the development. As such, they are also in a position to consider and adopt construction materials and processes which have lower embodied emissions. In our efforts to tackle all emissions end to end across the real estate value chain, we would ideally like to assess our financed embodied emissions. However, we are limited by a lack of available industry data and are not able to perform the assessment adequately. We seek to engage with the industry and authorities on making this data available and in a consistent manner for future iterations of our targets.

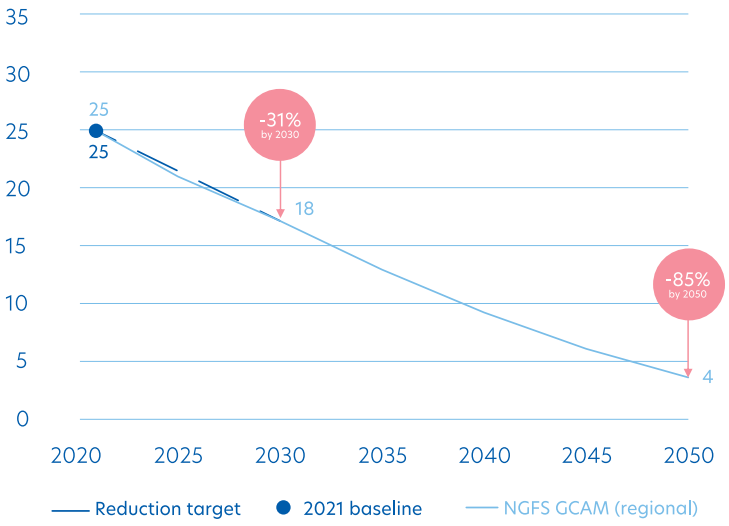
Construction

Carbon emissions are released directly during the construction process through on-site fuel consumption, for instance by construction equipment and heavy-duty vehicles, and indirectly through the use of electricity. While the construction process is less carbon intensive compared with the end-use of buildings, construction emissions have come under attention from industry bodies and regulators alike[41]. Through the inclusion of the construction sector's operational emissions into our target-setting exercise, we recognise the collective efforts required end to end across the built environment value chain in the transition towards net zero.

We have chosen the regional NGFS (GCAM) reference pathway for the construction sector and set emissions intensity reduction targets of 31% and 85% by 2030 and 2050 respectively.

Construction sector emissions baseline and targets

tCO_2/S$ million

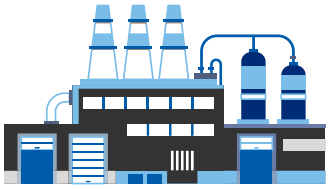


	2020	2030	2050
Reference scenario - NGFS GCAM (regional)	25	18	4
Emissions intensity reduction target		-31%	-85%

[41] Industry bodies and regulators have begun to account for construction process emissions within broader embodied whole-life carbon emissions. For example, the Singapore BCA enhanced its Green Mark certification scheme in 2021 to include whole-life carbon, including the adoption of sustainable and energy efficient construction practices, as a key eligibility criterion.

Scope of companies and emissions

Built environment value chain

Material manufacturing (cement and steel)	Construction	Development and operations
		
» Examples: cement manufacturers, steel manufacturers » Responsible for operational emissions during manufacturing processes such as cement calcination and plant fuel use	» Examples: construction companies, contractors » Responsible for operational emissions during construction process such as vehicle fuel use, and electricity used in construction sites	» Examples: real estate developers and operators » Responsible for operational emissions in building operations such as electricity used

Excluded from target calculation

We have segmented the construction value chain into construction, demolition, renovation and installation. We have focused on the Scope 1 and 2 operational emissions for construction and demolition as these components are most responsible for carbon emissions within the value chain. In contrast, renovation and installation companies require less energy and are less emissions intensive and we have therefore not included them in our scope.

We have chosen to focus on operational emissions given that they are directly managed and are within the control of construction companies. Emissions data are also more robust and well-reported.

We recognise that Scope 3 emissions from materials used in construction such as steel also form a significant part of embodied emissions for construction companies, but insufficient supply chain information currently limits our ability to effectively measure and accurately account for these emissions. As such, we have sought to capture materials manufacturing emissions within our separate steel sector targets.

We aim to include the embodied emissions of materials use, where possible, when emissions data and reporting from construction companies within our portfolio improve.

Establishing baseline emissions intensity

We have used a revenue-based emissions intensity metric – tonnes of carbon dioxide produced per million-Singapore dollar of revenue (tCO_2/S$ million) to measure operations emissions for the construction sector. Though a physical-based intensity metric had generally been our preference, we adopted the revenue-based intensity metric to allow comparability across the broad range of construction projects in real estate and infrastructure (such as industrial plants and roads) undertaken by construction companies. A revenue-based emissions intensity metric also provides broader comparability with the set targets of construction companies.

Further, current data availability limits our ability to choose a physical-based metric. This is because most construction companies do not disclose their emissions breakdown by project type nor provide granular information on the area built, be it on a kilometre basis for roads or square metre basis for buildings.

To calculate the emissions intensity of our portfolio, we have taken emissions data sourced directly from companies where possible, either through company reports or well-established third-party databases. The measurement and reporting of carbon emissions within the construction section are still at a nascent stage, especially among small- and medium-sized enterprises which are an important part of our portfolio.

As such, we had to rely largely on proxies to derive our portfolio's overall emissions intensity of 25 tCO_2/S$ million as the 2021 baseline. We will continue to engage and support our construction clients to improve their reporting. We expect data coverage to improve in the future as industry standards and guidelines strengthen within the region.

Selecting pathways and setting targets

Currently, the major IAMs have not included a dedicated decarbonisation pathway for the construction sector. Consequently, we have chosen to construct a reference scenario bottom-up through underlying drivers of operational Scope 1 and 2 emissions from the use of diesel for heavy-duty trucks and the use of electricity from the grid.

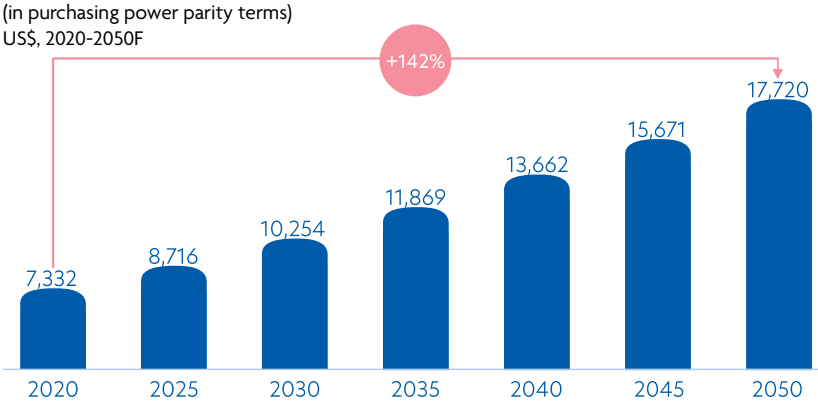
This was completed through two key steps:

- determining overall split across Scope 1 and 2 emissions using historical diesel use (Scope 1) and electricity use emissions (Scope 2); and
- applying reference scenarios for diesel and electricity to form Scope 1 and 2 emissions respectively, and aggregating them to form the overall reference scenario.

We have adopted the net zero-aligned NGFS GCAM model as it is the only regional model that provides the granular underlying data required to build the bottom-up reference scenario. Similar to other sectors, we have taken a regional view of an emissions pathway from the GCAM model to reflect the varying stages of development across our portfolio markets.

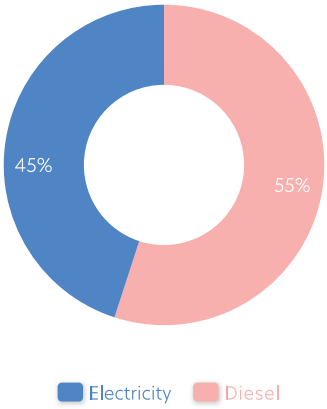
The GCAM scenario is consistent with projected continued GDP growth and improved living standards for the middle-income countries which make up a large part of our footprint. To this end, the scenario includes diesel use from heavy-duty trucks peaking in Southeast Asia by 2035, while electricity production quadruples, driven largely by growth in renewables.

NGFS GCAM scenario – GDP per capita in Southeast Asia
(in purchasing power parity terms)
US$, 2020-2050F



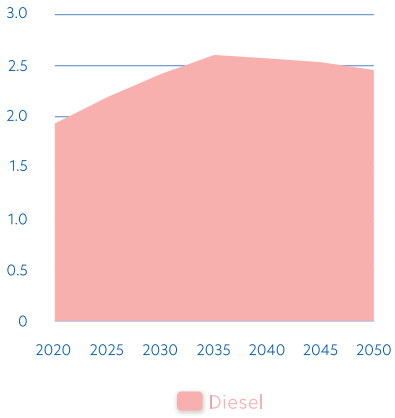
Source:
NGFS GCAM

Global split of diesel and electricity use for construction
EJ, 2019



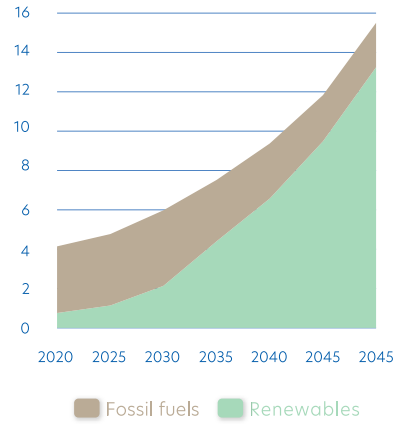
Source: UN Energy Statistics Database

NGFS GCAM scenario – Diesel use by heavy-duty trucks in Southeast Asia
EJ, 2020-2050F



Source: NGFS GCAM

NGFS GCAM scenario – Electricity use by source in Southeast Asia
EJ, 2020-2050F



Source: NGFS GCAM

We have strived to build a reference scenario that most accurately reflects our construction portfolio's emissions scope boundaries, while being consistent with our preference for regional pathways. However, we note that the NGFS GCAM model is aimed at 1.5℃ warming by 2050 and while consistent with our goals, it is classified by GFANZ as having high risk of overshoot[42]. For now, we view that as an acceptable and unavoidable limitation, as we believe it is important to set a target for the construction sector and have relied on the best available pathway to do so, albeit this being new for the banking industry.

We will continue to monitor for updates within the industry and seek opportunities to enhance our construction reference scenario going forward, with the hope of a wider scope of emissions pathways aimed directly at construction in our region in the future.

As outlined by our pathway, we target to align with the science-based path to net zero through a proportional reduction in revenue-based emissions intensity. On the back of our model assumptions, we aim to decline our emissions intensity at a rate of 4% per annum to achieve reductions of 31% to 18 tCO_2/S$ million by 2030, and to 4 tCO_2/S$ million by 2050.

The construction sector is a hard-to-abate sector, given its high dependence on ancillary technologies that may not be commercially available at the moment. Such technologies necessitate research and development into electric-powered equipment and the ability to support off-grid construction projects in a carbon-efficient manner.

To reach our 2030 target, we will rely on our clients' decarbonisation commitments and efforts. These include emissions intensity improvements for construction companies driven by site efficiency measures, as well as optimised processes to reduce operational costs and enhance productivity.

[42] Source: GFANZ, *Guidance on Use of Sectoral Pathways for Financial Institutions*, June 2022.

We aim to be at the forefront of financing our clients' transition efforts and where additional measures are required to be adopted. We will extend our funding to support the installation of on-site renewables, and employment of new construction processes such as pre-fabrication.

Steel

Steel production is a significant contributor to global emissions, responsible for about 8% of all carbon emissions globally[43]. Steel is a critical material in global industry and even more so in real estate as it is a foundational and highly demanded material in buildings and infrastructure. Its pervasiveness is due to its relatively simple production and low cost of production components, engineering properties and plentiful supply.

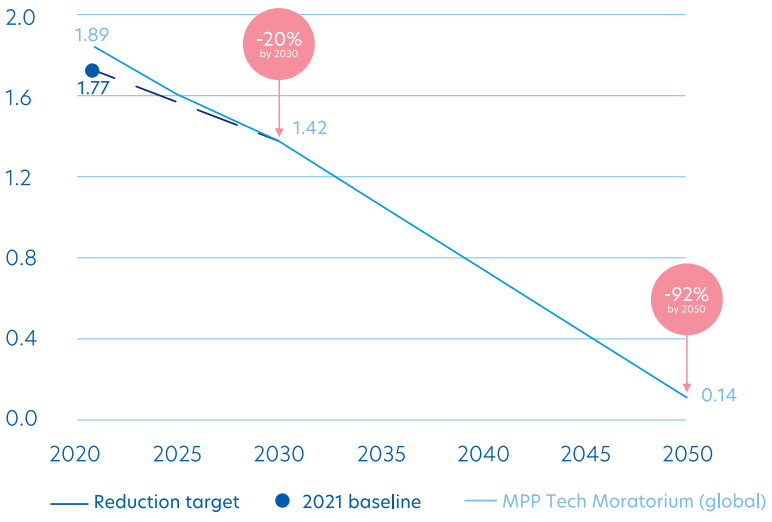
While real estate companies are experimenting with alternatives, such as innovative projects to build mass timber commercial buildings, the realistic path to net zero relies on the decarbonisation of crude steel production, which involves the burning of metallurgical coal that is highly emitting.

In ensuring that we cover emissions end to end in the built environment, we have included steel in our target-setting exercise, aiming to reduce the physical emissions intensity of steel production, measured as tonnes of carbon dioxide emissions per tonne of crude steel produced (tCO_2/tonne), in our portfolio.

We have chosen the global Mission Possible Partnership (MPP) Tech Moratorium reference pathway, with our 2021 baseline of 1.77 tCO_2/tonne below the pathway's 1.89 tCO_2/tonne. Also in line with the pathway, we target to reduce our emissions intensity by 20% to 1.42 tCO_2/tonne of crude steel by 2030 and 92% by 2050.

Steel sector emissions baseline and targets

tCO_2/tonne

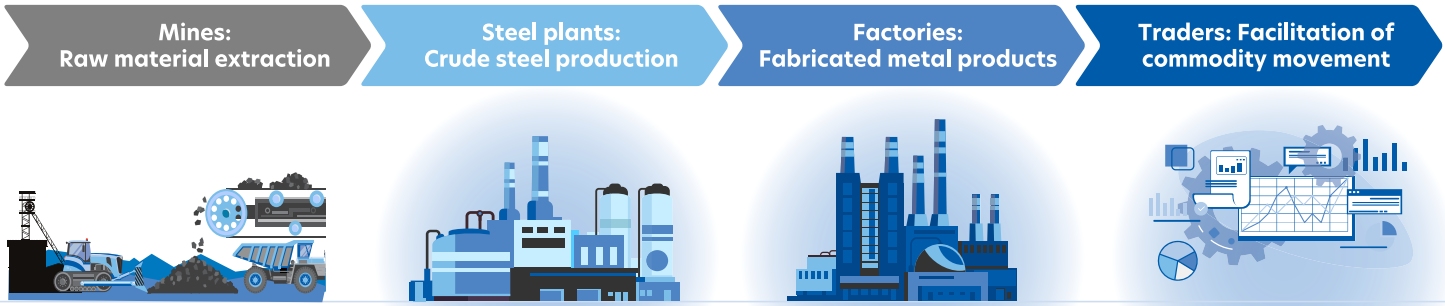


	2020	2030	2050
Reference scenario - MPP Tech Moratorium (global)	1.89	1.42	0.14
Emissions intensity reduction target		-20%	-92%

[43] Source: IEA, *Iron and Steel Technology Roadmap*, October 2020.

Scope of companies and emissions

Steel sector value chain



* Upstream emissions related to raw materials such as mining of iron ore / metallurgical coal are not included in our scope

The steel sector value chain includes the extraction of raw materials such as iron ore and metallurgical coal, crude steel production in steel plants, fabrication of metal products and steel trading. Given that the majority of emissions originate from steel production, our target-setting scope is focused on the Scope 1 and 2 emissions of crude steel production, as well as Scope 3 upstream emissions of fabricated metal producers and traders, limited to crude steel production.

There are currently two major steel production methods, namely blast furnace-basic oxygen furnace (BF-BOF) and electric arc furnace (EAF). The majority of crude steel, about 71%, is currently produced via the BF-BOF method[44], which is more emissions intensive than the EAF method due to the use of metallurgical coal as the reducing agent and source of energy. On average, the BF-BOF method releases 2.20 tCO_2 per tonne of crude steel produced[45]. In comparison, the EAF method, which accounts for the remaining production volume of 29%, uses electricity as the main source of energy. On average, the emissions intensity of the EAF method is 0.34 tCO_2/tonne when scrap steel is used as the main input, and 1.40 tCO_2/tonne when direct reduced iron is used[46].

Decarbonisation for the steel sector currently relies on the shift in production from BF-BOF to EAF and accordingly the increase in recycled steel, as well as operational efficiency improvements such as through enhanced process control and use of higher quality inputs[47].

[44] Source: World Steel Association, *World Steel in Figures 2022*, April 2022.
[45, 46] Source: MPP, *Net-Zero Steel Sector Transition Strategy*, October 2021.
[47] Source: IEA, *Iron and Steel Technology Roadmap*, October 2020.

New technologies such as carbon capture, utilisation and storage (CCUS) and green hydrogen as an alternative fuel source are also expected to reduce emissions intensity significantly across production methods in the long term. However, there must still be more significant advances in the viability and cost-accessibility of such technologies to achieve substitution of existing methods at scale. We expect that CCUS and green hydrogen will only be meaningfully adapted in steel production after 2030.

Establishing baseline emissions intensity

To estimate physical-based emissions intensity, we have used primarily crude steel production data at a plant level, which was in turn aggregated up to the companies which own the steel plants. This has enabled us to derive company-level emissions for our steel clients.

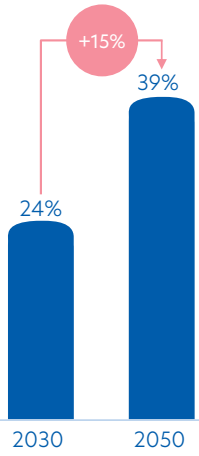
However, we face significant data challenges as our exposure leans towards smaller steel producers in Southeast Asia, whose crude steel production data are not reported, as well as steel traders that typically do not report the plants from which they procure. Where data is not available, we have used the global steel industry proxy as steel is a global commodity in nature. Using this approach, our 2021 baseline emissions intensity for our steel portfolio is 1.77 tCO_2/tonne.

The measurement and reporting of carbon emissions within the steel sector are still at a nascent stage, especially among Southeast Asian players that make up a majority of our portfolio. We will continue to engage and support our clients to improve their reporting, and we expect data coverage to improve in the future as industry standards and guidelines strengthen within the region. However, the reality of relying heavily on proxies may also lead to the volatility of our future emissions baseline when data coverage improves.

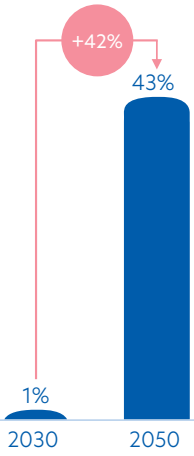
Selecting pathways and setting targets

We have used the global net zero-aligned pathway published by the MPP, which includes both Scope 1 and 2 emissions for steel, and its Tech Moratorium scenario, which assumes that future investments are confined to near zero emissions technologies from 2030 onwards.

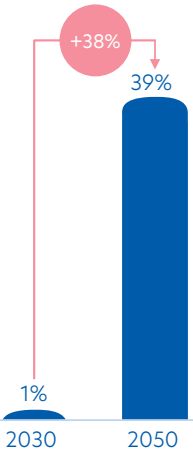
MPP Tech Moratorium scenario – Secondary production in total steel production
2030-2050F



MPP Tech Moratorium scenario – Primary steel with carbon capture production
2030-2050F



MPP Tech Moratorium scenario – Primary steel production using 100% hydrogen
2030-2050F



Source: MPP Tech Moratorium

While the MPP Tech Moratorium scenario, developed in consultation with the steel industry and published in October 2021, is relatively new, we believe that it represents the most realistic path to net zero for the hard-to-abate steel sector and is consistent with GFANZ guidance on the use of sectoral pathways.

Our 2021 baseline of 1.77 tCO_2/tonne crude steel is slightly lower than the global MPP Tech Moratorium reference scenario of 1.89 tCO_2/tonne. To meet the 2030 reference scenario target, we aim to reduce our emissions intensity by 20% to 1.42 tCO_2/tonne by 2030 and 92% to 0.14 tCO_2/tonne by 2050.

We recognise that steel is a hard-to-abate sector. The ability of the sector to decarbonise will be contingent on the availability and adoption of new technologies such as CCUS and green hydrogen, and industry-wide breakthroughs to scale up and reduce the cost of these transformational technologies. However, the impact of these technologies is expected to be minimal until after 2030.

We will also support the shift towards EAF production method and industry-level improvements in plant efficiency, though Southeast Asia is expected to continue expanding its BF-BOF steel production capacity in the near term[48].

To achieve our net zero goal, we will:

- continue to work closely with industry and regulatory bodies to understand how to best support our clients through this transition period;
- finance our clients in their research and development of new technologies, which are expected to contribute to substantial emissions reductions beyond 2030; and
- refine our own targets based on latest developments.

[48] Source: Wood Mackenzie, "Steel industry emissions to decline 30% by 2050", 17 May 2022.

The way forward

This paper outlines UOB's first set of sectoral emissions targets in our net zero commitment. We have three priorities going forward:

- executing the strategies and plans laid out in this paper to achieve our targets;
- reviewing, updating and improving our targets; and
- engaging with relevant stakeholders to help improve policies, data and technologies for the transition to net zero.

We are integrating our commitments and targets into our sector strategies, as well as performance indicators. In doing so, we will continue to be motivated to develop and deliver the financing and advisory solutions and services that our clients need for their decarbonisation ambitions, as well as provide the necessary funding for new and emerging green technologies.

We will also review our targets periodically to ensure that we keep pace with industry developments, scientific advice and improvements in data coverage.

- The scientific perspective of the path to net zero is constantly changing and we may need to update our targets accordingly. We will do this when a material change is needed to contain any disruptions to business and ensure year-on-year comparability.
- Should our sectors in practice significantly over- or undershoot our decarbonisation targets, we may need to set new targets to reflect this reality, while staying true to a science-based view of the path to net zero.
- We may adjust certain approaches as industries mature and data become available. For instance, we may change the current revenue-based emissions intensity metric for the construction sector to another appropriate metric.
- We will look to expand the scope of our targets to include new sectors and sub-sectors as data and climate scenarios become available.

We will provide updates on the progress against our targets annually.

While we do our best as a financial intermediary to facilitate an orderly transition, we should prepare for a disorderly ride.

The COVID-19 pandemic over the last few years has reduced emissions dramatically, though in some cases, emissions intensity increased with the much lower utilisation of services such as aviation. Recent geopolitical events also disrupted energy supplies, leading to higher short-term demand for fossil fuels such as coal and natural gas in the interest of energy security.

More of such disruptions are highly likely, though unpredictable. This means that we may experience volatility in some years where sector emissions intensity numbers go up within an overall downward trend. Further improvements in data quality and coverage may also lead to fluctuations in our sector emissions intensity levels, given the high reliance on proxies in our current estimations.

At UOB, we recognise that stronger climate action is needed to progress towards the 1.5°C goal, and the need to bring everyone along in this journey. Collaboration is and will remain more efficient and effective than any party acting alone. We are committed to working with our stakeholders in the region and globally, by creating and scaling partnerships and ecosystems to support the just transition of the region through positive change and impact for the real economy.

Appendix – Methodology for target-setting

Establishing baselines

Setting targets for each sector requires us to understand our starting point, which we termed as our emissions baseline. As this exercise was conducted in 2022, our starting baseline is 2021. In determining our clients' emissions, we make three key design decisions:

- emissions metric;
- value chain inclusion; and
- emissions scope.

Emissions metric

With our goal to achieve net zero and to support sustainable growth, our primary objective is to support more economic output for lower emissions. As such, our targets are to reduce emissions intensity, or reduced emissions per unit of sector output.

Where possible, we have used physical-based emissions intensity metrics, such as emissions per tonne of crude steel produced for the steel sector, and per square metre of floor space for the real estate sector, to reflect the direct relationship between the emissions-generating activity and the resulting emissions.

Where data on physical activities were not available, for instance within the construction sector, we have used a revenue-based emissions intensity metric in this initial target-setting exercise. For fossil fuels, we have set policy restrictions rather than targets, in recognition that the path to net zero for these sectors is more about a managed phase-down and less about reducing emissions intensity. There is also the critical priority to limit new supply so that price incentives for the switch to alternatives are maintained.

These approaches are tailored to our selected sectors and we are supporting net zero through our portfolio by making progress against our targets.

Value chain inclusion

Within each of our selected sectors, we focus on the parts of the value chain that generate the most emissions and where we have the most material exposure and influence on the emissions level. These decisions are made on a sector-by-sector basis, taking into account what is practical. In some instances, we have focused on areas that have the best available data; in others we have focused only on certain parts of the value chain in order to maintain comparability within the sector and with the available reference scenarios.

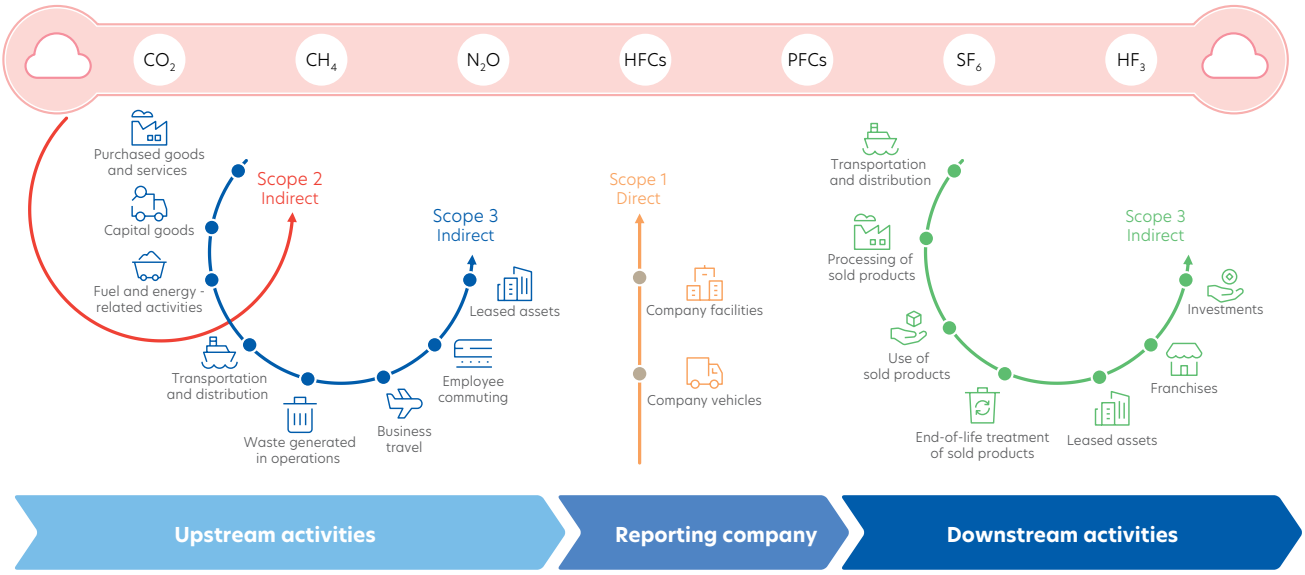
Emissions scope

Based on the GHG Protocol standards[49], emissions for an individual entity can be classified into three scopes:

- Scope 1: direct emissions from owned or controlled sources;
- Scope 2: indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed; and
- Scope 3: all other indirect emissions that occur in a company's value chain.

[49] Source: Greenhouse Gas Protocol, *Corporate Value Chain (Scope 3) Accounting and Reporting Standard*, 2021.

Definition of emissions scopes



Source: GHG Protocol

Using the steel sector for instance, the emissions scopes for a crude steel manufacturer are:

- Scope 1: emissions that arise from the burning of metallurgical coal and other fossil fuels in blast furnaces, either as a reducing agent or for energy use;
- Scope 2: emissions from fossil fuels burnt in the generation of power that is used to provide electricity in crude steel manufacturing facilities; and
- Scope 3: upstream emissions arise from the mining and transportation of iron ore and coal, while downstream emissions arise from the fabrication of steel products.

We have focused on the most material scopes of emissions for each sector and the emissions within the control of the clients for which we are setting targets, while ensuring that the scope included in our baseline is the same as defined by the science-based reference scenarios.

Aggregating emissions to sector levels

After we have calculated the emissions data for each client, we aggregated the data to form an overall sector-level emissions baseline based on the weight of the exposure in our portfolio:

$$Emissions\ intensity = \sum_i \frac{Exposure_i}{Total\ sector\ portfolio\ exposure}\ x\ Emissions\ intensity_i$$

where *i* is a borrower or investee company in each sector.

When creating the weighted averages, we aggregate the emissions data at an overall sectoral level and include the following products in the calculation of exposure:

- business lending;
- specialised lending, including project finance;
- investment securities; and
- debt capital markets underwriting.

Projecting the way forward

The sector emissions baselines form the starting point for our emissions projections. To understand the gaps from our emissions intensity baselines to our science-based targets, we need to consider the national policies in place, the technologies that may become available and affordable between now and 2050, and the actions to which our clients have committed.

This helps us form a reasonable range of estimates on the emissions levels our existing sector portfolios will likely deliver without significant intervention from UOB, with the balance being the work that we need to do to achieve our targets.

Selecting reference scenarios

In June 2021, GFANZ released guidance on the selection of reference scenarios for target-setting[50]. This lays out the considerations that financial institutions should make in selecting a reference scenario, covering five key factors:

GFANZ criteria	Areas to consider
Scope	• Scope of GHG emissions covered • Scope of companies within a sector covered • Scope of countries considered and the granularity of country pathways • Granularity of the reference scenario within a sector, especially for highly heterogenous sectors
Net zero and temperature alignment	• How well-aligned the reference scenario is to 1.5°C warming by 2050 and the risk of overshoot
Reliance on carbon capture and removal	• Extent to which the reference scenario depends on carbon removal, either nature-based or through direct air capture and other technologies, to achieve net zero
Social, economic and policy assumptions	• Financial institutions should be comfortable with the level of economic growth implied by the chosen reference scenario
Credibility and feasibility	• The scientific robustness and credibility of the chosen pathway

[50] Source: GFANZ, *Guidance on Use of Sectoral Pathways for Financial Institutions*, June 2022.

To understand the required levels of emissions intensity reductions, we have relied on science-based models that chart out the most credible pathways to net zero by 2050 across sectors and countries. These are from IAMs, including IEA NZE, NGFS – REMIND and NGFS – GCAM, or specialised industry research bodies such as CRREM for the real estate sector and MPP for the steel sector.

We have considered the appropriate and best available pathway on a sector-by-sector basis and in view of the following:

- ensuring scientific credibility and alignment with 1.5°C warming by 2050;
- ensuring an appropriate level of regional granularity for our portfolio. As we operate across Southeast Asia, we need to ensure that we select pathways that are realistic and fair for the emerging economies in which we operate as well as the developed countries we serve. Where possible, we have derived a region-specific net zero pathway that extract the scientific projections for our markets;
- ensuring the right level of sector granularity, especially in highly heterogenous sectors such as real estate, for which we have adopted an industry-specific pathway; and
- adopting pathways that assume continued economic growth and which do not overly rely on reduced growth or unrealistic assumptions around carbon removal to achieve net zero by 2050.

We recognise that the science of sector-based prescriptions towards net zero is an emerging and uncertain field. Of the scenarios we consider, the steel reference scenario from MPP was published in late 2021, while the IEA NZE scenario was published in mid-2021.

As actual circumstances and government policies shift, or when technologies come to the fore or fail to deliver the impact expected, new reference pathways will likely be needed.

Our approach will need to evolve with the science. To ensure comparability, we will continue to report against the targets outlined in this paper until there is a pressing need for new reference pathways. This will likely happen several times between now and 2050.

Appendix – Sectoral emissions baseline methodology

Ecosystem	Sector	Methodology
Energy	**Power**	Generation companies Calculated bottom-up at individual power plant level, taking into account power generation levels and emissions factors per fuel type Equipment manufacturers Attributed zero emissions intensity for pure-play renewables manufacturers; industry proxy used otherwise
	Automotive	Manufacturers Calculated bottom-up at individual company level, using production levels and emissions factors by car brand, engine type and size Dealers and financial leasing Calculated bottom-up at individual company level using country sales split and emissions factors across car brand, engine type and size; industry proxy used otherwise
	Oil and gas (Fossil fuels supply)	N/A as sectoral commitments are applied
Built environment	**Real estate**	Investment companies Calculated bottom-up at individual building level, taking into account energy use intensity and power grid emissions factors; industry proxy used otherwise Developers, operators and REITs Used reported emissions intensity where available; industry proxy used otherwise
	Construction	Used reported emissions and revenue where available; industry proxy used otherwise
	Steel	Calculated bottom-up at individual steel plant level, taking into account production levels and emissions factors by production type; industry proxy used otherwise

Appendix - Glossary

Acronyms	Definition
BCA	Singapore Building and Construction Authority
BF-BOF	Blast furnace-basic oxygen furnace
CCUS	Carbon capture, utilisation and storage
CRREM	Carbon Risk Real Estate Monitor
EAF	Electric arc furnace
EV	Electric vehicle
GHG Protocol	Greenhouse Gas Protocol
GCAM	Global Change Assessment Model
GFANZ	Glasgow Financial Alliance for Net Zero
IAM	Integrated Assessment Model
ICE	Internal combustion engine
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
JGCRI	Joint Global Change Research Institute
MAS	Monetary Authority of Singapore
MEPS	Minimum energy performance standards
MPP	Mission Possible Partnership
NGFS	Network for Greening the Financial System
PCAF	Partnership for Carbon Accounting Financials
REIT	Real estate investment trust
REMIND	Regional Model of Investment and Development
SPV	Special purpose vehicle
TCFD	Taskforce for Climate-Related Financial Disclosures

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