OCBC Bank

Partnering Clients towards a Net Zero ASEAN and Greater China

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Message from Helen Wong

Group Chief Executive Officer

“We have now set ambitious, quantitative and science-based Net Zero targets and pathways for emissions arising from our portfolio. In effect, we will partner our corporate clients to meaningfully contribute to a Net Zero ASEAN and Greater China by 2050 in an orderly and just transition.”

Helen Wong,
Group Chief Executive Officer

Over the years, I have always viewed protecting the environment as non-negotiable. When I joined OCBC, my colleagues did not need convincing.

Sustainability has long been at the heart of OCBC’s business, anchored on our purpose and values. Particularly, we have stepped up our efforts to combat climate change. In May 2022, for instance, we committed to spending more than SGD 25 million over four years to reduce our carbon footprint from operations in three key markets – Singapore, Malaysia and Greater China. The funds will go to deploying energy-efficient tech to reduce our emissions and solar energy systems to raise the share of renewables in our energy mix.

However, the bulk of our efforts – whether as a corporate entity or in daily life – must be conceived of as a collaboration with others. Partnership, in a word, is the most efficient way to magnify the impact of our individual actions. And that has indeed been our approach.

Since 2018, we have been proactively engaging our clients to develop and invest in greener assets by offering bespoke sustainable financing solutions. We set a target of SGD 10 billion by 2022 for our corporates of all sizes and institutional clients, a target we adjusted in 2022 to SGD 50 billion by 2025. By the end of March this year, we were already at SGD 47 billion.

We have also seen good progress in the OCBC sustainable financing framework for small and medium-sized enterprises (SMEs) that we launched in Nov 2020. This signifies a growing inclusion of sustainability in SMEs’ business strategies and operations that goes beyond mere awareness.

Especially, given the availability of lower-carbon energy generation technologies, we have made significant headway in the renewable energy sector, financing solar and wind farm projects worldwide. In tandem, we have worked to reduce greenhouse gas (GHG) emissions caused by burning coal. In April 2019, OCBC was the first Southeast Asian bank to stop financing new coal-fired power plants. In shipping, OCBC remains the only Singapore bank that is a signatory of the Poseidon Principles.

As a leading retail bank in Singapore, we have incentivised individuals to make eco-friendlier consumption choices. Over SGD 3.5 billion in OCBC Eco-Care loans – paying for homes, renovations and vehicles – has been extended since their introduction in March 2021.

It is just as important for us to support carbon reduction and sequestration community projects big or small. The #OCBCCares for the Environment Fund, in which we partner government bodies, advocates, citizen groups, customers and employees to address climate change, has funded many ground-up projects in Singapore. Our SGD 4 million sponsorship of the OCBC Arboretum at the Singapore Botanic Gardens funds studies and conserves 2,000 dipterocarp trees, the endangered giants of the Southeast Asian rainforests. Our recent SGD 3 million sponsorship of the OCBC Mangrove Park in Pulau Ubin in Singapore, and one mangrove project in Malaysia's Tebuk Mendeleng, will help grow 18,000 mangrove trees. Our inaugural Singapore Sustainability Innovation Challenge, partnering SATS, solicited innovations world-wide to address food waste arising from air travel.

We will keep building on these efforts. I am therefore pleased to report that – having joined the Net-Zero Banking Alliance in October 2022 – we have now set ambitious, quantitative and science-based Net Zero targets and pathways for emissions arising from our portfolio. In effect, we will partner our corporate clients to meaningfully contribute to a *Net Zero ASEAN and Greater China* by 2050 in an orderly and just transition. It will be a challenging but meaningful quest.

The six sectors we have set targets for – Power, Oil and Gas, Real Estate, Steel, Aviation and Shipping – represent the most emission intensive sectors that we finance. In addition to our sectoral emission reduction targets, OCBC will not extend project financing to upstream Oil & Gas projects that obtained approval for development after 2021.

42% of our corporate and commercial banking loan portfolio falls within the scope of our targets as we focus on parts of the sector value chains responsible for the majority of the emissions. The availability of established and credible reference pathways for these sub-sectors is another key consideration.

Our sectoral Net Zero targets and pathways are a culmination of months of hard work by many colleagues bankwide and in our core markets of ASEAN and Greater China. Beyond the numbers, the project exemplifies key aspects of our vigorously partnership-based approach. We could refer to them as our 4 'C's:

Commitment – Decarbonisation is a multi-stage journey that will take time. To absorb surprises and reverses, unwavering commitment is needed from all stakeholders.

Collaboration – This extends beyond just a fine-grained and continuing partnership with clients and partners to include, internally, a "One Group" approach by OCBC so that every part of the bank is aligned with the effort.

Catalyst – OCBC intends to act as a catalyst of change to guide, navigate and accelerate the transition. As more companies become change champions for their sectors, transition to Net Zero may even arrive ahead of 2050.

Courage – Giving up profitable businesses takes courage; venturing into new, greener businesses is a leap of faith with few guarantees.

I firmly maintain that a more sustainable world can be created so long as we are united with our clients and communities in pursuing one. Hope can take flight if we take action together – for now and beyond.

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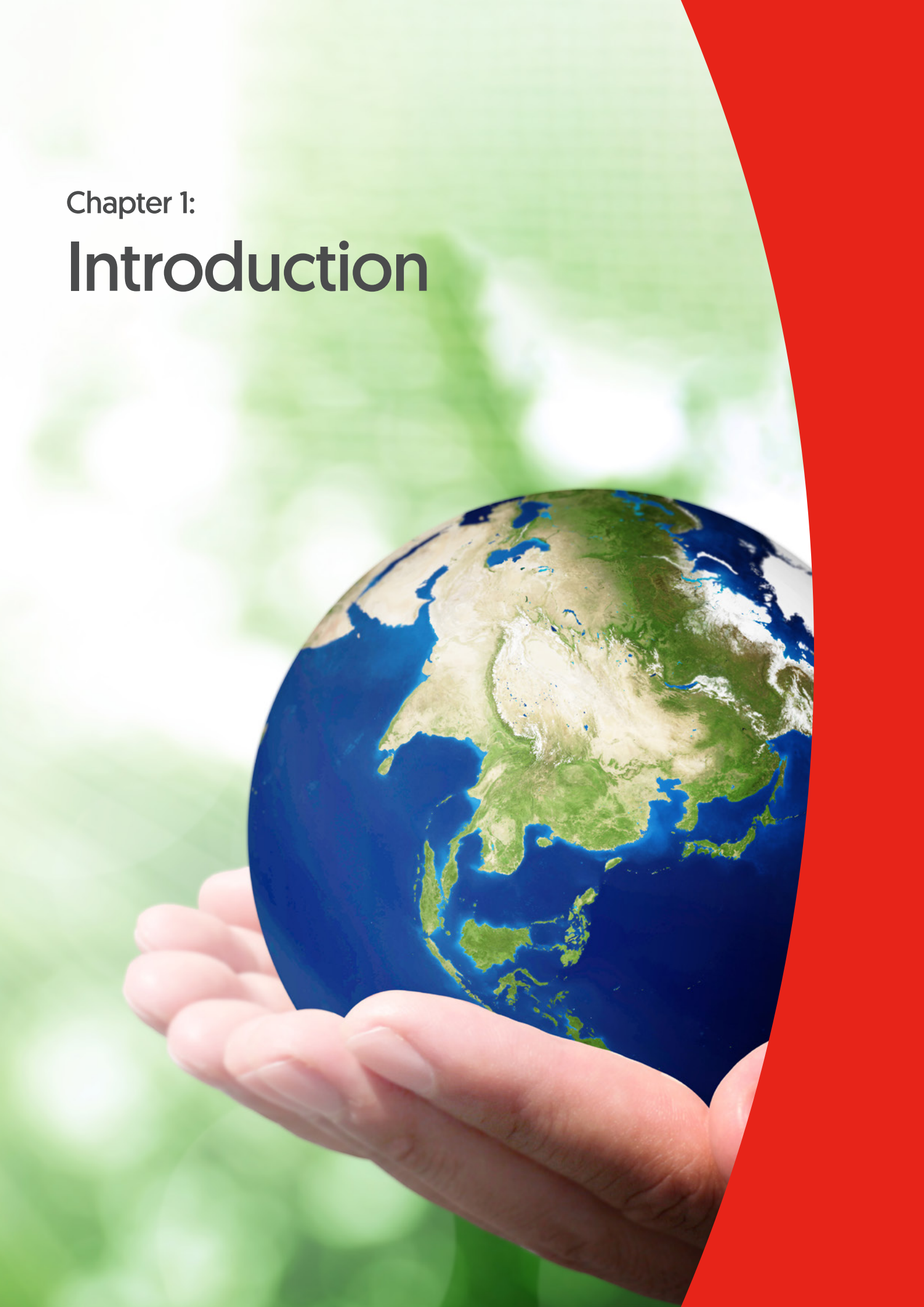
Glossary

Acronyms	Definition
AD	Alignment Delta
ASEAN	Association of Southeast Asian Nations
AER	Annual Efficiency Ratios
ATAG	Air Transport Action Group
APS	Announced Pledges Scenario
BCA	Building Construction Authority
BEEA	Building Energy Efficiency Assessment
BF-BOF	Blast Furnace – Basic Oxygen Furnace
BREEAM	Building Research Establishment Environmental Assessment Method
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CCUS	Carbon Capture, Utilisation, and Storage
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CRREM	Carbon Risk Real Estate Monitor
DCM	Debt Capital Markets
DRI	Direct Reduced Iron
DWT-NM	Deadweight Tonne-Nautical Mile
EAF	Electric Arc Furnaces
ECM	Equity Capital Markets
GFANZ	Glasgow Financial Alliance for Net Zero
GHG	Greenhouse Gas
GSPT	Global Steel Plants Tracker
IATA	International Air Transport Association
IEA	International Energy Agency
IMO	International Maritime Organisation
IPCC	Intergovernmental Panel on Climate Change
LCOS	Low Carbon Operating System
LEED	Leadership in Energy and Environmental Design
LNG	Liquefied Natural Gas
MGTC	Malaysian Green Technology and Climate Change Corporation
MPP- TM	Mission Possible Partnership's Tech Moratorium
NZBA	Net-Zero Banking Alliance
NZE	Net Zero Emissions by 2050
OSIC	OCBC Sustainability Innovation Challenge
PCAF	Partnership for Carbon Accounting Financials
PP	Poseidon Principles
PPAs	Power Purchase Agreements
Protocol	GHG Protocol
RECs	Renewable Energy Certificates
SME	Small and Medium Enterprise
SMEEA	Small and Medium Enterprise Energy Assessment
SAF	Sustainable Aviation Fuels
TCFD	Taskforce for Climate-related Financial Disclosures
UNEP FI	United Nations Environment Programme Finance Initiative
WBSCD	World Business Council for Sustainable Development
WRI	World Resources Institute

Chapter 1:

Introduction



Governments and companies around the world have responded to the call to accelerate their decarbonisation efforts to combat climate change. Many of our core markets in ASEAN and Greater China have pledged to achieve Net Zero by 2050.

Achieving Net Zero is especially important in these regions. ASEAN and Greater China accounted for more than one-third of global greenhouse gas emissions in 2021[1]. Maintaining a delicate balance between ambitious decarbonisation goals and ensuring a just transition, remains a challenge for OCBC's core markets, each of which will need unique decarbonisation strategies tailored to their needs.

As a regional Singapore-headquartered financial services group with the most comprehensive coverage in these regions, OCBC is well-positioned to partner our clients to meaningfully contribute to a Net Zero ASEAN and Greater China by 2050 in an orderly and just transition. With about 410 branches and offices across 12 markets in these two regions, we are well equipped to offer our customers a deep understanding of local context and the unique challenges and ambitions of each market.

ASEAN

Singapore

Total emissions 2021	Emissions per capita 2021	Decarbonisation commitment
58 Mt (0.15% of global emissions)	9.71 tCO_2/person	Net Zero by 2050

Malaysia

Total emissions 2021	Emissions per capita 2021	Decarbonisation commitment
252 Mt (0.66% of global emissions)	7.56 tCO_2/person	Carbon neutral by 2050 at the earliest

Indonesia

Total emissions 2021	Emissions per capita 2021	Decarbonisation commitment
603 Mt (1.59% of global emissions)	2.19 tCO_2/person	Peak emissions in 2030, exploring opportunities for Net Zero by 2060

Thailand

Total emissions 2021	Emissions per capita 2021	Decarbonisation commitment
270 Mt (0.71% of global emissions)	3.88 tCO_2/person	Carbon neutrality by 2050, Net Zero by 2065

Vietnam

Total emissions 2021	Emissions per capita 2021	Decarbonisation commitment
321 Mt (0.85% of global emissions)	3.24 tCO_2/person	Net Zero by 2050

1 European Commission, "CO_2 emissions of all world countries", 2022, https://edgar.jrc.ec.europa.eu/report_2022?vis=pop#emissions_table

Greater China

Mainland China

Total emissions 2021
12,466 Mt
(33% of global emissions)

Emissions per capita 2021
8.73 tCO_2/person

Decarbonisation commitment
Peak emissions before 2030, carbon neutrality before 2060

Hong Kong SAR

Total emissions 2021
33 Mt
(0.09% of global emissions)

Emissions per capita 2021
4.37 tCO_2/person

Decarbonisation commitment
Carbon neutrality before 2050

Macau SAR

Total emissions 2021
2.7 Mt
(0.01% of global emissions)

Emissions per capita 2021
4.01 tCO_2/person

Taiwan

Total emissions 2021
288 Mt
(0.76% of global emissions)

Emissions per capita 2021
12.07 tCO_2/person

Decarbonisation commitment
Net Zero by 2050

Sources:
- European Commission – CO_2 emissions of all world countries (https://edgar.jrc.ec.europa.eu/report_2022?vis=pop#emissions_table)
- Net Zero Tracker (https://zerotracker.net/)
- Taiwan National Development Council – Taiwan's Pathway to Net-Zero Emissions in 2050 (https://www.ndc.gov.tw/en/Content_List.aspx?n=B154724D802DC488)
- The Government of Hong Kong SAR – Government announces Hong Kong's Climate Action Plan 2050 (https://www.info.gov.hk/gia/general/202110/08/P2021100800588.htm)

As a financial institution, we aim to excel for sustainable growth, and driving the transition to a sustainable low-carbon world is our core strategic pillar. Increasing investment in greener activities is key, as is creating credible transition pathways for high-emissions, essential economic sectors such as power and metals; we need electricity to keep our societies and economy humming and steel for the construction of critical infrastructure. One priority is to redirect capital from high-emissions technology and processes to low- or zero-emissions ones, particularly in sectors where such technologies and ecosystems already exist.

Building on our sustainability efforts, we are now setting ambitious, quantitative, and credible decarbonisation targets for emissions arising from our portfolio (our "Net Zero targets", or "targets"). As a financial institution, our Scope 3 emissions – particularly our financed emissions – are the most material. We recognise that we have a role to play, and we are now setting Net Zero targets with the goal of reducing these emissions by partnering with our clients, thereby directing capital to facilitate meaningful change in the real economy.

For OCBC, we are setting targets for three key reasons:

1. Financing the transition is simply the responsible thing to do. The consequences of doing too little for the societies that we serve, especially future generations without the means to adequately adapt, are dire. The brunt of delayed action will be most acutely felt by people in our core markets. Through these targets, we signal our commitment to working with our clients and the governments where we operate to ensure this happens.

2. Climate transition is an aspiration of our clients. Our purpose is to help our clients achieve their aspirations with innovative financing. Increasingly, those aspirations include transitioning their businesses towards low- or zero-emissions technologies. Climate transition is a megatrend that is shaping the next great industrial revolution; by supporting that change, we believe we are helping to shape the future.

3. Supporting the climate transition is sound risk management. Climate change can cause financial and reputational risks for the financial sector. As decarbonisation gathers momentum, clients in carbon-intensive and hard-to-abate sectors could face greater pressures from more stringent climate policies, changes in technology standards, and shifts in demand patterns. Understanding and monitoring climate risks faced by our clients and helping them succeed in this transition is in line with our approach for prudent risk management.

As a key element of our business strategy, the Net Zero commitments will:

- Ensure we stay focused on the areas where our actions are most impactful, identifying opportunities that we can help realise as a financing partner.

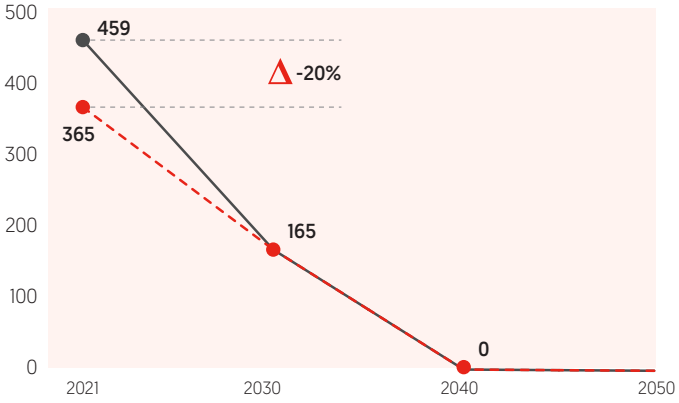
- Enable us to engage our clients on the basis of credible science-based decarbonisation pathways and a data-driven approach, giving us confidence in our clients' transition efforts; and

- Provide a benchmark for external stakeholders to hold us accountable. This is a public commitment on which we will provide an annual progress report.

1.1 Target dashboard

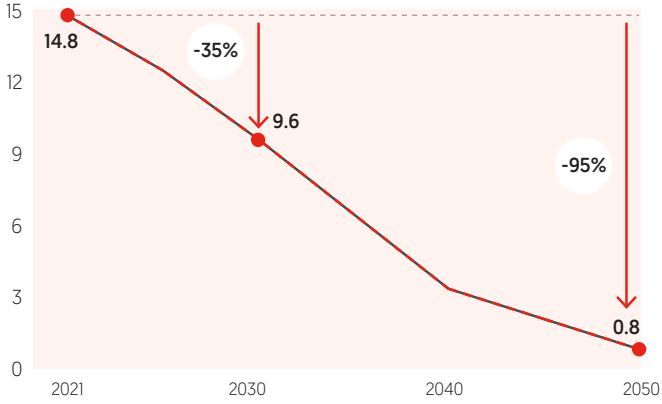
Sector	In scope	Emissions	Metric	Reference pathway	2021 baseline (reference)	2030 target (% reduction from baseline)	2050 target (% reduction from baseline)
Power	• Power generation companies • Power equipment manufacturers	• Scope 1 (generation) • Scope 3 (equipment manufacturers)	$kgCO_2/MWh$	IEA NZE	365 (459)	165 (55%)	0 (100%) by 2040
Oil & Gas	• Upstream • Integrated	• Scope 1 • Scope 2 • Scope 3	$MtCO_2e$	IEA NZE	14.8 (N/A)	9.6 (35%)	0.8 (95%)
Real Estate	• Real Estate owner-operators • Financed buildings • REITs	• Scope 1 • Scope 2 • Scope 3 (tenant / receptable energy)	Alignment Delta (%)	CRREM	-8% (N/A)	≤0% (N/A)	≤0% (N/A)
Steel	• Steel producers	• Scope 1 • Scope 2	$tCO_2/tSteel$	MPP – TM (regional)	1.93 (1.95)	1.68 (13%)	0.12 (94%)
Aviation	• Airline operators and lessors	• Scope 1 (operators) • Scope 3 (lessors)	$kgCO_2$/ passenger-km	IATA Fly Net Zero	0.261 (0.243)	0.088 (66%)	0 (100%)
Shipping	• Financed vessels	• Scope 1	Alignment Delta (%)	IMO – PP	+4.5% (N/A)	≤0% (N/A)	≤0% (N/A)

Power
[$kgCO_2/MWh$]



Portfolio baseline and targets — IEA NZE

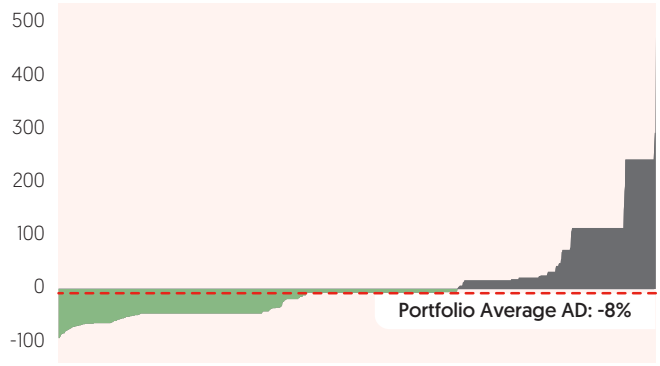
Oil & Gas
[$MtCO_2e$]



Portfolio baseline and targets — IEA NZE

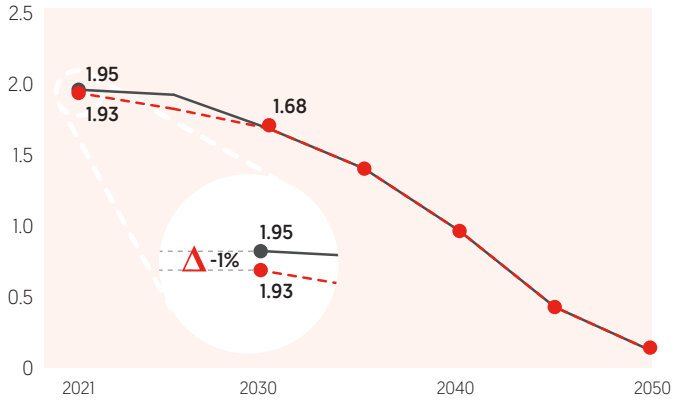
In addition to an absolute emissions reduction target, OCBC will not extend project financing to upstream Oil & Gas projects that obtained approval for development after 2021.

Real Estate
Alignment Delta [%]



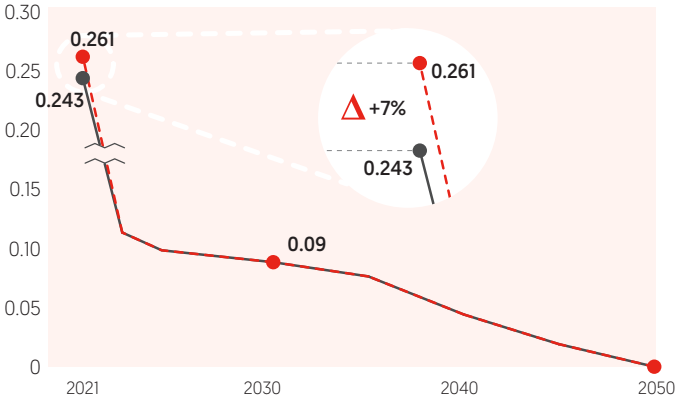
2021 portfolio baseline
[no forecast shown; target is to be under the benchmark]

Steel
[$tCO_2/tSteel$]



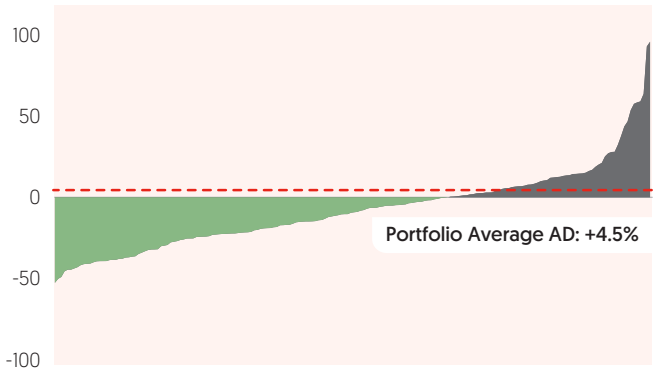
Portfolio baseline and targets
MPP TM [Regional]

Aviation
[$kgCO_2$/passenger-km]



Portfolio baseline and targets
IATA Fly Net Zero

Shipping
Alignment Delta [%]



2021 portfolio baseline
[no forecast shown; target is to be under the benchmark]

Chapter 2:

Our approach

2.1 Our principles

The path to Net Zero is sector-specific, given the different levels of technological maturity and action required in each sector. To ensure coherence while reflecting that sector-specificity, we have adopted a consistent approach overall and then tailored it to each sector. Throughout our Net Zero target setting exercise, we have been guided by the following key principles:

- Grounding our Net Zero targets in climate science. Our goal is to support the global transition to Net Zero by 2050 to limit global warming to 1.5°C above pre-industrial levels, based on the climate research. We have adopted internationally recognised, science-based pathways aligned with this scenario, which is more ambitious than the Net Zero pledges of several countries we operate in.

- Interim targets for 2030. Transition pathways that limit global warming to 1.5°C require rapid action during this decade. We have set 2030 as an interim checkpoint to ensure we are on track towards our ultimate 2050 goal.

- Sector-specific targets. Each sector has its unique challenges and characteristics, giving rise to distinct transition pathways. We have assessed our financed emissions and set decarbonisation targets at a sectoral level, using sector-specific metrics.

- Prioritising actions we can take with our clients. We have identified various levers to support clients in their transition. Even within a given sector, there is no one-size-fits-all solution since factors such as our clients' own decarbonisation targets, understanding of assets that need to transition, and historic trends and government plans in each market may play a role. We conducted analyses to identify the optimal levers under various assumptions to prioritise our actions and develop strategies for each sector.

- Searching for opportunities that enable economic growth as well as promote Net Zero. We have set targets that focus on the decarbonisation agenda while enabling the growth of a greener economy. Given that we primarily serve a region that is rapidly developing, there would be social implications arising from the transition. We believe the path to Net Zero is compatible with continued economic growth and prosperity for all.

2.2 Standards and guidelines

In setting our targets, we have been guided by the following:

Net-Zero Banking Alliance

The NZBA was launched by the United Nations Environment Programme Finance Initiative (UNEP FI) in April 2021. It is an alliance of banks committed to aligning their lending and investment portfolios with Net Zero emissions by 2050. NZBA reinforces, accelerates and supports the implementation of decarbonisation strategies, providing an internationally coherent framework and guidelines in which to operate, supported by peer-learning from member banks. As at April 2023, there are 129 member banks across 41 countries, representing about 41% of global banking assets amounting to USD 74 trillion[2]. OCBC joined the NZBA in October 2022.

The NZBA sets out guidelines that we have followed in setting our targets. Key examples include:

- Interim targets must be set for 2030 at the latest;
- Targets should be set in terms of absolute emissions or sector-specific emissions intensity;
- The targets should not be based on starting points that are more than two years prior to when the targets are set; and
- The reference pathways that we use must be from credible, well-recognised sources.

2 UN Environment Programme Finance Initiative "Members – Net Zero Banking Alliance", NZBA. https://www.unepfi.org/net-zero-banking/members/

Partnership for Carbon Accounting Financials

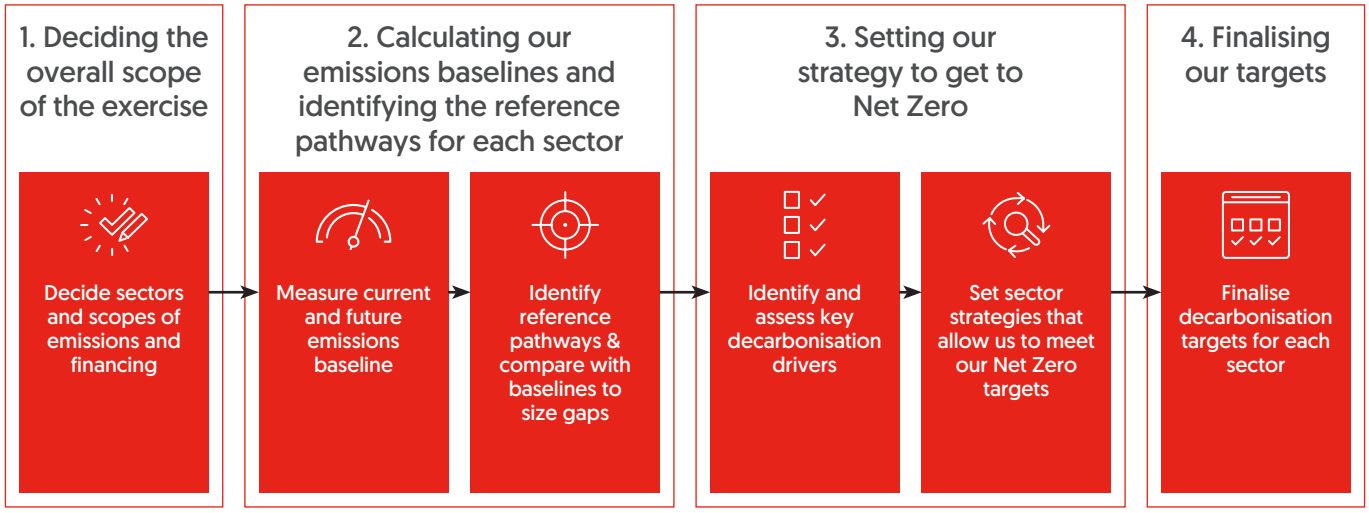
The Partnership for Carbon Accounting Financials (PCAF) is an industry-led initiative enabling financial institutions to measure and disclose GHG emissions associated with loans and investments. PCAF has developed a methodology for calculating financed emissions, in line with requirements set by GHG Protocol (Protocol). In this set of targets, we have taken guidance from PCAF's methodology in measuring emissions, especially for the Oil & Gas sector where we measure absolute emissions, and in the way that we have prioritised data sources.

Poseidon Principles

For the Shipping sector, our target-setting and disclosure is guided by technical guidance from the Poseidon Principles (PP). The Poseidon Principles are a set of guidelines developed by banks to promote environmentally sustainable shipping practices. The technical guidance from PP includes requirements for shipping lenders to assess and disclose the carbon intensity of their portfolio of loans to individual ships, as well as to set decarbonisation targets that align with the International Maritime Organisation (IMO)'s ambition of reducing total annual GHG emissions by at least 50% by 2050 based on 2008 levels.

Our disclosure on our shipping portfolio for 2021 can be found in the annual progress report https://www.poseidonprinciples.org/finance/wp-content/uploads/2022/12/Poseidon-Principles-Annual-Disclosure-Report-2022.pdf.

2.3 Our approach



Our approach to setting our targets involved four steps:

1. Deciding the overall scope of the exercise. This entailed deciding the sectors, scope of emissions and scope of financing to include in accounting for our financed emissions.

2. Calculating our emissions baselines and identifying the reference pathways for each sector. These baselines comprise of the current starting-point emissions from our portfolio and a projection of and how these emissions might evolve. Thereafter, we identified reference pathways for each sector, with which we compared our projections, to determine the magnitude of any gaps between where our portfolio may move to and where the reference pathways show it needs to be.

3. Setting our strategy to get to Net Zero. For each sector, we identified the key decarbonisation drivers and conducted impact analyses to understand what actions we could take to meet our 2030 interim targets and 2050 targets. These actions then formed the basis of our strategy for each sector.

4. Finalising our targets. This was a collective decision-making process involving all relevant internal stakeholders including our business and risk management teams. The targets were endorsed at the highest levels, by OCBC's senior management team and the Board Sustainability Committee.

2.3.1 Scope

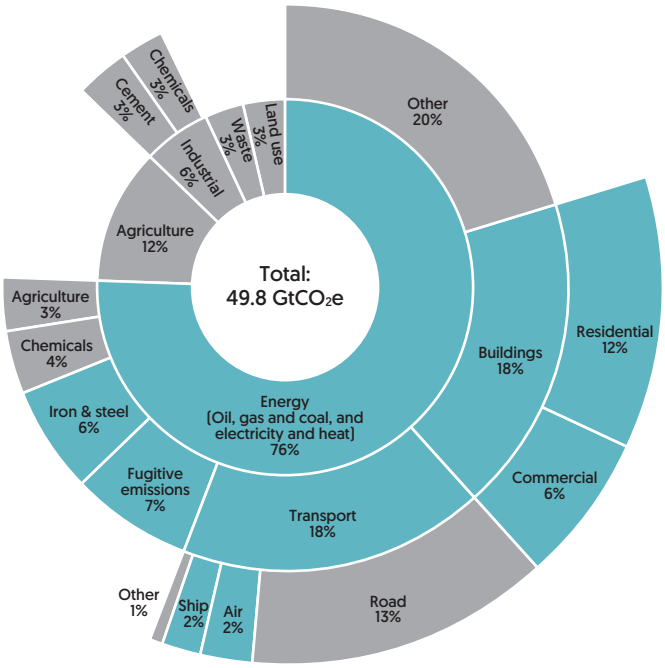
Selection of sector

The transition to Net Zero is a complex and multifaceted challenge that requires significant transformation across the full breadth of the economy. While we aspire to reduce our financed emissions from all our clients, we have chosen to start from the below six sectors as they are key high-emissions sectors that require urgent actions to decarbonise and comprise a material part of our corporate and commercial banking portfolio.

- **Contribution to global GHG emissions and the importance of the sector in the transition to Net Zero**

NZBA requires its members to set targets for all the major carbon intensive sectors[3]. As a member, we have set targets for the most carbon intensive sectors where data and methodologies allow. It is hard to precisely attribute annual global GHG emissions to specific industries as emissions can be double-counted. For instance, the Power and Oil & Gas sectors have impacts that go beyond their own sector boundaries as other sectors depend upon them, so their GHG emissions are often attributed both to them and to the end user of the energy they create. The World Resources Institute (WRI) reports that, globally, the Power and Oil & Gas sectors account for more than 75% of annual GHG emissions[4]. Meanwhile, the other four sectors that we have set targets for account for 28% of GHG emissions, most of which may be double-counted with Power and Oil & Gas sector GHG emissions (Figure 1).

Figure 1: Global greenhouse gas emissions by key sectors in 2019
(% of $GtCO_2e$)



Source: World Resources Institute – World Greenhouse Gas Emissions: 2019 (https://www.wri.org/data/world-greenhouse-gas-emissions-2019)

3 NZBA requires target setting on the following sectors: agriculture; aluminium; cement; coal; commercial and residential real estate; iron and steel; oil and gas; power generation; and transport.
4 World Resources Institute, "World Greenhouse Gas Emissions: 2019", (2022), https://www.wri.org/data/world-greenhouse-gas-emissions-2019

- **Materiality of the sector in the OCBC portfolio**

  We seek to address a large proportion of our portfolio; 42% of our corporate and commercial banking loan portfolio[5] is captured within the scope of our targets.

Selection of value chain within the sector

Within each sector, we have focused our targets on specific parts of the sector value chains based on the following considerations:

- In each sector, what is the sub-sector that is the most critical to decarbonise? In each sector, we have identified the sub-sectors responsible for the majority of the emissions in that sector. For example, we focused on electricity generation in the Power sector and not on transmission grids, as the bulk of emissions in the Power sector arise from the generation of electricity[6]. By decarbonising the power generation sub-sector, a vast majority of emissions in the overall Power sector will be removed;

- What do the sector-specific reference pathways seek to measure and address? Within a sector, reference pathways are typically established for a sub-sector that is critical for sector decarbonisation. For example, Aviation sector reference pathways focus on emissions from aircraft burning jet fuel, and not from airport infrastructure; and

- Which data is available for each sector? Emissions reporting is a relatively young practice, and our targets are limited by the availability of data. For example, in Real Estate sector, we are not yet able to set a robust target for embodied emissions, which result from the use of raw materials in construction.

Scope of GHG emissions

We have followed the definitions of GHG emissions outlined by the Protocol, a widely recognised standard for accounting and reporting GHG emissions developed by the WRI and the World Business Council for Sustainable Development (WBCSD). The Protocol splits GHG emissions into three scopes (Figure 2):

- Scope 1 emissions are direct emissions from sources that are owned and controlled by the organisation. These typically include emissions from combustion of fossil fuels in vehicles or generators for heat and electricity;

- Scope 2 emissions are indirect emissions from the generation of purchased electricity, heat or steam used by the organisation; and

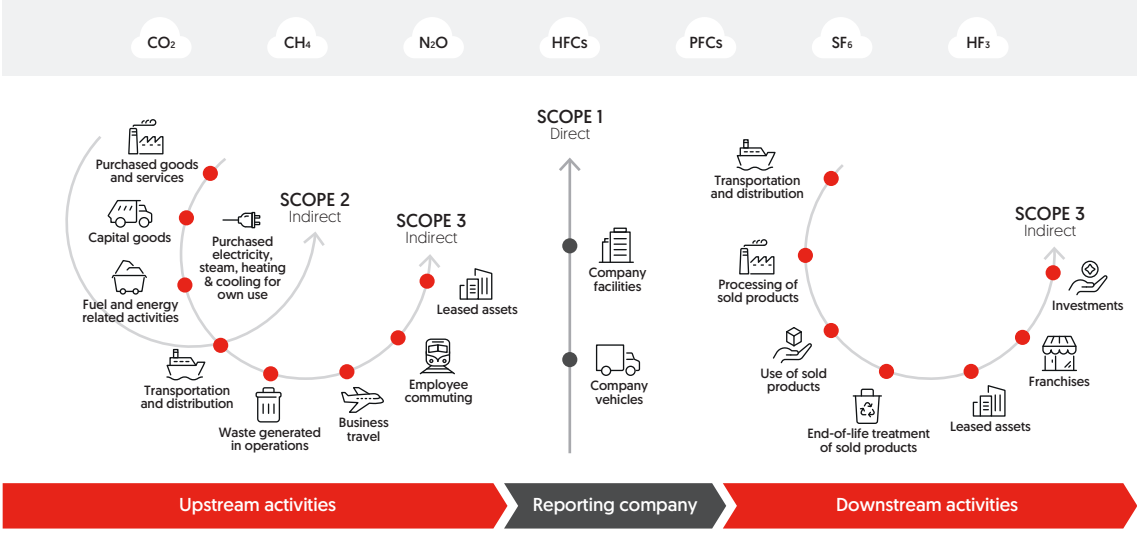
- Scope 3 emissions are all the other indirect emissions that occur in the organisation's value chain, both upstream and downstream. Financed emissions are typically the most significant Scope 3 emissions of financial institutions.

Companies wishing to manage their GHG emissions typically start with Scope 1 and 2 emissions, since these are the most directly under their control. However, to fully understand the overall impact on the environment, assessing Scope 3 emissions is critical, especially for sectors such as Oil & Gas, as this enables companies to understand and reduce their wider impact. We have evaluated sector-by-sector what should be included in each of our sector targets based on where the material source of each sector's emissions is, and where our clients are able to make an impact.

5 Defined as our total exposure to corporate and SME clients, excluding financial institutions and sovereign borrowers.

6 We recognise the key role that transmission grids play in decarbonising power generation – in many countries this is a central effort as it allows power to be distributed from areas with high access to renewable energy to the rest of the country. We do and will continue to support the extension of these grids. Excluding them from our targets, however, reflects that our focus should not be on decarbonisation of those grids, but on their extension.

Figure 2: Scope 1, 2 and 3 GHG emissions defined by GHG Protocol



Source: GHG Protocol – The Global GHG Accounting and Reporting Standard for the Financial Industry [https://ghgprotocol.org/global-ghg-accounting-and-reporting-standard-financial-industry]

Accounting for emissions using the three scopes creates double counting in some instances. For example, natural gas is supplied by our Oil & Gas clients to our Power generation clients, who then burn the gas to generate power that they in turn provide to our Real Estate clients. The emissions generated by the burning of the gas are made only once in reality, but in our scoping, they are included three times – as the downstream Scope 3 emissions of our Oil & Gas clients, as the Scope 1 emissions of our Power generation clients, and as the Scope 2 emissions of our Real Estate clients.

We made no attempt to strip out this double counting. Instead, our target setting approach works on decarbonisation at all three stages – we reduce emissions by working with our clients to improve the energy efficiency of buildings, to replace gas with renewables in power generation, and to limit the extraction of natural gas by Oil & Gas companies. Rather than being a pitfall of our methodology, we believe that the double counting of emissions is beneficial to our aim as it provides us with a holistic view of the actions we can take in each sector, and how their inter-relationships can impact decarbonisation across sectors at a portfolio level.

Products and portfolio

The NZBA guidelines stipulate that we calculate our financed emissions for lending and investment activities when setting our targets. In addition, we have extended the scope of our target to also include facilitated emissions from our Debt Capital Markets (DCM) and Equity Capital Markets (ECM) activities. The products that were included in our target setting are as follows:

- Our corporate loans and loan equivalents[7] in the corporate banking and commercial banking books, including specialised financing (e.g., project finance). These instruments comprise the bulk of the financing we provide to our clients and through them we directly enable our clients' activities.

- DCM and ECM transaction underwriting activities. These activities do not directly lead to financed emissions for the bank, as the equity or debt is ultimately held by the investors. However, the activities are key enablers for our clients to raise finance, so we have included our share of any transaction for which we have been in the underwriting consortium.

7 These include instruments such as letters of credit and banker's guarantees.

2.3.2 Metrics

We have chosen different emissions metrics for each of the sector targets to align with the best ways we can support decarbonising each sector. In this section, we outline the three types of metrics that we have used for our exercise.

Physical emissions intensity metrics:

We used physical emissions intensity metrics for the Aviation, Power, and Steel sectors. The path to Net Zero in these sectors requires both a reduction of emissions as well as a continuation, or even growth, of activity to increase the output of goods and services needed by society. In these sectors, we are therefore targeting a reduction in physical emissions intensity in order not to constrain the output of the sector, provided that decarbonisation is sufficiently rapid. This metric measures the volume of emissions per unit of the relevant product or output for the sector such as megawatt-hour in the Power sector, and tonnes of steel in the Steel sector.

By setting a target to reduce the intensity, we are committing to supporting our clients to decarbonise their businesses, and committing to steering our financing towards those with lower emissions intensity. We see this metric as most consistent with our dual objectives to support decarbonisation and economic growth.

Physical emissions intensity calculation for portfolio

$$\textit{Physical emissions intensity of portfolio } (x_p) = \sum_i \left(x_i \times \frac{e_i}{e_p} \right) \quad \text{[Equation 1]}$$

Where: x_i = emissions intensity of a client i
e_i = OCBC's exposure to a given client i
e_p = OCBC's exposure to the in-scope portfolio for the sector

Alignment delta

For the Shipping and Real Estate sectors, we have expanded on the physical emissions intensity metric to use an alignment delta (AD) metric. This is a variant on the physical emissions intensity approach, and is designed for highly heterogenous sectors; it was originally developed as part of the Poseidon Principles approach for decarbonising shipping portfolios.

The approach can be applied to sectors where the underlying assets have highly diverging levels of emissions intensity and are not substitutes for each other. For example, a hotel in Hong Kong will have different emissions to an office building in Singapore, and they cannot replace each other; the decarbonisation reference pathway for each asset is also different as a result.

To calculate the AD of the portfolio, the physical emissions intensity of each client is first measured. This is then compared to a specific reference pathway for that client based on the type of asset that it owns or operates to calculate the AD of the client, i.e. in percentage terms, how far above or below the reference pathway the client's physical emissions intensity is. The portfolio AD then summarises these individual comparisons by averaging them across the portfolio, weighting by exposure to each client.

The advantage of using this metric is that it allows comparison of clients to their appropriate reference pathways. This avoids building an unintended incentive into our target that enables us to achieve our target by switching to bank lower-emissions types of properties or vessels, rather than focusing on helping our clients to decarbonise the types of properties and vessels they own or operate.

Alignment delta calculation

$$\textit{Alignment delta of property or vessel } (\Delta_i) = \left(\frac{x_i - r_{ps}}{r_{ps}}\right) \quad \text{[Equation 2]}$$

Where: x_i = emissions intensity of property or vessel i

r_{ps} = required physical emissions intensity for the property (based on type and location) or ship (based on type and size class) using the relevant reference pathway

$$\textit{Alignment delta of portfolio } (\Delta_p) = \sum_i \left(\Delta_i \times \frac{e_i}{e_p}\right) \quad \text{[Equation 3]}$$

Where: e_i = OCBC's exposure to a given client i

e_p = OCBC's exposure to the in-scope portfolio of the sector

Absolute emissions

For the Oil & Gas sector, we have set our target as a reduction in absolute emissions. This is because the route to decarbonising the Oil & Gas sector is to use less oil and gas for generating energy, rather than to use oil or gas with lower emissions. We have measured the absolute emissions following the PCAF financed emissions calculation approach, with the following modifications.

Firstly, for purpose of calculating the share of a client's emissions that is attributed to us, we used the total assets of our clients, rather than the enterprise value for public companies, for consistency and to mute the impacts from year-on-year share price volatility. Secondly, we also measured emissions using our total commitment to our clients, including undrawn limits. This goes beyond the PCAF guidelines and will overstate the emissions that are attributable to OCBC; however, we believe that it is important to give an accurate picture of our overall financial commitments towards the sector.

Absolute emissions calculation

$$\textit{Portfolio emissions} = \sum_i \left(x_i \times \frac{e_i}{a_i}\right) \quad \text{[Equation 4]}$$

Where: x_i = The total emissions of a client, i

e_i = OCBC's commitment to a client, i

a_i = The total assets of a client, i

2.3.3 Reference pathways

We have selected reference pathways that reflect the level of decarbonisation required to reach Net Zero by 2050 and to support limiting global warming to 1.5°C by the end of the century. These reference pathways are developed by a range of leading international bodies to provide credibility to our targets.

Sector	Reference pathway
Power	International Energy Agency Net Zero Emissions (IEA NZE) by 2050
Oil & Gas	IEA NZE by 2050
Real Estate	Carbon Risk Real Estate Monitor (CRREM)
Steel	Mission Possible Partnership's – Tech moratorium (MPP – TM)
Aviation	Fly Net Zero scenario by International Air Transport Association (IATA)
Shipping	Initial GHG strategy from IMO adopted for Poseidon Principles (IMO – PP)

The key points in the reference pathways are 2030 when we set our interim targets, and 2050. We recognise that the reference pathways to these points may evolve over time. We will closely monitor changes to reference pathways, and will decide if and when we need to revise any of our targets, noting that we do not intend to change our targets every year. This will help provide consistency for our teams, and for our clients whom we will be engaging on our targets.

As a Singapore headquartered bank, our portfolio has a strong Asian footprint with significant exposure to emerging markets. However, we are cognisant that the effects of climate change are global in nature. When selecting reference pathways, we have taken a balanced approach in choosing between global and regional reference pathways. For sectors that are highly localised with production occurring in specific locations, we have generally used regional reference pathways. For instance, steel mill and real estate assets are fixed, and so we have selected regional pathways to reflect the required pace of decarbonisation in our clients' markets. For sectors that are more global in nature, we have selected global pathways. Aviation and shipping companies' emissions are made internationally, while Oil & Gas companies sell their products globally.

The Power sector is the only one which does not follow the general approach outlined above. Here, we have selected a global pathway, notwithstanding that power is generated and consumed locally. Regional reference pathways for emissions from power generation vary greatly, such that we do not feel comfortable selecting among them. Choosing a global reference pathway is a pragmatic choice, also an ambitious one with regard to achieving our global decarbonisation objective. Asian power grids are widely expected to decarbonise more slowly than those in many western markets, so by selecting a global pathway, we are committing to pushing a faster and more aggressive power transition in Asia. With the Power sector being a dominant driver in decarbonisation of other sectors, we believe our choice is consistent with our overall ambition towards a 1.5°C future.

2.3.4 Data

Emissions reporting has made significant advances in recent years – the development of reporting standards by the Taskforce for Climate related Financial Disclosures (TCFD) and efforts by regulators, stock exchanges and governments to make this a requirement has greatly increased the availability of emissions data. Industry regulators such as national building authorities have increasingly required emissions and energy efficiency reporting, and have updated standards. However, it remains a challenge to collect comprehensive and accurate data. Many companies, especially smaller ones, have not yet started reporting emissions and standards, and scope of emissions data can differ across companies. Additionally, we often finance only specific activities (trade, project development, etc.) of a company, or specific legal entities, that have very different emissions profiles to the parent; in such instances, data remains a challenge when it is available only at a parent level, but not at an activity or subsidiary level.

PCAF guides banks to use the highest quality emissions data available, giving guidelines on what constitutes different levels of quality. But it also recognises that data availability should not be an excuse to delay action, and guides that data quality can be improved over time. To get to the most accurate possible baseline position, we have therefore used a combination of data sources:

- Where available, we have used asset-level emissions data as this enables an accurate and consistent way of assessing clients' emissions profiles;
- Where companies are reporting their emissions, and this is provided at the same level as our financing, we have used that data;
- In some cases where borrowing entity level data is not available, we have taken the reported emissions of the parent as a proxy; and
- Where no other data is available, we have used proxies based on national or regional averages for the sector or asset class.

Where possible, we used 2021 data, which was the latest GHG emissions data at the point that we calculated our baselines. For some clients whose 2021 data was not available, we used the data from the closest possible year. For consistency, we used a year-end 2021 snapshot of our portfolio to compute our exposures to clients.

2.3.5 Use of carbon credits

We believe that high quality carbon credits will play a role in addressing hard-to-abate emissions. For instance, in the aviation industry, sustainable aviation fuels (SAF) will take several years to become widely available as production is currently low. In the interim, quality carbon credits could play a role in decarbonising Aviation sector. More broadly, carbon credits can be an important mechanism for companies which are themselves not in high-emitting industries but want to take climate action and contribute to decarbonisation efforts as it can bring necessary capital for carbon credit generating projects (e.g., accounting firms buying carbon credits to offset their emissions). Through such actions, capital is brought to carbon credit generating projects.

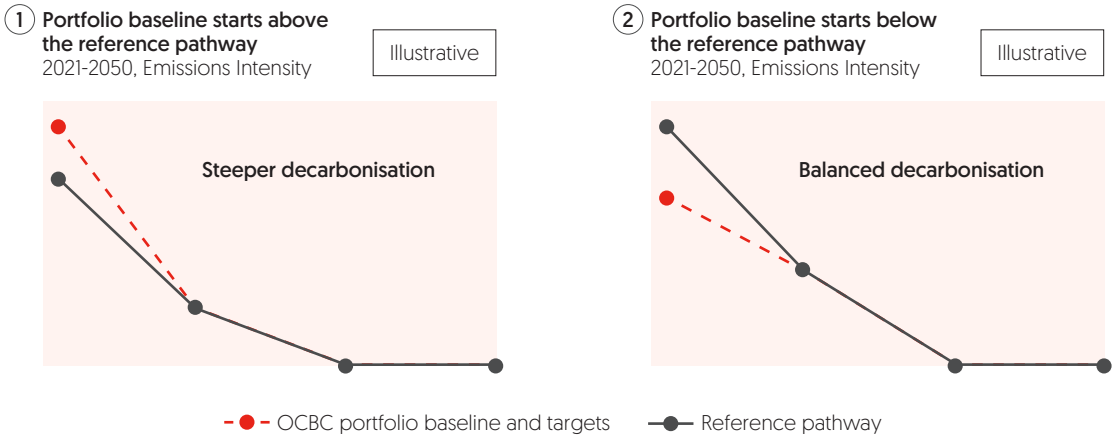
Carbon credits can however be controversial, especially in cases where poor-quality credits have been generated for activities that would have occurred even in the absence of such credits, thus giving a false sense of comfort on overall emissions. Carbon credits should not be used as an excuse to avoid or delay technological change required where the technologies are available and economically viable.

Given the immaturity of the market for such credits, we have not included them in our initial assessment. That said, we may in time relook at the possibility of our clients using high-quality carbon credits to reduce their reported emissions, should there be more guidance from industry bodies on the subject.

2.4 Developing our Net Zero strategy

Journey to 2030

In the nearer-term towards 2030, our approach for the sectors – Power, Real Estate, Steel, Aviation and Shipping – where we have physical emissions intensity targets is to ensure that our portfolio has the same physical emissions intensity as the reference pathway in 2030. This means that where our portfolio starts above the reference pathway, we need to decarbonise our portfolio faster than the chosen pathway over the coming decade; conversely where our portfolio baseline is lower than the starting reference pathway, we may be able to pursue decarbonisation at a more gradual pace, recognising the prior efforts that we have already expended to transition our portfolio.



For the Oil & Gas sector, where the targets are set based on absolute financed emissions, the level of the 2030 point is not set directly by the reference pathway. Rather, our 2030 target is to reduce financed emissions of our portfolio by 35% from its level at the end of 2021.

Beyond 2030

In the longer-term, committing to Net Zero involves navigating numerous uncertainties and lesser-known trajectories to the Bank. We recognise that achieving Net Zero targets is a long-term journey that will require us to continuously adapt and learn from the process. To help navigate this journey, we have developed four guiding principles that inform our approach to achieve Net Zero. These principles will help us stay focused on our goals while remaining agile enough to respond to evolving circumstances.

1. We want to partner with our clients to support their Net Zero transitions. We have assessed the different elements through which we believe we can meet our targets in each sector, and quantified where we expect to be able to have an impact with our clients. The next step is to engage with each of our clients and partner with them on their decarbonisation journeys, meeting our own targets in doing so.

   Based on our analysis, we are confident that our clients are capable of transitioning towards a Net Zero economy. Working together with our clients for their transition is our key priority.

   - For clients that are at an early stage of their decarbonisation journey or where their current ambitions are not fully aligned with our Net Zero targets, we want to help them set decarbonisation plans with confidence. That will mean increasing our transition advisory support to clients, especially smaller clients for whom this can be a daunting task.

   - For clients that are already making ambitious plans of their own, we are reinforcing our commitment to support them to achieve and over-achieve their goals by offering the necessary financing. Our clients' successes will add up to our success.

2. We will actively seek out new clients that are at the forefront of the transition and are offering new low-carbon solutions. The road to Net Zero will necessitate the innovation of new technologies, improvement of emerging technologies, and massive scaling up of existing technologies. Bringing these technologies to a stage of commercial viability and bringing down the green premium require widespread adoption, on a scale that we have not seen since the industrial revolution. We know that transition efforts can create new winners in the markets, and we want to be an active contributor to this growth. We will proactively seek to identify and support these companies by providing financing, connecting these players with relevant eco-systems, or through partnership initiatives.

3. We will optimise our portfolio mix towards a low-carbon economy. As a natural extension of our steering capital towards green and transitional activities, the composition of our portfolio will gravitate towards a low-carbon one. In sectors where we have used emissions intensity as a metric, we recognise that over time, our portfolio optimisation efforts may result in reallocation of capital, away from high-emissions intensity clients to low-emissions intensity ones.

4. We intend to devise sector-specific strategies. The characteristics and nuances of each industry are different, compounded by varying levels of decarbonisation technologies available and advances made. Our business footprint across markets of varying stages of development adds another layer of complexity. To address the challenges of each sector, we have identified decarbonisation levers and devised Net Zero strategies at a sectoral level, taking into account variances of the markets where we operate.

Embarking on our Net Zero strategy we are confident that the investments that our existing and prospective clients are making to transition present an era-defining opportunity for us as a financier. We see this megatrend as unambiguously positive for us. The momentum from our clients in decarbonising is substantial and accelerating, and we see this as an exciting opportunity. Riding on this tailwind, we will actively develop innovative financing solutions to support our clients – a case in point is the OCBC 1.5°C loan which was rolled out in March 2023 (Box 1).

Box 1: An innovative financing solution to support clients' transition

OCBC launched the OCBC 1.5°C loan in March 2023, as part of our commitment to support the world's low-carbon transition. To qualify for the loan, corporates should set clear GHG emissions reduction targets aligned with internationally recognised Net Zero pathways for the sector, based on limiting global temperature rise to 1.5°C above pre-industrial levels. This is in accordance with the goals of the Paris Agreement. The interest rate of the OCBC 1.5°C loan is pegged to the corporate's progress on these targets.

Working with corporates that take up the OCBC 1.5°C loan will help us to gain greater insights into corporates' transition strategies and their decarbonisation pathways, as well as their progress on the targets they have set and how they are tracking against industry peers. With these insights, we can better support corporates' transition plans with advisory and suitable financing solutions.

2.5 Factors beyond our control

The achievement of our targets ultimately relies on our clients' transitions. While we will exercise every effort to advise and support our clients in their transitions, we also recognise that a bank on its own has limited influence on their behaviour – we rely on them embarking on transitions, and on governments and societies in relevant countries to join us in creating the right environment and incentives. If the countries and sectors in which we operate, and ultimately our clients, fail to decarbonise sufficiently, then we will not be able to decarbonise our portfolio in line with our targets.

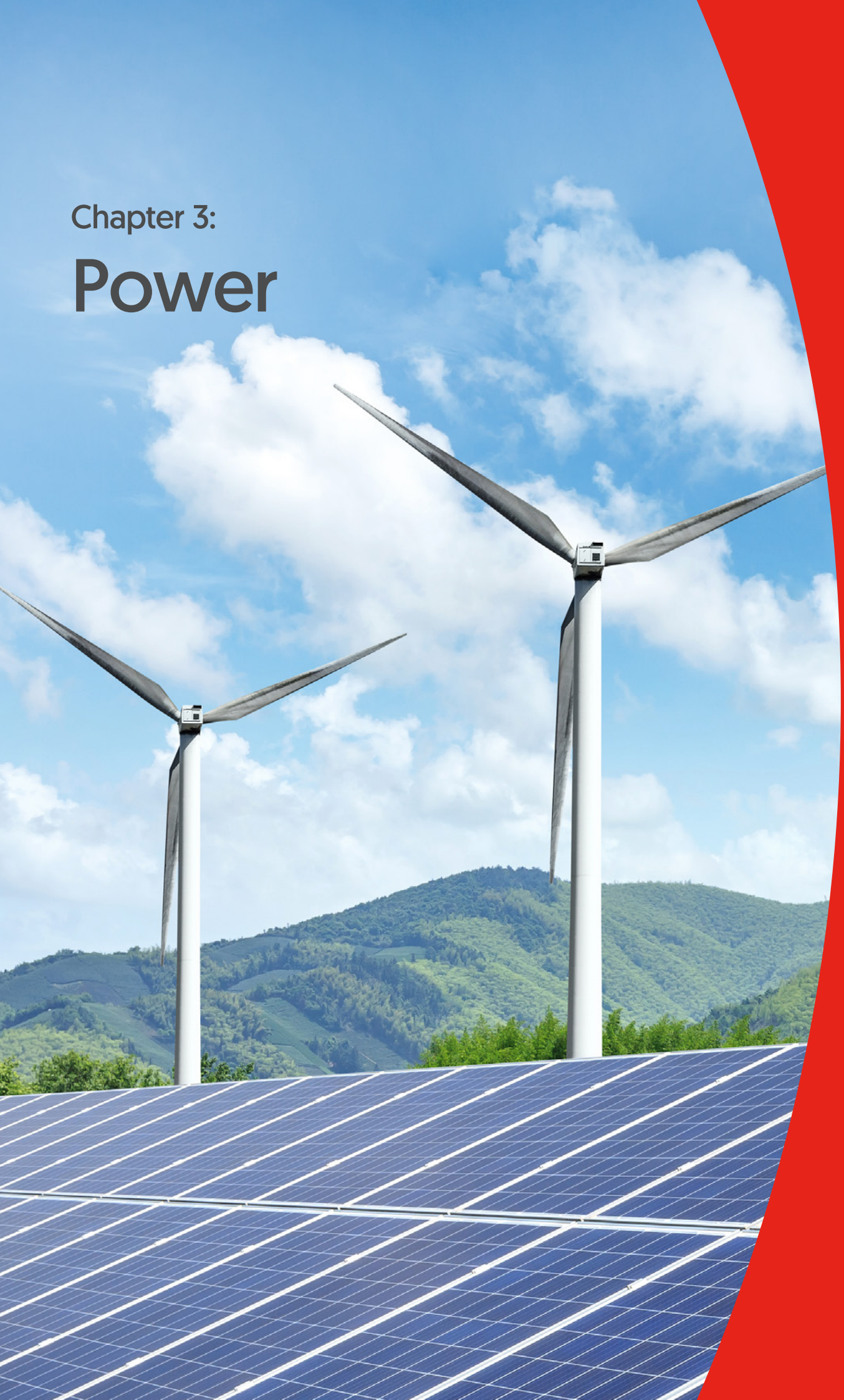
We believe that our Net Zero targets, and the actions we take, will help contribute to the momentum that will ultimately motivate our clients through their decarbonisation journeys.

In the near term, we should not expect decarbonisation to be a straight line. The preceding two years alone has seen encouragement from the exponential adoption of electric vehicles (ahead of most predictions) and expansion in renewable energy investment globally. But it has also seen backward steps with reopening of coal fired power plants in some parts of the world. Our progress will reflect that bumpiness – we aim to trend towards our targets but may see years where progress in some sectors is slower than anticipated or even temporarily reversed.

In many sectors, our targets from 2030 to 2050 also rely upon variables that are difficult to predict. During this period, we will need to see technologies currently in their infancy become mainstream and economically viable; we will need government policies to ratchet to create the right economic incentives for transition; we will need government, development agencies, and equity capital to support new initiatives; and we will rely on the ingenuity of mankind to develop new technologies not yet imagined. We approach this period with a sense of optimism, but also a realism about the scale of the challenge that faces us.

Chapter 3:

Power



Power is an important, if not the most important, sector when it comes to Net Zero ambitions and decarbonisation of economies. While the cost of renewable energy has fallen significantly over the past decade, we need to continue to scale up the use of existing technology, not only to satisfy the ever-increasing demand for electricity, but also to decarbonise other sectors such as Transportation and Steel manufacturing. We are however cognisant of the challenges ahead; we need to support solutions that deal with issues such as intermittency, storage and grid constraints. At OCBC, we will direct capital towards technologies that enable the massive scaling up of renewable energy and their supporting infrastructure.

3.1 Sector dynamics

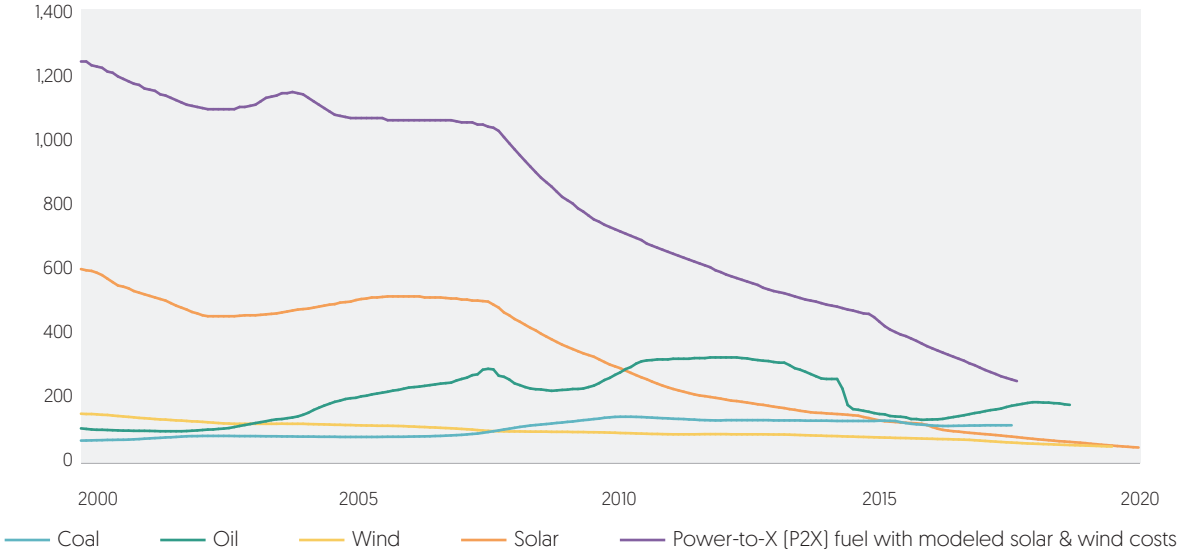
Power is a cornerstone of our economy and society, with our daily lives, infrastructure, and economic development heavily reliant on it. Global electricity demand reached 24,700 Terawatt hour (TWh) in 2021, and is projected to grow at 3.5% annually on average through 2050 under the IEA NZE scenario[8].

Access to affordable and reliable electricity has vast impacts on a wide range of development indicators, including health, education, food security, equality, livelihoods, and poverty reduction. This is especially prominent in developing markets, many of which are in our core Asian markets.

The growing global population, urbanisation and socio-economic development in developing economies will drive an increase in demand for power. Furthermore, a shift to electrification of other industries that are currently reliant on direct combustion of fossil fuels, such as transportation and steel manufacturing, will significantly add to power demand. The Special Report from the Intergovernmental Panel on Climate Change (IPCC) forecasts that electricity will have to power up to 71% of total energy end use by 2050 to align with 1.5°C pathways with no or limited overshoot, and that electricity will need to be generated with zero carbon emissions[9].

Much of the technology required to generate zero-carbon electricity has already been developed and shown to be viable at scale. In Asia, 25.3% of power was generated from renewable sources in 2021, up from 13.3% in 2000[10]. This comes at a time where the levelised cost of production for renewable energy sources has fallen steadily, such that in 2022, many were on par with traditional fossil fuel sources (Figure 3). Our aim is to facilitate the rapid scaling up of renewable energy technologies, in tandem with its decreasing costs.

Figure 3: Levelised cost of electricity by generation technology (including oil, for reference)
USD/MWh

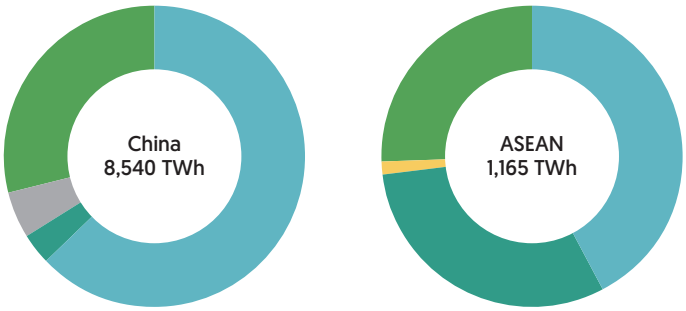


Source: RMI – Peak Fossil Fuel Demand for Electricity (https://rmi.org/insight/peak-fossil-fuel-demand-for-electricity/)

8 IEA, "World Energy Outlook 2022", October 2022, https://www.iea.org/reports/world-energy-outlook-2022
9 IPCC, "Global Warming of 1.5°C", https://ipcc.ch/sr15/
10 Enerdata, "World Energy & Climate Statistics – Yearbook 2021", https://yearbook.enerdata.net/

While this may sound simple, it certainly is not easy. In the Asian markets where we operate, fossil fuel generation makes up a larger share than in other parts of the world, creating a greater need for transition (Figure 4). The region also has some of the youngest coal-fired power plants – with plants typically lasting 50 years. A rapid transition means early decommissioning, implying a greater economic loss for asset owners than in areas of the world with older infrastructure.

Figure 4: Electricity generation in China and ASEAN by energy source in 2021 (TWh)



	China 8,540 TWh	ASEAN 1,165 TWh
Unabated coal	5,363 (63%)	493 (42%)
Unabated natural gas	291 (3%)	361 (31%)
Oil	12 (0%)	15 (1%)
Nuclear	408 (5%)	–
Renewables	2,466 (29%)	296 (26%)

Source: IEA – IEA World Energy Outlook 2022 (https://www.iea.org/weo/)

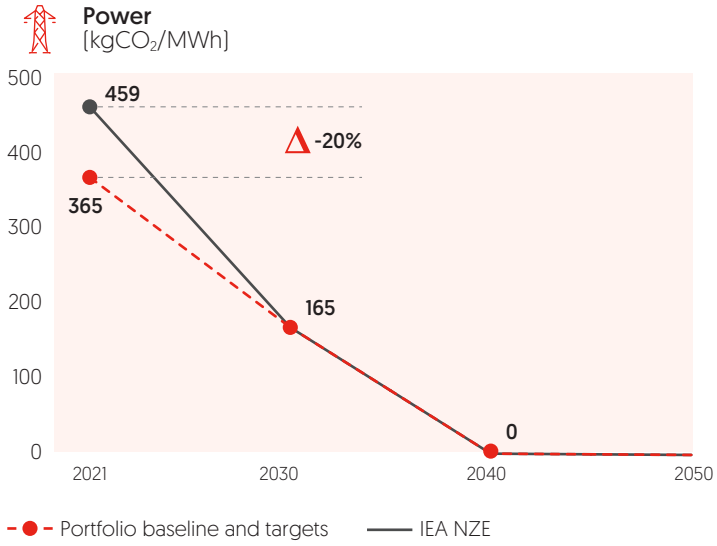
3.2 Our current emissions and targets

Sector coverage
- Power generation companies
- Power equipment manufacturers

Emissions scope
- Scope 1 (generation)
- Scope 3 (equipment manufacturers)

Metrics
$kgCO_2/MWh$

Reference pathway
IEA NZE by 2050



	2021 Baseline	2030 Target	2040 Target
IEA NZE	459	165	0
OCBC	365	165	0
% reduction from 2021 baseline		↓ 55%	↓ 100%

Scope of our targets

Our sector targets include clients who are directly involved in the generation of electricity, and in manufacturing of power equipment.

- Scope 1 emissions of power generation companies. This is the emissions in power generation that can be attributed to the burning of fossil fuels and the primary area where attention is necessary to achieve Net Zero.

- Scope 3 emissions of manufacturers of power equipment. Manufacturers are critical enablers and influencers in decarbonising the Power sector as they offer the necessary equipment and technologies for low-carbon energy. For example, by supporting manufacturers of clean energy equipment, we can support the growing number of on- or off-grid micro-power generation through rooftop solar at homes and industrial sites in Southeast Asia.

Metrics

We have selected an emissions intensity metric, $kgCO_2/MWh$ of energy generation, in our baselining and target-setting for the following reasons:

- With demand for power projected to rise significantly, the key is to provide access to clean energy. Using an emissions intensity metric allows us to support our clients in their transition towards green energy to meet this ever-growing global demand.

- The selected metric serves as an effective tool for engaging clients as this is an industry standard that is widely understood within the sector and the financial community, hence facilitating collective engagement.

- The selected metric enables comparison and consistent tracking across companies.

Reference pathway

Our Net Zero ambition for the Power sector is guided by the IEA NZE scenario from the 2022 World Energy Outlook. We selected this reference as it carries high international credibility in academic, policy and industry circles. The reference pathway is a global scenario based on the deployment of clean energy technologies, with all countries contributing according to their current circumstances to a smooth transition through strong, coordinated policies and incentives.

Given that power companies operate assets that are located in specific geographies, selecting a global pathway can entail a risk that we are setting the wrong target for the specific geographies that our clients operate in. While the consensus view is that ASEAN power grids will decarbonise more slowly than in more developed markets, currently available regional scenarios for power generation differ widely on the rate of decarbonisation that they forecast, based on different assumptions of how to apportion global carbon budgets across regions. Therefore, for simplicity and for the purpose of setting a high bar for ourselves, we have used the global pathway for our initial targets.

Our baseline and targets

Our 2021 baseline is 365 $kgCO_2/MWh$, which is 20% lower than the IEA's reference of 459 $kgCO_2/MWh$. This is driven by two actions which we have taken since 2019. First, OCBC was the first bank in Southeast Asia to stop financing and refinancing of coal-fired power plants, the highest GHG-emitting asset in the power generation sector. In 2022, we further committed to cease financing and refinancing of corporates with more than 50% of their total power generation capacity or revenue from coal-fired power plants. Second, we have in parallel made a deliberate, strategic decision to direct our capital towards renewable energy assets. These include corporate and project financings to projects and companies in the solar, and onshore and offshore wind sectors, including those in Singapore, Malaysia, Vietnam, Greater China, United Kingdom and USA.

In contrast to other sectors where we are setting Net Zero targets for 2050, the Power sector is one which has a 2040 Net Zero target as prescribed by the IEA NZE scenario. This demonstrates a critical enabling role of this sector in decarbonisation in other sectors, such as Real Estate, Transportation, and other hard-to-abate sectors.

Following the IEA NZE pathway means that we target to reduce our Power sector emissions intensity by 55% by 2030 and 100% by 2040. This is not an easy task that OCBC can drive alone as the power industry is heavily influenced by government policies and countries' decarbonisation ambitions. However, we continue to be encouraged by the rapid adoption of renewable energy and collective commitments and actions that the private and public sector have taken in recent years.

3.3 Our commitment to the Power sector

The Power sector is at the core of OCBC's decarbonisation strategy, and has been at the centre of climate action and governments' decarbonisation ambitions. The sector also plays a critical role in enabling decarbonisation across other sectors. Unlike other sectors where green technologies are still nascent, technologies for renewable energy generation are mature and can be deployed at scale. Since 2010, the cost of solar photovoltaic electricity has fallen by 85%, while the costs of both onshore and offshore wind electricity have been cut by about half[11]. The cost of renewable energy has become comparable to fossil fuel generation[12], allowing unabated fossil fuel power generation to be massively reduced in some countries. However, it is equally important to acknowledge that renewable energy faces challenges with intermittency and has limited potential in some countries. We need to continue to invest in new technologies such as batteries, green hydrogen, Carbon Capture, Utilisation, and Storage (CCUS), and green grids; overcome shortfalls in renewable energy sources; and continue to mobilise resources to reduce emissions from existing facilities.

Decarbonisation toolbox

Renewable energy

Investing in renewable energy assets, which convert energy from natural, recurring sources into electricity.

The key types are:

- Solar power
- Wind power
- Tidal and wave power
- Hydro power
- Geothermal power

Improving efficiency and reducing emissions

Supporting clients operating gas power plants to increase their fuel efficiency, to the extent that it does not materially lengthen the life of the assets. For instance, combined cycle gas turbines have higher fuel efficiency than single-cycle gas turbines by using the hot exhaust from the first generation cycle to power subsequent generation cycle, converting more heat from the gas combustion into electricity.

CCUS

Supporting the development and deployment of CCUS technology, which captures CO_2 from exhaust gases of power plants and other industrial facilities that burn fossil fuels.

11 World Economic Forum, "These are the key factors driving the growth of renewable energy", 6 October 2021, https://www.weforum.org/agenda/2021/10/which-factors-accelerate-the-growth-of-renewable-energy/

12 Bloomberg, "Renewable Power Costs Rise, Just Not as Much as Fossil Fuels", 30 June 2022, https://www.bloomberg.com/news/articles/2022-06-30/renewable-power-costs-rise-just-not-as-much-as-fossil-fuels?leadSource=uverify%20wall

Renewable energy – the future of the energy industry

Replacing fossil fuels with renewable energy sources is the most important contributor to a Net Zero world. In the IEA NZE scenario, the renewable energy share of global electricity supply will need to grow from 29% in 2021 to 61% by 2030 and 88% by 2050, complemented by nuclear, hydrogen and fossil fuels with CCUS[13] (Figure 5). Global renewable power capacity is now expected to grow by 2,400 gigawatts (GW) over the 2022-2027 period[13], an amount equal to the entire installed power capacity of China today, indicating accelerated adoption of renewables in the coming years. However, the speed of substitution will be highly market specific – for instance, Singapore is a highly urbanised island state with limited physical room to install solar panels, and limited wind to install wind turbines.

Despite these constraints, renewable energy has become affordable at scale and transmission grids are improving viability. Green hydrogen and various types of batteries, both chemical and mechanical, represent potential storage mechanisms to deal with intermittency. Renewable energy also contributes to energy security, as countries do not need to rely on importing fossil fuels. Remaining challenges are often as political as they are technical; we will need political influence and government support to drive the move towards renewable energy and ensure that new assets being created are connected to national grids. As these challenges are resolved, we see a tremendous opportunity for OCBC to finance the renewable energy space (Box 2).

Box 2: Supporting widespread adoption of renewable energy for businesses

OCBC seeks to encourage the installation of solar panels on rooftops of buildings across Singapore, through providing financing and making the adoption of solar energy easier for our clients. In order to incentivise building owners to install solar panels, the economics has to make sense, and the process needs to be straightforward.

OCBC has developed a structured loan programme to directly finance solar project developers, enhancing their capacity to offer small-scale solar installation to building owners through power purchase agreements (PPAs). Such PPAs remove the upfront capital and operational burden for building owners to switch to a low-carbon and cost-effective energy source, unlocking the solar potential for a wide pool of clients including SMEs.

Building on the solar finance programme, OCBC has partnered with Sembcorp through GoNetZero™, Sembcorp Industries' Carbon Management Business, enabling our clients to:

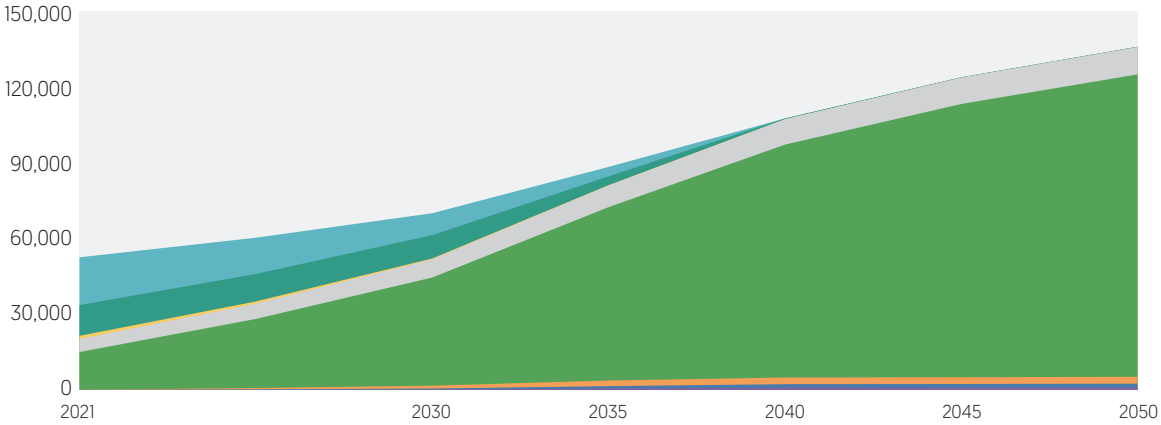
- Assess the solar potential of their rooftops through the use of satellite imagery and analysis, providing them with reliable estimates of the amount of solar electricity that could be generated and potential cost savings; and
- Gain access to GoNetZero's digital platform which enables them to register, issue, manage, sell or retire Renewable Energy Certificates (RECs) all on a single platform. Leveraging blockchain technologies, the platform assures transparency and traceability throughout all these stages of RECs management.
- Unlock monetisation potential of their RECs which would provide yet another economic incentive for our clients towards solar installation.

13 IEA, "World Energy Outlook 2022", October 2022, https://www.iea.org/reports/world-energy-outlook-2022

We continue to bring necessary capital to renewable energy: A significant increase in annual investment in clean energy projects and infrastructure globally to nearly USD 4 trillion by 2030 is required to get us on track to limiting global warming to 1.5°C above pre-industrial levels by 2050[14], and this brings exciting financing opportunities. OCBC has been actively financing renewable energy projects across the globe, via both project financing and green loans (i.e. ring-fenced loans where the use of proceeds are limited to renewable energy assets). As we grow our portfolio through time, and replace lending that amortises, we will look to onboard clients with higher proportions of renewable energy in their power generation mix and continue to support clients that manufacture equipment necessary for renewable power generation.

Additionally, we will search for opportunities to finance energy storage solutions that can help to solve the intermittency issues in renewable energy. Doing so will not directly impact our Power sector Net Zero targets, but will complement our target by promoting the growth of renewable energy projects.

Figure 5: Projected global electricity generation to 2050 by source (TWh)
2021-2050 referencing IEA NZE by 2050 Scenario



	2021	2030	2035	2040	2045	2050
Coal	10,201	4,666	1,997	0	0	0
Natural gas	6,552	4,977	1,902	164	80	82
Oil	682	180	56	4	4	3
Nuclear	2,776	3,896	4,629	5,413	5,610	5,810
Renewables	8,060	23,064	36,975	49,675	58,275	64,506
Hydrogen and ammonia	–	603	1,201	1,415	1,455	1,467
Coal with CCUS	1	198	518	765	795	827
Natural gas with CCUS	–	84	271	446	450	490

Source: IEA – IEA World Energy Outlook 2022 (https://www.iea.org/weo/)

Transitioning existing fossil fuel facilities

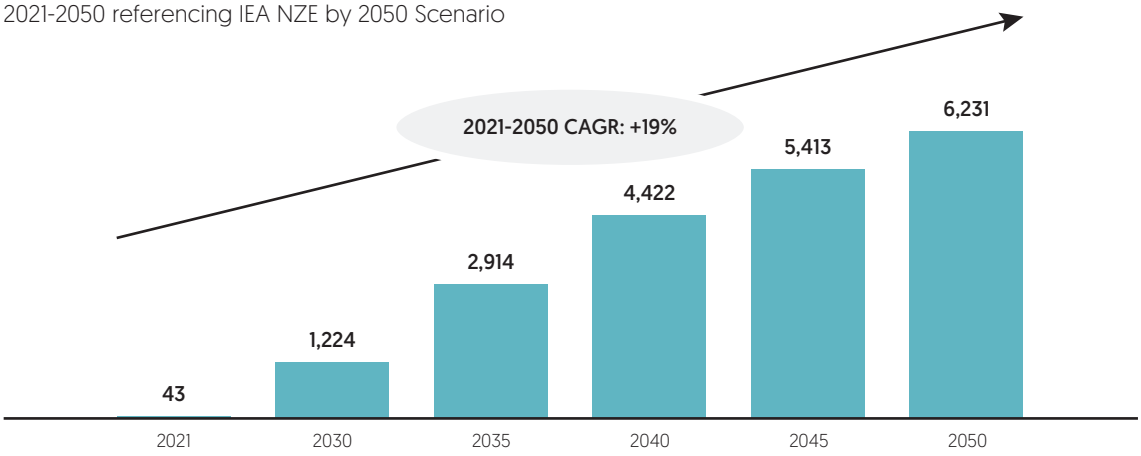
While our longer-term ambition is to move away from fossil fuel generation, improving the efficiency of fossil fuel-based power generation will form part of our decarbonisation toolbox towards our 2030 target. For example, co-firing gas plants that blend liquefied natural gas (LNG) with hydrogen can help lower emissions from existing fossil-fuel assets. Although green hydrogen is not yet available at scale, companies are already developing new plants or retrofitting existing gas plants to cater to hydrogen sources when they are available at scale and a reasonable cost.

14 IEA, "Renewables 2022", December 2022, https://www.iea.org/reports/renewables-2022

CCUS

CO_2 can be captured from exhaust gases of power plants and other industrial facilities that burn fossil fuels. This is typically achieved by passing the gas through chambers filled with 'scrubbers' which bind the CO_2 to them, allowing its removal and immediate storage in pressurised containers. The CO_2 can then be moved to sites where it can be utilised for other purposes or safely stored long-term. While CCUS is not projected to comprise a large share of the future power generation mix, the IEA transition scenarios show that coal- and gas-fired capacity with CCUS to abate emissions will continue to play a role (Figure 6). At present, CCUS is not yet commercially viable to be deployed at scale in most geographies, as the cost of building new CCUS capacity is high, and requires supporting infrastructure for transportation and storage. Furthermore, investments in CCUS remain sluggish, with annual investments in CCUS consistently representing less than 0.5% of global investment in clean energy and energy efficiency technologies[15].

Figure 6: Total projected CO_2 captured by CCUS (Mt CO_2)
2021-2050 referencing IEA NZE by 2050 Scenario



Source: IEA – IEA World Energy Outlook 2022 (https://www.iea.org/weo/)

CCUS can also be applied to other hard-to-abate sectors beyond power generation, such as in the production of cement, steel, chemicals, and synthetic fuels for long-distance transport, notably aviation explaining its potential growth (Figure 6). Therefore, in addition to our efforts towards clean energy, we are closely monitoring developments in this area for feasible collaboration opportunities with clients who seek to deploy CCUS solutions as part of their own Net Zero transitions.

Managed phaseout of coal-fired power plants

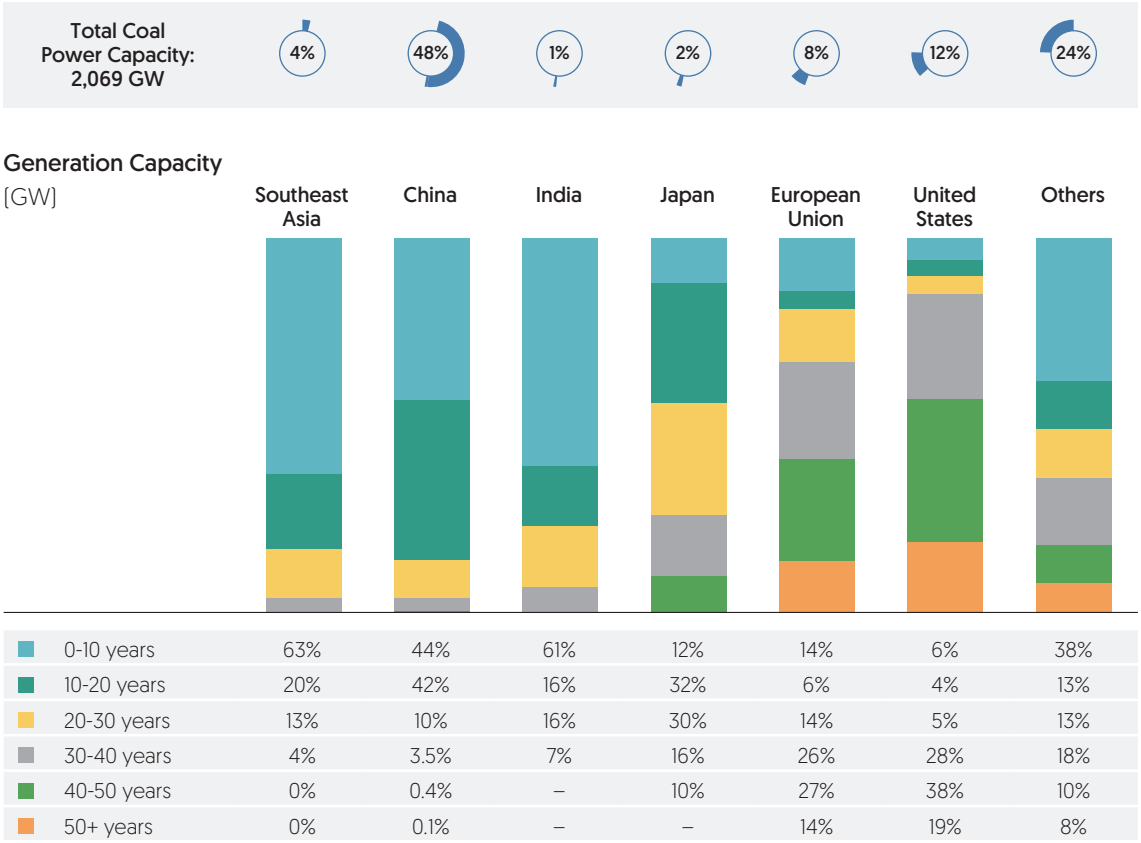
We need to work collectively to develop credible solutions for existing fossil fuel facilities. There are about 5,500 operational coal-fired generators in Asia, responsible for over 4.5 gigatonnes (Gt) of carbon emissions per year[16]. As illustrated in Figure 7, many of the coal-fired plants in the region are young and will remain in operation well beyond 2040 unless we take collective action. We need to be sensitive to the high environmental impacts such power plants have while understanding the devastating economic and social consequences should these plants be switched off without viable clean energy to replace them[17]. Wider solutions involve bringing together the power generation industry, financiers, agencies and governments to accelerate our transition away from coal-fired plants by shutting down plants before their retirement dates, while providing solutions that maintain stable provision of clean power and employment opportunities. We welcome the launch of an initiative to develop guidance for financial institutions on how they can facilitate the managed phase-out of coal power generation in the Asia Pacific by the GFANZ Asia-Pacific Network.

15 IEA, "A new era for CCUS", https://www.iea.org/reports/ccus-in-clean-energy-transitions/a-new-era-for-ccus

16 MAS, "Blended Finance for the Net-Zero Transition" – Opening Remarks by Mr Ravi Menon, Managing Director, Monetary Authority of Singapore, at the Transition Finance toward Net Zero Conference on 4 October 2022", 4 October 2022, https://www.mas.gov.sg/news/speeches/2022/blended-finance-for-the-net-zero-transition

17 Over 65 million people were employed in the energy and related sectors in 2019, 6.3 million of which in coal supply (IEA, World Energy Employment, https://iea.org/reports/world-energy-employment/overview)

Figure 7: Age structure of existing coal power capacity by region



	Southeast Asia	China	India	Japan	European Union	United States	Others
0-10 years	63%	44%	61%	12%	14%	6%	38%
10-20 years	20%	42%	16%	32%	6%	4%	13%
20-30 years	13%	10%	16%	30%	14%	5%	13%
30-40 years	4%	3.5%	7%	16%	26%	28%	18%
40-50 years	0%	0.4%	–	10%	27%	38%	10%
50+ years	0%	0.1%	–	–	14%	19%	8%

Source: IEA, Age structure of existing coal power capacity by region, IEA, Paris https://www.iea.org/data-and-statistics/charts/age- structure-of-existing-coal-power-capacity-by-region, IEA. Licence: CC BY 4.0

Chapter 4:

Oil & Gas

The transition from fossil fuels to clean energy sources is crucial to achieving Net Zero emissions. New technologies and solutions are constantly being developed to reduce GHG emissions, which will help accelerate the transition efforts. However, with the parallel importance of ensuring energy security amidst market volatility, we need to ensure an orderly transition in order to provide a long-term resilient solution. At OCBC, we are committed to working closely with our clients, supporting those who are taking an active role in transitioning towards Net Zero.

4.1 Sector dynamics

The Oil & Gas industry has enabled us to achieve our current global economic progress by offering affordable and reliable energy sources for our energy needs. The majority of our transportation system is dependent on oil while natural gas is an important fuel for generation of electricity, heating and cooking.

The Ukraine war has led to a re-awakening of the importance of national energy security as a policy priority, with many policy makers now linking the shift to renewables with the need for energy security as well as decarbonisation. With the cost of renewable energy falling, countries are making investments in renewable energy and grid connectivity. The adoption of electric vehicles is also seeing exponential growth. These trends provide tailwinds to recalibrate the demand for oil and gas, moving away from its conventional combustion to manufacturing uses.

The Oil & Gas sector is a carbon-intensive one, having emitted 21 Gt of carbon dioxide equivalent (CO_2e) in 2021 from combustion activities[18]. This comes both directly from the activity of Oil & Gas companies, specifically in the form of methane emissions at wells (Scope 1); and indirectly through the CO_2 generated by the end-use of oil and gas products (Scope 3). Both are significant. Methane is a much more pollutive[19], though shorter-lived, GHG than carbon dioxide, and has contributed around 30% of observed global warming to date[20].

The demand for oil and gas is driven by end-user industries including power and transportation. By supporting the transition of end-user industries, we can also reduce the demand for oil and gas, contributing to a Net Zero world. In addition, we want to support Oil & Gas clients to reduce methane emissions, and drive overall reductions in oil and gas usage through the pivoting of our Oil & Gas businesses towards low- and zero-carbon alternatives.

18 IEA, World Energy Outlook 2022, "Global Methane Tracker 2022", February 2022, https://www.iea.org/reports/global-methane-tracker-2022

19 Methane is a greenhouse gas that is more potent than carbon dioxide. According to the IPCC, one molecule of methane contributes the same amount to warming the atmosphere as thirty molecules of carbon dioxide over 100 years. (IPCC, "IPCC Sixth Assessment Report", https://www.ipcc.ch/report/ar6/wg1/)

20 IEA, World Energy Outlook 2022, "Global Methane Tracker 2022", February 2022, https://iea.org/reports/global-methane-tracker-2022/overview

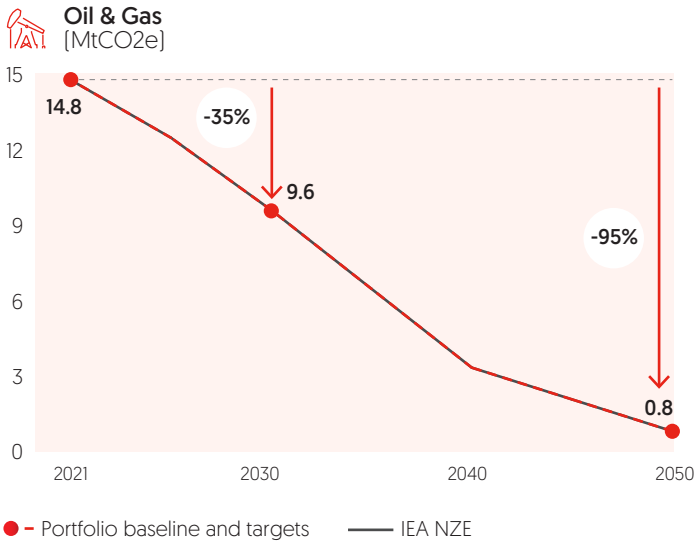
4.2 Our current emissions and targets

Sector coverage
- Upstream
- Integrated

Emissions Scope
- Scope 1
- Scope 2
- Scope 3

Metrics
$MtCO_2e$

Reference pathway
IEA NZE by 2050



Target 1	2021 Baseline	2030 Target	2050 Target
OCBC	14.8	9.6	0.8
% reduction from 2021 Baseline		↓ 35%	↓ 95%

Target 2
In addition to an absolute emissions reduction target, OCBC will not extend project financing to upstream Oil & Gas projects that obtained approval for development after 2021.

Scope of our targets

We have measured the emissions of our clients who are involved in the upstream part of the Oil & Gas value chain, including integrated Oil & Gas companies. Upstream operations are material contributors to sector emissions, through Scope 1 emissions, as well as Scope 3 emissions associated with final use or combustion of oil and gas products. By targeting the upstream sub-sector, a reduction in emissions will cascade down to the remaining parts of the value chain.

We have included the following in our scope of emissions:

- Scope 1 and 2 emissions arising from our clients' own operations through the release of GHG during the process of extracting oil and gas and energy usage. Natural gas is often found in wells predominantly dug to extract oil. Some amount of this can leak from the well, releasing methane into the atmosphere, but much of it is also burned at the well head in a process known as flaring.
- Scope 3 emissions, which account for 80-95% of total carbon emissions in this sector[21], arising largely from fuels that are combusted by the end users in all industries.

21 Wood Mackenzie, "Few oil and gas companies commit to Scope 3 net zero emissions as significant challenges remain", 28 October 2022, https://www.woodmac.com/press-releases/few-oil-and-gas-companies-commit-to-scope-3-net-zero-emissions-as-significant-challenges-remain/

Metrics

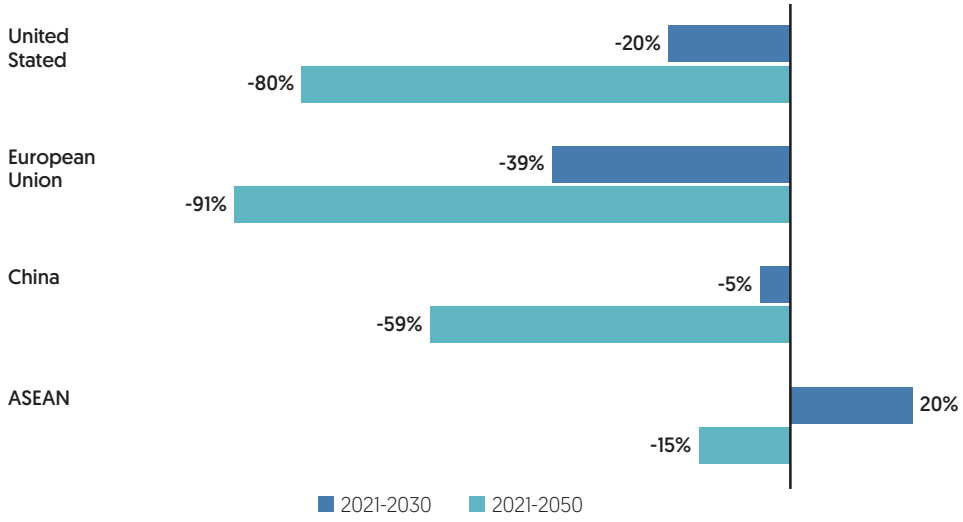
We have selected an absolute emissions target to reduce CO_2e emissions associated with our portfolio in both baselining and target-setting. The selected metric provides a snapshot of our financed emissions in the Oil & Gas sector and a solid commitment to reducing our overall financing towards Oil & Gas by 2050, underscoring our commitment to move decisively away from oil and gas while supporting sector developments towards low-carbon alternatives.

Reference pathway

Our target setting is guided by the IEA NZE scenario. The IEA is widely respected internationally, and its NZE scenario has become the de facto standard for energy targets in the financial services sector since 2021.

OCBC's footprint in the Oil & Gas sector is predominantly in ASEAN and Greater China, which are projected to take a longer time to move away from the use of oil and gas for energy, compared to more developed parts of the world (Figure 8). However, at present, attempts to split global scenarios into geographic parts are relatively immature, and the scenarios vary widely at the regional level. Therefore, we have presently chosen the IEA's global pathway, and will continue to monitor scientific developments on pathways for the sector, particularly for the geographies where we operate.

Figure 8: Projected change in total energy supply from oil and gas by region
2021-2030 and 2021-2050 referencing IEA Announced Pledges Scenario (APS)



Source: IEA – IEA World Energy Outlook 2022 (https://www.iea.org/weo/)

Our baseline and targets

Our current financed emissions for the Oil & Gas sector stands at 14.8 $MtCO_2e$ as at 2021, which will form the baseline emissions from where we will start our decarbonisation journey. To drive this shift, we are adopting a two-pronged approach in this sector.

Target 1

We are setting an emissions reduction target for the Oil & Gas sector, following the IEA's NZE scenario. This would mean a 35% reduction in our financed emissions by 2030, and ultimately a 95% reduction in our financed emissions by 2050.

Target 2

We will not extend project financing to upstream Oil & Gas projects that obtained approval for development after 2021. IEA 1.5°C pathway states that the oil and gas fields that were approved for development up till 2021 are sufficient to meet the interim energy needs as the population transitions towards a world that does not rely on fossil fuels[22].

We are prioritizing our actions towards upstream activities, as a reduction in upstream activities will inevitably reduce activities in other parts of the value chain – with less oil and gas to transport, store, refine and distribute, those activities will naturally decline.

4.3 Our approach to the Oil & Gas sector

The key to Net Zero in this sector centres around systematically and gradually reducing the reliance on oil and gas products. We currently rely heavily on oil and gas for our power generation, transportation system and manufacturing. The fossil fuel tap cannot be turned off overnight – we need continued supply to support an orderly transition.

However, traditional Oil & Gas companies will need to pivot their businesses to stay relevant in a world where fossil fuels will be phased out by 2050. Some of our clients have started this transition and some have disclosed ambitious transition pathways. Others have made a start by pledging to reduce or eradicate the use of flaring in their standard operations, while some companies are diversifying their businesses steadily away from fossil fuels. Their technical expertise and financial capacities in the sector give us confidence of successful pivots to future areas of impact, from alternative fuels (e.g., SAF, green hydrogen, and green ammonia) to CCUS technologies.

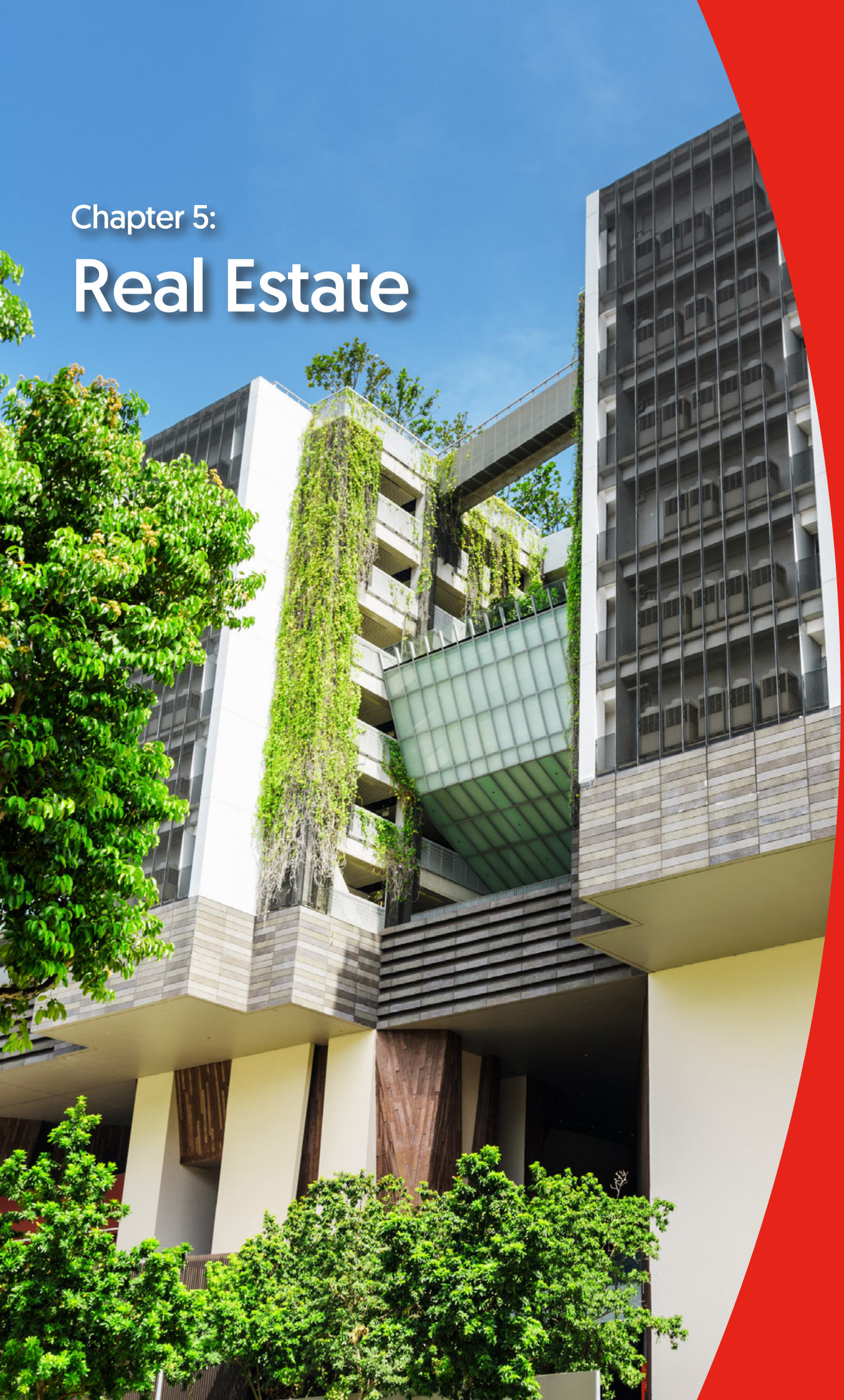
We stand ready to support the diversification of our Oil & Gas clients' businesses into cleaner energy sources and leveraging the right resources and technologies to future-proof their businesses. We do not expect full transition away from oil and gas by 2030, but it is important that we have a robust 2030 target to ensure we are on the right trajectory to reach Net Zero by 2050.

OCBC's efforts in supporting our clients' full transition away from oil and gas ultimately relies on an eventual void in the demand for oil and gas products. Thus, our success is contingent on realisation of the right technologies, infrastructure, market demands, policies and capital to accomplish this complex and challenging task of decarbonising.

22 IEA, "Net Zero by 2050", May 2021, https://www.iea.org/reports/net-zero-by-2050

Chapter 5:

Real Estate



Our core markets will see a significant growth of real estate assets with the continuation of rapid urbanisation taking place within Asia. While this poses great environmental challenges, there are incredible opportunities for our Real Estate clients to do well by doing good. As a bank we have set a clear and credible transition pathway for the sector and our clients. We are, however, under no illusion of the challenges the transition of real estate poses. We have a positive track record with our clients in the sector, forging trusted and lasting relationships across the entire built environment value chain, with innovative financing solutions, providing thought leadership and advice, while actively working in shaping some of the key global transition pathways being adopted. This puts us in good stead to deliver, in partnership with our clients, on our Net Zero ambition.

5.1 Sector dynamics

Real Estate is one of the most challenging sectors when setting a Net Zero ambition, given the interrelationships and dependencies with the other sectors, having a large and complex value chain, the uniqueness of every property, and the sector's direct and tangible impact on all human activities.

The Construction and Real Estate sector is globally responsible for 36% of energy consumption, 39% of energy related carbon emissions[23]. 50% of resource consumption and is expected to double in footprint by 2060[24], making urbanisation and the response of the Real Estate sector one of the twenty-first century's most transformative issues.

Real Estate contributes to global emissions in several direct and indirect ways. Emissions are generated throughout a building's life cycle:

- During construction, emissions are generated directly through the use of diesel trucks and power generators. They are also generated indirectly through the use of steel, cement and other materials that themselves relied on heavy emitting processes to manufacture, and through use of electricity provided through the grid;
- During the operation of buildings, Real Estate is responsible for direct emissions where fuels such as natural gas are burnt for heating, and indirectly through the use of electricity purchased from the grid; and
- The demolition process also directly generates emissions, and contributes to the emissions from raw materials where these are not recycled.

Real Estate thus grows emissions through the increase in total building stock and the operation intensity of existing buildings. Much of global growth in Real Estate is taking place within our core markets in Asia, where urban populations have increased from 20% of the population in 1950 to 50% in 2016. Urbanisation is expected to reach 64% in 2050. In absolute terms, the urban population in Asia is projected to increase from approximately 1.7 billion people today to 2.26 billion in 2030, and 2.75 billion in 2050[25]. This presents an opportunity for us as a trusted partner to empower our clients in taking the necessary actions to decarbonise the sector and seize the opportunities for transformational growth that positively impacts the lives of many.

23 IEA, "Buildings", September 2022, https://www.iea.org/reports/buildings
24 World Green Building Council, "Advancing Net Zero", https://worldgbc.org/advancing-net-zero/
25 Singapore Institute of Architects, "The Green Book", June 2020, https://sia.org.sg/sia-green-book/

5.2 Our current emissions and targets

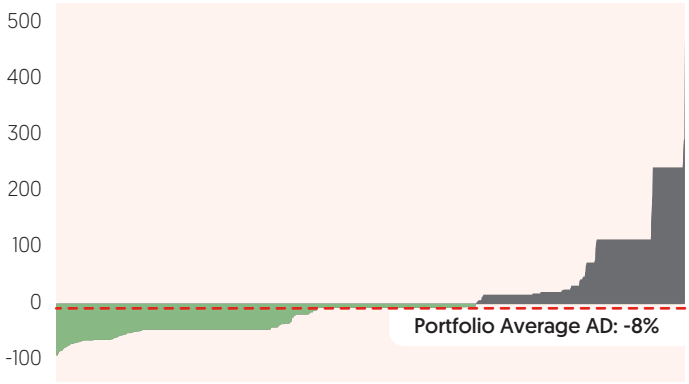
Sector coverage
- Real Estate owner-operators
- Financed buildings
- REITs

Emissions scope
- Scope 1
- Scope 2
- Scope 3 (tenant / receptable energy)

Metrics
Alignment Delta based on percentage

Reference pathway
CRREM

Real Estate
Alignment Delta (%)



Portfolio baseline (no forecast shown; target is to be under the benchmark)

	2021 Baseline	2030 Target	2050 Target
OCBC vs CRREM (AD)	-8%	≤ 0%	≤ 0%
Implied % reduction in emissions intensity from 2021 Baseline (static portfolio mix)		↓ 27%	↓ 98%

Scope of our targets

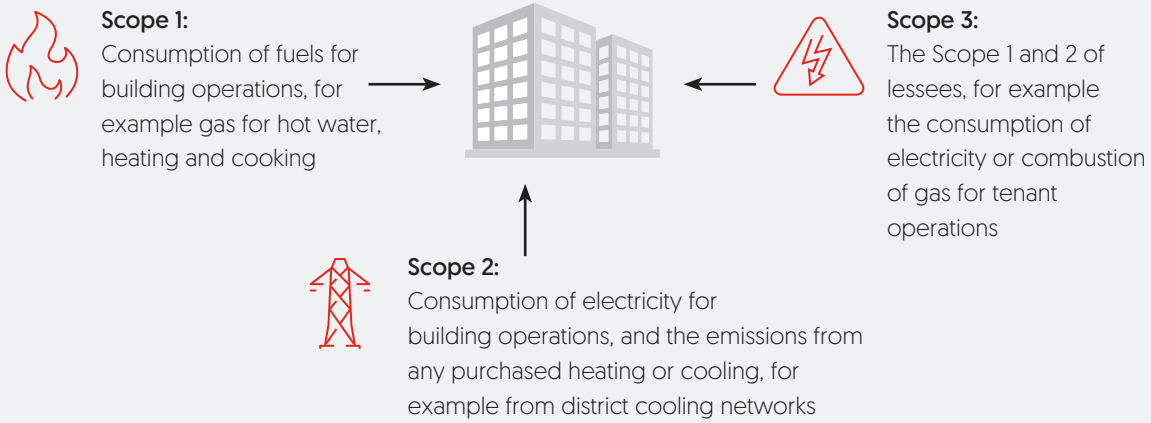
Building typologies covered

- Office
- Hospitality
- Industrial
- Residential
- Mixed Use (Commercial Mixed and Commercial & Residential Mixed)
- Healthcare
- Retail

We have measured financed emissions of our clients that develop, own and/or operate buildings, including our REIT clients in all the major markets that we have business in. We have decided to focus our Net Zero target on whole-building operational emissions, where data is available. These are essentially Scope 1 (combustion of fuel within the building, such as natural gas for heating, cooking), Scope 2 (electricity use of the base building) and Scope 3 (tenants' electricity use any receptacle loads if not captured under scope 2 reporting).

Whole building operational carbon

Includes targeted Scope 1, 2 and 3 emissions relating to building operations and use which includes base building and building occupants/tenants

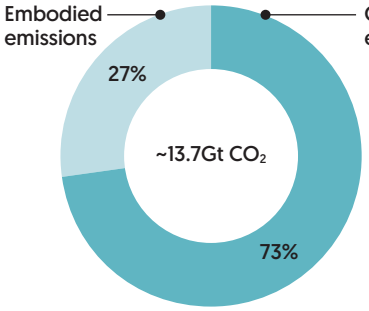


For the Real Estate sector, we take the 'whole building approach' to operational emissions. This is aligned with the wider professional, regulatory and market practice of the sector, which focuses on a building's GHG emissions performance regardless of how electricity, or gas is sub-metered or controlled.[26]

While our Net Zero targets focus on operational GHG emissions of the sector, as a bank we are fully aware of the importance of tackling the construction activities and their associated emissions. Our Net Zero Real Estate strategy is part of our wider engagement with the sector as a whole, and we continue to work on solutions and strategies that cut across the full value chain and life cycle of the sector from conception through to demolition.

26 GRESB, PCAF and CRREM, "Accounting and Reporting of GHG Emissions from Real Estate Operations", March 2023, https://carbonaccountingfinancials.com/files/downloads/ghg_emissions_real_estate_guidance_1.0.pdf

Figure 9: Emissions attributed to the global Real Estate sector in 2021



Over the course of a building's life, operational emissions contribute approximately 73% of building related emissions. We have focused on Real Estate developers, operators and REITs, as they form the majority of our portfolio, and this is where data and robust Net Zero pathways are more readily available.

Source: UNEP – 2022 Global Status Report for Buildings and Construction (https://www.unep.org/resources/publication/2022-global-status-report-buildings-and-construction)

Metrics

Our approach recognises the diverse and complex nature of the sector, our global financed portfolio as well as further sector specific challenges including the lack of universally adopted standards and definitions (including floor area, energy use, carbon emissions) as well as a lack of availability of high-quality data.

In order to evaluate our overall portfolio performance to the Net Zero reference pathway, we have adopted the AD approach that is well established in the shipping sector. For Real Estate sector, the AD is calculated based on measurements of clients' emissions intensities, measured by floor space ($kgCO_2/m^2/Year$). Given the necessity of the growth in this sector, using emissions intensity allows us flexibility to grow our total volume of lending to the sector, while demanding that we finance increasingly lower-carbon clients over time. Using AD allows us to compare clients' emissions intensity against relevant benchmarks for the relevant building types across locations, capturing diverse types of assets without bias.

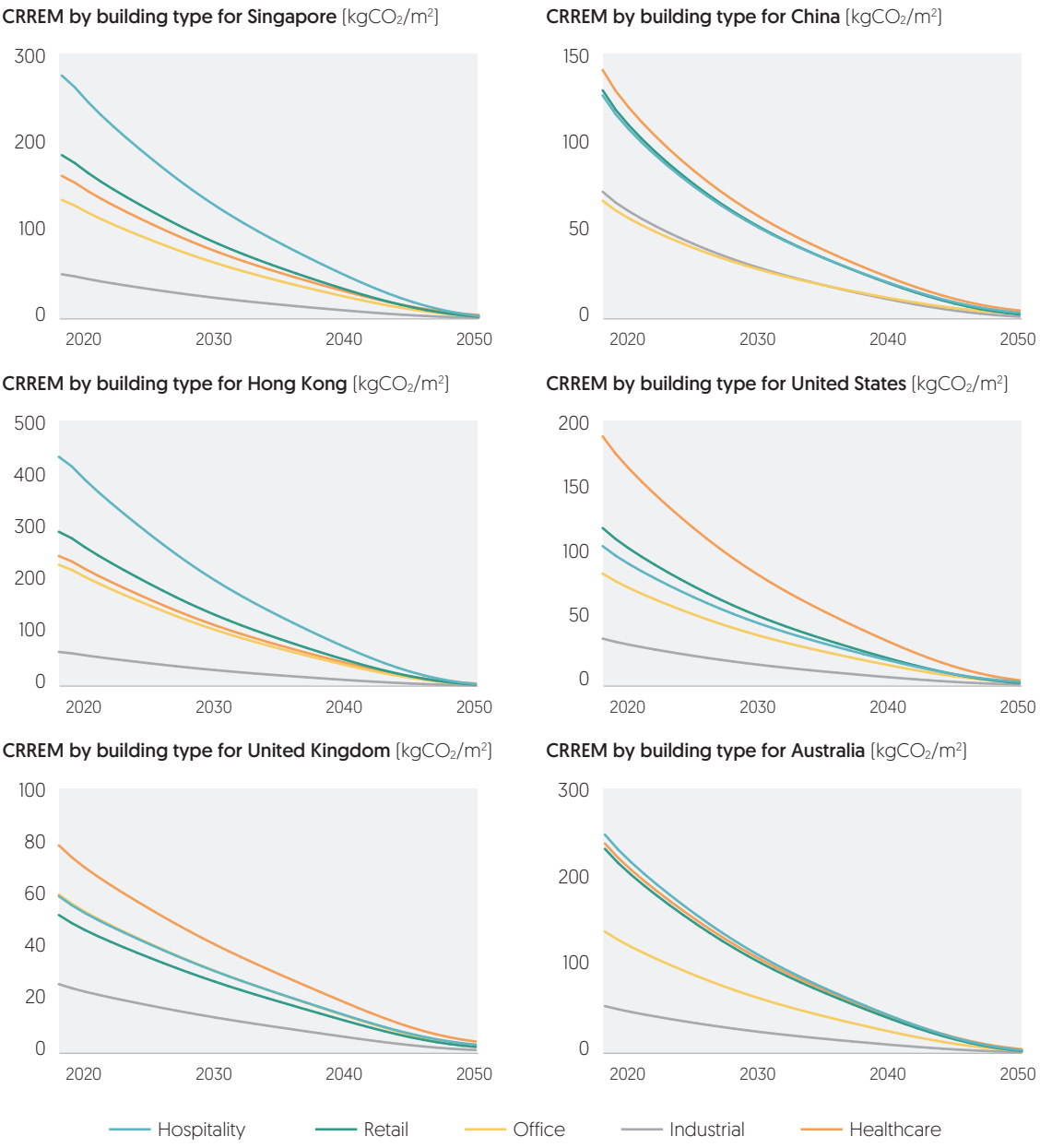
Committing to keep our Real Estate AD at or below zero allows us to set a single target for our Real Estate portfolio, that follows a credible Net Zero aligned pathway notwithstanding its underlying diversity across building types and regions.

Reference pathway

We have set our Real Estate sector target with reference to the CRREM 1.5°C pathways in terms of GHG emissions intensity which accounts for different property types in different countries. This reflects the diversity of grid emissions factors and their planned decarbonisation rates, climatic conditions of the geographies where the buildings are located, as well as the projected growth of floor area, and is thus the best fit for our diverse client portfolio.

The pathways are internationally credible, having been used in academic, policy and industry circles.

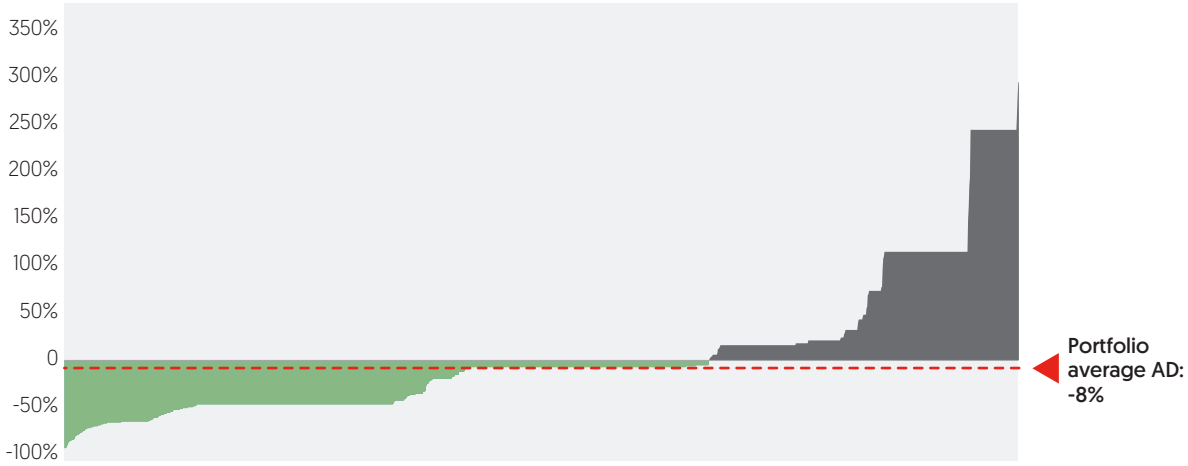
Figure 10-15: CRREM by building type across countries



Our baseline and targets

We have an alignment delta of -8% as a starting point compared to our portfolio weighted CRREM reference for 2021. This is a testament to our focus on financing high quality certified green buildings in key markets with strong client commitments and robust green building ecosystems. While we acknowledge the data gaps within the sector, we are encouraged by the good starting point on which we can build with our sector decarbonisation strategy, in partnership with our clients and enablers across the value chain.

Figure 16: Real Estate Portfolio Alignment Delta [%]



This chart shows our portfolio as ranked by AD. Those on the left, with a negative AD, have lower emissions intensity than their respective geography and building type benchmark. Those on the right with a positive AD have higher emissions intensity. Our portfolio AD is then the weighted average of all of these individual client AD, weighted by our financing.

5.3 Our commitment to the Real Estate sector

We have identified a simple decarbonisation toolbox to drive initial decarbonisation for the sector, based on key actions around new buildings, existing buildings, speeding up the energy transition and looking at reducing other GHG emissions such as those found in refrigerants.

Decarbonisation toolbox

New buildings

Upstream initiatives

Focusing on high quality, low carbon, climatically suited design, and construction, certified green buildings. This minimises the need for building-level energy intensive systems, while utilising low-carbon materials and construction processes.

Existing buildings: Efficiency & optimisation

Downstream initiatives

Energy efficiency – reduction and optimisation of energy demand, including the heating, cooling and ventilations systems, lighting systems, building management systems, and optimisation technologies.

Energy transition & electrification

Achieved through the decarbonisation of the Power sector, and/or direct interventions:

- Deploying on-site renewable energy, such as rooftop solar panels
- Purchasing lower carbon energy directly, including signing specific power purchase agreements with low-emissions generators
- Transitioning heating and cooling systems to low carbon district or community systems

Electrification of buildings:

- Transition from combustion of fossil fuels (e.g. heating and cooking) within the building to electricity.

Other transition

Fluorinated Gas Transition transition:

Replace the use of high global warming potential refrigerants in heating and cooling systems

At OCBC we can advise our clients on the relevant activities based on the market conditions, and provide financing programmes, solutions and enablers for our clients to transition. We are a member of the Singapore Green Building Council, working to advance the response of the real estate sector to climate change.

In order to meet our Net Zero ambition, our real estate strategy will centre around:

New buildings

New buildings have the greatest opportunity to achieve the highest level of environmental performance. By 2030 the World Green Building Council advocates that all new buildings should be designed and operated as Net Zero developments, with a 2050 target for existing building stock. In Singapore, the Singapore Green Building Masterplan states that in 2030, 80% of all new buildings will be designed to meet the Green Mark Super Low Energy building standard by the Building Construction Authority (BCA), while 80% of the total building stock will be green. This highlights the potential for the proliferation of a paradigm shift for new developments to be designed and constructed to the highest of environmental standards. OCBC recognises this and believes that adopting and working with green building standards are important drivers in mainstream adoption of sustainability objectives.

To encourage our clients to adopt the highest green buildings standards, the bank has been offering green financing solutions to our clients supporting higher tiers of internationally recognised green building rating tools, such as BCA Green Mark, Building Research Establishment Environmental Assessment Method (BREEAM), Green Star and Leadership in Energy and Environmental Design (LEED).

Existing buildings

In our mature markets the amount of new construction as a percentage of all buildings is small, for example in Singapore this is typically 5% of the total building stock[27]. This means addressing new construction alone is not a sufficiently robust Net Zero strategy.

A focus on energy efficiency improvement for existing building stock is key; this has the potential to reduce global emissions by 43%[28]. Through contributing to lower overall energy demand, improved energy efficiency can also help move the needle on power decarbonisation by facilitating earlier decommissioning of fossil fuel power plants.

OCBC is well positioned to create meaningful impact on our clients as we have key relationships with an ecosystem of enablers, including consultants, energy service companies, suppliers and contractors, bringing together parties to enable and scale energy efficiency improvements along with dedicated structured financing solutions for such players.

27 BCA, "Green Building Platinum Series: Existing Building Retrofit", 2010, https://www.bca.gov.sg/greenmark/others/existingbldgretrofit.pdf
28 World Green Building Council, "Advancing Net Zero ANZ status report 2022", https://viewer.ipaper.io/worldgbc/wgbc-anz-status-report-2022/

Box 3: Our commitment to buildings in operation

OCBC recognises the importance of enabling existing buildings to be operated and maintained to perform at the highest energy efficiency standards. We have developed a holistic approach tailored to variance in market maturity, and the barriers our clients face:

1. **Measurement and monitoring**
   We have partnered with Envision Digital to facilitate our clients to harness Envision Digital's Net Zero technologies, helping businesses monitor and report their operational carbon emissions and environmental impact. This provides near real-time aggregated insights for our clients, identifying opportunities for impactful optimisation of their real estate portfolios and for OCBC to provide dedicated financing solutions.

2. **Scaling access to challenging markets and segments**
   OCBC has been actively working with Singapore's BCA on the utilisation and refinement of the Building Energy Efficiency Assessment (BEEA) and Small and Medium Enterprise Energy Assessment (SMEEA) tools to help our smaller SME clients measure, predict and optimise their energy performance for strata title and developments. Through this engagement we are supporting clients in understanding the impacts of their energy use, optimisation strategies, cost and environmental impact of various green building technologies.

In Malaysia, a market which has a lower penetration of green building certification, replicating this engagement model with our clients is critical. OCBC is the first financial institution to work with the Malaysian Green Technology and Climate Change Corporation's (MGTC) online carbon management platform to incorporate the agency's Low Carbon Operating System (LCOS) into our transition financing plan for corporate and SME clients. LCOS, built on Envision Digital's technologies, is aligned with globally recognised standards to help businesses measure their carbon footprint to ensure emissions are well managed, so clients can take impactful action to mitigate the amount of carbon their operations produce and contribute towards a net-zero future.

Greening energy use

A crucial aspect to achieving Net Zero in the sector is supporting clients in transitioning to cleaner, or renewable, energy sources. A majority of the emissions reduction post 2030 in the property sector will depend on the source of electricity that the building consumes, constraints that the sector will have to manage.

We will work with our clients to help them reduce emissions from energy that they consume. This may be through building infrastructure upgrades, such as the electrification of buildings; moving them away from combustion of fossil fuels on site where grid emissions are low; installing on-site renewable power; or purchasing RECs or green power directly from the market.

Chapter 6:

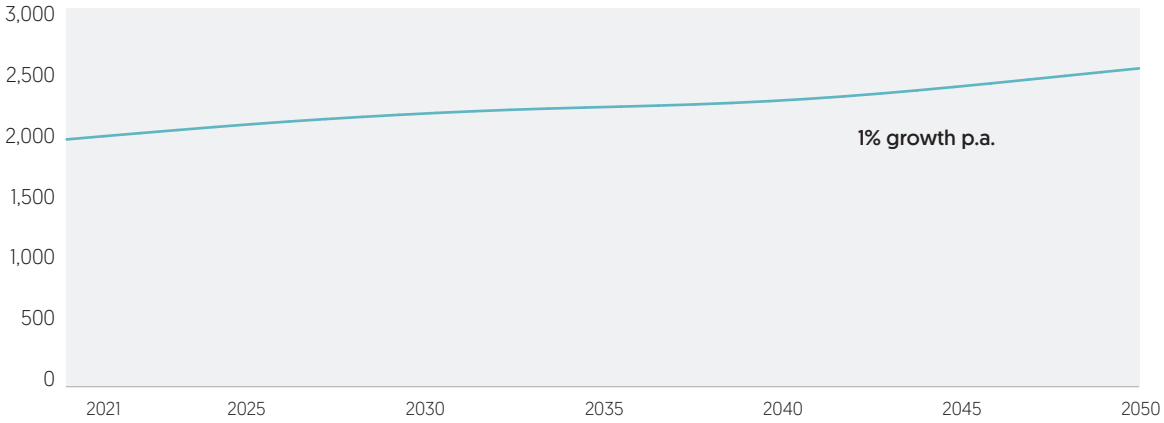
Steel

Steel is not only one of the key building blocks of urbanisation and modern economy, but also a material known for its exceptional strength, durability, versatility, and cost-effectiveness. Recognising the expected growth in demand for steel, we are convinced that the solution for the decarbonisation of the Steel sector will be centered around recycling of scrap steel and adopting cleaner, less carbon intensive production technologies such as Electric Arc Furnace (EAF) and green hydrogen. The decarbonisation of energy grids around the world will be another powerful enabler for the transition of the Steel sector. At OCBC, we are committed to directing capital to low-carbon steel production and working with our customers to prepare for a more circular, less carbon intensive Steel sector that is aligned with the goals under the Paris Agreement.

6.1 Sector dynamics

Steel is one of the world's most important engineering and construction materials. It is used in every aspect of our lives; from cars to skyscrapers, refrigerators to washing machines, cargo ships to surgical scalpels and everything in between. Steel can be recycled over and over again without loss of property, making it a highly versatile and durable material. With projected population growth and urbanisation, we expect there will be a correlated growth for steel demand (Figure 17).

Figure 17: Projected global steel production under MPP –TM scenario
2021-2050 (Mt)



Source: Mission Possible Partnership – Making Net Zero Steel Possible (https://missionpossiblepartnership.org/action-sectors/steel/)

Today, most crude steel is produced by using blast furnaces that are highly energy intensive and rely on fossil carbon as a fuel and reduction agent, making the production process carbon-intensive. Overall, the Steel industry currently contributes to around 8% of total global CO_2 emissions[29]. As a growing sector with a large carbon footprint, decarbonisation of the Steel sector is essential in order to achieve the climate goals under the Paris Agreement.

Steel production is split into two broad categories: primary and secondary. Primary steel refers to steel that is made for the first time through processes that extract iron from mined iron ore and turn it into steel. Secondary steel refers to recycled steel that is re-purified from steel that has previously been milled.

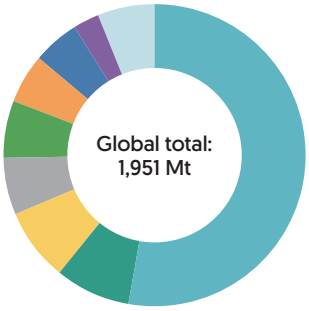
29 Leadership Group for Industry and Transition, "Green steel production: How G7 Countries can help change the global landscape", 10 June 2021, https://www.industrytransition.org/insights/g7-green-steel-production/

The most common route to manufacture primary steel is to use the Blast Furnace – Basic Oxygen Furnace (BF-BOF) process which accounts for approximately 74% of current global steel production[30]. The burning of metallurgical coal in this process generates the majority of the GHG emissions, making BF-BOF the most carbon-intensive production method so far. An alternative production route of primary steel is the Direct Reduced Iron (DRI) method, which is done by passing hot syngas (a mixture of carbon monoxide and hydrogen) over iron ore pellets to remove oxygen and other impurities. The DRI must then be further purified into steel, which is most commonly done using EAF. This method, commonly known as DRI-EAF, accounts for approximately 4% of current global steel production[31], but is expected to grow as it has great potential for emissions reduction if the syngas used to reduce the iron is replaced with green hydrogen.

Secondary steel is largely made by melting scrap iron using EAFs to renew the steel and allow it to be re-cast into crude steel. EAF secondary steel production has much lower GHG emissions intensity than the BF-BOF process, especially when the underlying electricity used is generated from renewable energy sources. However, manufacturing of secondary steel is limited by the amount of scrap that can be recycled. There is currently only limited scope to increase scrap availability as steel demand is growing at a faster rate than scrap is being released from the pool of 'steel in use'[32].

Overall, the need to transition is much greater for primary steel producers using BF-BOF technology.

Figure 18: Crude steel production and geographical distribution, 2021



China	53%
Other Asia	8%
EU	8%
India	6%
US/Canada/Mexico	6%
Russia and CIS countries	5%
Japan	5%
Other Europe	3%
Other	6%

Source: Worldsteel – World Steel in Figures 2022 (https://worldsteel.org/steel-topics/statistics/world-steel-in-figures-2022/)

30 Based on analysis of steel plants included in the Global Steel Plants Tracker (GSPT), Global Energy Monitor
31 Based on analysis of steel plants included in the Global Steel Plants Tracker (GSPT), Global Energy Monitor
32 Worldsteel Association, "Fact sheet: Scrap use in the steel industry", May 2021, https://worldsteel.org/wp-content/uploads/Fact-sheet-on-scrap_2021.pdf

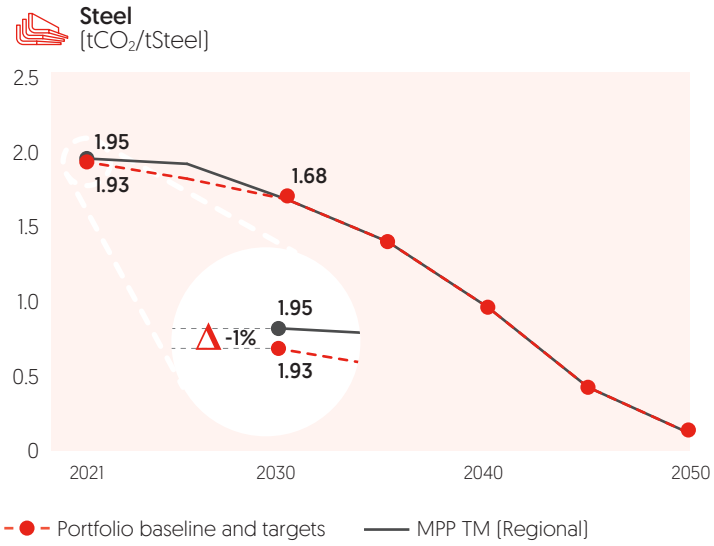
6.2 Our current emissions and targets

Sector coverage
- Steel producers

Emissions scope
- Scope 1
- Scope 2

Metrics
$tCO_2/tSteel$

Reference pathway
MPP – TM (regional)



	2021 Baseline	2030 Target	2050 Target
MPP – TM (Regional)	1.95	1.68	0.12
OCBC	1.93	1.68	0.12
% reduction from 2021 Baseline		↓ 13%	↓ 94%

Scope of our targets

We have included clients directly involved in the production of crude steel, when calculating our financed emissions for this sector. The majority of GHG emissions from the Steel sector are related to the steel production process[33], hence our focus is on the steel manufacturers rather than the wider iron and steel value chain.

Metrics

In setting our emissions targets, we have measured our Steel portfolio emissions with an intensity metric (tCO_2/tSteel). We have chosen an intensity metric as we recognise that the urgent need to decarbonise the steel production process must be balanced with the growing demand of steel in developing sustainable economies. This intensity metric is also widely adopted by steel manufacturers and other financial institutions, allowing us to use a common language with our clients and peer financiers in transitioning towards a greener steel industry.

Reference pathway

We have set our Steel sector targets with reference to the MPP – TM, which is prepared by a body of experts drawn from climate science, finance, policy, and industry. The MPP – TM has been recognised for containing highly granular, publicly available data on its assumptions and results. The MPP – TM trajectory's policy assumptions are also reflective of the current policy landscape, providing insights and transition pathways that are realistic and actionable[34].

Our steel exposure is weighted towards China, the largest producer of primary steel in the world (Figure 18). To better reflect the geographical mix of our steel portfolio, we have constructed a reference pathway matched to the geographies covered by our Steel portfolio by weight-averaging the relevant regional reference pathways according to the size of our exposures in these geographies.

33 Mission Possible Partnership, "Making Net-Zero Steel Possible", September 2022, https://missionpossiblepartnership.org/wp-content/uploads/2022/09/Making-Net-Zero-Steel-possible.pdf
34 Center for Climate Aligned Finance, "Sustainable Steel Principles", https://climatealignment.org/wp-content/uploads/2022/06/alignment_zone_briefing.pdf

Our baseline and targets

Our Steel portfolio's emissions intensity baseline in 2021 is 1.93 tCO_2/tSteel, which is 1% lower than the regionally weighted MPP – TM reference of 1.95 tCO_2/tSteel.

Looking ahead, our target is to reduce the emissions intensity of our Steel portfolio by 13% by 2030 and by 94% by 2050, in line with the regionally-weighted MPP – TM reference pathway. We see significant potential for investments in greener steel production technologies, and are committed to playing a key role in helping our Steel clients leapfrog to green steel production in the coming decades.

6.3 Our commitment to the Steel sector

The transition of the Steel sector has only just begun, although the transition has been driven mainly by cost optimisation considerations[35]. Steel producers are increasingly setting their respective Decarbonisation targets, while leading players in the industry are making ambitious plans to adopt technologies that will bring their emissions down in line with the Net Zero pathways. Some have published ambitions to reach Net Zero by 2050, with many also setting interim emissions reduction targets, ranging from 2025 to 2035.

The need for greening the steel production sector provides a unique opportunity for OCBC to support the industry's transition. Our plan for decarbonising our Steel portfolio is centered around the following pillars:

- **Supporting our clients in setting and meeting their Net Zero targets:** Many of our clients already have publicly announced decarbonisation targets aligned with Net Zero pathways. For these clients, we will continue to support them in following through with their transition plans. In the meantime, we will engage other clients, new or existing, to set and pursue their own decarbonisation goals aligned with the Paris climate objective.
- **Financing new and emerging low-carbon technologies:** We are committed to leveraging on our sustainable financing efforts and directing capital to technologies and services that are essential for the Steel sector's transition, such as recycling of scrap steel, EAFs and green hydrogen.

Decarbonisation toolbox

Recycle steel

Increasing the recycling of steel, which uses significantly less energy than mining and processing iron ores.

Cleaner energy in steel production

Increasing the use of renewable energy to power steel manufacturing

CCUS

CCUS, especially in the longer term, will be a key technology to reduce emissions from existing blast furnaces which are expected to remain a significant steelmaking production method over the coming decade.

Green hydrogen

The DRI-EAF process can be made even less carbon intensive by using green hydrogen instead of syngas as the reducing agent for the raw iron ore.

35 Center for Climate Aligned Finance, "Sustainable Steel Principles", https://climatealignment.org/wp-content/uploads/2022/06/alignment_zone_briefing.pdf

Maximising secondary steel production

We need to promote a shift in production route from primary to secondary steel. Recycling steel will reduce our reliance on mining for new iron ore and thereby avoid emissions and mitigate potential social risks incurred during the mining process. The IEA estimates that by 2030, 27% of steel will be produced through scrap-based production method, compared with 20% in 2020[36]. While demand for steel is expected to grow, primary steel production is projected to decrease, driven by the increase in availability of scrap steel to support secondary steel production.

Using cleaner energy in steel production process

Currently, burning of fossil fuels, either directly on-site in the BF-BOF process, or in power stations to provide electricity for EAFs, comprises the majority of sector emissions. EAFs require large amount of electricity, reiterating the dependency of creating a Net Zero Steel sector on power grid decarbonisation. As such, some steel companies are taking more proactive steps by installing on-site renewable power generators or purchasing RECs from the market to accelerate their greening process.

Development of alternative technologies – CCUS and green hydrogen

Alternative technologies such as CCUS and green hydrogen will play an important role in decarbonising the steel sector in the coming decades. The IEA estimates that CCUS technology needs to apply to more than 53% of primary steel production by 2050, equivalent to 700 million tonnes a year of CO_2 reduction in the Net Zero Emissions scenario.

At the same time, the DRI-EAF method can be further decarbonised if the syngas that is used to reduce the iron ore is made in other ways or replaced with other reducing agents. In the shorter term, this could mean using bio-methane instead of natural gas as the feedstock for creating syngas. In the longer term, the DRI-EAF method can be made close to Net Zero emissions by using green hydrogen, produced from renewable energy, as the reducing agent.

While these technologies are currently not used at scale, we will be monitoring this area as technologies mature and such avenues become commercially viable for our clients.

36 IEA, "Steel production by share of different process routes in the Net Zero Scenario, 2018-2030", 26 October 2022, https://www.iea.org/data-and-statistics/charts/steel-production-by-share-of-different-process-routes-in-the-net-zero-scenario-2018-2030

Chapter 7:

Aviation

Aviation has revolutionised the way we connect people, goods and culture across oceans and borders. With its rapid growth and sizeable emissions footprint, we have to harness the power of innovation and collaboration to develop cleaner ways of flying by switching to alternative fuels and more efficient aircraft for the sector to continue being a catalyst for global connectivity and economic growth. At OCBC, we are committed to partnering with our clients in their decarbonisation journey and seizing the new opportunities that arise from the transition.

7.1 Sector dynamics

Air travel is instrumental to global connectivity and is a crucial catalyst for global trade, business, tourism and economic growth. It is estimated that 128,000 flights take off every day, carrying 2.5 million passengers and facilitating USD 18 billion of world trade[37].

The global Aviation sector produces an estimated 3% of total CO_2 emissions globally[38] and is considered a hard-to-abate sector due to the long lifespan of airplanes and the high cost of alternative available solutions. Most of the aircraft in operation today consume jet fuel primarily derived from crude oil, hence generating substantial GHG emissions.

According to the report Waypoint 2050 by the Air Transport Action Group (ATAG), despite growing climate concerns over emissions from aviation, passengers generally expect the industry and governments to concentrate on mitigation options such as the use of SAF and technological developments, rather than trying to limit air travel supply or demand through quotas or taxes[39]. This is especially true in parts of the world where rail alternatives for international travel are less developed and feasible, as is the case in ASEAN.

Based on recent estimates, demand for air transport is expected to increase by an average of 4.3% annually over the next 20 years[40]. A large proportion of this growth is expected to be from emerging markets, especially in Asia. Significant effort and financing will thus be required to decarbonise the industry.

37 Aviation: Benefits Beyond Borders, https://aviationbenefits.org/
38 IEA World Energy Outlook 2021; based on total global CO_2 emissions by key sectors in 2019 which shows Aviation sector's historical status quo contribution to global emissions prior to pandemic.
39 Aviation: Benefits Beyond Borders, "Waypoint 2050", September 2021, https://aviationbenefits.org/media/167417/w2050_v2021_27sept_full.pdf
40 ICAO, "Future of Aviation", https://www.icao.int/Meetings/FutureOfAviation/Pages/default.aspx#:~:text=The%20most%20recent%20estimates%20suggest,GDP%20to%20the%20world%20economy.

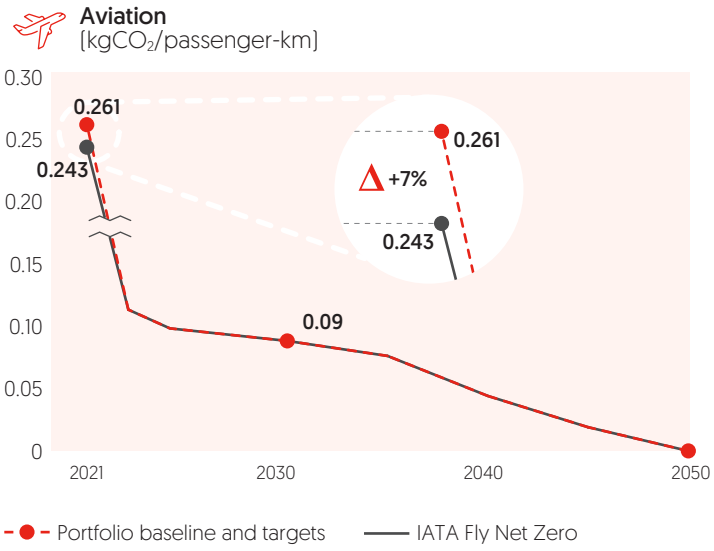
7.2 Our current emissions and targets

Sector coverage
- Airline operators and lessors

Emissions scope
- Scope 1 (operators)
- Scope 3 (lessors)

Metrics
$kgCO_2$/passenger-km

Reference pathway
IATA Fly Net Zero



	2021 Baseline	2030 Target	2050 Target
IATA Fly Net Zero	0.243	0.088	0
OCBC	0.261	0.088	0
% reduction from 2021 baseline		↓ 66%	↓ 100%

Scope of our targets

The scope includes all of our airline clients that operate commercial passenger aircraft, as well as our aircraft lessor clients that own and lease passenger aircraft to airlines. Jet fuel emissions are estimated to represent around 98% of an airline's total emissions[41]. For airliners, we used their Scope 1 emissions which includes emissions from combustion of jet fuel. For our aircraft lessors, we used their downstream Scope 3 emissions capturing emissions from combustion of jet fuel.

Metrics

We have adopted an emissions intensity metric for our target, $kgCO_2$/passenger-km. Using the emissions intensity metric means that we will be able to balance supporting the business growth of our clients in the Aviation sector while working with them to reduce the emissions generated per passenger-kilometre flown. This metric is also commonly used in the industry; hence it is a data point that is commonly available and also allows for comparability across players in the Aviation sector.

Reference pathway

We have set our Aviation sector target with reference to the Fly Net Zero scenario published by IATA. IATA is the trade association of the world's airlines, representing over 300 airlines that together form 83% of total air traffic. The Fly Net Zero commitment is a pledge by IATA member airlines to reach Net Zero carbon emissions by 2050, bringing air transportation in line with the objectives of the Paris Agreement to limit global warming to 1.5°C above pre-industrial levels. All of our current airline clients are IATA members who are committed to Fly Net Zero. Therefore, using it as the reference for required decarbonisation of our Aviation sector portfolio will directly facilitate our support for our clients as we partner with them to meet their decarbonisation goals.

41 Transition Pathway Initiative, "Management Quality and Carbon Performance of Airlines: March 2019", https://www.transitionpathwayinitiative.org/publications/35.pdf?type=Publication

Our baseline and targets

The entire aviation sector has been adversely affected during the period 2020-2022 as the volume of international travel dropped significantly due to public health measures, such as lockdowns and border controls, imposed to control the COVID-19 pandemic. This led to many planes being operated with much lower-than-average loads, increasing emissions intensity per passenger-kilometer.

Our 2021 emissions intensity baseline is 0.261 $kgCO_2$/passenger-km, which is 7.4% higher than the reference of 0.243 $kgCO_2$/passenger-km. This is because the largest share of our Aviation sector clients are Asia-based airlines. In Asia, passenger loads were impacted more by COVID-19 than in other parts of the world, as public health measures and border controls have been stricter and enforced for longer periods. This caused many of our clients' emissions intensities to be higher than those of their peers in 2021. We expect both our baseline and the reference pathway to decrease significantly when we refresh our baseline from 2022 and beyond, at which point comparisons will become more meaningful.

In line with the IATA targets, we target a 66% reduction of our Aviation sector CO_2 emissions intensity in 2021 by 2030. Adjusted for the pandemic impact, this is equivalent to a 10% emissions intensity reduction relative to normalised 2021 baseline figure.

7.3 Our commitment to the Aviation sector

Aviation is one of the hard-to-abate sectors that still requires concerted efforts to develop commercially viable alternative technologies and solutions that can be deployed at scale. To achieve Net Zero, the industry will have to reduce fuel-burn emissions from aircraft to zero, eliminating 21.2 Gt of CO_2 emissions between 2020 and 2050[42]. The IATA Net Zero strategy estimates that 65% of the reduction will have to come from the adoption of SAF, 13% of reduction from new aircraft technologies such as alternative propulsion, including electric and hydrogen, 3% from continued improvement of operational efficiency and finally 19% from carbon capture or offsets.

Decarbonisation toolbox

SAF

Increasing the adoption of SAF, which is produced from sustainable feedstocks with similar properties to conventional jet fuel but with a smaller carbon footprint.

New aircraft technologies

Improvements in aircraft technology that focus on increased engine efficiency, better aerodynamics and reduced aircraft weight

Optimisation and efficiency

Continuous enhancements of aircraft operations to improve fuel-burn per passenger km, such as

- Retrofitting winglets to increase fuel efficiency;
- Deploying electric or assisted taxiing; and
- Reconfiguring cabin to reduce aircraft weight and fuel use, among others.

Carbon capture and quality offsets

Sourcing high quality carbon credits through credible carbon markets

42 IATA, "Our Commitment to Fly Net Zero by 2050", https://www.iata.org/en/programs/environment/flynetzero/

Sustainable aviation fuel

SAF is estimated to reduce carbon emissions by up to 80% compared to traditional jet fuel. Additionally, it is a 'drop-in' fuel that does not require major retrofitting of existing aircraft. The usage of SAF is not commercially viable at this moment as the cost of production remains high due to the complex supply chain and availability of feedstock. The lack of supply has also driven up SAF prices. To achieve Net Zero, the yearly production of SAF has to grow an estimated 450 billion litres by 2050, which is significantly higher than the 2021 production levels of 100 million litres[43]. IATA believes SAF production levels can increase to cover 2% of total fuel consumption by 2025, with appropriate policy support and provided all options to increase SAF production are explored[44].

This transition represents a multi-faceted opportunity for our clients in Asia Pacific. In aviation, the adoption of SAF at scale can help them decarbonise and appeal to climate-sensitive passengers. For our Oil & Gas clients, the region is an attractive place to develop SAF based on the high potential for agricultural and used cooking oil feedstocks. And for our agriculture clients, this presents an opportunity to participate in the development of low-emissions fuels. In Singapore, investments have been made to contribute to increasing SAF production levels. The world's largest sustainable aviation fuel plant is expected to be completed in 2023 in Singapore[45].

New aircraft technologies

This lever involves moving away from traditional jet engine aircraft through the development of hybrid-electric, electric and hydrogen aircraft, as well as developing radical new aerodynamic designs that could result in significant efficiency improvements and make it easier for alternative propulsion systems to succeed.

Although this can be a real game changer in the industry, we do not expect to have a new type of aircraft for mass passenger transportation in the near term. The industry still needs time to develop new technologies and ensure their safety before they can become commercially viable. Electric and hydrogen propulsion, for instance, are expected to have limited impact until post-2040.

Optimisation and efficiency

Achieving Net Zero for the Aviation sector is a daunting task and we need to mobilise all actors and resources that are available to us. Improving the fuel-burn per passenger km through retrofitting and reconfiguring aircraft operations can help to improve optimisation and efficiency. While the overall reduction from this lever may be minimal and insufficient to get the industry to Net Zero, these measures are most feasible in the near term and will be critical in contributing to emissions reduction in the near term.

Carbon capture and quality offsets

Carbon offsets are a crucial lever for Aviation sector's decarbonisation, especially in the short to medium term while SAF adoption and technology improvements ramp up. IATA's Fly Net Zero strategy recognises the role of using quality carbon offsets to offset residual CO_2 emissions. It is expected that 19% of the total emissions reduction will be achieved either via carbon capture or approved offset programmes in 2050[46]. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), the global market-based measure designed to offset international aviation CO_2 emissions, estimates that presently almost 80% of CO_2 emissions growth over 2020 levels will be offset[47].

Aviation is one of the few sectors that recognises the purchase and use of high-quality carbon offsets at scale. Establishing robust carbon offsetting mechanisms will therefore be pivotal to achieve the sector's Net Zero goal. In this regard, we will help our current and potential clients to source high-quality carbon credits through credible carbon markets and create products that will help our clients to purchase them via our carbon trading desk.

43 IATA, "SAF production increases – incentives still needed", 7 December 2022, https://www.airlines.iata.org/news/saf-production-increases%E2%80%94incentives-still-needed
44 IATA, "Sustainable Aviation Fuels", May 2019, https://www.iata.org/contentassets/ed476ad1a80f4ec7949204e0d9e34a7f/fact-sheet-alternative-fuels.pdf
45 EDB Singapore, "Singapore to have world's largest sustainable aviation fuel plant". 27 April 2022, https://www.edb.gov.sg/en/business-insights/insights/singapore-to-have-world-s-largest-sustainable-aviation-fuel-plant.html
46 IATA, "Net Zero Resolution", June 2022, https://www.iata.org/en/iata-repository/pressroom/fact-sheets/fact-sheet----iata-net-zero-resolution/
47 Aviation Benefits Beyond Borders, "CORSIA explained", https://aviationbenefits.org/environmental-efficiency/climate-action/offsetting-emissions-corsia/corsia/corsia-explained/

Box 4: OCBC Sustainability Innovation Challenge with SATS

In June 2022, we launched our inaugural OCBC Sustainability Innovation Challenge (OSIC). OCBC partnered SATS to find solutions relating to effective waste management and reduction for the agri-food industry.

SATS, Asia's pre-eminent provider of food solutions and a global leader in gateway services, creates tasty, quality food in sustainable ways for airlines, food service chains, retailers and institutions. For the nine-month period ended 31 December 2022, SATS served 49.1 million meals, a year-on-year increase of 24.9%.

While not directly part of our Net Zero scope for this sector, SATS plays a vital role in encouraging the adoption of more sustainable practices across the aviation sector to deliver greater community impact. As 3.2% of global CO_2 emissions is attributable to the Waste sector while 18.4% is attributable to Agriculture, Forestry and Land Use[48], collaborating with aviation service providers on waste management and reduction will help contribute to the Net Zero agenda.

The OSIC aimed to address two challenge statements:

1. How we turn waste into energy or other by-products; and
2. How we create circularity of consumer products.

Start-ups with innovative solutions addressing the challenge statements were invited to participate. Close to 100 companies and start-ups from 24 markets across continents sent their proposals in response to the challenge statements. The winning teams, Enexor BioEnergy and TRIA, received up to SGD 80,000 from OCBC to pilot their solutions with SATS. If successful, the two pilot programmes may receive further support from OCBC and SATS.

OSIC is a demonstration of the Bank's support of sustainable innovation and technology. It is also a reflection of the Bank's deep commitment to support the sustainability journey of its clients, by building an ecosystem where key problems in the sustainability space can be collectively solved.

48 Our World in Data, "Emissions by sector", September 2020, https://ourworldindata.org/emissions-by-sector#agriculture-forestry-and-land-use-18-4

Chapter 8:

Shipping

The Shipping sector is a critical component of the global economy. Decarbonisation of the sector will require significant investments in new technologies and infrastructure, as well as changes in operational practices and business models. It will require a concerted effort from all stakeholders, including governments, shipping companies, suppliers and customers. At OCBC, we look to embrace and support new technologies and business models, as we believe that the benefits of a more sustainable Shipping sector are significant, including reduced emissions, improved air quality, and a more resilient and efficient global economy.

8.1 Sector dynamics

The Shipping sector is often quoted as the lifeblood of global trade as it is estimated to be responsible for the carriage of approximately 90% of world trade, which translates to moving roughly 11 billion tonnes of goods annually or 1.5 tonnes per person based on the current global population[49].

Similar to the Aviation sector, the bulk of GHG emissions from the Shipping sector arise from the combustion of fuel in ships' engines (i.e., fuel-burn emissions). About 99% of energy demand from the Shipping sector is met by oil products today[50], although an increasing number of ships are using less carbon-intensive fuels such as LNG. An estimated 3% of total global CO_2 emissions is attributable to the Shipping sector[51]. While shipping is the most efficient mode of bulk transport on an emissions per tonne-kilometre basis, work must still be done to reduce emissions from the sector.

Global demand for transportation of freight is projected to triple by 2050[52]. Rapidly growing trade volumes, combined with the lack of viable Net Zero shipping alternatives today result in shipping being widely considered a hard-to-abate sector with estimates that over USD 1 trillion in investments[53] will be required for the industry to reach Net Zero.

49 International Chamber of Shipping, "Shipping and world trade: driving prosperity", https://www.ics-shipping.org/shipping-fact/shipping-and-world-trade-driving-prosperity/
50 IEA, "International Shipping", September 2022, https://www.iea.org/reports/international-shipping
51 Poseidon Principles, "Annual Disclosure Report 2022", December 2022, https://www.poseidonprinciples.org/finance/wp-content/uploads/2022/12/Poseidon-Principles-Annual-Disclosure-Report-2022.pdf
52 International Transport Forum, "Transport demand set to triple, but sector faces potential disruptions", 22 May 2019, https://www.itf-oecd.org/transport-demand-set-triple-sector-faces-potential-disruptions
53 UN Global Compact, "Maritime Just Transition Task Force", https://unglobalcompact.org/take-action/think-labs/just-transition/about

8.2 Our current emissions and targets

Sector coverage

- Financed vessels under the purview of IMO[54]

Emissions scope

- Scope 1 from fuel burn

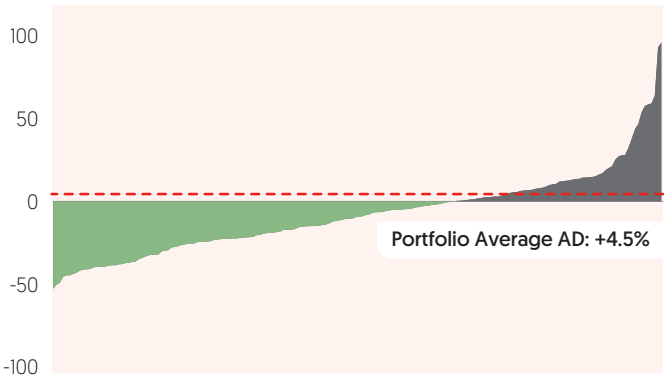
Metrics

Alignment Delta based on percentage

Reference pathway

IMO Initial Strategy on reduction of total annual GHG emissions by at least 50% by 2050 based on 2008 levels – adjusted for Poseidon Principles

Shipping
Alignment Delta (%)



- Portfolio baseline (no forecast shown; target is to be under the benchmark)

	2020 Score	2021 Score	2030 Target	2050 Target
OCBC vs IMO – PP (AD)	-1.8%	+4.5%	≤0%	≤0%

PP is a globally recognised framework that guides how financial institutions determine, assess and manage the climate alignment of their ship finance portfolios to support IMO's ambition of reducing total absolute GHG emissions by at least 50% by 2050 from 2008 levels, which implies a higher reduction in emissions intensity. PP was launched in June 2019 to provide a common, global baseline for financial institutions to quantitatively measure the carbon footprint of their shipping clients and disclose their lending portfolios versus the adopted climate goals by the IMO. In 2022, 28 major financial institutions, including OCBC, disclosed their financed emissions in their annual disclosure report, and this captured almost two-thirds of global ship financing. As a signatory, our target setting exercise is guided by the Technical Guidance from PP.

54 Vessels 5,000 gross tonnage and above which have an established Poseidon Principles trajectory whereby the carbon intensity can be measured with IMO Data Collection System.

Scope of our targets

PP requires the Bank to measure the emissions intensity of all the ocean-going ships that we directly finance.

Metrics

Ships' emissions intensities, or Annual Efficiency Ratios (AERs), are measured as CO_2 emissions from fuel-burn per deadweight tonne-nautical mile (DWT-NM)[55]. DWT-NM is measured to normalise for differences in emissions due to differences in ship size and load, as larger and more fully laden ships have higher fuel-burn emissions, but also carry more goods or passengers.

In comparing the vessels' emissions intensities with the reference pathways that PP publishes, we use the AD metric. This metric calculates the percentage difference between the emissions intensity of each ship and the relevant reference pathway emissions intensity for that ship's type and size. These ship-level ADs are exposure-weighted and aggregated across the portfolio to derive a portfolio-level AD that normalises across different ship types and sizes in our shipping portfolio. Similar to the Real Estate sector, each type and size of vessel has its unique usage, and they are not inter-changeable. Using AD helps us understand and consolidate our portfolio's emissions profiles without bias coming from changing composition of our shipping portfolio.

Reference pathway

Our Shipping sector target is to align with or outperform the IMO's shipping decarbonisation pathway (i.e., keep our portfolio-level alignment delta at or below 0%), in line with the ambitions of the PP. We are cognisant that the IMO trajectory is currently not aligned with the Paris Agreement's 1.5°C temperature goal. We have therefore expressed our willingness, together with the other signatories, to adopt an appropriate emissions reduction trajectory in line with Net Zero targets for the Shipping sector as soon as such a trajectory or trajectories become readily available[56]. At which point, we will work towards measuring our alignment delta against the revised reference pathways.

Our baseline and targets

For 2021, we were slightly above the reference by 4.5% (compared to an alignment of -1.8% in 2020) for two main reasons. Firstly, due to the changing consumption patterns during COVID-19, liners operated at higher speeds to meet an unprecedented increase in e-commerce activity while port congestion due to lockdowns and labour shortage added to longer waiting times. Secondly, there was a misalignment for shuttle tankers due to the nature of the business where these tankers perform shorter lightering runs. Overall, signatories reported a less favourable average score of +9.7% in 2021 (compared to +7% in 2020) as a result of COVID-19 induced impact on shipping.

55 For Cruise, Ferry-RoPax, Ferry-pax only and Vehicle, the denominator of carbon intensity is Gt*nm where Gt is gross tonnage instead of DWT*nm.

56 Poseidon Principles, "Leading shipping banks and maritime insurers pave the way for 1.5-aligned emissions benchmarking", 22 September 2022, https://www.poseidonprinciples.org/finance/news/leading-shipping-banks-and-marine-insurers-pave-the-way-for-1-5-aligned-emissions-benchmarking/

8.3 Our commitment to the Shipping sector

Decarbonising the Shipping industry will require concerted efforts from all stakeholders, including governments, shipping companies, and the broader maritime industry. Several decarbonisation enablers have emerged. We commit to continue supporting our clients in their efforts to green their operations and the wider Shipping sector, by focusing lending decisions towards an efficient, safe, reliable, and affordable supply of renewable fuels as well as technology development endeavours.

Decarbonisation toolbox

Lower carbon alternative fuels

Supporting the research, retrofit and purchase of alternative fuels, such as:

- LNG
- Ammonia
- Biofuels
- Hydrogen
- Methanol
- Battery technology

Retrofitting of existing ships

Retrofitting existing vessels to save energy and maximise operational efficiency, such as installing energy-saving or fuel-saving devices, using anti-fouling paints, and regular wind sails and main engine tuning.

Renewing shipping fleet

Replacing older, less efficient vessels with eco-designs with more efficient engines and better fuel efficiency.

Smart shipping management systems

Smart technology that optimises voyage and waiting times.

Low carbon alternative fuels

Key for the Shipping sector is to find commercially viable clean fuels that can move large vessels across the ocean safely. Various alternative fuels are currently being adopted, including LNG, ammonia, biofuels, hydrogen, and methanol.

While LNG is cleaner than bunker fuels, it is still a fossil fuel and there have been concerns around potential leakage of unburned methane (i.e. "methane slip") from the use of LNG-fuelled ships. LNG is therefore considered at best a transition fuel.

Ammonia does not release any CO_2 when burnt and can potentially be a long-term solution. However at present, the production of ammonia usually involves chemical processes that themselves create a large amount of GHG emissions. This is both from the high heat and pressure used to drive the chemical reaction, as well as from the production of hydrogen that it uses. Emissions from this process can be greatly reduced with green hydrogen, production of which requires a surplus of renewable energy, giving rise to a dependency of Shipping sector decarbonisation on decarbonisation of the Power sector. Ammonia also releases less energy per litre burnt as compared to bunker fuel and requires catalysts to work efficiently in engines, of which the development is still in the works. Therefore, switching the Shipping sector to widespread use of ammonia as a fuel is unlikely to occur soon.

Another alternative fuel is methanol which is easier to store and presents fewer pollution risks compared to ammonia. However, producing green methanol is an energy intensive process that also requires a surplus of renewable energy. In addition, it relies on capturing CO_2 from the atmosphere which is still an immature technology.

Biofuels are an attractive alternative as they are "drop-in fuels", meaning they can directly replace like-for-like bunker fuel and can be used in the short-term to reduce emissions. However, production of biofuels is currently limited and, coupled with the Aviation sector's demand for SAF, it is unlikely that biofuels will be able to sufficiently meet the demands of the Shipping sector in the near future.

Use of batteries to power ships are also being tested, however battery-powered ships that are available presently have limitations on both the size of the ship they can power and in the distance that they are able to cover.

Although it may take some time before we have commercially viable low carbon vessel technologies, it is heartening to see all parties including industry players, governments and academics mobilising their resources to develop technologies. We will support our current and potential clients by funding investments relating to the research, retrofit and purchase of alternative fuels.

Retrofitting existing ships

As of March 2023, the global merchant fleet had an average vessel age of over 12 years[57]. Due to the long economic lifespan of ships, retrofitting existing ships is critical to emissions reduction in the short term.

Common retrofit energy efficiency measures include:

- Retrofitting of existing vessel's engines to become dual-fuel engines that are able to run on alternative fuels as well;
- Improvements to the ship design such as engine derating to adjust the fuel injection time and reconfiguration of the bulbous bow to reduce wave-making resistance; and
- Improvements to ship propulsion such as installation of winglets to improve propeller efficiency and sails to harness wind power.

We will continue to incentivise current and potential clients to seek further optimisation and improvements in efficiency through innovative financing solutions.

57 Clarksons Research, "Shipping Intelligence Network", https://sin.clarksons.net/

Renewing shipping fleet

Ship fuel efficiency has been steadily improving over the past decades as design of hulls and engines have improved. Historically, newer ships are on average 20-30% less carbon intensive versus their predecessors, while older ships, particularly those that are 15 years or older, are typically 20-25% more carbon intensive than the weighted industry average[58]. Shipping companies that operate newer ships tend to have significantly lower fuel-burn emissions than their peers using older models.

We will support current and potential clients by funding investments relating to the development, construction, and acquisition of new generation ships.

Smart shipping management systems

Shipping companies can leverage on technology to enhance operational efficiencies and, in turn, contribute to reducing GHG emissions. Through real-time route management, for instance, smart shipping management systems are able to collect up-to-date data on weather patterns, piracy alerts, port traffic and other varying parameters, and keep the ship on the most efficient route and hence reduce the overall distance travelled and waiting time. More accurate navigational data generated by the systems could also help vessels adapt their speed so that they use less fuel, reducing their emissions intensity over time.

Box 5: First bank in Southeast Asia to adopt the Poseidon Principles

In December 2021, OCBC Bank became the first bank in Southeast Asia to adopt PP. By committing to reporting the climate alignment scores of our portfolio annually, we are able to regularly monitor our alignment with the decarbonisation pathway and our performance vis-à-vis other PP signatories, including the leading shipping banks.

Becoming a signatory signals to our clients that we are focused on companies with clear strategies on decarbonisation and are interested in how our clients are adapting and evolving in their decarbonisation journey. We are collecting actual operational data from our clients for our assessment and this exercise has also given us a better understanding of our client's operations and decarbonisation ambitions, allowing us to make informed lending decisions while providing opportunities for collaboration and support.

58 International Council on Clean Transportation, "Long-term potential for increased shipping efficiency through the adoption of industry-leading practices", July 2013, https://theicct.org/sites/default/files/publications/ICCT_ShipEfficiency_20130723.pdf

The Way Forward by Tan Teck Long

Head of Global Wholesale Banking

"The only viable path for us to reach Net Zero in our financed emissions is for our clients to reach Net Zero in their emissions. While the road ahead is fraught with uncertainties, we are optimistic and excited about the immense possibilities ahead. Taking climate action is a duty for all individuals and all businesses."

Tan Teck Long,
Head of Global Wholesale Banking

We now have a roadmap to Net Zero by 2050, with an interim checkpoint in 2030 to ensure that we are on track. We will now undertake the following initiatives.

Putting our plans into action. The only viable path for us to reach Net Zero in our financed emissions is for our clients to reach Net Zero in their emissions. There is simply no other way. We have determined what we need to do to meet our targets, by identifying the decarbonisation levers at our disposal for each sector. We have already begun engaging our clients on their transition journeys, and will continue to do so in earnest. We will continue to innovate and devise bespoke financing solutions to align ourselves with our clients' decarbonisation ambitions. To those clients boldly charting a path to a Net Zero future, we say – OCBC would love to partner with you on this journey. To those clients considering their next steps, we invite you to talk to us about how we can help you do so with confidence and ambition. And to those wondering where to start, we say – come speak to us and see how we can help you take that first step.

Holding ourselves to account. To track our progress against the 2050 and the interim 2030 targets, we will measure and update our financed emissions in the six priority sectors annually, and compare them against prior years and our targets. We will disclose our progress transparently in our Sustainability Report. We will closely monitor trends and developments in the six sectors, as well as revised sectoral reference pathways that may be released from time to time. We do not intend to update our targets as and when new reference pathways are released, in order to preserve consistency in our internal goal setting and client engagements. Nevertheless, we will review, and update if necessary, our targets at least once every 5 years.

Contributing to a dynamic ecosystem. Given the magnitude of the challenges ahead, no one can do this alone. As a financial institution committed to the sustainability cause, we want to play our part in the creation of a vibrant ecosystem in which all stakeholders come together to devise innovative solutions. These stakeholders can include regulators, digital technology firms, think-tanks, other financial institutions, NGOs, green technology innovators, and many more. To that end, OCBC has already inked a number of partnerships with green industry players, and is involved in various industry initiatives such as the Singapore Green Finance Industry Taskforce and the China-Singapore Green Finance Taskforce. We will also lead programs to find solutions to real-world problems, just like we did with the SATS Innovation Challenge.

While the road ahead is fraught with uncertainties, we are optimistic and excited about the immense possibilities ahead. Taking climate action is a duty for all individuals and all businesses. At OCBC, we see it as our responsibility and our purpose.