Strategic Report

Chair's message

"A large, multinational organisation, like Shell, can combine the pursuit of value with contributing to a better world."

Sir Andrew Mackenzie
Chair

Russia's invasion of Ukraine began more than a year ago. In the face of the humanitarian disaster this war created, Shell acted swiftly and decisively to support our own people in both countries, as well as Ukrainians who fled the conflict.

We also played a vital role in helping to safeguard energy supplies as many countries sought alternative sources to Russian oil and gas. Shell moved quickly, redirecting supplies, particularly liquefied natural gas (LNG), to where they were needed.

I am immensely proud of how our people responded to this challenge, especially given the continuing pandemic in some parts of the world, which added to the uncertainties. The tragic earthquakes in Turkey and Syria last month also showed how Shell people step up, this time when faced with a natural disaster. Thankfully none of our staff were hurt, although many of their families were affected. Shell provided fuel to support emergency workers and chemicals to make foam mattresses, and hand sanitiser in the absence of water for washing.

The impact of war in particular has shown how vital it is for Shell to continue to supply secure and affordable energy, while producing what our customers need to make the transition to cleaner energy. Whatever challenges dominate the immediate view, we must stay focused on our role in the energy transition and the need to tackle climate change.

Shareholder value

A large, multinational organisation, like Shell, can combine the pursuit of value with contributing to a better world. Our Powering Progress strategy sets out how we plan to generate value for shareholders while reducing our carbon emissions.

Rewarding shareholders must be a priority for a company wanting to deliver on its long-term strategy. They have put their faith in us and entrusted their money to us. Without their support we lack the remit to do what we must to become a net-zero emissions energy business. In 2022, we used some of our profits to buy back shares and distribute dividends. Importantly, we did this while keeping a strong balance sheet.

We also continued to make the kind of disciplined investments in the energy transition we need to help our customers achieve net zero by providing low- and zero-carbon energy. We completed our acquisition of Denmark's Nature Energy, Europe's largest producer of renewable natural gas made from biomass, in February 2023. This will enable us to provide enough renewable natural gas to heat thousands more homes and power thousands more buses. We are also investing in growing our renewable power business. In 2022, we acquired the solar and wind group Sprng Energy, in India.

As one of the world's largest producers of biofuels, we can help customers reduce their emissions by providing energy that can be used in existing aircraft, cars, trucks, or ships. We are also expanding our electric vehicle charging network around the world to help decarbonise road transport.

CEO succession

Wael Sawan became CEO on January 1, 2023, succeeding Ben van Beurden. In his years at the head of Shell, Ben achieved many great things. In 2016, he made Shell's largest ever acquisition in buying BG, he led us through the pandemic and the global financial turmoil that followed, and he led the historic move of our headquarters to London. He took the swift decision to start the process of pulling Shell out of Russia. We are grateful to Ben for his leadership through some of the most difficult challenges any CEO could face.

With Wael, Shell is in excellent hands. He has the capability and experience to focus on our strengths, such as the production of oil and gas, and oil products, and do this in ways that are profitable while

Chair's message continued

Shell: aiming for efficiency in the energy transition

(Top): The Shell Chemicals Park Moerdijk the Netherlands. In 2022, we announced plans to build a new pyrolysis oil upgrader. The plant will have capacity to produce up to 50,000 tonnes of pyrolysis oil per year. (Bottom left): In 2022, Shell opened its first electric vehicle charging hub in the UK in Fulham, London. (Bottom right): The Goldeneye pipeline at the St Fergus Gas Terminal. Sir Andrew Mackenzie, third from right.

lowering our emissions. But I believe that he will also drive the transformation of Shell into a business for the future, offering our customers a range of affordable energy, including from low- and zero-carbon sources, from renewables to biofuels and charging for electric vehicles.

When asked to describe Wael, I tell people that he is a man who pursues excellence with relentless efficiency. He has clarity of vision and the conviction that performance rightly comes first. Wael has already acted to simplify the business structure, and allow for faster and better decision-making by combining Integrated Gas with Upstream and placing Renewables and Energy Solutions into our Downstream business. This will create a simpler senior leadership structure, with greater clarity of purpose and accountability.

Contributing to the energy transition

My visit in September to St Fergus near Aberdeen, on the east coast of Scotland, gave me a glimpse of what Shell is doing to provide energy and take carbon out of the energy system. We pipe gas from the North Sea to St Fergus and process it to help meet the UK's energy needs.

But St Fergus is also going to be important in helping the UK achieve its net-zero targets. We are part of the Acorn carbon capture and storage (CCS) and hydrogen project, which is using existing oil and gas infrastructure for decarbonisation. We are repurposing our Goldeneye pipeline to carry carbon dioxide (CO_2) from our St Fergus gas plant and store it safely beneath the seabed.

Projects like these allow the skills and capability of our people to transfer from fossil fuels exploration and development to activities that help progress the energy transition.

As we develop low- and zero-carbon products, we must also find ways to provide oil products that have a lower net carbon impact. This includes continuing to produce oil-based products that do not require burning in their use, such as lubricants and essential plastics.

At all times, we must do this efficiently and sustainably. We are focusing on chemical recycling where we break down hard-to-recycle plastics into raw materials through a technique called pyrolysis. The pyrolysis oil can then be used as feedstock in our chemical plants, replacing traditional hydrocarbon feedstock.

Aiming for highest return, lowest emissions

We apply firm capital discipline at Shell. We are equally disciplined when it comes to budgeting for carbon. Our carbon management framework (CMF) allocates a carbon budget to the operating plans of our businesses. We began applying this in 2022 and in 2023 we will challenge our businesses even further: return the highest value within a given carbon and capital budget.

This approach is working. We reduced carbon emissions from our operations by 30% by the end of 2022, compared with 2016, our reference year. This is well over halfway towards our target of a 50% reduction by 2030.

Faced with the challenge of providing secure supplies of energy while transforming for a net-zero future, it is more important than ever that Shell act decisively. As Chair, I want the Board to ensure that our governance is always firmly in place and highly effective in guiding the Executive Committee and management to move quickly when opportunity comes.

Society has long enjoyed the benefits of oil and gas. But now the world must find ways to benefit from energy while urgently cutting emissions. This is going to be tough, but it is possible if everyone collaborates to develop and use low- and zero-carbon energy solutions and deploy technologies that capture CO_2 and store it underground or remove it directly from the air.

These are exciting times to work in the industry as we explore cleaner ways to keep the world moving. Opportunity surrounds us and I feel the same sense of adventure that I felt as a young geologist when my career began in the North Sea in the 1980s.

The story of Shell is the story of pioneers. We have always been at the forefront of developments, from our first oil discoveries to deep-water exploration, and now to the energy transition. It is this spirit of adventure that will carry us forward.

Sir Andrew Mackenzie
Chair

Chief Executive Officer's review

"The stark realities we are seeing globally reinforce the need for a balanced energy transition."

Wael Sawan
Chief Executive Officer

It was more than a year ago that Russia invaded Ukraine, triggering a war that has killed thousands and continues to wreck the lives of many more. I hope and pray for an end to this devastating conflict that is threatening the security of Europe.

We continue to provide support to our staff in both countries and we are working with aid organisations in Ukraine and in bordering countries, where millions of refugees are now trying to rebuild their lives. In the days following the invasion, we announced our intention to withdraw from our Russian oil and gas activities in a phased manner, aligned with government guidance.

In 2022, the invasion and reduction of gas supply from Russia that followed accelerated a surge in global energy prices. This pushed up the cost of almost everything for households, industry, and businesses. Europe took positive actions to secure energy supply with Germany, for example, getting two floating regasification facilities up and running by the end of the year.

Shell also did its part, responding with agility as an energy provider. For example, we used our strength as a global energy producer and supplier to deliver 194 cargoes of liquefied natural gas to Europe and the UK – almost five times the usual average – and helped countries like Germany and Austria ensure they had enough energy storage ahead of their winter. I am proud of how our people stepped up when called upon.

As we publish our Annual Report, the tragic aftermath of devastating earthquakes in Turkey and Syria is still unfolding. We are supporting our staff in the region, and they are working hard to keep fuel supplies flowing to help relief efforts and keep hospitals operating.

The stark realities we are seeing globally reinforce the need for a balanced energy transition. They also show that our Powering Progress strategy is the right one: delivering secure and affordable energy with increasingly lower emissions. We must do this profitably as we help build the net-zero energy system of the future.

Generating shareholder value

In becoming Chief Executive Officer in January 2023, I succeeded Ben van Beurden, who was CEO for nine years. In that time Ben transformed Shell into a much stronger company and set us on the path to net-zero emissions. I am grateful to Ben for his work and for what he has handed over to me. In my first Annual Report as CEO, I want to be clear: Shell is a great company, and we are changing to ensure we become a great investment too.

In 2022, we made income of around $43 billion and our highest ever Adjusted Earnings of around $40 billion. While the global business environment for energy producers helped make this possible, our Adjusted Earnings were still around $17 billion higher than in 2014, when Brent prices were at similar levels. Thanks to improvements made over the past few years, the quality of our portfolio also makes us resilient to market volatility, and the streamlining of our organisation has made us more efficient.

We delivered a cash flow from operations of more than $68 billion and our organic free cash flow was around $48 billion. This strong performance allowed us to increase our distributions to shareholders and we returned around $26 billion to them through share buybacks and dividends, which is more than 35% of our cash flow from operations. We will continue to target shareholder distributions with a hard floor of 20%, and the option of more than 30%, of our cash flow from operations, subject to Board approval.

Profit without sustainability erodes our licence to operate. Sustainability without profit erodes our shareholder support and financial capacity to play a meaningful part in the energy transition.

Chief Executive Officer's review continued

Investing to meet demand today and in the future

(Top): Energy users in South Africa. A mother and daughter cooking together. Shell is working to provide secure and affordable energy. (Bottom left): Holland Hydrogen 1 imagery, credit: Plotvis. Shell took the final investment decision to build Holland Hydrogen 1 in July 2022. (Bottom right): Denmark-based Nature Energy. Shell completed the acquisition of the renewable natural gas producer in February 2023.

We must continue to provide energy and do it with fewer emissions. We can only do this with the backing of our shareholders because it is their capital that enables us to invest in the energy transition.

Performance and discipline

In 2022, there were significant improvements in both personal and process safety. The safety of our employees and contractors is paramount. Despite our best efforts, I am saddened to say that in 2022 two of our contractor colleagues died tragically, one in Nigeria and one in Pakistan. We will, as always, learn from these accidents and do our utmost to keep our people safe and unharmed.

While our 2022 financial performance was strong, we can do even better. We aim to be disciplined in allocating our capital by investing in the best oil and gas projects and making investments in the energy transition with a relentless focus on shareholder value and returns.

Our acquisition of Nature Energy, the largest producer of renewable natural gas in Europe, is a case in point. This is a transformative investment because Nature Energy will supply customers we already have, while giving us access to new customers who want low-carbon products. Another investment that promises value is our acquisition of Sprng Energy group, a solar and wind platform in India, which has added significant capacity to our renewable generation portfolio. We also took the final investment decision to build Holland Hydrogen 1 in the Netherlands, which will be Europe's largest renewable hydrogen plant once operational from 2025.

In addition to this, our oil and gas activities are showing they can operate according to our belief that value is more important than volume. For example, our Vito deep-water oil platform, which produced first oil in February 2023 in the Gulf of Mexico, was redesigned to make the combined topsides and hull a third of the originally planned size and reduce costs by more than 70%.

As part of our efforts to improve our operating performance, all our businesses work within a rigorous capital and carbon budget. Shell will continue to apply capital discipline as we require directorates to adhere to our new carbon management framework, which sets limits for the emissions in each business.

In early 2023, I moved to simplify our business and leadership structure. By combining Integrated Gas with Upstream, and Renewables and Energy Solutions with the Downstream business, I believe we will be able to make faster, more focused decisions.

Balance and ingenuity

The energy transition must succeed, but balance is needed if society is to leave nobody behind. Trying to dismantle the current energy system before the new energy system is ready will lead to supply shortages and higher prices. The transition must seek to ensure energy security, affordability and sustainability.

Shell is ready to play a role in a balanced transition, profitably and purposefully. As we delivered record profits for 2022, we also reduced carbon emissions from our operations by over 30%, compared with 2016, our reference year. This is more than halfway towards our target of a 50% reduction by 2030. We are also making progress in reducing our fresh-water consumption in water-stressed areas and focusing on chemical recycling.

As I take on the role of CEO, I am reminded of when I joined Shell some 25 years ago. I was attracted to its core values of honesty, integrity and respect for people. I believe those same values, along with Shell's diverse and exceptional talent, our assets and capabilities, our brand and relationships, equip us well for the next phase of our journey. We can make a real difference in the world and create value for our shareholders by doing so.

Since my appointment was announced in September 2022, I have spent time with our teams in a number of countries, including Brazil, the Netherlands, Qatar, the UAE and the USA. I have drawn tremendous energy and pride from seeing the outstanding work that our people are engaged in every day. My single biggest contribution, along with my Executive Committee, will be to find ways to harness the collective energy and commitment that our 93,000 people possess.

Together, we have the ingenuity, talent and resilience to continue to transform our business into one that performs with increasing discipline, efficiency and excellence. We will unlock our potential, power progress, and help make this balanced energy transition happen.

Wael Sawan
Chief Executive Officer

Powering Progress strategy

Who we are

Shell is a global group of energy and petrochemical companies, employing 93,000 [A] people and with operations in more than 70 countries.

We use advanced technologies and take an innovative approach as we seek to help the world build a sustainable energy future. Shell is a customer-focused organisation, serving more than 1 million commercial and industrial customers, and around 32 million customers daily at more than 46,000 Shell-branded retail service stations.

[A] At December 31, 2022.

Our stakeholders

- Our investors
- Our customers
- Our employees/workforce/pensioners
- Our strategic partners/suppliers
- Communities
- NGOs/civil society stakeholders/academia/think-tanks
- Governments/regulators

See "Respecting nature", "Powering lives" and "Governance".

Our purpose

To power progress together by providing more and cleaner energy solutions.

Underpinned by our **core values** and our focus on **safety**

Our core values

Honesty | Integrity | Respect for people

See "Powering lives - Our people".

Our strategy

Our strategy

Powering Progress is our strategy to generate value for shareholders and become a net-zero emissions business by 2050. It is designed to help customers decarbonise and bring benefits for wider society, while respecting nature. Our strategy is underpinned by our focus on safety, and our core values of honesty, integrity and respect for people.

Context

Climate change is one of the biggest challenges the world faces today. In 2022, geopolitical events showed that a secure supply of energy is crucial, and a growing global population is likely to continue to drive demand for energy, including oil and gas, for years to come. This necessitates society's rapid transition to a low-carbon, multi-source energy system.

Shell supports the most ambitious goal of the Paris Agreement, which is to limit the rise in global average temperature this century to 1.5 degrees Celsius above pre-industrial levels. To achieve this, urgent action is needed to reduce emissions across power, transport, buildings, and hard-to-abate industries, such as steel and concrete. Around 140 countries and more than 2,000 companies and organisations have made commitments to get to net-zero emissions by 2050.

Shell seeks to play its part, purposefully and profitably, in the energy transition, while helping to maintain energy security. We are building a resilient business by putting customers at the centre of our strategy, and innovating the products and solutions they need. Our integrated assets and supply chains are designed to deliver value for our shareholders and customers. We aim to manage risk for Shell and our customers as we produce, buy, trade, transport and sell energy products and solutions worldwide.

The energy transition brings risks, involves confronting complex obstacles, and poses great challenges. The energy transition also offers significant opportunities.

We seek to work with our customers to identify available, affordable and low- and zero-carbon energy solutions that meet their changing needs and to help decarbonise the energy system.

There will be no single solution that fits all customers. Instead, there will be variations with differing approaches and rates of progress across countries, sectors and markets.

Customers' use of the energy we sell generates most emissions. Helping our customers get to net zero will also reduce our net carbon intensity, and the average amount of greenhouse gas emissions we produce for every unit of energy that we sell and that is used by our customers.

We work with sectors that would benefit from the expertise and experience that energy companies can provide to help them find a path to net-zero emissions. Aviation is one of these sectors. Together with our customers, we are working on changing energy demand and developing ways to help increase the use of low-carbon fuels and decrease carbon emissions from this sector. Meanwhile, on the supply side, in Rotterdam in the Netherlands, Shell is building an 820,000-tonnes-a-year biofuels facility. This is expected to be among the largest in Europe, producing sustainable aviation fuel and renewable diesel made from waste and certified sustainable vegetable oils.

Powering Progress

Our Powering Progress strategy comprises: generating shareholder value, achieving net-zero emissions, powering lives and respecting nature. It is a strategy that integrates sustainability with our pursuit of value through high performance. Our purpose is to power progress together by providing more and cleaner energy solutions. We also expect our employees and contractors to maintain Shell's focus on safety and abide by our core values of honesty, integrity and respect for people.

Powering Progress is a strategy that combines our financial strength and discipline with a dynamic approach to our portfolio of assets and products, so we can seize the opportunities of the energy transition. Shell transforms its portfolio continuously to better meet the clean energy needs of its customers today and in the future.

Achieving our strategy depends on how we respond to competitive forces. We assess the external environment – the markets and margins, and the underlying economic, political, social and environmental drivers that shape them – to evaluate commercial opportunities and potential new business models. We regularly review the markets where we operate, and assess our competitive position by analysing trends, uncertainties, and the strengths and weaknesses of our traditional and non-traditional competitors.

We maintain business plans that focus on actions and capabilities to create and sustain competitive advantage. We maintain a risk management framework that regularly assesses our response to, and appetite for, identified risks.

Our Executive Directors' remuneration is linked to the successful delivery of our strategy, based on performance indicators that we consider to be aligned with shareholder interests. Long-term incentives form the majority of the Executive Directors' remuneration for above-target performance. In 2022, the Long-term Incentive Plan (LTIP) included conditions relating to cash generation, capital discipline, value created for shareholders, and energy transition.

Our strategy continued

Generating shareholder value

Powering Progress is designed to pursue shareholder value, make disciplined and focused investments to grow our businesses, and help Shell become even more competitive and resilient.

We aim to create the conditions for share price appreciation by optimising the performance of our businesses. We are also preparing for the future by seizing the opportunities presented by the energy transition. Shell takes a dynamic approach to its portfolio by continuing to provide the energy the world needs and increasing our investments in low- and zero-carbon energy products and services.

We aim to generate value for shareholders by providing sustainable distributions through our progressive dividend policy and share buyback programmes. In 2022, we generated $68.4 billion cash flow from operating activities. Our cash capital expenditure was $24.8 billion and total shareholder distributions amounted to $25.8 billion, whilst we reduced our net debt to $44.8 billion as at December 31, 2022.

We completed our share buyback programmes in 2022 with a combined value of $18.4 billion. We increased our dividend to $0.25 per share in the first quarter of 2022 and announced a 15% increase for the fourth quarter of 2022. Total shareholder distributions were in excess of 35% of cash flow from operating activities.

We seek to maintain a strong balance sheet and apply a disciplined approach to capital investment. In this way, we believe we will achieve our aim of building a compelling investment case for our shareholders.

Achieving net-zero emissions

We have a long-term target to become a net-zero emissions energy business by 2050. The target covers emissions from our operations (Scope 1), emissions from the energy we buy to run our operations (Scope 2), and emissions from our customers' use of the energy products we sell (Scope 3).

We also have targets to reduce the net carbon intensity of the energy products we sell, with 2016 as our baseline year. These include targets of a 6-8% reduction by the end of 2023, a 9-12% reduction by the end of 2024, and a 9-13% reduction by the end of 2025. Our medium- and longer-term targets are to reduce by 20% by 2030, by 45% by 2035 and 100% by 2050. We achieved our target of a 3-4% reduction by the end of 2022. We also have an absolute emissions reduction target of 50% on all Scope 1 and 2 emissions under Shell's operational control by 2030 on a net basis. By the end of 2022, Shell had reduced its absolute Scope 1 and 2 emissions by 30%.

We place a high priority on combating methane emissions linked to oil and gas, and we have set a target to keep our methane emissions intensity for operated oil and gas assets (including liquefied natural gas) below 0.2% by 2025. In 2022, methane emissions intensity for operated facilities with marketing gas was 0.05%.

We are transforming our business and selling more low-carbon products and services, such as electricity generated by solar and wind power, hydrogen, biofuels, and charging for electric vehicles. We are helping sectors to decarbonise by working collaboratively with customers, businesses and governments.

Shell engages with governments and other stakeholders, such as international organisations and industry associations, to support robust policies, legislation and regulations designed to accelerate the transition to net-zero emissions.

Our strategy continued

Powering lives

Shell is dedicated to making a positive impact on the lives of people around the world. We work to improve people's lives through our products and activities, and by contributing to local communities and championing inclusion.

We help to power lives and livelihoods by providing vital energy for homes, businesses and transport. Millions of people live without access to affordable, reliable and sustainable energy, and this has been exacerbated by the geopolitical events of 2022. Energy supply is crucial for addressing global challenges, including those related to poverty and inequality. In line with our Powering Progress strategy, Shell has been striving to bring reliable electricity to those in emerging markets who do not yet have it.

We support livelihoods by providing employment and training in the communities where we operate. In addition, we buy and sell goods and services and generate revenues for governments through the taxes and royalties we pay and the sales taxes we collect on their behalf. This helps governments fund health care, education, transport and other essential services.

Shell is working to become one of the most diverse and inclusive organisations in the world, a place where everyone feels valued and respected. We are focusing on four areas: gender; race and ethnicity; lesbian, gay, bisexual and transgender (LGBT+); and disability.

We seek to respect human rights in all parts of our business. In 2021, Shell published a commitment to worker welfare as part of our approach to human rights and implemented the new Worker Welfare Control Framework requirements based on principles developed by the global, business-led coalition Building Responsibly. These requirements became mandatory in 2022 for Shell and our contractors.

Respecting nature

Our environmental ambitions include protecting and enhancing biodiversity. We are also focused on using water and other resources more efficiently and reusing as much of them as we can. We are reducing waste from our operations and increasing the recycling of plastics.

We are committed to recycling plastic waste in our chemical facilities. Shell's proprietary technology to improve the quality of pyrolysis oil is a key process in delivering on this ambition. Pyrolysis is a technique whereby hard-to-recycle plastics are broken down into raw materials. We have invested in our first pyrolysis oil upgrader unit at the Shell Energy and Chemicals Park Singapore. In Canada, Shell has been working with the people of Dawson Creek city to manage water use at our nearby natural gas operations at Groundbirch. We worked with the city council to open a plant that treats municipal waste water that would otherwise be discharged to a local river. Our Groundbirch site recycles around 98% of water used for its operations.

Across Shell, we are helping to improve air quality by reducing emissions from our operations and providing clean ways to power transport and industry.

Our purchasing policies include requirements that reflect our environmental framework and take the energy efficiency, material efficiency and sustainability of products into consideration in our purchases.

How we create value

Brand value

Value of Shell brand ($ billion) [F]:
48 2021: 50

We aim to meet the world's growing need for more and sustainable energy solutions in ways that are economically, environmentally and socially responsible. Our Powering Progress strategy is designed to create value for our shareholders, customers and wider society.

Our inputs [A]

Financial capital

Equity attributable to Shell plc shareholders ($ billion) [B]:
190 2021: 172

Non-current debt ($ billion) [B]:
75 2021: 81

Net debt ($ billion) [B][C]:
45 2021: 53

Average capital employed ($ billion) [B]:
270 2021: 265

Cash capital expenditure ($ billion) [C]:
25 2021: 20

Operations

Refining and chemicals availability:
96% 2021: 96%

Oil & gas production available for sale (kboe/d):
2,864 2021: 3,237

LNG liquefaction volumes (million tonnes):
30 2021: 31

Human capital

Number of employees (thousands) [B][D]:
93 2021: 83

Number of training days (thousands):
266 2021: 271

Relationships

Customers, joint arrangements, government relations, suppliers.
Operating countries [B]:
>70 2021: >70

Intellectual capital

Research and development expenses ($ million):
1,075 2021: 815

Number of patents [B][E]:
10,788 2021: 8,532

Natural resources

Proved oil and gas reserves (million boe) [B]:
9,578 2021: 9,365

Energy consumed (million MWh):
199 2021: 223

[A] In 2022 unless stated otherwise.
[B] At December 31.
[C] See "Non-GAAP measures reconciliations" on pages 362-365.
[D] Employee numbers, including comparatives, have been updated from Full Time Equivalents (FTE) to Headcount.
[E] Includes patents granted and pending patent applications.
[F] Source: Brand Finance Global 500 (years 2023 and 2022).

Business activities

Our outcomes and impacts [A]

GENERATING SHAREHOLDER VALUE

Cash flow from operating activities ($ billion):
68 2021: 45

Adjusted earnings ($ billion) [C]:
40 2021: 19

Shareholder distributions ($ billion) [C]:
26 2021: 9

ACHIEVING NET-ZERO EMISSIONS

Absolute emissions (Scope 1 and 2 – million tonnes of CO_2 equivalent):
58 2021: 68 | 2016: 83

Net carbon intensity (Grams of CO_2 equivalent per megajoule):
76 2021: 77 | 2016: 79

Methane emissions intensity for operated facilities with marketing gas:
0.05% 2021: 0.06%

POWERING LIVES

Women in senior leadership positions [B]:
30% 2021: 30%

Taxes paid and collected ($ billion):
68 2021: 59

Total spend on goods and services ($ billion):
42 2021: 38

RESPECTING NATURE

Fresh water consumed by four major facilities in high water-stressed areas (million m^3):
18 2021: 22 | 2018: 25

Total waste disposed (million tonnes):
2 2021: 2

Operational spills of more than 100 kilograms (thousand tonnes):
0.06 2021: 0.05

[A] In 2022 unless stated otherwise.
[B] At December 31.
[C] See "Non-GAAP measures reconciliations" on pages 362-365.

Powering Progress in action

ACHIEVING NET-ZERO EMISSIONS

Working with our customers and across sectors to accelerate the transition to net-zero emissions

January 2022 Shell started up a hydrogen electrolyser in China with 20 MW production capacity which is critical to decarbonisation in China.

January 2022 Shell completed sale of interest in Deer Park refinery. Shell plans to consolidate its refinery footprint to five or six core energy and chemicals parks. These locations will maximise the integration benefits of conventional fuels and chemicals production while also offering new low-carbon fuels and performance chemicals.

January 2022 Shell and ScottishPower won bids to develop 5 GW of floating wind power to become the world's first large-scale floating offshore wind farm in UK waters. Once built, it will power the equivalent of 6 million homes in Scotland.

February 2022 Shell's joint venture Atlantic Shores won acreage in New York Bight, which expands Shell's offshore wind renewable power generation capacity in the USA. This area, subject to a future investment decision, could support around 1.5 GW of commercial wind generation, enough to power nearly 700,000 New York and New Jersey homes.

February 2022 Shell completed the acquisition of Powershop in Australia an online energy retailer serving more than 185,000 customers. This complements Shell's existing Australian investments in low- and zero-carbon assets and technologies.

June 2022 Shell completed the acquisition of the Landmark fuel and convenience network which provides opportunities to offer customers expanded fuelling options (including electric vehicle charging, hydrogen, biofuels and lower-carbon premium fuels) and allows for the growth of non-fuel sales through an enhanced convenience offering.

July 2022 QatarEnergy selected Shell as a partner in the North Field East (NFE) expansion project in Qatar. In December 2022, QatarEnergy and Shell closed the transaction with Shell purchasing 25% of the joint venture (JV) which owns 25% of the overall project. Shell's ownership of NFE via its JV shareholding is 6.25%. The project will use CCS, helping to reduce emissions.

July 2022 Shell took the final investment decision to build Holland Hydrogen I, which will be Europe's largest renewable hydrogen plant once operational from 2025. Holland Hydrogen I demonstrates how new energy solutions can help meet society's need for cleaner energy. It is also an example of Shell's own efforts and commitment to become a net-zero emissions business by 2050.

August 2022 Shell completed the acquisition of Solenergi Power Private Limited and with it the Sprng Energy group, one of India's leading renewable power platforms that develops and manages renewable energy facilities and infrastructure assets.

October 2022 QatarEnergy selected Shell to participate in the North Field South project in Qatar. Shell will obtain a 9.375% participating interest in the 16 mtpa project out of a total 25% interest available for international partners. QatarEnergy will hold the remaining 75%.

February 2023 Shell completed the acquisition of Nature Energy which is a producer of renewable natural gas (RNG) from agricultural, industrial, and household waste. This acquisition, announced in November 2022, will increase Shell's ability to help customers decarbonise and accelerate its transition to net-zero emissions.

RESPECTING NATURE

Protecting the environment, reducing waste and making a positive contribution to biodiversity

Shell's Upstream business has a project under way to restore two hectares of coral reef in Mexico. The project aims to replant damaged coral reefs that support the marine ecosystem.

Shell Moerdijk's 39-hectare solar park, in the Netherlands, is designed with optimal habitats for pollinators that resulted in more species of bees than on neighbouring agricultural land, research showed. Future solar parks in the Netherlands, such as Heerenveen, will follow the same design.

Shell and Space Intelligence are maturing an artificial intelligence (AI) techniques to monitor the health of natural ecosystems. At scale, this use of AI can improve how Shell's nature-based solutions (NBS) business evaluates, tracks and assesses the performance of ecosystems and may augment the value of NBS projects worldwide.

POWERING LIVES

Improving people's lives through our products and activities, contributing to local communities and championing inclusion

Access to Energy In September 2022, Shell acquired Daystar Power, a provider of integrated solar power solutions to businesses in West Africa, helping customers reduce power costs and pollution. This deal marks our first power acquisition in Africa and is a fundamental step for Shell in growing our presence in emerging power markets.

Diversity, equity and inclusion (DE&I) In 2022, as part of Shell's ambition to become one of the most diverse and inclusive organisations in the world, we published data to demonstrate the progress we have made against all our individual commitments for gender, race and ethnicity, LGBT+ and disability inclusion. We published our DE&I roadmap and guiding principles to increase transparency around our approach and to drive leadership accountability and the behaviours we expect.

Communities In 2022, Shell's social investment amounted to almost $260 million. This included programmes supporting education, community development, disaster relief, energy access, community skills and enterprise development, health, biodiversity and road safety.

Human Rights Human rights are fundamental to Shell's core values of honesty, integrity and respect for people. In 2022, we completed a review of our salient human rights with an external advisor, Business for Social Responsibility (BSR). We published a list grouping these rights according to four focus areas: workplace, supply chains, community and security.

Outlook for 2023 and beyond

Our integrated business model is key to driving our strategy. Shell has a competitive portfolio and we intend to maintain that position as we develop our assets and the mix of energy that we sell to meet the needs of our customers for more affordable, reliable and cleaner energy. By doing so, we aim to generate additional value for our shareholders.

Delivering our strategy will require clear and deliberate capital allocation choices. We approach capital allocation at three levels: enterprise, portfolio and project. The enterprise level is about how we make choices between increasing distributions to our shareholders, investing in our business and strengthening our balance sheet. The portfolio level is about how we allocate capital between our business segments. The project level is about how we evaluate and prioritise investment opportunities.

For cash capital expenditure (capex), the 2023 outlook is in the $23-27 billion range.

Our capital framework target is a distribution of at least 20-30% of cash flow from operations to shareholders and we may choose to return cash to shareholders through a combination of dividends and share buybacks. Subject to Board approval, we aim to grow the dividend per share by around 4% every year. When setting the level of shareholder distributions, the Board looks at a range of factors, including the macro-environment, the underlying business earnings and cash flow of the Shell Group, the current balance sheet, future investment, acquisition and divestment plans and existing commitments.

We have announced an increase of our dividend per share of 15% for the fourth quarter of 2022 as part of our progressive dividend policy. Portfolio allocation affects our ability to deliver on targets we have made, and socio-economic, political and market factors sometimes change our outlooks. Existing global targets are currently under review. While no decisions have been made, to ensure our transition to a net-zero energy business is profitable, it is likely that some business targets may be retired, as part of normal strategy evolution and mindful of existing capital allocation in the latest operating plan. We expect to provide further insights during our Capital Markets Day in June 2023. All targets presented at Capital Markets Day in June will be filed with the SEC.

The statements in this section, including those related to our growth strategies and our expected or potential future cash flow from operations, organic free cash flow, share buybacks, capital investment, divestments, production, absolute emissions and net carbon intensity, are based on management's current expectations and certain material assumptions. Accordingly, these statements involve risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied herein.

Financial framework

Capital discipline

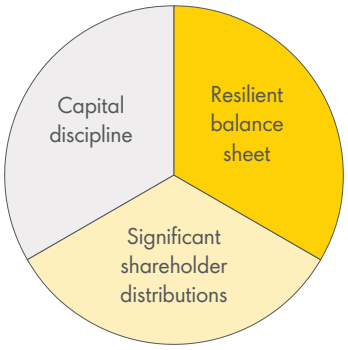
2023 cash capex within $23-27 billion

- Includes inorganic capex

Resilient balance sheet

Targeting AA credit metrics through the cycle

- Continued focus on Net debt reduction in upcycle
- Divest for value
- Invest for value



Significant shareholder distributions

Around 4% annual growth in dividend per share, subject to Board approval

Sustainable progressive dividend

Total shareholder distributions ≥ 20-30% [A] of cash flow from operating activities

Total shareholder distributions (dividends + share buybacks) based on cash generation, macro-outlook and balance sheet trajectory

[A] Potentially more than 30% (subject to Board approval and prevailing market conditions).

Our Powering Progress businesses in 2022

Integrated Gas, Renewables and Energy Solutions

Integrated Gas manages liquefied natural gas (LNG) activities and the conversion of natural gas into gas-to-liquids (GTL) fuels and other products. It includes natural gas and liquids exploration and extraction, as well as the operation of the upstream and midstream infrastructure necessary to deliver gas and liquids to market. The marketing, trading and optimisation of LNG are included within Integrated Gas.

Renewables and Energy Solutions (R&ES) manages Shell's integrated power activities. These comprise electricity generation, marketing and trading of power and pipeline gas, as well as digitally enabled customer solutions. The R&ES business also includes the production and marketing of hydrogen, development of commercial carbon capture and storage hubs, trading of carbon credits, and investment in nature-based projects that avoid or reduce carbon.

Upstream

Upstream explores for and extracts crude oil, natural gas and natural gas liquids. It also markets and transports oil and gas, and operates the infrastructure necessary to deliver them to the market. Upstream business delivers reliable energy from conventional oil and gas operations, as well as deep-water exploration and production activities.

We are focusing our Upstream portfolio to become more resilient, prioritising value over volume to provide the energy the world needs today whilst funding the energy system of tomorrow. Upstream will play a fundamental role in supporting Shell's transformation to a net-zero business by 2050. Upstream's oil and gas supplies help maintain the world's energy security. The business is working to provide these supplies with lower emissions.

Downstream

Marketing manages the Mobility, Lubricants, and Sectors & Decarbonisation activities. Mobility operates Shell's retail network, including electric vehicle charging services. Lubricants produces, markets and sells lubricants for road transport and machinery. Sectors & Decarbonisation sells fuels, speciality products and services including low-carbon energy solutions to a broad range of commercial customers.

Chemicals and Products manages chemical manufacturing plants with their own marketing network and refineries, which turn crude oil and other feedstocks into a range of oil products. These products are moved and marketed around the world for domestic, industrial and transport use. Downstream also includes the pipeline activities, and trading of crude oil, oil products and petrochemicals.

Projects & Technology

Projects & Technology manages the delivery of our major projects and drives research and innovation. It provides technical services for our businesses. It is also responsible for providing functional leadership across Shell in safety and environment, contracting and procurement, wells activities and greenhouse gas management.

Technology and innovation are essential to our efforts to meet the world's energy needs in a competitive way. Our main technology centres are in India, the Netherlands and the USA, with other centres in Brazil, China, Germany, Oman and Qatar.

On January 30, 2023, Shell announced that the Integrated Gas and Upstream businesses will be combined into a single Integrated Gas and Upstream Directorate. The Downstream business will be combined with Renewables and Energy Solutions to form a new Downstream and Renewables Directorate. The changes are expected to take effect on July 1, 2023. The intention of this change is to simplify the organisation further and improve performance as we deliver our Powering Progress strategy.

Risk factors

The risks discussed below could have a material adverse effect separately, or in combination, on our earnings, cash flows and financial condition. Accordingly, investors should carefully consider these risks.

Further background on each risk is set out in the relevant sections of this Report, indicated by way of cross references under each risk factor.

The Board's responsibility for identifying, evaluating and managing our significant and emerging risks is discussed in "Other regulatory and statutory information" on pages 211-219.

Strategic risks

We are exposed to macroeconomic risks including fluctuating prices of crude oil, natural gas, oil products and chemicals.

Further information: See "Market overview" on page 35.

Risk description

The prices of crude oil, natural gas, oil products and chemicals can be volatile and are affected by supply and demand, both globally and regionally. Macroeconomic, geopolitical and technological uncertainties can also affect production costs and demand for our products. Government actions may also affect the prices of crude oil, natural gas, oil products and chemicals. These include price caps on gas, the promotion of electric vehicle sales or the phasing-out of future sales of new diesel or gasoline vehicles (as announced in the UK and due to come into force in 2030). Oil and gas prices can also move independently of each other (as seen with European gas prices in 2022). Factors that influence supply and demand include operational issues, natural disasters, weather, pandemics such as COVID-19, political instability, conflicts, such as the Russian invasion of Ukraine, economic conditions, including inflation, and actions by major oil- and gas-producing countries. In a low oil and gas price environment, we would generate less revenue from our Upstream and Integrated Gas businesses, and parts of those businesses could become less profitable or incur losses. Low oil and gas prices have also resulted and could continue to result in the debooking of proved oil or gas reserves, if they become uneconomic in this type of price environment. Prolonged periods of low oil and gas prices, or rising costs, have resulted and could continue to result in projects being delayed or cancelled. Assets have been impaired in the past, and there could be impairments in the future. Low oil and gas prices have affected and could continue to affect our ability to maintain our long-term capital investment and shareholder distribution programmes. Prolonged periods of low oil and gas prices could adversely affect the financial, fiscal, legal, political and social stability of countries that rely significantly on oil and gas revenue. In the past, a high oil and gas price environment has generally led to sharp increases in costs and this could continue. Under high oil and gas prices, our entitlement to proved reserves under some production-sharing contracts could also be reduced. Higher prices could also reduce demand for our products, which could result in lower profitability, particularly in our Chemicals and Products and Marketing businesses. Some of the reduction in demand could be permanent. Higher prices can also lead to more capacity being built, potentially resulting in an oversupplied market which would negatively affect our Upstream, Integrated Gas, Renewables and Energy Solutions, Chemicals and Products and Marketing businesses.

Accordingly, price fluctuations could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We maintain a diversified portfolio to manage the impact of price volatility. We test the resilience of our projects and other opportunities against a range of prices and costs for crude oil, natural gas, oil products and chemicals. We prepare annual strategic and financial plans that test different scenarios and their impact on prices on our businesses and company as a whole. We also aim to maintain a strong balance sheet to provide resilience against weak market prices.

Our ability to deliver competitive returns and pursue commercial opportunities depends in part on the accuracy of our price assumptions.

Further information: See "Market overview" on page 37.

Risk description

We use a range of commodity price and margin assumptions, which we review on a periodic basis. These ranges help us to evaluate the robustness of our capital allocation for our evaluation of projects and commercial opportunities. If our assumptions prove to be incorrect, this could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

The range of commodity prices and margins used in our project and portfolio evaluations is subject to a rigorous assessment of short-, medium- and long-term market drivers. These drivers include the extent and pace of the energy transition.

Our ability to achieve our strategic objectives depends on how we react to competitive forces.

Further information: See "Our strategy" on page 7 and "Outlook" on page 13.

Risk description

We face competition in all our businesses. We seek to differentiate our services and products, though many of our products are competing in commodity-type markets. Accordingly, failure to manage our costs and our operational performance could result in a material adverse effect on our earnings, cash flows and financial condition. We also compete with state-owned hydrocarbon entities and state-backed utility entities with access to financial resources and local markets. Such entities could be motivated by political or other factors in making their business decisions. Accordingly, when bidding on new leases or projects, we could find ourselves at a competitive disadvantage because these state-owned entities may not require a competitive return. If we are unable to obtain competitive returns when bidding on new leases or projects, this could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We continually assess the external environment - the markets and the underlying economic, political, social and environmental drivers that shape them - to evaluate changes in competitive forces. We define multiple future potential scenarios and business environments by identifying drivers, uncertainties, enablers and constraints to our competitiveness. These scenarios help us to find issues which affect our operating environment and have implications for our strategy.

Risk factors continued

Strategic risks continued

Rising concerns about climate change and effects of the energy transition could continue to lead to a fall in demand and potentially lower prices for fossil fuels. Climate change could also have a physical impact on our assets and supply chains. This risk may also lead to additional legal and/or regulatory measures, resulting in project delays or cancellations, potential additional litigation, operational restrictions and additional compliance obligations.

For further explanations of our climate change governance, risk management approach, climate ambition and strategy, and our portfolio and performance, please refer to the section "Our journey to net zero" on pages 78-105.

Risk description

Societal demand for urgent action on climate change has increased, especially since the Intergovernmental Panel on Climate Change (IPCC) Special Report of 2018 on 1.5°C effectively made the more ambitious goal of the Paris Agreement to limit the rise in global average temperature this century to 1.5 degrees Celsius the default target. This increasing focus on climate change and drive for an energy transition have created a risk environment that is changing rapidly, resulting in a wide range of stakeholder actions at global, local and company levels. The potential impact and likelihood of the associated exposure for Shell could vary across different time horizons, depending on the specific components of the risk.

We expect that a growing share of our greenhouse gas (GHG) emissions will be subject to regulation, resulting in increased compliance costs and operational restrictions. Regulators may seek to limit certain oil and gas projects or make it more difficult to obtain required permits. Additionally, climate activists are challenging the grant of new and existing regulatory permits, and protesting at some of our facilities and projects. We expect that these challenges and protests are likely to continue and could delay or prohibit operations in certain cases. Our journey to achieving our target of becoming net zero on all emissions from our operations has resulted in and could continue to require additional costs. We also expect that actions by customers to reduce their emissions will continue to lower demand and potentially affect prices for fossil fuels, as will GHG emissions regulation through taxes, fees and/or other incentives. This could be a factor contributing to additional provisions for our assets and result in lower earnings, cancelled projects and potential impairment of certain assets.

The pace and extent of the energy transition could pose a risk to Shell if we decarbonise our operations and the energy we sell at a different speed relative to society. If we are slower than society, customers may prefer a different supplier, which would reduce demand for our products and adversely affect our reputation besides materially affecting our earnings and financial results. If we move much faster than society, we risk investing in technologies, markets or low-carbon products that are unsuccessful because there is limited demand for them.

The physical effects of climate change such as, but not limited to, increases in temperature and sea levels and fluctuations in water levels could also adversely affect our operations and supply chains.

Certain investors have decided to divest their investments in fossil fuel companies. If this were to continue, it could have a material adverse effect on the price of our securities and our ability to access capital markets. Stakeholder groups are also putting pressure on commercial and investment banks to stop financing fossil fuel companies. Some financial institutions have started to limit their exposure to fossil fuel projects. Accordingly, our ability to use financing for these types of future projects may be adversely affected. This could also adversely affect our potential partners' ability to finance their portion of costs, either through equity or debt.

In some countries, governments, regulators, organisations and individuals have filed lawsuits seeking to hold fossil fuel companies liable for costs associated with climate change. While we believe these lawsuits to be without merit, losing could have a material adverse effect on our earnings, cash flows and financial condition. For example, in May 2021, the District Court in The Hague, Netherlands, ruled that, by 2030, Shell must reduce, from its consolidated subsidiaries, its Scope 1 net emissions by 45% from its 2019 levels and use its best efforts to reduce its Scope 2 and Scope 3 net emissions by 45% from its 2019 levels. In 2019, our Scope 1 emissions from our consolidated subsidiaries were 86 million tonnes carbon dioxide equivalent, rounded. We expect to see additional regulatory requirements to provide disclosures related to climate risks.

In summary, rising climate change concerns, the pace at which we decarbonise our operations relative to society and effects of the energy transition have led and could lead to a decrease in demand and potentially affect prices for fossil fuels. If we are unable to find economically viable, publicly acceptable solutions that reduce our GHG emissions and/or GHG intensity for new and existing projects and for the products we sell, we could experience financial penalties or extra costs, delayed or cancelled projects, potential impairments of our assets, additional provisions and/or reduced production and product sales. This could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

Our response to the evolving risk outlook requires transparency and clarity around our plans and actions to achieve our climate target. Our climate change risk management approach is supported by standards, policies and controls, as part of our Health, Safety, Security and Environment and Social Performance (HSSE & SP) Control Framework. Climate change and risks resulting from GHG emissions are reviewed and managed in accordance with other significant risks through the Board and Executive Committee. We have established several dedicated climate change and GHG-related forums at different levels of the organisation. These forums seek to address, monitor and review climate change issues. Our strategy to assess and manage risks and opportunities resulting from climate change includes considering different time horizons and their relevance to risk identification and business planning.

We also actively monitor societal developments, such as regulation-driven carbon-pricing mechanisms and customer-driven preferences for products. We incorporate these into potential scenarios which provide insights into how the energy transition may unfold in the medium and long term. These insights and those from various other external scenarios (such as the IPCC Special Report 1.5°C) guide how we set our strategic direction, capital allocation and carbon emission commitments.

Overall, mitigation of the risk is addressed through our strategy to accelerate the transition to net-zero emissions, purposefully and profitably. This approach has three components:

- reducing the GHG emissions intensity of our operations. We expect to reduce our carbon intensity primarily through altering our product mix as customer (Scope 3) emissions represent the largest component of our carbon intensity. Our aim is to achieve this by shifting the focus of our portfolio as we build our power, hydrogen, biofuels, carbon capture and storage and nature-based solutions businesses and activities;
- demonstrating our resilience by aligning our disclosures to the Task Force on Climate-related Financial Disclosures; and
- working towards our target to become a net-zero emissions energy business by 2050.

We are also working with governments on their climate policy to help establish regulatory frameworks that will enable society to reach the goals of the Paris Agreement. The ruling delivered by the District Court in The Hague in May 2021 has provided an additional challenge in this context. We have appealed the ruling but have stated that we want to rise to the challenge and accelerate our Powering Progress strategy to become a net-zero emissions energy business by 2050, regardless of whether we win or lose the appeal.

Risk factors continued

Strategic risks continued

Investments in our low-carbon products and services may not achieve expected returns.

Further information: See "Marketing" on pages 60-64 and "Renewables & Energy Solutions" on pages 73-76.

We are building our portfolio of low-carbon products and services such as electricity generated from solar and wind power, hydrogen and biofuels, and charging for electric vehicles through organic and inorganic growth.

In expanding our offerings of these low-carbon products and services, we expect to undertake acquisitions and form partnerships. The success of these transactions will depend on our ability to realise the synergies from combining our respective resources and capabilities, including the development of new processes, systems and distribution channels. For example, it may take time to develop these areas through retraining our workforce and recruitment for the necessary new skills. It may take longer to realise the expected returns from these transactions.

The operating margins for our low-carbon products and services may not be as high as the margins we have experienced historically in our oil and gas operations. Some of our acquired companies are not yet in full compliance with the Shell Control Framework.

Therefore, developing our low-carbon products and services is subject to challenges which could have a material adverse effect on our earnings, cash flows and financial condition.

We maintain an integrated business model, with trading and optimisation, to help us manage our value delivery. Our investments are subject to financial modelling and stress-testing, due diligence and risk assessments to ensure that our capital is allocated to the most attractive low carbon opportunities. We rigorously monitor and evaluate the performance of our acquisitions against our expectations. Following specific assessments of each new acquisition, dedicated projects are put in place to achieve compliance with the Shell Control Framework.

We operate in more than 70 countries that have differing degrees of political, legal and fiscal stability. This exposes us to a wide range of political developments that could result in changes to contractual terms, laws and regulations. We and our joint arrangements and associates also face the risk of litigation and disputes worldwide.

Further information: See "Other regulatory and statutory information" on page 216.

Risk description

Developments in politics, laws and regulations can and do affect our operations. Potential impacts, which we have experienced in the past, include: forced divestment of assets; expropriation of property; cancellation or forced renegotiation of contract rights; additional taxes including windfall taxes, restrictions on deductions and retroactive tax claims; antitrust claims; changes to trade compliance regulations; price controls; local content requirements; foreign exchange controls; changes to environmental regulations; changes to regulatory interpretations and enforcement; and changes to disclosure requirements. Many parts of the world are facing economic and fiscal challenges and growing pressure on cost-of-living standards. The situation is further exacerbated by Russia's invasion of Ukraine, which is having an unprecedented impact on gas and power markets in terms of both supply and price. These issues impact our business as governments, in response to political and social pressures, pursue policies that could have a material adverse effect on our earnings, cash flows and financial condition.

From time to time, social and political factors play a role in unprecedented and unanticipated judicial outcomes that could adversely affect Shell. Non-compliance with policies and regulations could result in regulatory investigations, litigation and, ultimately, sanctions. Certain governments and regulatory bodies have, in Shell's opinion, exceeded their constitutional authority by: attempting unilaterally to amend or cancel existing agreements or arrangements; failing to honour existing contractual commitments; and seeking to adjudicate disputes between private litigants. Certain governments have also adopted laws and regulations that could potentially conflict with other countries' laws and regulations, potentially subjecting us to criminal and civil sanctions. Such developments and outcomes could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We continually monitor geopolitical developments and societal issues relevant to our interests. Our Legal and Tax functions are organised globally and support our business lines in seeking to ensure compliance with local laws and fiscal regulations. Our Corporate Relations department liaises with governments in countries where we operate to understand and engage on local policies and to advocate Shell's position on topics relevant to our industry. We are prepared to exit a country if we believe we can no longer operate there in accordance with our standards and applicable law, and we have done so in the past.

Risk factors continued

Operational risks

Russia's invasion of Ukraine has affected the safety and security of our people and operations in these and neighbouring countries. The resulting sanctions and export controls and the evolving geopolitical situation have caused wide-ranging challenges to our operations which could continue in the medium to longer term.

Further information: See "Post-balance sheet events" on page 307.

Risk description

Russia's invasion of Ukraine continues to pose wide-ranging challenges to our operations and commercial decisions. The immediate impacts included those relating to the safety and security of our people and operations in these and neighbouring countries. The subsequent sanctions and export controls imposed by countries around the world are having a material impact on a number of our activities, including supply, trading and treasury activities. More sanctions, export controls and taxes are expected.

Given the evolving situation, there may be many other unknown factors and events that could materially impact our operations, which may be temporary or more permanent in nature. These risks and future events could impact our supply chain, commodity prices, credit, commodity trading, treasury and legal risks. In addition, there is potential reputational risk associated with how Shell's decisions in response to evolving challenges are perceived. The tensions also create heightened cyber-security threats to our information technology infrastructure. The geopolitical situation may influence our future investment and financial decisions.

Any of these factors, individually or in aggregate, could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

In response to the invasion, a Group Crisis Team was set up to assess the situation, consider potential scenarios of how events may further develop and co-ordinate responses accordingly.

Care for our people remains Shell's top priority. Local crisis teams, led by the respective Country Chairs, have been deployed to ensure the health, safety and well-being of our staff, contractors and their families in Ukraine, Russia and neighbouring countries.

We are closely monitoring and responding to the sanctions that have been imposed and are following international guidelines where relevant to our business activities.

The estimation of proved oil and gas reserves involves subjective judgements based on available information and the application of complex rules. This means subsequent downward adjustments are possible.

Further information: See "Supplementary information - oil and gas (unaudited)" on pages 308-326.

Risk description

The estimation of proved oil and gas reserves involves subjective judgements and determinations based on available geological, technical, contractual, and economic information. Estimates can change over time because of new information from production or drilling activities, changes in economic factors, such as oil and gas prices, alterations in the regulatory policies of host governments, or other events. Estimates also change to reflect acquisitions, divestments, new discoveries, extensions of existing fields and mines, and improved recovery techniques. Published proved oil and gas reserves estimates could also be subject to correction because of errors in the application of rules and changes in guidance. Downward adjustments could indicate lower future production volumes and could also lead to impairment of assets. This could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

A central group of reserves experts undertakes the primary assurance of the proved reserves bookings. A multidisciplinary committee reviews and endorses all major proved reserves bookings. Shell's Audit Committee reviews all proved reserves bookings and Shell's CEO is responsible for final approval. The Internal Audit function also provides further assurance through audits of the control framework, from which information disclosed in "Supplementary information – oil and gas (unaudited)" is obtained.

Risk factors continued

Operational risks continued

Our future hydrocarbon production depends on the delivery of large and integrated projects and our ability to replace proved oil and gas reserves.

Further information: See "Powering Progress strategy" on page 6-14.

Risk description

We face numerous challenges in developing capital projects, especially those which are large and integrated. Challenges include: uncertain geology; frontier conditions; the existence and availability of necessary technology and engineering resources; the availability of skilled labour; the existence of transport infrastructure; project delays; the expiration of licences; delays in obtaining required permits; potential cost overruns; and technical, fiscal, regulatory, political and other conditions. These challenges are particularly relevant in certain developing and emerging-market countries, in frontier areas and in deep-water fields, such as off the coast of Mexico. We may fail to assess or manage these and other risks properly. Such potential obstacles could impair our delivery of these projects, our ability to fulfil the full potential value of the project as assessed when the investment was approved, and our ability to fulfil related contractual commitments. This could lead to impairments and could have a material adverse effect on our earnings, cash flows and financial condition.

Future oil and gas production will depend on our access to new proved reserves through exploration, negotiations with governments and other owners of proved reserves and acquisitions, and through developing and applying new technologies and recovery processes to existing fields. Failure to replace proved reserves could result in an accelerated decrease of future production, potentially having a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We continue to explore for and mature hydrocarbons across our Upstream and Integrated Gas businesses. We use our subsurface, project and technical expertise, and actively manage non-technical risks across a diversified portfolio of opportunities and projects. This involves adopting an integrated approach for all stages, from basin choice to development. We use competitive techniques and benchmark our approach internally and externally.

Oil and gas production available for sale

Million boe [A]

	2022	2021	2020
Shell subsidiaries	938	1,047	1,104
Shell share of joint ventures and associates	108	134	135
Total	**1,046**	**1,181**	**1,239**

[A] Natural gas volumes are converted into oil equivalent using a factor of 5,800 scf per barrel.

Proved developed and undeveloped oil and gas reserves [A][B]

Million boe [C]

	Dec 31, 2022	Dec 31, 2021	Dec 31, 2020
Shell subsidiaries	8,317	8,456	8,222
Shell share of joint ventures and associates	1,261	909	902
Total	**9,578**	**9,365**	**9,124**
Attributable to non-controlling interest of Shell subsidiaries	365	267	322

[A] We manage our total proved reserves base without distinguishing between proved reserves from subsidiaries and those from joint ventures and associates.
[B] Includes proved reserves associated with future production that will be consumed in operations.
[C] Natural gas volumes are converted into oil equivalent using a factor of 5,800 scf per barrel.

Risk factors continued

Operational risks continued

The nature of our operations exposes us, and the communities in which we work, to a wide range of health, safety, security and environment risks.

Further information: See "Respecting nature" on page 109, "Powering lives" on page 113 and "Safety" on pages 121-124.

Risk description

The health, safety, security and environment (HSSE) risks to which we and the communities in which we work are potentially exposed cover a wide spectrum, given the geographical range, operational diversity and technical complexity of our operations. These risks include the effects of natural disasters (including weather events), earthquakes, social unrest, pandemic diseases, criminal actions by external parties, and safety lapses. If a major risk materialises, such as an explosion or hydrocarbon leak or spill, which we have experienced in the past, this could result in injuries, loss of life, environmental harm, disruption of business activities, loss or suspension of permits, loss of our licence to operate and loss of our ability to bid on mineral rights. Accordingly, this could have a material adverse effect on our earnings, cash flows and financial condition.

Our operations are subject to extensive HSSE regulatory requirements that often change and are likely to become more stringent over time. Governments could require operators to adjust their future production plans, as has occurred in the Netherlands, affecting production and costs. We could incur significant extra costs in the future because of the need to comply with such requirements. We could also incur significant extra costs due to violations of or liabilities under laws and regulations that involve elements such as fines, penalties, clean-up costs and third-party claims. If HSSE risks materialise, they could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We have standards and a clear governance structure to help manage HSSE risks and avoid potential adverse effects. The standards and governance structure also help us to develop mitigation strategies aimed at ensuring that if an HSSE risk materialises, we avoid catastrophic consequences and have ways of trying to remediate any environmental damage. Our standards and governance structure are defined in our Health, Safety, Security, Environment and Social Performance (HSSE & SP) Control Framework and supporting guidance documents. These describe how key controls should be operated, for example to ensure safe production and implementation of maintenance activities. When planning new major projects, we conduct detailed environmental, social and health impact assessments. We routinely practise implementing our emergency response plans to significant risks (such as a spill, toxic substances, fire or explosion).

The Shell Internal Audit & Investigation team provides assurance on the HSSE & SP controls to the Safety, Environment and Sustainability Committee.

A further erosion of the business and operating environment in Nigeria could have a material adverse effect on us.

Further information: See "Upstream" on page 49.

Risk description

In our Nigerian operations, we face various risks and adverse conditions. These include: security incidents affecting the safety of our people, host communities and operations; sabotage and crude theft; ongoing litigation; limited infrastructure; challenges presented by delayed government and partner funding and budget delays; and regional instability created by militant activities. Some of these risks and adverse conditions, such as security issues affecting the safety of our people and sabotage and theft have occurred in the past and are likely to continue in the future, with a potential material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We test the economic and operational resilience of our Nigerian projects against a wide range of assumptions and scenarios. We seek to proportionally share risks and funding commitments with joint-venture partners. When we participate in joint ventures in Nigeria, we require that they operate in accordance with good industry practice. We monitor the security situation, and liaise with host communities, and governmental and non-governmental organisations to help promote peaceful and safe operations.

An erosion of our business reputation could have a material adverse effect on our brand, our ability to secure new resources or access capital markets, and on our licence to operate.

Further information: See "Other regulatory and statutory information" on page 215 and "Powering lives" on page 119.

Risk description

Our reputation is an important asset. The Shell General Business Principles (Principles) govern how Shell and its individual companies conduct their affairs, and the Shell Code of Conduct tells employees and contract staff how to behave in line with the Principles. Our challenge is to ensure that all employees and contract staff comply with the Principles and the Code of Conduct. Real or perceived failures of governance or regulatory compliance or a perceived lack of understanding of how our operations affect surrounding communities could harm our reputation.

Societal expectations of companies are increasing, with a focus on business ethics, quality of products, contribution to society, safety and minimising damage to the environment. There is increasing focus on the role of oil and gas in the context of climate change and energy transition. This could negatively affect our brand, reputation and licence to operate, which could limit our ability to deliver our strategy, reduce consumer demand for our branded and non-branded products, harm our ability to secure new resources and contracts, and restrict our ability to access capital markets or attract staff. Many other factors, including the materialisation of other risks discussed in this section, could negatively affect our reputation and could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We continually assess and monitor the external environment for potential risks to our reputation. We engage in ongoing dialogue with our key stakeholders such as investors, industry and trade groups, universities, governments and non-governmental organisations (NGOs) to gain greater insights into societal expectations of our business. We have mitigation plans for identified brand and reputation risks at the Group, country and line of business level. Our country chairs are responsible for implementing country reputation plans which are updated annually. We continually develop and defend our brand in line with Shell's purpose and promises, and target our investments to drive brand differentiation, relevance and preference.

Risk factors continued

Operational risks continued

We rely heavily on information technology systems in our operations.

Further information: See "Corporate" on page 77.

Risk description

Our continued focus on digitalising our business processes, and our increasing dependence on information technology (IT) systems for our core operations mean that we are heavily reliant on secure, affordable and resilient IT services.

Externally, we observe several dynamics impacting our IT and cyber risk profile: deterioration of the cyber security threat landscape represented by increasing volumes of attacks and sophisticated cyber actors, geopolitical conflicts and increases in regulations across the markets in which Shell operates. We have observed an increase in social engineering (manipulation of individuals) as a method of financially driven cybercrime. Threat actors are targeting bank account changes, invoice settlement and identity fraud to extract money from corporations. Ransomware attacks on corporations continue to be widespread. These contribute to potential breaches and disruptions of critical IT services, such as the security incident involving the transfer of files which Shell experienced in 2021. If the breaches are not detected early and responded to effectively, they could impact our operations and the safety of our staff and/or harm our reputation and/or result in material regulatory fines. This could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We operate globally integrated Information Risk Management (IRM) and cyber-defence teams that scan, assure and defend our global IT landscape. Our cyber-security capabilities are embedded into our IT systems, and our IT is protected by various detective and protective technologies. Identification and assessment capabilities are built into our support processes and align to industry best practices. The security of IT services, operated by external IT companies, is managed through contractual clauses and additionally through formal supplier assurance reports for critical IT services.

As a response to the growing set of threat actors and sophisticated forms of attacks resulting from the Russia/Ukraine war, we have prioritised accelerated closure of critical vulnerabilities identified by the Cybersecurity and Infrastructure Security Agency (CISA), performing rigorous rationalisation of high-risk entitlements, and supported our withdrawal/divestment from Russian operations. We continue to track cyber-attacks, threat intelligence, and vulnerabilities in our estate.

Our business exposes us to risks of social instability, criminality, civil unrest, terrorism, piracy, cyber disruption and acts of war that could have a material adverse effect on our operations.

Further information: See "Respecting nature" on page 109, "Powering lives" on page 113 and "Safety" on pages 121-124.

Risk description

As seen in recent years, these risks can manifest themselves in the countries where we operate and elsewhere. These risks affect people, our operations and assets. Potential risks, which we have experienced in the past, include: acts of terrorism; acts of criminality including maritime piracy; cyber espionage or disruptive cyber attacks; conflicts including war - such as Russia's invasion of Ukraine; malicious acts carried out by individuals within Shell - such as increased data exfiltration during divestments; civil unrest which for example caused disruptions to our Trading & Supply distribution operations in South Africa, and environmental and climate activism (including disruptions by non-governmental and political organisations) especially in the USA and north-west Europe.

The above risks can threaten the safe operation of our assets and the transport of our products. They can harm the well-being of our people, inflict loss of life and injuries, damage the environment and disrupt our operational activities. These risks could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We seek to obtain the best possible information to enable us to assess threats and risks. We conduct detailed threat and risk assessments for all our assets and activities, and implement appropriate measures to deter, detect and respond to security risks. Further mitigations include strengthening the security of assets, reducing our exposure as appropriate and using journey management plans. We also invest in information risk management capabilities and crisis management and business continuity measures. We conduct training and awareness campaigns for staff and provide them with travel and health advice and access to 24/7 assistance while travelling. We learn from incidents, in order to continually improve our security risk management in Shell.

Risk factors continued

Operational risks continued

Production from the Groningen field in the Netherlands causes earthquakes that affect local communities.

Further information: See "Upstream" on pages 46-47.

Risk description

Shell and ExxonMobil are 50:50 shareholders in Nederlandse Aardolie Maatschappij B.V. (NAM). An important part of NAM's gas production comes from the onshore Groningen gas field, in which EBN, a Dutch government entity, has a 40% interest and NAM a 60% interest. The gas field is in the process of being closed down owing to earthquakes induced by gas production. Some of these earthquakes have damaged houses and other structures in the region, resulting in complaints and lawsuits from the local community. The Dutch government has announced it intends to accelerate the close-down, bringing the end of production forward from 2030 to possibly 2023 or 2024. The exact close-down date is still to be decided and depends on the Dutch government's considerations of security of gas supply. While we expect the earlier close-down of the Groningen gas field to further reduce the number and strength of earthquakes in the region, any additional earthquakes could have further adverse effects on our earnings, cash flows and financial condition.

How this risk is managed

NAM is working with the Dutch government and other stakeholders to fulfil its obligations to residents of the area. These include compensating for damage caused by the earthquakes and paying to strengthen houses where this is required for safety considerations. Negotiations with the state are being conducted to determine how to manage the accelerated close-down. Specific remediations within the agreed scope of responsibilities are planned. NAM's joint-venture partners will review its financial robustness against different scenarios for Groningen's liabilities and costs, with the aim of the venture being able to self-fund any additional expenses and claims.

We are exposed to treasury and trading risks, including liquidity risk, interest rate risk, foreign exchange risk and credit risk. We are affected by the global macroeconomic environment and the conditions of financial and commodity markets.

Further information: See "Financial framework" on page 31 and Note 25 to the "Consolidated Financial Statements" on page 293-299.

Risk description

Our subsidiaries, joint arrangements and associates are subject to differing economic and financial market conditions around the world. Political or economic instability affects such markets.

We use debt instruments, such as bonds and commercial paper, to raise significant amounts of capital. Should access to debt markets become more challenging, the impact on our liquidity could have a material adverse effect on our operations. Group financing costs could also be affected by interest rate fluctuations or any credit rating deterioration.

We are exposed to changes in currency values and to exchange controls as a result of our substantial international operations. Our reporting currency is the US dollar, although, to a material extent, we also hold assets and are exposed to liabilities in other currencies. While we undertake some foreign exchange hedging, we do not do so for all our activities. Even where hedging is in place, it may not function as expected.

Commodity trading is an important component of our businesses. Processing, managing and monitoring many trading transactions across the world, some of them complex, exposes us to operational and market risks, including commodity price risks. The Russian invasion of Ukraine has led to supply constraints and increased commodity price volatility in 2022, together with additional sanctions and export controls imposed by countries around the world, both of which have an impact on our trading activities. We use derivative instruments such as futures, options and contracts for difference to hedge market risks. Due to differences between derivative instruments available in the market to hedge market risks and the actual market risks we are exposed to, perfect hedging is not always achievable. Therefore, our hedging has from time to time not functioned as expected and may not function as expected in the future.

We are exposed to credit risk; our counterparties could fail or be unable to meet their payment and/or performance obligations under contractual arrangements.

Our pension plans invest in government bonds, so they could be affected by a sovereign debt downgrade or other default.

If any of the above risks materialise, they could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We use various financial instruments for managing exposure to foreign exchange and interest rate movements. Our treasury operations are highly centralised and seek to manage credit exposures associated with our substantial cash, foreign exchange and interest rate positions. Our portfolio of cash investments is diversified to avoid concentrating risk in any one instrument, country or counterparty. Other than in exceptional cases, the use of external derivative instruments is confined to specialist trading and central treasury organisations that have the appropriate skills, experience, supervision, control and reporting systems.

We have credit risk policies in place which seek to ensure that products are sold to customers with appropriate creditworthiness. These policies include detailed credit analysis and monitoring of customers against counterparty credit limits. Where appropriate, netting arrangements, credit insurance, prepayments and collateral are used to manage credit risk.

We maintain committed credit facilities. Management believes it has access to sufficient debt funding sources (capital markets) and to undrawn committed borrowing facilities to meet foreseeable requirements.

In effecting commodity trades and derivative contracts, we operate within procedures and policies designed to ensure that market risks are managed within authorised limits and trading can only be performed by staff with the appropriate skills and experience. We closely monitor developments in sanctions and export controls to ensure compliance with international guidelines. Senior Management regularly reviews mandated trading limits. We operated with enhanced risk management and increased governance to protect the business during the period following Russia's invasion of Ukraine. A department that is independent from our traders monitors our market risk exposures daily, using value-at-risk techniques alongside other risk metrics as appropriate.

Risk factors continued

Operational risks continued

Our future performance depends on the successful development and deployment of new technologies that provide new products and solutions.

Further information: See "Powering Progress strategy" on pages 6-14.

Risk description

Technology and innovation are essential to our efforts to help meet the world's energy demands competitively. If we fail to effectively develop or deploy new technology, products and solutions, or fail to make full, effective use of our data in a timely and cost-effective manner, there could be a material adverse effect on the delivery of our strategy and our licence to operate. We operate in environments where advanced technologies are used. In developing new technologies, products and solutions, unknown or unforeseeable technological failures or environmental and health effects could harm our reputation and licence to operate or expose us to litigation or sanctions. The associated costs of new technology are sometimes underestimated. Sometimes the development of new technology is subject to delays. If we are unable to develop the right technology and products in a timely and cost-effective manner, or if we develop technologies, products and solutions that harm the environment or people's health, there could be a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

Shell's technology organisation and the relevant business lines work together to determine the content, scope and budget for developing new technology that supports our activities. The new technology is developed using a robust technology maturation process, to systematically de-risk both technical and commercial risks, while ensuring portfolio alignment with Shell's strategic ambitions and deployment commitments. A significant proportion of Shell's technology contributes to our Renewables and Energy Solutions portfolio and our emissions reduction targets. We benefit from key relationships with leading academic research institutes and universities, and from working with start-ups. In our Shell GameChanger programme, we help companies to mature early-stage technologies. In our Shell Ventures scheme, we invest in and partner with start-ups and small and medium-sized enterprises that are in the early stages of developing new technologies.

We have substantial pension commitments, the funding of which is subject to capital market risks and other factors.

Further information: See "Financial framework" on page 31.

Risk description

Liabilities associated with defined benefit pension plans are significant, and the cash funding requirement of such plans can also involve significant liabilities. They both depend on various assumptions. Volatility in capital markets or government policies could affect investment performance and interest rates, causing significant changes to the funding level of future liabilities and/or short-term liquidity requirements. Changes in assumptions for mortality, retirement age or pensionable remuneration at retirement could also cause significant changes to the funding level of future liabilities. We operate a number of defined benefit pension plans and, in case of a shortfall, we could be required to make substantial cash contributions (depending on the applicable local regulations). This could result in a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

A pensions forum chaired by the Chief Financial Officer oversees Shell's input to pension strategy, policy and operation. A risk committee supports the forum in reviewing the results of assurance processes with respect to pension risks. Local trustees manage the funded defined benefit pension plans, and the contributions paid are based on independent actuarial valuations that align with local regulations. Pension fund liquidity is managed by holding liquid assets and maintaining credit facilities.

We mainly self-insure our hazard risk exposures. Consequently, we could incur significant financial losses from different types of risks that are not insured with third-party insurers.

Further information: See "Corporate" on page 77.

Risk description

Our Group insurance companies (wholly owned subsidiaries) provide insurance coverage to Shell subsidiaries and entities in which Shell has an interest. These subsidiaries and entities may also insure a portion of their risk exposures with third parties, but such external insurance would not provide any material coverage in the event of a large-scale safety or environmental incident. Accordingly, in the event of a material incident, we would have to meet our obligations without access to material proceeds from third-party insurers. We have in the past incurred adverse impacts from events, such as Hurricane Ida in 2021. We may, in the future, incur significant losses from different types of hazard risks that are not insured with third-party insurers, potentially resulting in a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We continually assess the safety performance of our operations and make risk mitigation recommendations, where relevant, to keep the risk of an accident as low as possible. Our insurance subsidiaries are adequately capitalised and they may transfer risks to third-party insurers where economical, effective and relevant.

Many of our major projects and operations are conducted in joint arrangements or with associates. This could reduce our degree of control and our ability to identify and manage risks.

Further information: See "Other regulatory and statutory information" on page 216.

Risk description

When we are not the operator, we have less influence and control over the behaviour, performance and operating costs of joint arrangements or associates. Despite having less control, we could still be exposed to the risks associated with these operations, including reputational, litigation (where joint and several liability could apply) and government sanction risks. For example, our partners or members of a joint arrangement or an associate, (particularly local partners in developing countries), may be unable to meet their financial or other obligations to projects, threatening the viability of a given project. Where we are the operator of a joint arrangement, the other partner(s) could still be able to veto or block certain decisions, which could be to our overall detriment. Accordingly, where we have limited influence, we are exposed to operational risks that could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

For every major project where we share control, Shell appoints a Joint Venture Asset Manager, whose responsibility is to manage performance and create and protect value for Shell. The Joint Venture Asset Manager seeks to influence operators and other partners to adapt their practices in order to drive value appropriately and to mitigate identified risks. An annual assurance review assesses how the joint venture's standards and processes align with those of Shell. The Joint Venture Asset Manager follows up on any gaps identified.

Risk factors continued

Conduct and culture risks

We are exposed to regulatory and conduct risk in our trading operations.

Further information: See "Other regulatory and statutory information" on page 215 and Note 25 to the "Consolidated Financial Statements" on pages 293-299.

Risk description

Commodity trading is an important component of our Upstream, Integrated Gas, Renewables and Energy Solutions, and Chemicals and Products businesses. Our commodity trading entities are subject to many regulations including requirements for standards of conduct. The risk of ineffective controls, poor oversight of trading activities, and the risk that traders could deliberately operate outside compliance limits and controls, either individually or as a group, has occurred. This has resulted in losses in the past and may result in further losses in the future. The rapidly changing regulatory environment creates a risk of insufficient, delayed or incorrect implementation of new or changes to existing regulatory requirements. Violations of such regulatory requirements could also expose us and/or our employees to regulatory fines and have an adverse effect on our licence to operate. These risks could have a material adverse effect on our earnings, cash flows, reputation and financial condition.

How this risk is managed

We maintain a trading compliance function managed by a regulated Chief Compliance Officer with adequate resources, a comprehensive governance structure, including mitigating controls (both automated and non-automated), and established reporting lines. Staff receive clear guidance through the Shell Code of Conduct, the organisation's Trading Compliance Manual, a specific compliance website, training modules where completion is monitored, and additional quarterly training sessions. Shell leaders frequently reinforce the importance of managing compliance and conduct risk in the trading organisation.

Violations of antitrust and competition laws carry fines and expose us and/or our employees to criminal sanctions and civil suits.

Further information: See "Powering lives" on page 119 and "Other regulatory and statutory information" on page 215.

Risk description

Antitrust and competition laws apply to Shell and its joint arrangements and associates in the vast majority of countries where we do business. Shell and its joint arrangements and associates have been fined for violations of antitrust and competition laws in the past. This includes a number of fines by the European Commission Directorate-General for Competition (DG COMP). Because of DG COMP's fining guidelines, any future conviction of Shell or any of its joint arrangements or associates for violation of EU competition law could potentially result in significantly larger fines and have a material adverse effect on us. Violation of antitrust laws is a criminal offence in many countries, and individuals can be imprisoned or fined. In certain circumstances, directors may receive director disqualification orders. It is also now common for persons or corporations allegedly injured by antitrust violations to sue for damages. Any violation of these laws can harm our reputation and could have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We maintain an antitrust programme with adequate resources, a comprehensive governance structure and established reporting lines. Staff receive clear guidance that includes requirements in Shell's Ethics and Compliance Manual, an antitrust-specific website, training modules where completion is monitored and regular messages from Shell leaders on the importance of managing antitrust risks. Staff must understand and comply with the Protect Shell Policy, which explains Shell's position on managing antitrust risks in engagements with parties external to Shell. In response to fast-moving external antitrust developments/trends, internal, guidance is continually being monitored to ensure that it remains current (for example, recent guidance on collaboration in the energy transition and US enforcement action with regard to interlocking directors).

Violations of anti-bribery, tax-evasion and anti-money laundering laws carry fines and expose us and/or our employees to criminal sanctions and civil suits.

Further information: See "Powering lives" on page 119, "Other regulatory and statutory information" on page 215 and Note 31 to the "Consolidated Financial Statements" on pages 303-305.

Risk description

Anti-bribery, tax-evasion and anti-money laundering laws apply to Shell, its joint arrangements and associates in all countries where we do business. Shell and its joint arrangements and associates have in the past settled with the US Securities and Exchange Commission regarding violations of the US Foreign Corrupt Practices Act. Any violation of anti-bribery, tax-evasion or anti-money laundering laws, including potential violations associated with Shell Nigeria Exploration and Production Company Limited's investment in Nigerian oil block OPL 245 and the 2011 settlement of litigation pertaining to that block, could harm our reputation or have a material adverse effect on our earnings, cash flows and financial condition. Violations of such laws also could expose us and/or our employees to criminal sanctions, civil suits and other consequences, such as debarment and the revocation of licences.

How this risk is managed

We maintain an anti-bribery, anti-tax evasion and anti-money laundering (ABC/AML) programme with adequate resources, a comprehensive governance structure and established reporting lines. Staff receive clear guidance, which includes requirements in Shell's Ethics and Compliance Manual, an ABC/AML-specific website, training modules where completion is monitored and regular messages from Shell leaders on the importance of managing ABC/AML risks.

As regards OPL 245, we have always maintained that the 2011 settlement was fully legal and on March 17, 2021, the court in Milan, Italy, acquitted Shell and its former employees of all charges on the grounds that there was no case to answer. On July 19, 2022, the Milan public prosecutor withdrew its appeal, meaning the criminal case is now closed and the acquittal of all defendants is final. On July 21, 2022, the Dutch Public Prosecutor's office announced it had dismissed its investigation into bribery allegations related to OPL 245. On November 11, 2022, the Court of Appeal rejected the Federal Republic of Nigeria's civil appeal of the March 17, 2021 decision.

Risk factors continued

Conduct and culture risks continued

Violations of data protection laws carry fines and expose us and/or our employees to criminal sanctions and civil suits.

Further information: See "Other regulatory and statutory information" on page 215.

Risk description

Data privacy and the management of personal data have become an issue of increasing importance and focus for companies and regulators in recent years. Following the implementation of the EU General Data Protection Regulation (GDPR) in May 2018, we have on a global basis seen updates to, or the introduction of, data privacy laws largely based on the GDPR. More than 100 countries globally now have data privacy laws. Shell companies are increasingly processing large volumes of personal data as we continue to acquire small companies with relatively large amounts of customer data. As we accelerate the delivery of our Powering Progress strategy, we expect to acquire an increasing number of companies. In doing so, we must consider how this is done responsibly, including managing cyber risks and managing personal data effectively. In some countries that are key to Shell's business operations, such as China, relevant legislation continues to be amended or introduced. Shell must be able to adapt dynamically to such legislative changes and be capable of updating our internal programmes if necessary. Many countries require mandatory notification of data breaches often within short time frames (72 hours under the GDPR) in certain situations. In these circumstances we might be required to report to affected individuals and regulators in the relevant countries. Non-compliance with data protection laws could harm individuals and expose us to regulatory investigations. This could result in fines, which could be up to 4% of global annual turnover if under the GDPR; orders to stop processing certain data; harm to our reputation; and loss of the trust of existing and potential customers, stakeholders, governments, and employees. With regard to data breaches, we notified a number of data privacy regulators in 2022 of personal data breaches and have had fines issued against us. In addition to imposing fines, regulators may also issue orders to stop processing personal data, which could disrupt operations. We could also be subject to litigation from persons or entities allegedly affected by data protection violations.

Violation of data protection laws is a criminal offence in some countries, and individuals can be imprisoned or fined. Any violation of these laws could harm our reputation and have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

Over the last decade, the Shell Group has continued to invest in and develop a mature and robust privacy compliance programme based on our Binding Corporate Rules ("BCRs"). BCRs are a pragmatic way to enable large corporations to generate value from personal data by collecting them and sharing them between Group companies and are perceived as a positive mechanism by data privacy regulators for enabling lawful data sharing and demonstrating accountability within large corporate groups. BCRs allow intra-group transfers of personal data without needing to enter into additional complex intra-group agreements. The overall objective of the programme is to enable the Shell Group of companies to collect, handle and manage personal data in a professional, ethical, and lawful manner.

The Chief Privacy Officer also serves as the legally appointed "Data Protection Officer" (DPO) under the GDPR and other applicable data privacy laws, save where there is a requirement to have a locally based DPO, such as in China and the Phillippines.

Our staff receive clear guidance which includes requirements in Shell's Ethics and Compliance Manual, a website focusing on data privacy, training modules where completion is monitored, and regular messages from Shell leaders on the importance of managing data privacy risks.

We monitor new and imminent data privacy legislation and ensure we have a robust impact assessment process aligned with the relevant businesses. We design operations and processes with privacy requirements and build controls into our processes and practices which involve the handling of personal data.

We have and continue to update a Group-wide incident management process designed to immediately identify and remediate data breaches. The process also helps us to comply with country-level requirements for reporting breaches. We continue to address challenges with compliance in data-heavy companies controlled by Shell but not yet fully integrated into our systems.

Newly acquired companies are expected to become compliant with our Binding Corporate Rules within three years of acquisition and there is currently a multi-year programme under way to achieve compliance. IT remediation work remains a priority in such companies, as does the strengthening of programmes to support data privacy compliance.

Risk factors continued

Conduct and culture risks continued

Violations of trade compliance laws and regulations, including sanctions, carry fines and expose us and our employees to criminal proceedings and civil suits.

Further information: See "Other regulatory and statutory information" on page 215.

Risk description

We use "trade compliance" as an umbrella term for various national and international laws designed to regulate the movement of items across national boundaries and restrict or prohibit trade, financial flows and other dealings with certain parties, countries and territories. For example, the EU and the USA continue to impose comprehensive sanctions on countries and territories such as Syria, North Korea, and Crimea and other territories in Eastern Ukraine. The USA continues to have comprehensive sanctions against Iran and Cuba. The EU, UK and some other nations such as Canada and Australia continue to maintain targeted sanctions against Iran. The EU and the USA introduced sectoral sanctions against Venezuela in 2017, which the USA expanded in 2018 and 2019. The US sanctions primarily target the government of Venezuela and the oil and gas industry.

In 2014, the EU and the USA imposed additional restrictions and controls directed at defined oil and gas activities in Russia, as well as restricting access to EU and USA financing sources for certain Russian state-owned entities and military and dual use controls. These remain in force. The USA introduced further restrictions regarding Russia in 2017, expanding them in 2018. In February 2022, countries around the world began imposing additional sanctions and export controls against Russia over its invasion of Ukraine including regional trade bans, designations of entities (including Russian banks and state-owned entities) and individuals as Specially Designated Nationals and Blocked Parties, and restrictions on access by Russia to financial systems. Export controls have also been introduced targeting Russian defence, aerospace, oil and gas related technology, IT and maritime sectors. The EU, USA and UK have also adopted a significant number of trade controls on oil, petroleum products and a wide range of products and technologies. These restrictions are subject to different wind-down periods and limited exceptions. Furthermore, it is likely that sanctions against Russia will continue to escalate. A number of countries have also implemented significant new sanctions against Belarus for its role in the Russian invasion. Russia has in turn adopted a significant number of countermeasures including making it an offence to take steps to comply with foreign sanctions.

Many other nations are also adopting trade compliance programmes similar to those administered by the EU and the USA. Since January 2021, the UK has maintained a legal framework for trade compliance that is separate and distinct from those of the EU and the USA.

Abiding by all the laws and regulations on trade compliance and sanctions is often complex and challenging because of factors such as: the expansion of sanctions; the frequent addition of prohibited parties as well as other measures; the number of markets in which we operate; the risk of differences in how jurisdictions apply sanctions; and the large number of transactions we process. Shell has voluntarily self-disclosed potential violations of sanctions in the past.

Any violation of sanctions could lead to loss of import or export privileges and significant penalties on or prosecution of Shell or its employees. This could harm our reputation and have a material adverse effect on our earnings, cash flows and financial condition.

How this risk is managed

We continue to develop and maintain a trade compliance programme with adequate resources, robust screening protocols, a comprehensive governance structure and established reporting lines. Staff receive clear guidance, which includes requirements in Shell's Ethics and Compliance Manual, a specific website for trade compliance, training modules where completion is monitored and regular messages from Shell leaders on the importance of managing trade compliance risks. The effectiveness of the trade compliance programme is assessed annually (or more frequently if necessary) and we are continually seeking ways to improve it.

Investors should also consider the following, which could limit shareholder remedies.

Other (generally applicable to an investment in securities)

The Company's Articles of Association determine the jurisdiction for shareholder disputes. This could limit shareholder remedies.

Risk description

Our Articles of Association generally require that all disputes between our shareholders in such capacity and the Company or our subsidiaries (or our Directors or former Directors), or between the Company and our Directors or former Directors, be exclusively resolved by arbitration in The Hague, the Netherlands, under the Rules of Arbitration of the International Chamber of Commerce. At the 2023 AGM, shareholders will be asked to approve updated Articles of Association that change the place of any arbitration to London, the United Kingdom. Our Articles of Association also provide that, if this provision is to be determined invalid or unenforceable for any reason, the dispute could only be brought before the courts of England and Wales. Accordingly, the ability of shareholders to obtain monetary or other relief, including in respect of securities law claims, could be determined in accordance with these provisions.

Progress on strategy – year in review

Performance indicators

These indicators enable management to evaluate Shell's performance against our strategy and operating plans during the year. They are also used as part of the determination of Executive Directors' remuneration. See "Directors' Remuneration Report" on pages 178-182.

Financial delivery

Cash flow from operating activities ($ billion)

68 2021: 45

Cash flow from operating activities is the total of all the cash receipts and payments associated with our sales of oil, gas, chemicals and other products. The components that provide a reconciliation from income for the period are listed in the "Consolidated Statement of Cash Flows". This indicator reflects our ability to generate cash to service and reduce our debt and for distributions to shareholders and for investments.

See "Financial framework" on page 32.

Progress in the energy transition

Selling lower-carbon products (%)

60 2021: 65

The percentage of Marketing segment Adjusted Earnings from lower-carbon energy products (on a life cycle basis), defined as biofuels and EV charging, as well as non-energy products, defined as lubricants, bitumen, sulphur, and earnings from convenience retail.

See "Our journey to net zero" on pages 101-102.

Reducing operational emissions (thousand tonnes CO_2)

2,010 2021: 3,988

GHG abatement projects in 2022 that resulted in sustained GHG reductions (e.g. flare reduction projects or energy efficiency projects), site closures and decommissioning or transformations, and use of renewable electricity for Scope 2 reduction.

See "Our journey to net zero" on pages 101-102.

Electric vehicle (EV) charge points (thousand)

139 2021: 86

All charge points in Mobility organisation which includes both public out-of-home and Shell Recharge Solutions.

See "Our journey to net zero" on pages 101-102.

Performance indicators continued

Operational excellence

Asset management excellence

Upstream controllable availability (%)

84.7 2021: 87.8

Upstream controllable availability performance reflects our ability to optimally run our Upstream assets. Reliability issues, turnarounds and maintenance at own-operated or third-party facilities all impact controllable availability, but it excludes the impact of extreme unexpected events that are outside our control such as government restrictions and hurricanes. Upstream controllable availability includes all Shell-operated assets (excluding Groningen) and selected assets not operated by Shell, but for which Shell has strategic influence.

Midstream availability (%)

89.3 2021: 87.3

Midstream availability shows to what extent liquefied natural gas (LNG) assets are ready to process product as a comparison with capacity, considering the impact of planned and unplanned maintenance.

Refinery and chemical plant availability (%)

95.5 2021: 95.6

Refinery and chemical plant availability is the weighted average of the actual uptime of plants as a percentage of their maximum possible uptime. The weighting is based on the capital employed, adjusted for cash and non-current liabilities. This indicator is a measure of the operational excellence of our refinery and chemical plant facilities.

Project delivery excellence

Project delivery on schedule (%)

69 2021: 87

Project delivery reflects our capability to complete major projects on time and within budget on the basis of the targets set in our annual business plan. Project delivery on schedule measures the percentage of projects delivered on schedule.

Project delivery on budget (%)

103 2021: 104

Project delivery on budget reflects the aggregate cost against the aggregate budget for those projects, where a figure greater than 100% means over budget.

Customer excellence

Customer satisfaction (index)

8.3 2021: 8.2

The customer satisfaction index (CSI) score is generated from a transactional survey programme measuring performance (customer interactions). CSI is calculated as the average of customer satisfaction scores from email surveys.

Brand preference (%)

13.8 2021: 14.2

Brand Share Preference is the percentage of customers who answer 'Shell' in response to the question: "Assuming that all the fuel station companies that you would consider are conveniently located, which ONE company do you prefer most?". Responses are taken from survey respondents in more than 60 countries covering both fuel and non-fuel retail B2C customers.

Safety

Personal safety (SIF-F cases per 100 million working hours)

1.7 2021: 6.9

Serious Injury, Illness and Fatality (SIF) is defined as a serious work-related injury or illness that resulted in fatality or a life-altering event, which is defined as a long-term or permanent injury or illness with significant impact on daily activities. Serious Injury and Fatality Frequency (SIF-F) is calculated by dividing the number of employee and contractor SIF by 100 million working hours.

See "Safety" on page 121.

Process safety (number of events)

66 2021: 103 [A]

A Tier 1 process safety event is an unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials, from a process with the greatest actual consequence resulting in harm to employees, contract staff, or a neighbouring community, damage to equipment, or exceeding a threshold quantity, as defined by the API Recommended Practice 754 and IOGP Standard 456. A Tier 2 process safety event is a release of lesser consequence.

See "Safety" on page 121.

[A] 2021 adjustment on Tier 1+2 count from 102 to 103 due to an event identified after publication.

Generating shareholder value

Group results

Key statistics

$ million, except where indicated

	2022	2021	2020
Income/(loss) attributable to Shell plc shareholders	42,309	20,101	(21,680)
Income attributable to non-controlling interest	565	529	146
Income/(loss) for the period	42,874	20,630	(21,534)
Current cost of supplies adjustment	(1,312)	(3,148)	1,833
Total segment earnings [A][B][C], of which:	41,562	17,482	(19,701)
Integrated Gas	22,212	8,060	(7,230)
Upstream	16,222	9,603	(9,300)
Marketing	2,133	3,535	4,081
Chemicals and Products	4,515	404	(3,821)
Renewables and Energy Solutions	(1,059)	(1,514)	(479)
Corporate	(2,461)	(2,606)	(2,952)
Identified Items [C]	1,243	(2,216)	(24,767)
Adjusted Earnings [C]	39,870	19,289	4,846
Adjusted EBITDA [C]	84,289	55,004	36,533
Capital expenditure	22,600	19,000	16,585
Cash capital expenditure [C]	24,833	19,698	17,827
Operating expenses [C]	39,477	35,964	34,789
Underlying operating expenses [C]	39,456	35,309	32,502
Return on average capital employed [C]	16.7%	8.8%	(6.8)%
Net Debt at December 31 [D]	44,837	52,556	75,386
Gearing at December 31 [D]	18.9%	23.1%	32.2%
Oil and gas production (thousand boe/d)	2,864	3,237	3,386
Proved oil and gas reserves at December 31 (million boe)	9,578	9,365	9,124

[A] Segment earnings are presented on a current cost of supplies basis. See Note 8 to the "Consolidated Financial Statements" on pages 265-269.
[B] Revised to conform with reporting segment changes applicable from January 1, 2022.
[C] See "Non-GAAP measures reconciliations" on pages 362-365.
[D] See Note 20 "Debt" on pages 279-280 and "Non-GAAP measures reconciliations" on pages 362-365.

Earnings 2022-2021

Income attributable to Shell plc shareholders in 2022 was $42,309 million, compared with $20,101 million in 2021. With non-controlling interest included, income for the period in 2022 was $42,874 million, compared with $20,630 million in 2021. After current cost of supplies adjustment, total segment earnings in 2022 were $41,562 million, compared with $17,482 million in 2021.

Earnings on a current cost of supplies basis (CCS earnings) exclude the effect of changes in the oil price on inventory carrying amounts, after making allowance for the tax effect. The purchase price of volumes sold in the period is based on the current cost of supplies during the same period, rather than on the historic cost calculated on a first-in, first-out (FIFO) basis. When oil prices are decreasing, CCS earnings are likely to be higher than earnings calculated on a FIFO basis and, when prices are increasing, CCS earnings are likely to be lower than earnings calculated on a FIFO basis.

Integrated Gas earnings in 2022 were $22,212 million, compared with $8,060 million in 2021. The increase was mainly driven by the combined effect of higher realised prices and contributions from trading and optimisation, and gains related to the fair value accounting of commodity derivatives. This was partly offset by lower volumes and higher operating expenses.

See "Integrated Gas" on pages 38-43.

Upstream earnings in 2022 were $16,222 million, compared with $9,603 million in 2021. The increase was mainly driven by higher realised prices, gains relating to storage and working gas transfer effects and impairment reversals. This was partly offset by lower volumes, mainly as a result of divestments, and charges relating to the EU solidarity contribution and UK Energy Profits Levy.

See "Upstream" on pages 44-51.

Generating shareholder value | Group results continued

Marketing earnings in 2022 were $2,133 million, compared with $3,535 million in 2021. The decrease was mainly driven by higher operating expenses (including the effects of higher volumes), net losses on the sale of assets compared with net gains in 2021, and higher impairment charges. These were partly offset by higher margins.

See "Marketing" on pages 60-64.

Chemicals and Products earnings in 2022 were $4,515 million, compared with $404 million in 2021. The increase was mainly driven by higher Products margins (reflecting higher Refining margins and higher contributions from trading and optimisation), and lower impairment charges. These were partly offset by lower Chemicals margins and higher operating expenses.

See "Chemicals and Products" on pages 65-72.

Renewables and Energy Solutions earnings in 2022 were a loss of $1,059 million, compared with a loss of $1,514 million in 2021. The decrease in the loss was mainly driven by higher contributions from trading and optimisation for gas and power. This was partly offset by higher net losses related to the fair value accounting of commodity derivatives and higher operating expenses.

See "Renewables and Energy Solutions" on pages 73-76.

Corporate segment earnings in 2022 were an expense of $2,461 million, compared with an expense of $2,606 million in 2021. The lower expense was mainly driven by favourable movements in net interest expense. This was partly offset by lower tax credits and unfavourable currency exchange effects.

See "Corporate" on page 77.

Prior year earnings summary

Our earnings summary for the financial year ended December 31, 2021, compared with the financial year ended December 31, 2020, can be found in the Annual Report and Accounts (page 34) and Form 20-F (page 33) for the year ended December 31, 2021, as filed with the Registrar of Companies for England and Wales and the US Securities and Exchange Commission, respectively.

Production available for sale

Oil and gas production available for sale in 2022 was 2,864 thousand boe per day (boe/d), compared with 3,237 thousand boe/d in 2021. This net reduction was mainly driven by divestments, higher maintenance activities, and net field declines, partly offset by new fields ramp-ups.

Oil and gas production available for sale [A]

Thousand boe/d

	2022	2021	2020
Crude oil and natural gas liquids	1,460	1,685	1,752
Synthetic crude oil	46	54	51
Natural gas [B]	1,357	1,498	1,583
Total	2,864	3,237	3,386
Of which:			
Integrated Gas	921	1,004	1,011
Upstream	1,897	2,178	2,324
Oil sands (part of Chemical and Products)	46	54	51

[A] See "Oil and gas information" on pages 56-57.
[B] Natural gas volumes are converted into oil equivalent using a factor of 5,800 scf per barrel.

Proved reserves

The proved oil and gas reserves of Shell subsidiaries and the Shell share of the proved oil and gas reserves of joint ventures and associates are summarised in "Oil and gas information" on pages 52-54 and set out in more detail in "Supplementary information – oil and gas (unaudited)" on pages 308-326.

Before taking production into account, our proved reserves increased by 1,304 million boe in 2022. Total oil and gas production was 1,091 million boe. Accordingly, after taking production into account, our proved reserves increased by 213 million boe in 2022, to 9,578 million boe at December 31, 2022.

Cash capital expenditure and other information

Cash capital expenditure was $24,833 million in 2022, compared with $19,698 million in 2021.

Operating expenses were $39,477 million in 2022, compared with $35,964 million in 2021. Underlying operating expenses were $39,456 million, compared with $35,309 million in 2021.

Our return on average capital employed (ROACE) increased to 16.7%, compared with 8.8% in 2021, mainly driven by higher earnings.

Net debt was $44,837 million at the end of 2022, compared with $52,556 million at the end of 2021, mainly reflecting higher free cash flow.

Gearing was 18.9% at the end of 2022, compared with 23.1% at the end of 2021, mainly driven by net debt reduction and higher income which resulted in higher equity.

Significant accounting estimates and judgements

See Note 2 to the "Consolidated Financial Statements" on pages 242-252.

Legal proceedings

See Note 31 to the "Consolidated Financial Statements" on pages 303-305.

Generating shareholder value

Financial framework

We manage our businesses to deliver strong cash flows, sustain our strategy and create profitable growth. Management applies Shell's cash to support disciplined capital expenditure and maintain a resilient balance sheet; target AA credit metrics through the cycle; deliver a progressive dividend to shareholders with growth of around 4% annually (subject to Board approval); and target total distributions to shareholders of a minimum of 20% and (subject to Board approval and prevailing market conditions) potentially more than 30% of our cash flow from operating activities.

The Board may choose to return cash to shareholders through a combination of dividends and share buybacks. When setting the level of shareholder remuneration, the Board looks at a range of factors, including the macro environment, the underlying business earnings and cash flow of the Group, the current balance sheet, future investment, acquisition and divestment plans, and existing commitments.

Liquidity and capital resources

Shell generated cash flow from operations of $68.4 billion, including a negative impact from working capital of $5.4 billion, and free cash flow of $46.0 billion in 2022, aided by the improving global macro environment for oil and gas businesses, and divestments (for more information on free cash flow see "Non-GAAP measures reconciliations" on pages 362-365). Net debt decreased to $44.8 billion at December 31, 2022 (December 31, 2021: $52.6 billion). Gearing fell to 18.9% at December 31, 2022, compared with 23.1% at December 31, 2021, as higher income increased equity and cash flow generation reduced net debt. Note 20 to the "Consolidated Financial Statements" on pages 279-280 provides information on our debt arrangements, including net debt and gearing definitions.

Liquidity

We satisfy our funding and working capital requirements from the cash generated from our operations, the issuance of debt and divestments. In 2022, access to the international debt capital markets remained strong, with our debt principally financed from these markets through central debt programmes consisting of:

- a $10 billion global commercial paper (CP) programme, with maturities between 183 days and 364 days;
- a $10 billion US CP programme, with maturities not exceeding 397 days;
- an unlimited Euro medium-term note (EMTN) programme (also referred to as the Multi-Currency Debt Securities Programme); and
- an unlimited US universal shelf (US shelf) registration.

The CP, EMTN and US shelf debt is issued by Shell International Finance B.V., the issuance company for Shell, with its debt being guaranteed by Shell plc (the Company).

We also maintain committed credit facilities. The core facilities were extended in December 2022. Of the $9.92 billion total facility, $1.92 billion matures in 2023, $0.32 billion in 2025 and $7.68 billion in 2026. This remained fully undrawn at December 31, 2022. These core facilities and internally available liquidity provide back-up coverage for our CP programmes. Other than certain borrowing by local subsidiaries, we do not have any other committed credit facilities.

Our total debt decreased by $5.3 billion to $83.8 billion at December 31, 2022. The total debt excluding leases matures as follows: 8% in 2023; 8% in 2024; 11% in 2025; 7% in 2026; and 66% in 2027 and beyond. The portion of debt maturing in 2023 is expected to be repaid from some combination of cash balances, cash generated from operations, divestments and the issuance of new debt.

In 2022, we did not issue any bonds under our US shelf registration or EMTN programme. $175 million of CP was issued in the second quarter, and repaid within the same quarter. CP outstanding was zero at the end of 2022. Management believes it has access to sufficient debt funding sources (capital markets) and to undrawn committed borrowing facilities to meet foreseeable requirements.

While our subsidiaries are subject to restrictions, such as foreign withholding taxes on the transfer of funds in the form of cash dividends, loans or advances, such restrictions are not expected to have a material impact on our ability to meet our cash obligations.

Market risk and credit risk

We are affected by the global macroeconomic environment, as well as financial and commodity market conditions. This exposes us to treasury and trading risks, including liquidity risk, credit risk, and market risk (interest rate risk, foreign exchange risk and commodity price risk). See "Risk factors" on page 22 and Note 25 to the "Consolidated Financial Statements" on pages 293-299. The size and scope of our businesses require a robust financial control framework and effective management of our various risk exposures.

We use various financial instruments for managing exposure to commodity price, foreign exchange and interest rate movements. Our treasury and trading operations are highly centralised and seek to manage credit exposures associated with our substantial cash, commodity, foreign exchange and interest rate positions. Our portfolio of cash investments is diversified to avoid concentrating risk in any one instrument, country or counterparty. The use of external derivative instruments is confined to specialist trading and central treasury organisations that have appropriate skills, experience, supervision, control and reporting systems. Credit risk policies are in place to ensure that sales of products are made to customers with appropriate creditworthiness, and include credit analysis and monitoring of customers against counterparty credit limits. Where appropriate, netting arrangements, credit insurance, prepayments and collateral are used to manage credit risk.

Pension commitments

We have substantial pension commitments, the funding of which is subject to capital market risks (see "Risk factors" on page 23). We address key pension risks in a number of ways. Principal among these is the Pensions Forum, chaired by the Chief Financial Officer, which oversees Shell's input to pension strategy, policy and operation. A risk committee supports the forum in reviewing the results of assurance processes in respect of pensions risks. In general, local trustees manage the funded defined benefit pension plans, with contributions paid based on independent actuarial valuations in accordance with local regulations. Our total employer contributions were $0.7 billion in 2022 and are estimated to be $0.8 billion in 2023.

See Note 23 to the "Consolidated Financial Statements" on pages 285-291.

Generating shareholder value | Financial framework continued

Capitalisation table

$ million

	December 31, 2022	December 31, 2021
Equity attributable to Shell plc shareholders	190,472	171,966
Current debt	9,001	8,218
Non-current debt	74,794	80,868
Total debt [A]	83,795	89,086
Total capitalisation	274,267	261,052

[A] Of total debt of $83.8 billion (2021: $89.1 billion), $55.2 billion (2021: $61.5 billion) was unsecured and $28.6 billion (2021: $27.6 billion) was secured. $51.0 billion was issued by Shell International Finance B.V., a 100%-owned subsidiary of Shell plc with its debt guaranteed by Shell plc (December 31, 2021: $54.7 billion). See Note 20 to the "Consolidated Financial Statements" on pages 279-280 for further disclosure on debt.

Guarantees and other off-balance sheet arrangements

There were no guarantees or other off-balance sheet arrangements at December 31, 2022, or December 31, 2021, that were reasonably likely to have a material effect on Shell.

Statement of cash flows

Cash flow from operating activities in 2022 was an inflow of $68.4 billion, compared with $45.1 billion in 2021, mainly due to higher earnings, partly offset by unfavourable working capital movements of $5.4 billion (compared with unfavourable working capital movements of $10.4 billion in 2021). The increase in cash flow from operating activities in 2021, compared with $34.1 billion in 2020, was mainly due to higher earnings, partly offset by unfavourable working capital movements.

Cash flow from investing activities in 2022 was an outflow of $22.4 billion, compared with an outflow of $4.8 billion in 2021. The increased cash outflow was mainly due to lower proceeds from sale of property, plant and equipment in 2022. The decreased cash outflow in 2021 compared with $13.3 billion in 2020 was mainly due to higher proceeds from sale of property, plant and equipment in 2021, including the divestment of our Permian assets in the USA.

Cash flow from financing activities in 2022 was an outflow of $42.0 billion, compared with outflows of $34.7 billion in 2021 and $7.2 billion in 2020, mainly due to higher repurchases of shares of $18.4 billion (2021: $2.9 billion; 2020: $1.7 billion) and net repayment of debt of $7.9 billion (2021: $19.7 billion net repayment; 2020: $5.6 billion net issuance).

Cash and cash equivalents were $40.2 billion at December 31, 2022 (December 31, 2021: $37.0 billion; December 31, 2020: $31.8 billion).

See Consolidated Statement of Cash Flows on page 241.

Cash flow from operating activities

The most significant factors affecting our cash flow from operating activities are earnings, which are mainly impacted by: realised prices for crude oil, natural gas and LNG; production levels of crude oil, natural gas and LNG; chemicals, refining and marketing margins; and movements in working capita and derivative financial instruments.

The impact on earnings from changes in market prices depends on: the extent to which contractual arrangements are tied to market prices; the dynamics of production-sharing contracts; the existence of agreements with governments or state-owned oil and gas companies that have limited sensitivity to crude oil and natural gas prices; tax impacts; and the extent to which changes in commodity prices flow through into operating expenses. Changes in benchmark prices of crude oil and natural gas in any particular period provide only a broad indicator of changes in our Integrated Gas and Upstream earnings in that period. Changes in any one of a range of factors, derived from either within the industry or the broader economic environment, can influence refining and marketing margins. The precise impact of any such changes depends on how the oil markets respond to them. The market response is affected by factors such as: whether the change affects all crude oil types or only a specific grade; regional and global crude oil and refined products inventories; and the collective speed of response of refiners and product marketers in adjusting their operations. As a result, margins fluctuate from region to region and from period to period.

Divestment and cash capital expenditure

The levels of divestment proceeds and cash capital expenditure in 2022 and 2021 reflect our discipline and focus on the Powering Progress strategy. Divestment proceeds for 2022 were $2.1 billion, compared with $15.1 billion in 2021, which included the divestment of the Permian assets.

Cash capital expenditure is used to monitor investing activities on a cash basis, excluding items such as lease additions which do not necessarily result in cash outflows in the period.

Cash capital expenditure

$ million

	2022	2021	2020
Integrated Gas	4,265	3,502	3,566
Upstream	8,143	6,168	7,099
Marketing	4,831	2,273	1,774
Chemicals and Products	3,838	5,175	4,198
Renewables and Energy Solutions	3,469	2,359	928
Corporate	287	221	262
Total cash capital expenditure	24,833	19,698	17,827

See non-GAAP measures reconciliations on pages 362-365.

Generating shareholder value | Financial framework continued

Contractual obligations

The table below summarises our principal contractual obligations at December 31, 2022, by expected settlement period. The amounts presented have not been offset by any committed third-party revenue in relation to these obligations.

Contractual obligations

$ billion

	Less than 1 year	Between 1 and 3 years	Between 3 and 5 years	5 years and later	Total
Debt [A]	4.6	10.6	6.5	35.7	57.4
Leases	5.9	9.1	6.5	17.9	39.4
Purchase obligations [B]	34.1	30.9	18.4	63.8	147.2
Other long-term contractual liabilities [C]	0.2	0.6	0.1	0.6	1.5
Total	44.8	51.2	31.5	118.0	245.5

[A] See Note 20 to the "Consolidated Financial Statements" on pages 279-280. Debt contractual obligations exclude interest, which is estimated to be $1.7 billion payable in less than one year, $3.0 billion between one and three years, $2.5 billion between three and five years, and $14.8 billion in five years and later. For this purpose, we assume that interest rates with respect to variable interest rate debt remain constant at the rates in effect at December 31, 2022, and that there is no change in the aggregate principal amount of debt other than repayment at scheduled maturity as reflected in the table. Lease contractual obligations include interest.

[B] Purchase obligations disclosed in the above table exclude commodity purchase obligations that are not fixed or determinable and are principally intended to be resold in a short period of time through sale agreements with third parties. Examples include long-term non-cancellable LNG and natural gas purchase commitments and commitments to purchase refined products or crude oil at market prices. Inclusion of such commitments would not be meaningful in measuring liquidity and cash flow, as the cash outflows generated by these purchases will generally be offset in the same periods by cash received from the related sales transactions.

[C] Includes obligations included in "Trade and other payables" and provisions related to onerous contracts included in "Decommissioning and other provisions" in "Non-current liabilities" in the "Consolidated Balance Sheet" that are contractually fixed as to timing and amount. In addition to these amounts, Shell has certain obligations that are not contractually fixed as to timing and amount, including contributions to defined benefit pension plans (see Note 23 to the "Consolidated Financial Statements" on pages 285-291) and obligations associated with decommissioning and restoration (see Note 24 to the "Consolidated Financial Statements" on page 292-293).

Dividends

Subject to Board approval, Shell aims to grow the dividend per share by around 4% every year. In total, Shell targets the distribution of a minimum of 20% and, subject to Board approval and prevailing market conditions, potentially more than 30% of our cash flow from operations to shareholders. Shell may choose to return cash to shareholders through a combination of dividends and share buybacks.

When setting the level of shareholder distributions, the Board looks at a range of factors, including the macro environment, the earnings and cash flows of the Group, the current balance sheet, future investment, acquisition and divestment plans and existing commitments. We returned $7.4 billion to our shareholders through dividends in 2022.

The fourth quarter 2022 dividend of $0.2875 per share will be paid on March 27, 2023, to shareholders on the register at February 17, 2023, and represents an increase of 15% compared with the third quarter of 2022.

See Note 29 to the "Consolidated Financial Statements" on page 303.

Purchases of securities

On February 3, 2022, share buybacks of $8.5 billion for the first half of 2022 were announced, comprising two programmes which were completed in May 2022 and July 2022. These included the remaining $5.5 billion of the Permian divestment proceeds that had been allocated for share buybacks. On July 28, 2022, and October 27, 2022, the Company announced buybacks of $6 billion and $4 billion which were completed in October 2022 and January 2023 respectively, leading to a total of $18.4 billion across 2022. The buybacks were conducted on both London market exchanges and Amsterdam exchanges.

Between January 1, 2022, and January 28, 2022, 32 million B shares were purchased and cancelled. Over the remainder of 2022, 650 million ordinary shares were purchased and cancelled. Overall, a total nominal share value of €48 million ($57 million), 9.8% of the Company's total issued share capital at December 31, 2022, was purchased and cancelled during 2022 for a total cost of $18.4 billion, including expenses, at an average price of $26.99 per share.

The buybacks completed in the first half of 2022 were in accordance with the authorities granted by shareholders at the 2021 Annual General Meeting (AGM). The buybacks completed in the second half of 2022 were in accordance with the authorities granted by shareholders at the 2022 AGM. At the 2022 AGM, authority was granted for the Company to repurchase up to a maximum of 10% of its issued ordinary shares, excluding treasury shares, (758 million ordinary shares), both on and off market, allowing purchases on Amsterdam as well as London exchanges. As at December 31, 2022, 416 million ordinary shares could still be repurchased under the current AGM authorities. The purpose of the share repurchases in 2022 was to reduce the issued share capital of the Company.

New resolutions will be proposed at the 2023 AGM to renew the authority for the Company to purchase its own share capital, up to specified limits, for a further year. These proposals will be described in more detail in the 2023 Notice of Annual General Meeting.

Shares are also purchased by the employee share ownership trusts and trust-like entities (see Note 27 to the "Consolidated Financial Statements" on page 300) to meet delivery commitments under employee share plans. All share purchases are made in open-market transactions.

The table on the next page provides information on purchases of shares in 2022 and January 2023 by the Company and affiliated purchasers. Purchases in euros and sterling are converted into dollars using the exchange rate on each transaction date.

Generating shareholder value | Financial framework continued

Purchases of equity securities by issuer and affiliated purchasers in 2022 [A]

	Euro Shares			GBP Shares			ADSs [B]	
Purchase period	Number purchased for employee share plans	Number purchased for cancellation [C]	Weighted average price ($)[D]	Number purchased for employee share plans	Number purchased for cancellation [C]	Weighted average price ($)[D]	Number purchased for employee share plans	Weighted average price ($)[D]
January [E]	–	–	–	–	31,678,192	24.43	1,106,045	46.31
February	–	–	–	–	46,523,793	26.92	–	–
March	–	–	–	–	56,830,503	26.32	–	–
April	–	–	–	–	41,502,892	27.88	–	–
May	–	–	–	–	74,210,419	29.00	–	–
June	–	–	–	–	80,226,377	27.43	–	–
July	–	2,100,000	26.18	–	11,359,217	26.07	–	–
August	–	37,458,590	26.56	–	38,547,931	26.55	–	–
September	–	46,030,334	25.59	–	62,467,606	25.70	–	–
October	–	10,046,901	26.25	–	36,420,460	26.12		
November	–	27,532,944	27.91	–	21,324,945	27.91		
December	13,784,280	36,324,940	28.42	911,200	21,384,292	28.29	2,398,670	55.63
Total 2022	13,784,280	159,493,709	27.03	911,200	522,476,627	26.29	3,504,715	52.69
January	–	3,902,011	28.34	–	24,834,916	28.82	808,490	55.87
Total 2023	–	3,902,011	28.34	–	24,834,916	28.82	808,490	55.87

[A] Reported as at transaction date.
[B] American Depositary Shares.
[C] Under the share buyback programme.
[D] Includes stamp duty and brokers' commission.
[E] On January 29, 2022, one line of shares was established through assimilation of each A share and each B share into one ordinary share of the Company.

Financial information relating to the Royal Dutch Shell Dividend Access Trust

The results of the Royal Dutch Shell Dividend Access Trust (the Trust) are included in the consolidated results of operations and financial position of Shell. See "Royal Dutch Shell Dividend Access Trust Financial Statements" on pages 352-356. Certain condensed financial information in respect of the Trust is given below.

The Shell Transport and Trading Company Limited and BG Group Limited have each issued a dividend access share to Computershare Trustees (Jersey) Limited (the Trustee). For the years 2022, 2021 and 2020, the Trust recorded income before tax of £nil, £2.2 billion, and £2.8 billion respectively. In each period, this reflected the amount of dividends payable on the dividend access shares. Dividends are also classified as unclaimed where amounts have not cleared recipient bank accounts.

At December 31, 2022, the Trust had total equity of £nil (December 31, 2021: £nil; December 31, 2020: £nil), reflecting assets of £6 million (December 31, 2021: £7 million; December 31, 2020: £7 million) and unclaimed dividends of £6 million (December 31, 2021: £7 million; December 31, 2020: £7 million). The Trust only records a liability for an unclaimed dividend to the extent that dividend cheque payments have not been presented within 12 months, have expired or have been returned unpresented.

On January 29, 2022, one line of shares was established through assimilation of each A share and each B share into one ordinary share of the Company. This assimilation had no impact on voting rights or dividend entitlements. Dutch withholding tax, applied previously on dividends on A shares, no longer applies on dividends paid on the ordinary shares following the assimilation.

In relation to the assimilation of the Company's A and B shares, the Trust will continue in existence for the foreseeable future to facilitate the payment of unclaimed dividend liabilities for shareholders of the former B shares until these are either claimed or forfeited in line with the terms outlined.

Generating shareholder value

Market overview

In 2022, the energy price shock and rising food prices led to a cost-of-living crisis and lower economic growth, pushing up inflation to levels not seen for many decades.

Prices were already creeping up as a result of the economic rebound from the pandemic, its lockdowns and related supply chain constraints. But inflation soared globally after Russia's invasion of Ukraine, which triggered the war that continues today.

Shell maintains a large business portfolio across an integrated value chain and is exposed to fluctuating prices of crude oil, natural gas, oil products, chemicals and power (see "Risk factors" on page 15). This diversified portfolio provides resilience when prices are volatile. Our annual planning cycle and periodic portfolio reviews aim to ensure that our levels of capital investment and operating expenses are appropriate in the context of a volatile price environment.

We test the resilience of our projects and other opportunities against a range of prices for crude oil, natural gas, oil products, chemicals and power. We also aim to maintain a strong balance sheet to provide resilience against weak market prices.

Global economic growth

Higher energy and food prices have caused real wages to fall in many countries, slashing purchasing power. This is hurting consumers. In addition, central banks around the world are increasing interest rates to curb inflation and anchor inflation expectations in their economies. Tighter monetary policy and higher interest rates, weak real household income growth and declining confidence have resulted in lower economic growth during 2022.

For 2023, a further growth slowdown for the world economy is projected, as well as high, but declining, inflation in many countries. In the International Monetary Fund's latest global economic prospects report published in January 2023, global growth is forecast to decelerate from 6.2% in 2021 and 3.4% in 2022 to 2.9% in 2023. Asia is expected to be the main engine of growth in 2023 and 2024, whereas Europe, North America and South America are expected to see very low growth.

Risks to the economic outlook remain significant, including new uncertainties about natural gas supplies to Europe, the impact of the real estate and COVID-19 crises in China, and a resurgence of COVID-19 health scares around the world. Central banks must chart a difficult path as they face mixed economic signals, such as slowing economic growth with still-tight labour markets and strong pressure for wage growth. In this environment, an insufficient increase in interest rates may prove a mistake. If rates are not adequately raised, inflation could become entrenched, prompting higher interest rates in the future at a significant cost to the economy. On the other hand, increasing interest rates by too much may risk sending many economies into debt distress and prolonged recession.

Global prices, demand and supply

The following table provides an overview of the main crude oil and natural gas price markers to which we are exposed:

Oil and gas average industry prices [A]

	2022	2021	2020
Brent ($/b)	101	71	42
West Texas Intermediate ($/b)	95	68	39
Henry Hub ($/MMBtu)	6.4	4.0	2.0
EU TTF ($/MMBtu)	40	16	3
Japan Customs-cleared Crude ($/b) - 3 months	98	60	51

[A] Yearly average prices are based on monthly average spot prices. The 2022 average price for Japan Customs-cleared Crude is based on available market information up to the end of the period.

Crude oil and oil products

The global benchmark oil price Brent averaged $101 per barrel (/b) in 2022, the highest annual average price since 2013. This represents an increase of more than 40% increase from the annual average of $71/b recorded in 2021. High prices were mostly realised in the first half of the year, with demand recovering as economies reopened and supply constrained by the capacity of major oil producers. Russia's invasion of Ukraine triggered concerns about supply availability, sending Brent to a high of $133/b on March 8, 2022. Prices stayed at an elevated level until the middle of the year, before falling as recession concerns weighed on the market. Brent averaged $80/b in December, the same price as it was in the fourth quarter of 2021. West Texas Intermediate (WTI) traded at a sharper discount of around $6/b to Brent in 2022, compared with a discount of about $3/b in 2021. This is because of rising demand for Brent as a replacement for Urals, the most common grade of Russian crude exports.

In 2022, global oil product demand rose by more than 2 mb/d to nearly 100 mb/d, approaching the pre-COVID-19 level of 100.5 mb/d in 2019. Growth largely came from jet fuel, supported by the rebound in air travel after the pandemic. Growth in other product segments continued in 2022, albeit at a slower pace. Global diesel/gas oil growth eased from 1.5 mb/d in 2021 to 0.66 mb/d in 2022 based on IEA estimates, reflecting weakening economic activities. Naphtha, after a strong year of growth in 2021, declined by 0.13 mb/d due to a weak petrochemical sector. Regionally, growth has largely come from non-OECD markets, particularly the Middle East and India. Chinese demand dropped by about 0.4 mb/d as lockdowns in the country affected demand. Among OECD markets, European growth was particularly weak. While high gas prices resulted in a switch from gas to oil, this was largely offset by a weak petrochemical sector which struggled with high energy costs.

Global oil production increased to 100 million b/d in 2022, up by 4.7 mb/d from 2021. Growth was largely led by the ramp-up of Saudi Arabian and US shale oil. Saudi Arabia delivered an additional 1.4 mb/d compared with 2021, about half of the OPEC supply growth. Outside OPEC, the USA added 1.2 mb/d, providing about 60% of the non-OPEC growth. During the third quarter, there were concerns about whether OPEC would raise production in step with demand recovery because a number of member countries were producing below quota. But the trend started shifting from the fourth quarter, with OPEC in November reintroducing production cuts of 2 mb/d, in view of the potential surplus should economic conditions worsen.

Generating shareholder value | Market overview continued

Russia's invasion of Ukraine has strong ramifications for global crude and oil product supply. Before the invasion, Russian production was expected to surge by more than 0.8 mb/d in 2022, according to the IEA. But actual production growth was about 0.2 mb/d due to OECD market sanctioning. Global crude/product trade flow also shifted as Russian crude/products were redirected to non-OECD markets.

The outlook for 2023 demand is highly uncertain. One key uncertainty is the recession risk in OECD economies, particularly Europe. China's lifting of COVID-19 restrictions to focus on economic growth could provide some support to global oil demand. The main uncertainty on the supply side is the supply from Russia after the embargo on Russian crude and oil products took effect. The EU embargo and G7 price caps on Russian crude oil took effect in early December 2022. Russian oil product embargoes and price caps followed in February 2023. These measures could lead to a further reduction in Russia's oil supply.

Natural gas

Global demand for natural gas in 2022 is estimated to have declined by 1.6% compared with 2021. This was a result of high, volatile prices and shorter supply, particularly in Europe and emerging Asian countries, which led to reduced industrial, commercial and residential consumption. The year-on-year downturn came after gas demand rebounded in 2021 from the historically low levels during the pandemic. Europe's gas market experienced an unprecedented supply shock from the sharp reduction in Russian pipeline gas imports. Already-elevated spot gas prices in Europe rose further under the threat of Russian supply curtailments and the uncertainty about the LNG market's ability to make up the difference. This triggered demand curtailment in Europe's industrial sector. It also caused a slowdown in LNG import purchases in China amid economic weakness and COVID-19 lockdowns. Emerging economies, such as Pakistan and Bangladesh, struggled with the affordability of spot LNG.

European gas prices were turbulent in 2022 as almost all pipeline flows from Russia came to a halt. Exports through Gazprom's pipelines fell from a 2022 peak of just over 300 million cubic metres per day (mcm/d) to about 65 mcm/d in November. On an annual basis, Europe's imports of Russian pipeline gas almost halved. The European benchmark price Title Transfer Facility (TTF) was volatile, breaching $96/MMBtu at its peak. There were also large disconnections in regional European gas hub prices caused by the reconfiguration of supply flows and regasification capacity reaching maximum utilisation rates. This particularly affected the UK's National Balancing Point (NBP) and TTF prices, as well as the price of delivered LNG.

The pricing environment was a catalyst for major demand destruction. The residential and commercial consumer sector shed more than 15% of demand year-on-year, assisted by mild temperatures. The industrial sector is estimated to have lost more demand year-on-year than any period for over a decade. But TTF prices experienced a sharp decline at the end of the third quarter after Russian gas pipeline cuts materialised and gas inventories were built beyond government-mandated levels ahead of time. Europe remained the highest-priced global gas market for 2022 and attracted substantial volumes away from other markets, especially in Asia. Higher LNG exports into Europe, coupled with demand curtailment, made up for the lack of Russian pipeline imports, allowing for a comfortable storage situation by the start of the northern hemisphere winter. European LNG imports increased by about 45 million tonnes with north-west Europe accounting for more than 30 million tonnes of this growth. A migration of floating storage and regasification units (FSRUs) to Europe reduced bottlenecks and increased import capacity, specifically to north-west Europe. The commissioning of the Eemshaven FSRU in the Netherlands in September 2022, and the commissioning of several FSRUs for Germany have set Europe up to be a major LNG importer for years to come.

Asian spot LNG prices, as reflected by the Japan Korea Marker (JKM), traded at a significant discount to European prices for most of 2022, driven largely by lower LNG imports into China. By the end of the year, China had imported about 15 million tonnes less LNG year-on-year, ceding the title of the world's biggest LNG importer back to Japan. South Korea and Japan continued to import LNG despite the high spot prices because of JKM buyers' high concentration of long-term LNG contract volume. Crude-oil-linked contracts were cheaper than JKM prices by an average of 50% in 2022. This was evidenced by the Japan Landed Cost (JLC), which accounts for imported LNG long-term contract and spot prices averaging about $17/MMBtu versus an average of around $33/MMBtu for the spot price of JKM.

Henry Hub gas benchmark prices in North America were volatile throughout the year, ranging from below $4/MMbtu to nearly $10/MMbtu. Henry Hub cash prices averaged $6.39/MMBtu in 2022, reaching a peak of $9.84/MMBtu in August. The rise in the first half of the year was caused by a structurally tighter market and spill-over effects from the higher prices for LNG exports. The decline towards the end of the year was a result of strong production and comfortable storage expectations for the northern hemisphere winter. US LNG export plants consumed an average of 11.81 bcf (billion cubic feet) per day throughout the year, accounting for 12% of US overall production of around 97 bcf per day. This is a 547% increase from five years ago and a 203% increase from the previous five-year average. Strong power demand for gas in the USA and lagging upstream production supported the rise.

Power

Europe: European power prices were turbulent in 2022. In Germany, for example, the average power price in 2022 was $247/MWh, an unprecedented seven times higher than the average price of $37/MWh in the period from 2015 to 2019. Prices increased in the first quarter of the year, peaking in August with spot prices of up to $916/MWh. European power prices are strongly influenced by the power plants dependent on natural gas. Widespread unplanned outages of French nuclear power plants and low hydropower availability also pushed up power prices. The high European power prices have triggered a range of regulatory actions, including revenue caps for inframarginal power generators (generators which do not set marginal prices); national demand reduction goals; and a consultation for market reforms by the European Commission.

United States: US power prices were much higher across all major markets in 2022 compared with 2021. One of the key drivers of higher power prices and volatility in 2022 was gas prices. Henry Hub gas benchmark prices in North America were volatile throughout the year, ranging from below $4/MMbtu to nearly $10/MMbtu. Prices in the second half of the year traded back down to below $4.00/MMBtu as natural gas production steadily increased and the ability to increase storage injections prior to winter picked up. Power prices were also driven higher by weather events throughout the year and across the country. For the eastern part of the USA, cold weather in January led ISO-NE (New England) prices to average around $150/MWh, and a late December cold front led to significantly higher prices in PJM and MISO (Midcontinent) markets. For the ERCOT (Texas) market, a hot July in Texas led to record level demand and North Hub settled at $147/MWh. A heatwave in the western part of the USA in September sent Mid-C (Midcontinent) ISO and CAISO (California) prices to highs of $152/MWh and $118/MWh respectively, and a cold December resulted in even higher prices in Mid-C ($263/MWh) and CAISO ($254/MWh).

Generating shareholder value | Market overview continued

Australia: In 2022, the (East) Australia power market was volatile with spot prices averaging $191/MWh and $151/MWh in the second and third quarter respectively. This was because of unseasonal weather, unplanned outages of coal-fired power plants, and gas and hydropower supply constraints. High international coal and spot LNG prices pushed up domestic gas and coal prices. The gas market spiked to the $21–28 per gigajoule (GJ) range in the second and third quarters after having started the year at $7/GJ (well below international LNG prices). The spike was caused by a significant demand for uncontracted and unforecasted gas with little or no notice. This demand came primarily from the aforementioned power market disruptions, but also arose from the early onset of the Australian winter and a heavy reliance on spot markets by some industrial and power generation end-users. Prices became more moderate as Australia moved out of winter, but remained volatile as the government implemented gas and coal price caps and controls at the wholesale level for 2023 and beyond.

Crude oil and natural gas price assumptions

Our ability to deliver competitive returns and pursue commercial opportunities depends on the accuracy of our price assumptions (see "Risk factors" on page 15). We use a rigorous assessment of short-, medium- and long-term market uncertainties to determine what ranges of future crude oil and natural gas prices to use in project and portfolio evaluations. Market uncertainties include, for example, future economic conditions, geopolitics, actions by major resource holders, production costs, technological progress and the balance of supply and demand.

See also Note 12 to the "Consolidated Financial Statements" on pages 271-274.

Refining margins

Global indicative refining margin [A]

			$/bbl
	2022	2021	2020
Indicative refining margin	18.03	4.79	2.12

[A] The indicative margin is an approximation of Shell's global gross refining unit margin, calculated using price markers from third parties' databases. It is based on a simplified crude and product yield profile at a nominal level of refining performance. The actual margins realised by Shell may vary due to factors including specific local market effects, refinery maintenance, crude diet optimisation as the crudes in the IRM are indicative benchmark crudes, operating decisions and product demand. Gross refining unit margin is defined as the hydrocarbon margin net of purchased/sold utilities, additives and relevant freight costs, divided by crude and feedstock intake in barrels. It is only applicable to the impact of market pricing on refining business performance, excluding trading margin. Prior period comparatives are calculated on the same basis as the current year.

In 2022, gross refining margins improved in comparison with 2021, especially during the first half of the year. Economic recovery and disruption caused by the Russian war in Ukraine led to very strong refining margins, especially during the second quarter. With demand falling in sync with the economic slowdown, refining margins fell towards the end of the year. Weak chemical feedstocks and gasoline demand was partially offset by strong middle distillate demand. Middle distillate demand is supported by continued aviation demand recovery and disruptions to Russian product flows to Europe.

Construction of new capacity continued during the year, especially in the Middle East, Africa and Asia. However, several projects were delayed due to supply chain issues and inflationary cost pressures.

For 2023 and beyond, refining margins are expected to decline as refinery capacity increases and demand growth slows. This would result from weaker economic growth, high energy prices and the tightening of monetary policy by central banks.

Petrochemical margins

Global indicative chemical margin [A]

			$/tonne
	2022	2021	2020
Indicative chemical margin	48.04	216.44	184.55

[A] The Indicative Chemical Margin (ICM) is an approximation of Shell's global chemical margin performance trend (including equity-accounted associates), calculated using price markers from third parties' databases. It is based on a simplified feedstock and product yield profile at a nominal level of plant performance. The actual margins realised by Shell may vary due to factors including specific local market effects, chemicals plants maintenance, optimisation, operating decisions and product demand. Chemical unit margin is defined as the hydrocarbon margin net of purchased/sold utilities, additives and relevant freight costs, divided by a nominal denominator expressed in metric tons. It is only applicable to the impact of market pricing on Chemical business performance.Prior period comparatives are calculated on the same basis as the current year.

Chemical cracker margins came under pressure in 2022. The Russian war in Ukraine caused volatile energy prices, especially in Europe and Asia, leading to lower cracker margins. This has also impacted derivative trade and demand. Macroeconomic factors, including inflation and lower economic growth, further contributed to weaker global demand and lockdown restrictions in China resulted in further demand destruction in Asia. New capacity growth primarily in Asia and the USA led to global oversupply and lower margins. Producers continue to match demand through lower cracker utilisation.

The outlook for petrochemical margins in 2023 and beyond depends on feedstock costs and the balance of supply and demand. Demand for petrochemicals is expected to be affected by energy costs, macroeconomic factors, and any further COVID-19 impacts. A recovery in demand is needed to absorb the excess capacity. The supply of petrochemicals will depend on the net capacity effect of new facilities and plant closures with utilisation balancing the system. Product prices will reflect the prices of raw materials which are closely linked to crude oil and natural gas prices.

The statements in this "Market overview" section, including those related to our price forecasts, are forward-looking statements based on management's current expectations and certain material assumptions and, accordingly, involve risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied herein.

See "About this Report" on page iii and "Risk factors" on page 15.

Generating shareholder value

Integrated Gas

Integrated Gas (IG) includes liquefied natural gas (LNG), conversion of natural gas into gas-to-liquids (GTL) fuels and other products. It includes natural gas and liquids exploration and extraction, and the operation of the upstream and midstream infrastructure necessary to deliver these to market. IG also includes the marketing, trading and optimisation of LNG, including LNG as a fuel for heavy-duty vehicles.

Segment earnings ($ billion)

22.2 2021: 8.1

Adjusted Earnings ($ billion)

16.1 2021: 9.0

Cash flow from operating activities ($ billion)

27.7 2021: 13.2

Production (thousand boe/d)

921 2021: 1,004

LNG liquefaction volumes (million tonnes)

30 2021: 31

LNG sales volumes (million tonnes)

66 2021: 64

Generating shareholder value | Integrated Gas continued

Key statistics [A]

$ million, except where indicated

	2022	2021	2020
Segment earnings/(loss)	22,212	8,060	(7,230)
Including:			
Revenue (including inter-segment sales)	73,163	37,994	25,222
Share of profit of joint ventures and associates	1,219	1,933	612
Interest and other income	(714)	1,596	212
Operating expenses [B]	5,238	4,526	5,100
Underlying operating expenses [B]	4,884	4,295	4,318
Exploration	240	122	616
Depreciation, depletion and amortisation	2,211	5,908	19,314
Taxation charge/(credit)	5,899	2,648	(2,794)
Identified Items [B]	6,075	(988)	(11,443)
Adjusted Earnings [B]	16,137	9,048	4,213
Adjusted EBITDA [B]	26,569	16,754	11,908
Capital expenditure	3,432	3,306	3,491
Cash capital expenditure [B]	4,265	3,502	3,566
Oil and gas production available for sale (thousand boe/d)	921	1,004	1,011
LNG liquefaction volumes (million tonnes)	29.7	31.0	33.2
LNG sales volumes (million tonnes)	66.0	64.2	71.9

[A] With effect from January 1, 2022, our reporting segments are Integrated Gas, Upstream, Marketing, Chemicals and Products, Renewables and Energy Solutions and Corporate. Comparative information has been revised.
[B] See "Non-GAAP measures reconciliations" on pages 362-365.

Business conditions

For the business conditions relevant to Integrated Gas, see "Market overview" on pages 35-37.

Production available for sale

In 2022, our production was 336 million barrels of oil equivalent (boe) or 921 thousand boe per day (boe/d), compared with 366 million boe, or 1,004 thousand boe/d in 2021. Natural gas production was 86% of total production in 2022 and 83% of total production in 2021. In 2022, natural gas production decreased by 5% compared with 2021. This was mainly because of the derecognition of Sakhalin-related volumes and production-sharing contract effects, partly offset by new field ramp-up in Trinidad and Tobago. Liquids production decreased by 25%, driven mainly by derecognition of Sakhalin-related volumes.

LNG liquefaction volumes

LNG liquefaction volumes were 29.7 million tonnes in 2022, compared with 31.0 million tonnes in 2021. The decrease was mainly a result of the derecognition of Sakhalin-related volumes, and lower feedgas supply, partly offset by lower maintenance.

LNG sales volumes were 66.0 million tonnes in 2022 compared with 64.2 million tonnes in 2021. This increase was mainly a result of higher purchases from third parties and trading and optimisation opportunities.

Through our trading organisation, we market and sell a portion of our share of equity production of LNG together with third-party LNG through our hubs in the UK, UAE and Singapore. Shell has term sales contracts for the majority of our LNG liquefaction and term purchase contracts. We are able to optimise the income we generate from our LNG cargoes through our shipping network, regasification terminals and ability to purchase and deliver LNG spot cargoes from third parties. For example, if one customer does not need a scheduled cargo, we can deliver it to another customer who does need it. Similarly, if a customer needs an additional cargo not available from our production facilities, we contract with third parties to deliver the additional cargo. We conduct paper trades, primarily to manage commodity price risk related to sales and purchase contracts. We also sell LNG for trucks in China, Singapore and Europe.

Generating shareholder value | Integrated Gas continued

Integrated gas data table

LNG liquefaction volumes

Million tonnes

	2022	2021	2020
Australia	13.2	13.1	11.8
Brunei	1.2	1.4	1.6
Egypt	0.5	0.3	0.2
Nigeria	3.6	4.3	5.3
Oman	2.8	2.5	2.5
Peru	0.8	0.6	0.9
Qatar	2.4	2.4	2.4
Russia	0.9	2.8	3.1
Trinidad and Tobago	4.3	3.6	5.4
Other	–	–	0.2
Total	29.7	31.0	33.2

Earnings 2022-2021

Segment earnings in 2022 were $22,212 million, compared with $8,060 million in 2021. The increase was mainly driven by the combined effect of higher realised prices and contributions from trading and optimisation, and gains related to the fair value accounting of commodity derivatives. This was partly offset by lower volumes and higher operating expenses.

Full year segment earnings included identified items of $6,075 million which comprised gains of $6,273 million due to the fair value accounting of commodity derivatives and net impairment reversals of $779 million, partly offset by other impacts of $608 million, which mainly comprised loan write-downs, and charges of $387 million due to provisions for onerous contracts. The full year 2021 Identified Items were a loss of $988 million and included losses of $1,423 million due to the fair value accounting of commodity derivatives and impairment charges of $395 million, partly offset by gains of $1,097 million related to the sale of assets.

Earnings 2021-2020

Segment earnings in 2021 were $8,060 million, compared with a loss of $7,230 million in 2020. The increase was mainly driven by higher realised prices for oil, LNG and gas, favourable tax movements and higher volumes.

Full year 2021 segment earnings included Identified Items of $988 million loss which comprised losses of $1,423 million due to the fair value accounting of commodity derivatives and impairment charges of $395 million, partly offset by gains of $1,097 million related to the sale of assets. Full year 2020 Identified Items were $11,443 million loss, which included impairment charges of $10,152 million mainly reflecting revisions to mid- and long-term price outlook assumptions and primarily related to the Queensland Curtis LNG and Prelude floating liquefied natural gas (FLNG) operations in Australia and unconventional assets in North America. It also comprised a net charge of $880 million because of the fair value accounting of commodity derivatives and a charge of $607 million related to onerous contract provisions.

Cash capital expenditure

Cash capital expenditure in 2022 was $4,265 million, compared with $3,502 million in 2021. The increase was mainly due to investment in the North Field East expansion project in Qatar. Our cash capital expenditure is expected to be around $5 billion in 2023.

Portfolio and business development

Key portfolio events included the following:

- Shell announced in the first quarter 2022 its intent to withdraw from its ventures in Russia with Gazprom and related entities, and to end its involvement in the Nord Stream 2 pipeline project. See Note 6 on pages 262-264 for the actions we have taken since these announcements and for the impact on the consolidated financial statements.
- In March 2022, we produced first gas from Block 22 and NCMA-4 in the North Coast Marine Area in Trinidad and Tobago.
- In May 2022, Shell Australia Pty Ltd and its joint-venture partner, SGH Energy, took a final investment decision to approve the development of the Crux natural gas field, off the coast of Western Australia, which will be processed through the Prelude FLNG facility.
- In July 2022, QatarEnergy selected us to participate in the North Field East (NFE) expansion project in Qatar. In December 2022 QatarEnergy and Shell closed the transaction resulting in Shell purchasing 25% of the shareholding in a joint venture (JV) which owns a 25% interest in the overall NFE project. Thus, Shell's ownership of NFE via its JV shareholding is 6.25%.
- In October 2022, we were also selected as a partner in the North Field South (NFS) project (Shell interest 9.375%). Shell participation in the NFS project remains subject to clearance of remaining customary conditions precedent.

Generating shareholder value | Integrated Gas continued

Business and property

Integrated Gas

A complete list of LNG and GTL plants in operation and under construction in which we have an interest is provided below.

LNG liquefaction plants in operation at December 31, 2022 [A]

	Asset	Location	Shell interest (%)	100% capacity (mtpa) [B]	Shell-operated
Asia					
Brunei	Brunei LNG	Lumut	25	7.6	No
Oman	Oman LNG	Sur	30	7.1	No
	Qalhat LNG [C]	Sur	11	3.7	No
Qatar	Qatargas 4 [D]	Ras Laffan	30	7.8	No
Oceania					
Australia	Australia North West Shelf [D]	Karratha	16.7	16.9	No
	Gorgon LNG [D]	Barrow Island	25	15.6	No
	Prelude [D]	Browse Basin	67.5	3.6	Yes
	Queensland Curtis LNG T1 [D]	Curtis Island	50	4.3	Yes
	Queensland Curtis LNG T2 [D]	Curtis Island	97.5	4.3	Yes
Africa					
Egypt [E]	Egyptian LNG T1	Idku	35.5	3.6	No
	Egyptian LNG T2	Idku	38	3.6	No
Nigeria	Nigeria LNG	Bonny	25.6	24.1	No
South America					
Peru	Peru LNG	Pampa Melchorita	20	4.5	No
Trinidad and Tobago	Atlantic LNG T1	Point Fortin	46	3	No
	Atlantic LNG T2/T3	Point Fortin	57.5	6.6	No
	Atlantic LNG T4	Point Fortin	51.1	5.2	No

[A] We have offtake rights via a lease to 100% of the capacity (2.5 mtpa) of the Kinder Morgan-operated Elba Island liquefaction plant in Georgia, USA.
[B] 100% capacity represents the total capacity that all trains can process as reported by the operator.
[C] The interest is held via an indirect shareholding through Oman LNG.
[D] These assets are clustered as integrated assets and have onshore or offshore upstream production.
[E] In January 2014, force majeure notices were issued under the LNG agreements as a result of domestic gas diversions severely restricting volumes available to the Egyptian LNG (ELNG) plant. These notices remain in place.

LNG liquefaction plants under construction at December 31, 2022

	Asset	Location	Shell interest (%)	100% capacity (mtpa) [A]	Shell-operated
Africa					
Nigeria	Train 7 [B]	Bonny	25.6	7.6	No
North America					
Canada	LNG Canada T1-2 [C]	Kitimat	40.0	14.0	No
Asia					
Qatar	NFE JV [D]	Ras Laffan	25.0	8.0	No

[A] 100% capacity represents the total capacity that all trains are expected to process as reported by the operator.
[B] First LNG is expected around the middle of the 2020s.
[C] Construction started in October 2018 and first LNG is expected around the middle of the 2020s.
[D] Shell holds 25% in the joint venture, which in turn owns 25% of the North Field East expansion project, which has a nameplate capacity of 32 million tonnes per annum. First LNG is expected later in the 2020s.

GTL plants in operation at December 31, 2022

	Asset	Location	Shell interest (%)	100% capacity (b/d) [A]	Shell-operated
Asia					
Malaysia	Shell MDS	Bintulu	72.0	14,700	Yes
Qatar	Pearl	Ras Laffan	100.0	140,000	Yes

[A] 100% capacity represents the total capacity of the plant.

We also have interests and rights in the regasification terminals listed below. Extension of leases or rights beyond the periods mentioned below will be reviewed on a case-by-case basis.

Generating shareholder value | Integrated Gas continued

LNG regasification terminals

Project name	Location	Shell capacity rights (mtpa)	Capacity rights period	Shell interest (%) and rights
Costa Azul	Baja California, Mexico	2.7	2008–2028	Capacity rights
Cove Point	Lusby, MD, USA	1.8	2003–2023	Capacity rights
Dragon LNG	Milford Haven, UK	3.1	2009–2029	50
Eemshaven	Groningen, the Netherlands	3.1	2022–2027	Capacity rights
Elba Island	Elba Island, GA, USA	4.6	2003–2027	Leased
Elba Island	Elba Island, GA, USA	2.8	2006–2036	Leased
Elba Island Expansion	Elba Island, GA, USA	4.2	2010–2035	Leased
GATE (Gas Access to Europe)	Rotterdam, the Netherlands	1.5	2015–2031	Capacity rights
Lake Charles	Lake Charles, LA, USA	4.4	2002–2030	Leased
Lake Charles Expansion	Lake Charles, LA, USA	8.7	2005–2030	Leased
Singapore SGM	SLNG, Singapore	[A]	2013–2029	Import rights
Singapore SETL	SLNG, Singapore	[A]	2018–2035	Import rights
Singapore SETL	SLNG, Singapore	up to 1.0 [B]	2021–2025	Import rights
Shell Energy India Pvt Ltd (formerly Hazira)	Gujarat, India	5	2005–2035	100
Shell LNG Gibraltar	Gibraltar	up to 0.04	2018–2038	51

[A] Licences to import LNG and sell regasified LNG in Singapore with no volume cap.
[B] Exclusive licence to import LNG and sell regasified LNG in Singapore for up to 1.0 mtpa.

Colibri gas for LNG export and domestic use in Trinidad and Tobago

In 2022, we produced gas for the first time from the Shell-operated Colibri project in Trinidad and Tobago. Most of Colibri's gas is exported as liquefied natural gas (LNG). Gas will also be used in the country's petrochemical sector and to generate electricity for the country.

The final investment decision on Colibri was taken in March 2020. The team continued to implement the project and first gas was reached in March 2022, despite termination of operations by a key supplier. We delivered safely, within budget and ahead of schedule.

Colibri is expected to reach about 250 million standard cubic feet of gas per day at peak production through a series of four subsea gas wells. The wells are tied back to the existing Poinsettia platform in the North Coast Marine Area (NCMA).

Shell seeks to provide more affordable, reliable, and cleaner energy to our customers. While the vast majority of Colibri's gas will be exported, about 25% will be supplied to Trinidad and Tobago's National Gas Company (NGC), which will deliver it to the local power utility, Trinidad & Tobago Electricity Commission, to power homes and businesses. The NGC also supplies gas to petrochemicals plants in Trinidad, a major exporter of ammonia and methanol.

Photo: Seven Borealis pipelay vessel adjacent to the Poinsettia production facility conducting pipelay activities for the Colibri project.

Generating shareholder value | Integrated Gas continued

Oil and natural gas production, exploration and development

Australia

We operate the Queensland Curtis LNG (QCLNG) venture's natural gas operations, including wells, compression stations and processing plants, in Queensland's Surat Basin. We have interests ranging from 44% to 74% in 25 field compression stations and six central processing plants. Our production of natural gas from the onshore Surat Basin supplies the QCLNG liquefaction plant and the domestic gas market.

We have a 50% interest in Arrow, a Queensland-based joint venture with China National Petroleum Corporation (CNPC). Arrow owns coalbed methane assets and a domestic power business.

In addition, Shell has interests in offshore production, LNG liquefaction and exploration licences in the Browse Basin and in the North West Shelf (NWS) and Greater Gorgon areas of the Carnarvon Basin. Woodside is the operator on behalf of the NWS joint venture (Shell interest 16.7%). We have a 25% interest in the Chevron-operated Gorgon LNG joint venture that includes offshore production.

In the Browse Basin, Shell is the operator for the Prelude field (Shell interest 67.5%); the Crux gas and condensate development field (Shell interest 84.5%), where a final investment decision was taken in May 2022; and other backfill projects for Prelude FLNG.

We are also a partner in the Browse joint arrangement (Shell interest 27%) covering the Brecknock, Calliance and Torosa gas fields, which are under development and operated by Woodside.

Barbados

In 2022, we farmed into two exploration blocks (Shell interest 40%), where our partner is the operator.

Bolivia

We hold a 37.5% participating interest in the Caipipendi block where we produce and deliver natural gas to domestic and export markets. We also have a 25% interest in the Tarija XX West block where we produce from the Itaú field.

In 2022, we exited the Iñiguazu exploration block (operated by Repsol) where we held a 15% participating interest.

Canada

In Canada, we produce and market natural gas, natural gas liquids and condensate. We hold mineral acres, primarily in the Montney play in British Colombia and Alberta. We operate four natural gas processing area facilities at our Groundbirch asset in British Colombia.

China

We develop and produce from the onshore Changbei tight-gas field under a production-sharing contract (PSC) with CNPC.

Colombia

We have 50% interests in three blocks that we operate, and 60% interests in two other deep-water blocks where Chevron is the operator.

Egypt

We have a 25% interest in the Burullus Gas Company (Burullus) joint venture, which operates the West Delta Deep Marine concession (Shell interest 50%) and supplies gas to the domestic market and the Egyptian LNG plant. We have a 50% interest in the Rashid Petroleum Company (Rashpetco) joint venture, which operates the Rosetta concession (Shell interest 100%). We have a 30% interest in the El Burg Offshore Company (EBOC) joint venture, which operates the El Burg offshore concession (Shell interest 60%).

We have participating interests in several exploration concessions in the Nile Delta, the wider East Mediterranean and the Red Sea.

Indonesia

We have a 35% interest in the INPEX Masela Ltd joint venture, which owns and operates the offshore Masela block.

Oman

We have a concession to develop and produce natural gas from Block 10 (Shell interest 53.45%). We also have a separate gas sales agreement for gas produced from the block. In September 2022, Shell and its partners signed an exploration and production-sharing agreement with the government of Oman for the exploration, evaluation and development of natural gas resources and condensate in Block 11 (Shell interest 67.5%).

Qatar

We operate the Pearl GTL plant (Shell interest 100%) in Qatar under a development and production-sharing contract with the government. The fully integrated facility has the capacity to produce, process and transport 1.6 billion standard cubic feet per day (scf/d) of gas from Qatar's North Field.

We have a 30% interest in Qatargas 4, which comprises integrated facilities to produce around 1.4 billion scf/d of gas from Qatar's North Field, an onshore gas-processing facility. In July 2022, QatarEnergy selected us to participate in the North Field East (NFE) expansion project in Qatar. In December 2022, QatarEnergy and Shell closed the transaction resulting in Shell purchasing 25% of the shareholding in a joint venture (JV) which owns a 25% interest in the overall NFE project. Thus, Shell's ownership of NFE via its JV shareholding is 6.25%. In October 2022, we were also selected as a partner in the North Field South project (Shell interest 9.375%). Shell participation in the North Field South project remains subject to clearance of remaining customary conditions precedent.

Russia

Shell announced in the first quarter 2022 its intent to withdraw from its ventures in Russia with Gazprom and related entities, and to end its involvement in the Nord Stream 2 pipeline project.

See Note 6, which is incorporated by reference into the Strategic Report, on pages 262-264 for the actions we have taken since these announcements and for the impact on the consolidated financial statements.

Tanzania

We operate and have a 60% interest in Blocks 1 and 4 off the coast of southern Tanzania under a production-sharing agreement with the government of Tanzania that expires in 2024.

Trinidad and Tobago

We have interests in three concessions with producing fields: Central Block (Shell interest 65%), North Coast Marine Area (Shell interest 80.5%), and East Coast Marine Area (Shell interest 100%). In 2022, production started on Block 22 (Shell interest 90%) and NCMA-4 (Shell interest 80%) in the North Coast Marine Area.

Our interests range from 35% to 100% in exploration Blocks 5(d), 5(c)REA, 6(d), and Atlantic Area Block 5.

Turkey

In 2022 we released our exploration licence in the Western Black Sea.

Generating shareholder value

Upstream

Upstream explores for and extracts crude oil, natural gas and natural gas liquids. It also markets and transports oil and gas, and operates the infrastructure necessary to deliver them to the market. Shell's Upstream business delivers reliable energy from conventional oil and gas operations, as well as deep-water exploration and production activities. We are focusing our Upstream portfolio to become more resilient, prioritising value over volume to provide the energy the world needs today whilst funding the energy system of tomorrow.

Segment earnings ($ billion)

16.2 2021: 9.6

Adjusted Earnings ($ billion)

17.3 2021: 8.0

Cash flow from operating activities ($ billion)

29.6 2021: 21.6

Production (thousand boe/d)

1,897 2021: 2,178

Generating shareholder value | Upstream continued

Key statistics [A]

	$ million, except where indicated		
	2022	2021	2020
Segment earnings/(loss)	16,222	9,603	(9,300)
Including:			
Revenue (including inter-segment sales)	60,637	44,971	27,763
Share of profit of joint ventures and associates	2,111	632	(7)
Interest and other income	726	4,592	541
Operating expenses [B]	10,364	10,324	10,650
Underlying operating expenses [B]	10,802	10,086	9,894
Exploration	1,472	1,301	1,131
Depreciation, depletion and amortisation	10,334	13,485	21,079
Taxation charge/(credit)	14,070	6,057	(103)
Identified Items [B]	(1,096)	1,587	(6,874)
Adjusted Earnings [B]	17,319	8,015	(2,426)
Adjusted EBITDA [B]	42,100	27,170	13,045
Capital expenditure	8,020	6,277	6,714
Cash capital expenditure [B]	8,143	6,168	7,099
Oil and gas production available for sale (thousand boe/d)	1,897	2,178	2,324

[A] With effect from January 1, 2022, our reporting segments are Integrated Gas, Upstream, Marketing, Chemicals and Products, Renewables and Energy Solutions and Corporate. Comparative information has been revised.
[B] See "Non-GAAP measures reconciliations" on pages 362-365.

Business conditions

For the business conditions relevant to Upstream, see "Market overview" on pages 35-37.

Production available for sale

In 2022, production was 692 million barrels of oil equivalent (boe), or 1,897 thousand boe per day (boe/d), compared with 795 million boe, or 2,178 thousand boe/d in 2021. Liquids production decreased by 12% and natural gas production decreased by 15%, compared with 2021.

Total production, compared with 2021, decreased as a result of divestments and scheduled maintenance. The impact of field decline was more than offset by growth from new fields.

Controllable availability of 84.7% was driven mainly by unscheduled deferments in Nigeria (Forcados Oil terminal repairs), extended turnarounds and reliability in the UK (Pierce FPSO, Shearwater and Gannet).

Earnings 2022-2021

Upstream earnings in 2022 were $16,222 million, compared with $9,603 million in 2021. The increase was mainly driven by higher realised oil and gas prices and a gain related to storage and working gas transfer effects and impairment reversals. This was partly offset by lower volumes, mainly as a result of divestments, and charges related to the EU solidarity contribution and UK Energy Profits Levy.

Full year 2022 segment earnings included a gain from net impairment reversals of $853 million and charges of $1,385 million relating to EU solidarity contributions and $802 million relating to the UK Energy Profits Levy. These gains and losses are part of identified items and compare with the full year 2021, which included a net gain of $3,261 million related to the sale of assets (mainly related to the sale of the Permian business in the USA), partly offset by impairment charges of $633 million, losses of $393 million for the fair value accounting of commodity derivatives, and legal provisions of $287 million.

Adjusted Earnings and Adjusted EBITDA were driven by the same factors as the segment earnings and adjusted for identified items.

Earnings 2021-2020

Upstream earnings in 2021 were a profit of $9,603 million, compared with a loss of $9,300 million in 2020. Earnings were helped by higher oil and gas prices, mainly driven by the improved macroeconomic conditions and the one-off release of a tax provision in Nigeria and lower depreciation, partly offset by lower production volumes.

Full year 2021 segment earnings included a net gain of $3,261 million related to the sale of assets (mainly related to the sale of the Permian business in the USA), partly offset by impairment charges of $633 million, losses of $393 million for the fair value accounting of commodity derivatives, and legal provisions of $287 million. These gains and losses are part of identified items, and compare with the full year 2020 segment earnings which included a net charge of $5,387 million related to impairments, primarily in the US Gulf of Mexico, unconventional assets in North America, offshore assets in Brazil and Europe, and a project in Nigeria (OPL245), mainly triggered by revision of Shell's mid- and long-term commodity price and updated Appomattox subsurface understanding. Also included was a net charge of $782 million related to the impact of the weakening Brazilian real on a deferred tax position.

Adjusted Earnings and Adjusted EBITDA were driven by the same factors as the segment earnings and adjusted for identified items.

Cash capital expenditure

Cash capital expenditure in 2022 was $8.1 billion, compared with $6.2 billion in 2021. The increased expenditure in 2022 was mainly a result of the Brazil Atapu Transfer of Rights and a ramp-up in projects, partially offset by the slippage of activities across the portfolio and divestments. Our cash capital expenditure is expected to be around $8 billion in 2023.

Portfolio and business development

We took the following key portfolio decisions during 2022:

- In Brazil, in April 2022, we signed a production-sharing contract (PSC) to formally acquire a 25% stake in the Atapu Field.

Generating shareholder value | Upstream continued

- In Brazil, in May 2022, we started production at the FPSO Guanabara in the Mero field, in the offshore Santos Basin.
- In Malaysia, in September 2022, together with PETRONAS Carigali Sdn Bhd, we took the final investment decision (FID) to develop the Rosmari-Marjoram gas project.
- In the UK, in July 2022, we took the final investment decision (FID) to develop the Jackdaw North Sea gas field.
- In the US Gulf of Mexico, in March 2022, we started the production at PowerNap, a subsea development.
- In the US Gulf of Mexico, in February 2023, we started production at Vito, a Shell-operated floating production facility.

We continued to divest assets during 2022, including:
- In Malaysia, in December 2022, we agreed to sell our stake in two offshore production sharing contracts (PSCs) in the Baram Delta to Petroleum Sarawak Exploration & Production Sdn. Bhd. ("PSEP"). The sale concerns non-operated interests of 40% in the Amended 2011 Baram Delta EOR PSC and 50% in the SK 307 PSC. The remaining interests in both PSCs are held by the operator, PETRONAS Carigali Sdn Bhd ("PCSB"). Sale completion is expected in 2023.
- In the Philippines, in November 2022, we sold our 100% shareholding in Shell Philippines Exploration B.V. (SPEX) to Malampaya Energy XP Pte Ltd (MEXP), a subsidiary of Prime Infrastructure Capital Inc (Prime Infra).
- In the USA, in February 2023, we sold our 100% interest in Shell Onshore Ventures LLC, which holds a 51.8% membership interest in Aera Energy LLC to IKAV.

Shell announced in the first quarter of 2022 its intent to withdraw from its ventures in Russia with Gazprom and related entities.

See Note 6, which is incorporated by reference into the Strategic Report, on pages 262-264 for the actions we have taken since these announcements and for the impact on the consolidated financial statements.

Business and property

Our subsidiaries, joint ventures and associates are involved in all aspects of upstream activities, including land tenure, entitlement to produced hydrocarbons, production rates, royalties, pricing, environmental protection, social impact, exports, taxes and foreign exchange.

The conditions of the leases, licences and contracts under which oil and gas interests are held vary from country to country. In almost all cases outside North America, legal agreements are generally granted by, or entered into with, a government, state-owned company, government-run oil and gas company or agency. The exploration risk usually rests with the independent oil and gas company. In North America, these agreements may also be with private parties that own mineral rights. Of these agreements, the following are most relevant to our interests:
- Licences (or concessions), which entitle the holder to explore for hydrocarbons and exploit any commercial discoveries. Under a licence, the holder bears the risk of exploration, development and production activities, and is responsible for financing these activities. In principle, the licence holder is entitled to the totality of production less any royalties in kind. The government, state-owned company or government-run oil and gas company may sometimes enter into a joint arrangement as a participant, sharing the rights and obligations of the licence but usually without sharing the exploration risk. In a few cases, the state-owned company, government-run oil and gas company or agency has an option to purchase a certain share of production.
- Lease agreements, which are typically used in North America and are usually governed by terms similar to licences. Participants may include governments or private entities. Royalties are either paid in cash or in kind.
- Production-sharing contracts (PSCs) entered into with a government, state-owned company or government-run oil and gas company. PSCs generally oblige the independent oil and gas company, as contractor, to provide all the financing and bear the risk of exploration, development and production activities in exchange for a share of the production. Usually, this share consists of a fixed or variable part that is reserved for the recovery of the contractor's cost (cost oil). The remaining production is split with the government, state-owned company or government-run oil and gas company on a fixed or volume/revenue-dependent basis. In some cases, the government, state-owned company or government-run oil and gas company will participate in the rights and obligations of the contractor and will share in the costs of development and production. Such participation can be across the venture or on a field-by-field basis. Additionally, as the price of oil or gas increases above certain predetermined levels, the independent oil and gas company's entitlement share of production normally decreases, and vice versa. Accordingly, its interest in a project may not be the same as its entitlement.

Europe

Germany

Shell and ExxonMobil are 50:50 shareholders of BEB Erdgas und Erdoel GmbH & Co. KG (BEB) which owns interests in various concessions mainly in Lower Saxony. ExxonMobil Production Deutschland GmbH has a service contract with BEB under which it provides operating services to BEB for most of the concessions.

Italy

Shell has a 39% interest in the Val d'Agri producing concession, operated by ENI S.p.A.

We also have a 25% interest in the Tempa Rossa producing concession, operated by TotalEnergies EP Italia S.p.A.

Netherlands

Shell and ExxonMobil are 50:50 shareholders in Nederlandse Aardolie Maatschappij B.V. (NAM). NAM holds a 60% interest in the onshore low-calorific Groningen gas field (the remaining 40% interest is held by EBN, a Dutch government entity), the Schoonebeek oil field and some 25 smaller hydrocarbon production licences.

Production from the Groningen field induces earthquakes which have led to damage claims, security concerns, a strengthening operation to make buildings earthquake resistant and calls from residents and local politicians to close the field.

Since 2013, the Dutch government has set the annual production and capacity target for the Groningen field which for the gas year 2022-2023 (ending October 1, 2023) was set at 2.8 billion cubic metres. For 2021-2022 the production level was set at 4.5 billion cubic metres.

In June 2018, NAM's shareholders and the Dutch government signed a heads of agreement (HoA) to reduce and eventually stop production from the Groningen field, and to ensure the financial robustness of NAM to fulfil its obligations. Pursuant to this HoA no dividend is expected for 2022 as dividend payments can only be made if a solvency ratio of 25% is reached and maintained.

In September 2018, detailed agreements were signed to further implement the HoA. As part of these agreements, Shell has guaranteed 50% of NAM's 60% share of earthquake-related costs for damage claims and the strengthening of buildings. Whilst the Dutch government has responsibility for issuing production instructions for annual Groningen production and has set up public entities for settling damage claims and strengthening buildings, NAM remains liable to pay for damage caused by earthquakes and strengthening required to comply with the safety norm. Under the terms of the HoA, it was agreed that the Dutch government would pass on to NAM costs insofar

Generating shareholder value | Upstream continued

as the costs corresponded to NAM's liability. In 2022, NAM started arbitrations with the Dutch government to have its financial liability determined for costs which the Dutch government compensated to claimants and subsequently charged to NAM.

In September 2019, the Dutch government announced that the reduction of Groningen production would be accelerated and that production would cease in 2022, eight years earlier than planned in the HoA. This has been revised to 2023 or 2024, provided that certain conditions are met, including the timely start-up of a new nitrogen plant, sufficient reduction in demand for low-cal gas, usage of NAM's underground gas storages (UGS) in Grijpskerk and Norg, and sufficient supply of high-cal gas. Compensation payments are made by the government to NAM for the revised usage of the Norg UGS. Discussions continue between the Dutch government and NAM shareholders regarding the compensation payable by the Dutch government to NAM in order to give effect to the terms of the HoA.

The parliamentary enquiry into the production of gas from Groningen and the subsequent effects of the earthquakes moved into the public hearings phase in 2022 and the final report was published on February 24, 2023.

On October 26, 2021, NAM announced that it would split up its non-Groningen assets into several new legal entities, with the intent to divest those legal entities.

Norway
Shell is a partner in 20 production licences on the Norwegian continental shelf, and the operator of eight of these. We have interests in two gas-producing fields: Shell-operated Ormen Lange (Shell interest 17.8%) and Equinor-operated Troll (Shell interest 8.1%). In 2022, a plan for development and operation was submitted for government approval for the Equinor-operated gas discovery Irpa (Shell interest 10%), as a tie-back to the Aasta Hansteen field. We are also the operator of two fields which are being decommissioned: Knarr (which ceased production in 2022) and Gaupe. In addition, we are the technical service provider for the Gassco-operated Nyhamna processing plant.

UK
Shell operates a number of interests on the UK continental shelf under 50:50 joint-venture agreements with Neo Energy and has a 50:50 joint venture agreement with ExxonMobil for the SEGAL gas transportation system; the Brent Field, which is being decommissioned; and other assets in the North Sea. Shell also has non-operated positions in the West of Shetland area, namely Clair (Shell interest 27.97%) and Schiehallion (Shell interest 44.89%), both operated by BP.

In May 2022, the UK's Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) approved the revised environmental statement for the Jackdaw gas field development and gave production consent in June 2022. In July, Greenpeace applied for a judicial review of the Regulator's decision. The application has, at Greenpeace's request, been put on hold pending the decision by the UK Supreme Court on another case which concerns similar legal issues, and which will likely be heard in the second half of 2023. If the hold on Greenpeace's judicial review application is lifted, we currently believe there is a relatively low risk of disruption to the Jackdaw project, in terms of delays and/or changes to the project. The project is expected to come on stream in the mid-2020s.

In 2022, Shell drilled five exploration wells on the UK continental shelf.

From April 2022, Shell assumed the role of technical development lead for the CO_2 capture, transportation and storage modules of the Acorn carbon capture, utilisation and storage (CCUS) and hydrogen project. Acorn is part of the Scottish Cluster, which continues to be the Track 1 reserve cluster in the UK government's CCUS cluster sequencing process. This means that if another cluster selected as Track 1 is discontinued the Scottish Cluster may take its place.

In November 2022, Shell completed the acquisition of a 100% interest in Corallian Energy Limited. The interest comprises the P.2596 licence containing the Victory field gas discovery west of Shetland which is expected to be a subsea tie-back to existing infrastructure tied into the Shetland Gas Plant. Gas would be exported via existing pipelines to the North Sea Midstream Partners operated plant at St Fergus, helping to ensure longer-term gas supply for the UK.

Decommissioning of the Heather A platform and Curlew floating production, storage and offloading (FPSO) asset continued in 2022. Production from Brent Charlie ceased in the first quarter of 2021 and topsides preparations are ongoing in readiness for the lift, removal and recycling of the facilities. OPRED continues to assess the Brent Field decommissioning programme, which pertains to the Brent gravity-based substructures.

Rest of Europe
Shell also has interests in Albania.

Asia (including the Middle East and Russia)
Brunei
Shell and the Brunei government are 50:50 shareholders in Brunei Shell Petroleum Company Sendirian Berhad (BSP). BSP has long-term onshore and offshore oil and gas concession rights and sells most of its gas production to Brunei LNG Sendirian Berhad, with the remainder sold in the domestic market.

See "Integrated Gas" on pages 38-43.

In addition to our interest in BSP, we have a non-operating interest in the offshore Block B concession (Shell interest 35%, operated by TotalEnergies), where gas and condensate are produced from the Maharaja Lela field.

We have a non-operating interest in a gas holding area for deep-water Block CA2 (Shell interest 12.5%, operated by Petronas), under a PSC.

We operate the deep-water Block CA1 (Shell interest 86.95%), in which the Jagus-East field is located, under a PSC. As referred to in the Malaysia section below, the Jagus-East field and the Geronggong field, held by BSP, form part of the unitised GKGJE field.

Iraq
Shell has a 44% interest in the Basrah Gas Company, which gathers, treats and processes associated gas that was previously being flared from the Rumaila, West Qurna 1 and Zubair fields. The processed gas and associated products, such as condensate and LPG, are sold to the domestic market. Any surplus condensate and LPG is exported.

Kazakhstan
Shell is the joint operator with ENI S.p.A. of the onshore Karachaganak oil and condensate field (Shell interest 29.3%). The Karachaganak field is in north-west Kazakhstan and covers an area of more than 280 square kilometres.

We also have an interest in the North Caspian Sea Production Sharing Agreement (Shell interest 16.8%) which includes the Kashagan field in the Kazakh sector of the Caspian Sea. The North Caspian Operating Company is the operator. This shallow-water field covers an area of around 3,400 square kilometres.

Generating shareholder value | Upstream continued

We have a 7.4% interest in the Caspian Pipeline Consortium which owns and operates an oil pipeline running from the Caspian Sea to the Black Sea, across parts of Kazakhstan and Russia. We hold our interest in the Caspian Pipeline Consortium via three legal entities, two of which are wholly owned by Shell, and the other is a joint venture with Rosneft (Shell interest 49%), Rosneft-Shell Caspian Ventures Ltd (Cyprus) (RSCV), which was formed in 1996 to primarily own and manage pipeline capacity rights. We continue to manage that part of our interest in CPC held through RSCV in full compliance with applicable laws.

Malaysia

Shell explores for and produces oil and gas off the coast of Sabah and Sarawak under 21 PSCs, in which our interests range from 20% to 92.5%.

Offshore Sabah

- We operate two producing oil fields: (i) the Malikai deep-water field (Shell interest 35%), and (ii) the unitised GKGJE field consisting of the Malaysian Gumusut and Kakap fields and the Bruneian Geronggong and Jagus-East fields that straddle the Malaysia-Brunei border and have been made into a single unit. Shell's interest in the unitised field is 37.89%. In June 2022, we took the final investment decision on the GKGJE Phase 4 oil development project. In July 2022, we achieved first oil for the Phase 3 development.
- In March 2022, we signed two new exploration PSCs for Block 2W and X (Shell interest 50% each).
- In our non-operated portfolio:
  - We have a 21% interest in the Siakap North-Petai deep-water field and a 30% interest in the Kebabangan field.
  - In October 2022, we signed a new exploration PSC for Block SB 2K (Shell interest 25.1%).
  - In February 2023, we completed the farm-in to one exploration PSC for Block SB2V (Shell interest 40%).

Offshore Sarawak

- We are the operator of eight producing gas fields and one producing oil and gas field. Nearly all the gas produced offshore Sarawak is supplied to Malaysia LNG (MLNG) and to our gas-to-liquids plant in Bintulu. The fields are:
  - gas fields F6, F23, E8, F13 East and F13 West under the MLNG PSC (Shell interest 40%);
  - gas fields F14 and F28 under the SK308 PSC (Shell interest 50%);
  - gas field Gorek under the SK408 PSC (Shell Interest 30%); and
  - oil and gas field E6 under the SK308 PSC (Shell interest 50%).

See "Integrated Gas" on pages 38-43.

- We are also the operator for Block SK318 PSC. This block contains the Timi field (Shell interest 75%) which is under development, and the Rosmari-Marjoram fields (Shell interest 80%). In September 2022, together with PETRONAS Carigali Sdn Bhd, we took the final investment decision to develop the Rosmari-Marjoram natural gas project. Situated around 220 kilometres off the coast of Bintulu, the project comprises a remotely operated offshore platform and onshore gas plant. Rosmari-Marjoram will mainly be powered by renewable energy from solar power offshore and hydroelectric power onshore.
- In November 2022, we progressed with the execution of the MLNG F22, F27, Selasih (FaS) project, which comprises a single well development in each of the F22, F27 and Selasih fields to be drilled from the wellhead platforms with tie-backs to the F23 hub.
- In March 2022, we signed one new exploration PSC for Block SK439 and SK440 (Shell interest 92.5%). In February 2023, we signed one new PSC for Block SK3B (Shell interest 45%).
- In our non-operated portfolio:
  - First gas was achieved for SK320 (Shell interest 20%) in April 2022.

Using renewables to produce gas in Malaysia

In 2022, we took the final investment decision to develop the Rosmari-Marjoram gas production project in Malaysia. The project will be mainly powered by renewable energy, using solar power for its remotely operated offshore platform and hydroelectric power for its onshore gas plant.

Rosmari-Marjoram is designed to produce 800 million standard cubic feet of gas per day and is expected to start production in 2026. The project will include one of the longest gas offshore pipelines in the world, stretching more than 200 kilometres from the field to the coast of Sarawak. Once production starts, the gas will be piped to the Malaysia liquefied natural gas (Malaysia LNG) complex.

Rosmari-Marjoram will help Shell deliver a reliable supply of gas and do this while reducing the emissions from our operations. This is in line with our Powering Progress energy transition strategy to become a net-zero business by 2050.

The project team has demonstrated ingenuity and applied a learner mindset to the design, evolving the project from a conventional offshore processing platform to a carbon-competitive onshore gas plant. Shell focuses on seeking the highest return from investments within the lowest possible carbon emissions budget.

Rosmari-Marjoram's offshore platform will use power from 240 solar panels and the onshore plant is connected to the Sarawak grid system, which is supplied mainly by hydroelectric plants. Batteries and diesel generators will be held in reserve as back-up to ensure the safety of our operations.

Photo: The Rosmari-Marjoram gas project will feed the Bintulu LNG export plant in Sarawak, Malaysia.

Generating shareholder value | Upstream continued

- We have a 30% interest in Jerun which is part of the Block SK408 PSC. Jerun is a gas development with an integrated central processing platform. Block SK408 also contains the producing non-Shell-operated Larak and Bakong fields.
- We also have a 40% interest in the amended 2011 Baram Delta enhanced oil recovery PSC and a 50% interest in the SK307 PSC. In December 2022, Shell signed an agreement to sell its non-operated interests in these two PSCs to Petroleum Sarawak Exploration and Production Sdn Bhd (PSEP), effective January 1, 2023. The sale is expected to be completed in early 2023, subject to completion of conditions which include, amongst others, regulatory approval.

Oman

Shell has a 34% interest in Petroleum Development Oman (PDO), which operates the Block 6 oil concession. Shell is entitled to 34% of oil produced from Block 6 through its interest in Private Oil Holdings Oman Ltd. The government of Oman has a 60% interest in PDO and the Block 6 oil concession through its 100% owned company, Energy Development Oman (EDO). PDO operates a concession area of about 90,000 square kilometres and has more than 200 producing oil fields.

We have a 50% interest in Block 42 under an Exploration and Production Sharing Agreement (EPSA) where Shell is the operator. The other 50% interest is held by the government through its 100% owned company, OQ. We have a 100% interest in Block 55 under an EPSA.

Russia

Shell announced in the first quarter of 2022 its intent to withdraw from its ventures in Russia with Gazprom and related entities.

See Note 6, which is incorporated by reference into the Strategic Report, on pages 262-264 for the actions we have taken since these announcements and for the impact on the "Consolidated Financial Statements".

Syria

Shell holds a 65% interest in Syria Shell Petroleum Development B.V. (SSPD), a joint venture between Shell and the China National Petroleum Corporation. SSPD holds a 31.25% interest in Al Furat Petroleum Company, a Syrian joint stock company, whose role was to perform petroleum operations. Shell also holds a 70% interest in two exploration licences via Shell South Syria Exploration B.V. In December 2011, in compliance with international sanctions on Syria, including European Council Decision 2011/782/CFSP, Shell suspended all exploration and production activities in Syria. SSPD continued to fulfil minimum contractual obligations towards the Syrian finance and labour ministries, in compliance with applicable trade control laws. In 2022, as part of the minimum contractual obligations, payments for taxes related to salary and social security amounted to $1,400.

Rest of Middle East and Asia

Shell also has interests in Kuwait and the United Arab Emirates.

On November 1, 2022, Shell Petroleum N.V. completed the sale of its 100% shareholding in Shell Philippines Exploration B.V. (SPEX) to Malampaya Energy XP Pte Ltd, a subsidiary of Prime Infrastructure Capital Inc (Prime Infra). SPEX owns a 45% operating interest and is operator in Service Contract 38, which includes the Malampaya gas field. The sale completion transferred ownership and control of SPEX to Prime Infra.

Africa

Nigeria

Shell operates a number of interests in onshore and offshore oil exploration and production assets in Nigeria.

Onshore

The Shell Petroleum Development Company of Nigeria Limited (SPDC) is the operator of the SPDC joint venture (SPDC JV, Shell interest 30%) which, after the handover of its operations in OML 11 in 2022, has 15 Niger Delta onshore oil mining leases (OMLs).

SPDC also has three shallow-water oil mining leases (OML 74, 77 and 79) and a 40% interest in the non-operated Sunlink joint venture which has one shallow-water lease (OML 144).

In 2021, we announced our intention to reduce our involvement in onshore oil production in Nigeria, in line with our Powering Progress strategy.

Offshore

Our main offshore deep-water activities are carried out by Shell Nigeria Exploration and Production Company Limited (SNEPCo, Shell interest 100%). SNEPCo has interests in three deep-water blocks that are under PSC terms: the producing assets Bonga (OML 118) and Erha (OML 133), and the non-producing asset Bolia Chota (OML 135). SNEPCo operates OML 118 (Shell interest 55%), including the Bonga field FPSO vessel. We also operate OML 135, encompassing the Bolia and Doro fields (Shell interest 55%). We have a 43.8% non-operating interest in OML 133 (including the Erha FPSO).

In 2022, OML 118 and OML 133 were renewed for 20 years following settlement of disputes regarding historic allocation of production between Nigerian National Petroleum Corporation (NNPC) and the parties to the PSCs.

Authorities are investigating our involvement in Nigerian oil Block OPL 245 and the 2011 settlement of litigation pertaining to that block.

See Note 31 to the "Consolidated Financial Statements" on pages 303-305.

Business update

In August 2021, the Petroleum Industry Act (PIA) entered into effect, creating a new regulatory framework for the petroleum industry in Nigeria. The PIA introduces significant changes and we are actively engaged in the implementation process to ensure that these changes are implemented in a timely manner in our operations.

In 2022, our share of production, onshore and offshore, in Nigeria was 131 thousand boe/d, compared with 175 thousand boe/d in 2021. Security issues, sabotage and crude oil theft in the Niger Delta continued and remained significant challenges to our onshore operations in 2022, leading to a significant reduction of crude available for export from the Bonny terminal for several months. We will continue to monitor the situation closely and evaluate implications for the integrity of our infrastructure and the sustainability of our current operations. We continue to put the safety of our employees and contractors first.

In our Nigerian operations, we face various risks and adverse conditions which could have a significant adverse effect on our operational performance, earnings, cash flows and financial condition.

See "Risk factors" on page 20.

There are limitations to the extent to which we can mitigate these risks. We liaise with host communities, and governmental and non-governmental organisations to help promote peaceful and safe operations for our people and local communities. We carry out regular portfolio assessments so we can maintain our long-term competitiveness in Nigeria. We support the Nigerian government's efforts to improve the efficiency, functionality and domestic benefits of Nigeria's oil and gas industry. We monitor legislative developments and the security situation. We continue to be transparent about how we manage and

Generating shareholder value | Upstream continued

report spills, and how we respond to spills. We implement a maintenance strategy to support sustainable equipment reliability and have begun a multi-year programme to reduce routine flaring of associated gas.

See "Our Journey to net zero" on pages 78-105.

Rest of Africa

Shell also has interests in Algeria, Mauritania, Namibia, Sao Tome and Principe, South Africa and Tunisia.

In 2021, Shell announced plans to hand back to the government of Tunisia upstream assets associated with the Miskar and Hasdrubal concessions. In 2022, Shell handed back the Miskar concession upon its expiry. Discussions continue regarding the Hasdrubal hand-back.

North America

Canada

Shales assets in Canada are now reported as part of the Integrated Gas segment instead of the Upstream segment.

See "Integrated Gas" on pages 38-43.

USA

The majority of our oil and gas interests in the USA comprise leases for federal offshore tracts in the deep waters of the Gulf of Mexico. Such leases usually have a fixed primary term and, once production is established, the leases remain in effect through continued production, subject to compliance with the terms and provisions of the leases (including appurtenant applicable laws and regulations).

In February 2023, we sold our 100% interest in Shell Onshore Ventures LLC, which holds a 51.8% membership interest in Aera Energy LLC to IKAV.

Shell holds one licence interest in the North Slope area of Alaska. In 2020, we received regulatory approval to combine our near-shore leases in West Harrison Bay into a single unit. Shell is currently seeking a co-owner to operate the unit.

Gulf of Mexico

Shell's major production area in the USA is the Gulf of Mexico. We have a total of 327 active federal offshore leases where Shell is the operator and an additional 103 active federal offshore leases where Shell has a non-operated interest.

We are the operator of eight production hubs: Mars (Shell interests ranging from 33.7% to 100%), Olympus (Shell interests ranging from 71.5% to 100%), Auger (Shell interests ranging from 27.5% to 100%), Perdido (Shell interests ranging from 33.3% to 40%), Ursa (Shell interests ranging from 40% to 80%), Enchilada/Salsa (Shell interests ranging from 37.5% to 75%), Appomattox (Shell interest 79%) and Stones (Shell interest 100%). We also have the West Delta 143 processing facilities (Shell interest 71.5%).

We continue to produce from Coulomb (Shell interest 100%) which ties into the Na Kika platform (Shell interest 50%) operated by BP.

We continued exploration, development and abandonment activities in the Gulf of Mexico in 2022.

In March 2022, we began production at PowerNap (Shell interest 100%), a subsea tie-back to the Shell-operated Olympus tension leg platform (Shell interest 71.5%) in the Mars Corridor. PowerNap is expected to produce up to 20,000 barrels of oil equivalent per day (boe/d) at peak rates.

Vito - delivering value with a smaller, less costly design

Upstream seeks to deliver more value for shareholders by producing oil and gas more cost competitively, while striving for lower carbon emissions. Shell has more than 40 years of deep-water experience and we are constantly learning.

We planned a new Shell-operated deep-water platform for the Gulf of Mexico, Vito (Shell interest 63.1%), and then redesigned it to be simpler and more cost-efficient. The result: a platform a third of its original planned size at 70% less cost. The Vito team rose to the challenge and achieved first production in February 2023. Peak production is estimated at 100,000 barrels of oil equivalent per day.

Vito's simplified hull design reduces operating expenses since it requires less maintenance. Its simplified mooring design requires less equipment, less capital investment and reduces safety exposures to operators. By limiting the topside scope to a weight less than 9,000 tonnes, this new design focused on being less complex to operate and less expensive to build.

Vito has not only delivered shareholder value but will also pave the way for other deep-water developments through innovation and simplification. Our Shell-operated Whale project (Shell interest 60%), also in the Gulf of Mexico and approved in 2021, will follow suit and replicate much of Vito's smaller, more cost-effective design.

Photo: In July 2022, our latest deep-water project, Vito, set sail from Ingleside, Texas to go out for installation in the US Gulf of Mexico.

Generating shareholder value | Upstream continued

Together with our partner, China National Offshore Oil Corporation (CNOOC), we have reached a final investment decision (FID) on Rydberg (Shell interest 80%). It is a subsea tie-back to the Shell-operated Appomattox production hub (Shell interest 79%). The project is expected to start production in 2024 and produce up to 16,000 barrels of oil equivalent per day (boe/d) at peak rates.

In June 2022, we acquired a 51% operated interest from Equinor in the North Platte deep-water development project. To reflect Shell's entry to the project, Shell and Equinor have agreed to rename the North Platte opportunity to Sparta. Front-end engineering and design (FEED) has been well matured, and Shell is working closely with Equinor to progress the opportunity.

In February 2023, we began production at the Shell-operated Vito floating production facility (Shell interest 63.1%). Vito is expected to produce up to 100,000 barrels of oil equivalent per day (boe/d) at peak rates. We also made progress on the development of Whale (Shell interest 60%), which is a Shell-operated stand-alone host in the execution phase, expected to achieve first oil in late 2024.

The 2022 Atlantic hurricane season did not have a material impact on production at our Gulf of Mexico assets.

Rest of North America
Shell also has deep-water licences and one shallow-water licence in Mexico.

South America
Argentina
Shell has interests in the onshore Vaca Muerta Basin in the Neuquén Province. We are the operator of the Cruz de Lorena, Sierras Blancas and Coiron Amargo Sur Oeste (Shell interest 90% each), and Bajada de Añelo (Shell interest 50%) areas. We have non-operated interests in the areas of Rincon La Ceniza and La Escalonada (Shell interest 45% each), both operated by Total Austral S.A., and in the Bandurria Sur area (Shell interest 30%), operated by YPF S.A. We are the operator of a joint venture created for the construction of a pipeline which connects Sierras Blancas and the regional distribution network (Shell interest 60%).

In the north-western Argentina basin, we have a non-operated interest in the onshore Acambuco area (Shell interest 22.5%), operated by Pan American Energy.

In addition to the producing interests, we are the operator of two frontier exploration areas offshore Argentina (Shell interest 60% each) and we have a non-operated interest in an adjacent area (Shell interest 30%), operated by Equinor.

Brazil
Shell's operated assets in Brazil consist of the Bijupirá and Salema fields (Shell interest 80% each), which are being decommissioned; the producing BC-10 field (Shell interest 50%) in the Campos Basin; the Gato do Mato and the adjacent Sul de Gato do Mato areas in the Santos Basin (Shell interest 50%), subject to unitisation and with development options under evaluation. We also hold an interest in 13 exploration blocks in the Santos Basin (Shell interests ranging from 45% to 100%), 10 blocks in the Barreirinhas Basin (Shell interests ranging from 50% to 100%), four blocks in the Campos Basin (Shell interests ranging from 40% to 100%) and one block in the Potiguar Basin (Shell interest 100%).

Our non-operated portfolio consists of eight producing fields in the offshore Santos Basin: the Sapinhoá field (Shell interest 30%, operated by Petrobras and straddling the BM-S-9 and Entorno de Sapinhoá blocks already unitised); the Lapa field (Shell interest 30% in Block BM-S-9A, operated by TotalEnergies); the Berbigão and Sururu fields (Shell interest 25% in Block BM-S-11A, operated by Petrobras and subject to ongoing unitisation agreement discussions); the Atapu field (Shell interest 16.7% and straddling the BM-S-11A and Atapu PSC area already unitised); the Tupi field (Shell interest 23%, already unitised, in Block BM-S-11 and operated by Petrobras); the Iracema field (Shell interest 25% in Block BM-S-11 and operated by Petrobras); and the Mero field in the Libra PSC area (Shell interest 20%, unitisation with an adjoining area still subject to government approval and operated by Petrobras).

In addition to the producing assets, we hold interests in four non-operated exploration blocks, two in the Santos Basin (Shell interest of 20% and 40%, both operated by Petrobras) and two in the Potiguar Basin (Shell interest 40%, both operated by Petrobras).

The FPSO Guanabara production started in the Mero field in April 2022, offshore Santos Basin. Mero is expected to receive three more FPSOs and start producing from these between 2023 and 2025.

In April 2022, we signed the PSC related to the acquisition of 25% of Atapu Transfer of Rights area (acquired in the ANP bid round in 2021) and increasing Shell's interest in the Atapu field from 4.3% to 16.7%.

In December 2022, Shell placed a successful bid in the ANP's Permanent Offer PSC bid round for the acquisition of 40% of the Sudoeste de Sagitário block in the Santos Basin and is awaiting ratification.

Rest of South America
Shell also has interests in Suriname and Uruguay.

Trading and supply

Shell markets and trades crude oil from most of its Upstream operations.

Generating shareholder value

Oil and gas information

Proved developed and undeveloped reserves of Shell subsidiaries and Shell share of joint ventures and associates

	Crude oil and natural gas liquids (million barrels)	Synthetic crude oil (million barrels)	Natural gas (thousand million scf)	Total (million boe)[A]
Shell subsidiaries				
Increase/(decrease) in 2022:				
Revisions and reclassifications	137	(25)	(31)	107
Improved recovery	32	–	–	32
Extensions and discoveries	61	–	1,270	280
Purchases and sales of minerals in place	66	240	662	420
Total before taking production into account	296	215	1,901	839
Production [B]	(504)	(17)	(2,648)	(978)
Total	(208)	198	(747)	(139)
At January 1, 2022	3,820	533	23,795	8,456
At December 31, 2022	3,612	731	23,048	8,317
Shell share of joint ventures and associates				
Increase/(decrease) in 2022:				
Revisions and reclassifications	(25)	–	(733)	(152)
Improved recovery	–	–	–	–
Extensions and discoveries	4	–	80	18
Purchases and sales of minerals in place	159	–	2,549	599
Total before taking production into account	138	–	1,896	465
Production [C]	(29)	–	(486)	(113)
Total	109	–	1,410	352
At January 1, 2022	228	–	3,949	909
At December 31, 2022	337	–	5,359	1,261
Total	–	–	–	–
Increase/(decrease) before taking production into account	434	215	3,797	1,304
Production	(533)	(17)	(3,134)	(1,091)
Increase/(decrease)	(99)	198	663	213
At January 1, 2022	4,048	533	27,744	9,365
At December 31, 2022	3,949	731	28,407	9,578
Reserves attributable to non-controlling interest in Shell subsidiaries at December 31, 2022	–	365	–	365

[A] Natural gas volumes are converted into oil equivalent using a factor of 5,800 standard cubic feet (scf) per barrel.
[B] Included 40 million boe consumed in operations (natural gas: 228 thousand million scf; synthetic crude oil: 1 million barrels).
[C] Included 5 million boe consumed in operations (natural gas: 31 thousand million scf).

Generating shareholder value | Oil and gas information continued

Proved reserves

The proved oil and gas reserves of Shell subsidiaries and the Shell share of the proved oil and gas reserves of joint ventures and associates are set out in more detail in "Supplementary Information – Oil and Gas (unaudited)" on pages 308-326.

Before taking production into account, our proved reserves increased by 1,304 million boe in 2022. This consisted of an increase of 839 million boe from Shell subsidiaries and an increase of 465 million boe from the Shell share of joint ventures and associates. After taking production into account, our proved reserves increased by 213 million boe in 2022 to 9,578 million boe at December 31, 2022.

Shell subsidiaries

Before taking production into account, Shell subsidiaries' proved reserves increased by 839 million boe in 2022. This consisted of an increase of 296 million barrels of crude oil and natural gas liquids, an increase of 328 million boe (1,901 thousand million scf) of natural gas and an increase of 215 million barrels of synthetic crude oil. The 839 million boe increase is the net effect of a net increase of 107 million boe from revisions and reclassifications, an increase of 280 million boe from extensions and discoveries, an increase of 32 million boe from improved recovery, and a net increase of 420 million boe related to purchases and sales of minerals in place.

After taking into account production of 978 million boe (of which 40 million boe were consumed in operations), Shell subsidiaries' proved reserves decreased by 139 million boe in 2022 to 8,317 million boe. In 2022, Shell's subsidiaries proved developed reserves (PD) decreased by 519 million boe to 6,221 million boe and proved undeveloped reserves (PUD) increased by 380 million boe to 2,096 million boe.

Shell share of joint ventures and associates

Before taking production into account, the Shell share of joint ventures and associates' proved reserves increased by 465 million boe in 2022. This consisted of an increase of 138 million barrels of crude oil and natural gas liquids and an increase of 327 million boe (1,896 thousand million scf) of natural gas. The 465 million boe increase comprised a net decrease of 152 million boe from revisions and reclassifications, an increase of 18 million boe from extensions and discoveries and an increase of 599 million boe from purchase of minerals in place.

After taking into account production of 113 million boe (of which 5 million boe were consumed in operations), the Shell share of joint ventures and associates' proved reserves increased by 352 million boe to 1,261 million boe at December 31, 2022.

The Shell share of joint ventures and associates' proved developed reserves (PD) decreased by 193 million boe to 608 million boe, and proved undeveloped reserves (PUD) increased by 545 million boe to 653 million boe.

For further information, see "Supplementary Information - oil and gas (unaudited)" on pages 308-326.

Proved undeveloped reserves

In 2022, Shell subsidiaries and the Shell share of joint ventures and associates' PUD increased by 925 million boe to 2,749 million boe. There were decreases of 331 million boe as a result of maturation to PD, mainly 39 million boe in Mero (Brazil), 31 million boe in Pierce (UK), and 261 million boe spread across other fields. This was a decrease of 116 million boe as a result of revisions, reclassifications and entitlement changes, which were mainly because of the de-recognition of reserves in Russia and de-maturation of some PUD wells in British Columbia, Canada, after regulator authorisations were suspended in 2022. These were offset by an increase of 301 million as a result of de-maturation of PD to PUD, mainly due to 262 million boe in Kashagan (Kazakhstan), where a new slug catcher needs to be installed, an increase of 32 million boe due to improved recovery, a net increase of 741 million boe due to purchases and sales of minerals in place and a net increase of 298 million boe due to extensions and discoveries, mainly due to 102 million boe in Crux (Australia), 78 million boe in Marjoram (Malaysia), and 118 million boe spread across other fields.

In addition to the maturation of 331 million boe from PUD to PD, 126 million boe was matured to PD from contingent resources through PUD as a result of project execution during the year.

PUD held for five years or more (PUD5+) at December 31, 2022, amounted to 156 million boe, a decrease of 82 million boe compared with the end of 2021. The decrease in PUD5+ during 2022 was driven mainly by changes in Lunskoye (Russia) and Kolo Creek (Nigeria).

The fields with the largest PUD5+ on December 31, 2022, were Gorgon (Australia) and Tupi (Brazil). These PUD5+ remain undeveloped because of the complexity and scale of the project (Australia) or because ongoing development requires the ongoing drilling of additional wells (Brazil).

During 2022, we spent $5.8 billion on development activities related to PUD maturation.

Delivery commitments

We sell crude oil and natural gas from our producing operations under a variety of contractual obligations. Most contracts generally commit us to sell quantities based on production from specified properties, although some natural gas sales contracts specify delivery of fixed and determinable quantities, as discussed below.

In the past three years, we met our contractual delivery commitments, with the notable exceptions of Egypt, Trinidad and Tobago, and Malaysia. In the period 2023-2025, we are contractually committed to deliver to third parties, joint ventures and associates a total of 5,870 billion scf of natural gas from our subsidiaries, joint ventures and associates. The sales contracts contain a mixture of fixed and variable pricing formulae that are generally referenced to the prevailing market price for crude oil, natural gas or other petroleum products at the time of delivery.

In the period 2023-2025, we expect to meet our delivery commitments for almost all the areas in which they are carried, with an estimated 71% coming from PD, 5% through the delivery of gas that becomes available to us from paying royalties in cash, and 24% from the development of PUD as well as other new projects and purchases. The key exceptions are:

- In Egypt, the expected shortfall of 491 billion scf (85% of the promised gas delivery) for the 2023-2025 period is mainly caused by the performance of the West Delta Deep Marine fields being insufficient to meet the committed quantities to ELNG. If the government divert more gas to the domestic market, this would increase the shortfall.
- In Trinidad and Tobago (North Coast Marine Area), we expect to cover 77% of our delivery commitments from existing developed resource volumes and new projects, resulting in an expected true shortfall of some 62 billion scf.
- In Malaysia, one of the third-party gas supply lines which was under maintenance has not been repaired during 2022. Force majeure has been declared, and no penalties have been incurred, resulting in an expected true shortfall of some 77 billion scf (64% of the promised gas delivery).

Generating shareholder value | Oil and gas information continued

Summary of proved oil and gas reserves of Shell subsidiaries and Shell share of joint ventures and associates (at December 31, 2022)

Based on average prices for 2022

	Crude oil and natural gas liquids (million barrels)	Natural gas (thousand million scf)	Synthetic crude oil (million barrels)	Total (million boe)[A]
Proved developed				
Europe	143	2,635	–	597
Asia	1,153	8,959	–	2,698
Oceania	73	4,240	–	804
Africa	187	984	–	356
North America				
USA	356	275	–	404
Canada	3	712	731	857
South America	838	1,589	–	1,113
Total proved developed	2,753	19,394	731	6,829
Proved undeveloped				
Europe	52	424	–	125
Asia	585	5,127	–	1,469
Oceania	33	1,878	–	356
Africa	31	857	–	179
North America				
USA	187	246	–	229
Canada	1	244	–	43
South America	307	237	–	348
Total proved undeveloped	1,196	9,013	–	2,749
Total proved developed and undeveloped				
Europe	195	3,059	–	722
Asia	1,738	14,086	–	4,167
Oceania	106	6,118	–	1,160
Africa	218	1,841	–	535
North America				
USA	543	521	–	633
Canada	4	956	731	900
South America	1,145	1,826	–	1,461
Total	3,949	28,407	731	9,578
Reserves attributable to non-controlling interest in Shell subsidiaries			365	365

[A] Natural gas volumes are converted into oil equivalent using a factor of 5,800 scf per barrel.

Generating shareholder value | Oil and gas information continued

Exploration

Shell's exploration team searches for crude oil and gas, both onshore and offshore. Exploration may result in discoveries of oil and gas that we can develop, helping maintain energy security and contributing to our Powering Progress strategy.

In 2022, producible hydrocarbons were encountered in Malaysia, the UK and the Gulf of Mexico. Hydrocarbons were also encountered in Namibia and further appraisal is being undertaken to determine producibility.

Gulf of Mexico

In 2022, Shell acquired 20 blocks in the Gulf of Mexico in Lease Sale 257. We relinquished a lease for one block ahead of expiration.

Brazil

In 2022, the Brazilian government ratified 11 Santos Basin blocks. Shell secured five blocks in the 2021 17th National Petroleum Agency Bid-Round and the remaining six in the 2022 3rd Permanent Offer Concession Bid-Round (Shell interest 70% in seven of them, 100% in the remaining four, operator in all cases). We also secured one Santos block in 2022 1st Production Sharing Permanent Offer Bid-Round in Brazil (Shell interest 40%, non-operated), which is awaiting government ratification.

Malaysia

In 2022, Shell relinquished one non-operated Sabah block (Shell interest 50%). We signed three exploration PSCs for the offshore Sarawak and Sabah blocks (Shell interest 92.5% in two Sarawak blocks, 50% in two Sabah blocks, operator). We also signed an exploration PSC for another non-operated Sabah block (Shell interest 25.1%).

UK

In 2022, Shell farmed into three exploration licences in the UK's southern North Sea area (Shell interest 50%, non-operated).

New frontiers

In June 2022, Shell secured two blocks in the Open Uruguay Round, which are awaiting government ratification (Shell interest 100%, operator).

In September 2022, we took over an additional 50% participating interest in two operated blocks offshore Sao Tome and Principe, after the withdrawal of a partner, giving us a total interest of 85% in both blocks.

In December 2022, we completed the farm-out of a 45% non-operated participating interest in a deep-water exploration licence off the Western Cape of South Africa.

For further information, see "Supplementary Information - oil and gas (unaudited)" on pages 308-326.

Location of oil and gas exploration and production activities

Location of oil and gas exploration and production activities [A] (at December 31, 2022)

	Exploration	Development and/or Production	Shell operator [B]
Europe			
Albania	●	●	●
Cyprus		●	
Germany		●	
Italy		●	
Netherlands	●	●	●
Norway	●	●	●
UK	●	●	●
Asia			
Brunei	●	●	●
China		●	●
Indonesia		●	
Kazakhstan		●	
Malaysia	●	●	●
Oman	●	●	●
Qatar		●	●
Oceania			
Australia	●	●	●
Africa			
Egypt	●	●	●
Mauritania	●		●
Namibia	●		●
Nigeria	●	●	●
Sao Tome and Principe	●		●
South Africa	●		●
Tanzania		●	●
Tunisia		●	●
North America			
Mexico	●		●
USA	●	●	●
Canada	●	●	●
South America			
Argentina	●	●	●
Barbados	●		
Bolivia		●	
Brazil	●	●	●
Colombia	●	●	●
Suriname	●		●
Trinidad and Tobago	●	●	●
Uruguay	●		●

[A] Includes joint ventures and associates. Where a joint venture or an associate has properties outside its base country, those properties are not shown in this table.
[B] In several countries where "Shell operator" is indicated, Shell is the operator of some but not all exploration and/or production ventures.

Generating shareholder value | Oil and gas information continued

Oil and gas production available for sale

Crude oil and natural gas liquids [A]

Thousand barrels

	2022		2021		2020	
	Shell subsidiaries	Shell share of joint ventures and associates	Shell subsidiaries	Shell share of joint ventures and associates	Shell subsidiaries	Shell share of joint ventures and associates
Europe						
Italy	9,091	–	9,677	–	11,342	–
UK	23,905	–	25,554	–	30,061	–
Other [B]	3,722	621	5,456	1,205	7,523	1,084
Total Europe	36,718	621	40,687	1,205	48,926	1,084
Asia						
Brunei	3,256	16,282	1,076	17,894	387	17,094
Kazakhstan	29,667	–	35,592	–	37,769	–
Malaysia	16,759	–	17,983	–	18,494	–
Oman	82,006	–	78,745	–	74,854	–
Russia	10,955	1,963	21,012	7,769	20,816	9,050
Other [B]	24,965	7,498	30,061	7,548	30,101	7,629
Total Asia	167,608	25,743	184,469	33,211	182,421	33,773
Total Oceania [B]	9,391	–	11,844	–	7,416	–
Africa						
Nigeria	27,554	–	35,911	–	48,620	–
Other [B]	1,855	–	5,540	–	8,485	–
Total Africa	29,409	–	41,451	–	57,105	–
North America						
USA	121,690	–	164,811	–	165,169	–
Canada	687	–	2,640	–	8,128	–
Total North America	122,377	–	167,451	–	173,297	–
South America						
Argentina	9,023	2,587	4,836	1,566	3,371	729
Brazil	127,862	–	126,566	–	131,339	–
Other [B]	1,583	–	1,620	–	1,701	–
Total South America	138,468	2,587	133,022	1,566	136,411	729
Total	503,971	28,951	578,924	35,982	605,576	35,586

[A] Reflects 100% of production of subsidiaries except in respect of production-sharing contracts (PSCs), where the figures shown represent the entitlement of the subsidiaries concerned under those contracts.
[B] Comprises countries where production was lower than 10,100 thousand barrels or where specific disclosures are prohibited.

Synthetic crude oil

Thousand barrels

	2022	2021	2020
	Shell subsidiaries	Shell subsidiaries	Shell subsidiaries
North America - Canada	16,949	19,891	18,920

Generating shareholder value | Oil and gas information continued

Natural gas [A]

Million standard cubic feet

	2022		2021		2020	
	Shell subsidiaries	Shell share of joint ventures and associates	Shell subsidiaries	Shell share of joint ventures and associates	Shell subsidiaries	Shell share of joint ventures and associates
Europe						
Netherlands	–	133,210	–	159,107	–	131,648
Norway	174,523	–	178,577	–	187,627	–
UK	69,647	–	49,128	–	65,012	–
Other [B]	45,159	–	47,127	–	48,923	–
Total Europe	289,329	133,210	274,832	159,107	301,562	131,648
Asia						
Brunei	15,328	138,007	17,989	147,865	21,025	159,846
China	56,008	–	55,967	–	46,750	–
Kazakhstan	57,932	–	72,176	–	86,999	–
Malaysia	200,249	–	193,871	–	226,791	–
Russia	2,085	37,897	4,113	125,973	4,301	142,418
Other [B]	378,313	118,435	447,743	118,397	452,528	118,153
Total Asia	709,915	294,339	791,859	392,235	838,394	420,417
Oceania						
Australia	693,293	22,577	696,562	19,272	633,580	20,646
Total Oceania	693,293	22,577	696,562	19,272	633,580	20,646
Africa						
Egypt	49,618	–	86,348	–	104,946	–
Nigeria	118,032	–	161,916	–	190,982	–
Other [B]	11,966	–	23,473	–	27,438	–
Total Africa	179,616	–	271,737	–	323,366	–
North America						
USA	112,560	–	198,578	–	255,383	–
Canada	122,753	–	116,423	–	164,451	–
Total North America	235,313	–	315,001	–	419,834	–
South America						
Bolivia	40,360	–	45,214	–	45,015	–
Brazil	73,975	–	72,107	–	73,914	–
Trinidad and Tobago	186,150	–	121,411	–	141,576	–
Other [B]	12,912	2,227	11,006	393	9,609	830
Total South America	313,397	2,227	249,738	393	270,114	830
Total	2,420,863	452,353	2,599,729	571,007	2,786,850	573,541

[A] Reflects 100% of production of subsidiaries except in respect of PSCs, where the figures shown represent the entitlement of the subsidiaries concerned under those contracts.
[B] Comprises countries where production was lower than 41,795 million scf or where specific disclosures are prohibited.

Generating shareholder value | Oil and gas information continued

Average realised price by geographical area

Crude oil and natural gas liquids

$/barrel

	2022		2021		2020	
	Shell subsidiaries	Shell share of joint ventures and associates	Shell subsidiaries	Shell share of joint ventures and associates	Shell subsidiaries	Shell share of joint ventures and associates
Europe	94.52	91.26	68.30	64.18	39.51	39.05
Asia	88.69	100.81	63.82	70.09	38.73	42.51
Oceania	78.37	–	63.56	–	21.29	–
Africa	104.84	–	70.89	–	41.23	–
North America - USA	92.89	–	62.75	–	34.17	–
North America - Canada	62.10	–	46.58	–	27.17	–
South America	85.84	71.21	64.28	56.91	36.01	37.28
Total	90.06	97.80	64.28	69.34	36.72	42.31

Synthetic crude oil

$/barrel

	2022	2021	2020
	Shell subsidiaries	Shell subsidiaries	Shell subsidiaries
North America - Canada	86.93	60.11	31.13

Natural gas

$/thousand scf

	2022		2021		2020	
	Shell subsidiaries	Shell share of joint ventures and associates	Shell subsidiaries	Shell share of joint ventures and associates	Shell subsidiaries	Shell share of joint ventures and associates
Europe	27.24	26.87	10.71	9.86	3.66	3.76
Asia	3.74	10.88	2.54	6.91	1.88 [A]	4.19
Oceania	13.21	6.75	7.74	4.04	5.95 [A]	3.15
Africa	7.08	–	3.43	–	2.55	–
North America - USA	8.46	–	4.40	–	1.72	–
North America - Canada	4.08	–	2.70	–	1.61	–
South America	8.71	3.90	4.04	1.82	1.35	1.90
Total	10.88	14.56	5.39	7.60	2.99 [A]	4.06

[A] As revised, following a reassessment.

Generating shareholder value | Oil and gas information continued

Average production cost by geographical area

Crude oil, natural gas liquids and natural gas [A]

$/boe

	2022		2021		2020	
	Shell subsidiaries	Shell share of joint ventures and associates	Shell subsidiaries	Shell share of joint ventures and associates	Shell subsidiaries	Shell share of joint ventures and associates
Europe	24.83	12.25	21.48	8.59	20.05	11.44
Asia	6.75	8.06	5.66	7.64	5.54	6.83
Oceania	10.32	24.97	9.26	24.68	8.92	20.23
Africa	13.66	–	11.47	–	9.43	–
North America - USA	11.03	–	10.88	–	12.50	–
North America - Canada	11.15	–	10.64	–	10.52	–
South America	6.91	7.74	5.80	5.51	5.18	9.18
Total	10.20	9.59	9.12	8.23	9.10	8.02

[A] Natural gas volumes are converted into oil equivalent using a factor of 5,800 scf per barrel.

Synthetic crude oil

$/barrel

	2022	2021	2020
	Shell subsidiaries	Shell subsidiaries	Shell subsidiaries
North America - Canada	23.05	18.87	18.28

Generating shareholder value

Marketing

Marketing comprises Mobility, Lubricants, and Sectors and Decarbonisation activities. Mobility operates Shell's retail network, including electric vehicle charging services. Lubricants produces, markets and sells lubricants for road transport, and for machinery used in manufacturing, mining, power generation, agriculture and construction. Sectors and Decarbonisation sells fuels, and speciality products and services, including energy solutions that help customers reduce emissions in the aviation, marine, commercial road transport and agricultural sectors, among others.

Segment earnings ($ billion)

2.1 2021: 3.5

Adjusted Earnings ($ billion)

2.8 2021: 3.5

Cash flow from operating activities ($ billion)

2.4 2021: 5.0

Marketing sales volumes (thousand b/d)

2,503 2021: 2,433

Generating shareholder value | Marketing continued

Key statistics [A]

$ million, except where indicated

	2022	2021	2020
Segment earnings [B]	2,133	3,535	4,081
Including:			
Revenue (including inter-segment sales)	121,243	83,748	55,997
Share of profit of joint ventures and associates	237	385	491
Interest and other income	(104)	278	143
Operating expenses [C]	8,384	7,501	6,305
Underlying operating expenses [C]	8,281	7,366	6,161
Depreciation, depletion and amortisation	1,900	1,700	1,499
Taxation charge/(credit)	903	903	846
Identified Items [C]	(622)	68	13
Adjusted Earnings [C]	2,754	3,468	4,068
Adjusted EBITDA (CCS basis) [C]	5,324	6,021	6,455
Capital expenditure	4,527	2,122	1,684
Cash capital expenditure [C]	4,831	2,273	1,774
Marketing sales volumes (thousand b/d)	2,503	2,433	2,276

[A] With effect from January 1, 2022, our reporting segments are Integrated Gas, Upstream, Marketing, Chemicals and Products, Renewables and Energy Solutions and Corporate. Comparative information has been revised.
[B] See Note 8 to the "Consolidated Financial Statements" on pages 265-269. Segment earnings are presented on a current cost of supplies basis.
[C] See "Non-GAAP measures reconciliations" on pages 362-365.

Business conditions

For the business conditions relevant to Marketing, see "Market overview" on pages 35-37.

Marketing sales

In 2022, Marketing sales volumes were 2,503 thousand barrels of oil per day (TBL/day), which was 3% higher than 2021 sales volumes of 2,433 TBL/day mainly as a result of demand recovery in aviation (within Sectors and Decarbonisation).

Earnings 2022-2021

Segment earnings in 2022 of $2,133 million were 40% lower than in 2021. This was driven by higher operating expenses($704 million) partly offset by higher marketing margins ($171 million).

Segment earnings in 2022 included a net charge of $622 million, comprising:

- impairment charges of $321 million (mainly related to withdrawal from Russian oil and gas activities);
- net loss from sale of assets of $135 million (mainly related to the withdrawal from Russian oil and gas activities, partly offset by a gain on the revaluation of the existing 50% share of the Texas Petroleum Group following the acquisition of the remaining 50% share); and
- provisions for onerous contracts of $62 million.

These net losses are part of identified items and compare with 2021 which included a net gain of $68 million as follows:

- net gain from disposal of assets of $290 million (mainly related to the dilution of interest in the Raizen joint venture);
- redundancy and restructuring costs of $109 million (mainly the cost of Reshape 2020-2021); and
- impairment charges of $106 million (goodwill impairment on acquisitions of Ubitricity and Multi Service Commercial Road Transport card platform).

Adjusted Earnings compared with 2021 decreased by $714 million, driven by the following:

- Mobility adjusted earnings were $469 million lower than in 2021, mainly as a result of higher operating expenses and unfavourable tax movements. This was partly offset by better margins.
- Lubricants adjusted earnings were $266 million lower than in 2021, mainly because of lower margins due to a higher base oil price, lower associate and joint-venture income and higher operating expenses.
- Sectors and Decarbonisation adjusted earnings were $21 million higher than in 2021, mainly because of better margins (demand recovery in aviation). This was partly offset by higher operating expenses and higher financing expenses in joint ventures.

Earnings 2021-2020

Segment earnings in 2021 of $3,535 million were 13% lower than in 2020. This was driven by higher operating expenses, partly offset by higher volumes.

Segment earnings in 2021 included a net gain of $68 million as described above. This net gain is part of identified items and compares with 2020 which included a net gain of $13 million as follows:

- net gains of $132 million on sale of assets, mainly related to the acquisition of the remaining 51% equity shares from a joint-venture partner in China;
- restructuring costs of $90 million (various initiatives across the Marketing segment); and
- impairment charges of $33 million.

Adjusted Earnings compared with 2020 decreased by $600 million, driven by the same factors as the segment earnings adjusted for identified items.

Generating shareholder value | Marketing continued

Cash capital expenditure

Cash capital expenditure was $4.8 billion in 2022, of which $1.5 billion was in non-energy products and $1.4 billion in low-carbon energy solutions. Cash capital expenditure was $2.3 billion in 2021, of which $0.7 billion was in non-energy products and $0.5 billion in low-carbon energy solutions.

Cash capital expenditure increased by $2.5 billion, because of higher spend on business acquisitions across Marketing (including the acquisition of certain company-owned fuel and convenience retail sites from the Landmark group of companies in the USA, and the acquisition of EcoOils Limited in Singapore). Our cash capital expenditure is expected to be around $6 billion in 2023.

Portfolio and business developments

Significant portfolio and business developments in 2022 included:

- In May 2022, we completed the sale of Shell Neft LLC, Shell's retail stations and lubricants business in Russia, to PJSC LUKOIL. See Note 6 on pages 262-264 for more information.
- In June 2022, we completed the acquisition of 184 company-owned fuel and convenience retail sites and 107 supply agreements for the independently operated retail fuel and convenience retail sites from the Landmark group of companies in the USA. The agreement to acquire the retail fuel station network (including fuel stations, convenience retail and dealer supply agreements) was signed in October 2021.
- In December 2022, we completed the acquisition of the Environmentally Considerate Lubricants (ECLs) business of the PANOLIN Group. The transaction includes the PANOLIN brand, ECL product formulations, intellectual property, technical expertise and technology, international customer base and portfolio of products.
- In February 2023, we completed the acquisition of 100% of the shares of Nature Energy Biogas A/S for nearly $2 billion.

Building integrated renewable natural gas (RNG) value chain at global scale

On February 20, 2023, Shell announced it had completed the acquisition of Denmark-based Nature Energy, Europe's largest producer of renewable natural gas (RNG) from biomass, for around $2 billion. The acquisition, which was announced in November 2022, helps accelerate our transition to become a net-zero emissions energy business by 2050 by offering our customers low-carbon fuels, which can help them decarbonise.

Nature Energy produces RNG from agricultural, industrial, and household waste. It has 14 operating plants and established supply infrastructure. The company produced around 6.5 million MMBtu in 2022 and has around 30 new plant projects in Europe and North America which could deliver up to 9.2 million MMBtu/year by 2030.

RNG, also known as biogas or biomethane, is chemically identical to conventional natural gas and can be used in our existing transmission and distribution infrastructure. This makes it a competitive option to help decarbonise hard-to-abate sectors, including commercial road transport, shipping, heating and heavy industry. The sustainability benefits are amplified by the processing and use of methane that would otherwise be released to the atmosphere from the decomposition of organic byproducts and waste.

Shell's Powering Progress strategy seeks to deliver affordable, reliable, low-carbon energy to our customers.

Photos: A truck has delivered manure to Nature Energy's Korskro plant, in the southwest of Jutland, near the Danish city of Esbjerg. Nature Energy converts waste, like manure, into renewable natural gas.

Generating shareholder value | Marketing continued

Business and property

Mobility

Shell is one of the world's largest mobility retailers, by number of sites, with more than 46,000 Shell-branded mobility locations in more than 80 markets at the end of 2022. We operate different models across these markets, from full ownership of retail sites through to brand licensing agreements.

Every day, around 32 million customers visit our mobility locations for an evolving range of quality fuels, including electric vehicle charging, and convenience and non-fuel products and services. We offer our business customers Shell Fleet Solutions, through which they can obtain items including fuel cards, road services and carbon-offset offers. Beyond our mobility locations, we also serve electric vehicle customers at their homes and workplaces through Shell Recharge Solutions, and at on-street locations through Ubitricity.

In addition to fuels, we are expanding our convenience and non-fuel retail offer to cater to more of our customers' needs. At many of our sites, we offer a range of convenience items, including beverages and fresh food, and services such as lubricant changes and car washes. At the end of 2022, Shell operated 12,500 convenience stores worldwide and we expect to grow this number to 15,000, including Shell-branded mobility locations by 2025. We have upgraded more than 1,500 stores with our Shell Café premium fresh coffee and food offer since launching in 2021.

We remain committed to developing traditional fuels for drivers of internal combustion engine vehicles. Aided by our partnership with Scuderia Ferrari, we have concentrated on developing fuels with special formulations designed to clean engines and improve performance. In 2022, we launched a new and improved formulation of Shell V-Power across multiple markets, with further roll-out planned for 2023. We sold fuels under the Shell V-Power brand in 69 markets in 2022.

We are also expanding networks of refuelling stations of lower-emission fuels, including biofuels, hydrogen, and various gaseous fuels such as LNG and bio-LNG. We have more than 50 hydrogen retail sites in Europe and North America, where drivers can fill up their vehicles with hydrogen fuel. In nine markets, Shell Mobility provides customers with the opportunity to compensate their carbon emissions, including through carbon credits.

Shell Mobility aims to take a leadership position in the energy transition by marketing more and cleaner fuels for our customers. At the end of 2022, Shell owned or operated around 139,000 charge points, including more than 28,000 charge points at Shell forecourts, on-street locations, mobility hubs and destinations like supermarkets.

In January 2022, Shell opened its first electric vehicle charging hub in the UK in Fulham, London, where petrol and diesel pumps at an existing fuel station have been replaced with charge points. Shell Fulham features nine high-powered, ultra-rapid 175 kW charge points.

Lubricants

Shell Lubricants has been the number one global finished lubricants supplier in terms of market share for 16 consecutive years, according to Kline & Company data for 2021. Shell lubricants are available across more than 160 markets for passenger cars, motorcycles, trucks, coaches, and machinery used in manufacturing, mining, power generation, agriculture and construction.

We also make premium lubricants for conventional vehicles and Shell E-fluids for electric vehicles using gas-to-liquids (GTL) base oils that are made from natural gas at our Pearl GTL plant in Qatar.

See "Integrated Gas" on page 43.

We have a global lubricants supply chain with a network of 32 blending plants, four base oil plants, ten grease plants and six GTL base oil storage hubs.

Through our marine activities, we primarily provide the shipping and maritime sectors with lubricants. We also provide fuels, chemical products, and related technical and digital services. We supply more than 200 grades of lubricants and seven types of fuel to vessels worldwide, ranging from large ocean-going tankers to small fishing boats. Shell marine lubricant products are currently used in more than 10,000 vessels and are available in over 700 ports across more than 60 countries.

Sectors and Decarbonisation

Sectors and Decarbonisation sells fuels, speciality products and services including energy solutions that help customers reduce emissions in the aviation, marine, commercial road transport, and agricultural sectors, among others.

Shell Aviation provides aviation fuel, lubricants and low-carbon solutions globally. In February 2022, Shell became the first supplier of sustainable aviation fuel (SAF) to customers in Singapore. Together with Accenture and American Express Global Business Travel (Amex GBT), Shell launched Avelia - one of the world's first blockchain-powered digital sustainable aviation fuel book-and-claim solutions for business travel. Avelia is designed to help trigger demand for SAF, providing confidence to suppliers like us to further increase investment in production, and in turn lowering the price point for these fuels.

Shell Marine offers a portfolio of marine fuels, lubricants and low-carbon solutions, with a supply network that covers key bunkering locations globally.

Shell is investing in a variety of fuels, technologies and solutions to support a decarbonised future for shipping. In June 2022, Shell and CMA CGM signed a non-binding memorandum of understanding to support the advancement of low-carbon marine fuels and innovative technical solutions, alongside a multi-year LNG supply agreement in the Port of Singapore from the second half of 2023.

Shell Commercial Road Transport provides fuels, lubricants and digital services to customers with heavy-duty vehicles in their fleets. In 2022, Shell expanded its LNG refuelling network to more than 60 operated sites, bringing the number of sites where Shell customers can access LNG in Europe to more than 160. In February 2022, Shell became the first fuel provider to offer customers in the Netherlands a blended product, by feeding a portion of Shell BioLNG into its entire LNG network.

Shell Bitumen supplies customers across 60 markets and provides enough bitumen to resurface 500 kilometres of road lanes every day. It also invests in research and development to create innovative products.

Generating shareholder value | Marketing continued

Shell Sulphur Solutions manages the complete value chain of sulphur, from refining to marketing. It provides sulphur for use in applications such as fertiliser, mining and chemicals. It also licenses Shell Thiogro technologies to create innovative and custom sulphur-enhanced fertilisers.

In 2022, around 9.5 billion litres of biofuels (2021: 9.1 billion litres) went into Shell's fuels worldwide, which includes sales made by Raízen, our non-operated joint venture in Brazil (Shell interest 44%).

In 2022, Raízen produced around 3 billion litres of ethanol (2021: 2.5 billion litres) and around 4.8 million tonnes of sugar from sugar cane (2021: 4 million tonnes). The cellulosic ethanol plant at Raízen's Costa Pinto mill in Brazil produced 26 million litres of ethanol in 2022 (2021: 19 million litres).

Renewable natural gas (RNG), also known as biogas or biomethane, is gas derived from processing organic waste in a controlled environment until it is fully interchangeable with conventional natural gas.

Shell is constructing two facilities which will convert dairy manure to RNG and which will be co-located at the Bettencourt Dairies in Wendell, Idaho, USA. Once operational, Shell Downstream Bovarius is expected to produce approximately 400,000 MMBtu a year of negative-carbon-intensity RNG. The second facility, Shell Downstream Friesian, is expected to produce approximately 350,000 MMBtu a year of negative-carbon-intensity RNG using cow manure from the dairy once operational.

In Europe, we are offering liquefied renewable natural gas (bio-LNG) to customers with trucks powered by natural gas. In 2022, in collaboration with Nordsol, we commenced production at our first European bio-LNG plant, in Amsterdam Westpoort, in the Netherlands. This made us the first fuel provider to offer a blend of bio-LNG throughout the entire LNG network in the Netherlands. We also began construction of a bio-LNG plant at our Energy and Chemicals Park Rheinland, scheduled to commence operations in 2023.

Business activities with Syria and Cuba

Syria

We ceased all operations in Syria in 2011. In 2022, we renewed our trademark rights in Syria and paid $381 to the Syrian Arab Republic Ministry of Finance, and $783 in agent and handling fees. The renewal of the trademark rights is not indicative of any sales of products in Syria.

Cuba

We do not have any operations in Cuba.

Marketing data tables

Branded retail sites [A]

	2022	2021	2020
Europe	8,260	8,178	8,071
Asia [B]	10,470	10,753	10,387
Oceania [B]	1,083	1,060	1,071
Africa	2,815	2,724	2,622
Americas [C]	23,597	23,305	23,461
Total	46,225	46,020	45,612

[A] Includes different models, from full-ownership retail sites, and sites operated by joint ventures, through to brand licensing agreements, and excludes sites closed for more than six months.
[B] Asia includes Turkey and Russia; Oceania includes French Polynesia, Guam, Palau and New Caledonia.
[C] Includes around 7,900 retail sites operated by the Raizen joint venture.

Marketing sales volumes [A][B][C][D]

Thousand b/d

	2022	2021	2020
Europe			
Mobility	296	360	344
Lubricants	17	16	15
Sectors & Decarbonisation	238	121	107
Total	551	497	466
Asia			
Mobility	520	512	475
Lubricants	38	42	30
Sectors & Decarbonisation	124	107	111
Total	682	661	616
Africa			
Mobility	47	45	40
Lubricants	3	3	3
Sectors & Decarbonisation	8	7	7
Total	58	55	50
Americas			
Mobility	797	828	782
Lubricants	25	24	23
Sectors & Decarbonisation	390	368	339
Total	1,212	1,220	1,144
Total product sales			
Mobility	1,660	1,745	1,641
Lubricants	83	85	71
Sectors & Decarbonisation	760	603	564
Total	2,503	2,433	2,276
Gasolines	1,160	1,165	1,090
Kerosines	321	232	214
Gas/Diesel oils	731	746	698
Fuel oil	11	7	8
Other products	280	283	266
Total	2,503	2,433	2,276

[A] With effect from January 1, 2022, the Marketing segment consists of Mobility, Lubricants, and Sectors and Decarbonisation. Comparative sales volumes have been revised for these businesses, with the exception of the Commercial Road Transport sector, which transferred from Mobility to Sectors and Decarbonisation with effect from January 1, 2022, but where comparative information is not revised due to impracticability.
[B] Excludes deliveries to other companies under reciprocal sale and purchase arrangements, that are in the nature of exchange contracts.
[C] Includes the Shell share of Raízen's sales volumes and joint ventures' sales volumes.
[D] Sales volumes from markets where Shell operates under trademark licensing agreements are excluded.

Generating shareholder value

Chemicals and Products

Chemicals and Products includes chemicals manufacturing plants with their own marketing network, and refineries which turn crude oil and other feedstocks into a range of oil products. These are moved and marketed around the world for domestic, industrial and transport use. The business also includes pipelines, trading of crude oil, oil products and petrochemicals, and oil sands activities, which involves the extraction of bitumen from mined oil sands and its conversion into synthetic oil.

Segment earnings ($ billion)

4.5 2021: 0.4

Adjusted Earnings ($ billion)

4.7 2021: 2.1

Cash flow from operating activities ($ billion)

12.9 2021: 3.7

Refinery processing intake (thousand b/d)

1,402 2021: 1,639

Refining & Trading sales volumes (thousand b/d)

1,700 2021: 2,026

Chemicals sales volumes (thousand tonnes)

12,281 2021: 14,216

Generating shareholder value | Chemicals and Products continued

Key statistics [A]

$ million, except where indicated

	2022	2021	2020
Segment earnings/(loss) [B]	4,515	404	(3,821)
Including:			
Revenue (including inter-segment sales)	147,026	118,338	85,713
Share of profit of joint ventures and associates	374	989	1,064
Interest and other income	244	37	(236)
Operating expenses [C]	11,361	10,347	10,514
Underlying operating expenses [C]	11,368	10,298	9,916
Depreciation, depletion and amortisation	3,289	5,485	10,096
Taxation charge/(credit)	935	(210)	(1,754)
Identified Items [C]	(204)	(1,712)	(6,656)
Adjusted Earnings [C]	4,719	2,115	2,835
Adjusted EBITDA [C]	8,561	5,635	6,032
Capital expenditure	3,835	5,091	4,163
Cash capital expenditure [C]	3,838	5,175	4,198
Chemicals manufacturing plant utilisation (%)	79%	85%	88%
Refinery utilisation (%)	86%	80%	83%
Refinery processing intake (thousand b/d)	1,402	1,639	2,063
Refining & Trading sales volumes (thousand b/d)	1,700	2,026	2,434
Chemicals sales volumes (thousands tonnes)	12,281	14,216	15,036

[A] With effect from January 1, 2022, our reporting segments are Integrated Gas, Upstream, Marketing, Chemicals and Products, Renewables and Energy Solutions and Corporate. Comparative information has been revised.
[B] See Note 8 to the "Consolidated Financial Statements" on pages 265-269. Segment earnings are presented on a current cost of supplies basis.
[C] See "Non-GAAP measures reconciliations" on pages 362-365.

Business conditions

For the business conditions relevant to Chemicals and Products, see "Market overview" on pages 35-37.

Chemical manufacturing plant utilisation

Utilisation is defined as the actual usage of the plants as a percentage of the rated capacity. Chemicals manufacturing plant utilisation was 79% in 2022 (previous methodology: 72%) compared with 85% in 2021 (previous methodology: 78%). The decrease was mainly a result of optimisation for the low-margin environment and higher turnarounds during 2022.

Refinery utilisation

Utilisation is defined as the actual usage of the plants as a percentage of the rated capacity. Refinery utilisation was 86% in 2022 (previous methodology: 74%) compared with 80% in 2021 (previous methodology: 72%) as a result of less unplanned maintenance and lower turnarounds.

With effect from the second quarter 2022, the methodology applied in calculating both Chemicals plant utilisation and Refinery utilisation has been revised to further align with industry disclosures. The revisions include moving from stream days capacity (defined as the maximum throughput, excluding the impact of maintenance or operational outages) to calendar days capacity (defined as the throughput including typical limitations such as maintenance over an extended period of time). Furthermore, Refinery utilisation is now specific to the capacity of the crude distillation unit (except for Scotford Refinery which uses the capacity of the hydrocracker), and no longer the capacity across all refinery units.

Chemicals and Products sales

In 2022, Chemicals sales volumes were 12,281 thousand tonnes, 14% lower than 2021 sales volumes of 14,216 thousand tonnes, due to lower demand.

In 2022, Refining & Trading sales volumes were 1,700 thousand b/d, 16% lower than 2021 volumes of 2,026 thousand b/d due to impact of divestments

Earnings 2022-2021

Segment earnings in 2022 were $4,515 million, 1018% higher than in 2021, reflected higher Products margins (increase of $5,721 million) reflecting higher Refining margins and higher contributions from trading and optimisation, lower tax charges (decrease of $300 million), as well as lower depreciation charges (decrease of $175 million). These were partly offset by lower Chemicals margins (decrease of $2,705 million) and higher operating expenses (increase of $822 million).

Segment earnings in 2022 included a net charge of $204 million.

This included:

- impairment charges of $226 million mainly related to impairment of capital expenditure additions across sites based on the revisions to medium- and long-term price outlook assumptions decision considered in 2020;
- legal provisions of $149 million;
- losses of $147 million related to the fair value accounting of commodity derivatives;
- tax charges relating to the EU solidarity contribution of $74 million;
- gains of $223 million related to the sale of assets; and
- gains of $104 million related to the remeasurement of redundancy and restructuring costs (mainly pension curtailments).

Generating shareholder value | Chemicals and Products continued

These gains and losses are part of identified items and compare with 2021 which included a net charge of $1,712 million as follows:
- impairment charges of $1,814 million mainly related to the divestment of Puget Sound, Mobile and Deer Park refineries in the USA and closure of production unit on Jurong Island, Singapore;
- provisions for onerous contracts of $82 million; and
- a net gain of $160 million related to the fair value accounting of commodity derivatives.

Adjusted Earnings in 2022 were $4,719 million, compared with $2,115 million in 2021. Chemicals accounted for (29)% of these 2022 earnings, Refining for 80% and Trading and Supply for 49%. The increase in Adjusted Earnings of $2,604 million, driven by the following:
- Products Adjusted Earnings were $5,728 million higher than in 2021, mainly driven by higher realised refining margins due to increased prices and higher contributions from trading and optimisation. These were partially offset by higher operating expenses.
- Chemicals Adjusted Earnings were $3,125 million lower than in 2021, mainly because of lower margins due to weak price environment, lower associate income and higher operating expenses.

Earnings 2021-2020

Segment earnings in 2021 were $404 million, 111% higher than in 2020.

Segment earnings in 2021 included a net charge of $1,712 million as described above. This net charge is part of identified items and compares with 2020 which included a net charge of $6,656 million as follows:
- Impairment charges of $5,500 million (across sites, reflecting revisions to medium- and long-term price outlook assumptions in light of changes in supply and demand fundamentals in the energy market; macroeconomic conditions; the COVID-19 pandemic; expenditure at Pulau Bukom in Singapore including transformation; and the shutdown of the Convent refinery in Louisiana, USA);
- restructuring costs of $313 million, mainly shutdown of Convent, Bukom transformation and various initiatives across Chemicals & Products;
- other net charges of $657 million (mainly onerous contract provisions due to shutdown of Convent and legal provision);
- net charge of $112 million related to the fair value accounting of commodity derivatives; and
- net loss from sale of assets of $74 million.

Adjusted Earnings were $2,115 million in 2021 compared to $2,835 million in 2020. The decrease in Adjusted Earnings of $720 million was driven by the following:
- Products adjusted earnings were $1,511 million lower than in 2020, mainly driven by lower contributions from trading and optimisation, higher operating expenses and unfavourable tax movements. These were partially offset by higher margins in Refining, Oil sands (higher average realised price) and lower depreciation.
- Chemicals adjusted earnings were $792 million higher than in 2020, mainly because of higher margins due to stronger price environment, favourable deferred tax movements, partly offset by higher operating expenses.

Cash capital expenditure

Cash capital expenditure was $3.8 billion in 2022, compared with $5.2 billion in 2021.

Cash capital expenditure decreased by $1.4 billion, mainly because of lower spend on the construction of our cracker facilities in Pennsylvania, USA, and lower turnaround. Our cash capital expenditure is expected to be around $3 billion to $4 billion in 2023.

Portfolio and business developments

Significant portfolio and business developments in 2022 included:
- In October 2022, Shell USA, Inc. and Shell Midstream Partners, L.P. completed the definitive agreement and plan of merger announced in July 2022, pursuant to which Shell USA, Inc. acquired all of the common units representing limited partner interests in Shell Midstream Partners, L.P. not held by Shell USA, Inc. or its affiliates.
- In November 2022, we commenced operations of our Pennsylvania Chemical project, Shell Polymers Monaca (SPM). The Pennsylvania facility is the first major polyethylene manufacturing complex in the north-eastern USA and has a designed output of 1.6 million tonnes annually.

Business and property

Chemicals

Our plants produce a range of base chemicals, including ethylene, propylene and aromatics, and intermediate chemicals such as styrene monomer, propylene oxide, solvents, detergent alcohols, ethylene oxide and ethylene glycol. We have the capacity to produce around 8.1 million tonnes of ethylene a year (including the Shell share of capacity entitlement (offtake rights) of joint ventures and associates, which may be different from nominal equity interest). We are expanding our product portfolio to include sustainable chemicals made from bio-based and circular feedstocks, more intermediates and performance chemicals such as polyethylene and polycarbonate. We operate chemical plants worldwide and have a global balance of locations, feedstocks and products that allows us to seize commercial opportunities and withstand cycles of lower margins.

Shell Chemicals is transforming and has integrated further with Refining. In addition to our standalone, chemicals-only production sites, we are transforming our refineries into energy and chemicals parks. We expect this to happen at the following sites: Norco in the USA, Scotford in Canada, Pernis in the Netherlands, Rheinland in Germany and Pulau Bukom in Singapore. We are also exploring options for the former Convent Refinery in Louisiana, USA, which is currently shut down, and may turn it into a low-carbon fuels facility. The energy and chemicals parks are expected to focus more on meeting customers' low-carbon and sustainability needs.

In 2022, we supplied more than 12 million tonnes of petrochemicals to more than 1,000 industrial customers worldwide. Products made from chemicals are used in everyday life in medical equipment, construction, transport, electronics, agriculture and sports. As global demand for chemicals increases, we plan to increase the size of our business, by understanding and responding to our customers' needs.

Generating shareholder value | Chemicals and Products continued

Products – Refining & Trading

Refining

We have interests in eight refineries worldwide, with a capacity to process a total of 1.7 million barrels of crude oil per day. The distribution of our refining capacity is 60% in Europe, 26% in the Americas and 14% in Asia.

Shell Refining is transforming. We are concentrating our refineries portfolio to meet our strategic aims and to capitalise on the strong integration between our customers, trading operations, chemical plants and, increasingly, our low-carbon fuels output. We are transforming our refining sites into energy and chemicals parks. See "Chemicals" on page 67 for details. Transforming our refineries will mean developing new facilities and converting or dismantling existing units. We plan to process less crude oil and use more renewable and recycled feedstocks such as hydrogen, biofuels and plastic waste.

Trading and Supply

Through our main trading offices in London, Houston, Singapore and Rotterdam, we trade crude oil, low-carbon fuels, refined products, chemical feedstocks and environmental products. Trading and Supply trades in physical and financial contracts, lease storage and transportation capacities, and manages shipping and wholesale commercial fuel activities globally.

Operating in around 25 countries, with about 180 Shell and joint-venture (including pipeline) terminals, we believe our supply and distribution infrastructure is well positioned to make deliveries around the world.

Shipping and Maritime enables the safe delivery of the Shell Trading and Supply contracts. This includes supplying feedstocks for our refineries and chemical plants, and finished products such as gasoline, diesel and aviation fuel to our Marketing segment and customers.

Shell Wholesale Commercial Fuels provides fuels for transport, industry and heating and from reliable main-grade fuels to premium products.

Pipelines

We own and operate eight tank farms across the USA through Shell Pipeline Company LP (Shell interest 100%). It transports around 1.5 billion barrels of crude oil, refined products and chemicals a year through around 6,000 kilometres of pipelines in the Gulf of Mexico and nine US states. Our non-Shell-operated ownership interests provide another 13,000 kilometres of pipeline.

We carry more than 40 types of crude oil and more than 20 grades of fuel and chemicals, including gasoline, diesel, aviation fuel, chemicals and ethylene.

Shell Midstream Partners, L.P., a master limited partnership headquartered in Houston, Texas, became a wholly owned subsidiary of Shell in October 2022. Accordingly, we now own, operate, develop and acquire pipelines and other midstream and logistics assets. Our assets include interests in entities that own crude oil and refined products pipelines and terminals that serve as key infrastructure to (i) transport onshore and offshore crude oil production to USA Gulf Coast and Midwest refining markets and (ii) deliver refined products from those markets to major demand centres. Our assets also include interests in entities that own natural gas and refinery gas pipelines that transport offshore natural gas to market hubs and deliver refinery gas from refineries and plants to chemical sites along the USA Gulf Coast.

See "Governance - related party transactions" on page 214 for further information regarding the acquisition of remaining common units held by the public representing limited partner interests in Shell Midstream Partners, L.P.

Oil Sands

Synthetic crude oil is produced by mining bitumen-saturated sands, extracting the bitumen, and transporting it to a processing facility where hydrogen is added to make a wide range of feedstocks for refineries. The Athabasca Oil Sands Project (AOSP) in Alberta, Canada, includes the Albian Sands mining and extraction operations, the Scotford upgrader and the Quest carbon capture and storage (CCS) project.

We have a 50% interest in 1745844 Alberta Ltd. (formerly known as Marathon Oil Canada Corporation), which holds a 20% interest in the Athabasca Oil Sands Project.

Business activities with Syria

We ceased supplying polyols, via a Netherlands-based distributor, to private-sector customers in Syria in 2018. Polyols are commonly used for the production of foam in mattresses and soft furnishings.

Chemicals and Products data tables

The tables below reflect Shell subsidiaries and instances where Shell owns the crude oil or feedstocks processed by a refinery. Other joint ventures and associates are only included where explicitly stated.

Refining & Trading sales volumes [A][B]

Thousand b/d

	2022	2021	2020
Europe	830	426	472
Asia	377	870	974
Africa	39	47	70
Americas	454	683	918
Total	1,700	2,026	2,434
Gasolines	410	551	660
Kerosines	117	123	163
Gas/Diesel oils	616	735	921
Fuel oil	270	337	346
Other products	287	280	344
Total	1,700	2,026	2,434

[A] Excludes deliveries to other companies under reciprocal sale and purchase arrangements, that are in the nature of exchanges. Sales of condensate are included.
[B] Certain contracts are held for trading purposes and reported net rather than gross. The effect in 2022 was a reduction in refining and trading sales of approximately 1,197 thousand b/d (2021: 1,127 thousand b/d; 2020: 1,284 thousand b/d).

Cost of crude oil processed or consumed [A]

$/barrel

	2022	2021	2020
Total	84.39	60.51	35.03

[A] Includes Upstream and Integrated Gas margins on crude oil supplied by Shell subsidiaries, joint ventures and associates.

Generating shareholder value | Chemicals and Products continued

Crude distillation capacity [A]

Thousand b/stream day [B]

	2022	2021	2020
Europe	990	1,023	1,059
Asia	237	307	573
Africa	23	90	90
Americas	449	729	1,028
Total	1,698	2,149	2,750

[A] Average operating capacity for the year, excluding mothballed capacity.
[B] Stream day capacity is the maximum capacity with no allowance for downtime.

Crude oil processed [A]

Thousand b/d

	2022	2021	2020
Europe	715	761	810
Asia	184	223	292
Africa	16	57	54
Americas	353	455	719
Total	1,268	1,496	1,875

[A] Includes natural gas liquids, share of joint ventures and associates and processing for others.

Refinery processing intake [A]

Thousand b/d

	2022	2021	2020
Crude oil	1,267	1,496	1,876
Feedstocks	135	143	187
Total	1,402	1,639	2,063
Europe	763	806	854
Asia	184	225	302
Africa	16	57	54
Americas	439	551	853
Total	1,402	1,639	2,063

[A] Includes crude oil, natural gas liquids and feedstocks processed in crude distillation units and in secondary conversion units.

Refinery processing outturn [A]

Thousand b/d

	2022	2021	2020
Gasolines	477	624	771
Kerosines	166	141	158
Gas/Diesel oils	512	611	774
Fuel oil	90	108	140
Other	193	258	279
Total	1,438	1,742	2,122

[A] Excludes own use and products acquired for blending purposes.

Manufacturing plants at December 31, 2022

Refineries in operation

Thousand barrels/stream day, 100% capacity [B]

	Location	Asset class	Shell interest (%) [A]	Crude distillation capacity	Thermal cracking/ visbreaking/ coking	Catalytic cracking	Hydro-cracking
Europe							
Germany	Miro [C]		32	313	40	96	–
	Rheinland	■ ●	100	354	49	–	90
	Schwedt [C]		38	234	46	57	–
Netherlands	Pernis	■ ●	100	447	–	53	104
Asia							
Singapore	Pulau Bukom	■ ●	100	237	–	–	61
Africa							
South Africa	Durban [C] [D]		36	180	25	37	–
Americas							
Argentina	Buenos Aires [C]	● □	44	108	20	22	–
Canada							
Alberta	Scotford	■	100	100	–	–	83
Ontario	Sarnia	□	100	85	5	21	10
USA							
Louisiana	Norco	■	100	250	29	119	44

[A] Shell interest is rounded to the nearest whole percentage point; Shell share of production capacity may differ.
[B] Stream day capacity is the maximum capacity with no allowance for downtime.
[C] Not operated by Shell.
[D] Refinery operations were paused from Q2 2022.

■ Integrated refinery and chemical complex
● Refinery complex with cogeneration capacity
□ Refinery complex with chemical unit(s)

Generating shareholder value | Chemicals and Products continued

Chemicals data tables

The tables below reflect Shell subsidiaries and instances where Shell owns the crude oil or feedstocks processed by a refinery. Other joint ventures and associates are only included where explicitly stated.

Ethylene capacity [A]

Thousand tonnes/year

	2022	2021	2020
Europe	1,710	1,726	1,701
Asia	2,542	2,542	2,530
Americas [B]	3,821	2,321	2,268
Total	8,073	6,589	6,499

[A] Includes the Shell share of capacity entitlement (offtake rights) of joint ventures and associates, which may be different from nominal equity interest. Nominal capacity is quoted at December 31.
[B] Includes data pertaining to Shell Polymers Monaca which commenced operations in November 2022.

Converting plastic waste to chemical feedstock at Moerdijk

Shell is investing in a new pyrolysis oil upgrader at its Shell Chemicals Park Moerdijk in the Netherlands which will convert plastic waste into chemical feedstock, replacing traditional hydrocarbon raw materials. The new upgrader is expected to start production in 2024 and will help us meet the rising demand from our customers for more low-carbon products that are made from recycled material.

The new pyrolysis oil upgrader unit treats liquid made from plastic waste that cannot be mechanically recycled. The upgrader prevents waste that would otherwise have gone to landfill or incineration. The unit will have a capacity of 50,000 tonnes per annum, which is equivalent to the weight of about 7.8 billion plastic bags. This contributes to our circular economy ambition to recycle one million tonnes of plastic waste in our chemical plants by 2025.

We will use the treated pyrolysis oil to produce chemicals which are the ingredients used in many end products that are all around us.

Over the next 10 years, the Shell Chemicals Park Moerdijk plans to increase the use of circular and bio-based feedstocks, growing its offer of low-carbon products, and aims to become net zero through using hydrogen and implementing carbon capture and storage (CCS) technology.

Photo: Pipe racks in one of the many units of Shell Chemicals Park Moerdijk, the Netherlands.

Generating shareholder value | Chemicals and Products continued

Chemicals sales volumes [A]

Thousand tonnes/year

	2022	2021	2020
Europe			
Base chemicals	2,809	3,883	3,490
Intermediates and other chemicals products	1,955	2,076	1,990
Total	4,764	5,959	5,480
Asia			
Base chemicals	825	1,354	1,192
Intermediates and other chemicals products	2,147	2,656	2,969
Total	2,972	4,010	4,161
Americas			
Base chemicals	2,125	1,984	2,936
Intermediates and other chemicals products	2,420	2,263	2,459
Total	4,545	4,247	5,395
Total product sales			
Base chemicals	5,759	7,221	7,618
Intermediates and other chemicals products	6,522	6,995	7,418
Total	12,281	14,216	15,036

[A] Excludes feedstock trading and by-products.

Major chemical plants in operation [A]

Thousand tonnes/year, Shell share capacity [B]

	Location	Ethylene	Polyethylene	Styrene monomer	Ethylene glycol	Higher olefins [C]	Additional products
Europe							
Germany	Rheinland	324	–	–	–	–	A
Netherlands	Moerdijk	971	–	815	153	–	A, I
UK	Mossmorran [D]	415	–	–	–	–	O
Asia							
China	Nanhai [D]	1,100	605	645	415	–	A, I
Singapore	Jurong Island [E]	281	–	1,069	1,081	–	A, I, P, O
	Pulau Bukom	1,161	–	–	–	–	A, I
Americas							
Canada	Scotford	–	–	475	462	–	A, I
USA	Monaca [F]	1,500	1,600	–	–	–	
	Deer Park	889	–	–	–	–	A, I
	Geismar	–	–	–	400	1,390	I
	Norco	1,432	–	–	–	–	A
Total		8,073	2,205	3,004	2,511	1,390	

[A] Major chemical plants are large integrated chemical facilities, typically producing a range of chemical products from an array of feedstocks.
[B] Shell share of capacity of subsidiaries, joint arrangements and associates (Shell- and non-Shell-operated), excluding capacity of the Infineum additives joint ventures.
[C] Higher olefins are linear alpha and internal olefins (products range from C4 to C2024).
[D] Not operated by Shell.
[E] The Polypropylene and olefins production mentioned refers to Shell share of capacity of our non-operated joint ventures Petchem Corporation of Singapore (PCS) and The Polyolefin Company (TPC) which are on Jurong Island.
[F] Shell Polymers Monaca commenced its operations in November 2022.

A Aromatics, lower olefins
I Intermediates
P Polypropylene
O Other

Generating shareholder value | Chemicals and Products continued

Other chemical locations [A]

	Location	Products
Europe		
Germany	Karlsruhe	A
	Schwedt	A
Netherlands	Rotterdam	A, I, O
Americas		
Argentina	Buenos Aires	I
Canada	Sarnia	A, I

[A] Other chemical locations reflect locations with smaller chemical units, typically serving more local markets.

A Aromatics, lower olefins
I Intermediates
O Other

Generating shareholder value

Renewables and Energy Solutions

Renewables and Energy Solutions (R&ES) includes renewable power generation, the marketing and trading of power and pipeline gas, as well as carbon credits, and digitally enabled customer solutions. R&ES also includes the production and marketing of hydrogen, development of commercial carbon capture and storage (CCS) hubs, investment in nature-based projects that avoid or reduce carbon emissions (NBS), and Shell Ventures, which invests in companies that work to accelerate the energy and mobility transformation.

Segment earnings ($ billion)

(1.1) 2021: (1.5)

Adjusted Earnings ($ billion)

1.7 2021: (0.2)

Cash flow from operating activities ($ billion)

(6.4) 2021: 0.5

External power sales (terawatt hours) [A]

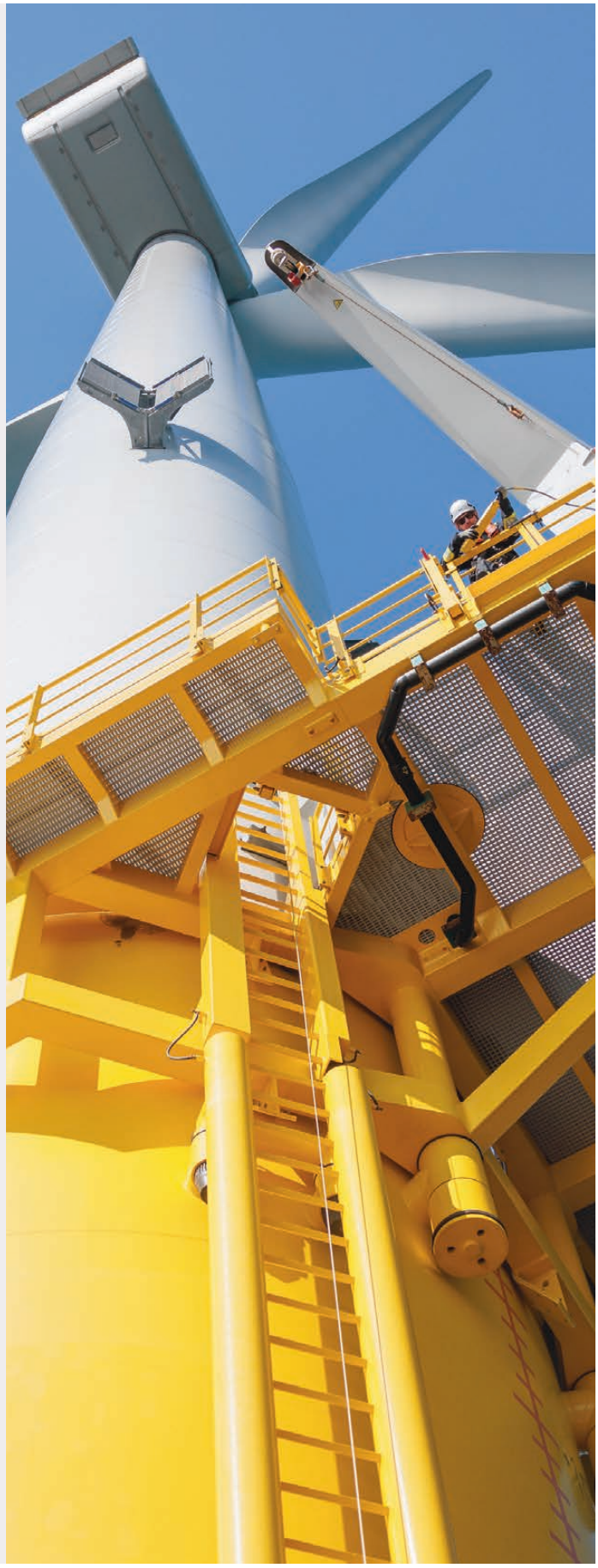
243 2021: 247

Sales of pipeline gas to end-use customers (terawatt hours) [B]

843 2021: 899

Renewable capacity (gigawatt) [C]

6.4 2021: 3.0



[A] Physical power sales to third parties; excluding financial trades and physical trade with brokers, investors, financial institutions, trading platforms, and wholesale traders.
[B] Physical natural gas sales to third parties; excluding financial trades and physical trade with brokers, investors, financial institutions, trading platforms, and wholesale traders. Excluding sales of natural gas by other segments and LNG sales.
[C] Renewable power generation capacity (Shell Interest) in operation, under construction and/or committed for sale.

Generating shareholder value | Renewables and Energy Solutions continued

Key statistics [A]

	$ million, except where indicated		
	2022	2021	2020
Segment earnings/(loss)	(1,059)	(1,514)	(479)
Including:			
Revenue (including inter-segment sales)	59,981	27,090	13,979
Share of profit of joint ventures and associates	(7)	(27)	(50)
Interest and other income	57	200	(197)
Operating expenses [B]	3,590	2,745	1,716
Underlying operating expenses [B]	3,583	2,737	1,711
Depreciation, depletion and amortisation	777	326	424
Taxation charge/(credit)	(303)	(342)	(61)
Identified Items [B]	(2,805)	(1,272)	(277)
Adjusted Earnings [B]	1,745	(243)	(202)
Adjusted EBITDA [B]	2,459	(21)	25
Capital expenditure	2,609	2,069	363
Cash capital expenditure [B]	3,469	2,359	928
External power sales (terawatt hours)	243	247	252
Sales of pipeline gas to end-use customers (terawatt hours)	843	899	882

[A] With effect from January 1, 2022, our reporting segments are Integrated Gas, Upstream, Marketing, Chemicals and Products, Renewables and Energy Solutions and Corporate. Comparative information has been revised.
[B] See "Non-GAAP measures reconciliations" on pages 362-365.

Business conditions

For the business conditions relevant to Renewables and Energy Solutions, see "Market overview" on pages 35-37.

External power sales

In 2022, our external power sales were 243 terawatt hours (TWh), compared with 247 TWh in 2021. The difference was mainly a result of higher volume sales during a Texas winter storm in 2021 and mild weather conditions in 2022. This was partly offset by business growth in the Americas and Europe.

Sales of pipeline gas to end-use customers

In 2022, our sales of pipeline gas to end-use consumers were 843 TWh, compared with 899 TWh in 2021. This difference was also mainly a result of high demand during the Texas winter storm in 2021, and more sales to trading intermediaries versus end-user counterparties.

Earnings 2022-2021

Segment earnings in 2022 were a loss of $1,059 million, compared with a loss of $1,514 million in 2021. The narrowing of the loss was mainly driven by higher prices and contributions from trading, marketing and optimisation results for gas and power (around $1,900 million). This was partly offset by higher operating expenses as a result of business growth and acquisitions (around $900 million), impairment (around $400 million) and tax charges (around $100 million).

Full year 2022 segment earnings included Identified Items of $2,805 million which comprised losses of $2,443 million due to the fair value accounting of commodity derivatives and impairment charges of $361 million mainly in Europe. The full year 2021 Identified Items were a loss of $1,272 million, mainly as a result of the fair value accounting of commodity derivatives.

Adjusted Earnings were $1,745 million in 2022. Adjusted Earnings from Energy Marketing and Trading and Optimisation accounted for 135% of R&ES 2022 Adjusted Earnings, partially offset by Renewable Power Generation, Hydrogen, CCS, NBS and Shell Ventures that accounted for (35)%.

Adjusted EBITDA was $2,459 million and included the impact of underlying operating expenses of $3,583 million, driven by business growth and the early-development stage of some of the portfolios prior to operating status.

Adjusted Earnings were a loss of $243 million in 2021. Adjusted Earnings from Renewable Power Generation, Hydrogen, CCS, NBS, and Shell Ventures accounted for 155% of R&ES 2021 negative Adjusted Earnings. These were partially offset by a positive Adjusted Earnings contribution from Energy Marketing and Trading and Optimisation (55)%.

Earnings 2021-2020

Segment earnings in 2021 were a loss of $1,514 million, compared with a loss of $479 million in 2020. This bigger loss was mainly driven by higher operating expenses, mainly related to provisions for counterparty risk due to the Texas winter storm (around $1,000 million), and lower contributions from trading, marketing and optimisation results for gas and power (around $300 million). This was partly offset by lower tax charges (around $300 million).

Full year 2021 segment earnings included Identified Items of $1,272 million which comprised losses mainly due to the fair value accounting of commodity derivatives. Full year 2020 Identified Items were a loss of $277 million reflecting impairment charges of $190 million and the fair value accounting of commodity derivatives of $89 million.

Generating shareholder value | Renewables and Energy Solutions continued

Cash capital expenditure

Cash capital expenditure in 2022 was $3.5 billion, of which $2.9 billion was in low-carbon energy solutions. Cash capital expenditure in 2021 was $2.4 billion, of which $1.8 billion was in low-carbon energy solutions. This increase was mainly a result of the development projects in our wind and solar power generation business.

Our cash capital expenditure is expected to be in the range of $2-4 billion in 2023.

Portfolio and business development

Key portfolio events included the following:

- In January 2022, Shell and ScottishPower won bids to develop 5 GW of floating wind power in the UK.
- In January 2022, we started operations at the power-to-hydrogen electrolyser in China.
- In February 2022, we completed the acquisition of online energy retailer Powershop Australia which was announced in November 2021.
- In April 2022, Atlantic Shores Offshore Wind (ASOW), our 50:50 joint venture with EDF Renewables North America, was awarded the commercial lease for acreage in the New York Bight offshore wind auction, USA. This was after it was announced as provisional winner in February.
- In July 2022, we took the final investment decision to build a 200 MW electrolyser, Holland Hydrogen I (Shell interest 100%), which is expected to be operational from 2025.
- In August 2022, we completed the acquisition of renewable energy platform Sprng Energy group in India, which was announced in April 2022.
- In December 2022, Ecowende, our joint venture with Eneco, won the tender to develop a 760 MW offshore wind farm at Hollandse Kust (west) lot VI in the Netherlands.

Business and property

We are building our R&ES portfolio through organic and inorganic growth. Most of these growth opportunities are in sectors that differ from, but have similarities and links to, Shell's existing oil and gas businesses.

Some acquired companies in new business sectors are not yet in full compliance with the Shell Control Framework. Following specific assessment for each of those companies, dedicated projects were put in place to achieve compliance, with regular updates on the progress.

Energy Marketing

We provide electricity and smart energy solutions to residential, commercial and industrial customers. We do this through direct electricity sales, storage solutions and energy optimisation services.

We sell natural gas and power to more than 2.2 million retail customers mainly in the UK, the USA, Australia, Germany, and the Netherlands.

Our largest markets for commercial and industrial customers are Australia and the USA. In Australia we are one of the largest commercial and industrial retailers of electricity in the market.

In January 2023 we launched a strategic review of our European home energy retail business including our operations in the UK, the Netherlands and Germany. Our priority remains to ensure our customers in those countries continue to receive a reliable and affordable energy supply. No decisions have been taken at this time. We intend to provide an update on the outcome of the review in due course.

Trading and Optimisation

We market and trade natural gas and power from our own assets and from third parties. In the USA we are one of the leading power wholesale traders.

Renewable Power Generation

We enable renewable power generation by owning and operating wind farms and solar plants, and participating in joint ventures. At the end of 2022, our share of renewable generation capacity was 2.2 GW in operation and 4.2 GW in development. Our renewable power capacities are listed below:

Renewable power capacity in operation and in development as of December 31, 2022 - by region

	In operation [A]		In development [B]	
Location	100% capacity (MW)	Shell interest (MW)	100% capacity (MW)	Shell interest (MW)
Asia	2,250	1,830	681	614
Europe	932	344	1,664	1,208
North America	103	51	3,596	2,241
Australia	–	–	120	120
Total	3,285	2,225	6,061	4,183

Renewable power generation capacity in operation and in development as of December 31, 2022

	2022	2021	2020
Renewable power generation capacity (Shell interest - gigawatt):			
In operation [A]	2.2	0.7	0.4
In development [B]	4.2	2.3	1.7

[A] Renewable generation capacity post commercial operation date.
[B] Renewable generation capacity under construction and/or committed for sale under long-term offtake agreements (PPA).

Generating shareholder value | Renewables and Energy Solutions continued

Hydrogen

We are part of joint ventures and alliances that have built hydrogen filling stations for passenger cars and trucks. Since July 2021, we have operated an electrolyser (Shell interest 100%) in Germany, which produces green hydrogen (produced using electricity from renewable sources). In China, our joint venture Zhangjiakou City Transport and Shell New Energy Co., Limited (Shell interest 47.5%) developed a renewable power electrolyser and is developing hydrogen filling stations in Zhangjiakou City in the Beijing-Tianjin-Hebei region. The electrolyser started operations in January 2022. In July 2022, we announced the final investment decision to build the 200 MW electrolyser Holland Hydrogen I (Shell interest 100%) in the Netherlands, which is expected to be operational from 2025.

Carbon capture and storage

Carbon capture and storage (CCS) is a combination of technologies that capture and store CO_2 deep underground, preventing its release into the atmosphere. In the R&ES segment we offer CCS services to our customers. Existing CCS operations that help decarbonise our own assets are reported in the segment where the relevant asset sits.

We have a 33.3% interest in the Northern Lights CCS joint venture, where the other partners are Equinor and TotalEnergies (equal partners). The project is located in Norway and is under construction. Phase One is expected to be operational in 2024.

Nature and Environmental Solutions

Nature and Environmental Solutions include our Nature-Based Solutions (NBS) business and the Environmental Products Trading Business (EPTB). NBS conserve, enhance and restore ecosystems – such as forests, grasslands and wetlands – to prevent greenhouse gas emissions or reduce atmospheric CO_2 levels.

Through EPTB we develop, offtake, trade and supply environmental products across compliance and voluntary markets, and this includes working with our other businesses such as Integrated Gas or Marketing to provide integrated energy solutions to customers.

Shell Ventures

Shell Ventures are corporate venture funds, where we act as an investor and a partner to help commercialise innovative businesses. We aim to accelerate the energy and mobility transformation by investing in companies that lower emissions, electrify energy systems, gain data-based insights and provide innovative consumer solutions.

Treasury Wine Estates switches to solar

In 2022, Shell helped wine producer Treasury Wine Estates, owner of the Penfolds, 19 Crimes, St Huberts and Wolf Blass labels, get closer to achieving its net-zero target and become a renewable energy producer by installing a combined 9,500 solar panel modules at two of its Australian sites.

The solar modules were installed at the Barossa Winery and packaging centre in South Australia, and the Karadoc Winery in Victoria. They have been installed on rooftops and in open ground areas, and are expected to generate more than 5,500 megawatt-hours of electricity per year. This is the equivalent of powering 900 homes and offers an example of how the wine industry can navigate the energy transition.

Treasury Wine Estates wants to produce wine sustainably and is aiming for net-zero emissions from its own operations and the energy it consumes by 2030. Shell's Powering Progress strategy seeks to help customers decarbonise by identifying and providing solutions for cleaner, affordable and reliable energy.

Shell Energy is working with Treasury Wine Estates, which has 13,000 hectares of vineyards all over the world, to provide renewable energy across the wine company's operations, from cultivation to cellar door, tasting halls, offices and packaging centres. A further 9,000 solar panels are in the process of being installed at Treasury Wine Estates' Californian vineyards, including Sterling Winery, TWE Paso Winery, Paris Valley Ranch and Beaulieu Vineyards.

Photo: Solar panels installed at Treasury Wine Estates, Australia, helping TWE get closer to achieving its net-zero target.

Generating shareholder value

Corporate

Earnings

$ million

	2022	2021	2020
Segment earnings	(2,461)	(2,606)	(2,952)
Comprising:			
Net interest [A]	(1,723)	(2,701)	(2,991)
Operating expenses and other [B]	(745)	(570)	(943)
Taxation credit	7	665	982
Identified Items	(90)	81	460
Adjusted Earnings	(2,371)	(2,686)	(3,412)
Adjusted EBITDA	(725)	(554)	(933)

[A] Mainly Shell's interest expense (excluding accretion expense) and interest income.
[B] Other mainly comprises net foreign exchange gains and losses on financing activities, headquarters and central functions' costs not recovered from business segments, and net gains on sale of properties.

Overview

The Corporate segment covers the non-operating activities supporting Shell. It comprises Shell's holdings and treasury organisation, self-insurance activities and headquarters and central functions. All finance expense, income and related taxes are included in Corporate segment earnings rather than in the earnings of business segments.

The holdings and treasury organisation manages many of the Corporate entities. It is the point of contact between Shell and external capital markets, conducting a wide range of transactions, such as raising debt instruments and transacting foreign exchange. Treasury centres in London and Singapore support these activities.

Headquarters and central functions provide business support in communications, finance, health, human resources, information technology (IT), legal services, real estate and security. They also provide support for shareholder-related activities. The central functions are supported by business service centres, which process transactions, manage data and produce statutory returns, among other services. Most headquarters and central-function costs are recovered from the business segments. Costs that are not recovered are retained in Corporate.

Earnings 2022-2021

Segment earnings in 2022 were an expense of $2,461 million, compared with $2,606 million in 2021.

This decrease in expense was mainly driven by favourable movements in net interest expense. This was primarily due to an increase in interest income generated on cash balances, a reduction in interest expense on lease liabilities, and a reduction in interest expense on debt following repayments in 2021. This was partially offset by lower tax credits on financing items and higher net foreign exchange losses due to unfavourable exchange rate movements.

Prior year earnings summary

Our earnings summary for the financial year ended December 31, 2021, compared with the financial year ended December 31, 2020, can be found in the Annual Report and Accounts (page 74) and Form 20-F (page 73) for the year ended December 31, 2021, as filed with the Registrar of Companies for England and Wales and the US Securities and Exchange Commission, respectively.

Self-insurance

We mainly self-insure our hazard risk exposures. Our Group insurance companies are adequately capitalised to meet self-insurance obligations and respective regulations, though they may transfer risks to third-party insurers where economical, effective and relevant (see "Risk factors" on page 23). We continually assess the safety performance of our operations and make risk mitigation recommendations, where relevant, to minimise the risk of an accident.

Information technology and cyber security

Digitalisation is a key success factor in Shell's Powering Progress strategy. Shell is fast transforming its IT systems to support the evolving portfolio of businesses and is investing in new technologies to enhance IT capabilities such as data analytics, artificial intelligence, machine learning and virtual reality, bringing value to the business.

The growing dependence on information technology and data also brings risks which could cause significant harm to Shell in the form of loss of productivity, loss of intellectual property, regulatory fines and reputational damage. Cyber security is key to managing those risks, especially in today's increasingly regulated environment and adverse cyber threat landscape.

Shell operates a multi-level defence strategy underpinned by the Shell IT Control Framework and advanced cyber defence capabilities to prevent, detect, respond to, and evolve with complex cyber and data privacy risks. At the same time, we continuously measure and, where required, further improve our cyber-security capabilities to reduce the likelihood of successful cyber attacks.

A cyber security mindset across the enterprise forms the first line of defence to protect Shell. Robust governance processes are embedded across Shell to increase cyber awareness, monitor key cyber risks, and provide risk assurance. Cyber risk strategy and risk management are regularly reviewed with the Audit Committee and Board of Directors. Shell employees and contract staff are subject to mandatory courses and regular awareness campaigns aimed at protecting us against cyber threats.

See "Risk factors" on page 21.

Our journey to net zero

Shell has long recognised that greenhouse gas (GHG) emissions from the use of hydrocarbon-based energy are contributing to the warming of the climate system. We support the more ambitious goal of the UN Paris Agreement, which is to limit the rise in global average temperature this century to 1.5 degrees Celsius above pre-industrial levels.

Shell's Powering Progress strategy is designed to generate shareholder value while meeting our target of becoming a net-zero emissions energy business by 2050.

Since 2017, Shell has supported the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). The TCFD aims to improve the disclosure of climate-related risks and opportunities and provide stakeholders with the information they need to undertake robust and consistent analyses of the potential financial impacts of climate change. The TCFD recommends disclosure of qualitative and quantitative information aligned to its four core elements: governance, strategy, risk management, and metrics and targets.

We recognise the value that the recommendations bring and, in accordance with UK Listing Rule 9.8.6R, set out below our climate-related financial disclosures consistent with all of the TCFD Recommendations and Recommended Disclosures. By this we mean the four recommendations and the 11 recommended disclosures set out in Figure 4 of Section C of the report entitled "Recommendations of the Task Force on Climate-related Financial Disclosures" published in June 2017 by the TCFD. We also take into account relevant supplemental guidance including, for example, the TCFD's additional guidance "Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures" (also known as the 2021 TCFD Annex) published in October 2021 by the TCFD. We continue to align and enhance our climate-related disclosures.

Our journey to net zero continued

Our journey to net zero

Governance (see Governance for more information)

Board

- Safety, Environmental and Sustainability Committee
- Audit Committee
- Remuneration Committee

Oversight of our energy transition strategy by the board, supported by board committees.

Accountability for delivering our energy transition strategy sits with the CEO, with support from the Executive Committee and regular monitoring by the Board.

Executive Committee

- Capital Investment Committee
- Carbon committees such as the Carbon Reporting Committee

Our carbon management framework oversees carbon reduction considerations across the Shell Group.

Delivery of the strategy through our businesses

Strategy (see Strategy for more information)

We seek to decarbonise our own operations...

- portfolio changes: acquisitions, new low-carbon projects, shutting down and decommissioning units, divestments, natural decline
- improving the energy efficiency of our operations
- low-carbon energy and chemicals parks
- using more renewable electricity in our operations
- developing carbon capture and storage (CCS)
- using high-quality carbon credits, if required

...whilst supporting the transformation of the energy system

- provide more electricity and renewable power
- develop low- and zero-carbon alternatives to traditional fuels
- help customers to decarbonise their use of energy
- address remaining emissions from conventional fuels with CCS and carbon credits

Our financial strength and access to capital give us the ability to reshape our portfolio as the energy system transforms.

Climate Risk Management (see Climate Risk Management for more information)

Key Risk Factors

- Commercial risk
- Regulatory risk
- Physical risk
- Societal risk

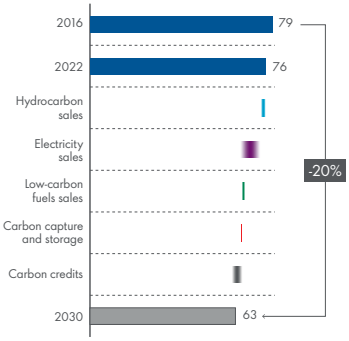
Climate risk assessment and monitoring integrated into Shell's overall risk management processes via:

- mandatory standards and manuals
- project-level risk management
- management and Board reviews
- internal audits and investigations
- annual attestation processes

Metrics & Targets (see Metrics & Targets for more information)

Working to reduce our net carbon intensity

Net carbon intensity in gCO_2e/MJ, equity control

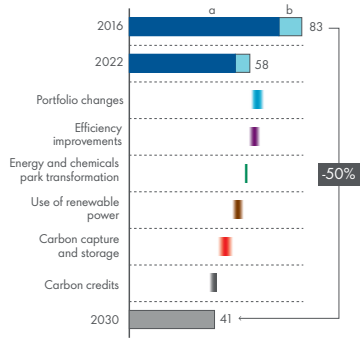


-20%
Net carbon intensity 20% reduction by 2030

-1.3%
-1.3% reduction vs 2021 actual

Working to reduce our absolute Scope 1 and 2 emissions

Scope 1 and 2 emissions in million tonnes CO_2e per annum, operational control



-50%
Scope 1 and 2 emissions 50% reduction by 2030

-15%
-15% reduction vs 2021 actual

Our journey to net zero continued

Governance of climate-related risks and opportunities

Board oversight of climate-related risks and opportunities

Our governance framework is designed to effectively deliver on the energy transition ambitions of Shell's Powering Progress strategy.

For detailed information on our Powering Progress strategy refer to pages 7-9.

The Board reviews our energy transition strategy periodically and oversees its implementation and delivery. In 2022, the Board considered climate-related matters throughout the year, including the assessment of climate-related risks and the effectiveness of corresponding risk management activities, and challenged and endorsed business plans, including consideration of major capital expenditures, acquisitions and divestments. In 2022, the Board convened eight times and continued to oversee the Powering Progress strategy and net-zero initiatives, including at the Board Strategy Day in June 2022.

Find more information in "Governance" (Board activities on pages 150-152 and Board engagements in 2022 on pages 154-156).

Three Board committees provide primary oversight of the delivery of our energy transition strategy: the Safety, Environmental and Sustainability Committee (SESCo), the Audit Committee (AC) and the Remuneration Committee (REMCO). The importance of our energy transition strategy means that these committees are informed about climate-related matters on a frequent basis throughout the year. See "Climate change governance organogram" below.

The SESCo provides oversight of our technical delivery when it comes to reducing our carbon emissions, and the potential impacts and adaptation measures related to the physical risks of climate change. This includes reviewing our carbon management framework (CMF) and monitoring progress in reducing emissions to meet targets. The SESCo met five times in 2022 and discussed some aspects of climate-related matters at every meeting. After each meeting the SESCo Chair provided updates to the Board.

For more information on the SESCo's activities in 2022, see pages 163-164.

Our AC provides oversight of the effectiveness of the risk management framework and the integrity of our financial reporting to ensure that our financial statements reflect the risks and opportunities associated with our energy transition strategy and climate change. During 2022, the AC convened six times and discussed climate-related matters on each occasion.

More information on our Audit Committee's activities in 2022 can be found in the Audit Committee Report on pages 165-177.

The REMCO develops our remuneration policy and sets performance conditions designed to challenge and support the Executive Committee to reduce net carbon emissions while maintaining shareholder value. The REMCO met five times during 2022, with climate-related matters discussed at each meeting.

Find more information on our Remuneration Committee's activities in 2022 in the "Directors' Remuneration Report" on pages 178-182 and the "Annual Report on Remuneration" on page 184.

Climate performance and remuneration

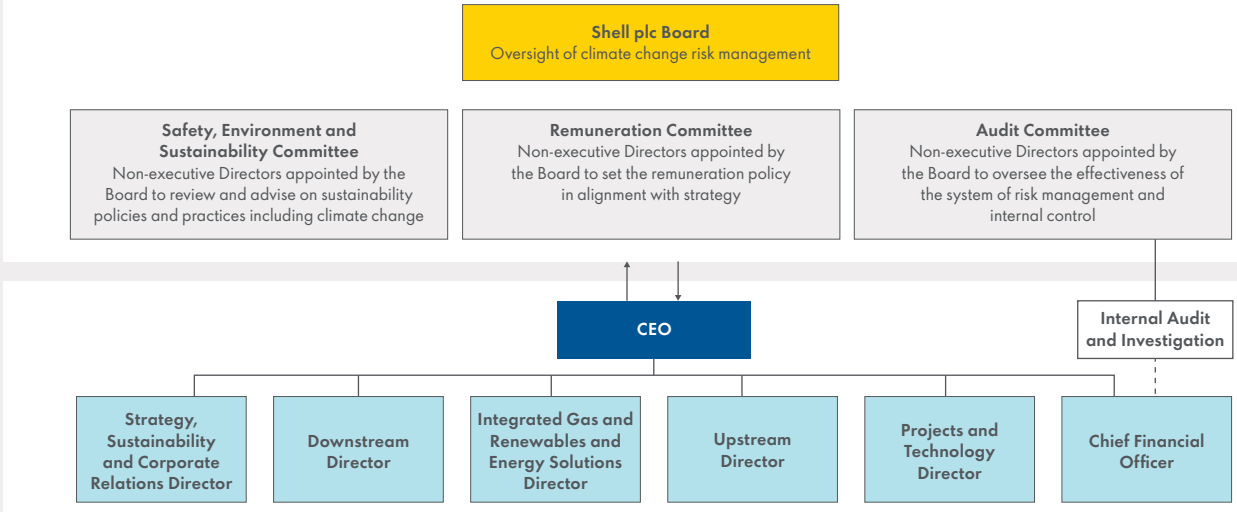
Energy transition targets were part of the 2022 annual bonus scorecard (15% weighting) for almost all of Shell's employees, as well as the 2022 Performance Share Plan (PSP) awards (10% weighting) and the 2022 Long-term Incentive Plan (LTIP) for senior executives (20% weighting), both vesting in 2025.

See "Directors' Remuneration Report" on pages 178-182 for further information.

Find additional information on the Board's oversight in "Governance framework" on pages 148-149.

Management's role in assessing climate-related risks and opportunities

Climate change governance organogram [A]



[A] Current structure which is subject to change with effect from July 1, 2023. See page 81 for more information.

Our journey to net zero continued

The Chief Executive Officer (CEO) has the delegated authority from the Board to manage Shell's actions in relation to the Company's strategy, which includes climate change. The CEO is assisted on climate-related matters by members of the Executive Committee to implement Shell's energy transition strategy and ensure that such matters are appropriately monitored:

- The Director of Strategy, Sustainability and Corporate Relations supports the CEO in developing Shell's energy transition strategy, including climate scenarios development, and augmenting our CMF. The CMF includes the setting of carbon budgets for our businesses, and the implementation of carbon management activities.
- The Downstream Director is responsible for identifying and delivering climate-related opportunities, as well as managing and mitigating the climate risks of our existing Downstream businesses. The Sectors and Decarbonisation organisation supports the Downstream Director in implementing the sectoral decarbonisation approach.
- The Integrated Gas, Renewables and Energy Solutions Director is responsible for developing and advancing low-carbon solutions and opportunities, including those across our solar, hydrogen and wind businesses, as well as managing and reducing carbon emissions from our business.
- The Upstream Director is responsible for identifying and delivering low-carbon and emission-reduction opportunities in our oil and gas business. This includes managing and reducing our carbon emissions, for example, by reducing routine flaring and, in some cases, by using renewable energy to power our oil and gas extraction activities.
- The Projects & Technology (P&T) Director is responsible for setting emissions, climate, and reporting standards that are applicable to all our businesses. The P&T Director is also responsible for developing new technologies that will help our businesses to deliver on net-zero emissions reduction targets through both energy efficiency measures and solutions geared towards decarbonisation.
- The Chief Financial Officer (CFO) is responsible for monitoring the effective application of the Shell Control Framework, which provides the basis for managing our material risks including climate-related risks and opportunities, and the assurance over our financial information, carbon emissions and climate-related disclosures.

On January 30, 2023, Shell announced it would reduce the size of its Executive Committee from nine to seven members. The changes are expected to take effect from July 1, 2023. The Integrated Gas and Upstream businesses will be combined into a single Integrated Gas and Upstream Directorate. The Downstream business will be combined with Renewables and Energy Solutions to form a new Downstream and Renewables Directorate. The Strategy, Sustainability and Corporate Relations directorate will be discontinued, and Strategy, Sustainability and New Business Development will now report directly to the CFO. The new structure is aimed at enabling more streamlined planning and capital allocation decisions. The intention of this change is to simplify the organisation further and improve performance as we deliver our Powering Progress strategy.

Additional supporting governance

There are two key supporting management committees, with representatives from across Shell, which play a critical role in driving our energy transition strategy:

- The Capital Investment Committee (CIC) facilitates portfolio management discussions and reviews each investment opportunity that is, due to its size, subject to approval by the CEO or the Board. These reviews ensure that the climate risks and opportunities, together with other defined criteria including shareholder value, are embedded in investment decision-making. This committee is made up of senior executives, including the CEO, CFO, and individual business directors.
- The Carbon Reporting Committee (CRC) includes senior management representatives from business units, P&T climate-related disciplines and various functions, such as Strategy, Finance and Legal. This committee is tasked with ensuring that GHG emissions measures, both absolute emissions and carbon intensity, and associated metrics, comply with all regulatory and legal requirements. The CRC is responsible at Group level for the calculation methodologies and reporting of GHG emissions metrics, and the review and approval of external disclosures.

In addition to these committees, our network of country chairs supports the overall governance and development and deployment of climate-related initiatives. They facilitate the setting of each country's plans in support of Powering Progress.

Processes by which management is informed about climate-related issues

Several processes are employed across the organisation to ensure that management teams can effectively monitor and manage climate-related matters. The management teams are helped by a combination of carbon-management-related standards and frameworks, forums at various levels of the organisation, and capability development programmes. These include our carbon management framework, carbon pricing, and the Greenhouse Gas (GHG) and Energy Management process, which forms part of our Health, Safety, Security, Environment and Social Performance (HSSE & SP) Control Framework.

Carbon management framework

Shell's carbon management framework (CMF) helps us set carbon budgets in the operating plans for our businesses. The CMF seeks to manage and reduce emissions in a manner that is similar to how we use our financial framework. Carbon budgets are an effective measure for maintaining absolute emissions below a capped level, however achieving our intensity target is dependent on our energy product mix which is not driven by carbon budgets alone.

The CMF allows for carbon budgets to be allocated to our businesses and trade-offs between emitting carbon and generating shareholder value to occur within those budgets. The CMF helps inform portfolio decisions and support our decarbonisation targets. This provides leadership with the information required to make decisions on GHG reduction opportunities and portfolio choices required to achieve our decarbonisation targets.

For the 2022 operating plan cycle, our net carbon intensity (NCI) targets were translated into Scope 1, 2 and 3 (see definition on page 82) carbon budgets for each business. These budgets were used to optimise the operating plans for each business.

Some examples of how our decarbonisation targets are taken into account in fundamental decisions across the organisation are as follows:

- Our businesses further embedded carbon emissions objectives in their respective Capital, Portfolio and Carbon forums. The forums consist of the most senior business management representatives who are responsible for active portfolio management through evaluation, and delivery of growth and divestment decisions.
- Certain assets are required to identify GHG abatement opportunities and reflect them in their annual business plans.

Our journey to net zero continued

Greenhouse gas and energy management

Each Shell entity and Shell-operated venture is responsible for the development of its GHG emissions and energy management plans.

Our Greenhouse Gas and Energy Management process sets out Shell's requirements for GHG reduction opportunities and portfolio choices to meet our carbon budgets and achieve our decarbonisation targets. These requirements allocate accountabilities for GHG and energy management within businesses, assets and projects, including responsibility for analysing our emissions, benchmarking performance, identifying improvement opportunities, and forecasting future performance. These requirements are applied to capital project delivery and through the asset-level annual business planning process, ensuring it is reflected in both opportunity realisation and strategic asset management planning.

A key aspect of the GHG and Energy Management process is the development of an energy efficiency and greenhouse gas reduction opportunity curve, economically assessed against the current and future costs of carbon. This information provides the basis for forecasts of absolute GHG emissions and associated intensities at the asset and project level. These forecasts are then aggregated to inform decisions on potential decarbonisation opportunities across our businesses.

A Global Process Council for GHG and Energy Management, led by the Global Process Owner for GHG and including business and functional experts, meets regularly to evaluate opportunities for the ongoing improvement of processes, tools, communications, and capabilities needed within the businesses to achieve our decarbonisation aspirations.

The requirements of our GHG & Energy Management Process are integrated into our annual business planning cycle.

Definition - Scope 1, 2 and 3 emissions

We follow the GHG Protocol's Corporate Accounting and Reporting Standard, which defines three scopes of GHG emissions:

- Scope 1: direct GHG emissions from sources under Shell's operational control.
- Scope 2: indirect GHG emissions from generation of purchased energy consumed by Shell assets under operational control.
- Scope 3: other indirect GHG emissions, including emissions associated with the use of energy products sold by Shell.

Carbon pricing

We consider the potential costs associated with operational GHG emissions when we assess the resilience of new projects. For each region, we have developed short-, medium- and long-term estimates of future costs of carbon. These are reviewed and updated annually. See Note 4 to the "Consolidated Financial Statements" for further details on our regional cost of carbon estimates.

Up to 2030, costs for carbon emissions estimates are largely policy driven through emission trading schemes or taxation levied by governments and which varies significantly on a country-by-country basis. Beyond 2030, where policy predictions are more challenging, the costs for carbon emissions are estimated based on the expected costs of abatement technologies required for 2050. The costs are estimated to be at $125 per tonne (RT 2022) under Shell's mid-price scenario. Under a high-price scenario, the costs are set at $220 per tonne (RT 2022), the top of the bioenergy with CCS cost range and the lower end of the direct air capture cost range.

See "The resilience of Shell's strategy" on pages 88-89 for more information on how carbon costs impact Shell's resilience to climate-related risks, including sensitivity analysis.

Our journey to net zero continued

Energy transition strategy

Powering Progress is our strategy to become a net-zero emissions energy business, purposefully and profitably. Powering Progress aims to deliver value for our shareholders, for our customers and for wider society.

For more information, see the "Our strategy" section on pages 7-9.

Our strategy aims to support the more ambitious goal of the Paris Agreement

Tackling climate change is an urgent challenge. It requires a fundamental transformation of the global economy and the energy system so that society stops adding to the total amount of greenhouse gases in the atmosphere, achieving what is known as net-zero emissions. That is why Shell has set a target to become a net-zero emissions energy business by 2050.

To help us get there, we have set short-, medium- and long-term targets to reduce our carbon intensity, measured using our net carbon intensity (NCI) metric. For more information see "Setting targets for NCI" on page 99.

There is no established standard for aligning an energy supplier's decarbonisation targets with the temperature limit goal of the Paris Agreement. In the absence of a broadly accepted standard, Shell has developed its own approach to demonstrate Paris alignment by setting carbon intensity targets within a pathway derived from scenarios from the IPCC Special Report on Global Warming of 1.5°C (SR 1.5), most of which show the global energy system reaching net zero between 2040 and 2060.

This pathway is aligned with the more ambitious temperature goal of the Paris Agreement to limit global mean temperature rise to 1.5°C above pre-industrial levels by 2100. We believe our targets are aligned with the IPCC SR1.5 pathway.

When constructing the pathway, we filtered out certain outlying IPCC scenarios to ensure that Shell's targets are aligned with earlier action, and low-overshoot scenarios. Overshoot refers to the extent to which a scenario exceeds an emissions budget and subsequently relies on carbon sinks to compensate for the excess emissions.

Becoming a net-zero emissions energy business means reducing emissions from our operations, and from the fuels and other energy products, such as electricity, that we sell to our customers. It also means capturing and storing any remaining emissions using technology, protecting natural carbon sinks, and providing high quality carbon credits to our customers to compensate for hard-to-abate emissions.

An increasing number of countries and companies have announced targets to achieve net-zero emissions by the middle of the century, and we are starting to see some changes in the demand and supply of energy. However, achieving the 1.5 degrees Celsius goal will be challenging and requires unprecedented global collaboration. The pace of change will also vary around the world.

Climate-related risks and opportunities identified by Shell over the short, medium and long term

We are continually enhancing our strategic risk management approach to addressing climate-related risks. Our strategy is shaped in response to risks and opportunities identified across the customer sectors and regions we work in.

The process for identifying and assessing climate-related risks and opportunities is set out under "Climate Risk Management" below. Shell has identified climate change and the associated energy transition as a material risk based on societal concerns and developments related to climate change and managing GHG emissions. The risks could potentially result in changes to the demand for our products, our operational costs, supply chains, markets, the regulatory environment, our licence to operate, and litigation. The risks are composed of a combination of complex and interrelated elements that affect Shell's overall business value chain, and our asset, product and business portfolio. The risk landscape is evolving rapidly. To achieve our emissions reduction targets, active holistic management of all climate-related risk components is important. The composite risk is broken down into the following sub-components:

- commercial risk;
- regulatory risk;
- societal risk (including litigation risk); and
- physical risk.

We also seek to identify opportunities for Shell in the energy transition, from our existing position as a leading global energy provider. These risks and opportunities are described below and are also summarised in the "Risk factors" section of the Strategic Report on pages 15-26.

Time horizons: short, medium and long

Due to the inherent uncertainty, and the pervasive nature of the risks across our strategy and business model, we monitor climate-related risks and opportunities across multiple time horizons.

- Short term (up to three years): we develop detailed financial projections and use them to manage performance and expectations on a three-year cycle. These projections incorporate decarbonisation measures required to meet our short-term targets.
- Medium term (generally three to 10 years): embedded within our operating plan, with our continued focus on the customer, the investments and portfolio shifts required in the medium term that will fundamentally reshape Shell's portfolio. At the same time, our existing asset base is expected to provide the cash flow to finance this transition of our revenue in this period.
- Long term (generally beyond 10 years): it is expected that our portfolio and product mix will look very different, addressing the shift from an asset-based approach to a customer-based business model.

Our journey to net zero continued

Transition risks

Climate-related commercial risk

- The transition to a low-carbon economy may lead to lower sales volumes and/or margins due to a general reduction or elimination of demand for oil and gas products, possibly resulting in underutilised or stranded oil and gas assets and a failure to secure new opportunities.
- Changing preferences of investors and financial institutions could reduce access to and increase the cost of capital.

Relevant time horizon:
medium and long

Potential material impacts on the organisation

Lower demand and margins for oil and gas products
Changing customer sentiment towards renewable and sustainable energy products may reduce demand for our oil and gas products. An excess of supply over demand could reduce fossil fuel prices. This could be a factor contributing to additional provisions for our assets and result in lower earnings, cancelled projects and potential impairment of certain assets.

Changing preferences of investors and financial institutions
Financial institutions are increasingly aligning their portfolios to a low-carbon and net-zero world, driven by both regulatory and broader stakeholder pressures. A failure to decarbonise the business portfolios in line with investor and lender expectations could have a material adverse effect on our ability to use financing for certain types of projects. This could also adversely affect our potential partners' ability to finance their portion of costs, either through equity or debt.

Sensitivity analysis of a 1% shift in Shell's weighted average cost of capital on asset carrying values is presented in 'Carbon pricing and discount rate sensitivities' on page 89.

Remaining in step with the pace and extent of the energy transition
The energy transition provides us with significant opportunities, as described in the "Transition opportunities" below. If we fail to stay in step with the pace and extent of change or customers' and other stakeholders' demand for low-carbon products, this could adversely affect our reputation and future earnings. If we move much faster than society, we risk investing in technologies, markets or low-carbon products that are unsuccessful. Therefore we cannot transition too quickly or we will be trying to sell products that customers do not want. This could also have a material adverse effect on financial results.

Technology and innovation are essential to our efforts to help meet the world's energy demands competitively. If we are unable to develop the right technology and products in a timely and cost-effective manner, or if we develop technologies, products and solutions that harm the environment or people's health, there could be an adverse effect on our future earnings.

Climate-related regulatory risk

The transition to a low-carbon economy will likely increase the cost of compliance for our assets and/or products, and may include restrictions on the use of hydrocarbons. The lack of net-zero-aligned global and national policies and frameworks increases the uncertainty around this risk.

Relevant time horizon:
short, medium, and long

Potential material impacts on the organisation

Increased compliance costs
Some governments have introduced carbon-pricing mechanisms, which we believe can be an effective way to reduce GHG emissions across the economy at the lowest overall cost to society.

Shell's cost of compliance with the EU Emissions Trading Scheme (ETS) and related schemes was around $493 million in 2022, as recognised in Shell's Consolidated Statement of Income for 2022. A further $3,512 million of costs were incurred in respect of biofuels ($2,918 million) and renewable power ($594 million) programmes (see Note 5 to the "Consolidated Financial Statements" on pages 261-262).

Shell's annual carbon cost exposure is expected to increase over the next decade because of evolving carbon regulations. The forecasted annual cost exposure in 2023 is estimated to be around $0.8 billion and around $1.5 billion in 2032. This estimate is based on a forecast of Shell's equity share of emissions from operated and non-operated assets (including joint ventures and associates), and real-term carbon cost estimates using the mid-price scenario (see Note 4 to the "Consolidated Financial Statements" on pages 252-260 for more information). This exposure also takes into account the estimated impact of free allowances as relevant to assets based on their location.

Restrictions on use of hydrocarbons
Around 90% of the global economy is now signed up to net-zero commitments as of June 2022, according to the Energy and Climate Intelligence Unit. This brings an increasing risk that governments set future regulatory frameworks that restrict further exploration and production of hydrocarbons, and bring in controls to limit the use of such products. Failure to replace proved reserves could result in an accelerated decrease of future production, which could have a material adverse effect on our earnings, cash flows and financial condition.

Lack of net-zero-aligned global and national policies and frameworks
The lack of net-zero-aligned global and national policies and frameworks increases the uncertainty around how carbon pricing and other regulatory mechanisms will be implemented in the future. This makes it harder to determine the appropriate assumptions to be taken into account in our financial planning and investment decision processes.

Our journey to net zero continued

Transition risks continued

Climate-related societal risk (including litigation risk)

As societal expectations develop around climate change, there is a potential impact on Shell's licence to operate, reputation, brand and competitive position. This is likely to include litigation.

Relevant time horizon:
short, medium and long

Potential material impacts on the organisation

Decline in reputation and brand
Societal expectations of businesses are increasing, with a focus on business ethics, quality of products, contribution to society, safety and minimising damage to the environment. There is an increasing focus on the role of the oil and gas sector in the context of climate change and the energy transition. This could negatively affect our brand, reputation and licence to operate, which could limit our ability to deliver our strategy, reduce consumer demand for our branded and non-branded products, harm our ability to secure new resources and contracts, and restrict our ability to access capital markets or attract staff.

Deteriorating relationships with key stakeholders
Failure to decarbonise Shell's value chain in line with societal, governmental and investor expectations is a material risk to Shell's reputation as a responsible and market-leading energy company. The impact of this risk includes shareholder divestment, greater regulatory scrutiny and potential asset closure resulting from public interest groups' protests.

Litigation
There is an increasing risk to oil and gas companies from public, private and governmental lawsuits. Such action may have wide-ranging consequences, including forcing entities to hand over strategic autonomy in part to regulators, divest from hydrocarbon technologies, denial of regulatory approvals and/or paying fines/penalties or large compensation packages to the plaintiff.

In some countries, governments, regulators, organisations and individuals have filed lawsuits of a wide variety, including seeking to hold oil and gas companies liable for costs associated with climate change, or seeking court-ordered reductions in emissions, challenging the regulatory approvals and operating licenses, or challenging energy transition strategies and plans. While we believe these lawsuits to be without merit, losing could have a material adverse effect on our earnings, cash flows and financial condition.

For example, in May 2021, the District Court in The Hague, the Netherlands, ruled that, by end 2030, Shell must reduce, from its consolidated subsidiaries, its aggregate net Scope 1, 2 and 3 emissions by 45%, compared with 2019 levels. The Scope 1 component is a results-based obligation and the Scope 2 and 3 components are a significant best efforts obligation. In 2019, our Scope 1 emissions from our consolidated subsidiaries were 86 million tonnes of carbon dioxide equivalent (CO_2e) (rounded) (financial control basis).

Physical risks

Climate-related physical risk

The potential physical effects of climate change may impact Shell's assets, operations, supply chains, employees and markets.

Relevant time horizon:
short, medium and long

Potential material impacts on the organisation

Mitigation of physical risks, whether or not related to climate change, is considered and embedded in the design and construction of assets. The potential impact of physical changes comes from both acute and chronic physical risks.

Acute risks, such as flooding and droughts, wildfires and more severe tropical storms, and chronic risks, such as rising temperatures and rising sea levels, could potentially impact some of our facilities, operations and supply chains. The frequency of these hazards and impacts is expected to increase in certain high-risk locations. Extreme weather events, whether or not related to climate change, could have a negative impact on our earnings, cash flows and financial conditions.

We have performed a limited analysis addressing a range of typical climate change features for a select group of assets. As this is an emerging area of risk assessment, we aim to deepen our understanding of these potential future risks.

Additionally, the impact of physical climate change on our operations is unlikely to be limited to the boundaries of our assets. The overall impact including how supply chains, resource availability and markets may be affected also needs to be considered for a holistic assessment of this risk. Our assets manage this risk as part of broad risk and threat management processes as required by our HSSE & SP Control Framework.

Our journey to net zero continued

Transition opportunities

Climate-related opportunities

The transition to a low-carbon economy also brings significant opportunities for us to benefit from changing customer demands, given our position as a leading global energy provider.

Relevant time horizon:
short, medium and long

Potential material impacts on the organisation

As the global energy mix changes, our current infrastructure, know-how and global footprint put us in an ideal position to service the changing energy demands of the market. Our research and development (R&D) activities are key to achieving our net-zero emissions target.

As we shift from an asset-based to a customer-focused business model our current key focus areas for seizing this opportunity are:

1. Renewables and Energy Solutions
This encompasses our wind, solar, hydrogen, electric vehicle charging, nature-based solutions, and carbon capture and storage businesses. Electricity generated by wind and solar power plays a direct role in reducing emissions in passenger transport and parts of industry. It can also be used to create hydrogen. We expect hydrogen to present a business opportunity for heavy-duty road freight over a shorter time horizon and within shipping, industry and, possibly, aviation, over a longer time horizon. Hydrogen also has the potential to become a material part of Shell's business-to-business (B2B) operations, as heavy industry begins to transition away from energy sourced from hydrocarbons.

In 2022, Shell announced the final investment decision to build Holland Hydrogen 1, a 200 MW electrolyser that will be constructed on the Tweede Maasvlakte in the Port of Rotterdam and is expected to produce up to 60,000 kilograms of renewable hydrogen per day.

In 2022, Shell's spending on CCS opportunities (operating expenses and cash capital expenditure) amounted to around $220 million, an increase of 51% from the $146 million in 2021. Shell's equity share of captured and stored CO_2 was around 0.4 million tonnes in 2022, in line with the 2021 amount.

2. Biofuels
Shell and the non-operated joint venture Raízen (Shell interest 44%) are together one of the world's largest blenders and distributors of biofuels. Shell plans to continue to invest in and increase the production of these low-carbon fuels. Our low-carbon fuels projects and operations around the world form part of a wider commitment to provide a range of energy choices for customers. For example, we believe that sustainable aviation fuels (SAF) provide the most effective way of reducing emissions within the aviation sector, with wider adoption of SAF enabling us to provide more low-carbon fuels to our customers. Biofuels may also present opportunities in the shipping, road freight and other sectors.

Together with our customers, we are working on changing energy demand and developing ways to help increase the use of low-carbon fuels and decrease carbon emissions from this sector. Meanwhile, on the supply side, in Rotterdam in the Netherlands, Shell is building an 820,000-tonnes-a-year biofuels facility. This is expected to be among the largest in Europe producing sustainable aviation fuel and renewable diesel made from waste and certified sustainable vegetable oils.

3. Natural gas
Demand for liquefied natural gas (LNG) is expected to grow. As one of the world's largest suppliers of liquefied natural gas (LNG), with around 40 million tonnes of equity capacity, we can ship natural gas to where it is needed. LNG plays an important role in enabling countries to replace coal-fired power generation with a less carbon-intensive alternative. Shell seeks to provide more affordable, reliable and cleaner energy to our customers. In 2022, we produced gas for the first time from the Shell-operated Colibri project in Trinidad and Tobago. While the majority of Colibri's gas will be exported as LNG, around 25% will be used to power local homes and businesses.

4. Transforming refineries into energy and chemicals parks
An important aim of our Powering Progress strategy is to transform refineries into energy and chemicals parks so that we can sell more low-carbon and sustainable products.

Impact of climate-related risks and opportunities on Shell's businesses, strategy and financial planning

The transformation of the energy system to net-zero emissions will require simultaneous action in three areas – an unprecedented improvement in the efficiency with which energy is used, a sharp reduction in the carbon intensity of the energy mix, and the mitigation of residual emissions using technology and natural sinks. While it is difficult to predict the exact combination of actions that will deliver the net-zero goal, scenarios help us to consider the variables and the potential direction and pace of the transition needed.

We have been developing scenarios within Shell for almost 50 years, helping Shell leaders to explore ways forward and make better decisions. Shell scenarios are designed to stretch management's thinking when it comes to considering events that may be remotely possible. Scenarios help management make choices in times of uncertainty and transition as we grapple with tough energy and environmental issues. They are aligned to different energy transition pathways and help in decision-making by guiding the identification of risks and opportunities.

Different socio-economic and technological parameters are used to construct these scenarios, such as:

- sectoral and regional energy demand;
- future trajectory of oil consumption and demand for natural gas;
- renewable electricity demand and the pace of the electrification of the global energy system;
- supply of solar and wind energy;
- pace of uptake of electric vehicles;
- demand for biofuels;
- growth of the hydrogen economy;
- level of carbon capture and storage (CCS);
- deployment of lower-carbon energy technologies; and
- global trade of oil and gas.

Management consideration of different climate change outcomes informs a range of areas including, but not limited to, the setting of the long-term strategy, business planning, and investment and divestment decisions. The outcomes considered by management vary in relation to the extent and pace of the energy transition.

Our journey to net zero continued

Impact on strategic planning

The application of scenario analysis informs our assessment of the impact of a wide range of risks and opportunities, including climate-change related issues, on our strategy and business planning, both at the Group and business unit levels. At the Group level, the potential impacts of the energy transition on our business model are discussed and assessed at the Board and the Executive Committee level as part of the annual strategic and business planning cycle. This assessment allows us to challenge accepted ways of thinking, identify material risks and opportunities, and identify key tensions and trade-offs.

Key financial and non-financial components of business planning

The Board approves our annual business plan. The plan contains operational and financial metrics, and its objective is to drive the delivery of our Powering Progress strategy.

Decarbonisation targets are key to our business planning process. Each business owner offers viable Scope 1, 2 and 3 reduction opportunities as part of this process, in line with the CMF (see page 81).

The business plan is underpinned by assumptions about internal and external parameters and includes:

- commodity prices;
- refining margins;
- production levels and product demand;
- exchange rates;
- future carbon costs;
- the schedules of capital investment programmes; and
- risks and opportunities that may have material impacts on free cash flow.

These assumptions are developed with input from our scenarios and internal estimates and outlooks. The level of uncertainty around these assumptions increases over longer time horizons.

Impact on business and financial planning

There is no single scenario that underpins Shell's business and financial planning. Scenarios are not intended to be predictions of likely future events or outcomes and, therefore, are not the basis for Shell's operating plans and financial statements. Our scenarios help in developing our future oil and gas pricing outlooks. The oil and gas pricing outlooks takes account of factors relating to the energy transition, such as potential changes in supply and demand (see details of scenario parameters above). The low-, medium- and high-pricing outlooks are prepared by a team of experts, reviewed by the Shell Executive Committee, and approved by the CEO and CFO. The medium pricing outlook represents management's reasonable best estimate and is the basis for Shell's financial statements, operating plans and impairment testing.

Shell's targets to reduce absolute Scope 1 and 2 emissions by 50% by 2030, compared with 2016 levels on a net basis (i.e. including carbon credits), and 20% reduction in net carbon intensity by 2030 have been included in Shell's operating plan. We will continue to update our business plan, price outlooks and assumptions as we move towards net-zero emissions by 2050.

As described in "Climate-related risks and opportunities identified by Shell over the short, medium and long term", the low-pricing outlooks could result in increased commercial, regulatory and societal risks, as well as transition opportunities. How these risks are prioritised is described in "Shell's processes for identifying and assessing climate-related risks". Given our target to become a net-zero emissions energy business by 2050, the use of low-pricing outlooks is a part of our resilience testing and resulting actions.

Our strategy and national net-zero commitments

In line with LR 9.8.6FG, we have considered the extent to which country-level net zero commitments have been considered in developing our transition plan.

Our Powering Progress strategy aims to deliver a net-zero emissions energy business by 2050. The pace of the energy transition will be heavily influenced by government policy, creating a strong country and regional dimension in seeking to deliver the aims of the Paris Agreement. Our commitment is a global one and, as such, we look to deliver our strategy through a global lens.

We seek to translate our energy transition strategy into specific targets and plans at a business segment level, ensuring we take capital deployment and portfolio decisions in the context of the globally integrated nature of our operations. However, we continue to recognise the importance of engagement and collaboration in delivering the fundamental changes to the energy system that are required. This includes supporting and advocating for policies that aim to reduce carbon emissions and working with governments and other stakeholders in the development of policy that supports the transition to a lower-carbon energy system. As national transition plans develop, consideration will be given to the impact on our operations and the associated implications for our energy transition strategy.

Our journey to net zero continued

Resilience of Shell's strategy to different climate-related scenarios

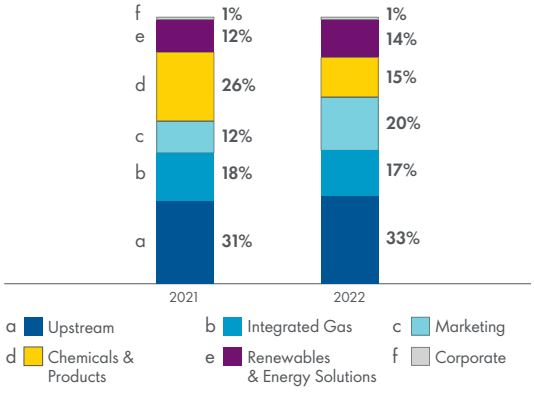
Shell's financial strength and access to capital give us the ability to reshape our portfolio as the energy system transforms. They also allow us to withstand volatility in oil and gas markets.

We continue to optimise our capital allocation balancing energy security and demand, as well as internal and external transition considerations and opportunities. We aim to find the right balance between managing our upstream assets – which provide the vital supplies of oil and gas that the world needs today and produce the returns needed to help us fund the transition – and investing in the energy transition. These activities are essential to identify, build and scale up profitable projects that offer low-carbon energy solutions for our customers.

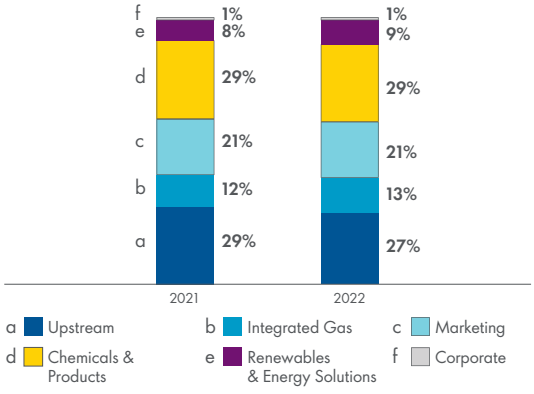
From January 1, 2022, we have disclosed the financial performance of our Renewables and Energy Solutions (R&ES) segment. R&ES is a business through which we seek to develop commercial opportunities which will be key in supporting the delivery of our net-zero emissions target.

See Note 8 to the Consolidated Financial Statements "Segment Information" on pages 265-269 for more information.

Cash capital expenditure evolution by segment



Operational expenditure evolution by segment



Cash capital expenditure by segment for 2023 is expected to be in the range of $8 billion for Upstream, $6 billion for Marketing, $5 billion for Integrated Gas, $3-4 billion for Chemicals and Products, and $2-4 billion for R&ES.

Investing through the energy transition

Total cash capital expenditure of $25 billion in 2022

Non-energy products [A]	Low-carbon energy solutions [B]
$3.9 billion	$4.3 billion
LNG, gas and power marketing and trading [C]	**Oil, oil products and other [D]**
$4.2 billion	$12.5 billion

[A] Products for which usage does not cause Scope 3, Category 11 emissions: Lubricants, Chemicals, Convenience Retailing, Agriculture & Forestry, Construction & Road.
[B] E-Mobility and Electric Vehicle Charging Services, Low-Carbon Fuels (Biofuels/HEFA), Renewable Power Generation (Solar/Wind), Environmental Solutions, Hydrogen, CCUS. We define low-carbon energy products as those that have an average carbon intensity that is lower than conventional hydrocarbon products, assessed on a lifecycle basis (including emissions from production, processing, distribution and end use).
[C] LNG Production & Trading, Gas & Power Trading, and Energy Marketing.
[D] Upstream segment, GTL, Refining & Trading, Marketing fuel and hydrocarbon sales, Shell Ventures, Corporate segment.

Movements in cash capital expenditure versus 2021 were as follows:

- 'Non-energy products' reduced by 9% (from $4.2 billion in 2021) mainly through lower spend at Shell Polymers Monaca as construction came to completion.
- 'Low-carbon energy solutions' increased by 89% (from $2.3 billion in 2021) mainly through higher investments in renewable power generation, low-carbon fuels, and e-mobility.
- 'LNG, gas and power marketing and trading' increased by 17% (from $3.6 billion in 2021) reflecting investment in the North Field East expansion project in Qatar.
- 'Oil, oil products and other' increased by 30% (from $9.6 billion in 2021) mainly through our Upstream deepwater operations, including the acquisition of a 25% stake in the Atapu field in Brazil.

Key aspects of Shell's financial resilience in the context of climate-related impacts are assessed and described in more detail in Note 4 to the "Consolidated Financial Statements". This describes how Shell has considered climate-related impacts in key areas of the financial statements and how this translates into the valuation of assets and measurement of liabilities. Shell's financial statements are based on reasonable and supportable assumptions that represent management's best estimate of the range of economic conditions that may exist in the foreseeable future.

Sensitivity analysis using external, and often normative, climate scenarios has been performed for the period covering asset life cycles. If these different price outlooks were used, this would impact the recoverability of certain assets recognised in the Consolidated Balance Sheet as at December 31, 2022.

As there is no single scenario that underpins our plans, sensitivity analysis has been conducted using a range of key assumptions to test the resilience of our asset base. This includes sensitivity analysis on asset carrying values using commodity price outlooks from external and often normative climate change scenarios; shifting trends in our portfolio, particularly exploration and evaluation, Upstream production and refineries; risks related to stranded assets; resilience of investments for transformation of the refining portfolio into five energy and chemicals parks; forecasted taxable profits sufficient to recover deferred tax assets; dividend resilience; and limited risk on timing of decommissioning and restoration activities for Integrated Gas and Upstream.

Our journey to net zero continued

Commodity price sensitivities

Oil and gas prices are one of the key assumptions that underpin Shell's financial statements, with the mid-price outlook informed by Shell's scenario planning representing management's best estimate. Price outlooks reflect a broad range of factors, including, but not limited to, future supply and demand, and the pace of growth of low-carbon solutions. The scenarios have been selected to illustrate the resilience of the asset base under a range of possible outcomes, including the price implications arising from the IEA Net Zero Emissions scenario which provides a potential path for the global energy system to net-zero emissions by 2050. Sensitivities of asset carrying amounts to prices are under the assumption that all other factors in the models used to calculate impacts remain unchanged.

Sensitivity analysis has been performed using price outlooks from:

1. Average prices from three 1.5-2 degrees Celsius external climate change scenarios. In view of the broad range of price outlooks across the various scenarios, the average of three external price outlooks was taken from IHS Markit/ACCS 2022; Woodmac WM AET-1.5 degree; and IEA NZE50.

   Applying these prices to Integrated Gas assets of $75 billion and Upstream assets of $88 billion as at December 31, 2022, shows recoverable amounts that are $4-6 billion and $1-2 billion lower, respectively, than the carrying amounts as at December 31, 2022.

2. Hybrid Shell Plan and IEA NZE50: for this Shell's mid-price outlook is applied for the next 10 years. Because of greater uncertainty, the IEA normative Net Zero Emissions scenario is applied for the period after 10 years. This weights less price-risk uncertainty to the first 10 years reflected in the operating plan period and applies more risk to the more uncertain subsequent periods.

   Applying this priceline to Integrated Gas assets of $75 billion and Upstream assets of $88 billion as at December 31, 2022, shows recoverable amounts that are $4-6 billion and $1-2 billion lower, respectively, than the carrying amounts as at December 31, 2022.

3. For 2022, we have also included sensitivities based on a 1.5 degree scenario, derived from IEA NZE50. This priceline applies the IEA normative Net Zero Emissions scenario over the whole period under review. This priceline has been applied for the first time in the current year in order to also reflect the sensitivity to a pure net-zero emissions scenario from the IEA.

   Applying this priceline to Integrated Gas assets of $75 billion and Upstream assets of $88 billion as at December 31, 2022, shows recoverable amounts that are $9-12 billion and $8-11 billion lower, respectively, than the carrying amounts as at December 31, 2022.

In addition, further sensitivities are provided of -10% or +10% to Shell's mid-price outlook, as an average percentage over the full period. A change of -10% or +10% to the mid-price outlook, as an average percentage over the full period, would result in around $2-5 billion impairment or some $2-4 billion impairment reversal, respectively, in Integrated Gas and Upstream as at December 31, 2022.

Compared with the prior year the impact on recoverable amounts is significantly lower as a result of the higher short- and medium-term commodity prices.

Carbon pricing and discount rate sensitivities

The risk of stranded assets may increase in a higher carbon price scenario. Sensitivities of our asset carrying values to carbon prices have been based on an IEA NZE 2050 scenario, to illustrate the resilience of asset carrying values to higher long-term carbon prices than those included in the Shell mid-price outlook.

Applying the IEA NZE 2050 carbon price scenario to Integrated Gas assets of $75 billion and Upstream assets of $88 billion, up to the end of life of these assets, shows recoverable amounts that are $2-5 billion and not significantly lower, respectively, than the carrying amounts as at December 31, 2022.

See "Carbon pricing" on page 82 for more information on our carbon price assumptions.

The discount rate applied for impairment testing is based on a nominal post-tax weighted average cost of capital (WACC) of 5% for Power activities and a nominal post-tax WACC of 6.5% for all other businesses. The discount rate includes generic systematic climate change risk. In addition, cash flow projections applied in individual assets include specific asset risks. An increase in systematic climate risk could lead to a higher WACC and consequently to a higher discount rate to be applied in impairment testing. We have used a 1% shift in discount rate for sensitivity analysis purposes as an indicator of the resilience of our asset base to incremental increases in our cost of capital.

An increase of the WACC of 1% under the assumption that all other factors in the models used to calculate recoverability of carrying amounts remain unchanged would lead to an impairment of $1-3 billion for Integrated Gas and up to $1 billion in each of the following segments: Upstream, Chemicals and Products, and Renewables and Energy Solutions. No significant impairment would arise in the Marketing segment.

See Note 4 to the Consolidated Financial Statements on page 252 for further information on climate-related impacts in key areas of the financial statements.

Delivering our energy transition strategy

To ensure the resilience of our Powering Progress strategy, our responses to the risks and opportunities identified are:

- delivery through our integrated business model;
- a sectoral decarbonisation approach – recognising that we need to work with our customers to identify low-carbon energy solutions for their energy demands; and
- decarbonisation of our energy value chains and operations.

Our net-zero target includes emissions from our operations, and the life-cycle emissions from all the energy products we sell. We will seek to reduce emissions from our own operations, including the production of oil and gas. More than 90% of the total emissions we include within the NCI boundary are indirect emissions associated with third-party products and end use emissions of energy products we sell, so we are also working with our customers to support them in transitioning to low-carbon products and services.

Our integrated approach allows us to withstand volatility in oil and gas markets. Our financial framework is based on sector-leading cash flow, continued capital discipline, capital flexibility and a strong balance sheet.

- Upstream delivers the cash and returns needed to fund our shareholder distributions and the transformation of our portfolio, and provides vital supplies of oil and natural gas to help meet the world's energy needs.
- Integrated Gas and Chemicals and Products make the products needed to help enable the energy transition. They produce sustainable cash flow and provide us with the asset infrastructure to support our investments in the future of energy.
- Marketing and R&ES include service stations, sales of gasoline and diesel, fuels for business customers, power, hydrogen, biofuels, charging for electric vehicles, carbon credits, and development of commercial CCS. They focus on working with our customers to help accelerate the transition to net zero and are the foundation for the future businesses in Shell.

See "Outlook" for more information on page 13.

Our journey to net zero continued

Our research and development (R&D) activities are also key to achieving our net-zero emissions target. They are an important way to address the technology risk as mentioned in the "Transition risk and opportunities" section.

In 2022, our R&D expenditure on projects that contributed to decarbonisation was around $440 million, representing about 41% of our total R&D spend, compared with around 40% in 2021. This includes expenditure on reducing greenhouse gas emissions:

- for our customers through renewable power generation, storage, e-mobility and other electrification solutions;
- from our own operations, for example, by improving energy efficiency and electrification;
- from the fuels and other products we sell to our customers - for example, biofuels, synthetic fuels and products made from low-carbon electricity, and hydrogen produced using renewable sources;
- by carbon capture, utilisation and storage applied to hydrogen production from natural gas and other carbon emissions; and
- by researching nature-based solutions to offset emissions.

Examples of R&D activities other than decarbonisation include safety, performance products such as lubricants and polymers, robotics, automation and artificial intelligence.

Supporting our customers in achieving net-zero emissions

Changes to the supply of energy products and decarbonising the energy system require structural changes in the end-use of energy. This requires energy users to improve, update or replace equipment so that they can use carbon-based energy more efficiently, or switch to low- and zero-carbon energy.

For example, in the transport sector, decarbonisation includes replacing internal combustion engine vehicles with electric and hydrogen vehicles. In the industrial sector, replacing oil- and coal-fired furnaces with electrical furnaces would be one solution, carbon capture and storage is another. And in the buildings sector, replacing gas heating systems with electric heating systems would also contribute to decarbonisation.

Such structural changes will help to trigger transitions along the supply chain of individual sectors and across sectors, including the production of energy and emissions over time. The IEA estimates that these changes in the end-use of energy will require substantial investment. Under the IEA Net Zero Emissions by 2050 scenario, for every one US dollar spent on fossil fuels, a further five US dollars need to be spent on clean energy and a further four US dollars spent on efficiency and end-uses.

Helping to transform energy demand is the focus of our decarbonisation strategy. To help transform demand, we are working with customers sector-by-sector across the energy system. We will seek to change the mix of energy products we sell to our customers as their needs for energy change. This is reflected in Shell's strategy to develop a portfolio that seeks to:

- provide more electricity to customers, while also driving a shift to renewable electricity;
- develop low- and zero-carbon alternatives to traditional fuel, including biofuels, hydrogen, and other low- and zero-carbon gases;
- work with customers across different sectors to decarbonise their use of energy; and
- address any remaining emissions from conventional fuels with solutions such as CCS and carbon credits.

Energy transition in action - selection of portfolio changes and actions in 2022:

Electricity and renewable power

- acquisition of Sprng Energy Group, a solar and wind platform in India;
- winning bids with our partners to build offshore wind farms in the UK, the Netherlands and US waters (December: Hollandse Kust west VI with Eneco; July: with Scottish Power in the UK; February: Atlantic Shores in the USA);
- the acquisition of Powershop Australia, an online energy retailer; and
- started operations at the power-to-hydrogen electrolyser in China.

Develop low- and zero-carbon alternatives to traditional fuels

- acquisition of Denmark's Nature Energy - the largest producer of renewable natural gas in Europe, completed on February 20, 2023;
- final investment decision to build a 200 MW electrolyser, Holland Hydrogen I (Shell interest 100%);
- agreement to buy sugar-cane ethanol under a long-term agreement with Raízen (Shell interest 44%). The low-carbon fuel is expected to be produced by five plants that Raízen plans to build in Brazil, bringing its total portfolio of ethanol facilities to nine; and
- began construction of a bio-LNG plant at the Energy and Chemicals Park Rheinland in Germany to make liquefied natural gas from biological waste.

Help customers to decarbonise their use of energy

- launched a programme with our partners called Avelia which will encourage companies to invest in the production of SAF;
- made progress rolling out our network of charging for electric vehicles and joint venture with Chinese automobile company BYD to operate a network of charging points in Shenzhen; and
- acquisition of German company SBRS GmbH, which provides electric charging services for e-buses, e-trucks and e-vans. This is a step towards decarbonising the commercial road transport sector.

CCS and carbon credits

- Agreement with Northern Lights CCS joint venture (Shell interest 33.3%) in Norway and Yara for a world-first cross-border carbon capture, transport and storage contract.
- Investment in Carbonext, a Brazilian company operating carbon-centric preservation projects in the Amazon.

Our journey to net zero continued

Because emissions resulting from customer use of our energy products make up the greatest percentage of Shell's carbon emissions, this is where we believe we can make the greatest contribution to the energy transition, by enabling our customers to transition to low-carbon energy products and services. We intend to increase our share of low-carbon energy sales, which is reflected in our target to reduce the NCI of the energy products we sell by 20% between 2016 and 2030.

See "Working to reduce our net carbon intensity" for more information on page 100.

We have restructured our company so that we can better identify opportunities and the role that we can play in each sector to help transform demand. We are moving from an approach focused on types of products to one where our customer and account management is focused on sectors.

We aim to build on our existing relationships across each sector, with consumers, infrastructure owners, other suppliers and policymakers to help to accelerate change.

Our strategic approach to climate change emphasises the need to work collaboratively. We aim to make strategic alliances with customers, other companies and entire sectors so we and they can make profitable progress towards net zero.

Collaborating with our customers

We are helping software company SAP move to an emissions-free global car fleet by 2030 in support of its net-zero targets. Through our Accelerate to Zero programme, Shell is providing on-the-go and home charging, as well as other fleet solutions, for SAP employees in several countries. At SAP's headquarters in Walldorf, Germany, we are working to build solar generation capacity to help the company decarbonise and become more self-reliant in its energy use.

As a founding member of the Oil and Gas Climate Initiative (OGCI) we are part of a group of 12 national and international energy companies. The OGCI supports the climate goals of the UN Paris Agreement and recognises that collective actions will help drive the energy transition.

Decarbonising our value chains and operations

We will seek to base the decarbonisation of our value chains and operations on a deep understanding of the decarbonisation strategies and plans of our customers and users of our energy products. We are focused on decarbonising our own operations by:

- making portfolio changes, such as acquisitions of and investments in new, low-carbon projects. We are also decommissioning plants, divesting assets and reducing our production through the natural decline of existing oil and gas fields;
- improving the energy efficiency of our operations;
- transforming our remaining integrated refineries into low-carbon energy and chemicals parks, which involves decommissioning plants;
- using more renewable electricity to power our operations;
- developing CCS for our facilities; and, if required,
- using high-quality carbon credits to compensate for any remaining emissions from our operations.

We have set an interim target to achieve a 50% reduction in absolute Scope 1 and 2 emissions under our operational control by 2030 on a net basis, when compared with 2016.

See "Working to reduce our absolute Scope 1 and 2 emissions" for more information on page 100.

Our journey to net zero continued

Climate risk management

Shell's processes for identifying and assessing climate-related risks

Identifying climate-related risks

As discussed in "Energy transition strategy", Shell considers climate change and GHG emissions a material risk factor. We monitor the risks related to these across four components:

- commercial risks;
- regulatory risks;
- societal risks (including litigation risk); and
- physical risks.

These components are monitored and assessed on an integrated basis, necessitated by the interdependence of the risks and the related actions. The different components pose different kinds of exposures spanning different time horizons. Similarly, the responses to the components of the risk are also planned by taking a holistic view.

For example, the increasing cost of complying with emission limits in some regions is a regulatory risk that may require operational responses in the near term. The reduction in demand for legacy hydrocarbons is a commercial risk that may have a medium- to long-term impact, demanding changes to our strategic portfolio and business models. The risk of physical impacts of climate change may occur in the short, medium and long term and would require actions to mitigate adverse impacts on our assets and supply chain. As an example, the transformation of our refineries into energy and chemicals parks reduces the level of our operational emissions and medium- to long-term commercial risks, allowing us to plan for future adaptation measures.

Our integrated approach to risk management and the resulting changes in our strategy ensure we manage our aggregate climate change risk within our overall risk appetite over different time horizons.

Shell's processes for identifying and assessing risks are part of our Shell Control Framework.

Our risk management procedures that help us identify climate-related risks and opportunities include:

- monitoring external developments, including policy changes and new regulations;
- evaluating the status of risk indicators, which illustrate how well we are managing each component of the risk related to climate change and GHG emissions; and
- learning from incidents and assurance findings.

We use these procedures to identify risks relating to climate change and GHG emissions, which in turn enables us to determine their significance, both individually and relative to other risks.

Assessing climate-related risks

Processes within the Shell Control Framework that help us assess each identified risk include the evaluation of its impact, likelihood and the level of risk we are willing to accept.

When assessing the likelihood of a risk occurring, we consider factors such as our ability to prevent the risk happening and whether the risk has materialised in the past.

We consider the financial consequences and how it might affect our reputation, our ability to comply with regulations, and possible damage to health, safety, our assets and the environment. The impact, and hence materiality, of a risk is based on how critical it could be to our business model.

We operate in multiple countries and therefore societal risks are material as they are directly linked to our licence to operate.

The impact and likelihood assessment helps us to prioritise risks and determine their relative materiality, based on a comprehensive picture of significant risks to a relevant business's objectives.

To support our risk assessments, we seek to establish the level of risk that we are willing to accept in pursuit of Shell's strategy and objectives. We consider the amount of resources – such as financial resources, people, processes, systems and controls – that we are willing and able to allocate to manage each risk in pursuit of our objectives and the impact to Shell's overall risk profile.

The impact and likelihood assessment, combined with risk appetite, determines the type of risk responses, such as controls and assurance activities, that may be required to manage each risk.

Possible responses include:

- accepting the risk without any further action;
- mitigating or reducing the risk with appropriate controls, supported by assurance activities;
- transferring the risk, for example to insurance providers where appropriate; and
- altogether stopping or forgoing the activity that gives rise to the risk.

In determining our risk responses, we always seek to comply with our Code of Conduct and other boundaries, such as our financial framework, which set the aggregate level of risk appetite that could be sustained. The financial framework considers boundaries such as our net debt levels and our credit rating.

Physical risks

Potential physical impacts to our assets, irrespective of cause, are important for us to manage.

Climate variability is considered in the design and operation of our assets and infrastructure to minimise the risk of adverse incidents to our employees and contractors, the communities where we operate, our equipment and infrastructure. Our new projects consider anticipated weather and climatic events in their design and Metocean (meteorology and oceanography) engineering experts are available, if requested, to assist our assets and project teams in the evaluation of physical risks.

On an ongoing basis, our assets leverage broad risk and threat management processes to identify and respond to emerging challenges to their ongoing safe, compliant and efficient operation, as required by our HSSE & SP Control Framework. We are working to deepen our understanding of this risk and to establish metrics in this area to monitor our exposure across the Group.

Our journey to net zero continued

Classifications of risks
We identify and assess three distinct categories of risk across the Group:

- strategic: we consider current and future portfolio issues, examining parameters such as country concentration or exposure to higher-risk countries. We also consider long-range developments in order to test key assumptions or beliefs in relation to energy markets.
- operational: we consider material operational exposures across Shell's entire value chain to provide a more granular assessment of key risks that the organisation is facing.
- conduct and culture: we consider alignment of our policies, practices and behaviours against our purpose and core values.

The four sub-components of risk related to climate change and GHG emissions – commercial, regulatory, societal (including litigation), and physical risks – are assessed across the above three categories to ensure we maintain strategic resilience, have robust day-to-day operational risk responses and that responses align with Shell's purpose and core values.

Shell's processes for managing climate-related risks

Our climate-related risk management process is carried out at the Group, business, function and asset level, which includes projects.

We apply the Shell Control Framework to ensure that we effectively manage our climate-related risks at all these levels. The framework includes:

- mandatory risk standards and manuals;
- project-level risk management processes;
- management and Board reviews;
- internal audits and investigations; and
- annual attestation processes.

Mandatory risk standards and manuals

We have mandatory standards and manuals which establish the requirements on how to effectively manage material risks including the operation of appropriate controls. Our standards and manuals also provide guidance on how to monitor, communicate and report changes in the risk environment. These documents aim to:

- ensure consistent management and assessment of climate risk across Shell;
- clarify expectations for risk management and reporting, including roles and responsibilities of the risk owners;
- clarify types of assurance activities that may be applicable;
- strengthen decision-making by ensuring that businesses have better awareness and understanding of climate risks (including their likelihood and potential impact) and mitigation plans; and
- enable integration of Shell's reporting.

We periodically review and, if necessary, update our standards and manuals in light of developments in risks, including those associated with climate change. Our approach continues to evolve as we increase our understanding of changing policies and the differing pace of energy transition in different regions.

Project-level risk management processes

At a project level, assessing climate-related risks is an important part of making initial investment decisions. Projects of a certain size or which carry unusual risks are required to follow Shell's Opportunity Realisation Standard, which sets out the rules for managing and delivering opportunities in the organisation. Each project is assisted by experts from our global subject matter groups during its development, implementation and operation.

Projects under development that are expected to have a material GHG impact must meet our internal carbon performance standards or industry benchmarks. Our performance standards are used for measuring a project's average lifetime GHG intensity or energy efficiency per asset type. Applying these criteria ensures that our projects can compete and prosper in the energy transition. An exception process is in place to manage specific incidental cases. Performance standards are under development for power and hydrogen projects.

The performance standards are approved by the Executive Vice President accountable for implementation in the relevant businesses, and by the Executive Vice President Safety, Environment and Asset Management.

Projects with a material GHG footprint that meet the performance standards or industry benchmarks will often set more ambitious emissions targets for themselves. GHG abatement plans help determine the nature of these targets, and we assess the effects of a project's emissions alongside economic and technical design factors.

We assess the future GHG emissions of projects against performance standards and by considering the GHG emissions from the use of the products that are to be manufactured. These assessments can lead to projects being stopped or designs being changed.

We expect the performance standards to evolve as our portfolio changes in the energy transition.

Management and Board reviews

Management, the Board and Board committees review the risk of climate change and GHG emissions to ensure awareness of emerging issues that may impact our strategy and to ensure the effectiveness of our responses in managing this risk at a more granular, operational level. For example, as part of the annual planning cycle, the Executive Committee and the Board assess how climate change and GHG emissions may affect the pace of the energy transition, business emission reduction plans and the implications for Shell's current portfolio.

Our journey to net zero continued

In addition, each business and function regularly reviews its risk profile, risk responses and assurance activities throughout the year to ensure climate-related risks are managed effectively. These insights are used to provide management with updates on the operational management of climate change and GHG emissions risks. During these updates, management considers the significance of the climate change and GHG emissions risks relative to other risks on the Group risk profile and reviews whether our risk responses are effective in addressing the four sub-components of the climate change and GHG emissions risk.

Our management reviews help us to update Shell's plans and guide our day-to-day operational decisions such as maintenance schedules and our risk response plans.

Internal audits and investigations processes
Shell's Internal Audit and Investigations (SIAI) team provides independent and objective assurance and advises management and the Board on the adequacy and effectiveness of our risk management and internal controls.

For example, SIAI conducted four GHG audits during 2022 to test whether controls are adequately designed and operating effectively to mitigate the identified risks. The controls tested covered GHG emissions measurement, reporting and forecasting and abatement projects. Additionally, SIAI conducted two audits focused on decarbonisation of industry sectors and nature based solutions.

Annual attestation processes
On an annual basis, all directors are required to provide an attestation of their business's or function's compliance with our HSSE & SP Control Framework and to report this to Shell's CEO. This includes the assessment of the effectiveness of the internal controls in managing climate-related risks.

Project-level risk management in action: Shell Energy and Chemicals Park Singapore
We are transforming our refining business and making it fit for the future. The Pulau Bukom Manufacturing Site in Singapore transformed into the Shell Energy and Chemicals Park Singapore. We have reduced our crude processing capacity by about half and delivered a significant reduction in CO_2 emissions.

We are repurposing Bukom by making significant changes in our refinery configuration, establishing a foundation for producing low-carbon energy products like biofuels. We are also incorporating circularity, such as waste plastics for feedstock, as well as providing renewable energy.

Integration of the climate-related risk management process into Shell's overall risk management

Our climate-related risk management process follows the approach set out by the Shell Control Framework, ensuring that it is integrated into the overall risk management processes of the Group.

Climate-related risks are considered from a strategic and operational perspective to ensure we maintain a comprehensive view of the different types of climate risks we face and the different time horizons in which they may affect us.

The monitoring and review of risks is a key risk management process in Shell. The Executive Committee, the Board and Board committees review climate-related risks and their impact on the Group. This allows management to take a holistic view and to optimise risk mitigation responses, to ensure that climate-related risk responses are properly integrated into the relevant activities.

Our journey to net zero continued

Climate-related metrics and targets

Metrics used by Shell to assess climate-related risks and opportunities in line with its strategy and risk management process

This section describes our energy product and carbon emissions performance and metrics used to monitor our progress in respect of significant climate-related transition risks and opportunities, including targets reflected in remuneration of senior management and employees.

Key metrics we use to track progress against our energy transition strategy are the NCI of our portfolio and our absolute emissions. Additional metrics associated with the resilience of Shell's strategy to transition risks and opportunities are included in "Resilience of Shell's strategy to different climate-related scenarios" from page 88. This includes information on capital allocation between our business segments and the sensitivity of our assets to carbon, discount rate and commodity price assumptions.

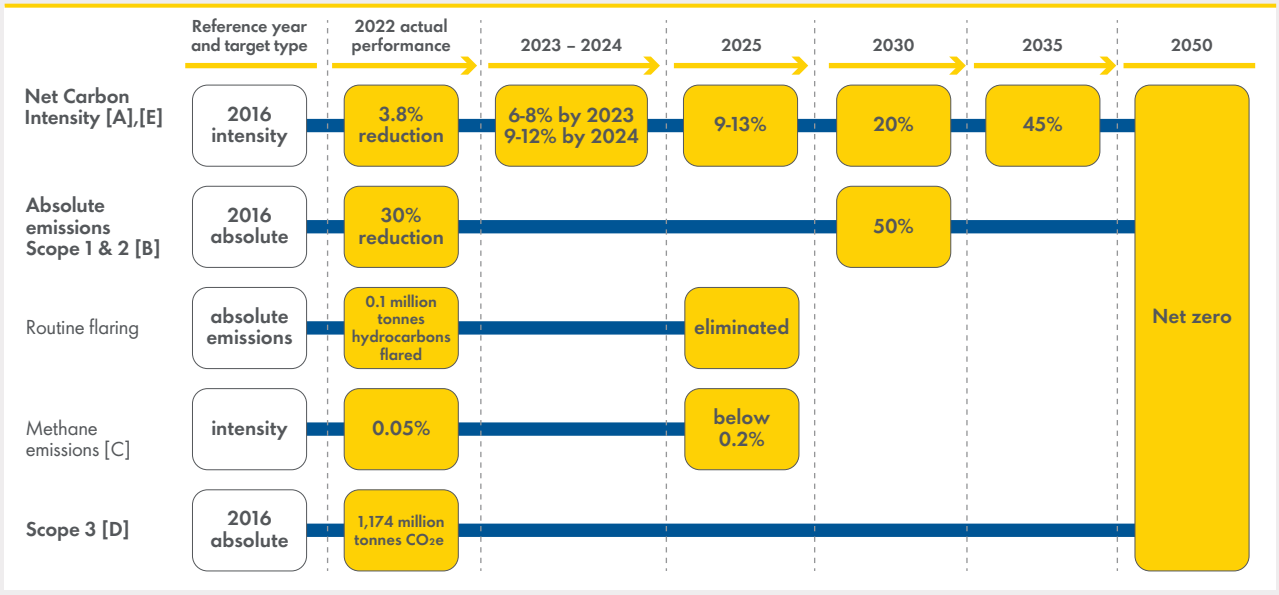
Another potentially significant climate-related risk relates to Shell's physical risk exposure at an asset level. We are working to establish metrics in this area to monitor our exposure to this risk across the Group.

Our overall climate target is to become a net-zero emissions business by 2050. It includes net-zero emissions from our operations (Scope 1 and 2 emissions), as well as net-zero emissions from the end-use of all the energy products we sell (Scope 3 emissions). We have set short-, medium- and long-term targets to track our performance against our overall climate target over time.

We believe our total absolute emissions peaked in 2018 at 1.73 gigatonnes of carbon dioxide equivalent ($GtCO_2e$).

In October 2021, in support of our 2050 net-zero emissions target, we set a target to reduce Scope 1 and 2 absolute emissions from assets and activities under our operational control (including divestments) by 50% by 2030 compared with 2016 levels on a net basis. We monitor our progress against these targets using the key metrics described.

Climate-related targets summary



[A] Our total absolute emissions peaked in 2018 at around 1.73 gigatonnes of carbon dioxide equivalent ($GtCO_2e$) per annum.
[B] Operational control boundary.
[C] Overall methane emissions intensity for facilities with marketing gas.
[D] Indirect GHG emissions (Scope 3) based on the energy product sales included in Net Carbon Intensity (NCI) using equity boundary.
[E] Our interim targets for 2035 and 2050 are based on mitigation activities undertaken by both Shell and our customers.

Our journey to net zero continued

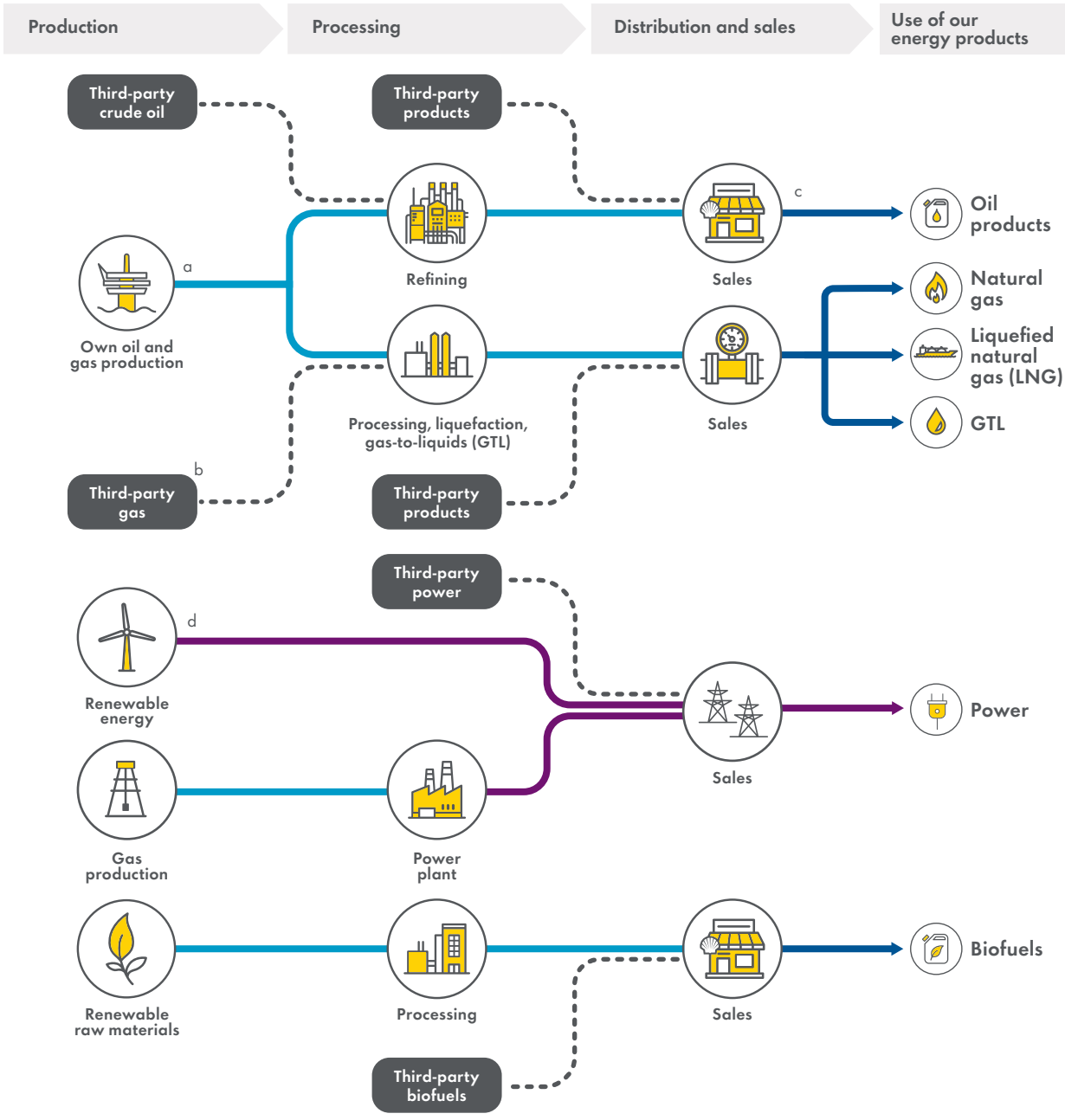
Net carbon intensity (NCI)

Shell's NCI is the average intensity, weighted by sales volumes, of the energy products sold by Shell. It is tracked, measured and reported using the Net Carbon Footprint (NCF) methodology.

We have received third-party limited assurance on our net carbon intensity for the period 2016 to 2022.

Scope of Net Carbon Intensity [A]

Emissions from energy products included within the Net Carbon Footprint methodology



[A] To be read in conjunction with Basis of preparation on page 102.

Our journey to net zero continued

Performance – NCI

In 2022, Shell's NCI was 76 grams of carbon dioxide equivalent per megajoule of energy (gCO_2e/MJ), a 1.3% decrease from the previous year and a 3.8% reduction compared with 2016, the reference year. The decrease in Shell's NCI in 2022 was primarily due to an increased proportion of renewable power and corresponding reduction in the carbon intensity of our power sales. Shell's 2022 NCI includes 4.1 million tonnes of carbon credits, compared to the 5.1 million tonnes which were included in Shell's 2021 NCI.

NCI reference year: 2016 (equity boundary)		2022	2021	2020	2016
NCI [E]	gCO_2e/MJ	76	77	75	79
Estimated total energy delivered by Shell [A]	trillion (10^12) MJ	16.29	17.89	18.40	20.93
Estimated total GHG emissions included in NCI (net) [B]	million tonnes CO_2e	1,240	1,375	1,384	1,645
Carbon credits	million tonnes CO_2e	4.1	5.1	3.9	0.0
Estimated total GHG emissions (gross) [C][D]	million tonnes CO_2e	1,244	1,381	1,388	1,645

[A] The NCI calculation uses Shell's energy product sales volumes data, as disclosed in the Annual Report and Sustainability Report. This excludes certain contracts held for trading purposes and reported net rather than gross. Business-specific methodologies to net volumes have been applied in oil products and pipeline gas and power. Paper trades that do not result in physical product delivery are excluded. Retail sales volumes from markets where Shell operates under trademark licensing agreements are also excluded from the scope of Shell´s net carbon intensity metric.
[B] These numbers include well-to-wheel emissions associated with energy products sold by Shell, on an equity boundary basis; they also include the well-to-tank emissions associated with the manufacturing of energy products by others that are sold by Shell. Emissions associated with the manufacturing and use of non-energy products are excluded.
[C] All figures disclosed are rounded.
[D] While the NCI is an intensity measure and not an inventory of absolute emissions, a notional estimate of the amount of GHG emissions covered by the scope of the NCI calculation can be derived from the final NCI value for any year. Similarly, a fossil-equivalent estimate of the total amount of energy sold included in the calculation can also be determined.
[E] Acquisitions and divestments are included in the actual performance tracking with the target and baseline year unchanged. Note that acquisitions and divestments could have a material impact on meeting the targets.

As we implement our Powering Progress strategy, we are increasing the share of low-carbon products in our energy product sales, which is the biggest driver for reducing our NCI.

Our ability to change the emissions intensity of each energy product varies depending on the product type:

- Hydrocarbon fuels - emissions from end-use by customers are by far the biggest contributors to the carbon intensity of the product. As a result, the emissions intensity of hydrocarbon fuels is expected to stay relatively unchanged over time. This is why we are focused on helping our customers decarbonise.
- Power - the emissions intensity of power can be highly variable depending on how it has been generated. The proportion of our renewable power sales and the generation mix in countries where we sell power to the market both affect Shell's overall power mix and its resulting emissions intensity.
- Biofuels - can vary significantly in intensity depending on the feedstock and production process used.

Scope 1, Scope 2 and Scope 3 GHG emissions and related risks

In assessing progress against our target to be a net-zero emissions energy business by 2050, we report our performance against our operational Scope 1 and 2, and Scope 3 emissions. Scope 1, 2 and 3 emissions are among the metrics we use to mitigate climate risks and seize opportunities in the energy transition.

Shell's absolute emissions in 2022

In 2022, our total combined Scope 1 and 2 absolute GHG emissions (from assets and activities under our operational control) were 58 million tonnes on a CO_2 equivalent basis, a 15% reduction compared with 2021, and a 30% reduction compared with 2016, the base year. Our Scope 3 emissions from energy products included in our net carbon intensity were 1,174 million tonnes CO_2e.

	Absolute emissions [D], [F] million tonnes of CO_2e				Targets [E]	
Scope	2016	2020	2021	2022	Target 2030	Target 2050
Scope 1 [A]	72	63	60	51	50% reduction compared with 2016 levels on a net basis	0
Scope 2 [B]	11	8	8	7		0
Scope 3 [C]	1,545	1,305	1,299	1,174	No target	0

[A] Total direct (Scope 1) GHG emissions from assets and activities under our operational control. It includes emissions from production of energy and non-energy products.
[B] Total indirect GHG emissions from imported energy (Scope 2) from assets and activities under our operational control using the market-based method. It includes imported energy used for production of energy and non-energy products.
[C] Indirect GHG emissions (Scope 3) based on the energy product sales included in NCI using equity boundary. The NCI calculation uses Shell's energy product sales volumes data, as disclosed in the Annual Report and Sustainability Report. This excludes certain contracts held for trading purposes and reported net rather than gross. Business-specific methodologies to net volumes have been applied in oil products and pipeline gas and power. Paper trades that do not result in physical product delivery are excluded. Retail sales volumes from markets where Shell operates under trademark licensing agreements are also excluded from the scope of Shell´s net carbon intensity metric.
[D] Emissions are reported gross without the inclusion of carbon credits.
[E] Our 2030 and 2050 targets are on a net basis (i.e. including carbon credits). Acquisitions and divestments have been included in the actual performance tracking with the target unchanged. Note that acquisitions and divestments could have a material impact on meeting the targets.
[F] Oil and gas industry guidelines from IPIECA indicate that several sources of uncertainty can contribute to the overall uncertainty of a corporate emissions inventory. We have estimated the overall uncertainty for our direct GHG emissions (Scope 1) to be around 3% and for our energy indirect GHG emissions (Scope 2) to be around 7% for the market-based method and 6% for the location-based method for 2022. IPIECA also notes that due to the diversity of Scope 3 emissions, sources and the fact that these emissions occur outside the company's boundaries, the emissions estimates may be less accurate or may have high uncertainty.

Our Scope 3 emissions reported above can be categorised as follows, using the definitions from the GHG Protocol's Corporate Value Chain (Scope 3) Standard:

GHG emissions, million tonnes CO_2e	2022	2021
Scope 3, category 1: purchased goods and services	144	147
Scope 3, category 3: fuel and energy-related activities	115	136
Scope 3, category 9: downstream transport and distribution	5	6
Scope 3, category 11: use of sold products	910	1,010
	1,174	1,299

Scope 3 emissions from categories 1, 3 and 11 make up the majority of Shell's Scope 3 emissions. Shell reports Scope 3 emissions across all 15 categories annually.

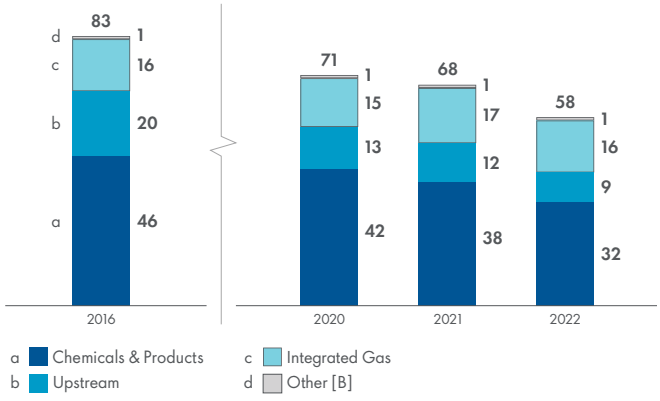
For further details see: www.shell.com/ghg

Our journey to net zero continued

The Scope 3 emissions from the energy products we sell account for the majority of the total emissions we report. When we calculate our emissions, we include emissions not only from the products that we produce ourselves but also from the oil and gas that others produce and we sell as products to our customers. We sell more energy products than the energy we produce ourselves, therefore, to account for Shell's full effect, we include energy products sold in the measurement of our carbon emissions as shown in the chart on page 96.

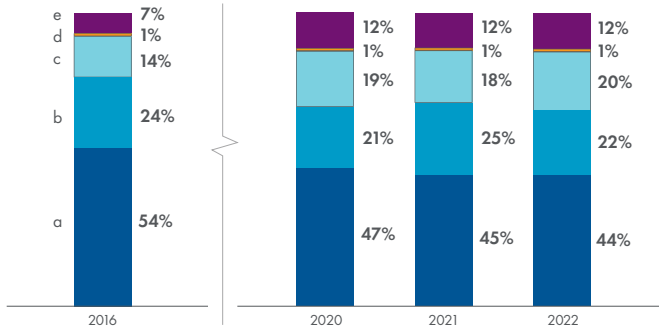
Scope 1 & 2 – performance [A]

million tonnes carbon dioxide equivalent (CO_2e)



[A] Total direct (Scope 1) and energy indirect (Scope 2) GHG emissions from assets and activities under operational control boundary. It includes emissions from production of energy and non-energy products. For Scope 2, we used the market-based method.
[B] Other covers Renewables and Energy Solutions, Marketing, P&T and Real Estate.

Share of energy delivered per energy product type [A]-[F]



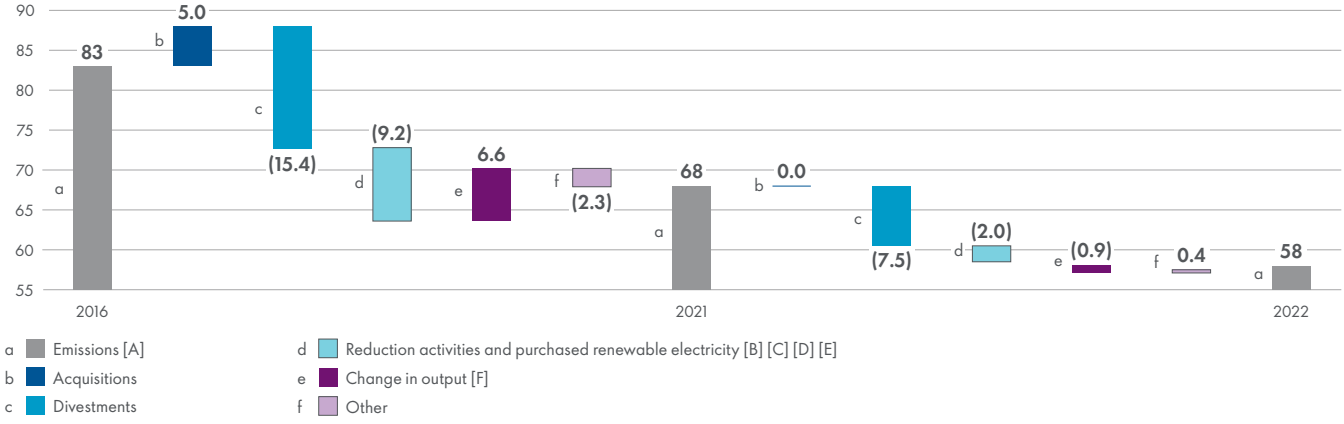
[A] Percentage of delivered energy may not add up to 100% because of rounding.
[B] Total volume of energy products sold by Shell, aggregated on an energy basis, with electricity represented as fossil equivalents. This value is derived from energy product sales figures disclosed by Shell in the Annual Report and the Sustainability Report.
[C] Lower heating values are used for the energy content of the different products and a fossil-equivalence approach is used to account for electrical energy, so that it is assessed on the same basis as our other energy products.
[D] The NCI calculation uses Shell's energy product sales volumes data, as disclosed in the Annual Report and Sustainability Report. This excludes certain contracts held for trading purposes and reported net rather than gross. Business-specific methodologies to net volumes have been applied in oil products and pipeline gas and power. Paper trades that do not result in physical product delivery are excluded. Retail sales volumes from markets where Shell operates under trademark licensing agreements are also excluded from the scope of Shell's carbon intensity metric.
[E] Emissions included in the carbon intensity of power have been calculated using the market-based method.
[F] The carbon intensity of biofuels provided in the graph "Share of energy delivered per energy product type" reflects the global average for biofuels sold by Shell for 2022.

We undertake external verification of our GHG emissions annually. Our Scope 1 and 2 GHG emissions from assets and activities under our operational control and emissions associated with the use of our energy products (Scope 3) included in our NCI have been verified to a level of limited assurance by LRQA Group Limited.

Drivers of absolute Scope 1 and 2 emissions change

Scope 1 and Scope 2 GHG emissions changes from 2016 to 2021 and from 2021 to 2022

million tonnes carbon dioxide equivalent (CO_2e)



[A] Total Scope 1 and Scope 2 emissions, rounded to the closest million tonnes. Scope 2 emissions were calculated using the market-based method.
[B] In addition to reductions from GHG abatement and energy efficiency projects, this category also includes reductions from permanent shutdown of Convent and Tabangao refineries and the impact of transformational activities at our Shell Energy and Chemicals Park in Singapore.
[C] Excludes 5.80 million tonnes of CO_2 captured and sequestered by the Shell-operated Quest CCS facility in Canada in 2016-2021. Scope 1 and 2 GHG emissions from operating Quest are included in our total emissions.
[D] Excludes 0.97 million tonnes of CO_2 captured and sequestered by the Shell-operated Quest CCS facility in Canada in 2022. Scope 1 and 2 GHG emissions from operating Quest are included in our total emissions.
[E] Of the 2,010 thousand tonnes of reduction activities and purchased renewable electricity in 2022, around 80 thousand tonnes related to purchased renewable electricity.
[F] Change in output relates to changes in production levels, including those resulting from shutdowns and turnarounds as well as production from new facilities.

Our journey to net zero continued

Our direct GHG emissions (Scope 1) (consolidated using the operational control boundary) decreased from 60 million tonnes of carbon dioxide equivalent (CO_2e) in 2021 to 51 million tonnes CO_2e in 2022, driven by several factors including:

- divestments in 2021 and 2022 (e.g. the Deer Park and Puget Sound refineries in the USA) and the handover of operations in OML 11 in Nigeria in 2022;
- shutdowns or conversion of existing assets, including the shutdown of some units at the Shell Energy and Chemicals Park Singapore;
- GHG abatement projects (see examples in the list of energy efficiency projects on page 105) and purchase of renewable electricity.

These decreases were partly offset by the commissioning of Shell Polymers Monaca.

Total routine hydrocarbons flaring reduced from 0.2 to 0.1 million tonnes of hydrocarbon flared from 2021 to 2022.

Around 50% of flaring in our Upstream and Integrated Gas facilities in 2022 occurred in assets operated by the Shell Petroleum Development Company of Nigeria Limited (SPDC) and Shell Nigeria Exploration and Production Company (SNEPCo). We will continue to work in close collaboration with joint-venture partners and the Federal Government of Nigeria to make progress towards the objective of ending the continuous flaring of associated gas.

Our target to keep methane emissions intensity below 0.2% was met in 2022 with Shell's overall methane emissions intensity at 0.05% for facilities with marketing gas and 0.01% for facilities without marketing gas. We believe our methane emissions are calculated using the best methods currently available. This target covers all Shell-operated oil and gas assets in our Upstream and Integrated Gas businesses. Methane emissions include those from unintentional leaks, venting and incomplete combustion, for example in flares and turbines.

Our indirect GHG emissions associated with imported energy (Scope 2) (consolidated using the operational control boundary) decreased from 8 million tonnes CO_2e in 2021 to 7 million tonnes CO_2e in 2022 (using the market-based method), in part, due to divestments.

Drivers of absolute Scope 3 emissions change in 2022

Emissions associated with the use of energy products sold by Shell account for the majority of our reported carbon emissions. The reported Scope 3 emissions within the NCI boundary have reduced from 2021. The decrease is largely due to a reduction in oil product and gas sales, and a decrease in the intensity of power sold.

There was a decrease in 2020 from 2019 related to volumes associated with additional contracts being classified as held for trading purposes with effect from January 2020. We estimate that netting of oil products sales volumes resulted in a reduction in GHG emissions of 102 million tonnes CO_2e.

Our strategy is based on working with our customers to address the emissions from the use of our products and to help them find ways to reduce their emissions to net zero by 2050.

Targets used by Shell to manage climate-related risks and opportunities and performance against targets

Shell's material climate-related risks and opportunities are set out in the "Climate-related risks and opportunities identified by Shell over the short, medium and long term" section. Our response to the energy transition risk focuses on decarbonising our value chain. Our climate targets are focused on reducing our NCI and our absolute emissions.

Setting targets for NCI

There is no established standard for aligning an energy supplier's decarbonisation targets with the temperature limit goal of the Paris Agreement. In the absence of a broadly accepted standard, we have developed our own approach for demonstrating Paris alignment by setting carbon intensity targets within a pathway derived from the IPCC SR 1.5 scenarios. This pathway is aligned with the more ambitious temperature goal of the Paris Agreement to limit global average temperature rise to 1.5 °C above pre-industrial levels by 2100.

When constructing the pathway, we started by filtering out certain scenarios to ensure that Shell's targets are aligned with earlier action, and low-overshoot scenarios. Overshoot refers to the extent to which a scenario exceeds an emissions budget and subsequently relies on sinks to compensate for the excess emissions. Next, we calculated the carbon intensity (gCO_2e/MJ of energy) for each of the remaining scenarios by dividing net emissions by total final energy consumption, with electricity represented as a fossil fuel equivalent.

To set a starting point, we then indexed the resulting carbon intensities to a common value of 100 in 2016 to remove the impact of differences between Shell's historical net carbon intensity and the intensities calculated from the IPCC scenarios. Finally, the pathway was constructed using the range of carbon intensity reductions over time. Outlying values at the top and bottom of the range were removed, which had the effect of narrowing the final pathway.

By using the 1.5 °C pathway produced by this approach to set our targets, we aligned them with the necessary reduction in carbon intensity shown in the 1.5 °C scenarios. This is illustrated in the table, which shows that our targets are positioned within the range of the 1.5 °C pathway. The upper and lower limits represent the upper and lower boundaries of the 1.5 °C pathway derived using the approach described above.

	2023	2024	2025	2030	2035	2050
IPCC derived upper limit	-4%	-5%	-7%	-15%	-34%	-68%
IPCC derived lower limit	-10%	-13%	-17%	-36%	-64%	-104%
Shell target range	**6-8%**	**9-12%**	**9-13%**	**20%**	**45%**	**100%**

Until 2035, our calculation of the total net emissions of each scenario includes only the expected mitigation actions by Shell, such as CCS and offsetting using natural sinks including any use of offsets included in the carbon-neutral energy products we offer our customers. After that date, we included mitigation actions taken separately by our customers. This is because we expect that customers will need to take action to mitigate their emissions from the use of our products, if society is to achieve the goals of the Paris Agreement.

To account for reductions in emissions across full energy value chains, it is necessary to build new protocols to include mitigation actions by both energy suppliers and users. Energy suppliers report the Scope 3 emissions from the use of their products, which are equivalent to the Scope 1 emissions reported by the users of those products. However, when users of energy products mitigate their Scope 1 emissions by the use of CCS or offsets there is no protocol for reflecting a corresponding reduction in the Scope 3 emissions reported by the energy supplier. We will continue to engage stakeholders on these carbon protocols and will seek to align with new frameworks as they evolve.

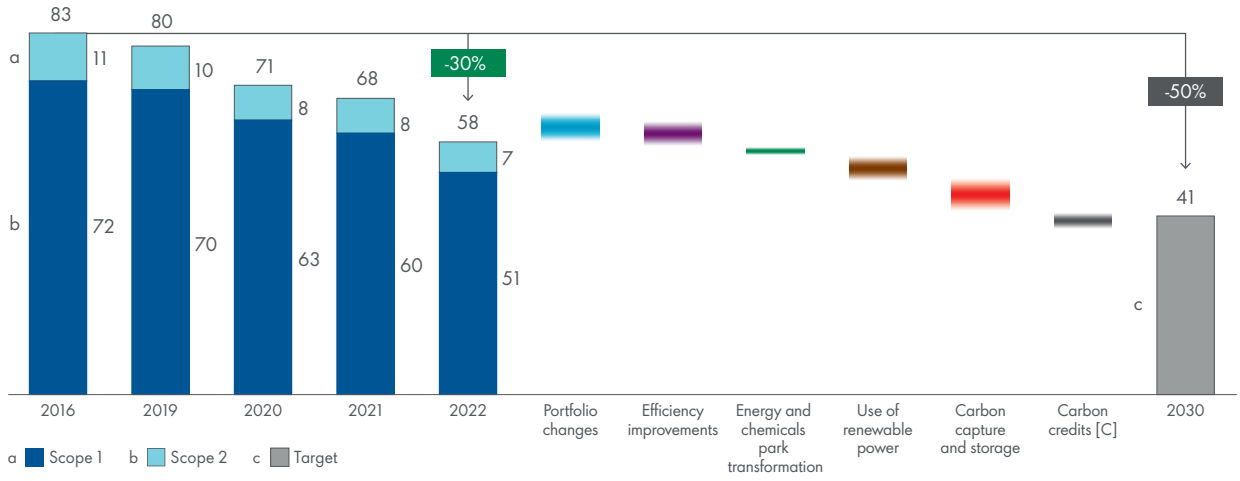
Shell has set a target to reduce the NCI of the energy products it sells by 20% by 2030. We believe this target is aligned with a 1.5 °C pathway derived from the IPCC SR 1.5 scenarios. We also believe that the pace of change will vary around the world by region and by sector, taking into consideration the time needed for energy users to invest in large-scale equipment and the energy infrastructure changes needed for Shell to deliver more low- and zero-carbon energy.

Our journey to net zero continued

The chart below shows our progress since 2016 in reducing our Scope 1 and 2 emissions and gives an indication of how we expect to achieve our target in 2030. The actions we will take to achieve our target will depend on the evolution of our asset portfolio and the continued development of technologies which reduce carbon emissions. Following divestment activity in 2022, we expect that on a net portfolio basis, new investments across our portfolio will increase our Scope 1 and 2 emissions between 2023 and 2030 and that they will exceed reductions associated with planned divestments and natural decline. Our investments in producing low-carbon energy such as biofuels will increase our Scope 1 and 2 emissions, while reducing the net carbon intensity of the products we sell. Subsequent reductions in our emissions are reflected in the mechanisms outlined below and reflect an expected path to meeting our target in 2030.

Working to reduce our absolute Scope 1 and 2 emissions

Scope 1 and 2 emissions in million tonnes per annum [A],[B]

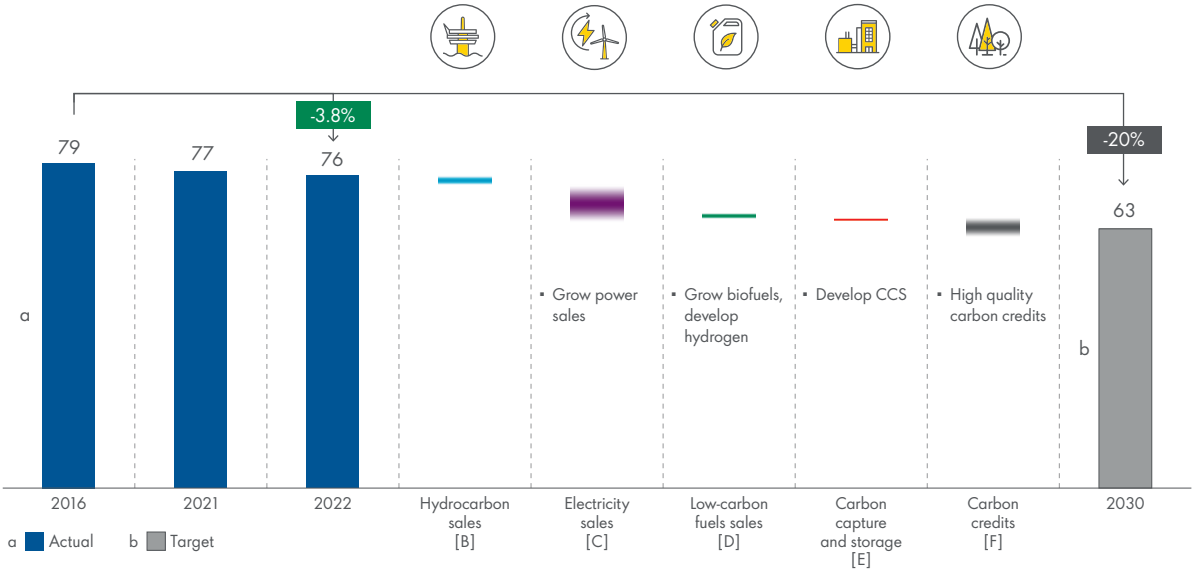


[A] The 2016 Base Year was not recalculated in 2022. The 2016 Base Year may be recalculated in future years if an acquisition or a divestment has an impact of more than 10% on the total Scope 1 and 2 emissions.
[B] Operational control boundary.
[C] Including nature-based solutions.

The biggest driver for reducing our NCI is increasing the sales of and demand for low-carbon energy. The chart below illustrates how changes in the volume of products and services we sell could result in NCI reductions to 2030. The change in our sales of these products and services will also reflect the development and adoption of new technologies and infrastructure, and the adoption of public policies designed to encourage the energy transition.

Working to reduce our net carbon intensity

Net carbon intensity in gCO_2e/MJ [A]



[A] Grams of carbon dioxide equivalent per megajoule.
[B] Hydrocarbon sales reflect the effect of lower sales of oil products, and higher sales of natural gas. Emissions associated with gas are lower than those of oil products.
[C] Electricity sales show the expected growth of our integrated power business and increasing sales of renewable electricity.
[D] Sales of low-carbon fuels reflect higher sales of biofuels and hydrogen, which are low- and zero-carbon products.
[E] Carbon capture and storage (CCS) reduces carbon emissions by capturing them at source.
[F] Carbon credits such as nature-based solutions can be used to offset remaining carbon emissions, particularly in hard-to-abate sectors such as aviation and industries including cement and steel.

Our journey to net zero continued

Linking Shell's emissions targets to remuneration policies

We have established remuneration policies which are designed to support us in achieving our net-zero emissions targets:

- Our Performance Share Plan (PSP) and Long-term Incentive Plan (LTIP) are linked to net carbon intensity targets; and
- Our PSP, LTIP and annual bonus scorecard are linked to performance indicators that guide an assessment of our success in delivering our energy transition strategy.

See also "Directors' Remuneration Report" on pages 178-182.

The LTIP and PSP are designed to ensure that remuneration is clearly aligned with Shell's operating plan and longer-term strategic ambitions. The same measures apply to Executive Directors and Senior Management and to a significantly broader employee base.

The LTIP (measured over a three-year performance period) is used to make long-term share incentive awards to Executive Directors, Executive Committee members and Senior Executives.

PSPs are long-term incentives, also measured over a 3 year performance period, designed to retain key employees and ensure they have a greater investment in Shell's future.

Energy transition performance condition and the vesting of the 2020 LTIP and PSP awards

The following performance outcomes for the energy transition performance condition were considered in the assessment of the 2020 LTIP and PSP vest, covering the performance cycle 2020-2022:

	Outcome
Reduce net carbon intensity	Performance indicator met
Grow a material power business	Substantively met
Grow low-carbon products	Performance indicator met
Develop emissions sinks	Performance indicator met

In addition to the above, a number of broader indicators of Shell's progress in the energy transition were considered. Overall, it was determined that the energy transition measure (accounting for 10% of the LTIP award and 5% of the PSP award) should vest at 180%.

See also "Annual Report on Remuneration" on pages 188-192.

Energy transition performance condition in the 2022 LTIP and PSP awards

For LTIP and PSP awards granted in 2022, the energy transition performance condition had a weighting of 10% for the PSP and 20% for the LTIP. The energy transition performance condition for these awards includes a mix of leading and lagging indicators on the following strategic measures:

- Build a valuable power business: our ambition is to expand our power business through selective investments in generation and by reselling power generated by others;
- Grow new lower-carbon energy product offerings: continue to invest in low- and zero-carbon products, such as renewable electricity, hydrogen, biofuels and chemicals;
- Develop emission sinks: invest in carbon capture and storage opportunities, to reduce emissions where there are no currently scalable low-carbon alternatives, and in the development of high-quality nature-based projects, to compensate for emissions; and
- Reduce the NCI of the energy products sold by Shell.

The vesting outcome of the LTIP awards is at the discretion of the REMCO, and will be guided by performance indicators set at the outset of the scheme alongside a more holistic assessment of progress.

Proposed energy transition performance condition for 2023 LTIP awards

For 2023 LTIP awards, assessment of performance against energy transition measures will be based on NCI reduction, plus supporting strategic themes including:

- Reducing Scope 1 and 2 emissions;
- Building a renewable power business;
- Growing new lower-carbon energy offerings; and
- Developing emission sinks and offsets.

The REMCO assesses progress against the NCI target and Shell's longer-term goals for each strategic theme when making the vesting decision for each reward cycle.

See "Annual Report on Remuneration" on page 201 for more information on the proposed performance framework.

Energy transition targets in the annual bonus scorecard

Delivering on our net-zero emissions target is a part of the annual scorecard, which helps determine annual performance bonus outcomes for senior management and almost all of Shell's employees.

The energy transition progress measures in our annual scorecard have, until 2022, focused on managing and reducing our operational emissions. However, succeeding in the energy transition requires us to change what we sell. In 2022, we widened the scope of the energy transition progress measures in the annual bonus scorecard:

- Selling lower carbon products – we help customers to reduce their emissions by supplying low-carbon products. We measure our success by the earnings share of our Marketing activities from low-carbon energy products as well as non-energy products and convenience retail.
- Reducing operational emissions – our target is to achieve a 50% reduction by 2030; and this measure is based on reducing our Scope 1 and 2 operational emissions.
- Partnering to decarbonise – we seek to collaborate with our customers to help them reduce their emissions. In 2022, we measured success in this area in terms of our progress in rolling out our electric vehicle charging network.

Our journey to net zero continued

2022 Scorecard: Shell's journey in the energy transition

	2022 Target	2022 Performance	2022 Status
Selling lower-carbon products % of Marketing Adjusted Earnings from lower-carbon products	60	60	on target
Reducing operational emissions thousand tonnes of CO_2 absolute emissions reduction	1,700	2,010	outstanding
EV charge points Number	130,000	138,610	above the target

In 2022, the score for operational emission reductions was above the top end of the range. It reflects the cumulative effects of actions taken across the portfolio, including GHG abatement projects, permanent shutdowns and conversions of some facilities such as the shutdown of some units at the Shell Energy and Chemicals Park Singapore, flaring reduction and energy efficiency projects (page 105). The above reductions do not include CO_2 reduced by CCS projects.

We have set annual targets measuring our roll-out of electric vehicle charge points, in line with Shell's target of having more than 500,000 by 2025. We outperformed the 2022 target, with a significant increase in the second half of the year.

The full year score for providing lower-carbon products was on target. We will continue to deliver decarbonisation solutions sector by sector enabled by innovation and collaboration.

See also "Annual Report on Remuneration" on page 187.

Metrics and targets in respect of climate-related environmental risks

We have set targets to reduce our consumption of fresh water in water-stressed areas by 15% by 2025, compared with 2018 levels. We also monitor the level of waste disposed of from our operations, and the amount of plastic waste generated.

See "Respecting Nature" on pages 108-109 and "How we create value" on page 11 for more information.

Basis of preparation – net carbon intensity

Shell's NCI provides an annual measure of the life-cycle emissions intensity of the portfolio of energy products sold. The intended use of the NCI metric is to track progress in reducing the overall carbon intensity of the energy products sold by Shell. The NCI is calculated on a life-cycle basis and as such includes GHG emissions – on an equity basis – from several sources, including:

- direct GHG emissions from Shell operations;
- indirect GHG emissions from generation of energy consumed by Shell; and
- indirect GHG emissions from the use of the products we sell.

Emissions from other parts of the product life cycle are also included, such as those from the extraction, transport and processing of crude oil, gas or other feedstocks and the distribution of products to our customers. Also included are emissions from parts of this life cycle not owned by Shell, such as the extraction of oil and gas processed by Shell but not produced by Shell; or from the production of oil products and electricity marketed by Shell that have not been processed or generated at a Shell facility.

We also take into account emissions mitigated through various measures, such as by creating carbon sinks by working with nature – including through protecting forests and wetlands – and by using CCS technology.

Refer to scope of NCI on page 96 for details of the supply chains and steps in the product life cycles that are included in the Net Carbon Footprint methodology.

The following GHG emissions are not included in the NCI:

- emissions from production, processing, use and end-of-life treatment of non-energy products, such as chemicals and lubricants;
- emissions from third-party processing of sold intermediate products, such as the manufacture of plastics from feedstocks sold by Shell;
- emissions associated with the construction and decommissioning of production and manufacturing facilities;
- emissions associated with the production of fuels purchased to generate energy on site at a Shell facility;
- other indirect emissions from waste generated in operations, business travel, employee commuting, transmission and distribution losses associated with imported electricity, franchises and investments; and
- emissions from capital goods, defined by the GHG Protocol as including fixed assets or property, plant and equipment (PP&E), and other goods and services not related to purchased energy feedstocks sourced from third parties or energy products manufactured by third parties and sold by Shell.

The NCI calculation uses Shell's energy product sales volume data, as disclosed in the Annual Report and Sustainability Report. This excludes certain sales volumes such as:

- certain contracts held for trading purposes reported net rather than gross. Business-specific methodologies to net volumes have been applied in oil products and pipeline gas and power. Paper trades that do not result in physical product delivery are excluded; and
- retail sales volumes from markets where Shell operates under trademark licensing agreements.

Important notes on the NCF methodology

1. The NCF is not a mathematical derivation of total emissions divided by total energy, nor is it an inventory of absolute emissions.
2. It is a weighted average of the life-cycle CO_2 intensities of different energy products, normalising them to the same point relative to their final end-use. The use of a consistent functional unit, grams of carbon dioxide equivalent per megajoule (gCO_2e/MJ), allows like-for-like comparisons and the aggregation of individual life-cycle intensities for a range of energy products including renewables.

For further information see our detailed NCF methodology documentation (www.shell.com/ghg).

Basis of preparation – absolute Scope 1, 2 and 3 emissions

We follow the GHG Protocol's Corporate Accounting and Reporting Standard, which defines three scopes of GHG emissions:

- Scope 1: direct GHG emissions from sources under Shell's operational control.
- Scope 2: indirect GHG emissions from generation of purchased energy consumed by Shell assets under operational control.
- Scope 3: other indirect GHG emissions, including emissions associated with the use of energy products sold by Shell.

GHG emissions comprise carbon dioxide (CO_2), methane (CH_4), nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride, with carbon dioxide and methane being the most significant contributors. Our GHG inventory was prepared in line with the requirements outlined in the ISO 14064-1:2018 Specification with Guidance at the Organisational Level for Quantification and Reporting of Greenhouse Gas Emissions and Removals and the GHG Protocol's Corporate Accounting and Reporting Standard.

Our journey to net zero continued

In line with external standards, Shell aggregates its GHG emissions into tonnes of CO_2 equivalent by applying global warming potential (GWP) factors to each greenhouse gas. These factors are taken from the IPCC Fourth Assessment Report (AR4) over a 100-year time horizon, in line with the UK Government GHG Conversion Factors for Company Reporting.

GHG emissions are aggregated using a bottom-up approach: emission source -> asset -> operating unit -> business -> Group. GHG emissions in this Report include emissions from Upstream, Integrated Gas, Renewables and Energy Solutions, Downstream (Chemicals and Products and Marketing), and Projects & Technology, plus Shell's functions. All operated assets are included in the GHG inventory in the reporting period.

Basis of preparation – Scope 1 emissions
Sources included in Scope 1 emissions comprised:
- combustion of carbon-containing fuels in stationary equipment (e.g. boilers, gas turbines) for energy generation;
- combustion of carbon-containing fuels in mobile equipment (e.g. trucks, vessels, mobile rigs);
- flares;
- venting and emissions from industrial processes (e.g. hydrogen plants, catalytic cracking units); and
- fugitive emissions, including piping and equipment leaks and non-routine events.

Our Scope 1 emissions follow the GHG protocol guidance. As a result, the following are not included in our reported Scope 1 emissions:
- CO_2 emissions from biogenic sources (for example, biofuels, biomass). Instead, they were captured separately. Methane and nitrous oxide emissions from biogenic sources were included in our Scope 1 emissions.
- Captured CO_2 that was subsequently sold or otherwise transferred to third parties.
- CO_2 captured and sequestered using CCS technologies. However, the emissions from operating CCS were included in our Scope 1 and 2 emissions.
- Carbon credits.

All significant sources were included in the Scope 1 inventory.

Basis of preparation – Scope 2 emissions
Sources included in Scope 2 emissions comprised indirect emissions from purchased and consumed electricity, steam and heat. We did not identify any assets with imported cooling or compressed air used for energy purposes.

Scope 2 emissions were calculated using the market- and location-based methods separately as defined by the GHG Protocol Scope 2 Guidance.

All significant sources were included in our Scope 2 inventory.

Basis of preparation - Scope 3 emissions
This Report provides Scope 3 emissions included in our NCI. They were consolidated using the equity boundary approach. Under this approach, we reported the Shell share of emissions from energy products sold by Shell to end-users, including those sourced from third parties. Scope 3 categories included in the total number in this Report include the following:

Scope 3, Category 1: purchased goods and services
This category includes well-to-tank emissions from purchased third-party unfinished and finished energy products excluding electricity (which was reported separately under Category 3: Fuel and energy-related activities (not included in Scope 1 or Scope 2)).

Emissions in this category were estimated using well-to-tank emission factors for crude oil, natural gas, refined oil products (such as gasoline, and diesel), LNG and biofuels. Because the emission factors include transport, we did not estimate emissions from transport of purchased third-party products separately.

Emissions from purchased non-energy products were not included in this Report.

Scope 3, Category 3: fuel and energy-related activities (not included in Scope 1 and 2)
This category includes well-to-wire emissions from purchased third-party electricity sold by Shell, calculated using the market-based method. Emissions were not adjusted for any potential double-counting of sold natural gas that may have been used for generating this electricity.

This category does not include:
- indirect emissions from generation of imported energy (steam, heat or electricity consumed by our assets). These emissions were reported separately as Scope 2 emissions; and
- well-to-tank emissions from purchased electricity, steam and heat consumed by our assets (i.e. Scope 3 emissions from extraction, refining and transport of primary fuels before their use in the generation of electricity or steam).

Scope 3, Category 9: downstream transport and distribution
This category includes estimated emissions from transport and distribution of energy products produced or refined by Shell. It does not include the emissions associated with transporting third-party products, which are included in Scope 3, Category 1. In order to avoid double counting the emissions from transport, Scope 1 and 2 emissions from transport included in our equity emissions were subtracted from the total in this category.

Scope 3, Category 11: use of sold products
This category includes estimated emissions from the use of sold energy products, such as LNG, GTL, pipeline gas, refined oil products and biofuels. The emissions consist of two sub-categories: products manufactured and sold by Shell, and third-party products sold by Shell.

This category does not include non-energy products that may have been combusted during use (for example, lubricants).

Biogenic CO_2 emissions from combustion of sold biofuels
Biogenic CO_2 emissions from combustion of sold biofuels were estimated and reported separately outside of scopes. Methane and nitrous oxide have been included in Scope 3, Category 11 in line with the ISO 14064-1:2018 and GHG Protocol requirements.

We did not estimate biogenic CO_2 emissions in other Scope 3 categories. It is assumed that the presence of biogenic emissions in other categories is negligible at present.

Other Scope 3 categories
As noted above, this Report only covers Scope 3 GHG emissions included in the boundary of our NCI metric.

Other Scope 3 GHG emissions can be found on our website: www.shell.com/ghg.

Our journey to net zero continued

Other regulatory disclosures

GHG emissions and energy consumption data - information provided in accordance with UK regulations

Data in this section are consolidated using the operational control approach. Under this approach, we account for 100% of the GHG emissions and energy consumption in respect of activities where we are the operator, irrespective of our ownership percentage.

Reporting on this operational control basis differs from that applied for financial reporting purposes in the "Consolidated Financial Statements". We acknowledge the strong preference of the UK's Financial Reporting Council (FRC) for companies to report the GHG emissions and energy consumption data using the financial consolidation boundary and are working on including the data and information on this boundary in our Annual Report in the future.

See "Basis of preparation – absolute emissions" on page 102.

GHG emissions in million tonnes of CO_2 equivalent

	2022	2021	2020
Total global direct (Scope 1) [A]	51	60	63
UK including offshore area [B]	1.7	1.7	2.0
Market-based			
Total global energy indirect (Scope 2) [C]	7	8	8
UK including offshore area	0	0	0
Location-based			
Total global energy indirect (Scope 2) [D]	8	9	10
UK including offshore area	0.04	0.05	0.06
Intensity ratio in tonnes per tonne			
Intensity ratio of all facilities [E]	0.27	0.27	0.25

[A] Emissions from the combustion of fuel and the operation of our facilities globally, calculated using global warming potentials from the IPCC's Fourth Assessment Report.
[B] Emissions from the combustion of fuels and the operation of our facilities in the UK and its offshore area, calculated using global warming potentials from the IPCC´s Fourth Assessment Report.
[C] Emissions from the purchase of electricity, heat, steam and cooling for our own use globally, calculated using a market-based method as defined by the GHG Protocol Corporate Accounting and Reporting Standard.
[D] Emissions from the purchase of electricity, heat, steam and cooling for our own use globally, calculated using a location-based method as defined by the GHG Protocol Corporate Accounting and Reporting Standard.
[E] In tonnes of total direct and energy indirect GHG emissions per tonne of crude oil and feedstocks processed and petrochemicals produced in downstream manufacturing, oil and gas available for sale, LNG and GTL production in Integrated Gas and Upstream. For an additional breakdown by segment, see Scope 1 and 2 GHG intensity by segment section below.

The activity data used to calculate GHG intensity ratios at a portfolio level shown in the table above are reported on an operational control basis. As a result, they are not directly comparable with the production data reported elsewhere in this Report, which are reported on a financial control basis. The table below shows the numbers used in the calculation of the intensity:

Inputs used for calculating the GHG emissions intensity ratio

		2022	2021	2020
A	8.1 Scope 1 - Direct GHG emissions [A]	51	60	63
B	8.2 Scope 2 - Energy Indirect GHG emissions [A]	7	8	8
C=A+B	**Total Scope 1 and 2 GHG emissions [A]**	58	68	71
D	6.5 Total oil and gas production available for sale [B]	111	128	149
E	6.6 Refinery crude and feedstock processed [B]	63	84	99
F	6.3 Chemicals total production [B]	23	25	26
G	6.4 LNG production [B]	9	10	8
H	6.6 GTL production [B]	6	6	6
I=D+E+F+G+H	**Total Upstream, Integrated Gas and Downstream activity [B]**	**212**	**253**	**288**
J=C/I	**GHG intensity ratio [C]**	**0.27**	**0.27**	**0.25**

[A] In million tonnes CO_2 equivalent.
[B] In million metric tonnes of production.
[C] In tonnes of CO_2 equivalent per tonne of production.

Energy use in our operations

The energy consumption data provided below comprise own energy, generated and consumed by our facilities, and supplied energy (electricity, steam and heat) purchased by our facilities for our use.

Energy consumption data reflect primary (thermal) energy (e.g. the energy content of fuels used to generate electricity, steam, heat, mechanical energy, etc.). This includes energy from renewable and non-renewable sources. Own energy generated was calculated by multiplying the volumes of fuels consumed for energy purposes by their respective lower heating values. Own energy generated that was exported to third-party assets or to the power grid is excluded. Thermal energy for purchased and consumed electricity was calculated using actual electricity purchased multiplied by country-specific electricity generation efficiency factors (from IEA statistics). Thermal energy for purchased and consumed steam and heat was calculated from actual steam/heat purchased multiplied by a supplier-specific conversion efficiency, or a generic efficiency factor where supplier-specific data were not available.

Our journey to net zero continued

Our energy consumption decreased from 223 billion kilowatt-hours (kWh) in 2021 to 199 billion kWh in 2022, in line with the decrease in our Scope 1 and 2 GHG emissions. Around 1% of the energy we used in 2022 for our operations came from low-carbon and renewable sources.

Energy consumption in billion kilowatt-hours

	2022	2021	2020
Own energy generated and consumed			
Total energy generated and consumed	168	189	205
UK including offshore area	6.1	6.2	7.6
Purchased and consumed energy			
Total purchased and consumed energy	31	33	36
UK including offshore area	0.2	0.2	0.2
Energy consumption			
Total energy consumed	199	223	241
UK including offshore area	6.3	6.4	7.8

In 2022, we implemented a variety of measures to reduce the energy use and increase the energy efficiency of our operations.

Examples of some of the principal measures taken in 2022 (with estimated total savings of around 1,155 million kWh in 2022):

- At our GTL asset in Qatar, we completed several projects to reduce energy use and improve efficiency, e.g. by making improvements to catalyst performance which resulted in reduced generation of off-gas leading to lower energy consumption.
- At our Gulf of Mexico operations in the USA, we have implemented a project to reduce energy use and improve efficiency by using waste heat to generate steam.
- At our Upstream operations in the UK, we have completed several projects to reduce energy use and improve efficiency, for example by implementing an online model at Shearwater to optimise fuel gas usage.
- At our Scotford site in Canada, we have implemented several projects to reduce energy use and improve efficiency, for example by using analysers to optimise fuel usage.
- At our Geismar site in the USA, we have implemented several projects to reduce energy use and improve efficiency, for example by making changes to how some equipment operates.
- At our QGC operations in Australia, we implemented several projects to reduce energy use and improve efficiency, for example by introducing a CO_2 / energy performance dashboard for control room operators, which allowed operators to see gap to potential in efficiency savings based on real time operating data.

Examples of some of the principal measures taken in 2021 are listed below (with estimated total savings of around 675 million kWh in 2021):

- At our Scotford upgrader facility in Canada, we completed several projects to minimise energy use and improve efficiency, for example by installing new equipment and making changes to how some equipment operates.
- At our Gannet asset in the UK, we completed a project to enhance the efficiency of the fuel gas compressors by fine-tuning their performance to the specific needs of the platform.
- At our Jurong Island site in Singapore, we installed a second stage flash vessel to recover the heat for reuse in other equipment, and completed a project to minimise power consumption by one of the incinerators.
- At our Rheinland site in Germany, we completed several projects to reduce energy use and improve efficiency, for example, by installing more efficient equipment and changing maintenance schedules to improve efficiency.
- At our Bukom site in Singapore, we completed a project to reduce the consumption of natural gas in flare purge.
- At our Scotford refinery and chemical site in Canada, we completed several projects to reduce energy use and improve efficiency, for example, by enabling the reduction of steam usage.
- At our QGC operations in Australia, we implemented a project to reduce power requirements for gas compression.

The targets in this "Our journey to net zero" section, including those relating to the NCI targets, are forward-looking targets based on management's current expectations and certain material assumptions and, accordingly, involve risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied herein.

EU Taxonomy Regulation

The EU Taxonomy Regulation is a classification system that translates the European Union's environmental objectives into criteria for determining when an economic activity can be considered environmentally sustainable for investment purposes. As a UK company with its registered office and headquarters in London, Shell plc is not currently subject to the Taxonomy Regulation. Nevertheless, we elect to report against the taxonomy voluntarily because we recognise the importance of increasing transparency about how companies are progressing in the energy transition, even if the regulation is evolving and not yet mature.

For further information, see "Supplementary Information - EU Taxonomy Disclosure" on pages 327-339.

Respecting nature

Our approach to sustainability

Our commitment to contribute to sustainable development has been part of the Shell General Business Principles since 1997. These principles, together with our Code of Conduct, apply to the way we do business and to our conduct with the communities where we operate. We have embedded this sustainability commitment in our Powering Progress strategy, and our business and decision-making processes.

For more information on our Powering Progress strategy, see page 6.

Sustainability reporting boundary and guidelines

Data in this section are reported on a 100% basis in respect of activities where a Shell company is the operator (unless noted otherwise). Reporting on an operational control basis differs from that applied for financial reporting purposes in the "Consolidated Financial Statements" on pages 237-307. Additional data on our 2022 environmental and social performance can be found in the Shell Sustainability Report.

Our reporting on sustainability follows certain guidelines. For example:

- As a member of the World Business Council for Sustainable Development, we support its updated criteria for membership from 2022, which include requirements for corporate transparency.
- Our reporting is informed by guidelines developed by Ipieca, the global oil and gas association for advancing environmental and social performance across the energy transition.
- We map our disclosures against the Sustainability Accounting Standards Board's Oil & Gas - Exploration & Production Standard.
- In the "Our journey to net zero" section of this Report, we set out our climate-related financial disclosures consistent with all the recommendations and recommended disclosures of the Task Force on Climate-related Financial Disclosures (TCFD).

United Nations Sustainable Development Goals

The UN's 17 Sustainable Development Goals (SDGs) seek to address the world's biggest challenges, including tackling climate change, ending poverty, improving health and education, and making cities sustainable. Governments are responsible for prioritising and implementing approaches that meet the SDGs, but achieving these tasks will require collaboration and collective action across businesses, governments and civil society. We strive to play our part in helping governments and societies to achieve the SDGs. The goals were one of the considerations in the development of our Powering Progress strategy. We believe the actions we take as part of our strategy can help directly contribute to 13 of the SDGs, while indirectly contributing to others.

See our website shell.com for information on how Shell is contributing to the SDGs.

Board oversight for sustainability

We describe Shell's overall governance framework on pages 148-149 and provide information on the roles of the Board, its committees, and the Executive Committee. The Safety, Environment and Sustainability Committee (SESCo) is one of the four standing committees of the Board of Directors of Shell plc. The (SESCo) assists the Board in reviewing the policies, practices, targets and performance of Shell, primarily with respect to safety, the environment including climate change, and broader sustainability.

More information on SESCo's role and activities in 2022 is provided on pages 163-164.

The Annual Report on Remuneration (see pages 183-202) provides details of how the Shell scorecard captures key performance indicators for safety, environment and climate.

Shell General Business Principles

The Shell General Business Principles set out our responsibilities to shareholders, customers, employees, business partners and society. They set the standards for how we conduct business with integrity, care and respect for people. As part of these principles, we commit to contribute to sustainable development, balancing short- and long-term interests and integrating economic, environmental and social considerations into our decision-making. All Shell employees and contractors, and those at joint ventures we operate, are expected to behave in line with our General Business Principles.

HSSE & SP Control Framework

In Shell, health, safety, security, environment, and social performance (HSSE & SP) are vitally important to generating value. They are indispensable elements of our organisation. The Shell HSSE & SP Control Framework (CF) consists of mandatory manuals, which align with the Shell Commitment and Policy on HSSE & SP. Guidance documents, assurance protocols, and training materials support the implementation of the manuals.

The HSSE & SP CF applies to every Shell entity and Shell-operated venture. It defines requirements and accountabilities at each organisational level, setting expectations for the management of HSSE & SP risks. We aim to ensure that significant HSSE & SP risks associated with our business activities are assessed and managed to minimise them as far as reasonably practicable. Our HSSE & SP functions provide expert advice and support businesses to improve HSSE & SP performance. The applicability of specific HSSE & SP CF requirements to contract staff depends on the defined HSSE & SP risks of the material or services procured as determined by the contracting Shell entity in the context of the HSSE & SP CF. Contractors are required through appropriate contract provisions to adhere to either Shell requirements and standards or applicable industry standards.

We aim to minimise the environmental impact of new projects and existing operations. Shell conducts an environmental, social and health impact assessment for every major project. We engage with local communities and non-governmental organisations (NGOs) in order to understand and respond to their concerns in a timely and suitable manner.

Respecting nature continued

Health, Safety, Security, Environment & Social Performance Control Framework

The HSSE & SP Control Framework defines mandatory standards, requirements and accountabilities. The framework applies to Shell entities and Shell-operated ventures, including employees and contractor staff.

Mandatory manuals describe:
- Purpose of the manual
- Accountabilities and responsibilities
- Scope
- Requirements to be met

Shell Commitment and Policy on Health, Security, Safety, the Environment and Social Performance

Assurance

The Shell Internal Audit & Investigations (SIAI) team is the single independent assurance organisation within Shell. Within SIAI, the HSSE & SP and Asset Management Assurance team provides assurance to the Board on the effectiveness of the HSSE & SP Control Framework (CF) through an audit programme.

We expect joint ventures not operated by Shell to apply standards and principles substantially equivalent to our own. We support these joint ventures in implementing such standards and principles. We also offer to help them review the effectiveness of their implementation. Even if such a review is not conducted, we periodically evaluate HSSE & SP risks faced by the ventures that we do not operate. If a joint venture does not meet our HSSE & SP expectations, we seek to improve performance by working with our partners to develop and implement remedial action plans. We take care to invest responsibly in the energy transition and screen our investments against multiple criteria.

When considering divestments, we collaborate with in-house and external experts, where appropriate, to conduct checks and examine key attributes of potential buyers. These attributes may include their financial strength, operating culture, HSSE policies, and approach to ethics and compliance. We also consider risk- and people-management processes and standards, community liaison practices, and social performance programmes.

Applicable attributes are assessed against Shell's policies and the requirements of relevant local regulations. Divestments are often subject to the approval of regulatory authorities, which may in part depend on potential buyers' HSSE capacity, compliance record, and asset-stewardship capabilities.

See the section "Risk management and controls" on page 20 for more information.

Decommissioning and restoration

Decommissioning is part of the normal life cycle of every oil and gas structure. We work hard to close and dispose of installations in a safe, efficient, cost-effective and environmentally responsible manner. This includes restoring the surroundings of platforms and facilities in line with relevant legislation, while taking our own standards into account. We have decommissioning and restoration activities under way in Brazil, Brunei, India, the Netherlands, the UK and the USA. We seek to reuse, repurpose and recycle materials in decommissioning. At the end of 2022, we reported $20 billion on our balance sheet for current and non-current decommissioning and other provisions (see Note 24 to the Consolidated Financial Statements on pages 292-293).

Shell invests in innovative technologies for decommissioning and restoration which are developed in-house or by funding third parties. For instance, our Local Expander technology is used throughout the industry to plug unused wells and stop methane and liquids from escaping over time. The expander is easy to deploy and typically reduces greenhouse gas emissions by at least half compared to the alternative method of plugging.

See the business sections on pages 38-77 for more information.

Respecting nature continued

Respecting Nature

We recognise there is a growing urgency to protect and enhance biodiversity, preserve water quality and availability, improve air quality and use resources more efficiently. Nature loss and climate change are interconnected and need to be tackled together, as recognised at COP27 and COP15.

Respecting the environment has been an integral part of the way we do business for many years, as set out in the Shell General Business Principles and Shell Commitment and Policy on HSSE & SP. Respecting Nature is one of four pillars of our Powering Progress strategy, which we launched in 2021 (see page 6). Our commitments focus on four priority areas: biodiversity (land and marine environments), water, circular economy and waste, and air quality. They set out our ambitions for 2030 and later, as well as shorter-term goals.

We have included our commitments in our performance management and reporting systems and have been working to define baselines and track progress. Our Executive Committee is accountable for delivery of the Respecting Nature goal.

We have made a commitment to include requirements in our purchasing policies that reflect our environmental framework and take the energy efficiency, material efficiency and sustainability of products into consideration in our purchases.

We will continue to seek opportunities to go further. Our environmental ambitions are underpinned by collaboration with our supply chains and transparent reporting.

Environmental standards

Shell's global environmental standards are set out in our HSSE & SP Control Framework and we seek to apply them wherever we operate. Our approach draws on external standards and guidelines, such as those developed by the World Bank and the International Finance Corporation. Our environmental standards include details of how to manage emissions of greenhouse gases (GHG); consume energy more efficiently; reduce gas flaring and monitor and improve air quality; prevent spills and leaks of hazardous materials; use less fresh water; and conserve biodiversity.

When planning new major projects, we conduct detailed environmental, social and health impact assessments. The Shell HSSE & SP Standards require that we certify our major installations against an internationally recognised independent environmental management system standard if they have significant environmental risks. Major installations are crude oil and natural gas terminals; gas plants; manned offshore and onshore production platforms or flow stations; floating production and storage vessels; refineries; chemicals manufacturing facilities; mines; or upgraders. For the purpose of this Report, we did not count each major installation in Upstream and Integrated Gas separately. They were aggregated into their respective operating unit or operating company, such as Shell Upstream UK or Nederlandse Aardolie Maatschappij (NAM), in line with the scope of their certifications. At the end of 2022, 100% of major installations within that scope and operated by Shell were certified against the ISO 14001:2015 Environmental Management System or were in compliance with equivalent environmental frameworks required by local regulations. In addition, many installations that are not classified as major, such as lubricant plants or supply terminals, are also certified against ISO 14001 but are not included in the data above.

See also "Control Framework" on page 107 and "Our journey to net zero" on page 82 for more information on how we manage our GHG emissions.

Biodiversity

We aim to minimise the impact of our onshore and offshore projects on biodiversity and ecosystems, whether life on land or life below water.

Since 2021, all projects in critical habitats and nature-based solutions projects must have measures in place to achieve a net-positive biodiversity result. If we decide to go ahead with a project that is in a critical habitat, we develop a biodiversity action plan. This includes applying the mitigation hierarchy, a decision-making framework that involves a sequence of four key actions: avoid, minimise, restore and offset. We assess the potential impact of projects on biodiversity as part of our impact assessment process. If there is an impact on biodiversity, the plan outlines the actions required to help achieve a net-positive outcome for biodiversity. For example, in our recently announced Jackdaw project in the UK, our impact assessment determined there were no significant environmental or socio-economic impacts identified after implementation of mitigation measures.

Our commitments include replanting forests, achieving net-zero deforestation from new activities, while maintaining biodiversity and conservation value. Deforestation occurs when forests are converted to non-forest uses. We use the definition of forest used by the Food and Agriculture Organization of the United Nations.

In 2022, around 145 hectares were deforested as a result of our new activities. Reforestation plans are in development which we intend to implement to help achieve biodiversity and contribute to conservation. We work with partners and stakeholders to create robust and credible plans unique to each reforestation project.

In 2003, we committed not to explore for, or develop, oil and gas resources in natural and mixed World Heritage Sites.

Circular economy and waste

We are aiming for zero waste by reducing waste generated and increasing reuse and recycling in our businesses and supply chains. In 2022, we completed 19 assessments on waste across our businesses, adding to five that were completed in 2021. These assessments determined a high number of varied waste sources. Further review is required before setting additional waste reduction, reuse and recycling goals. In 2023, we plan to take action to help address reductions across the most significant of Shell's waste streams.

In 2022, we disposed of 1,982 thousand tonnes of hazardous and non-hazardous waste, which is relatively flat compared with 1,993 thousand tonnes in 2021. We also sent 457 thousand tonnes of residual materials for reuse, recycling or beneficial use as a raw material in another process. For example, waste that might otherwise go to landfill can be incinerated to generate energy.

We continue to explore ways to reduce, reuse and recycle packaging across our supply chains, and introduce sustainable packaging. We have also set commitments to work with our suppliers and contractors to help end plastic waste in the environment:

- By 2030, we will increase the amount of recycled plastic in our Shell-branded packaging to 30% and ensure that the packaging we use for our products is reusable or recyclable.
- We will increase the amount of recycled materials used to make our products, starting with plastics. Our ambition is to use 1 million tonnes of plastic waste a year in our global chemical plants by 2025.

We are focusing on chemical recycling where we break down hard-to-recycle plastics into raw materials through a technique called pyrolysis. The technique breaks down hard-to-recycle plastics into raw materials. The pyrolysis oil can then be used as feedstock in our chemical plants, replacing traditional hydrocarbon feedstock. This contributes to our circular economy ambition and prevents waste that would otherwise have gone to landfill or incineration.

Respecting nature continued

At the Shell Chemicals Park Moerdijk in the Netherlands, we are building a new pyrolysis oil upgrader. The plant will have the capacity to process up to 50,000 tonnes of pyrolysis oil per year.

At our Shell Energy and Chemicals Park Singapore, we are also building a pyrolysis oil upgrader, with a capacity of 50,000 tonnes per year.

In 2021, we announced plans - along with our joint-venture partner BlueAlp - to build two hard-to-recycle plastic waste conversion units in the Netherlands. Since the signing, we have worked together to improve the operational set-up and process safety. The plant is expected to convert more than 30,000 tonnes of plastic waste a year into pyrolysis oil.

We are a member of Operation Clean Sweep, a voluntary programme which supports companies in the plastics value chain to put in place measures to prevent pellet loss.

Water

Managing our impacts on water and ensuring the availability of fresh water for our operations is a growing challenge in some parts of the world. Increasing demand for water resources, growing stakeholder expectations and concerns, and water-related legislation may reduce our access to water.

We manage water use carefully, and tailor our use of fresh water to local conditions and requirements. We sometimes use alternatives to fresh water in our operations. These include water that has been recycled from our operations, processed sewage water and desalinated water. We require that all Shell facilities and projects are assessed to see what risks they might pose to water availability. In places where water is scarce, we develop water-management action plans for using less fresh water, increasing water recycling and closely monitoring water use.

We aim to reduce our consumption of fresh water in water-stressed areas by 15% by 2025 compared with 2018 levels.

At the end of 2022, four of our major facilities were in areas where there is a high level of water stress, based on analysis using water stress tools, including the World Resources Institute's Aqueduct Water Risk Atlas and local assessments. These four facilities are the Pearl GTL (gas-to-liquids) plant in Qatar, the Shell Energy and Chemicals Park in Singapore, the Shell Jurong Island chemical plant, also in Singapore, and the Tabangao Import Terminal in the Philippines. In 2022, these four facilities consumed 18 million cubic metres of fresh water, compared with 22 million cubic metres in 2021 and their baseline of 25 million cubic metres in 2018.

In 2022, we continued to review our water use and stewardship. We are applying procedures across our businesses to improve water efficiency and reduce fresh-water use. This has involved detailed assessments at six Shell sites: QGC upstream and midstream, Australia; Shell MDS, Malaysia; Shell Hazira LNG Terminal, India; Shell Energy and Chemicals Park Rheinland, Germany; and Shell Chemicals Park Moerdijk. The assessments involved desktop analysis and detailed site evaluations conducted with external organisations. A key learning from the assessments was that Water Stewardship principles can be applied to Shell's onshore facilities. We expect to update our approach further in 2023.

In 2022, our overall intake of fresh water decreased to 156 million cubic metres, compared with 166 million cubic metres in 2021, mainly driven by divestments and the shutdown of some units at the Shell Energy and Chemicals Park Singapore, and at Jurong Island Singapore.

Around 85% of our intake of fresh water in 2022 was used for manufacturing oil products and chemicals, with the rest mainly used for oil and gas production. Around 30% of our fresh-water intake was from public utilities, such as municipal water supplies. The rest was taken from surface water such as rivers and lakes (around 55%) and groundwater (around 15%).

Additional information on our 2022 environmental performance is expected to be published in the Shell Sustainability Report in March 2023.

Air quality

We are helping to improve air quality by reducing emissions from our operations and providing clean ways to power transport and industry. We follow our own standards and those of local regulators to manage airborne pollutants in our oil and gas production and processing, including emissions of nitrogen oxides, sulphur oxides and volatile organic compounds.

Our sulphur oxide (SOx) emissions increased to 36 thousand tonnes in 2022, compared with 32 thousand tonnes in 2021. This increase was mainly because of turnarounds at the Shell Energy and Chemicals Park Singapore, and our Sarnia refinery in Canada.

Our nitrogen oxide (NOx) emissions decreased from 105 thousand tonnes in 2021 to 93 thousand tonnes in 2022, in part because of the handover of OML 11 operations in Nigeria, divestment of our Permian assets in the USA, and fewer ships operated by Shell.

Our emissions of volatile organic compounds (VOCs) decreased to 38 thousand tonnes in 2022 from 45 thousand tonnes in 2021. Reductions were in part due to divestment of Permian assets in the USA, the handover of OML 11 operations in Nigeria, and reduced flaring.

For more information about our approach to biodiversity, circular economy and plastic waste, and water see our website shell.com.

Spills

Large spills of crude oil, oil products and chemicals associated with our operations can harm the environment, and result in major clean-up costs, fines and other damages. They can also affect our licence to operate and harm our reputation. We have requirements and procedures designed to prevent spills. We design, operate and maintain our facilities with the intention of avoiding spills. To further reduce the risk of spills, Shell has routine programmes to reduce failures and maintain the reliability of facilities and pipelines. Our business units are responsible for organising and executing spill responses in line with Shell guidelines and relevant legal and regulatory requirements. Our offshore installations have spill response plans for when an incident occurs. These plans set out response strategies and techniques, available equipment, and trained personnel and contracts. We can engage specialist contracted services for oil spill response, including vessels, aircraft or other equipment and resources, if required, for large spills. We conduct regular exercises that seek to ensure these plans remain effective and fit for purpose.

We have further developed our ability to respond to spills to surface water. We have a worldwide network of trained staff to help with this. We also have a global oil spill expertise centre, which tests local capability and maintains our ability to respond to a significant spill into a marine environment.

Spills still occur for reasons such as operational failure, accidents or unusual corrosion. In 2022, there were 54 operational spills of more than 100 kilograms compared with 42 in 2021. The weight of operational spills of oil and oil products in 2022 was 0.06 thousand tonnes, compared with 0.05 thousand tonnes in 2021. In 2022, all of the spills caused by sabotage and theft were in Nigeria. The number

Respecting nature continued

of these spills decreased to 75 in 2022 from 106 in 2021, with the volume also decreasing to 0.6 thousand tonnes from 3.3 thousand tonnes in 2021.

See "Safety" section on page 121 for more information on emergency response.

Spills in Nigeria

In the Niger Delta, over the last 12 years, the total number of operational hydrocarbon spills and the volume of oil spilled from them into the environment have been significantly reduced.

Most oil spills in the Niger Delta region continue to be caused by crude oil theft, the sabotage of oil and gas production facilities, and illegal oil refining, including the distribution of illegally refined products.

In 2022, the Shell Petroleum Development Company of Nigeria Limited (SPDC), as operator of the SPDC joint venture (JV, Shell interest 30%), reported 10 operational spill incidents of more than 100 kilograms of crude oil, more than the nine reported in 2021. The volume of around 0.01 thousand tonnes was less than the 0.03 thousand tonnes recorded in 2021.

SPDC [A] has an ongoing work programme to appraise, maintain and replace key sections of pipelines and flow lines, in order to reduce the number of operational spills. In 2022, around 27 kilometres of pipelines and flow lines have been replaced. This work is organised through a proactive pipeline and flow line integrity management system. The system installs barriers where necessary, and recommends when and where pipeline sections should be replaced to prevent failures.

[A] Unless otherwise stated, all activities reported for or as relating to Shell Petroleum Development Company Limited (SPDC) in this section should be understood as SPDC acting as the operator of the SPDC joint venture (SPDC JV). SPDC, as the corporate entity, owns 30% of the JV.

Spills caused by sabotage in 2022

In 2022, about 88% of the oil spills of more than 100 kilograms from the SPDC-operated facilities were caused by the illegal activities of third parties. In 2022, the volume of crude oil spills of more than 100 kilograms caused by sabotage was around 0.6 thousand tonnes (75 incidents), compared with around 3.3 thousand tonnes (106 incidents) in 2021. The decreased number of incidents in 2022 correlates with a shut-down of production for about six months because of an unprecedented increase of crude oil theft from the Trans Niger Pipeline (TNP), which is operated by SPDC on behalf of the SPDC JV. SPDC continues to work with the government security agencies to maintain surveillance and address illegal activities of third parties, primarily along the SPDC JV pipeline and its operational areas.

In 2022, SPDC continued on-ground surveillance of its areas of operation, including its pipeline network, to mitigate third-party interference and ensure that spills are detected and responded to as quickly as possible.

There are daily overflights of the most vulnerable segments of the pipeline network to identify any new spills or illegal activity. SPDC has introduced anti-theft protection mechanisms for key infrastructure such as wellheads and manifolds. The programme to protect wellheads with steel cages continues to help deter theft, and drones have been introduced to inspect pipelines and monitor security of operations.

By the end of 2022, a total of 311 steel cages were installed, including 38 that had been upgraded with CCTV. This compared with a total of 283 installed cages at the end of 2021. In 2022, out of 732 registered attempts, 47 were successful.

Response and remediation

Regardless of the cause of a spill, SPDC cleans up and remediates areas affected by spills originating from its facilities. In 2022, the time that SPDC needed to complete the recovery of free-phase oil – oil that forms a separate layer and is not mixed with water or soil – remained at around one week. This is the average time it takes to safely access a damaged site, initiate containment to prevent further spread of the spill, and to start joint investigation visits with regulators, affected communities, and in some cases with NGOs, to clean up oil not mixed with water or soil.

Clean-up activities include bio-remediation which stimulates micro-organisms that naturally break down and use carbon-rich oil as a source of food and energy, effectively removing it. Once clean-up and remediation operations are completed, the work is inspected and, if satisfactory, approved and certified by the Nigerian regulators. With operational spills, SPDC also pays compensation to affected people and communities.

SPDC has been working with the International Union for Conservation of Nature (IUCN) since 2012 to enhance remediation techniques and protect biodiversity at sites affected by oil spills in its areas of operation in the Niger Delta. Based on this collaboration, SPDC has launched further initiatives to help strengthen its remediation and restoration efforts. In 2021, SPDC, IUCN, the Nigerian Conservation Foundation, and Wetlands International began working together on the Niger Delta Biodiversity Technical Advisory Group (BTAG), which continues to monitor biodiversity recovery at remediated sites.

SPDC also works with a range of stakeholders in the Niger Delta to build greater trust in spill response and clean-up processes. For example, local communities participate in remediation work for operational spills. Various NGOs have sometimes gone on joint investigation visits with SPDC, government regulators, and members of affected communities to establish the cause and volume of oil spills.

SPDC has sustained efforts to raise awareness of and counter the negative effects of crude oil theft and illegal oil refining. Examples include awareness and education programmes, community-based pipeline surveillance, and promoting alternative livelihoods through Shell's flagship youth entrepreneurship programme, Shell LiveWIRE.

Bodo clean-up process

In 2015, SPDC and the Bodo community signed a memorandum of understanding (MOU) granting SPDC access to begin cleaning up areas affected by two operational spills that occurred in 2008. The MOU also provided for the selection of two international contractors to conduct the clean-up under the oversight of an independent project director. Engagement with the Bodo community and other stakeholders began in September 2015 and was managed by the Bodo Mediation Initiative. The clean-up project was delayed in 2016 and for most of 2017 because of access challenges from the community.

In September 2017, it was possible to start the first phase of clean-up and remediation activities. The clean-up consists of three phases:
1) removal of oil from shoreline surfaces and mud flat beds;
2) remediation of soil and sediments; and
3) planting mangroves and monitoring.

The first phase was completed in August 2018. Phase two's contract procurement process was completed in 2019. Remediation activities in the field started in November 2019. During 2020, work paused until November because of COVID-19 restrictions.

Respecting nature continued

During 2021 and 2022, the remediation of soil and sediments continued. By the end of 2022, remediation work was completed on more than 87% (about 60% by end of 2021) of about 1,000 hectares that had been designated for clean-up. Remediation is expected to be completed by the end of the third quarter of 2023.

The planting of mangrove seedlings (phase 3) started in 2021. Around two million mangrove seedlings need to be planted and survive to 2025 to fulfil the project's goal. By the end of 2022, close to 340,000 seedlings had been planted. The National Oil Spill Detection and Response Agency (NOSDRA) had completed the certification for the planting on about a third of 722 hectares that have been remediated.

Ogoniland: commitment to the United Nations Environment Programme

SPDC remains committed to the implementation of the 2011 United Nations Environment Programme (UNEP) Report on Ogoniland which assessed contamination from oil operations in the region and recommended actions to clean it up. Over the last 11 years, SPDC has acted on all and completed most of the UNEP recommendations that were specifically addressed to it as the operator of the joint venture.

The clean-up efforts are led by the Hydrocarbon Pollution and Remediation Project (HYPREP), an agency established by the federal government. The UNEP report had recorded 67 sites, of which two were classified as waste sites without hydrocarbon pollution. This left 65 sites to be remediated, with all completed sites to be certified by NOSDRA. In 2021, for nine sites, remediation and certification was completed, work on 11 sites continued in 2022. In 2022, remediation of another nine sites and certification of four were completed. Work on two sites continues in 2023. Also, for 13 sites, NOSDRA certified that - in contrast to the original report - remediation was not needed. For the 17 sites, contracts have been awarded and field work is expected to commence in 2023. For the remaining 15 sites, remediation plans are being developed.

The UNEP report recommended creating an Ogoni Trust Fund (OTF) with $1 billion capital, to be co-funded by the Nigerian government, SPDC and other operators in the area. SPDC remains fully committed to contributing $900 million to the fund as its share over five years. SPDC contributed the first instalment of $180 million for the clean-up in July 2018, and released the second instalment of $180 million in 2019. HYPREP did not request the release of any funds in 2020. In 2021, HYPREP requested the release of funds for 2020 and 2021 ($360 million). SPDC paid $212 million in 2022, which brought the total contribution to the OTF to $572 million at the end of 2022.

Although remediation works continue to make progress, challenges remain. These include re-pollution, land disputes, environmental issues such as flooding caused by excessive rainfall, and security issues in Ogoniland.

UNEP continues to monitor the progress of the clean-up through its observer status at HYPREP´s Governing Council and the Ogoni Trust Fund. UN agencies such as the United Nations Development Programme and the United Nations Institute for Training and Research provide services to HYPREP in the areas of livelihood programmes, training and project services.

Hydraulic fracturing

Onshore Operating Principles

We use five aspirational operating principles which focus on safety, environmental safeguards, and engagement with nearby communities to address concerns and help develop local economies. We are working towards making all of our Shell-operated onshore projects where hydraulic fracturing is used to produce gas and oil from tight sandstone or shale consistent with these principles.

We consider each project – from the geology to the surrounding environment and communities – and design our activities using technology and innovative approaches best suited to local conditions. We also support government regulations consistent with these principles that are designed to reduce risks to the environment and keep those living near operations safe.

Seismicity

Overall, we believe it is relatively unlikely that hydraulic fracturing or well operations for disposing of produced water will induce seismicity that is felt on the surface. We would also expect any such impact to be limited to a relatively small area. The geology of some places, though, does increase the risk of inducing seismicity that can be felt on the surface. With the production from the Groningen onshore gas field in the Netherlands, seismicity was felt.

Shell assesses the risk profile of each basin before entering and manages operations accordingly, often beyond regulatory requirements. We assess the subsurface formation and surface environment around our operations and have developed appropriate mitigation plans to follow if needed.

For information about our induced seismicity management practices, such as the "Onshore Operating Principles in Action: Induced Seismicity Fact Sheet", see our website Shell.com.

For information on the Groningen onshore gas field in the Netherlands, see "Upstream" on pages 46-47.

Environmental costs

We are subject to a variety of environmental laws, regulations and reporting requirements in the countries where we operate. Infringing any of these laws, regulations and requirements could harm our reputation and ability to do business, and result in significant costs, including clean-up costs, fines, sanctions and third-party claims. Ongoing operating expenses include the costs of preventing unauthorised discharges into the air and water, and the safe disposal and handling of waste.

For information about our environmental costs, see Note 24 "Decommissioning and other provisions" on pages 292-293.

We place a premium on developing effective technologies that are also safe for the environment. But when operating at the forefront of technology, there is always the possibility that a new technology has environmental impacts that were not assessed, foreseen or determined to be harmful when originally implemented. While we believe we take reasonable precautions to limit these risks, we could be subject to additional remedial, environmental and litigation costs as a result of unknown and unforeseen impacts of operations on the environment.

For information about risk management, see section "Risk management and controls" on page 23.

Powering lives

Contribution to society

We work to improve people's lives through our products and activities, and by contributing to local communities and championing inclusion.

Shell's businesses are part of society and contribute to it by buying and selling goods and services in many countries. Our employees, suppliers and contractors are part of the local communities where Shell operates. Our activities also generate revenues for governments through the taxes and royalties we pay and the sales taxes we collect on their behalf. This helps governments fund health care, education, transport and other essential services.

In 2022, Shell paid $68.2 billion to governments (2021: $58.7 billion). We paid $13.4 billion in corporate income taxes and $8.2 billion in government royalties, and collected $46.6 billion in excise duties, sales taxes and similar levies on our fuel and other products on behalf of governments. In 2022, Shell spent $41.5 billion (2021: $37.5 billion) on goods and services from about 24,000 suppliers globally.

Social and economic impacts

We continue to assess our social and economic impact in a number of countries and regions. To do this, we have enlisted the help of Oxford Economics using its Global Sustainability Model.

In 2021, Shell had published its first report based on 2019 social and economic performance data. It detailed the impacts of our activities in five countries: the Netherlands, UK, USA, Nigeria and India.

In 2023, we are working to complete further reports, based on 2021 social and economic performance data for the 27 European Union member states. This work includes a combined report for Poland, Bulgaria, Hungary, Czech Republic, and Slovakia, as well as individual reports on these five countries.

These new reports aim to provide performance data on Shell's contribution to in-country gross domestic product, job numbers, tax payments to governments, and our spending on social and educational programmes. They also provide details of our operations and our procurement of goods and services in these regions and countries.

Supply chain engagement

Building strong relationships with our suppliers, including contractors, is essential to delivering new projects and running our operations. Suppliers often play an important part in Shell having a positive impact on local communities and achieving business success.

Shell aims to work with suppliers that behave in an economically, environmentally and socially responsible manner, as set out in our Shell General Business Principles and Shell Supplier Principles. In 2022, we spent around $41.5 billion on goods and services from around 24,000 suppliers globally.

The way we engage with our contractors and suppliers is based on our Shell Supplier Principles, which are embedded in contracts. They require contractors and suppliers:

- to commit to protect the environment in compliance with all applicable environmental laws and regulations;
- to use energy and natural resources efficiently; and
- to continually look for ways to minimise waste, emissions and discharge from their operations, products and services.

We will include requirements in our purchasing policies to reflect our environmental framework, and take the energy efficiency, material efficiency and sustainability of products into consideration in our purchases.

We also work with our partners and industry peers to include worker welfare in industry standards, guidance, and best practice. This helps raise expectations and levels of consistency across the industry. We participate in organisations such as:

- the Building Responsibly group of engineering and construction companies working together to raise the bar in promoting the rights and welfare of workers across the industry;
- the International Association of Oil and Gas Producers (IOGP); and
- Ipieca, the global oil and gas industry association for advancing environmental and social performance across the energy transition.

We also work closely with our key contractors. As a result, by the end of 2022, 23 of our biggest contractors had signed up to the Building Responsibly principles, which cover more than 1 million workers.

Helping our suppliers decarbonise

We continually work with our suppliers to find ways to reduce greenhouse gas emissions across our supply chains. We seek to understand their energy needs and jointly identify potential low-carbon solutions that are economically sustainable.

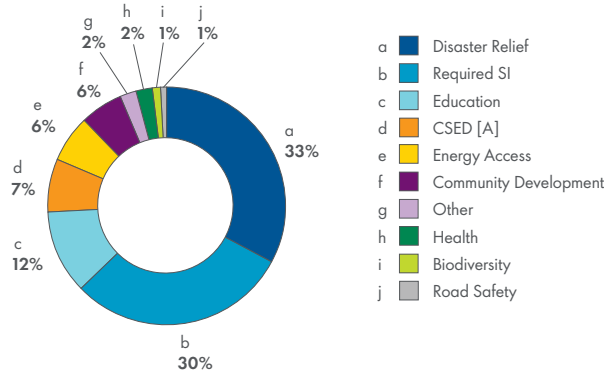
In 2021, we rolled out a new digital platform, the Shell Supplier Energy Transition Hub, free of charge to our supply chain and any other interested company. The platform enables them to set emission ambitions and track performance, share best practice and exchange emissions data with their own supply chains. By the end of 2022, 1,039 of our suppliers had joined the platform, 460 of which have already set emission reduction targets. This is more than a fourfold increase on 2021 in both instances.

See our website shell.com for more information about how we engage with contractors and suppliers.

Social investment

We make social investments in areas determined by local community needs and priorities. This investment is sometimes voluntary, sometimes required by governments, or part of a contractual agreement. In 2022, we spent almost $260 million on social investment, of which 30% was required by government regulations or contractual agreements. We spent the remaining $182 million (70%) on voluntary social programmes.

2022 Social Investment spend by theme

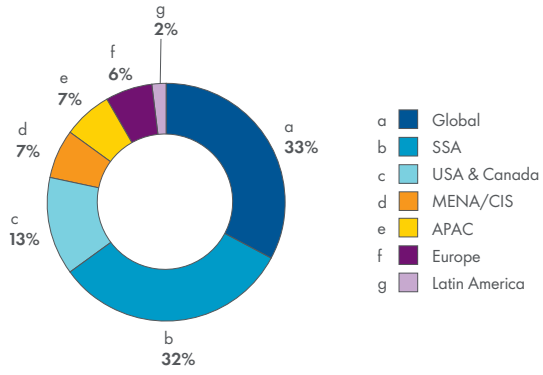


[A] CSED – Community Skills & Enterprise Development.

Powering lives continued

Around $92 million of our total social investment spend in 2022 was in countries that, according to the UN Development Programme's Human Development Index 2021, have a gross national income of less than $15,000 a year per person.

2022 Social Investment spend by region



See our website shell.com for more information about our social investment.

Neighbouring communities

We engage with communities as part of our approach to managing human rights and providing access to remedy. Shell's HSSE & SP Control Framework helps us operate responsibly and avoid or minimise potentially negative social impacts of our operations. The requirements set out in the framework also help us in our aim to be a positive presence in the communities through, for example, local employment and contractual opportunities. When we divest assets or exit areas, we apply well-established processes systematically to guide our risk assessment with the aim of leaving a positive legacy.

The requirements are supplemented by guidance that helps practitioners on the ground to engage with communities around our operations. Major projects and facilities operated by Shell have a social performance plan for managing potentially negative impacts, such as noise pollution, and maximising benefits, such as using local suppliers. These plans typically begin with defining the social environment, focusing in particular on people who may be especially vulnerable to the potential impacts of our operations. In larger facilities, we implement a community feedback mechanism for listening and responding to questions and resolving complaints in a timely manner. We have specific requirements to avoid, minimise or mitigate potential impacts on the traditional lifestyles and cultural heritage of Indigenous Peoples. We also have specific requirements to avoid, minimise or mitigate their involuntary resettlement.

We use our online community feedback tool, launched in 2020, to track and respond to questions, complaints and feedback that we receive. It allows our network of about 121 community engagement practitioners to document feedback and outcomes. They are the face of Shell in the communities and act as a bridge between communities and our activities.

We continually seek to improve our community engagement and to align with the UN Guiding Principles on Business and Human Rights. As part of this we work with selected sites to improve their community feedback mechanisms in the following areas:

- promoting public access to and transparency of the sites' community feedback mechanisms;
- improving written procedures so they are better aligned with global good practice and more reflective of local circumstances;
- providing clear steps for recognising alternative options for communities to seek remedy; and
- respecting people's anonymity and data privacy.

In 2022, we developed new community feedback mechanism procedures for four additional sites, bringing the total number of sites with operational feedback procedures aligned with the effectiveness criteria spelled out in the UN Guiding Principles to 16. Several more sites have procedures in place which are not specifically aligned with those criteria.

In 2022, we used the data in our online reporting tool to analyse how feedback was addressed. We found that most issues were resolved directly by the community engagement practitioners and the remainder were resolved by site management.

See our website shell.com for more information about our work with communities.

Human rights

Human rights are fundamental to Shell's core values of honesty, integrity and respect for people. Our approach is informed by the UN Guiding Principles on Business and Human Rights. Respect for human rights is embedded in the Shell General Business Principles and our Code of Conduct.

We focus our efforts on four key areas, where respect for human rights is critical to the way we operate and where we have identified the highest risk of potential impact on human rights. These four key areas are the workplace, communities, supply chains and security. In 2022, we continued to take steps to improve our approach to human rights.

We expect joint ventures not operated by Shell to apply standards and principles substantially equivalent to our own. The Shell Supplier Principles outline how we expect our contractors and suppliers to respect the human rights of their workforce, and to manage the social impacts of their activities on Shell's neighbouring communities.

In 2021, we published Shell's Approach to Human Rights, which increases transparency by providing our staff and external stakeholders with important information about our approach and commitment to human rights. The publication includes Shell's position on respecting and promoting worker welfare. It also contains information on how we provide access to remedy. In 2022, supported by an external advisor, we developed recommendations to further improve our approach to human rights. We do this, for example, by expanding the disclosure of our human rights due diligence strategy and salient issues, seeking opportunities to expand the scope of contracting and procurement human-rights-related controls in our supply chain beyond Tier 1 suppliers, and opportunities for a more integrated approach to human rights due diligence.

In 2021, we launched an updated human rights training course and by the end of 2022, about 460 Shell staff had completed the course and the roll-out is expected to continue through 2023. The course is mandatory for selected staff working in higher-risk focus areas, such as social performance, human resources, and contracting. We encourage all staff to do the course, regardless of their role, to build greater understanding of human rights across Shell.

An internal Human Rights Working Group with experts from different functions, including an external adviser, guides Shell businesses on best practice when implementing and reviewing our approach to human rights. In 2022, a committee composed of senior executives, chaired by the Director of Strategy, Sustainability and Corporate Relations, supported the work of the Human Rights Working Group.

Powering lives continued

Shell Supplier Principles

Human rights due diligence is particularly relevant when it comes to our supply chains. For example, we engage with suppliers who may be at risk of having issues with labour rights to assess their management systems before deciding whether to award a contract. If we are dissatisfied with the results of supplier assessments, we may work with suppliers to help them implement corrective actions. We may also conduct on-site audits or consider terminating contracts if serious or persistent shortcomings are found.

The most common shortcomings found during our supplier assessments typically relate to the following areas:

- freely chosen employment;
- avoiding child labour;
- working hours, wages and benefits;
- dormitory, housing and working conditions;
- equal opportunities and freedom of association; and
- supply chain and performance management.

The Shell Supplier Principles include specific labour and human rights expectations for suppliers, including contractors. Shell companies use a joint industry supplier capability assessment that is delivered in collaboration with other operators. This is intended to support the improvement of working conditions in the participating companies' supply chains.

Shell's salient human rights issues

Salient human rights are those that are most at risk from a company's operations. We focus on four areas where respect for human rights is particularly critical to the way we operate and where we have identified the highest risk of potential impacts on human rights.

In 2022, we completed a review of our salient human rights issues with the support of an external advisor, Business for Social Responsibility (BSR). As a result, we have grouped Shell's salient human rights issues into the focus areas, reflected in the table alongside.

The exercise of reassessing and identifying our current most salient issues is part of our continued effort to ensure our human rights approach is effective and fit for purpose. As our business evolves, our salient issues profile might change. We will continue to assess risks and adapt our approach as required.

Human rights focus areas	Salient issues
At the workplace	▪ Health and safety ▪ Discrimination ▪ Decent living conditions in workers' accommodation ▪ Access to adequate and readily available channels to voice concerns
In supply chains	▪ Labour rights in our supply chains, e.g. prevention of forced labour, access to remedy ▪ Safe and healthy working conditions ▪ Decent living conditions in worker accommodation
In communities	▪ Social impact management ▪ Vulnerable persons/communities ▪ Land access, livelihoods, and cultural heritage ▪ Engagement and access to remedy
In security	▪ Human rights impact on communities by private security and/or government security forces we rely on ▪ Security of employee and contract staff in high-risk environments where we work

See our website shell.com for more information about our approach to human rights.

Powering lives continued

Our people

Our people play an important role in accelerating Shell's transition to a net-zero emissions business, while also helping us address the energy needs of today. We aim to develop the talent of our people within a diverse and inclusive environment where we can empower them to be their best.

All metrics throughout this section exclude the employees in portfolio companies, except for the metrics reflecting total employee numbers, actual number of employees by geography, percentage of women employees, and mandatory training courses.

In 2022

Employees
93,000
employees at December 31, 2022

Countries and territories
>70
countries in which we operate

Directors
55%
women on the Board of Directors

Executive Committee
22%
women in Executive Committee

Senior leaders
30%
women in senior leadership positions

Women employees
33%
women employees

Training
266,000
formal training days for employees, joint-venture partners, and contractors

Experienced hires
10,076
people joined Shell (40% women, 60% men)

Graduate hires
332
people joined Shell (49% women, 51% men)

Employee overview

We employed 93,000 people on a full- or part-time basis at the end of 2022. This compares with 83,000 at the end of 2021 and 88,000 at the end of 2020. The data include people working in Shell subsidiaries, Shell-operated joint ventures and those seconded to non-Shell-operated joint operations, or ventures and associates. The employee numbers for 2021 and 2020 reflect headcount in the Shell HR system and full-time equivalent numbers for portfolio companies, which maintain their own HR systems.

Changes in headcount

In Shell companies, excluding portfolio companies, headcount fell by 5,000 from 82,000 to 77,000 between 2020 and 2021.

At the end of 2022, after the implementation of our Reshape strategy which saw a reduction of more than 7,300 jobs in Shell, headcount grew by 2,000 to 79,000 people because of the recruitment of employees in Information and Digital Technology and Trading and Supply.

The Reshape job reduction includes 3,500 employees who elected to leave Shell on selective voluntary severance (SVS), thereby reducing the number of enforced redundancies. We have always sought to conduct the job reductions process in accordance with our core values of honesty, integrity, and respect for people. Throughout the Reshape process, we supported those facing job reductions by helping them to find internal and external opportunities to retrain or learn new skills.

In Shell portfolio companies which maintain their own HR system, full-time equivalent employee numbers remained constant between 2020 and 2021. At the end of 2022, the employee headcount in portfolio companies increased by 8,000 to 14,000 people driven mainly by acquisitions, growth in new activities and new disclosure in Mobility, Lubricants, Renewables and Energy Solutions as we continue to implement our Powering Progress strategy.

The table below presents the breakdown of employee numbers by geographical area.

Note 32 to the "Consolidated Financial Statements" on page 306 provides the average number of employees by business segment.

Actual number of employees by geographical area

Thousand

	2022	2021	2020
Europe	30	27	28
Asia	32	30	31
Oceania	3	2	3
Africa	4	4	4
North America	23	18	20
South America	1	2	2
Total	93	83	88

Voluntary turnover is a reliable indicator of the effectiveness of Shell's people management policies. In 2022, our voluntary resignations remained low compared with a range of industries. Around 5.0% of all Shell employees voluntarily resigned in 2022. This compared with 4.4% in 2021.

Powering lives continued

The tables below present the breakdown of employees by type of employment contract and age group.

Percentage of employees by contract types

	2022	2021	2020
Permanent Contract/ employment at-will [A]	98%	98%	98%
Fixed Term Contract	2%	2%	2%

[A] Employment at-will is used in the USA to describe employment contracts.

Percentage of employees by age group

	2022	2021	2020
Under 30 years old	14%	13%	14%
Between 30-50 years old	64%	65%	64%
Above 50 years old	22%	22%	22%

Shell aims to be an attractive employer to its existing and prospective employees. Across the more than 70 countries we operate in, we provide competitive remuneration with a range of benefits, such as global minimum maternity leave of 16 weeks. From January 2023, we offer at least eight weeks paid parental leave for non-birthing parents.

People are our most important asset and we believe in developing our employees. Career progression tools, such as an internal job portal, individual development plans, coaching and formal training have been in place for many years. We offer employees the opportunity to develop their careers within Shell, including rotations across different parts of the businesses to advance their skills and progress.

In 2022, 10,300 Shell employees were promoted (40% of which were women and 60% men), compared with 10,000 promotions (44% of which were women and 56% men) in 2021.

People development is a priority in company-wide and leadership communications. We account for learning as part of annual budget planning and we aim to ensure our learning curricula are updated and accessible to all employees.

In 2022, 266,000 formal training days were delivered to employees, joint-venture partners and contractors. This compares with 271,000 in 2021 and 234,000 in 2020. We aim to build the confidence of our employees in their employability throughout the energy transition. Shell has increased learning offerings related to new skills that may be needed. In 2022, around 4,000 Shell employees completed courses on various topics, including hydrogen production, carbon capture and storage, and energy management.

We have focused efforts on expanding access to virtual courses and on a return to in-person training workshops, which were paused due to the pandemic.

Team leadership plays a key role in driving employee engagement. We seek to develop leaders through learning programmes, domestic and international assignments, and project opportunities. In 2022, 25% of team leaders in Shell received access to a classroom learning.

Employee engagement and support

Hearing from employees provides valuable information for management and contributes to the governance of Shell. Insight into employee needs and perspectives enables Shell to continually learn and improve its policies, processes, and practices.

Management regularly engages with employees, including through internal and external elected employee representatives, and a range of local formal and informal channels. Our employee engagement forums also include webcasts and all-employee messages from our CEO and other senior leaders; town halls and team meetings; virtual coffee/chai connects; interviews with senior management, and internal social platforms. These engagements enable Shell to maintain a locally constructive employee and industrial relations environment.

In June 2022, the Chair of the Board, Sir Andrew Mackenzie, met with representatives of the Shell European Workers Council (SEWC) as part of their annual plenary meeting at Shell Centre in London. Also in 2022, various members of the Board visited sites in Singapore and the UK, where they engaged with Shell employees.

For further information on stakeholder engagement, see "Workforce engagement" on pages 157-158.

The Shell People Survey is one of the key tools we use to measure employee engagement, motivation, affiliation and commitment to Shell. It provides insights into employees' views and has had a consistently high response rate of above 80% since 2016. In 2022, the survey attained its highest ever response rate of 87% (up 3.4 percentage points from 2021). We believe that increased employee engagement can result in better business performance and safety. The Shell People Survey 2022 showed a positive, upward trajectory across all Shell businesses and functions. The average employee engagement score rose three points to 78 from the 2021 level and returned to the level seen in 2019 and 2020, our highest engagement score in the last 10 years, reflecting the resilience of our people during a time of change. Across Shell, employees also have access to senior leaders, local employee forums and employee resource groups. The Shell Global Helpline is available for employees to raise concerns or dilemmas, anonymously if they wish.

Employee well-being

Shell believes people perform at their best when they feel cared for. We operate in locations with different local regulations and we seek to comply with all applicable local laws and regulations, including on working hours. Across Shell operations, we aim to eliminate discrimination in employment, forced labour, and child labour. We also respect the right to collective bargaining and freedom of association.

We take pride in fostering an environment that provides employees with the flexibility and support to focus on their mental, social, physical, and financial well-being. Shell has implemented initiatives and programmes to raise awareness of well-being at work, such as our Be Well, Care for Self, and I'm Not OK campaigns. We aim to develop individual and team skills, mindsets, and behaviours to create a safe working environment, to nurture a culture of care, and to continuously improve the support Shell offers employees.

Flexible work

Shell's offices remain essential to business performance. Through them we seek to build a sense of community, foster affiliation, and collaboration, and create a place where employees feel welcomed and valued. Shell wants individuals and teams to perform at their best and key to this is to enable people to balance their work and personal lives. Following the pandemic, Shell launched its Future of Work guide to give employees and teams advice and greater choice in determining how, when and where they work to better meet business and their own needs.

Powering lives continued

We provide our people with what they need to work in our offices and other locations, with flexibility based on their reasonable business and personal needs. We also seek to provide what they need if they are working remotely. In 2022, we continued our home-working ergonomics programme, providing funding for proper office equipment for home use by existing employees and new joiners. We also provided tips on setting up and maintaining good ergonomics, working with others virtually and maintaining productivity. In 2022, more people chose to make use of Shell's flexible working options.

Mental well-being

At Shell we strive to reduce the stigma related to mental ill health through open conversations, planned campaigns at country and global level, communications from senior leaders, engagement with elected employee representatives, and our experience-sharing portal for employees. In 2022, we developed and piloted our Global Mental Health Strategy and Programme designed to build a culture that promotes good mental health and protects against mental ill-health. The programme includes timely access to quality mental health support through Shell's Employee Assistance Programme, which is available in most locations, and delivers professional counselling services. It also offers resources to help reduce the risk of stress and burnout.

Financial well-being

In 2022, Shell published its Fair Pay Principle, which provides transparency internally and externally on the criteria Shell uses to pay employees fairly and competitively. The Fair Pay Principle includes our pay adjustment approach, assurance processes for paying a living wage and how we seek to mitigate bias in pay-related decisions. The cost-of-living crisis in 2022 has caused concerns for many people and during the year we have sought to help our employees navigate these challenging times. One of the ways in which we have done this is by sharing pay-related information more frequently in a bid to remove as much uncertainty as possible.

Diversity, equity and inclusion

Our Powering Lives ambition is to become one of the world's most diverse and inclusive organisations, a place where everyone – including employees, customers, partners and suppliers – feels valued, respected and has a strong sense of belonging. This ambition underpins our strategy and we believe it is the right thing to aspire to, making us a stronger organisation. We have set goals for diversity, equity and inclusion (DE&I), and our CEO and Executive Committee are accountable for our progress. In 2022, we launched new external DE&I content on shell.com/DEI which includes data and proof points to show our progress against our DE&I ambitions.

Living by our values

Our core values of honesty, integrity and respect for people underpin our DE&I approach. The Shell General Business Principles, Code of Conduct and Ethics and Compliance Manual help everyone at Shell act in line with our values.

All Shell employees and contractors with access to our HR systems are required to complete two mandatory training courses on DE&I, Conscious Inclusion and Respect in the Workplace, which reinforce expected behaviours for a respectful, inclusive workplace and Shell's stance against discrimination and harassment, including bullying and sexual harassment.

Our inclusion strategy is about everyone. In 2022, our Shell People Survey showed a result of 82 points out of 100 for all questions relating to DE&I (up two points from 2021).

We also started rolling out voluntary self-identification for employees in our HR system. Employees now have the option to voluntarily declare their gender, sexual orientation, race and ethnicity, and disability, where relevant and legal. This data can enable us to better track and improve our progress.

We are focusing on removing barriers and taking targeted action to create equity of opportunity in four strategic priority areas: gender; race and ethnicity; lesbian, gay, bisexual and transgender (LGBT+); and enablement and disabilities inclusion. These focus areas are sponsored by various members of the Executive Committee.

Gender

We strive for gender equality across Shell and we have signed the World Economic Forum declaration on closing the gender gap in the oil and gas sector. We have also endorsed the Catalyst CEO Champions for Change initiative, where more than 70 chief executives seek to accelerate the advancement of women, especially those from ethnic minorities, into senior leadership and board positions.

As at December 31, 2022, 55% of the members of Shell plc's Board were women up from 50% in 2021, with one woman also being the Deputy Chair and Senior Independent Director. This exceeds the FTSE Women Leaders Review target of 40% women on boards by 2025 and is on track with our own ambition. Representation of women on the Executive Committee was 22% at the end of 2022.

At the end of 2022, the representation of women within our Senior Executive [A] positions was 25% compared with 27% in 2021. Our ambition is to improve women's representation in this group every year to achieve gender equality.

[A] Senior Executives include the Executive Committee.

By 2025, we aim to have 35% representation of women in our Senior Leadership [A] and at least 40% representation by 2030. In 2022, 30.4% of Senior Leadership were women, up from 29.5% in 2021.

[A] Senior Leadership is a Shell measure based on compensation grade levels and is distinct from the term "senior manager" in the statutory disclosures in the table below.

Gender diversity data (at December 31, 2022)

Gender diversity data		Men		Women
Directors of the Company	5	45%	6	55%
Senior managers [A]	827	68%	381	32%
Employees (thousand)	62	67%	31	33%

[A] Senior manager is defined in section 414C(9) of the Companies Act 2006 and, accordingly, the number disclosed comprises the Executive Committee members who were not Directors of the Company, and other directors of Shell subsidiaries.

In 2022 the proportion of women amongst experienced hires was 40%, compared with 44% in 2021. Our graduate hires number has consistently been 48% or 49% women, against our 50% ambition since 2019. In 2022, 49% of our graduate hires were women and 51% were men. Our overall representation of women in Shell was 33% at the end of 2022.

Powering lives continued

A crucial element of improving gender balance is addressing any gender pay gap and we are working on this. For example, in the UK, our 2022 average differences of pay of all men and women across all in-scope [A] Shell companies in the UK narrowed to 11.7% - 20.7%, compared with 7.3% - 21.8% in 2021. In parallel, the average differences of bonuses between men and women ranged from -0.2%-54.2% in 2022. In 2021, the top of this range was 54.9%. This gap exists for several reasons, including fewer women in senior leadership positions and fewer women in higher-paid specialist roles. More information about the UK gender pay gap at Shell can be found on our website.

[A] Shell companies in the UK with 250 or more employees in line with UK government requirements on gender pay gap reporting.

We also conduct an annual global gender pay equity review using a robust statistical approach. Countries in this review include Australia, France, the UK and South Africa. We take immediate action if required.

Race and ethnicity

We are working to address racial inequity and create an inclusive work environment where everyone feels valued. In 2020, we created the Shell Global Council for Race supported by a 20-member Employee Advisory Board composed of members from a diverse mix of racial and ethnic backgrounds. The Council, which is sponsored by the CEO, aims to advance diversity in our workforce so that it better reflects communities where we work and from which we draw talent, and focuses on the USA, the UK and the Netherlands.

At December 31, 2022, Shell had one director from an minority ethnic group on its Board of Directors. At the time of publication of this report, Shell plc's Board had three members from a minority ethnic background, which exceeds the UK's Parker Review recommendation of at least one. In addition, one of our Executive Committee members identifies as being from a minority ethnic group.

In the USA:

- In 2022, 13.7% of our US employees were Asian, 8.7% Black or African American, 11.9% Hispanic Latino, 63.5% White and 2.2% from other racial and ethnic groups, as reported to the US Department of Labor.

In the UK:

- In 2022, 14.5% of our UK employees identified as Asian, 3.7% Black, 2.4% Mixed, 76.5% White and 3.0% from other ethnic minority background.
  [A] As ethnicity declaration is voluntary, our ethnicity declaration rate is not 100% and all calculations are based on a declaration rate of 82.7% in the UK. The 17.3% of our workforce who have not provided data or have chosen not to declare their ethnicity were not included in our calculations.
- We have set a recruitment ambition to have 8% Black representation in our graduate and experienced hires by 2025, to increase representation in line with UK society through actions such as mentoring and outreach.
- Shell in the UK was one of the first FTSE 100 companies to voluntarily publish its ethnicity pay gap data in November 2020.

In the Netherlands, we continued to implement our first Ethnic Inclusion plan. We launched voluntary self-identification for race and ethnicity for employees in our HR system in 2022.

In addition, Shell is working with key suppliers to ensure they understand Shell's DE&I ambitions and expectations. For more information on our progress in the UK, the USA, and the Netherlands, see our website shell.com/DEI.

LGBT+

We are working to advance lesbian, gay, bisexual and transgender plus (LGBT+) inclusion within Shell and the communities where we work. We promote equal opportunity and aim to create an environment where people feel included, regardless of sexual orientation or gender identity. Our approach reinforces respect for people and provides psychological safety for our LGBT+ employees. Most of our work around LGBT+ inclusion happens at a country level in line with local policies, laws and regulations.

In 2022, we published our Global LGBT+ Inclusion Guidelines, which are based on best practice and are designed to help country teams develop their own plans.

We benchmark ourselves externally. In 2022, we were recognised as well advanced in our LGBT+ Workplace inclusion journey in the Workplace Pride Global 2022 Benchmark. We also received a 100% score from the Human Rights Campaign Foundation's Corporate Equality 2022 Index and have earned this 100/100 award every year since 2016.

Shell's LGBT+ forum has 15 chapters globally, with the most recent employee resource groups established in Singapore and Spain.

Disability inclusion and enABLEment

We aim to create an inclusive, psychologically safe and accessible environment where people with disabilities can excel. We provide support and make adjustments for people with disabilities during the recruitment process and throughout their careers with Shell. This includes equal access to valuable educational resources, training programmes, and emphasis on personal and professional development.

Our Global enABLEment Coalition, made up of leaders from our Employee Resource Groups, allies and key teams, helps to shape and drive the enABLEment strategy across Shell. The Coalition provides expertise and advice to Shell leaders, our businesses and our employee resource groups for accessibility, disability inclusion and enABLEment.

In 2022, we rolled out our Global enABLEment priorities which set out the actions we intend to deliver in countries around the world to support Disability Inclusion and enABLEment. We now have 15 enABLE employee resource groups around the world.

Our workplace accessibility (WPA) service covers 81 locations around the world to ensure that all employees have access to reasonable workplace adjustments so that they can work effectively. The team is supported by functions such as Shell Health, Human Resources, Real Estate and IT. During the pandemic we combined our home-working ergonomics programme with WPA to help all employees to continue to work from home. In collaboration with Purple Space, a professional development hub for disability network leaders, we piloted a personal development course for our employees with disabilities based in the UK. We also launched a LinkedIn learning path called "Spotlight – Disability Inclusion: A Guide for Line Managers".

We are part of the Valuable500, which connects 500 of the world's most influential global businesses to create a tipping point for large-scale disability inclusion. We are also active members of the Business Disability Forum.

Powering lives continued

Code of conduct

Shell is committed to prohibiting bribery, money laundering and tax evasion, and to conducting business in line with our Shell General Business Principles and Code of Conduct. We maintain a global anti-bribery and corruption (ABC) and anti-money laundering (AML) programme designed to prevent, detect, remediate, and learn from potential violations. This is in line with the UN Global Compact Principle 10 which states that businesses should work against corruption in all its forms, including extortion and bribery.

We do not tolerate the direct or indirect offer, payment, solicitation or acceptance of bribes in any form, nor the facilitation of tax evasion. Facilitation payments are also prohibited. The Shell Code of Conduct includes specific guidance for Shell employees and contractors on requirements to avoid or declare actual, potential or perceived conflicts of interest, and on offering or accepting gifts and hospitality.

To support the Code of Conduct, we have mandatory risk-based procedures and controls that address a range of compliance risks and ensure that we focus resources, reporting and attention appropriately. By making a commitment to our core values of honesty, integrity and respect for people, and by following the Code of Conduct, employees and contractors help protect Shell's reputation.

The pandemic led to an increase in hybrid working and this has required Shell to focus even more on conduct risk. Managerial duties have increased to maintain oversight of employees more frequently working from locations outside of an office and where information must continue to be safeguarded. All employees and contractors are required to undertake mandatory training courses in the Code of Conduct and Safeguarding Information every four and two years respectively. We continue to reiterate and emphasise that adherence to Shell's compliance requirements is essential to protecting our business.

Our ethics and compliance requirements are articulated through our policies, standards and procedures and supported by the Ethical Decision-Making Framework, a tool to help employees think through and discuss, in a structured way, the potential legal, ethical and external consequences of decisions. They are communicated to Shell employees and contractors and, where necessary and appropriate, to agents and business partners. We monitor and report internally on adherence to select ethics and compliance requirements, such as mandatory training completion and due diligence screening. We pay particular attention to our due diligence procedures when dealing with third parties. We also make our requirements clear to third parties through a variety of measures, such as standard contract clauses. We offer a good practice anti-bribery and corruption e-learning course to third parties that may not have a training programme in place. We have published our Ethics and Compliance Manual on shell.com.

The Shell Ethics and Compliance Office, with assistance from Legal, helps the businesses and functions to implement the ABC/AML and other programmes, assess risks, and monitors and reports on progress. In 2022, lawyers and compliance professionals supported Shell businesses and functions in addressing the implications of the war in Ukraine. They provided legal, and ethics and compliance support, including in relation to Shell's intention to withdraw from Russian hydrocarbons. The Shell Ethics and Compliance Office regularly reviews and revises all ethics and compliance programmes to ensure they remain up to date with applicable laws, regulations and best practices. This includes incorporating results from relevant internal audits, assurance reviews and investigations, and periodically commissioning external reviews and benchmarking.

We investigate all good-faith allegations of breaches of the Code of Conduct, however they are raised. We are committed to ensuring all such incidents are investigated by specialists in accordance with our Investigation Principles. Allegations may be raised confidentially and anonymously through several channels, including a Shell Global Helpline operated by an independent provider. We align with local reporting and investigation channels where required by law.

In 2022, there were 1,790 entries to the Shell Global Helpline: 1,381 allegations and 409 enquiries. The Business Integrity Department is a specialist investigative unit within Shell Internal Audit that is responsible for managing the Shell Global Helpline and the Group level incident management procedures. The Board has delegated the oversight of the functioning of the Shell Global Helpline to the Audit Committee. The Audit Committee is authorised to establish and monitor the implementation of procedures for the receipt, retention, proportionate and independent investigation and follow-up action of reported matters.

Violation of the Code of Conduct or its policies can result in disciplinary action, up to and including contract termination or dismissal. In some cases, we may report a violation to the relevant authorities, which could lead to legal action, fines or imprisonment.

Internal investigations confirmed 183 substantiated breaches of the Code of Conduct in 2022. Disciplinary action was taken against 216 group employees and contractors, including 53 contract terminations. In 2022, most violations of our Code concerned the categories of Harassment, Conflict of Interest and Protection of Assets.

Employee share plans

We have a number of share plans designed to align employees' interests with our performance through share ownership.

For information on the share-based compensation plans for Executive Directors, see the "Directors' Remuneration Report" on pages 178-182.

Performance Share Plan, Long-term Incentive Plan and exchanged awards under the BG Long-term Incentive Plan

Under the Performance Share Plan (PSP), 50% of the award is linked to certain indicators described in "Performance indicators" on pages 27-28, averaged over the performance period. For 2019, 12.5% of the award was linked to free cash flow (FCF) and the remaining 37.5% was linked to a comparative performance condition which involves a comparison with four of our main competitors over the performance period, based on three performance measures. For 2020, 11.25% of the award was linked to the FCF measure and 5% was linked to an energy transition measure. The remaining 33.75% was linked to the comparative performance condition. From 2021 and 2022, 10% of the award is linked to the FCF measure and 10% is linked to an energy transition measure. The remaining 30% is linked to the comparative performance condition. From 2023, 12.5% of the award is linked to an organic FCF measure and 12.5% is linked to an energy transition measure. The remaining 25% is linked to the comparative performance condition, which is based on two performance measures.

Under the Long-term Incentive Plan (LTIP) awards made in 2019 and 2020, 22.5% of the award is linked to the FCF measure and 10% is linked to an energy transition measure. The remaining 67.5% is linked to the comparative performance condition mentioned above. From 2021 and 2022, 20% of the award is linked to the FCF measure and 20% is linked to an energy transition measure. The remaining 60% is linked to the comparative performance condition. From 2023, 25% of the award is linked to an organic FCF measure and 25% is linked to an energy transition measure. The remaining 50% is linked to the comparative performance condition, that is based on two performance measures.

Powering lives continued

Separately, following the BG acquisition, certain employee share awards made in 2015 under BG's Long-term Incentive Plan were automatically exchanged for equivalent awards over shares in the Company. The outstanding awards take the form of nil-cost options.

Under all plans, all shares that vest are increased by an amount equal to the notional dividends accrued on those shares during the period from the award date to the vesting date. In certain circumstances, awards may be adjusted before delivery or subject to clawback after delivery. None of the awards result in beneficial ownership until the shares vest.

See Note 27 to the "Consolidated Financial Statements" on page 300.

Restricted share plan

Under the Restricted Share Plan (and the Free Share Schedule to the Shell Share Plan 2014), free share awards are made on a highly selective basis to senior staff. Shares are awarded subject to a two- or three-year retention period. All shares that vest are increased by an amount equal to the notional dividends accrued on those shares during the period from the award date to the vesting date. In certain circumstances, awards may be adjusted before delivery or subject to clawback after delivery.

Global Employee Share Purchase Plan

Eligible employees in participating countries may participate in the Global Employee Share Purchase Plan. This plan enables them to make contributions from net pay towards the purchase of the Company's shares at a 15% discount to the market price, either at the start or at the end of an annual cycle, whichever date offers the lower market price.

UK Shell All Employee Share Ownership Plan

Eligible employees of participating Shell companies in the UK may participate in the Shell All Employee Share Ownership Plan, under which monthly contributions from gross pay are made towards the purchase of the Company's shares. For every six shares purchased by the employee, one matching share is provided at no cost to the employee.

Powering Progress Share Award

This was a one-off share award granted to all eligible employees of Shell on June 18, 2021. This award supports employee engagement in the Powering Progress strategy. These awards vested on June 20, 2022.

Safety

Our approach to safety

Shell's Powering Progress strategy is underpinned by our focus on safety. We aim to do no harm to people and to have no leaks across our operations. We call this our Goal Zero ambition.

We seek to improve safety by focusing on the three areas where the safety risks associated with our activities are highest: personal, process and transport. We strive to reduce risks and to minimise the potential impact of any incident, with a particular emphasis on the risks with the most serious consequences if something goes wrong.

In 2020, we started a multi-year process of refreshing our approach to safety for all employees and contractors. Our updated approach is rooted in a consistent focus on human performance. We aim to better understand the gap between how we anticipate work will be done safely and how the work is actually carried out. We work to prevent incidents by maintaining safety barriers and providing training. We acknowledge that people make mistakes and not all incidents may be preventable. We continue to focus more on installing adequate controls to create capacity to fail safely. With that, we believe that we will enhance our safeguards and reduce the likelihood of serious injuries.

People are key to executing complex tasks and to finding solutions to problems. We aim to apply a learner mindset, by which we mean the belief that we can always improve, enhance individual capabilities, learn from mistakes and successes, and speak up without being punished. We seek to create conditions that encourage employees and contractors to share ideas and concerns without fear of rejection or punishment.

In 2022, as part of our new approach to our safety programme, we focused on conducting detailed change impact assessments across the Group to assess the extent to which our new safety principles are being integrated. These assessments covered all change areas, including mindset and behaviours, pre-work processes, and relationships with third-party contractors. We completed 49 of 52 assessments of assets, projects, functions and businesses within Shell (the remaining assessment to be completed in 2023). In addition, seven non-operated joint ventures (NOVs) elected to embed elements of our approach to safety in their improvement plans.

We work with a large number of our contractors and suppliers so they understand our safety requirements. We strive to help improve safety throughout the energy industry by sharing our safety standards and experience with other operators, contractors and professional organisations. This helps lead to the standardisation of safety practices within the industry, such as the IOGP Life-Saving Rules, Helicopter Recommended Practices, Site Construction Safety, and programmes from the Energy Institute, e.g. Hearts and Minds for fair event handling.

On November 1, 2022, we welcomed safety leaders from BP, Chevron, ExxonMobil, IOGP, TotalEnergies and many others active in the field of capital projects and wells to participate in the first industry Safety Collaboration Forum (SCF) in Houston. Delegates declared their intent to continue to play an active role in making the industry safer and more efficient.

Personal safety

We continue to strengthen the safety culture and leadership among our employees and contractor staff. This aligns with our focus on caring for people. The set of nine industry Life-Saving Rules came into effect at Shell on January 1, 2022. By the end of 2022, around 126,000 staff and contractors had completed our mandatory e-learning on the new rules.

We expect everyone to consider two aspects when performing their tasks: the hazards that could potentially cause serious harm, and the effectiveness of the barriers in place to avoid serious harm if something goes wrong. We have ongoing safety awareness programmes, and hold an annual global Safety Day to give employees and contractors time to reflect on how to prevent incidents and how to work together to improve performance.

In 2022, our annual Safety Day explored how we are all connected to the work that we do, and how our actions can create a chain of events that can influence the decisions and actions of others, including at the frontline.

We continue to learn from safety incidents. For example, in 2021, six contractor personnel and one government security agent lost their lives after their convoy came under attack on the way to the Assa North Project site in Nigeria. After the investigation into the incident, we shared information materials across Shell to raise awareness and encourage reflection and learning.

In 2022, we completed the construction of the Pennsylvania Petrochemicals Complex in the USA with more than 67 million work hours without fatality. During the building of a floating production storage and offloading vessel for the Shell-operated Penguins field (Shell interest 50%) in the UK North Sea, the China Offshore Oil Engineering Company (COOEC) achieved 16 million hours without fatality or serious injury.

Process safety

Process safety management is about keeping hazardous substances inside pipes, tanks and vessels, and ensuring that well fluids are contained during well construction and well intervention so that they do not harm people or the environment. It starts at the design and construction stage of projects and continues throughout the life cycle of facilities to ensure they are safely operated, well maintained and regularly inspected.

Our global standards and operating procedures define our expectations for the controls and physical barriers required to reduce the risks of incidents. For example, offshore wells must be designed with at least two independent barriers in the direction of flow, in order to reduce the risk of an uncontrolled release of hydrocarbons. For the event of a loss of containment such as a spill or a leak, our standards require the use of independent recovery measures to stop the release from becoming catastrophic. We regularly inspect, test and maintain these barriers to ensure they meet our standards.

Working with industry stakeholders, customers and suppliers is critically important to achieve our process safety ambitions.

We strive to learn not only from leaks that have happened, but also from potential events that were prevented by our barriers, such as avoided leaks which might have caused significant harm to assets and people.

In 2022, there were no Level 1, or Level 2, well control incidents in Shell-operated ventures.

Emergency response

We routinely prepare and practise our emergency response to potential incidents, such as a spill or a fire. This involves working closely with local emergency services and regulatory agencies to jointly test our plans and procedures. Shell requires key operating assets to test their emergency response preparedness every three years. In 2022, we held four large-scale emergency response exercises to ensure we have the required preparedness at assets we operate in Brazil, Nigeria, the Philippines and the US Gulf of Mexico.

Safety continued

Transport safety

Transporting large numbers of people, products and equipment by road, rail, sea and air poses safety risks. We seek to reduce these risks by developing best-practice standards within Shell. We also work with specialist contractors, industry bodies, non-governmental organisations and governments to find ways of reducing transport safety risks.

Road safety

In 2022, Shell employees and contractors drove around 456 million kilometres on business in more than 50 countries, a decrease of around 3% compared with 2021.

In Pakistan, a contractor colleague died during road transport activities under operational control of Shell. The number of severe motor vehicle incidents increased from nine in 2021 to 14 in 2022.

In 2022, around 40,000 Shell employees and contractors completed some form of in-vehicle or virtual defensive driving training.

In 2022, we installed active fatigue and distraction detection (AFDD) devices in around 2,400 vehicles operated by Shell or our contractors in countries where road transport risks are highest. By end of 2024, we aim to complete the installation of AFDD devices in vehicles operated by Shell, including both contractor and Shell-owned vehicles.

People are key to executing complex tasks and to finding solutions to problems.

Safety at sea

At the end of 2022, we managed and operated a global fleet of 25 tankers, liquefied natural gas carriers, and the world's first liquefied hydrogen carrier, the Suiso Frontier.

Air safety

In 2022, for Shell-operated ventures, our owned and contracted aircraft flew more than 35,000 hours and safely carried more than 266,000 Shell employees and contractors to destinations all over the world. In addition, remotely piloted aircraft safely completed close to 1,000 hours of survey and inspection flights.

See our website shell.com for more information on transport safety.

Safety and technology

Shell has been a pioneer in the development and deployment of digital technologies for decades, including those that help keep people and our operations safe. For example, we use smart sensors, which can be fixed, robot-mounted or carried by personnel, and are inter-connected so that they can gather and share data. Sensors can scan large areas across an asset to help detect leaks. Data analytics can reveal trends, which enables real-time risk assessment and timely interventions. Data analytics can reveal trends, which enables real-time risk assessment and timely interventions.

Safety continued

Contractor safety

Executives from Shell and our major contractor companies have collaborated on Shell's contractor safety leadership (CSL) programme since 2014. The programme seeks to identify strategies and practical ways to improve a shared safety culture and achieve our Goal Zero ambition of no harm and no leaks.

Importance of contractor safety for Shell

We have worked with contractors on standardisation and simplification of safety procedures, and collaborated to develop a contractor safety leadership initiative called Declared Future. We believe these efforts have helped to align our organisations and improve frontline safety.

Our transition to the industry Life-Saving Rules also brings us closer to the standard shared by most of the main contractor companies in our contractor safety leadership programme which was something they had requested of us.

Safety continued

Safety performance

Regrettably, in 2022, two of our contractor colleagues in Shell-operated ventures lost their lives in the course of their work for Shell. One contractor colleague in Nigeria died from injuries sustained during a fire incident. In Pakistan, a contractor colleague died during road transport activities under operational control of Shell.

On March 3, 2023, in Nigeria at the site of an illegal connection used for crude theft a fire incident occurred on the Rumuekpe - Nkpoku trunk line which was not operational at the time. There are confirmed fatalities and investigations are ongoing.

The Shell organisation feels these losses deeply. We are determined to learn from these incidents and do everything possible to prevent anything similar from happening again. We continue to work closely with our contractors to help build a strong safety culture at the frontline.

Several industry safety leadership groups confirm that serious and high-potential incidents often have different root causes than most lower-consequence events. To improve insights from incident investigations and data analysis, we changed how we report incidents. Since 2021, we measure the number of serious injuries and fatalities per 100 million working hours, instead of the Total Recordable Case Frequency, which measured injuries per million working hours. The Serious Injury, Illness and Fatality Frequency (SIF-F) allows us to focus our investigations on the most serious incidents. The aim is to collect and analyse relevant, high-quality data that can help us improve our efforts to prevent serious injuries and fatalities.

In 2022, the SIF-F was 1.7 injuries and illnesses per 100 million working hours, compared with 6.9 in 2021.

The number of Tier 1 and 2 operational process safety events in 2022 decreased significantly compared with 2021. There were 66 incidents reported during the year compared with 103 in 2021.

For reporting on process safety, in this Report, we combine Tier 1 and 2 events. A Tier 1 process safety event is an unplanned or uncontrolled release of any material from a process, including non-toxic and non-flammable materials, with the greatest actual consequence resulting in harm to employees, contract staff or a neighbouring community, damage to equipment, or exceeding a defined threshold quantity. A Tier 2 process safety event is a release of lesser consequence.

As part of Shell's learner mindset approach, we investigate all serious incidents so we can understand the underlying causes, including technical, behavioural, organisational and human factors. We share what we learn widely, including with contractors. We implement mitigations at the site and in the country and business where the incident occurred. We seek to turn incident findings into improved standards or better ways of working that can be applied widely across similar facilities.

Additional information on our 2022 safety performance is expected to be published in the Shell Sustainability Report in March 2023.

Security

Our operations expose us to criminality, civil unrest, activism, terrorism, cyber-disruption and acts of war that could have a material adverse effect on our business (see "Risk factors" on page 21). We seek to obtain the best possible information to enable us to assess threats and risks. To help us understand the threats, we build strong and open relationships with government, law enforcement, armed forces, industry peers and specialist security information providers. On the basis of these threat assessments, we identify security risks to staff, assets including information technology equipment, and operations. We then seek to manage the risks so they are as low as reasonably practicable. Risk mitigation includes strengthening the security of sites, reducing our exposure to threats as appropriate, journey management, information risk management and cyber-defence operations, crisis management and business continuity measures. We conduct training and awareness campaigns for staff, and provide them with travel advice and access to 24/7 assistance while travelling. We consistently verify the identity of our employees and contract staff, we control physical access to our sites and activities, and we document access with digital tools.

We take steps to have clear and planned responses to security incidents, so that we are able to react quickly and effectively if they occur.

Shell is a member of the Voluntary Principles on Security and Human Rights initiative. This is a multi-stakeholder initiative of governments, extractive sector industries and NGOs that gives guidance on how to respect human rights while providing security for business operations. Shell implements this guidance across its companies, concentrating on countries where the risks of working with state and private security forces are greatest.

The Board's Safety, Environment and Sustainability Committee (SESCo) has oversight of Shell's security risk management activities. In the Executive Committee, accountability for security matters sits with the Chief Human Resources and Corporate Officer.

Principal decisions and stakeholders

Section 172(1) statement

The Companies (Miscellaneous Reporting) Regulations 2018 (2018 MRR) require Directors to **explain** how they considered the interests of key stakeholders and the broader matters set out in Section 172(1) (a) to (f) of the Companies Act 2006 (S172) when performing their duty to promote the success of the Company under S172.

This includes considering the interests of other stakeholders which may affect the long-term success of the company. This S172 statement explains how Shell's Directors:

- have engaged with employees, suppliers, customers and others; and
- have considered employee interests, the need to foster business relationships with suppliers, customers and others, and the effects of those considerations, including on the principal decisions taken during the financial year.

The S172 statement focuses on matters of strategic importance to Shell, and the level of information disclosed is consistent with the size and the complexity of Shell's businesses.

S172 Statement by Shell's Directors

After due and careful consideration of the requirements set out in S172, and having regard to long-term consequences and the interests of stakeholders in relation to Board decision-making, the Directors, during the financial year ending December 31, 2022, have acted in a way that they consider, in good faith, would be most likely to promote the success of the Company for the benefit of its members as a whole.

General confirmation of directors' duties

Shell's Board has a clear framework for determining the matters within its remit and has approved Terms of Reference for the matters delegated to its Committees. Certain financial and strategic thresholds have been set, in order to identify matters requiring Board consideration and approval. The Manual of Authority sets out the delegation and approval process across the broader business.

More information on Shell's controls and procedures can be found in "Other regulatory and statutory information" from pages 211-219.

All Directors upon joining Shell have participated in induction training and are provided with ongoing guidance covering regulatory requirements of their role, including, but not limited to, S172.

More information on Directors' induction and training can be found from page 152.

Board decision-making is predicated on the appropriateness of information provided to Directors which is subject to review as part of the wider board evaluation process. The most recent board effectiveness review is detailed on page 153. In particular, board materials are assessed as to their suitability in relation to assisting and facilitating Directors' decision-making in accordance with S172.

When making decisions, each Director ensures that (s)he acts in the way he or she considers, in good faith, would most likely promote Shell's success for the benefit of its members as a whole, and in doing so has regard (among other matters) to the issues set out below.

S172(1) (a) "The likely consequences of any decision in the long term"

The Directors understand the business and both the evolving and challenging environment in which we operate, including the challenges of continuing to navigate through the energy transition and also the geopolitical tensions associated with Russia, which have, amongst other things, resulted in Shell's withdrawal from Russian oil and gas activities (see Note 6 to the Consolidated Financial Statements on pages 262-264). Based on Shell's established purpose to power progress together by providing more and cleaner energy solutions, the ongoing strategy set by the Board is intended to accelerate the transition of our business to net-zero emissions, purposefully and profitably. We continue to have a strong, resilient business including focus on energy security, by putting customers at the centre of our strategy, innovating the products and solutions customers need on our journey to net zero by 2050.

In 2022, the Board continued with its oversight of Shell's Powering Progress strategy, which combined our ambitions under four goals: generating shareholder value, achieving net-zero emissions, powering lives and respecting nature. The Board focused on financial strength and discipline with a dynamic approach to our portfolio of assets and products. Our new CEO has confirmed his support for Shell's strategy set out in the 2021 Annual Report with further strategy updates expected to be provided at the next scheduled Capital Markets Day in June 2023. See pages 6-14 for more on our Powering Progress strategy.

The Directors recognise there are significant complexities in relation to Board decision-making, given differing societal and stakeholder views about our operations and the intricacies associated with the evolving energy transition. Accordingly, the Directors have considered S172 and made their decisions in good faith relating to Shell's strategy having regard to the long-term sustainable success of the Company.

S172(1) (b) "The interests of the Company's employees"

The Directors recognise that Shell employees are fundamental and core to our business model and the safe delivery of our strategic ambitions. The success of our business depends on attracting, retaining, developing and motivating talented employees. The Directors consider and assess the implications of relevant decisions on employees and the wider workforce. The Directors seek to ensure that Shell remains a responsible employer, including with respect to pay and benefits, fairness (including gender pay gap reporting, see page 118), diversity (information on Shell's Diversity, Equity and Inclusion is detailed on page 117), health and safety issues, and the workplace environment. The Directors regularly engage with employees and the wider workforce (a summary of engagements is provided on pages 157-158) as well as consider annual employee surveys (the most recent is detailed on page 116).

The Directors recognise that our pensioners also remain important stakeholders.

More information on this can be found in "Workforce engagement" on pages 157-158.

S172(1) (c) "The need to foster the Company's business relationships with suppliers, customers and others"

Delivering our strategy requires strong mutually beneficial relationships with suppliers, customers, governments, national oil companies and joint-venture partners. Shell seeks to promote and apply certain general principles in such relationships. The Board continues to review Shell's approach to suppliers, which is set out in the Shell Supplier Principles. In 2022, the Board reviewed steps taken with suppliers and supply chains to combat modern slavery and human trafficking. More detail on Shell's Modern Slavery Act statement is set out on page 212. The

Section 172(1) statement continued

businesses continually assess the priorities related to customers and those with whom we do business, with the Board engaging with the businesses on these topics, for example, within the context of business strategy updates and investment proposals.

The Directors also receive updates on a variety of topics that indicate how these stakeholders have been engaged. These updates include information provided by the Projects & Technology function on suppliers and joint-venture partners, with respect to items such as project updates and supplier contract management. Businesses also provide information, as relevant, on customers and joint-venture partners in relation to business strategies, projects, and investment or divestment proposals.

The CEO provides a comprehensive update to the Board on material business and external developments at each main Board meeting. These include: i) a report on safety performance; ii) significant operational updates relating to each of the business segments, e.g. partnerships, investments, divestments, flagship projects, commercial highlights and achievements; iii) the development of new technologies and innovation via collaborations with partners, suppliers and others; and iv) political or regulatory developments. The CEO also summarises his own external engagements and any changes of senior executive staff.

S172(1) (d) "The impact of the Company's operations on the community and the environment"

This aspect continues to be integral to our strategic ambitions. The Board receives information on various topics to help it make decisions. The topics can include, for example, the Net Carbon Footprint target, proposals to invest or divest, and business strategy reviews. The information also goes into Group-level overviews, such as updates on safety and environment performance, reports from the Chief Ethics and Compliance Officer, and reports from the Chief Internal Auditor. In 2022, certain Board committees and Non-executive Directors conducted site visits of various Shell operations and overseas offices and held external stakeholder engagements. In contrast to 2021, visits were made in person with restrictions relating to the COVID-19 pandemic being largely removed in most countries. This enabled the Board to maintain and strengthen the interface with businesses and staff, with virtual engagements additionally used when appropriate, making the best use of technology available.

More information can be found in "Understanding and engaging with our stakeholders" on pages 154-156, and in the reports of each Board committee.

S172(1) (e) "The desirability of the Company maintaining a reputation for high standards of business conduct"

Shell aims to meet the world's growing need for more and cleaner energy solutions in economically, environmentally, and socially responsible ways. The Board periodically reviews and approves clear frameworks, such as The Shell General Business Principles, Shell's Code of Conduct, specific Ethics and Compliance manuals, the Ethical Decision-Making Framework, and its Modern Slavery Statement, to ensure that high standards are maintained in Shell businesses and in Shell's business relationships. Complemented by the ways the Board is informed and monitors ethics and compliance with relevant governance standards, this helps to ensure that Board decisions and the actions of Shell companies both promote and maintain high standards of business conduct.

S172(1) (f) "The need to act fairly as between members of the Company"

After weighing up all relevant factors, the Directors consider which course of action best enables delivery of our strategy in the long-term interests of the Company, taking into consideration the effect on stakeholders. In doing so, our Directors act fairly as between the Company's members but are not required to balance the Company's interests with those of other stakeholders. This can sometimes mean that certain stakeholder interests may not be fully aligned.

Culture

The Board plays an important role in establishing, assessing and ongoing monitoring of our desired culture and how it is embedded in our values, attitudes and behaviours, including in our activities and stakeholder relationships. The Board has established honesty, integrity and respect for people as Shell's core values. The General Business Principles and Code of Conduct help everyone at Shell to act in line with these values and comply with relevant laws and regulations. The Shell Commitment and Policy on Health, Safety, Security, Environment & Social Performance applies across Shell and is designed to help protect people and the environment. Under the industry Life-Saving Rules, we have simplified and standardised our approach and adopted a broader risk scope that focuses on potential for harm to people, creating a greater sense of individual and team responsibility to avoid fatalities and life-changing injuries. The result is a strengthened foundation with an increased and deliberate focus on human performance, the way people work, culture, equipment, work systems and processes interact as a system. Our ambition remains unchanged: **achieve Goal Zero, no harm and no leaks across all our operations**.

To achieve our strategic goals, we need to adapt our mindset and behaviours as we navigate the increasing complexity in the world around us. At Shell we seek to have a culture that encourages the attitudes and behaviour that we believe will help us succeed. We seek to encourage:

- **Applying a learner mindset:** everyone has the ability to grow, learn from mistakes and successes, and speak up openly in a safe environment. We encourage curiosity, humility, openness, helping each other to make better decisions and create more value;
- **Maximising our performance:** we collaborate across boundaries and speak up when we see things that can be improved. We enable people to deliver, and we work in an integrated way with discipline, clear focus on priorities, and tangible outcomes in order to reach our full potential;
- **Increasing trust in Shell:** we aim to be a valued member of the communities in which we operate, and to make a positive contribution to society. We seek to listen carefully and with humility and we have a strong desire to understand, and, where possible, adapt to the changing needs and expectations of society, especially as they relate to the environment. We build strong and trusted relationships with customers and partners which are fundamental to our collective success;
- **Living by our values and Goal Zero:** we live by our values and do the right things with respect to ethics, safety, and the environment; and
- **Inspiring and engaging:** we aspire to a situation where everyone feels connected to what we stand for. We build trusting and effective teams where everyone feels ownership and has a voice in how work gets done. We strive to maintain a diverse and inclusive culture.

The Board considers the Shell People Survey to be an important tool for measuring employee engagement, motivation, affiliation, and commitment to Shell. With consistently high response rates, it provides valuable insights into employee views. It also helps the Board understand how the survey's outcomes are being used to strengthen Shell culture and values.

Section 172(1) statement continued

Stakeholder engagement (including employee engagement)

The Board recognises the important role Shell has in many societies and is deeply committed to public collaboration and stakeholder engagement. The Board strongly believes that Shell will only succeed by working together with customers, governments, business partners, investors, and other stakeholders.

Continuing to work together with stakeholders is critical, particularly at a time when we and society, including businesses, governments, and consumers, face issues as complex and challenging as climate change, energy security and affordability.

We continue to build on our long track record of working with others, such as investors, industry and trade groups, universities, governments, non-governmental organisations (NGOs) and, in some appropriate instances, our competitors through our joint-venture operations or industry bodies. We believe that working together and sharing knowledge and experience with others offers us greater insight into our business. We also appreciate our long-term relationships with our investors and acknowledge the positive impact of ongoing engagement and dialogue.

The guidance on preparing information, proposals or discussion items for the Board asks for these materials to include considerations of the views, interests, and concerns of stakeholders and how management addressed them. This helps to strengthen the Board's knowledge of how the broader business undertakes significant levels of stakeholder engagement. Board minutes have also reflected key points on stakeholder considerations, where appropriate. The Terms of Reference for our Safety, Environment and Sustainability Committee also include, within the Committee's remit, the review and consideration of external stakeholder perspectives and how major issues of public concern that could affect Shell's reputation and licence to operate were or are being addressed.

The Board also engaged with certain stakeholders directly, to understand their views. The Board draws upon Shell's substantial in-house expertise by periodically receiving input from economics and policy experts on key political and economic themes, with some updates being presented to the Board each quarter.

More on this engagement is provided in "Understanding and engaging with our stakeholders" on pages 154-156.

Information on how the Directors have engaged with employees can be found on pages 157-158 and in the "Powering lives" section on page 116. The tables below include examples of how Directors have considered the interests of Shell employees and the resulting outcomes.

Principal decisions

In the table below, we outline some of the principal decisions made by the Board over the year. We explain how the Directors have engaged with or in relation to key stakeholder groups and how stakeholder interests were considered in decision-making.

To remain concise, we have categorised our key stakeholders into seven groups. Where appropriate, each group is considered to include both current and potential stakeholders. The groups are:

- investor community;
- employees/workforce/pensioners;
- our customers;
- regulators/governments;
- NGOs/civil society stakeholders/academia/think-tanks;
- communities; and
- suppliers/strategic partners.

Board decisions

We define principal decisions taken by the Board as decisions taken in 2022 that are of a strategic nature and significant to any of our key stakeholder groups. As outlined in the UK Financial Reporting Council (FRC) Guidance on the Strategic Report, we include decisions related to capital allocation and dividend policy.

How were stakeholders considered

We describe how regard was given to the likely long-term consequences of the decision, including how stakeholders were considered during the decision-making process.

What was the outcome

We describe which accommodations or mitigations were made, if any, and how Directors have considered different interests, and what factors they took into account.

Strategic updates

Powering Progress strategy

Shell's Powering Progress strategy was launched in 2021, and is outlined within this Annual Report. As part of the Board's continuing oversight of strategy, the Directors receive and discuss regular strategy updates including feedback from stakeholder engagements by management, investors, the media, climate activists and internal staff.

How stakeholders were considered

Energy Transition Progress Report

In 2021, Shell produced a report (the Shell energy transition strategy (ETS)) with the aim of helping investors and society obtain a better understanding of how Shell is addressing the risks and opportunities of the energy transition. The ETS was put to shareholders for approval at the 2021 Annual General Meeting (AGM) for an advisory vote, and the Board committed to provide an advisory vote on the progress against this strategy in 2022 and 2023, with the ETS itself coming back to shareholders in 2024. The ETS is outlined within this report on pages 83-91, as is the progress against that strategy. During the year the Board have been provided with updates on Shell's energy transition commitments.

What was the outcome

Energy Transition Progress Report

There are differing societal views about Shell's energy transition ambitions, targets and strategy and the Board recognise that some decisions taken today may not align with all stakeholder interests. The Board continues to listen, learn and adapt as it frames delivery against its strategy on the long-term success of the Company.

Feedback from the stakeholder discussions is considered during the drafting and formal approval stages of the energy transition progress report. We strive to provide clear information on Shell's progress, along with the clarifications our stakeholders are seeking. The feedback received from when the ETS was first published, along with that from our progress reports will be later utilised as the business moves to focus on updating its ETS ahead of putting it to a shareholder vote in 2024.

More information on the results of the AGM vote is provided on pages 145 and 154.

Section 172(1) statement continued

Strategic updates

At the 2022 AGM, almost 80% of shareholders that voted supported our progress in this strategy, and shareholders will be asked again with the same resolution being put to the 2023 AGM.

Both before and after the 2022 AGM, the Chair, CEO and some members of the Executive Committee engaged with key stakeholders to understand their views and opinions on Shell's progress on its ETS. Differing views were shared by these groups and were later shared with the Board.

In 2024, our ETS will come back to shareholders for an advisory vote and we will be engaging on this strategy through the latter part of 2023.

Board Strategy Days
In June 2022, the Board held in-person strategy meetings over the course of three days in Singapore, providing for a number of engaging and interactive events with both internal and external stakeholders. A summary of the event is on page 150. The key areas of focus related to accelerating the energy transition.

Staff engagements
Virtual and in-person staff engagements were held with Directors which enabled them to speak directly with staff on themes including the benefits of working in Upstream. For further information on the engagement with our workforce see "Board activities" and "Workforce engagement" on pages 150-151 and pages 157-158.

Board Strategy Days
Through multiple engagements with stakeholders the Board:
- considered geopolitical contexts on accelerating the energy transition and engaged with Shell leaders from across the Asian region;
- considered feedback from a cross-section of Shell's staff on the energy transition;
- discussed core elements of the Powering Progress strategy with key customers, government officials, and other stakeholders in the region.

The stakeholder engagements were considered as part of driving Shell's energy transition in Asia, and framing discussions on both Shell's Operating Plan and Financial Framework.

Financial strength, cash allocation including shareholder distributions

The Board considered cash flow, the macro environment and business performance in 2022 compared with 2021. The Board also considered management's view of the outlook for the Group's performance, and reviewed the Financial Framework with specific focus on shareholder distributions. Directors approved several proposals with the aim of delivering value to shareholders and increasing shareholder distributions through a combination of progressive dividends and share buybacks.

How stakeholders were considered
A number of considerations underpinned each proposal, with proposals discussed and reviewed at certain points throughout the year. These considerations took account of the macro environment, robust business performance and outlook, the strength of the balance sheet, capital discipline, feedback from advisers and feedback from other stakeholders. The Financial Framework was reviewed as part of the Board's strategy event held in June 2022 in Singapore.

What was the outcome
In relation to the decisions to increase distributions to shareholders, the Board and management considered the views of stakeholders, the strength of the Company's balance sheet and the need to continue to invest for the future of energy. The form and timing for distributing funds to shareholders were announced throughout 2022.

Subject to Board approval, Shell aims to grow the dividend per share by around 4% every year, and Shell will target the distribution of a minimum of 20% and, subject to Board approval, and prevailing market conditions, potentially more than 30% of its cash flow from operations to shareholders.

Approval of Shell's detailed Operating Plan 2023-2025 (OP22)

The approval of OP22 followed an in-depth review by the Board of proposals on capital allocation, capital investment outlook, competitive outlook, operating expenses, return on average capital employed and shareholder distributions. This included reviews in numerous Board meetings leading up to the December 2022 Board meeting in which OP22 was approved.

How stakeholders were considered
OP22 discussions included a full review against Shell's Powering Progress strategy, the macroeconomic environment, and the financial strength of the organisation. The Directors and Executive Committee balanced the priorities in the financial framework including capital and operating expenditure commitments towards the energy transition alongside increased shareholder distributions, maintaining balance sheet strength, aspired credit ratings and greenhouse gas target tracking. The plan was discussed extensively and reviewed thoroughly. Responses from investors and discussions with equity and debt market analysts were also presented to the Board for consideration. The Board asked questions of management on the flexibility of OP22 to be as agile as feasible in the event of various energy transition scenarios.

What was the outcome
Following extensive review and discussion, the overall outcome of this decision was an Operating Plan that the Board believes is robust against various scenarios and features strong optionality if needed. In particular, the Board assured itself that, as decisions are taken by the Board over the Plan period, OP22 flexibly demonstrates pathways to enable delivery of Shell's absolute Greenhouse Gas (GHG) emissions and GHG intensity targets by 2030.

While stakeholder opinions differ on Shell's approach, OP22 is based on society's demand for products and services. OP22 also supports Shell in maintaining a reputation for high standards on business conduct and health, safety, security, and environment issues. It maintained the approach to employee remuneration and benefits to pensioners. OP22 also seeks to reward our investors with returns and maintain the long-term financial strength of the Company to invest in more and cleaner forms of energy and meet the current and future needs of society.

Section 172(1) statement continued

Investing in new business, acquisitions and divestments, and closures

Over the course of the year, the Board considered and approved new opportunities and projects and proposed divestments or closures. The Board also considered and approved Shell's exit from Russia, with more details in this section relating to particular divestments in Russia.

How stakeholders were considered

The Board considered the impact of decisions related to new business opportunities and divesting from existing opportunities in the context of sustainability, supply, regulations, and carbon intensity. Critically, the Board reviewed the various proposals' alignment with Shell's strategy. Particular focus was given to potential benefits of certain divestments, including their potential to: create returns for shareholders; further strengthen the balance sheet; de-risk future cash flow; and avoid significant additional capital investment. As part of the discussions, the Board considered the strategic drivers for the intended divestments, including the Scope 1 emissions of each asset, anticipated regulatory changes expected to lead to value erosion, and any value opportunities afforded by the macro environment.

As part of each proposal, the respective business unit will undertake effective due diligence on prospective purchasers from a financial, reputational as well as operating philosophy standpoint to ensure future obligations are met or suitable mitigating measures are in place to protect Shell and its people.

Within each divestment proposal, the Board considered if the Company was being a responsible seller of its assets and if the purchasers have the capability to manage our assets/people appropriately. Staff matters are explicitly considered during negotiations and the due diligence process for acquisitions and divestments. Comprehensive engagement plans are developed as appropriate in parallel to the negotiations.

As part of Shell's intercompany approval process, the following investments / divestments were discussed and supported by the Board.

Purchase of renewables platform in India
The acquisition of Sprng Energy group and the associated solar and wind assets triples Shell's present renewables capacity in operation and helps deliver on Shell's Powering Progress strategy.

Purchase of fuel and convenience retail sites in the USA
The Landmark group of companies.

Production-sharing contract in Brazil
This acquisition consisted of a 25% stake of the Atapu field, Brazil, facilitating the delivery of Shell's Powering Progress strategy.

Investment in Jackdaw gas field in the UK North Sea
The investment in Jackdaw gas field in the UK North Sea, following regulatory approval.

Investment in Rosmari-Marjoram fields in Malaysia
The development of the Rosmari-Marjoram gas project, together with PETRONAS Carigali Sdn Bhd (20%).

Sale of interest in Aera Energy in the USA
The divestment of Shell's interest in In Aera Energy LLC.

What was the outcome

Purchase of renewables platform in India
This acquisition was considered by the Board as an important part of Shell's Powering Progress strategy to develop an integrated power business, which will help Shell reach its target of becoming a profitable net-zero emissions energy business by 2050 to the benefit of all our key stakeholders.

Purchase of fuel and convenience retail sites in the USA
The Board considers that this acquisition advances Shell's Powering Progress strategy in three ways: by growing its retail footprint in a core market, by providing opportunities to offer customers expanded fuelling options (including electric vehicle charging, hydrogen, biofuels and lower-carbon premium fuels) and by allowing for the growth of non-fuel sales through an enhanced convenience offering.

Production-sharing contract in Brazil
The Board considers this acquisition supports our Powering Progress strategy to deliver the stable, secure energy resources the world needs today while investing in the energy of the future. Shell's Powering Progress strategy includes increasing investment in lower-carbon energy solutions, while continuing to pursue the most resilient, competitive, and highest-return Upstream investments to sustain material cash delivery into the 2030s, to support our dividend and fund Shell's transformation.

Investment in Jackdaw gas field in the UK North Sea
Jackdaw is part of Shell UK's broader intent to invest £20-£25 billion in the UK energy system in the next decade, subject to Board approval and stable fiscal policy, with the aim of investing 75% in the development of low- and zero-carbon products and services. Hundreds of millions of pounds are expected to be spent in the UK supply chain during Jackdaw's construction, which is a significant boost to companies, jobs and the prosperity of communities.

The Board considers that projects like Jackdaw will help ensure that the overall decline in UK North Sea production is gradual rather than too steep, matching a gradual drop in hydrocarbon demand as the energy transition takes place. Gas from the Jackdaw field will come ashore at St Fergus, where Shell is involved in the development of the Acorn Carbon Capture and Storage project, which could sequester carbon dioxide (CO_2) from industrial clusters in Scotland, the UK and northern Europe. The Acorn project could also reform natural gas into low-carbon hydrogen, by capturing and storing the CO_2.

Investment in Rosmari-Marjoram fields in Malaysia
The Board considers that this investment will help to deliver a secure and reliable supply of energy, responsibly and efficiently. This demonstrates our Powering Progress strategy - powering lives, generating value, and reducing emissions by using renewable energy to power Rosmari-Marjoram.

Sale of interest in Aera Energy in the USA
This Board considers that this divestment supports Shell's strategy to create a resilient and competitive Upstream portfolio by focusing on positions with high growth potential and a strong integrated value chain.

Section 172(1) statement continued

Investing in new business, acquisitions and divestments, and closures

Exiting equity partnerships held with Gazprom entities in Russia
In February 2022, the Board announced its intention to exit its joint ventures with Gazprom and related entities, including its 27.5% stake in the Sakhalin-II liquefied natural gas facility, its 50 percent stake in the Salym Petroleum Development; and also the Gydan Energy venture. In addition, the Board also announced its intention to end its involvement in the Nord Stream 2 pipeline project.

Sale of retail and lubricants business in Russia
On March 8, 2022, Shell announced its intent to withdraw from its involvement in all Russian hydrocarbons, including crude oil, petroleum products, gas and liquefied natural gas (LNG) in a phased manner. Following this announcement, the Board approved, as part of our internal approval process, the sale of Shell Neft LLC, Shell's retail stations and lubricants business in Russia, to PJSC LUKOIL. The sale included 411 retail stations, mainly located in the Central and Northwestern regions of Russia, and the Torzhok lubricants blending plant, around 200 kilometres north-west of Moscow.

In relation to Russian divestments, the Board received regular updates and engaged with both internal and external stakeholders throughout the year to ensure a controlled and measured exit from Russia.

Sale of interest in Shell Philippines Exploration B.V (SPEX) to Malampaya Energy XP Pte Ltd (MEXP)
Following consent from the joint venture partners and regulatory approval, Shell sold its 100% shareholding in Shell Philippines Exploration B.V.

What was the outcome

Exiting equity partnerships held with Gazprom entities in Russia
The divestments were considered by the Board with an immediate focus on the safety, security and well-being of Shell personnel. The Board considered discussions with governments around the world, working through the detailed business implications, including the importance of secure energy supplies to Europe and other markets, in compliance with relevant sanctions.

At the end of 2021, Shell had around $3 billion in non-current assets in these ventures in Russia. The Board expected that the decision to start the process of exiting joint ventures with Gazprom and related entities would impact the book value of Shell's Russia assets and lead to impairments. Subsequently, these impairments were reflected in the first quarter 2022 results statement.

Further to the divestments, Shell's Powering Progress strategy and financial framework remain unchanged, with the Board reiterating Shell's progressive dividend policy and intent to distribute 20-30% of CFFO to shareholders in the form of dividends and share buybacks while targeting a strong balance sheet with long-term AA credit metrics.

Sale of retail and lubricants business in Russia
The Board prioritised the well-being of Shell employees, with more than 350 people being transferred to the new owner of the business. The agreement with LUKOIL follows Shell's announcement in early March of its intention to withdraw from all Russian hydrocarbons in a phased manner, with all divestments being carried out in full compliance with applicable laws and regulations.

Sale of interest in Shell Philippines Exploration B.V. (SPEX) to Malampaya Energy XP Pte Ltd (MEXP)
The Board considers the Philippines as an important country for Shell after over a century of successful operations Shell will continue to pursue opportunities in the Philippines where it can leverage its global expertise in line with its Powering Progress strategy.

Section 172(1) statement continued

Investing in new business, acquisitions and divestments, and closures

Building Europe's largest renewable hydrogen plant in the Netherlands
Shareholder approval to build Holland Hydrogen I, which will be Europe's largest renewable hydrogen plant once operational from 2025.

Investment in Crux project in Western Australia
Shareholder approval for the development of the Crux natural gas field, off the coast of Western Australia. Crux will provide further supplies of natural gas to the existing Prelude floating liquefied natural gas (FLNG) facility.

Partnering in the North Field South LNG project in Qatar
Shareholder approval for participation in the next wave of Qatar's LNG expansions – the North Field South project (NFS). Shell obtains a 9.375% participating interest in the 16-Mtpa NFS project, out of a total 25% interest available for international partners.

Investment in offshore wind farm at Hollandse Kust (west) in the Netherlands
Shareholder approval to build and operate a joint-venture offshore wind farm with a capacity of 750 MW to be completed in 2026.

Shell acquired renewable natural gas producer Nature Energy
Shareholder approval for the acquisition of 100% shareholding of Nature Energy Biogas A/S (Nature Energy) with the acquisition completing in February 2023. The acquisition will be absorbed within Shell's current capital range, which remains unchanged.

What was the outcome

Europe's largest renewable hydrogen plant in the Netherlands
The Board considers that this investment demonstrates how new energy solutions can work together to meet society's need for cleaner energy. This investment additionally contributes to Shell's efforts and commitment to become a net-zero emissions business by 2050 with renewable hydrogen playing a pivotal role in the energy system of the future and this project being an important step in helping hydrogen fulfil that potential.

Investment in Crux project in Western Australia
This project is considered by the Board to be an important part of Shell's integrated gas portfolio. Natural gas from Crux will play a key role in helping Asian customers move from coal to gas as a cleaner-burning fuel. The project will help Shell to meet the increasing demand for liquefied natural gas (LNG) as the energy market transitions to a lower carbon future.

The project will also boost Shell's customers' security of supply, which is becoming a significant consideration for global consumers.

Developing the Crux project reinforces Shell's commitment to Australia, including boosting the regional economy, creating jobs and providing training opportunities.

Partnering in the North Field South LNG project
The Board considers that LNG has a key role in ensuring energy system reliability and this investment will support the energy transition and energy security.

Investment in offshore wind farm at Hollandse Kust (west) in the Netherlands
The Board considers that this investment will grow Shell's offshore wind portfolio while making a positive contribution to biodiversity. This project accelerates the large-scale wider roll-out of offshore wind and fits well with Shell's Powering Progress strategy to deliver more and cleaner energy to our customers, at home, on the road and at work.

Shell to acquire renewable natural gas producer Nature Energy
The Board considers that this acquisition fits with the Powering Progress strategy to accelerate its energy transition and supports Shell's ambition to profitably grow its low-carbon offerings to customers across multiple sectors.

Strategic Report signed on behalf of the Board

/s/ Caroline J. M. Omloo

Caroline J. M. Omloo
Company Secretary
March 8, 2023