



Sustainability Report

2018, Royal Dutch Shell plc

DELIVERING ENERGY
IN A RESPONSIBLE WAY

The word 'DELIVERING' is connected by a black curved line to a white line-art icon of a wind turbine. The word 'ENERGY' is connected by a black curved line to a white line-art icon of a truck. The word 'IN A' is connected by a black curved line to a white line-art icon of an airplane. The word 'RESPONSIBLE' is connected by a black curved line to a white line-art icon of a cargo ship. The word 'WAY' is connected by a black curved line to a white line-art icon of an oil rig and another to a white line-art icon of a person in a suit.



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Digital

The Sustainability Report is published in an online version at reports.shell.com. The online version includes additional information, such as an interactive GRI index to enhance usability for the reader. In the event of any discrepancy between the online and hardcopy versions, the information contained in the online report prevails. This hardcopy version is provided for the reader's convenience only.

Scenarios

This report contains data and analyses from Shell's new Sky Scenario. Unlike Shell's previously published Mountains and Oceans exploratory scenarios, the Sky Scenario is based on the assumption that society reaches the Paris Agreement's goal of holding the rise in global average temperatures this century to well below two degrees Celsius (2°C) above pre-industrial levels. Unlike Shell's Mountains and Oceans scenarios which unfolded in an open-ended way based upon plausible assumptions and quantifications, the Sky Scenario was specifically designed to reach the Paris Agreement's goal in a technically possible manner. These scenarios are a part of an ongoing process used in Shell for over 40 years to challenge executives' perspectives on the future business environment. They are designed to stretch management to consider even events that may only be remotely possible. Scenarios, therefore, are not intended to be predictions of likely future events or

outcomes and investors should not rely on them when making an investment decision with regard to Royal Dutch Shell plc securities.

Additionally, it is important to note that Shell's existing portfolio has been decades in development. While we believe our portfolio is resilient under a wide range of outlooks, including the IEA's 450 scenario (World Energy Outlook 2016), it includes assets across a spectrum of energy intensities including some with above-average intensity. While we seek to enhance our operations' average energy intensity through both the development of new projects and divestments, we have no immediate plans to move to a net-zero emissions portfolio over our investment horizon of 10-20 years. Although we have no immediate plans to move to a net-zero emissions portfolio, in November of 2017, we announced our ambition to reduce our Net Carbon Footprint in accordance with society's implementation of the Paris Agreement's goal of holding global average temperature to well below 2°C above pre-industrial levels. Accordingly, assuming society aligns itself with the Paris Agreement's goals, we aim to reduce our Net Carbon Footprint, which includes not only our direct and indirect carbon emissions, associated with producing the energy products which we sell, but also our customers' emissions from their use of the energy products that we sell, by around 20% in 2035 and by around 50% in 2050.

Letter from the CEO



Welcome to Shell's Sustainability Report for 2018.

In my five years in this role I have worked to drive change for Shell and the industry as a whole. Change that puts us in a strong position to help society meet increasing energy demand while providing products with a lower carbon footprint.

Yet one area remains consistently essential to the way Shell does business. That is sustainability. We continue to put three things at the heart of our approach.

First, we aim to run a safe, responsible and profitable business. That means getting the basics right. One basic is doing no harm. For our industry, that means operating safely without hurting people or the environment. However, in 2018, there were two fatalities at Shell locations – one person died at a refinery in Germany and another at an onshore well in the USA. Every life lost is unacceptable. We must all work safely. In Nigeria, for example, a country that presents complex operating challenges, Shell companies there have sometimes struggled. In Groningen, in the Netherlands, we continue to work with others, including the government, to help people affected by earthquakes linked to our gas production activities. When we do not live up to the standards society expects, we must learn and repair any related damage.

We have also reflected deeply on the terrible road tanker incident in Pakistan in 2017. The tragedy, which was outside the scope of Shell's operational control, underscored the need to consider how we can encourage effective health and safety standards in operations not under our control. Shell Pakistan Limited is currently contributing to long-term relief efforts for the families affected. Sadly, in October 2018 there was another roll-over incident in Pakistan involving a customer tanker, which resulted in the death of the relief driver and a spill. Events like these are a stark reminder that we must never forget the role that safety plays in our lives every day.

Second, to deliver energy products that people need and want – and do this responsibly to help shape a more sustainable energy future. People rely on the energy we produce to live their lives, in their homes and businesses, and for transport. We must be responsible stewards for these energy products. This means taking action on the greenhouse gas emissions associated with our energy products. Only by making relevant products responsibly can we be in business sustainably.

Third, to make a positive contribution to society. This means paying taxes, boosting local economies and developing talent, as well as investing in education to inspire new generations of people with innovative ideas. It is an effort that also includes helping to achieve universal access to clean, affordable energy, one of the UN's 17 sustainable development goals. Part of this effort is the ambition we announced in 2018: to provide a reliable electricity supply to 100 million people in the developing world by 2030. We continue to work on developing a longer-term strategy to achieve this ambition.

This approach to sustainability provides the deep foundations we need to support our business strategy: to become – and remain – a world-class investment, to thrive through the transition to lower-carbon energy and to maintain a strong societal licence to operate.

The 2018 Sustainability Report, our 22nd such report, shows real action in the three parts of our approach to sustainability. It also includes details of our social, safety and environmental performance in 2018. Once again, I am grateful for the valuable input of the independent Report Review Panel, who help us provide more balanced, relevant and responsive reporting. As a founding member of the UN Global Compact, we also continue to support its corporate governance principles on human rights, environmental protection, anti-corruption and better labour practices.

This report shows much progress. But I believe we can do better. We must do the right thing on climate change, which means helping to reduce the environmental impact that comes with making our energy products.

If society is to meet the aims of the Paris Agreement, there is a lot of work to do to cut global greenhouse gas emissions while meeting rising demand for energy.

Shell's ambition is to reduce the Net Carbon Footprint of the energy products we sell by around half by the middle of the century in step with society as it moves towards meeting the aims of Paris. We were the first international oil and gas company to set an ambition using a measure which includes our customers' emissions when they use the energy products we sell, as well as emissions from our operations and supply chains that bring these products to market. This also includes those emissions generated by third parties who supply energy and finished products to us. In 2018, we also announced we would set short-term Net Carbon Footprint targets. We linked a Net Carbon Footprint target and other measures to our executive remuneration starting in 2019, one year earlier than planned. To achieve our 2050 ambition, we will adapt and evolve over time the range of products we offer in line with our customers' needs, increase the lower and zero emission energy products we offer, including natural gas, biofuels and renewable power.

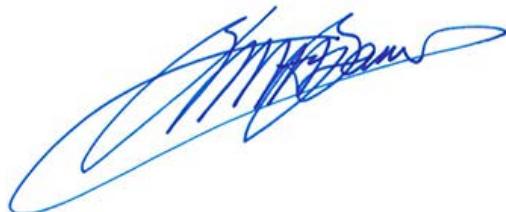
We will also be working increasingly with nature, such as forests and wetlands, and progressing carbon capture and storage to create sinks for those emissions that are hard to avoid.

And we are working on making our own operations more efficient. In our natural gas production and processing, this means limiting leaks of methane, a potent greenhouse gas. To do this, in 2018 we launched a drive to improve the data we gather on our own operational methane leaks and set a methane intensity target. We are also finding better ways to detect and repair methane leaks in our operations.

The Net Carbon Footprint ambition will help ensure our relevance and resilience in the energy system of the future, which is crucial to being a world-class investment over the long term.

In this report you will find details of the actions we are taking to operate safely, to respect the environment and to work closely with communities. There is detail on our drive to build on our solid financial foundations guided by our business strategy, which will help us navigate through all the change to come.

In a time of constant change, keeping sustainability as the consistent bedrock of our approach to doing business is not only right for society. It will be critically important to Shell's success.

A handwritten signature in blue ink, appearing to read "Ben van Beurden".

Ben van Beurden
Chief Executive Officer

Introduction

Welcome to the Shell Sustainability Report, which covers our social, safety and environmental performance in 2018 and significant events for Shell during the year.

IN THIS CHAPTER

- 04** About this report
- 08** Our business strategy
- 10** Our approach to sustainability



About this report

TOPIC OVERVIEW

The 2018 Sustainability Report, published on April 2, 2019, is our 22nd. It focuses on the key sustainability challenges we face and the many ways we are responding. It details our social, safety and environmental performance in 2018.

TOPIC SELECTION

The topic selection process identifies the sustainability subjects that were most relevant to Shell and our stakeholders or were prominent globally in 2018.

Each year, we use a structured process to select the report's content and confirm its validity. We engage with various groups and individuals to understand specific concerns about our business and its impact around the world, particularly in relation to the environment and society. We consider, among others, the views of our stakeholders such as non-governmental organisations, customers, the media, academics, investors and employees across our business. We gather opinions and advice in various ways including formal and informal meetings, workshops and online surveys.

This report lists the topics that were a priority to Shell in 2018. The topics that consistently ranked of higher importance were energy transition and climate change, as well as business ethics, transparency and corporate governance.

The main steps involved in selecting the topics are:

- identify and understand topics that are important to our stakeholders and our strategy;
- collate the topics identified as of high importance;
- identify the topics that will be covered elsewhere on www.shell.com;
- consider input from our Report Review Panel to ensure that coverage is balanced, relevant and complete; and
- inform Shell's Executive Committee of the chosen topics, for their endorsement.

EXTERNAL VOICES

Several individuals have shared their views on Shell's more significant activities in sections of the report called External voices. These quotes are intended to give independent perspectives on our activities. They come from a range of organisations in areas such as civil society, academia, contracting and supply, community leadership, as well as from customers and people living or working near our facilities. They also reflect some of the different regions where we operate and some of our various businesses and projects. Contributors are not remunerated for their quotes.

REPORTING GUIDELINES

We report in line with guidelines developed by IPIECA, the global oil and gas industry association for environmental and social issues. This report has also been prepared in accordance with the Global Reporting Initiative (GRI) Standards: Core option (see [GRI index](#) for full details).

We used the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) to guide and inform our reporting in our [Annual Report](#) and Sustainability Report, complemented by our Sky scenario and the Shell Energy Transition Report. The TCFD was set up by the Financial Stability Board, an international body, and its recommendations call on companies to provide greater transparency about how they identify, assess and manage climate-related risks and opportunities.

More detailed information about how we report is available at www.shell.com.

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REPORT REVIEW PANEL

We have used external review panels to strengthen our sustainability reporting since 2005. They help us evaluate and improve the quality and credibility of our Sustainability Report.

The 2018 Report Review Panel, previously called the External Review Committee, comprises five sustainability and corporate reporting experts. Panel members are offered an honorarium for their time and expertise. This year's panel comprised:

- Faris Natour, Germany/USA. Director, Human Rights & Business Initiative, UC Berkeley Haas School of Business, (Chair of the Report Review Panel)
- Andrew Logan, USA. Director, Oil and Gas, Ceres
- Changhua Wu, China. Chief Executive Officer, Beijing Future Innovation Center
- Marie Morice, USA. Senior Advisor Sustainable Finance, UN Global Compact
- Mandy Kirby, UK. Chief Strategist, City Hive

Read below some of the feedback given in the 2017 report by the expert reviewers, and our response (see table).

2017 RECOMMENDATIONS AND OUR RESPONSES

2017 RECOMMENDATIONS

Strategic focus: Provide greater emphasis on the ways in which Shell's sustainability efforts strengthen its core businesses.

Detailed disclosure of social issues: Articulate more fully how Shell is contributing to the UN's sustainable development goals (SDGs). Provide more clarity on the interconnectedness between social and environmental issues. Provide more detail on diversity and inclusion.

Water: Provide more information on Shell's water use and approach to water management.

Focus areas: Provide fewer but more in-depth case studies. Show greater alignment between the report and Shell's strategic priorities.

HOW SHELL RESPONDED IN 2018

In the 2018 report, you can read more about our approach to sustainability – running a responsible business, shaping a sustainable energy future and making a positive contribution to society – explained through more in-depth case studies on key business decisions (see [Special reports](#)). See also [Our business strategy](#).

Shell's approach to the SDGs has been further refined in 2018, with the focus now on the three goals where we believe we can make the largest contribution.

Information about human rights has been expanded and includes more information on our approach to diversity and inclusion. We also showcase our efforts to encourage more women to study science, technology, engineering and mathematics. Shell's gender balance is included in [Our people](#) and information is provided about our diversity and inclusion initiatives. We have also included more about our approach to social and environmental aspects in some recent case studies (see [Special reports](#)).

Information about water has been expanded. A new graph and infographic have been added to the report to show the use of recycled and fresh water, and case studies included to show water management in practice (see [Water use](#)).

You can read new in-depth case studies in the [Special reports](#) section. We have also increased links within the report to direct readers to relevant strategic and commercial content, including on [www.shell.com](#).

You can read more about the panel members on [www.shell.com](#)

The panel provided input as part of our content selection process and reviewed the report in depth before preparing their statement focusing on the quality of the report. The panel met to discuss Shell's reporting, question Shell experts and prepare their statement.

The 2018 panel's mandate focused on the quality – including the credibility, completeness and responsiveness – of Shell's reporting.

2017 RECOMMENDATIONS

Balance: Provide more balanced content which includes challenging experiences and lessons learned.

HOW SHELL RESPONDED IN 2018

Case studies and commentary have been carefully appraised to provide balanced reporting and lessons learned, with further content available on www.shell.com.

Diversity of third-party comments: Diversify external opinions to provide greater constructive criticism.

The number of external voices in the report has been increased to provide a more diverse range of views.

Commentary on performance: Include more context and explanation for the performance data included in the report.

You can find information on the factors that influence our performance, including relevant graphs, within the safety, environment and social performance sections.

Navigation: Improve navigation.

The digital structure of the report has been updated and menus enhanced to improve the visibility of key topics. More links have been included to relevant content, both within the report and on www.shell.com.

2018 RECOMMENDATIONS LETTER

REPORT REVIEW PANEL STATEMENT

The Report Review Panel issues the following independent statement on Shell's 2018 Sustainability Report:

"We commend Shell on its continued commitment to transparency and progress on its most material sustainability impacts. We have had the opportunity to review two drafts of the 2018 Sustainability Report and provide feedback to Shell through conference calls and in writing. Shell has responded to our questions and suggestions. We have developed this statement independently following our review.

We appreciate the opportunity to provide feedback and recommendations for further improving Shell's sustainability reporting. In line with the scope of our review, our feedback focuses on the quality of Shell's sustainability reporting rather than its sustainability performance.

We are pleased to see many of our recommendations on the 2017 Sustainability Report reflected in this report. For example, Shell has elevated its disclosure on social issues with a more comprehensive [human rights](#) section that brings together updates on its human rights priorities. Similarly, Shell included more information on its approach to the [UN's sustainable development goals](#), although there remains an opportunity for the company to use the goals to more clearly frame strategic priorities, such as increasing access to electricity and to connect related steps Shell is taking to meet its objectives. Independent comments from external stakeholders throughout this report provide a more balanced view of Shell's strengths and challenges.

We are encouraged by the expanded information about Shell's approach to managing water risk and would like to see additional disclosure of targets and other measures Shell uses to minimise risks of adverse impacts at the project level. The inclusion of Shell's approach to [plastics](#) in this report is equally important. For the next report, we see an opportunity to discuss Shell's role in addressing the global challenge of ocean plastics. We welcome Shell's continuing efforts to disclose its approach to public policy issues as we see responsible engagement as a key sustainability priority for the energy sector.

Building on its experience and leadership in sustainability reporting, we believe that for 2019, Shell has an opportunity for a transformative evolution of its approach to sustainability reporting. While the wide range of topics covered in detail shows leadership in sustainability reporting, this comprehensiveness also presents challenges: for readers to focus on content most relevant to them and for the company to articulate its strategic priorities and the measurement of progress against them in the most effective way. In the future, Shell could focus on integrating its strategic priorities under a clearly articulated sustainability strategy. This would also allow Shell to produce a more succinct report with the opportunity for more in-depth discussions and precise reporting on progress on strategic priorities.

We would like to thank Shell for the opportunity to share our feedback here and throughout the drafting process and we look forward to the next evolution in Shell's sustainability reporting."

OIL

**1.5%**

of the world's oil provided by Shell

CUSTOMERS

**30 million**

customers served at our retail sites on average every day

CAPITAL INVESTED

**\$24.8 billion**

in 2018

NATURAL GAS

**3%**

of the world's natural gas provided by Shell

PRODUCTION

**3.7 million**

barrels of crude oil equivalent a day in 2018

R&D

**\$986 million**

invested in research and development in 2018

Our business strategy

BUSINESS STRATEGY

Shell's purpose is to power progress together by providing more and cleaner energy solutions. Our strategy is to strengthen our position as a leading energy company by providing oil, gas and low-carbon energy as the world's energy system transforms. Safety and social responsibility are fundamental to our business approach. Shell will only succeed by working collaboratively with customers, governments, business partners, investors and other stakeholders.

Our strategy is founded on our outlook for the energy sector and the chance to grasp the opportunities arising from the substantial changes in the world around us. The rising standard of living of a growing global population is likely to continue to drive demand for energy, including oil and gas, for years to come. At the same time, technology changes and the need to tackle climate change means there is a transition under way to a lower-carbon energy system with increasing customer choice. We recognise that the pace and specific path forward are uncertain and so require agile decision-making.

STRATEGIC AMBITIONS

Against this backdrop, we have the following strategic ambitions to guide us in pursuing our purpose:

- to provide a world-class investment case. This involves growing free cash flow and increasing returns, all built upon a strong financial framework and resilient portfolio;
- to thrive in the energy transition by responding to society's desire for more and cleaner, convenient and competitive energy; and
- to sustain a strong societal licence to operate and make a positive contribution to society through our activities.

The execution of our strategy is founded on becoming a more customer-centric and simpler organisation, focused on growing returns and free cash flow. By investing in competitive projects, driving down costs and selling non-core businesses, we are continuously reshaping our portfolio to become more resilient and focused.

Our ability to achieve our strategic ambitions depends on how we respond to competitive forces. We continuously assess the external environment – the markets as well as the underlying economic, political, social and environmental drivers that shape them – to evaluate changes in competitive forces and business models. We use multiple future scenarios to assess the resilience of our strategy. We undertake regular reviews of the markets we operate in and analyse trends and uncertainties, as well as our traditional and non-traditional competitors' strengths and weaknesses, to understand our competitive position. We maintain business strategies and 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 risk appetite for, identified risk factors.

Our Executive Directors' remuneration is linked to the successful delivery of our strategy, based on performance indicators that are aligned with shareholder interests. Long-term incentives form the majority of the Executive Directors' remuneration for above-target performance. Our Long-term Incentive Plan includes cash generation, capital discipline and value created for shareholders.

For more details on our business strategy, see the [Business overview](#) section in our Annual Report.

DELIVERING ON OUR STRATEGY

We refreshed our business strategy in 2016, not long after completing the acquisition of BG, which added significantly to our portfolio in liquefied natural gas (LNG) worldwide as well as deep-water oil and gas production in Brazil. As part of the strategy, we also created a New Energies business to continue to explore investment opportunities in areas including new fuels for transport, such as advanced biofuels, hydrogen and charging for battery-electric vehicles; and power, including from low-carbon sources such as wind and solar, as well as natural gas. In 2017, we continued to reshape Shell as a world-class investment case that could thrive in the energy transition with a strong licence to operate; selling assets not central to our strategy such as our partial divestment of oil sands mines and discontinuing frontier exploration in Arctic waters, while growing free cash flow and reducing debt.

We have continued to make progress in 2018 to deliver a world-class investment. We must maintain our focus and build on the success of our divestment goals, reduction of net debt, the start of share buy-backs and the growth in free cash flow.

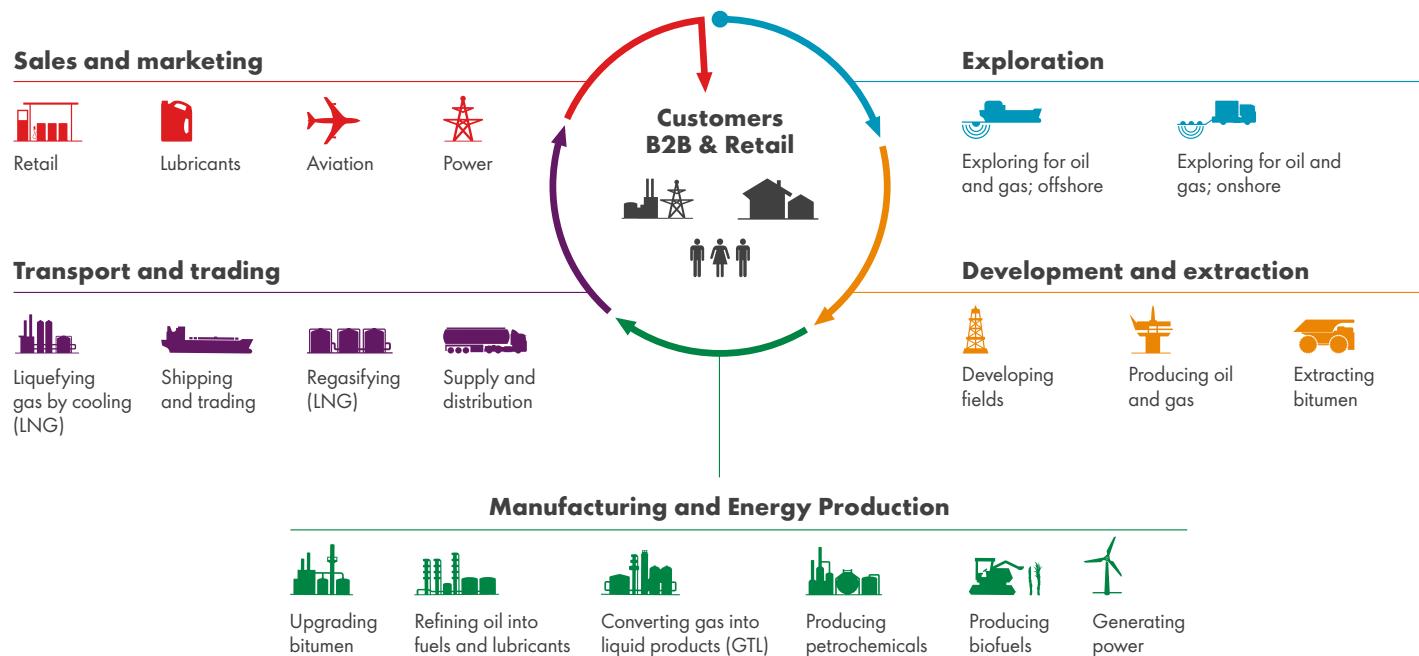
During the same period, we continued to position ourselves as a leader among peers in the transition to a lower-carbon future. We expanded our New Energies business and announced a methane emissions intensity target for our oil and gas assets. We worked with the Task Force on Climate-related Financial Disclosures (see [Greenhouse gas emissions](#)) and set our ambition to reduce the Net Carbon Footprint of the energy products we sell by around half by the middle of the century and in step with society as it moves towards meeting the goals of the Paris Agreement.

In 2018, we committed to operationalise our ambition of around 50% Net Carbon Footprint reduction by 2050, through the setting of short-term targets linked to executive remuneration. This commitment was made in a joint statement developed with institutional investors on behalf of Climate Action 100+, an initiative led by investors with more than \$32 trillion in assets under management. Further, in early 2019, as part of our transparency efforts within remuneration, we have published our CEO Pay Ratio, in line with new legislation. Although this is not required until 2020, we were keen to publish this information early. For full details, please see our [Directors' Remuneration Report](#) in our Annual Report.

We maintained our focus on running a safe, responsible and profitable business. For example, in 2018 we announced our decision to build an LNG facility in British Columbia, Canada. The project was planned and designed by working closely with local communities, First Nations and governments to ensure sustainable development was considered in every aspect of the project. For example, the project has been designed to achieve the lowest carbon intensity of any LNG project in operation today, partly aided by the use of hydropower.

Finally, we announced our ambition to provide a reliable electricity supply to 100 million people in the developing world by 2030 at the One Young World conference in The Hague, the Netherlands (see [Access to energy](#)). We continue to work on developing a longer-term strategy to achieve this ambition.

Shell business model



Our approach to sustainability

Sustainability at Shell means providing more and cleaner energy solutions in a responsible manner – in a way that balances short- and long-term interests, and that integrates economic, environmental and social considerations into decision-making.

SUSTAINABILITY AT SHELL

Our core values of honesty, integrity and respect for people – first laid out in the Shell General Business Principles more than 40 years ago – underpin our approach to sustainability. A commitment to contribute to sustainable development was added in 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. Since 1997, we have worked to embed this commitment in our strategy, our business processes and decision-making. We have set clear ambitions, goals and targets that address our key sustainability challenges. Sustainability is core to our project planning and operational activities.

OUR APPROACH

Sustainability at Shell means providing more and cleaner energy solutions in a responsible manner – in a way that balances short- and long-term interests, and that integrates economic, environmental and social considerations into decision-making.

Sustainability is integrated across our business on three levels:

- **in Shell company operations** – by running a safe, efficient, responsible and profitable business
- **for our customers** – by helping to shape a more sustainable energy future; and
- **with communities and wider society** – by sharing benefits where we operate and making a positive contribution.

Running a safe, efficient, responsible and profitable business

This is the foundation of our approach. We strive to produce and deliver energy responsibly – in a way that respects people, their safety and their environment. At the simplest level, this means doing no harm. We apply global standards to manage safety, the environment and how we engage with communities and we work to continuously improve our performance.



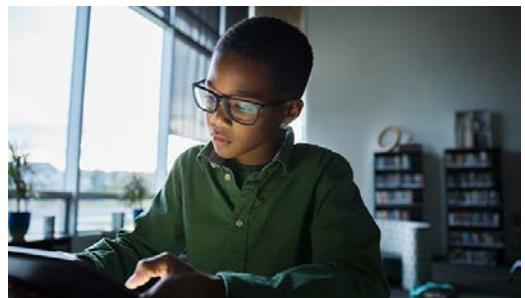
A Shell community liaison officer meets a landowner near a well site at our unconventional project in Appalachia, USA.

Helping to shape a more sustainable energy future

We provide products that people need and want to improve their lives – in their homes and businesses, and for transport. We aim to be responsible stewards for these products. We intend to adapt, innovate and play our part in the global shift to provide more and cleaner energy solutions for all in a sustainable future. This means transforming our product mix over time. We are taking action on the greenhouse gas emissions associated with our products. We aim to cut the Net Carbon Footprint of the energy products we sell by around half by 2050, in step with society's progress to align with the goals of the Paris Agreement.

Making a positive contribution to society

We aim to play a positive role in communities where we operate and in wider society. We contribute to the development of local economies by creating jobs, boosting skills, sourcing from local suppliers, as well as paying taxes and royalties. We support community projects that are based on the needs of local communities. Our ambition that, by 2030, we will be providing a reliable electricity supply to 100 million people in the developing world who do not have this today is also designed to bring wider benefits. We continue to work on developing a longer-term strategy to achieve this ambition.



We aim to deliver energy products that people need and want – and do this responsibly to help shape a more sustainable energy future.

SUPPORT FOR INTERNATIONAL AGREEMENTS

We welcome the UN's sustainable development goals, which seek to tackle the world's economic, social and environmental challenges by 2030, and aim to play our part in helping governments and society to achieve them (see [Sustainable development goals](#)).

We respect human rights as set out in the UN Universal Declaration of Human Rights and the International Labour Organization's core conventions. We also support a number of external voluntary codes that promote responsible business practices.

We support the UN Paris Agreement on climate change, which aims to limit the rise in global average temperatures this century to well below two degrees Celsius above pre-industrial levels.

EMBEDDING SUSTAINABILITY INTO PROJECTS

Our commitment to safety, the environment and communities plays an important role in how we plan, design and operate our projects and facilities. We conduct detailed environmental, social and health impact assessments for every major project.



An environmental adviser to Shell Bolivia takes measurements from a river with the help of three community coordinators at the Jaguar Camp. Shell is running an exploration project nearby to find natural gas in a remote and mountainous community.

When we invest in projects, we aim to balance the short- and long-term interests of our business. For investment decisions, we consider the economic, social, ethical and environmental risks and opportunities as well as the political and technical risks. The LNG Canada joint venture and Shell Canada's Groundbirch asset in British Columbia are examples of how we embed sustainability in our projects (see [Delivering natural gas in Canada](#)).

Managing risks to people and the environment is essential to delivering a successful project. The mandatory requirements in our Health, Safety, Security, Environment and Social Performance (HSSE&SP) Control Framework help to ensure our projects and assets are safe.

As part of the HSSE&SP Control Framework, we require projects and assets that produce more than 50,000 tonnes of greenhouse gases per year to have a greenhouse gas and energy management plan in place (see [Energy efficiency in our operations](#)). For projects, our planning process helps to guide our decisions on which technology to use, including whether carbon capture and storage should be considered, and whether to move ahead with the project.

For example, applying the framework at our Gorek gas platform in Malaysia highlighted that solar panels could be used as one source for the power supply. At our Pearl gas-to-liquids plant in Qatar, we are using a fuel by-product of the process to power the plant. This fuel had previously been flared, or burned off. Using it in this way has helped reduce our overall emissions by 550,000 tonnes of CO₂ on a yearly basis.

We engage with communities and other stakeholders as part of our impact assessment process to explain the project, consider suggestions and discuss possible ways to address any concerns. In addition to complying with relevant social and environmental regulations and align with international standards, including those from the World Bank and its International Finance Corporation, seeking community input helps us to improve project design.

We train our project teams to understand how to use impact assessments to embed sustainability into projects. Project teams are supported by specialists in areas such as biodiversity, waste, air, energy and water management, as well as indigenous peoples' rights, cultural heritage and resettlement.

A guide to sustainability across the life of a project

	Identify and assess	Select	Define	Execute	Operate	Decommission and restore
Identify people who may be interested in or affected by the project						
Engage with stakeholders (e.g. communities, host governments and NGOs) and feed responses into our risk analyses and decision-making process						
Conduct baseline studies of the local environment (e.g. water, biodiversity, social livelihoods) and consider how the project may affect it						
Based on assessment of potential impacts and stakeholder engagement, identify mitigation and enhancement measures						
Implement a mitigation plan for project development, construction and operation						

UN SUSTAINABLE DEVELOPMENT GOALS

The UN's 17 sustainable development goals (SDGs) seek to address the world's biggest challenges, including ending poverty, improving health and education, making cities sustainable and tackling climate change.

Governments are responsible for prioritising and implementing approaches that meet the SDGs, and many have started to articulate plans to meet the goals. But achieving these tasks will require unprecedented collaboration and collective action with business and civil society.

We welcome the SDGs and believe we have an important role to play in supporting the ambitions.

All the SDGs are relevant to Shell operations to varying degrees and we are already contributing to many of these goals. In 2018, following a review by senior executives, we decided to focus on supporting the three goals where we can make the greatest contribution: Goal 7 (Ensure access to affordable, reliable, sustainable and modern energy), Goal 8 (Decent work and economic growth) and Goal 13 (Climate action).



7 ☀ Goal 7 - Ensure access to affordable, reliable, sustainable and modern energy

Today, around 1 billion people live without access to electricity. The same number live with unreliable or unsafe supplies of electricity. Access to reliable and safe energy is critical to enabling economic and social development and improving health, education and livelihoods. Goal 7 is crucial to achieving almost all the SDGs. For our part, we announced our ambition to provide a reliable electricity supply to 100 million people in the developing world by 2030. We continue to work on developing a longer-term strategy to achieve this ambition.

Read more in the report and on shell.com:

- Climate change and energy transition
- Access to energy
- Energy-efficient products
- New Energies
- Local content and skills development
- Shell LiveWIRE (see www.shell.com/shell-livewire)

8 ⚡ Goal 8 - Decent work and economic growth

Employment is a critical route out of poverty and towards prosperity. We provide jobs and follow applicable labour, health and safety standards. We encourage local businesses to be part of our supply chain, and seek to ensure our suppliers meet Shell standards. We work with governments and others to offer training to build local skills and expertise. We support entrepreneurs through various programmes, including the Shell LiveWIRE programme, which helps young people start their own businesses. We also contribute to economic growth by paying taxes and royalties to local governments.

Read more in the report and on shell.com:

- Our people
- Social performance
- Supply chain including worker welfare
- Safety
- Revenue transparency and tax
- Shell LiveWIRE (see www.shell.com/shell-livewire)

13 🌎 Goal 13 - Climate action

We have an ambition to reduce the Net Carbon Footprint of the energy products we sell by around half by 2050, in step with society, towards meeting the goals of the Paris Agreement to keep the rise in global average temperatures to well below two degrees Celsius above pre-industrial levels. As an interim step, by 2035, and based on societal progress, we aim for a reduction of around 20% compared with 2016 levels. Our approach to calculating the Net Carbon Footprint covers emissions directly from Shell operations (including from the extraction, transport and processing of raw materials, and transportation of products), those generated by third parties who supply energy to us for production, and our customers' emissions from their use of our energy products.

Read more in the report and on shell.com:

- Climate change and energy transition
- Managing greenhouse gas emissions
- Advancing lower carbon options
- Shell Scenarios (see www.shell.com/scenarios)
- Shell Energy Transition Report (see www.shell.com/set)
- Climate change: an imperative to act (see www.shell.com/inside-energy)

PERFORMANCE HIGHLIGHTS

This table represents a selection of global metrics that we track within Shell. These metrics have been selected because they reflect the direct impact of Shell companies' operations on people and the environment. We used them to set our goals and measure progress in 2018 and to define priorities for 2019.

We review our metrics regularly to ensure we capture the information needed to improve our performance. For example, we introduced Goal Zero for personal safety at Shell in 2007. Since then, we have broadened the goal to aim for no harm to people and the environment. More information on our performance, definitions of the indicators and the referenced goals are provided in the environmental, social and safety data sections.

Goals, performance and plans for 2018 and beyond

	Goal 2018	Progress in 2018	Priorities in 2019												
PERSONAL SAFETY	<p>TRCF ≤ 0.7 Achieve total recordable case frequency (TRCF) – the number of injuries per million working hours – of 0.7 or below for employees and contractors. Goal Zero has been our ambition for personal safety since 2007.</p>	<p>Progress in 2018</p> <p>Total recordable case frequency (TRCF)</p> <table border="1"> <thead> <tr> <th>Year</th> <th>TRCF</th> </tr> </thead> <tbody> <tr><td>2014</td><td>1.0</td></tr> <tr><td>2015</td><td>0.9</td></tr> <tr><td>2016</td><td>1.0</td></tr> <tr><td>2017</td><td>0.8</td></tr> <tr><td>2018</td><td>0.9</td></tr> </tbody> </table> <p>The TRCF increased slightly to 0.9 compared with 0.8 in 2017, which was our lowest ever performance (see Safety performance).</p>	Year	TRCF	2014	1.0	2015	0.9	2016	1.0	2017	0.8	2018	0.9	<ul style="list-style-type: none"> Continue to focus on our three safety themes of care, dilemmas and risk normalisation in engagements with employees and contractors. In road safety, continue to focus on effective implementation of proven practices across all lines of business, with an emphasis on improving management of fuel transport in high-risk countries. Support the development and implementation of common industry safety standards. Improve our capabilities to learn from audit findings and investigations into incidents with the potential to cause harm.
Year	TRCF														
2014	1.0														
2015	0.9														
2016	1.0														
2017	0.8														
2018	0.9														
PROCESS SAFETY	<p>Leaks ≤ 125 Reduce the number of operational leaks to 125 or below (classified as "operational Tier 1 & 2 process safety events"). Since 2011, we have extended our ambition of Goal Zero to process safety. From 2017, we combined operational Tier 1 & 2 safety events when setting the target. Previously, we only used Tier 1 events.</p>	<p>Number of operational process safety Tier 1 and 2 events</p> <table border="1"> <thead> <tr> <th>Year</th> <th>Events</th> </tr> </thead> <tbody> <tr><td>2014</td><td>251</td></tr> <tr><td>2015</td><td>220</td></tr> <tr><td>2016</td><td>146</td></tr> <tr><td>2017</td><td>167</td></tr> <tr><td>2018</td><td>121</td></tr> </tbody> </table> <p>The number of Tier 1 and 2 operational process safety events fell from 166 in 2017 to 121 in 2018 (see Safety performance).</p>	Year	Events	2014	251	2015	220	2016	146	2017	167	2018	121	<ul style="list-style-type: none"> Continue to focus on asset integrity and quality of operational execution by, among other things, embedding our Process Safety Fundamentals and the roll out of a group-wide asset management system. Continue to improve learning from process safety events with high potential impact.
Year	Events														
2014	251														
2015	220														
2016	146														
2017	167														
2018	121														
ENVIRONMENT	<p>Goal Zero extends to the environment with our goal of no operational spills.</p>	<p>Volume of operational spills in '000 tonnes</p> <table border="1"> <thead> <tr> <th>Year</th> <th>Volumes ('000 tonnes)</th> </tr> </thead> <tbody> <tr><td>2014</td><td>0.7</td></tr> <tr><td>2015</td><td>0.8</td></tr> <tr><td>2016</td><td>0.8</td></tr> <tr><td>2017</td><td>0.4</td></tr> <tr><td>2018</td><td>0.8</td></tr> </tbody> </table> <p>The number of operational spills fell from 104 in 2017 to 92 in 2018. The volume of operational spills of oil and oil products in 2018 was 0.8 thousand tonnes, an increase from 0.4 thousand tonnes in 2017 (see Environmental performance).</p>	Year	Volumes ('000 tonnes)	2014	0.7	2015	0.8	2016	0.8	2017	0.4	2018	0.8	<ul style="list-style-type: none"> Continue to learn from incidents with spills to improve the reliability of our facilities and further reduce the number and volume of operational spills. Continue to work with the oil and gas industry to further develop effective oil-spill response capacities.
Year	Volumes ('000 tonnes)														
2014	0.7														
2015	0.8														
2016	0.8														
2017	0.4														
2018	0.8														

Reduce flaring in our upstream business.

Our policy is to reduce flaring and venting to as low a level as is reasonably practical. We are a signatory of the World Bank's Zero Routine Flaring by 2030 initiative.

Upstream flaring in million tonnes CO₂ equivalent [A]



- Continue to link staff bonuses to the management of greenhouse gas emissions.
- Further embedding the guiding principles for reducing methane emissions across the natural gas value chain, which Shell and seven other energy companies signed in November 2017.

- Continue to focus on maintenance measures to enhance the reliability of our equipment and reduce emissions through leaks.

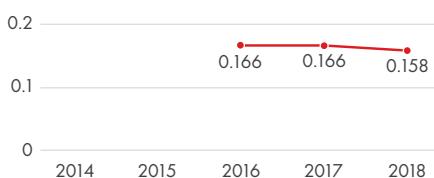
Upstream and Integrated Gas GHG intensity ≤ 0.164

For our Upstream and Integrated Gas facilities, achieve a GHG intensity of 0.164 tonnes or below of CO₂ equivalent per tonne of hydrocarbon production available for sale.

[A] Includes Upstream and Integrated Gas

Our upstream flaring decreased to 5.2 million tonnes of CO₂ equivalent in 2018 from 8.2 million tonnes in 2017 (see [Flaring](#)).

Upstream and Integrated Gas: tonnes CO₂e per tonne of hydrocarbon production available for sale



Our Upstream and Integrated Gas intensity was 0.158 tonnes CO₂ equivalent per tonne of hydrocarbon production available for sale in 2018 compared to 0.166 in 2017.

Refineries: tonnes CO₂e per Solomon's Utilised Equivalent Distillation Capacity [UEDC]



Refinery GHG intensity in 2018 was 1.05 tonnes CO₂e per UEDC compared to 1.14 in 2017.

Chemicals: tonnes CO₂e per tonne of petrochemicals produced



Chemical GHG intensity was 0.96 tonnes CO₂ equivalent per tonne of high value chemicals produced in 2018 compared to 0.95 in 2017.

Chemical GHG intensity ≤ 0.97

For our chemical plants, reduce GHG intensity to 0.97 tonnes or below of CO₂ equivalent per tonne of high-value petrochemicals produced.

Effective community feedback.

Our community feedback mechanism (CFM) has been used to address community concerns since 2012. We continue to progress the implementation of our standard online community feedback tool, which helps to strengthen tracking and reporting of concerns.

We conducted a full evaluation of our online community feedback tool to understand how it has been used across our projects and facilities. Following the evaluation, we identified a number of areas for improvement, which are now being considered to enhance the tool.

We developed the CFM self-check to assess the effectiveness of the mechanism for implementation in all major facilities and projects. The check is based on UN Guiding Principles and Human Rights criteria.

(see [Social performance](#)).

- Enhance the online community feedback tool, based on the improvement areas we identified in 2018, such as user friendliness to ensure short response times. The improvements help to ensure we are able to effectively receive, assess and support assets and projects to respond quickly to concerns.

- Identify further improvement opportunities from the self-check exercise for an effective implementation of CFM.

Innovating for India's energy needs

2018 was Shell's 25th anniversary in India since our re-entry into the country in 1993. Our links with India go back much further – to 1928. Today, Shell sees India as an important growth market, as a hub for innovation and a source of world-class talent.

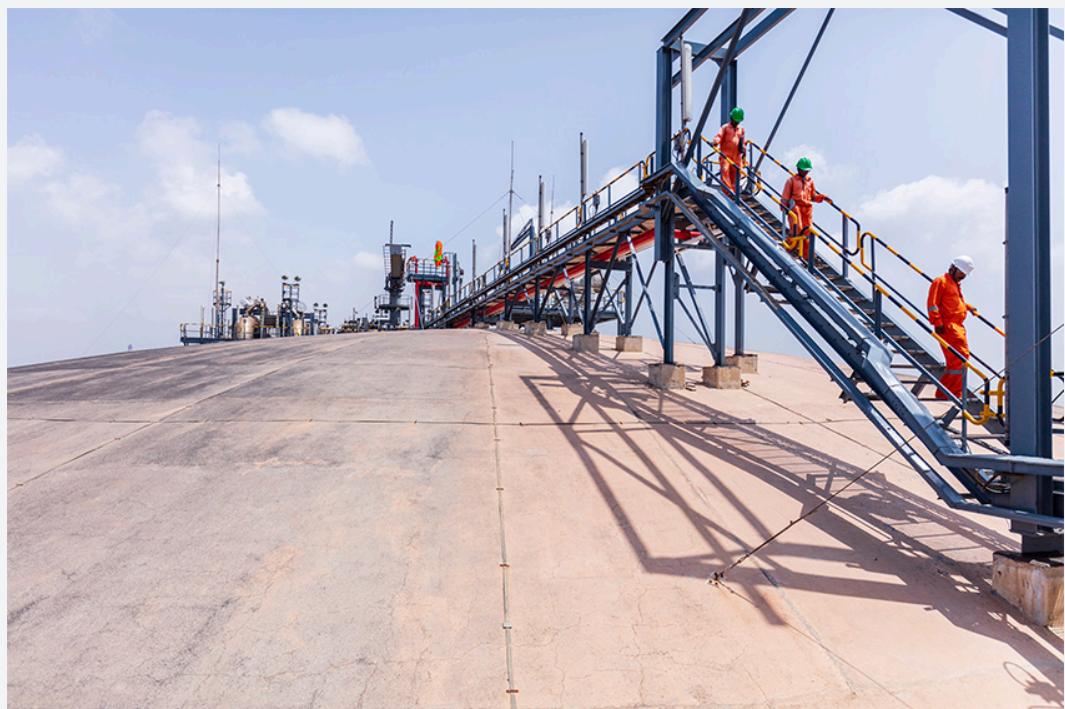
We are working with our partners to deliver more and cleaner energy solutions – in a way that integrates environmental and social considerations – as India's population grows and living standards rise. We plan to significantly expand in the country by offering customers a range of more energy-efficient, lower emission fuels and lubricants, natural gas and renewable energy for power generation and biofuels.

The country has a series of goals for both changing the kinds of energy it uses and increasing energy access to rural communities. For instance, the government has set several targets, including increasing the share of natural gas in the primary energy mix from 6.5% today to 15% in 2030.

The Hazira LNG port and terminal in Gujarat – which Shell Gas B.V. acquired in early 2019 – is one of the largest ever international investments in India's energy sector. Plans are also under way to expand the number of Shell retail sites in India.



A ship delivers a cargo of liquefied natural gas to the Hazira regasification facility.



A natural gas tank at the Hazira facility.

The Shell Technology Centre in Bangalore is one of Shell's three major innovation hubs, alongside similar centres in Amsterdam, the Netherlands and Houston, USA. The centre conducts research into bitumen, subsurface modelling, enhanced computational research, chemicals and advanced catalysts. Scientists and engineers also work on international projects, including many aspects of our Prelude floating liquefied natural gas facility.

The engineering team also developed computer modelling to help us understand how the Malikai platform in Malaysia would perform in the fast-flowing currents of the South China Sea - helping to keep workers safe.



Scientists and engineers work on international projects at Shell Technology Centre Bangalore

The technology centre conducts vital research into lower-carbon biofuels. Shell is keen to invest in developing and deploying technologies like IH², which converts biomass - wood, agricultural residues or algae, for example - into fuel that significantly reduces greenhouse gas emissions. We have opened a demonstration plant in Bangalore that can process up to five tonnes of feedstock a day - a big step towards scaling up IH² technology for commercial use.

We recently invested in Husk Power Systems, a leading mini-grid company operating in India, that uses solar and biomass to provide reliable and affordable electricity to some of the several million people in India without it. We also acquired a 49% interest in Cleantech Solar, which provides solar power to commercial and industrial customers across South East Asia and India.

We also encourage the deployment of innovative energy solutions at our own facilities. At our technology centre in Bangalore, we aim to achieve a net-zero emissions footprint. For instance, we have set up a contract to purchase solar electricity from an offsite developer, delivered through the grid for use in our technology centre. This programme is being rolled out across other Shell India sites as well.

A RESPONSIBLE PARTNER

Around the world, we work with local partners to help us understand and address the needs of the communities where we operate. In India, we are involved in several local community initiatives, including promoting science, technology, engineering and maths (STEM) education and improving road safety, as well as integrating social investment into our core business.

In 2018, we launched NXplorers, a programme to encourage young innovative minds to pursue STEM education and strengthen India's intellectual capital. The programme was rolled out across four states in India in 2018 and aims to reach 3,000 schools and 260,000 students by 2020.

We also worked with the Transport Ministry on a road safety awareness campaign to influence young adults through social media. We have reached more than 6 million millennials across the 10 most accident-prone cities in the country.

Exposure to smoke from traditional cookstoves and open fires causes around 783,000 deaths in India each year, according to the Clean Cooking Alliance. We are working together with the Alliance to provide access to and generate demand for clean cooking solutions, including launching a campaign to educate rural populations about the potential health benefits.

In 2018, Shell commissioned a pre-production prototype of the world's first flat-pack truck, the OX. We are showcasing this truck in India, including how it can bring low-cost all-terrain mobility to rural communities. Limited mobility in hard-to-reach communities in developing economies can restrict access to basic services. The OX truck has the potential to broaden access to transport possibilities with many resulting benefits. Read more at www.shell.in/ox.

As a part of its business activities, Shell India Lubricants has provided health camps for more than 30,000 truck drivers and mechanics, while the retail team has supported hiring people with disabilities at Shell retail sites. Shell India also has numerous other community outreach programmes through its service centres and joint ventures, and has recently launched an employee volunteer programme.

SUSTAINABILITY GOVERNANCE

CORPORATE AND SOCIAL RESPONSIBILITY COMMITTEE

The Corporate and Social Responsibility Committee (CSRC) is one of four standing committees of the Board of Royal Dutch Shell plc. The committee's role is to review and advise on our strategy, policies and performance against the Shell General Business Principles, our Code of Conduct and our Health, Safety, Security, Environment and Social Performance (HSSE&SP) standards.

The CSRC meets regularly to review and discuss a wide range of sustainability-related topics, including our sustainability performance and the results of audits. The committee advises the Remuneration Committee on the sustainable development metrics that apply to the Executive Committee scorecard. The CSRC also reviews major issues of public concern and Shell's strategy to address them.

The committee is assisted and advised by Executive Committee member Harry Brekelmans, with a senior manager acting as secretary to the CSRC. The Chair of the Board, the CEO and senior managers regularly attend CSRC meetings to discuss specific topics.

CSRC priorities



In 2018, the CSRC balanced its time between safety, environment and ethics, with a strong focus throughout on corporate culture and conduct. The topics discussed in depth included personal and process safety, road safety, the energy transition and climate change, Shell's Net Carbon Footprint, the company's environmental and societal licence to operate, and its ethics programme. The CSRC also discussed Shell companies' operations and the challenges faced in Pakistan, Nigeria and the Netherlands. In 2018, the committee held five meetings in person and two meetings by conference call.

The CSRC conducted two major site visits in 2018. In February, the committee visited Nigeria, where over three days it met with Shell staff, government officials, and representatives from local non-governmental organisations to gain a deeper understanding of operations in the Niger Delta. In December, the committee spent a day visiting the Moerdijk facility in the Netherlands, where they discussed process safety performance and local site challenges, including Shell's relationship with the local community.

COMMITTEE VOICE

"As the CSRC, we examined many aspects of sustainability across safety, environment and ethics in 2018. Our agenda was focused on the topics of most strategic importance to Shell. We have full access to the senior managers responsible for all aspects of sustainability. We probe and raise challenging questions, drawing on our collective experience, and provide feedback to the company's management. During site visits, when we see Shell's operations first-hand, we talk with local management, front-line staff and a wide range of stakeholders to gain a sense of how Shell's standards are being applied in practice."



Sir Nigel Sheinwald
CSRC Chair



The CSRC conducted a site visit to Gbaran-Ubie, an important project in Nigeria's Niger Delta region, to gain a deeper understanding of its operations.

The CSRC plays an important role in helping to ensure that Shell has effective sustainability governance structures in place throughout the company, along with performance standards and other controls. These help the company to manage risks and opportunities, and shape decisions and actions across all Shell businesses.

In 2018, the members of the committee were:

- Hans Wijers – Chair since May 2015 and stood down as Non-Executive Director in May 2018;
- Sir Nigel Sheinwald – Member since July 2012 and Chair since May 2018;
- Catherine Hughes – Member since November 2017; and
- Linda G. Stuntz – Member since May 2018.

For further details on the Corporate and Social Responsibility Committee and how sustainability is managed at Shell see www.shell.com and our [Annual Report](#).

EXECUTIVE REMUNERATION

ANNUAL BONUS

In 2018, sustainable development continued to account for 20% of Shell's Executive scorecard, which is used to help determine the annual bonuses awarded to Royal Dutch Shell plc's Executive Directors.

Targets are set each year by the Board's Remuneration Committee, based on recommendations from the Corporate Social Responsibility Committee (CSRC), and the relevant outcomes are reported retrospectively in the [Annual Report](#). The same annual bonus scorecard approach applies to senior executives and most other employees.

The metrics on sustainable development in 2018 had equal weighting between Shell's safety (10%) and environmental (10%) performance. Since 2017, the environmental component has included greenhouse gas emissions management in specific business areas. The greenhouse gas emissions metrics in the 2018 scorecard evolved, with coverage increasing to around 90% of operated portfolio emissions. The refining metric remained unchanged, while the scope of the chemicals metric was adjusted to cover only steam cracker high value petrochemicals production. Emissions coverage in upstream and midstream was also revised, meaning that it is now measured on an intensity basis and has been expanded beyond flaring.

Scorecard measures for 2019 will remain the same.

LONG-TERM INCENTIVE PLAN

In 2017, we were the first international oil and gas company to set an ambition to reduce the Net Carbon Footprint of the energy products we sell, taking into account their full life-cycle emissions, which include our customers' emissions associated with the energy products that we sell, in the period to 2050 in step with society as it moves toward the goals of Paris (see [Net Carbon Footprint](#)).

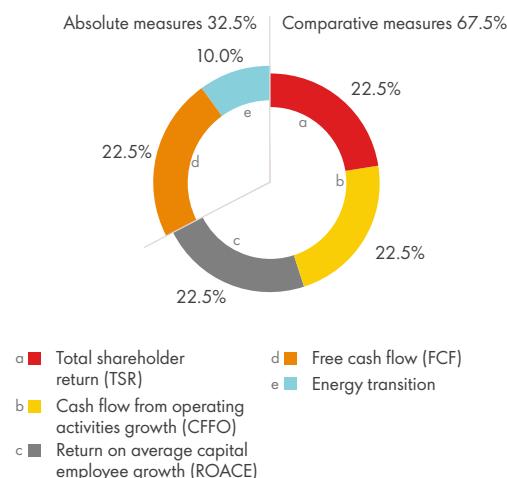
We took a big step forward in delivering our strategy in 2018 by announcing plans to link short-term targets to reduce the Net Carbon Footprint of the energy products we sell to executive remuneration.

We have accelerated our plans by including an energy transition condition in the performance conditions for the 2019 long-term incentive plan (LTIP) grant. This condition will include the first three-year target to reduce the Net Carbon Footprint of the energy products we sell and will also include other measures that will help us achieve our strategic ambitions in the long term, related to the growth of Shell's power business, commercialising opportunities in advanced biofuel technology and the development of systems to capture and store carbon. These measures are based on recommendations from the CSRC.

The energy transition condition will apply to the Executive Directors, Executive Committee members and around 150 of Shell's senior executives in 2019. From 2020, subject to any required staff consultation, we intend to incorporate the energy transition condition into the performance share awards made to around 16,000 employees globally.

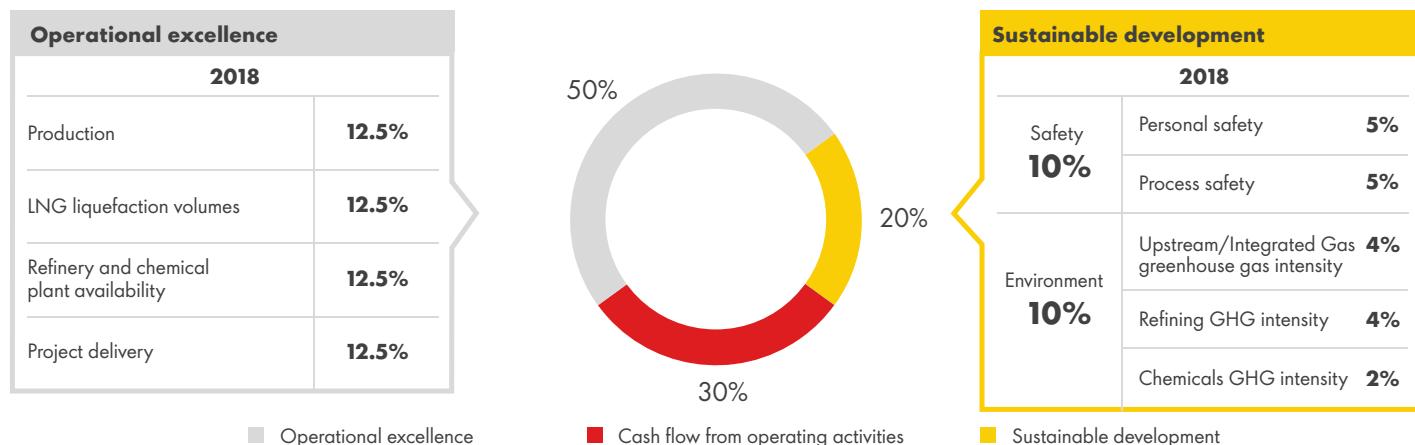
Long-term incentive plan

%



Read more about the 2018 directors' remuneration in the [Annual Report](#).

Scorecard structure



Responsible business

We work to reduce our environmental impact and manage our operations safely and responsibly. Safety and respect for people – our employees, contractors and neighbours – are fundamental to how we do business.

IN THIS CHAPTER

- 20** Human rights
- 22** Safety
- 27** Environment
- 38** Economic development in Nigeria
- 41** Spill response and prevention in Nigeria



Human rights

RESPECTING HUMAN RIGHTS

We recognise our responsibility to respect human rights in all aspects of doing business. We focus on four areas where human rights are critical to the way we operate: communities, security, labour rights and supply chains.

Our approach applies to all our employees and contractors and is informed by the Universal Declaration of Human Rights, the core conventions of the International Labour Organization, and the United Nations Guiding Principles on Business and Human Rights. Our approach is set out in our Shell General Business Principles, Code of Conduct, and Shell Supplier Principles.

We have embedded human rights into our existing frameworks and processes to demonstrate we respect human rights across the business.

Our Health, Safety, Security, Environment and Social Performance (HSSE&SP) Control Framework sets out how we identify, assess and manage our impacts on communities where we operate - including any impact on human rights - and how we engage respectfully with our neighbours. Our goal is to keep employees, contractors and facilities safe, while respecting the human rights of local communities in accordance with the UN Voluntary Principles on Security and Human Rights.

The Shell Supplier Principles include specific expectations for contractors and suppliers covering business integrity, health and safety, social performance, and labour and human rights. Our joint venture partners are expected to implement our control framework or an equivalent (see [Non-operated ventures](#)).

We have made several external regulatory declarations that describe how we manage human rights risks in our supply chains. We expect our contractors and suppliers to obey the national laws and international standards that require them to treat workers fairly, and to provide a safe and healthy work environment.

In 2018, we joined forces with our industry peers to create a Common Framework for Supplier Labour Rights Assessment. The initiative is designed to make it easier for

suppliers to demonstrate how they respect human rights and care for people; this transparency is intended to improve working conditions in our companies' supply chains.

We have community feedback mechanisms at all our major facilities. These mechanisms, along with a global helpline operated by an independent provider, enable employees, people in the communities where we operate, contractors and any third party to raise concerns, so they can be resolved.

We also consult with international organisations, companies and civil society to understand and respond to current and emerging human rights issues relevant to our business. These include the global oil and gas industry association for environmental and social issues IPIECA, and the human rights working group of Business for Social Responsibility.

Read more on our approach to human rights at www.shell.com/humanrights and our external regulatory declarations at www.shell.com/external-voluntary-codes.

MANAGING OUR IMPACT ON PEOPLE

Our projects and operations can affect our neighbours. Our social performance team, working with environmental specialists, assesses and manages the impact of Shell's business to ensure that work is carried out in a responsible way.

We manage the impact we may have on people living near our operations in line with the International Finance Corporation's Performance Standards and the UN Guiding Principles on Business and Human Rights.

Our Health, Safety, Security, Environment and Social Performance Control Framework expects us to, first, avoid or, where this is not possible, minimise our impacts on people through project design. For example, in 2018, original plans for an above ground pipeline in Germany, which would have impacted three roads, were changed to a tunnel design following community engagement and agreement with the road agency.

Approach to human rights



We work with local communities to jointly identify solutions and opportunities. For example, in 2018, we worked with fishermen in Malaysia on a programme called "Safety at sea" to promote awareness of the dangers of fishing near oil platforms. We have also worked in a similar way to help communities in Colombia to adopt better fishing practices.

INDIGENOUS PEOPLES

Our activities in certain parts of the world affect indigenous peoples who hold specific rights for the protection of their cultures, traditional ways of life and special connections to land and water. Shell has developed a public position statement on Free Prior Informed Consent (FPIC), a principle recognised in the United Nations Declaration on the Rights of Indigenous Peoples. Our statement is based on a prerequisite to engage in dialogue with local indigenous communities and come to a joint agreement on the way forward in project development. For example, the LNG Canada joint venture (Shell interest 40%) was planned and designed by working closely with local communities, First Nations (indigenous peoples) and governments.

We continue to seek the support and agreement of indigenous peoples potentially affected by our projects. We do this through mutually agreed, transparent and culturally appropriate dialogue and impact management processes.

CULTURAL HERITAGE

Preserving cultural heritage is an important part of managing social impact. When two slave cemeteries were discovered five years ago in a sugar cane field next to Shell Convent Refinery in Louisiana, we commissioned an archaeological and genealogical study. The property is owned by Shell and contains the remains of more than 1,400 people. Together with the River Road African American Museum, we decided to invest in protecting and preserving the cemeteries for future generations. Dedication ceremonies were held in March 2018. The project has resonated strongly with descendants, members of the local communities and our employees.

INVOLUNTARY RESETTLEMENT

Shell company operations sometimes require temporary or permanent access to areas of land or sea where people are living or working. Where resettlement is unavoidable, we work with local communities to help them relocate and maintain, or improve, their standard of living. If necessary, we help support them as they establish alternative livelihoods.

In Kazakhstan, an expansion of the safety perimeter around the Karachaganak field, owned and operated by Karachaganak Petroleum Operating B.V. (KPO) (Shell interest 29.25%) required 464 families from the villages of Berezovka and Bestau to be resettled. The physical resettlement of the families was successfully completed in 2018 with work currently underway to support the restoration of their livelihoods and monitor their resettlement.

KPO worked with the government and communities to help people obtain comparable or better housing and restore their livelihoods. Resettlement started in 2015 and was carried out in accordance with KPO's final production sharing agreement, current legislation of the Republic of Kazakhstan and international standards for resettlement (IFC Performance Standard 5). Read more at www.shell.com/resettlement.

EXTERNAL VOICE

When the safety zone around Karachaganak Petroleum Operating BV's (KPO) facility in Bestau, Kazakhstan, was expanded, nearby residents like Zauresh were required to move home.

"I have lived over 40 years in Bestau and my children were born here. This is my home. So, I would like to thank the KPO management for this opportunity to spend the rest of my life in favourable and good living conditions. This means the world to me and my family. We have a community grievance procedure in place so we can contact the community liaison officer at KPO any time. KPO continues to monitor the resettlement and assist with repairs and other problems when we report them via the community feedback tool."



Zauresh Selbayeva

Resident of Araltal, Kazakhstan

SECURITY

Managing security risks helps protect our employees, contractors, fence-line communities and the environment.

In line with our goal of no harm to people, we carefully assess the security threats and risks to our operations. We work with governments and partners to safeguard assets and provide a secure working environment for employees and contractors. Shell only uses armed security in countries where the threats are most severe, or if it is a requirement under local laws.

Given our digitalisation efforts and increasing reliance on information technology systems for our operations, we continuously monitor external developments and actively share information on threats and security incidents. Shell employees and contract staff are subject to mandatory courses and regular awareness campaigns aimed at protecting us from cyber threats.

We periodically test and adapt cyber-security response processes and seek to enhance our security monitoring capability. Read more about our approach to cyber security in our [Annual Report](#).

Security and human rights

We work to maintain the safety, security and human rights of our employees, contract staff and local communities. The Voluntary Principles on Security and Human Rights (VPSHR) are implemented across Shell where there are identified threats of infraction.

Safety

We continue to play an active role in the Voluntary Principles Initiative, considered the benchmark for human rights standards related to security. In 2018, a Shell representative was a member of its steering committee, working with other partners on the initiative to advance security and human rights implementation. The steering committee drives the initiative's agenda and helps build consensus across the various stakeholders, who include governments, civil society organisations and major oil and gas companies.

KEEPING SAFE

We work to deliver energy responsibly and safely. We aim to do no harm to people and to have no leaks across our operations. We refer to this as our Goal Zero ambition.

Every employee and contractor is expected to meet our safety standards and requirements, including following our 12 Life-Saving Rules. We continue to strengthen the safety culture among our employees and contractors.

We expect everyone working for Shell to intervene and stop work that may appear unsafe.

We investigate incidents and aim to learn from them, sharing findings to improve safety performance across our industry.

Read more about our 12 Life-Saving Rules at www.shell.com/lifesavingrules.

PERSONAL SAFETY

Every one of our people plays an important role in maintaining a safe working environment. We aim for a safety culture that goes beyond compliance. This means people should feel listened to and cared for, and comfortable raising concerns or dilemmas.

We hold a safety day each year when employees and contractors across Shell share perspectives about safety hazards in their work. In 2018, sessions focused on care, dilemmas and avoiding complacency towards everyday risks (or "risk normalisation").

Our facilities are often located in harsh environments and our people often work in demanding roles, having to manage many different hazards. We ensure that people have the necessary safety training and skills. For example, everyone working in an offshore location must complete basic offshore safety induction and emergency training in survival skills.

Personal safety performance

In 2018, following steady and significant improvements in our safety performance over the past decade, the number of injuries per million working hours – the total recordable case frequency (TRCF) – increased slightly to 0.9 compared with 0.8 in 2017.

We include VPHSR clauses in our private security contracts and raise the principles in engagements with public security forces. We carry out annual risk assessments and develop plans to manage the identified risks. For example, in 2018 in Iraq, we trained the Iraqi Oil Protection Force (the government security force) on VPSHR as part of a broader skills training programme. And in Nigeria, we maintained a regular dialogue on VPSHR with the government security agencies and work to deliver human rights training.

Read more about our approach to security and human rights at www.shell.com/humanrights.

Total recordable case frequency (TRCF)

Injuries per million working hours



The level of injuries that led to time off work in 2018 also increased compared to 2017.

Lost time injury frequency (LTIF)

Injuries per million working hours



Tragically, two people lost their lives while working at Shell locations in 2018: one person died at a refinery in Germany and another at an onshore well in the USA. Our fatal accident rate – the number of fatalities per 100 million working hours – remained flat in 2018 compared to 2017.

Fatal accident rate (FAR)

Fatalities per 100 million working hours



PROCESS SAFETY

Process safety management is about keeping our hazardous substances in pipes, tanks and vessels so they do not cause harm to people or the environment. It starts with designing and building projects and is implemented throughout the life cycle of the facilities to ensure they are operated safely, well-maintained and regularly inspected.



Shell operates a liquefied natural gas regasification terminal in Hazira on the west coast of India.

Our global standards and operating procedures define the controls and physical barriers we believe are necessary to prevent incidents. For example, our offshore wells are designed with at least two independent barriers in the direction of flow to mitigate the risk of an uncontrolled release of hydrocarbons. Shell companies regularly inspect, test and maintain these barriers to ensure they meet our standards.

In 2018, leaders throughout Shell continued to work with their teams to develop a better shared understanding of process safety challenges and behaviours, and how to jointly design improvements. For example, at the Moerdijk chemicals site in the Netherlands, leaders and frontline operators co-created an improved approach to safe isolation, which is intended to ensure people and dangers – such as electricity or hazardous chemicals – are separated during operations.

We continue to take steps to better align and improve the various approaches to managing facilities across our businesses with the aim of having simpler and safer ways of working. These steps include starting to introduce a single global asset management system to be adopted by Shell-operated facilities and some non-operated ventures. The system provides asset managers with an overview of steps they should take for safe and efficient management of facilities. For example, it includes expectations related to asset equipment care, maintenance, learning from incidents and conducting assurance. Having a single system is expected to help Shell companies improve the way they manage the safety performance of assets. It also helps to foster better knowledge management and networking across businesses to enable us to accelerate lessons learned across Shell.

Process safety fundamentals

Since 2016, we have been embedding a set of process safety fundamentals across Shell, which provide clear guidelines for good operating practice to prevent unplanned releases of hazardous materials. We have encouraged employees and contractors at facilities to use these fundamentals in everyday conversations to give visibility to safety dilemmas, so they can be resolved.

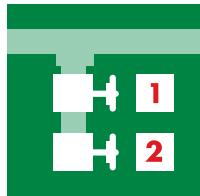
Read more about our approach to process safety at www.shell.com/process-safety.

Process safety performance

In line with industry standards, we measure and report process safety incidents according to significance, with Tier 1 as the most significant. Following the disappointing results in 2017, when our process safety performance deteriorated, there has been renewed focus and effort in all businesses in 2018 to improve performance, including further implementation of our Process Safety Fundamentals.

10 process safety fundamentals

Always use two barriers for hydrocarbon and chemical drains and vents



Do not leave an open drain or critical transfer unattended



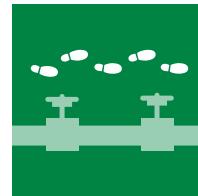
Take interim mitigating measures in case of failure of Safety Critical Equipment



For all defined high-risk activities, follow the procedures and sign off after each step



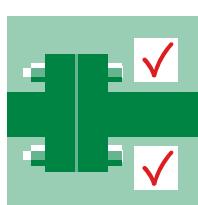
Walk the Line – Verify and validate any line up change



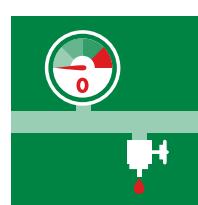
Do not make a change without a proper Management of Change



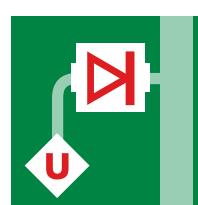
Verify for complete tightness after maintenance work



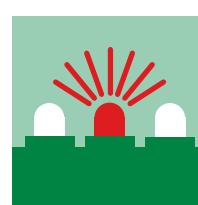
Always check that equipment is pressure free and drained, and provides safe isolation before starting maintenance work



Perform Management of Change and install backflow protection when connecting utilities to process



Respond to critical alarms

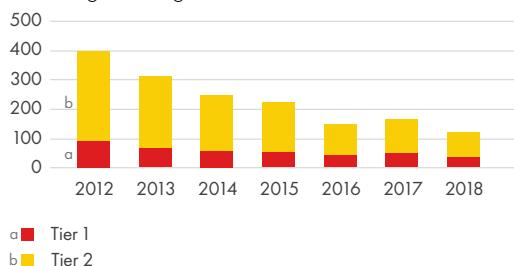


The number of Tier 1 and 2 operational process safety events decreased from 166 in 2017 to 121 in 2018, of which 35 were Tier 1 and 86 were Tier 2, returning to our multi-year improvement trend.

In 2018, the most significant incidents related to process safety were a fatality at our Rheinland refinery in Germany and a spill at the Trans Ramos pipeline in Nigeria.

Tier 1+2 process safety events

excluding sabotage



Process safety events related to sabotage and theft in Nigeria are recorded separately. There were nine Tier 1 events in 2018, the same as in 2017.

Read more about Shell and safety at www.shell.com/safety.

PRODUCT STEWARDSHIP

We work to ensure our products - such as fuels, lubricants and chemicals - are safe throughout their life cycle. Our goal is to protect employees, customers, communities and the environment from potential risks posed by these products.

Good product stewardship means we assess and manage the products' potential health, safety and environmental risks. We work with our customers and suppliers, monitor changes in the science behind our products and support research to reduce risks. We communicate the potential hazards associated with our products and publish safe handling information on labels and safety data sheets.

We also comply with, and monitor changes to, applicable regulations. In regions around the world, various regulations designed to create a more circular economy are in development and we are preparing to meet those requirements when they are introduced.

We also support safe and sustainable products through the use of internal reviews for products we develop. Our OilSafe programme uses a classification process, for example, to identify lubricant additives that have characteristics that could lead to handling risks, such as a low flash point or hazardous or toxic components. When these substances are part of a formulation, our process requires that their use be reviewed. Based on our review results, we either stop use, replace the additive, or implement controls to reduce the risk of handling the final product.

You can read more about our product stewardship, as well as our commitment to animal welfare in relation to product safety testing at www.shell.com/product-stewardship.

RAISING STANDARDS

ACROSS THE INDUSTRY

We share our safety experience and standards with other operators, contractors and professional organisations, including the International Association of Oil & Gas Producers (IOGP) and the Energy Institute.

In 2018, we shared [training materials](#) with the Energy Institute, including toolkits that encourage reflection on how incidents with potential safety risk could be managed and how participants could apply the lessons learned in their line of work.

We have also started sharing what we have learned from the tragic road tanker incident that took place in Pakistan in 2017 with others in the fuel transport industry (see Pakistan section below).

IN TRANSPORT

Moving large numbers of people, products and equipment by road, rail, sea and air poses safety risks. We develop best-practice standards within Shell to reduce transport safety risks, and work with specialist contractors, industry bodies, non-governmental organisations and governments.

In shipping, for example, we are working with our contractor partners on a programme to improve the quality and consistency of their safety management and on tools to help learn from incidents. In 2018, we visited more than 700 ships to engage mariners on safety and make the programme more effective.

We also launched a new risk model for accident prevention. In the past, the shipping industry mostly relied on learning about incidents after they have happened. This new statistical model recognises precursors or small leading events, such as a small leak or technical issue, to predict the risk of a serious incident. Identifying the precursors allows companies to address them, which helps to reduce the potential for significant incidents.

In the air, chartered planes, which fly around 11,000 hours a year for us, are used to transport passengers, observe pipelines and carry out geophysical surveys. Everyone at Shell working in an offshore location must complete basic offshore safety induction and emergency training (BOSIET) in survival skills.



We use helicopters for about 52,000 flying hours a year to carry people to and from facilities onshore and offshore.

In 2018, we worked on a programme with offshore helicopter safety association HeliOffshore, the IOGP, aircraft manufacturers and aviation regulators to drive safer ways of working with aircraft. This included improving helicopter vibration monitoring systems, passenger survival training and survival equipment.

Also in 2018, we saw growth in the use of remotely-piloted aircraft systems – or drones – and they are now used regularly. This technology helps our teams to conduct tasks, such as inspecting the condition of oil and gas facilities and infrastructure in high or hard to reach places, more safely and efficiently.



An inspection of QGC Pty Limited's gas production operations in Australia only took two days compared to weeks of traditional ground inspection, saving around 6,500 kilometres of driving.

Road traffic accidents claim around 1.35 million lives every year, according to the World Health Organization. Shell employees and contractors drove a combined distance of around 600 million kilometres on business in 2018 in more than 60 countries. There were no road transport related fatalities in 2018 in assets and activities under the operational control of a Shell company.

We run road safety programmes, such as our mandatory defensive driving course, which teaches safe techniques and behaviour.



We require everyone driving more than 7,500 kilometres a year on Shell business on public roads and those who drive in high-risk road safety countries to take an in-vehicle defensive driving course.

In 2018, around 3,200 people completed some form of in-vehicle training. We also introduced an annual online defensive driving training course, which consists of seven different modules with a focus on hazards such as fatigue, for all who drive on public roads on Shell business.



In the USA, rising energy industry activity in the Permian Basin has led to increased traffic and more serious road accidents and fatalities.

SWEPI LP, a subsidiary of Shell Oil Company, has taken proactive steps to improve safety in the Permian Basin, including piping water to operations to reduce water trucks on the road and building accommodation for workers to split up long journeys.

We also work with our industry peers, such as operators and contractors, to develop policies that improve road safety. For more information about these efforts, see [The road to better safety](#).

Outside our operations, we also work to improve road safety in several communities and countries where we operate.

Myanmar

The Yangon-Nay Pyi Taw highway is known for its high accident rate. In 2017, Shell Myanmar Energy Private Limited launched a road safety campaign with the Myanmar Red Cross Society and the Global Road Safety Partnership to educate drivers and communities on safe road use. In October 2018, the second phase of the campaign was launched, covering the entire Yangon-Nay Pyi Taw-Mandalay highway.

The campaign reminds motorists to drive carefully and return home safely by using billboards and signs with messages from children. We also worked with the campaign partners using social media to educate and encourage a wide audience on safe driving habits and road use.

More than 6.5 million drivers have been exposed to the road safety messaging on the highway and 7.5 million people have been reached through the national campaign.



In December 2018, our road safety campaign on the Yangon-Nay Pyi Taw highway was recognised for its effectiveness in delivering change by the prestigious Prince Michael International Road Safety Award.

EXTERNAL VOICE

TechnipFMC is a global contractor that has worked with Shell on several major construction projects, including the Kaikias deep-water oil and gas project in the Gulf of Mexico. TechnipFMC participates in our contractor safety leadership initiative which encourages us to work more closely to improve safety.

"We set out to optimise the design of the Kaikias deep-water project in the Gulf of Mexico by taking an integrated approach, working closely with the Shell team. This meant taking steps included executives engaging early with each other and their people, using a single execution team, a simplified architecture and using next generation products. Shell empowered us to implement our health, safety, security and environmental management plan, which was a key factor for both companies to focus on a common safety goal, Goal Zero, which is to achieve no harm and no leaks across all operations. All this helped us achieve an exceptional safety record. Our aligned objective was to deliver an accelerated time to first oil and a sustainable capital expenditure reduction in a safe and responsible manner. Shell's contractor safety leadership programme allowed us to identify collaborative strategies to successfully accomplish our shared objective."



Doug Pferdehirt
Chief Executive Officer, TechnipFMC

India

In India, Shell India Markets Private Limited worked with the transport ministry on an awareness campaign on social media which reached close to 7 million people across the 10 most accident-prone cities in the country. IndiGo airlines and Mahindra Logistics have now joined the campaign.

Pakistan

In June 2017, a devastating roll-over incident occurred in Pakistan involving a road tanker hired by a company that was providing road transport services to Shell Pakistan Limited, following which people from a nearby village approached the incident site to collect spilled fuel. Tragically, the fuel ignited resulting in the loss of more than 200 lives and left many other people seriously injured.

Following the incident, Shell Pakistan Limited provided immediate relief support including providing food supplies for 150 affected families for nine months and medical supplies to hospitals. Shell Pakistan Limited has also contributed to long-term relief efforts for those impacted. For example, the CARE Foundation, in partnership with Shell Pakistan Limited, has 'adopted' two public schools within the impacted villages to improve infrastructure and education standards. Shell Pakistan Limited is also working with the National Rural Support Programme to help restore livelihoods of people in affected communities, providing vocational training and support for setting up small businesses.

We finalised our internal investigations in 2018 and we continue to implement our learnings from the incident. This includes deep reflection by the Royal Dutch Shell plc Board and Executive Committee, who have initiated several improvement programmes to be adopted throughout Shell globally. We have developed and started the implementation of a road transport improvement project, specifically targeted at the management of fuel transport in high-risk countries. We are working with road transport companies in other locations where factors relevant to the Pakistan incident may exist and have also started sharing what we have learned with others in the fuel transport industry.

Shell Pakistan Limited continues to work with regulators, emergency services and the wider oil and gas industry in Pakistan with a view to improving safety standards. Shell Pakistan Limited has also required the road transport companies it hires to improve the safety of their transport fleets and has ongoing safety engagements with hauliers and their drivers, seeking to help them to identify and address the risks associated with driving fuel tankers. This has included emergency response drills to build and test capability.

Road transportation remains a challenging and complex area for industry worldwide. Sadly, in October 2018, there was another roll-over incident in Pakistan involving a customer tanker, which resulted in the death of the relief driver and a spill. This incident was outside of Shell's operational control and outside of our reporting scope.

WITH OUR CONTRACTORS

We employ a large number of contractors who often perform activities with high safety risk. We work with our contractors to ensure they understand our safety requirements and together we build skills and expertise to improve safety performance.

For example, Shell's Pulau Bukom Manufacturing Site in Singapore continued to embed a programme to improve safety by encouraging people to identify hazards and take ownership of barriers to keep themselves and others safe. The Blue Zone Barrier Thinking programme, originally successful in our lubricants business, uses briefing materials with clear, simple language and visuals that enhance daily safety sessions, and encourages supervisors to hold discussions rather than tell teams about risks. Around 6,000 Shell employees and contractors, from diverse backgrounds and nationalities, work at the Bukom site.

Working together

Since 2014, executives from Shell have collaborated in pairs with executives of major contractor companies – as part of Shell's contractor safety leadership programme – to identify strategies and practical steps to improve safety culture and achieve our Goal Zero ambition of no harm and no leaks, including driving standardisation together. The programme has a joint safety vision – what they call a declared future – and now includes 19 companies. One of these companies, TechnipFMC worked with us to deliver the Kaikias project in the Gulf of Mexico ahead of schedule, with an outstanding health, safety and environmental rating. Together, we set the project up to succeed through early engagement and by agreeing to simplified structures and processes.

After five years of preparation and onshore work, and eight months of offshore work, Heerema Marine Contractors (HMC) completed the offshore installation of the Appomattox (USA) project for Shell in October. The executive pair's close collaboration and alignment, nurtured throughout the project execution, helped to deliver an outstanding safety performance. Almost 830,000 offshore man hours of work were spent on HMC's deep-water construction vessel Balder without significant incidents.

In 2018, Shell and these major contractor partners signed up to a set of principles with the goal to improve worker welfare within our industry (see [Supply chain](#)).

PREPARING FOR EMERGENCIES

We make sure that we have the necessary resources to deal with spills, leaks, fires and explosions, both offshore and onshore. We regularly test our oil-spill and emergency response procedures and capability to ensure employees and contractors can respond rapidly to an incident.

In 2018, we trained around 850 employees on four large-scale oil spill exercises – two in the USA, one in Kazakhstan and one in the Philippines. All the exercises involved our emergency response contractors and joint venture partners, and local authorities. The events included training followed by two-day exercises to test and practice our organisational capability to manage a worst-case spill incident.

For example, in our Kazakhstan joint venture North Caspian Operating Company (NCOC) (Shell interest 16.81%), an exercise designed and led by Shell simulated a leak from a damaged oil pipeline near reed beds in shallow water, making it difficult to respond by boat. The simulation tested the necessary procedures required to effectively use dispersants and control in-situ burning. The exercise involved close collaboration with our joint venture partners and local government officials.

All our offshore facilities have plans in place to respond to spills. We have resources available on location, for example, floating barriers to contain an oil spill, or through our contractors, such as collection vessels and aircraft used for spill monitoring or dispersant spraying when permitted. We were founding members of the Subsea Well Response Project consortium (now part of the Oil Spill Response Limited), an industry group which aims to improve well-containment globally, and the Marine Well Containment Company, a non-profit industry body providing a response system for the Gulf of Mexico.

During drilling operations, we gather and analyse information about wells to better understand the geology of the area. Pressure and temperature sensors track conditions in real time so that we can immediately detect any changes. Shell-operated drilling activities are continually monitored from onshore operating centres which allow oversight and timely technical support.

Environment

OUR APPROACH

We carefully consider the potential environmental impact of our activities and how local communities might be affected during the lifetime of a project.

We aim to comply with all applicable environmental regulations, continually improve our performance and prepare for future challenges and opportunities. We use external standards and guidelines, such as those developed by the World Bank and its International Finance Corporation, to inform our approach.

We follow global environmental standards for managing our emissions, minimising our use of fresh water and

conserving biodiversity. Within our operations, we also focus on reducing energy use, flaring less gas and preventing spills and leaks of hazardous materials.

When planning new major projects, we carry out detailed environmental, social and health impact assessments (see [Embedding sustainability into projects](#)).

As a member of the Natural Capital Coalition, we continue to follow work on the evolving concept of natural capital – the value of nature to people, society, business and the economy.

BIODIVERSITY AND SENSITIVE AREAS

We seek to understand and respond to any potential impacts our activities may have on biodiversity. This includes the benefits that people or businesses derive from ecosystems, such as food and clean water.

In our projects and operations, we aim to avoid impacts on biodiversity and ecosystem services. Where avoidance is not possible, we aim to minimise our impact. Where our operations have affected biodiversity and the communities who rely on biodiversity for their livelihoods, we take measures to help restore impacted habitats. We look for opportunities to make a positive contribution to conservation where we operate.



Once barren, an area of 1,200 hectares along the Hazira peninsula now thrives with animal and plant life. Shell and its partners planted mangroves as part of the coastline restoration project.

We develop biodiversity action plans when operating in areas that are rich in biodiversity, known as critical habitats, to assess and mitigate our impact on local biodiversity and dependent communities. To help us improve our environmental performance, including protecting biodiversity, we work with scientific and conservation organisations around the world.

We support research programmes to protect [life below water](#), for example to increase our understanding of marine mammals and their behaviour and find ways to minimise the impact on them when working in marine environments. Shell is a member of the International Association of Oil & Gas Producers Joint Industry

Programme on Sound and Marine Life, an initiative to improve understanding of the effect that sound generated by oil and gas exploration and production has on marine life.

In 2018, the joint industry programme worked with academia and regulators to review progress of its research. Since 2006, it has funded \$60 million of research leading to about 120 peer-reviewed publications, which help operations planning and to inform industry mitigation strategies and government regulations. An example of this is the study carried out by Leiden University and its partners in 2018, where cod in the North Sea were tagged and observed during an experiment using seismic sounds.

BIODIVERSITY MANAGEMENT IN CANADA

The LNG Canada project has carried out impact assessments and developed comprehensive management and mitigation plans to respond to and offset the impacts that activities may have on the local marine environment.

In Canada, we are releasing about 50,000 square kilometres of exploratory permits off coastal British Columbia to support [marine conservation efforts](#). We are working with the Government of Canada in consultation with indigenous peoples and environmental groups to support effective conservation outcomes.

Shell's contribution is in line with the Government of Canada's commitment to conserve 10% of Canada's coastal and marine areas by 2020, and the aim of government, indigenous communities and environmental organisations to advance marine conservation.

At Shell Canada's Groundbirch natural gas project in British Columbia, a collaboration with the Twin Sisters Native Plant Nursery, a local indigenous-owned business, is enabling reclamation of the natural landscape using traditional knowledge and native plant species (see [Delivering natural gas in Canada](#)).

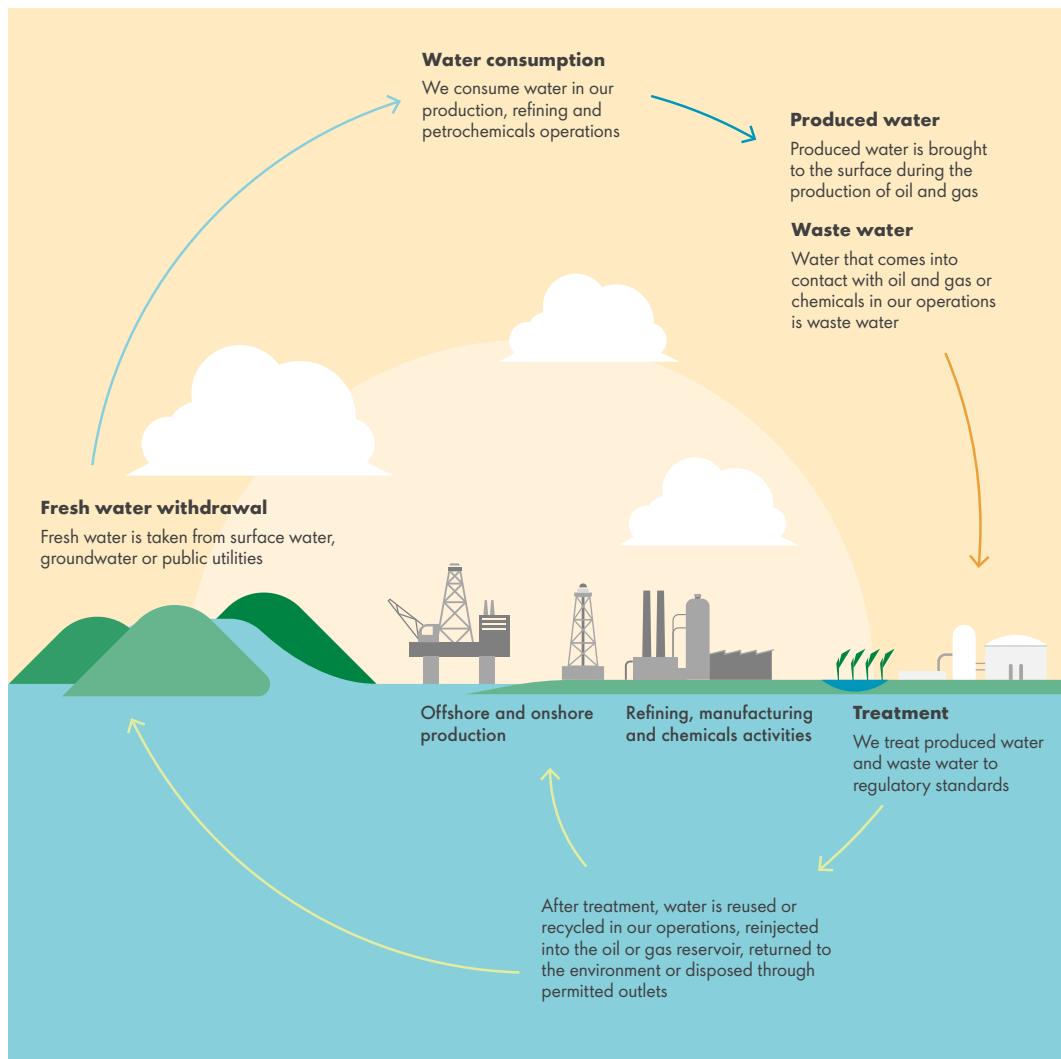
Read more at www.shell.com/biodiversity.

WATER USE

Few natural resources are as essential as fresh water and its importance will only rise as the world's population increases and developing economies continue to grow. The availability of fresh water is a growing challenge in some parts of the world, as it is not always available where people need it or in a form that is easy to use.

We carefully manage our water use and discharges. We design and operate our facilities to help reduce fresh water use, and we tailor our use of fresh water to local conditions because water constraints affect people at the local or regional level.

Water use



ASSESSING WATER CONSTRAINTS

Our environmental, social and health impact assessments help us to better understand the water risks for our projects and broader watershed impacts. We evaluate the long-term sustainability of water resources to select the option that avoids or minimises disruption to the environment and other users.

We assess risks based on water availability, quality and accessibility. To help us define water stress conditions, we use a combination of publicly available water stress tools, such as the World Resources Institute's Aqueduct Water Risk Atlas, and information specific to the local environment.

In water-scarce areas, we develop water management plans for our facilities. These plans describe the long-term risks to water availability and define measures to minimise our use of fresh water or recommend alternatives, such as recycled water, processed sewage water and desalinated water.

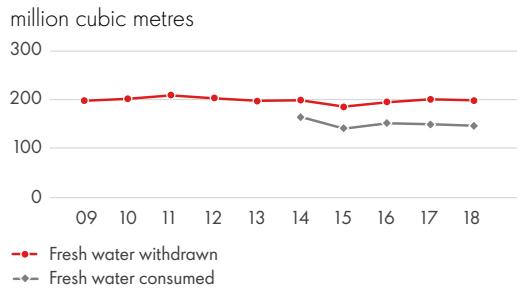
For example, in 2018, Shell affiliate QGC Pty Limited's natural gas project in Queensland, Australia, continued to conduct research into groundwater-dependent ecosystems in the Surat Basin. We want to determine the impact of water use in areas where surface water is absent for large parts of the year and where ecosystems are dependent on groundwater. We have a robust monitoring programme with response plans in place to identify and mitigate any impacts from our operations.

Read more at www.shell.com/water-use.

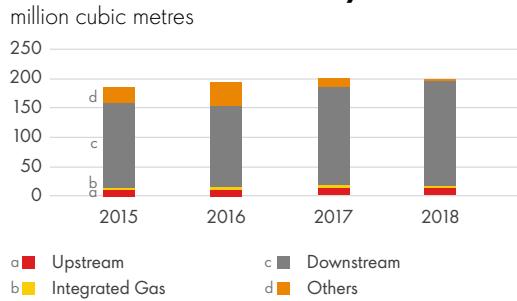
FRESH WATER USE PERFORMANCE

In 2018, our intake of fresh water was 199 million cubic metres, about the same as 2017. Around 90% of our fresh water intake was used for refining oil products and chemicals, with the balance mainly consumed in oil and gas production. Around 40% of fresh water intake was from public utilities such as municipal water supplies.

Fresh water withdrawn and consumed



Fresh water withdrawn by business



The volume of fresh water withdrawn by our Downstream business increased in 2017 and 2018, due primarily to the inclusion of two refineries previously operated by the Motiva joint venture in the USA in our data from May 2017. This increase was partly offset by the exclusion of oil sands when operatorship was transferred to another company, Canadian Natural, in 2017 (oil sands data are included in Others in the graph).

WASTE WATER AND PRODUCED WATER

We develop technologies to treat, reuse and recycle water from our operations so that we can manage our water footprint in a responsible way while meeting environmental standards. Where appropriate, we look for ways to treat water from our operations using natural solutions such as constructed wetlands.

We have worked for several years to improve water management at our unconventional projects. For example, SWEPI LP – a subsidiary of Shell Oil Company – at its operation in Appalachia, USA, shares produced water with other operators in the region so it can be reused, thereby minimising disposal of waste water.

At the Groundbirch shale gas project near Fort St. John, Canada, we minimise the use of fresh water by storing, recycling and reusing produced water. However, the asset still has excess waste water in the system that needs to be managed responsibly. In 2018, we started testing a new technology unit which enables us to dehydrate waste water at the point of creation and evaporate clean water back to the atmosphere, reducing waste water volumes for disposal.

We track low-level concentrations of oil, grease and other hydrocarbons within water returned to the environment from the day-to-day running of our facilities (collectively referred to as "discharges to surface water"). We work to minimise these discharges in line with regulatory requirements and our own standards to reduce the potential for environmental impacts on local water quality. In 2018, the combined total hydrocarbons discharged to surface water from our facilities was 1.4 thousand tonnes, up from 1.2 thousand tonnes in 2017. This was mainly due to changes in how we collect and analyse samples and calculate the amount of oil discharged to water at our Pulau Bukom site in Singapore.

WORKING WITH OTHERS

We support [open innovation](#) and work closely with organisations, such as the World Business Council for Sustainable Development (WBCSD) and IPIECA, the global oil and gas industry association for environmental and social issues.

In 2018, Shell led the development of water horizon scanning through IPIECA's Water Working Group. As water trends, regulation and policy advance, it is important that IPIECA tracks these trends proactively to allow members to plan for the future.

Shell is a member of the [Water Nexus consortium](#) in the Netherlands, a collaboration between universities, government bodies and industry. The consortium supports research on innovative approaches to secure water supply essential for domestic, industrial and agricultural use, such as green infrastructure and the use of saline water instead of fresh water.

SOIL AND GROUNDWATER

We assess and carefully manage the risks of potential soil and groundwater contamination. We conduct scientific research on the behaviour and potential risks of contamination from petroleum activities and share our findings with government agencies, researchers and other stakeholders to support the development of environmental guidelines.

Soil and groundwater remediation is designed to mitigate risks to health and the environment, but can also generate its own environmental, social and economic impacts. We believe remediation activities can be made more sustainable and have co-authored the first ISO Standard on Sustainable Remediation. We have started to apply the approach in our own soil and groundwater projects.

Producing shale oil and gas responsibly

Shales – also known as tight gas and oil – will continue to play an important role in meeting global energy demand. We remain focused on producing oil and gas from shales safely and responsibly, using advances in technology and by following our onshore [operating principles](#).

We are involved in six shale plays in the Americas and expect the shales business to become a significant growth priority for Shell in the next decade.

In 2018, we focused on production growth at the SWEPI LP (a subsidiary of Shell Oil Company) light tight oil facilities in the Permian Basin in the USA and our facilities at Fox Creek in Canada, bringing new wells online and investing in supporting infrastructure.

TACKLING EMISSIONS

Addressing air quality and fugitive emissions is a top priority in our shale operations. Our approach includes voluntary methane leak detection and repair programmes, primarily using optical gas imaging cameras (see [Methane emissions](#)).

In 2018, Shell and its partner Avitas Systems, were the first in the USA to gain approval for flying commercial drones beyond visual line of sight with the support of radar, which enables next generation detection technology such as surveillance drones.



Drones use onboard sensors and cameras to collect data. They can allow us to automate tasks, including detecting oil and gas leaks, corrosion, abnormal heat signatures, and monitoring road conditions. They also mitigate significant risk to personal safety by reducing the road exposure of our operations teams and providing better insight into the overall condition of facilities. This could enable teams to proactively identify issues and fix them faster, while also reducing safety exposure.



Shell is testing drones in the Permian Basin to survey infrastructure across vast stretches of land faster than ever before.

ROAD SAFETY

Rising oil and gas production activity in recent years in the Permian Basin has led to increased traffic and more serious accidents and fatalities.



The shale revolution has transformed the Permian region, bringing thousands of oil and gas workers and causing a massive spike in traffic.

As a founding member of the Permian Road Safety Coalition, we successfully advocated and helped secure \$1.8 billion in funding from the Texas Department of Transportation to help find ways to reduce risks on the roads. This work includes agreeing to policies such as lowering the 75 mile-per-hour (120km/hour) speed limit, widening roads and constructing passing and turning lanes to minimise conflict points prone to crashes.

Read more about this ongoing work at www.shell.com/permian-basin-road-safety.

In 2018, Shell also collaborated with 16 energy companies that together pledged to set aside \$100 million over the next few years to ease the increase in demand for roads, healthcare, education and affordable housing from the rising shale activity in West Texas and New Mexico. The aim is to preserve the quality of life that make so many want to live and work in the region.



Shell has provided funding and support for medical clinics in the Permian region. Many of the operations in the Permian region are two or more hours away from hospital services.

WATER USE

We have worked for several years to improve water management at our shale facilities in Canada. At Shell's Groundbirch project, in British Columbia, we minimise the use of fresh water by storing, recycling and reusing produced water (see [Delivering natural gas in Canada](#)).

At Fox Creek, Alberta, we also agreed with the municipality to use treated waste water for hydraulic fracturing and the municipality helped upgrade the town's reclaimed water facilities.

For more details on our approach, see [Water use](#).

LOCAL COMMUNITIES

In 2018, we held extensive engagement sessions with indigenous people, local farmers, and nearby communities in the Vaca Muerta shales basin in Neuquén, Argentina. This included training programmes for local community members interested in joining the industry and a programme that promoted livestock production and farming, and helping local farmers gain better access to water. Through this outreach, we have managed to develop strong relationships with the community in the basin, avoiding impact on other people and disruption to our activities.

DECOMMISSIONING AND RESTORATION

Safe and responsible decommissioning is a priority for Shell. This includes restoring the surroundings of platforms and facilities in line with relevant legislation, while taking our own environmental standards into account.

Decommissioning is part of the normal life cycle of every oil and gas structure when a facility reaches the end of its life. A growing number of oil and gas platforms and facilities are ageing, and their economically recoverable reserves offshore extracted, so we expect decommissioning will increase over the next few decades.

Every decommissioning project is different and needs to be tailored to the facility design, local context and local legislative requirements. Some of our more complex decommissioning projects take place offshore.

Our largest decommissioning project to date is the Brent oil and gas field, which lies in the North Sea between the UK and Norway. Preparation for decommissioning the four Brent platforms – Alpha, Bravo, Charlie and Delta – started more than a decade ago.



The 24,200-tonne Brent Delta topside, which was removed and brought onshore in 2017, is being recycled in Hartlepool, UK.



In 2018, we made significant progress in dismantling the topside.



We expect to recycle more than 97% of Brent Delta's material. Furniture, equipment and lighting has been donated to local charities.

In 2018, Shell also received regulatory approval to decommission the Tapti field, a former BG project in India. Through our subsidiary BG Exploration and Production India Limited, we jointly operate the project (Shell interest 30%) with Indian National Oil Company, Oil and Natural Gas Corporation and Reliance Industries Limited. Production at Tapti stopped in March 2016 and plugging and abandonment of all 38 wells has been completed. Work is underway to decommission the field's five platforms and its pipelines.

WASTE

We aim to reduce the amount of waste we generate and to reuse or recycle materials.

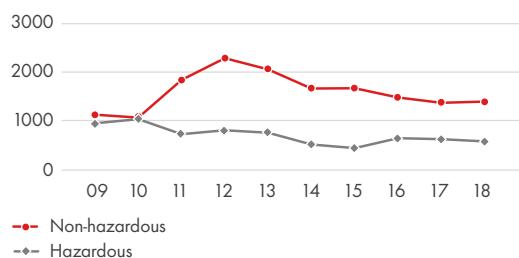
In 2018, we disposed of 1,999 thousand tonnes of hazardous and non-hazardous waste, which is broadly comparable to 2017.

We also track the amount of residual materials sent off-site for recycling or reuse that otherwise would have been disposed of as waste.

In 2018, we sent close to 400,000 tonnes off-site for recycling or reuse. Six of our downstream manufacturing sites sent more than 50% of their waste generated during the year for recycling or reuse in 2018. Of these six, three sites sent more than 80% of their waste for recycling and reuse.

Waste disposal

thousand tonnes



We identify effective partnerships when it comes to managing our waste. Shell's floating liquefied natural gas (FLNG) facility Prelude, off the coast of Australia, set up a waste management process with Rusca Environmental Solutions, which is the only 100% indigenous-owned waste management contractor in Australia. The partnership has generated capacity building opportunities with Rusca, enabling the company to develop new skills and improvements in waste management.

In 2018, Shell's logistics, information technology and waste support team identified a waste management software solution. We believe the system will generate significant value through greater transparency and automation of our waste management procedures around the world.

PLASTICS

We produce chemicals that are the raw materials for plastics and plan to produce more as global demand increases. Plastics provide important benefits, helping to improve living standards, hygiene and nutrition around the world. Plastics are often associated with disposable and throwaway packaging but many products have different and long-term uses such as medical equipment, computers, smart phones, window frames, sports equipment and roofing.

Most plastics use fewer resources and have a lower carbon footprint than the glass, paper and metal they have replaced. For instance, efficient plastic insulation and lightweight plastic parts in cars and planes save energy, which helps to avoid CO₂ emissions. Plastics are also integral in the construction of renewable energy infrastructure, such as wind turbines and solar panels.

We share public concern about plastic waste and want to play an active role in finding lasting solutions to this challenge. The problem is not with plastics themselves, but what happens after people use them. Sometimes waste management infrastructure and traditional recycling do not exist, or plastic waste is not managed appropriately. And as a result, plastic waste can end up as litter.

We are a founding member of the new Alliance to End Plastic Waste. This alliance of global companies includes chemicals and plastic manufacturers, consumer goods companies and waste management companies, along with the World Business Council For Sustainable Development. The alliance has committed more than \$1 billion with the goal of investing \$1.5 billion over five years to help end plastic waste in the environment. It focuses on four areas: waste infrastructure, innovation, education and clean-up.

WHAT ELSE IS SHELL DOING?

We are exploring process technologies to make better use of plastics after consumers have finished using them. For example, by turning them into useful liquids that could be used as a source of energy, as chemicals or as new products, which would help develop a circular economy of plastics.

The Shell Pennsylvania Petrochemicals Complex (Shell Chemical Appalachia LLC) in the USA is collaborating with local groups to encourage more plastics collection, recycling and education. Shell Retail is helping its service stations reduce, reuse and repurpose food, paper and packaging waste across its operations and supply chain, for example by incentivising the use of reusable bags and cups. And Shell Lubricants, our business that makes and sells engine and industrial oils, has a strategy to reduce, reuse and recycle packaging across its supply chains. Shell Lubricants is also exploring different and more sustainable packaging solutions, such as new packaging formats and dispensing and refill solutions.

Read more at www.shell.com/plasticwaste.

FLARING

The flaring of natural gas wastes valuable resources and contributes to climate change. We are working hard to reduce flaring associated with oil and gas production.

Flaring is used to safely dispose of hydrocarbons that could otherwise pose a hazard to workers, nearby residents and facility equipment during non-routine occurrences. These occurrences include start-ups, process upsets, maintenance turnarounds, and equipment or power failures where production system pressure must be safely relieved.

In some situations, gas that is produced alongside oil, known as associated gas, may also be flared when there are insufficient or no facilities to gather the gas.

As a signatory to the World Bank's "Zero Routine Flaring by 2030" initiative, Shell continues to actively pursue its 2015 commitment to eliminate associated gas flaring at its operations by 2030. Shell's flaring and venting policy, as set out in our Health, Safety, Security, Environment and Social Performance (HSSE&SP) Control Framework, calls for facilities to meet strict performance criteria, including being designed to export, use or reinject associated gas.

Our policy also aims to minimise all types of flaring, managed through annually updated greenhouse gas and energy management plans.

OUR FLARING PERFORMANCE

Flaring of gas in our Upstream and Integrated Gas businesses contributed around 7% of our overall direct greenhouse gas emissions in 2018. More than 40% of this flaring took place at facilities where there was no infrastructure in place to capture the associated gas.

Flaring – upstream

million tonnes hydrocarbons flared



Our upstream flaring decreased to 5.2 million tonnes of CO₂ equivalent in 2018 from 8.2 million tonnes in 2017. In the Upstream business, reductions in the emissions from flaring were primarily a result of the divestment of the Majnoon asset in Iraq, and our continuing focus to bring additional gas-gathering facilities online in Nigeria to reach our goal of zero routine flaring by 2030.

Flaring – upstream

million tonnes CO₂ equivalent



Across our Integrated Gas projects and plants, where flaring occurs only for operational reasons, greenhouse gas emissions from flaring have decreased by more than 30% since the start of 2016. This has primarily been due to reduced flaring in our Pearl gas-to-liquids plant (Qatar Shell GTL Ltd, QSGTL), which continues to deliver a multi-year flare reduction programme. Shell affiliate QGC Pty Limited has also implemented upstream flare reduction projects.

IRAQ

In 2018, Shell completed the divestment of the Majnoon facilities (Shell interest 45%). Flare reduction programmes are continuing and have captured around 52% of the associated gas that would have been flared in the past. The gas is exported to a local power plant for electricity generation.

Basrah Gas Company (BGC, Shell interest 44%), is a non-operated joint venture with Iraq's South Gas Company and Japan's Mitsubishi. It continued to capture gas that would otherwise be flared from three non-Shell-operated oil fields in southern Iraq (Rumaila, West Qurna 1 and Zubair).

NIGERIA

In Nigeria, the levels of hydrocarbons flared from Shell Petroleum Development Company's joint-venture (SPDC JV - Shell interest 30%) facilities have fallen by 90% since the start of the programme in 2002. This decrease is mainly due to investing in facilities that capture the associated gas and commercialise it through domestic and export markets. Divestments also provided further reduction.

Flaring at SPDC JV facilities decreased by around 9% to 0.5 million tonnes in 2018 from 0.6 million tonnes in 2017, mainly due to improved compressor availability and facility outages in the Western Delta.

SPDC remains committed to eliminating associated gas flaring with reductions already realised from associated gas gathering initiatives such as Adibawa, Otumara and Bonny associated gas gathering projects. In 2019, the Forcados Yokri Integrated Project and Southern Swamp Associated Gas Gathering Solutions project are planned to come on-stream to add to these efforts.

Following successful engagements with the Federal Government of Nigeria, the SPDV JV has included the remaining flare sites in the Nigeria Flared Gas Commercialisation Program. This government-led programme is expected to address these remaining sites.

Nigeria LNG (Shell interest 25.6%), a non-operated joint venture, is identifying ways to reduce flaring by improving the reliability of equipment, reducing train start-up time and delivering operational improvements.

QATAR

In Qatar, at QSGTL's Pearl gas-to-liquids plant, flaring takes place for operational reasons. In 2018, further enhancements have been made to the plant to limit the amount of operational flaring as part of a multi-year flare reduction programme (see [Natural gas](#)). Pearl has reduced its total flaring year on year since 2015 with flaring in 2018 nearly 50% lower than in 2015.

USA

We continued to take steps to reduce flaring at the SWEPI LP (a subsidiary of Shell Oil Company) Permian unconventional oil asset in the USA in 2018. For example, we are investing in operational upgrades that remove flares from well pad design and in new technologies to improve the reliability of our vapour recovery systems. Since 2017, we have invested around \$10 million in operational improvements to reduce flaring at Permian. In 2018, we achieved a reduction in the volume of gas flared per total gas production of more than 80% compared to the 2017 levels.

BRUNEI

A review of greenhouse gas performance in 2018 highlighted the importance of flare reduction in Brunei Shell Petroleum (BSP, Shell interest 50%), a non-operated joint venture. Through detailed analysis across all facilities, BSP developed a multi-year target and plan to reduce flaring intensity.

TRINIDAD AND TOBAGO

Atlantic LNG in Trinidad and Tobago implemented a flare reduction project in 2017 to recover LNG vapour (gas) during ship loading activities. A year later, the project continued to recover the gas, routing it back into the liquefaction process rather than to the flare.

SPILLS, ENERGY EFFICIENCY AND NON-GHG EMISSIONS

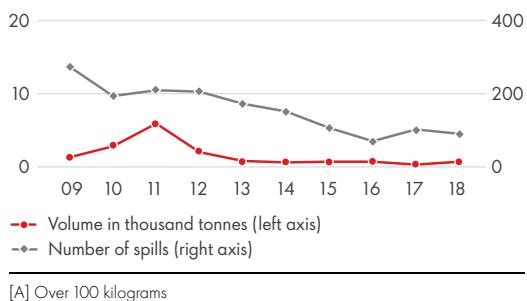
We improved or maintained our environmental performance across many business areas during 2018. This was due to operational improvements as well as reduced activities at some of our facilities and divestments. Details about our environmental performance are provided below and in the [Greenhouse gas emissions](#), [Managing methane emissions](#) and [Flaring](#) sections.

SPILLS

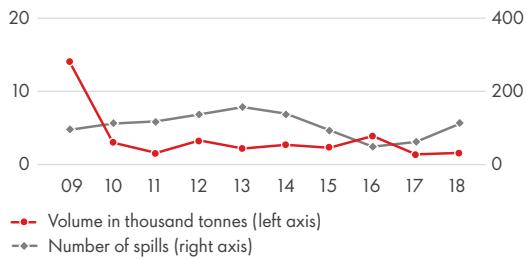
Shell has requirements and procedures in place to prevent operational spills. Shell companies have routine programmes to maintain facilities and pipelines, and improve their reliability, to reduce spills. However, spills still occur for reasons such as operational failure, accidents or unusual corrosion.

The volume of operational spills of oil and oil products in 2018 was 0.8 thousand tonnes, an increase from 0.4 thousand tonnes in 2017, in part due to operational spills on the Trans Ramos pipeline in Nigeria and an underground leak in Majnoon in Iraq. The number of operational spills decreased to 92 in 2018 from 104 in 2017. We have programmes in place to reduce the number of operational spills over the long term (see [10-year data table](#)).

Spills – operational [A]



Spills – sabotage [A]



[A] Sabotage and theft-related spills of more than 100 kilograms. All sabotage- and theft-related spills have occurred in Nigeria, except in 2016 (0.001 thousand tonnes) and 2015 (0.005 thousand tonnes).

The number of spills caused by sabotage and theft rose to 111 from 62 in 2017. The volume of these spills increased to 1.6 thousand tonnes in 2018 from 1.4 thousand tonnes in 2017. Sabotage and oil theft remained a significant cause of spills in the Niger Delta, Nigeria. The increase can be partly explained by increased availability of our production facilities following the repair of a major export line in 2017 and the price of crude oil and refined products, which is seen as an opportunity for more illegal refining.

We investigate and learn from all spills to improve our performance and Shell companies aim to clean up the areas around operations that are affected by spills, irrespective of the cause.

ENERGY EFFICIENCY IN OUR OPERATIONS

Improving the energy efficiency of Shell-operated facilities is one of the ways we manage greenhouse gas emissions. The main metric is energy intensity, the amount of energy consumed for every unit of output.

Shell-operated facilities and proposed projects that generate more than 50,000 tonnes of greenhouse gas emissions a year are required to produce a greenhouse gas and energy management plan with annual updates. These plans must include the sources of greenhouse gas emissions, as well as a forecast of expected emissions at the site for at least 10 years, and must identify options for improving energy efficiency or reducing emissions.

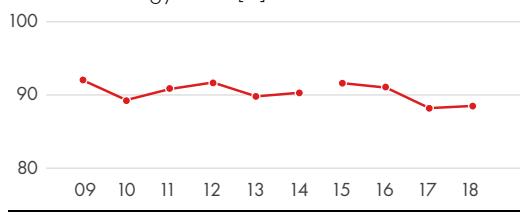
Some of the ways Shell improved energy efficiency in 2018 include making our equipment more reliable through regular maintenance, by smart scheduling of maintenance activities and by installing more energy efficient equipment.

We aim for the Shell-operated refineries and chemical plants to be leaders in energy efficiency. We invest in combined heat and power units and implement heat integration and waste gas recovery systems. We replace steam turbine drives with electrical motors and end-of-life equipment with higher efficiency types.

The overall energy intensity index of the 17 Shell-operated refineries and chemical plants in 2018 was similar to the year before: refineries improved slightly to 94.3 in 2018, from 94.8 in 2017 and chemical plants declined slightly to 88.5 in 2018 from 88.2 in 2017.

Energy intensity – chemical plants

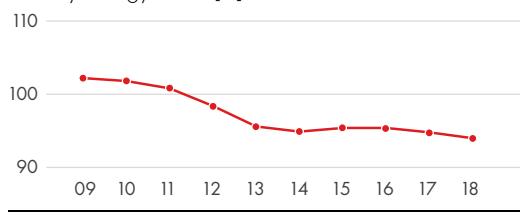
chemicals energy index [A]



[A] Methodology was updated in 2015. Data for previous years are not directly comparable

Energy intensity – refining

refinery energy index [A]

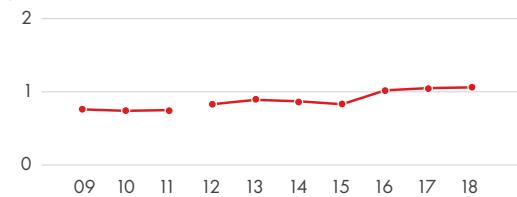


[A] Indexed to 2002; based on 2006 Solomon Ell™ methodology.

In 2018, the overall energy intensity for the production of oil and gas in our Upstream and Integrated Gas businesses (excluding liquefied natural gas and gas-to-liquids) increased slightly compared with 2017, partly due to lower production from the NAM joint venture (Shell interest 50%) in the Netherlands. We expect it will be difficult to maintain the energy intensity levels of recent years, as existing fields age and new production comes from more energy-intensive sources. This may increase our upstream energy intensity over time.

Energy intensity – upstream

(excluding oil sands, GTL and LNG) gigajoules/tonne production [A]



[A] Methodology was updated in 2012. Data for previous years are not directly comparable

NON-GREENHOUSE GAS EMISSIONS

We track emissions released into the atmosphere from our upstream and downstream facilities and work to reduce air pollution from our operations. This includes making investments to lower our emissions of nitrogen oxides, sulphur oxides and volatile organic compounds that are released during oil and gas production and processing. These pollutants can affect air quality in the areas where we operate. We evaluate and take action to mitigate potential adverse impacts of our emissions.

Our sulphur oxide emissions in 2018 decreased to 69 thousand tonnes compared with 81 thousand tonnes in 2017, primarily due to higher sulphur recovery at the Pulau Bukom refinery in Singapore in 2018 (the sulphur recovery unit was offline for part of 2017 due to planned maintenance).

Our nitrogen oxide emissions increased from 107 thousand tonnes in 2017 to 111 thousand tonnes in 2018, primarily the result of additional vessels joining our shipping fleet.

Our emissions of volatile organic compounds (VOCs) decreased to 59 thousand tonnes in 2018 from 95 thousand tonnes in 2017, mainly due to the divestment of our interest in the Majnoon project in Iraq. We expect our VOC emissions to further decrease in the coming years as a result of our efforts to reduce flaring and venting.

Read about Shell's [Greenhouse gas emissions](#).

Economic development in Nigeria

Shell has interests in several companies in Nigeria that help power economic growth and improve the quality of life for Nigerians. Safety and security remain top priorities and we continue to work closely with federal and state government agencies, communities, civil society, contractors and joint venture partners to create a safe operating environment.

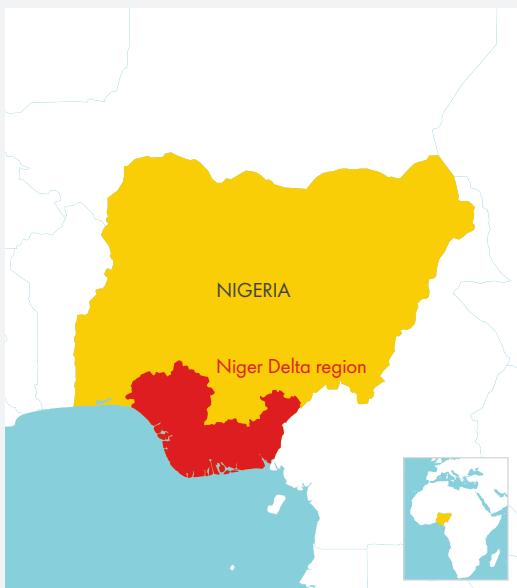
Shell Companies in Nigeria produce oil and natural gas, distribute gas to industries and for domestic power generation, produce liquefied natural gas (LNG) for export and generate revenues for the government.

The companies also contribute social investment in communities and support the development of Nigerian communities and indigenous companies.

DEEP-WATER PRODUCTION OF OIL AND GAS

Unlocking the rich oil and gas resources in the deep waters of the Gulf of Guinea can help meet growing energy demand in Nigeria and international markets.

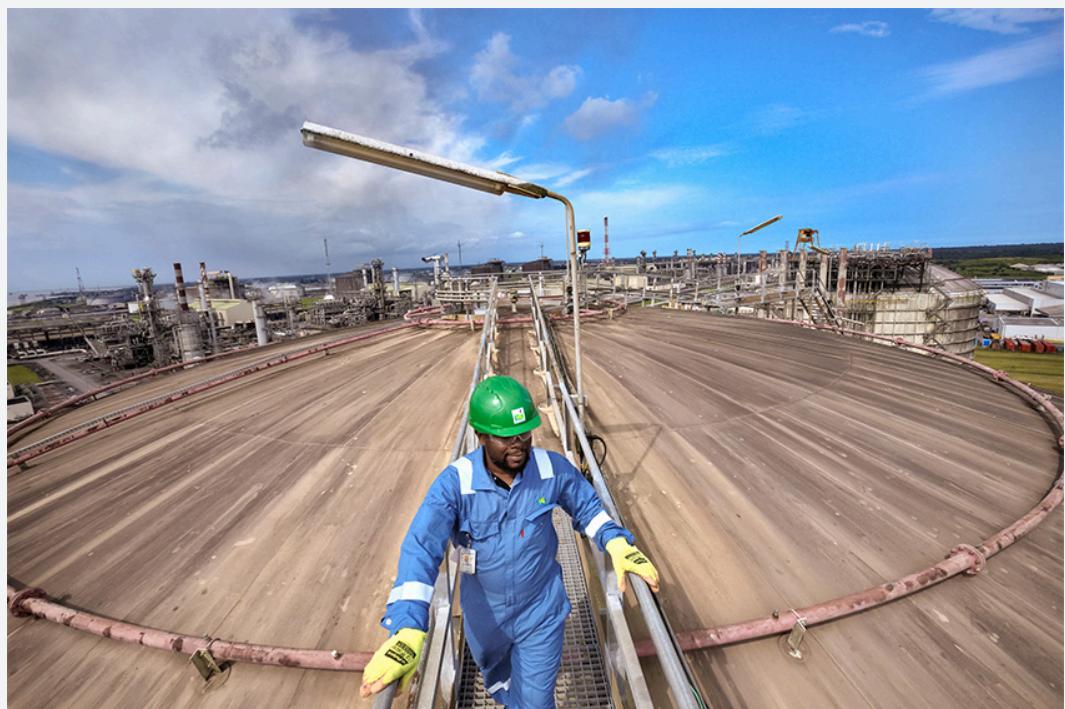
Since 2005, the Shell Nigeria Exploration and Production Company (SNEPCo), operator of the Bonga field, has produced more than 819 million barrels of oil cumulatively that generated a stable source of revenue for the Nigerian government through taxes, royalties and levies.



In 2018, SNEPCo continued to use its knowledge, experience and proven deep-water technologies to unlock new resources safely and efficiently.

SUPPLYING GAS TO MARKETS

The Shell Petroleum Development Company of Nigeria Ltd (SPDC), the operator of the SPDC Joint Venture (SPDC interest 30%), is working closely with its government partner, the Nigerian National Petroleum Corporation, to increase gas for power supply.



Nigeria LNG operates a facility on Bonny Island in Rivers State that produces LNG for export.

In 2018, SPDC made a commitment to deliver three of the government's seven biggest gas projects, one of which - the Assa North Gas Development Project in Imo State - received its final investment decision in December. At peak production, this project is expected to produce 300 million standard cubic feet of gas per day, contributing to increased power generation and industrialisation.

A new financing model was developed in 2017 to overcome challenges with government funding for the SPDC JV. The model's purpose is to help fund future projects, including those to commercialise the country's gas resources.

Shell Nigeria Gas, the only wholly-owned subsidiary of an international oil company involved in gas distribution in Nigeria, expanded its capacity in 2018 by the equivalent of 400 megawatts of gas to power. This was achieved by adding production facilities in Ogun State. It will help to increase gas supply to industries and boost local economies, while also providing job opportunities to the country.



The Agbara/Ota pressure reduction and metering station in Ogun State, where new production facilities were added in 2018.

OPERATING SAFELY

The safety of employees and contractors in Nigeria remains our top priority. Shell companies there continue to strengthen the safety culture and leadership, which is focused on achieving no harm to people and no leaks across their operations. We refer to this as our Goal Zero ambition.

In 2018, the number of personal injuries that required medical treatment or time off work decreased to 13 from 19 in 2017.

The focus in safety was on three areas in 2018: improving how managers stop unsafe work in their teams, preventing objects being dropped from height - a common hazard in the industry - and marine safety. This included a business-wide stand-down moment to give employees and contractors time to reflect on how to prevent incidents. Campaigns were also run in production operations to help people better understand the safety culture in their workplace.

Shell Companies in Nigeria continue to contribute to the safety of communities around assets by responding to third-party fires and emergencies. In 2018, Shell companies responded to 69 of these incidents, including an overturned fuel tanker and a search and rescue operation on a collapsed hotel building under construction, both in Port Harcourt.

EXTERNAL VOICE

Tarakiri Cluster is a collection of six communities in Bayelsa State in the Niger Delta that undertakes development projects and programmes supported by the SPDC JV and delivered through the global memorandum of understanding (GMoU).

"We are working to empower communities to undertake their own development by themselves. The GMoU cluster in Tarakiri started in 2010 and has received around \$5.8 million to finance about 92 projects and programmes, including job training, and for basic services and infrastructure. Around 85 of the projects have been completed. One ongoing programme focuses on enterprise and business skills development for women, part of the mandatory 15% funding allocation under the terms of the GMoU, and provides grants to get their projects off the ground."



Dr. Jude A. Ebibokefie
Tarakiri Cluster Development Board

SECURITY IN THE NIGER DELTA

Security issues, sabotage and crude oil theft in the Niger Delta remained significant challenges in 2018. Shell companies there continued to address safety and environmental challenges related to illegal activities and operational spills. Although there has been no major damage to key oil and gas infrastructure caused by militant activity since November 2016, the security situation remains volatile in this region of the country.

CONTRIBUTION TO SOCIETY

Shell Companies in Nigeria continue to support the development of local communities and companies as part of their contribution to the economy. We also work with the government, communities and civil society to fund and implement social investment programmes. Community-driven development programmes and initiatives also are funded, with focus areas as determined by benefiting communities.

Shell Companies in Nigeria have provided technical and financial support to Nigerian companies across a range of sectors, including transport, manufacturing and research and development. For example, SAIDEL Nigeria Limited, working on the SPDC JVs South Swamp Associated Gas Project, acquired the first Nigerian flagged pipelay vessel in Nigeria (S900).

At state government and local community levels, Shell Companies in Nigeria focus their social investment activities on areas such as enterprise development, education, health and access to energy. In 2018, Shell's flagship youth development programme, Shell LiveWIRE, was launched in the Ogbia community in Bayelsa State. The Ogbia community is located close to Oloibiri where the first oil well was drilled in Nigeria in 1958 and near to SPDC JV's Kolo Creek Flow Station. Three categories of beneficiaries – university graduates, secondary school leavers and informal women traders – undertook entrepreneurship training and on graduation received business start-up grants totalling about \$90,000. This will enable them to convert their bright ideas into sustainable businesses, creating wider employment and income opportunities for their communities.



Graduates of the Ogbia LiveWIRE programme received entrepreneurship training and start-up grants.

Social and economic contribution

Economic contribution from all SPDC JV partners to the Nigerian government from 2014–2018.	Shell Companies in Nigeria contracts awarded to Nigerian companies in 2018.	Employees of Shell Companies in Nigeria in 2018 who are Nigerian.
\$17.8 billion	92%	96%
Shell share of royalties and corporate taxes paid to the Nigerian government in 2018 (SPDC \$0.9 billion; SNEPCo \$0.8 billion).	Shell Companies in Nigeria spend on contracts awarded to Nigerian companies in 2018.	Niger Delta youth trained in enterprise development and management since inception in 2003.
\$1.7 billion	\$1.3 billion	7,072
SPDC JV, SNEPCo and Shell Nigeria Gas and All On direct spending on social investment projects in 2018 (Shell share \$31 million).	Funds disbursed by the SPDC JV to GMoU clusters for community-driven projects since inception in 2006.	SPDC JV and SNEPCo secondary and university educational grants awarded since 2011.
\$56.2 million	\$239 million	13,923

All On, an independent impact investing company with seed funding from Shell, works with partners to increase access to commercial energy products and services for underserved and unserved off-grid communities in Nigeria, with a special focus on the Niger Delta. Off-grid energy solutions span solar, wind, hydro, biomass and gas technologies deployed by both foreign and local access-to-energy companies that complement available grid power across Nigeria and help bridge the significant energy gap.

In 2018, All On focused on partnerships to help accelerate access to electricity at scale. For example, it approved investments for solar home system provider Lumos and for Cold Hubs, a company that provides solar powered refrigeration for agricultural products. It also co-

invested in a dedicated debt fund for off-grid energy companies – the Off-Grid Energy Fund – along with the African Development Bank and other leading development financial institutions. In addition, All On partnered with the United States African Development Foundation to provide \$100,000 in grants and convertible debt to several enterprises providing off-grid solutions that deploy renewable resources and power local economic activities.

NIGERIAN LITIGATION

Authorities in various countries are investigating our investment in Nigerian oil block OPL 245 and the 2011 settlement of litigation pertaining to that block (see Note 25 to the Consolidated Financial Statements in our Annual Report).

Spill response and prevention in Nigeria

Shell Companies in Nigeria continue their relentless focus on working with communities and managing their impact on the environment. This means addressing environmental challenges related to oil spills in areas with significant oil theft and illegal refining.

The vast majority of oil spills in the Niger Delta continue to be caused by crude oil theft or sabotage of pipelines, as well as illegal oil refining. In 2018, close to 90% of the number of oil spills of more than 100 kilograms from SPDC JV facilities was due to illegal activities by third-parties.

In 2018, the SPDC JV experienced an increase in the number of sabotage related spills. Regrettably, operational spills also increased (more below on Spill and response data). Regardless of the cause, SPDC cleans up and remediates areas impacted by spills that come from its facilities. In the case of operational spills, SPDC also pays compensation to people and communities impacted by a spill. Once the clean-up and remediation are completed, the work is inspected, and, if satisfactory, approved and certified by Nigerian government regulators.

To reduce the number of operational spills, SPDC is focused on implementing its ongoing work programme to appraise, maintain and replace key sections of pipelines and flow lines. Over the last seven years, more than 1,300 kilometres of pipelines and flow lines have been replaced.

More details on how Shell Companies in Nigeria are responding, reporting and preventing oil spills in their operations can be found at www.shell.com.ng/environment and www.shell.com.ng/security-theft-and-sabotage.

COLLABORATING WITH THE IUCN

SPDC has worked 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 SPDC's areas of operation in the Niger Delta.

An independent scientific advisory panel, the Niger Delta Panel, was set up and based on its input SPDC strengthened its approach to oil spill response and remediation of soil and groundwater contamination.

In 2018, SPDC and IUCN formed the Niger Delta Biodiversity Technical Advisory Group, which also includes representatives from the Nigerian Conservation Foundation and Wetlands International, to monitor biodiversity recovery of remediated sites.



Wildlife return to the Bodo creeks following the first phase of clean-up activities, a sign of ecosystem recovery.

CLEAN-UP IN BODO

In 2015, SPDC – on behalf of the SPDC JV – and the Bodo community signed a memorandum of understanding granting SPDC access to begin the clean-up of areas affected by two operational spills in 2008. As part of this initiative, two contractors were selected to conduct the clean-up, overseen by an independent project director.

After two years of significant engagement with the Bodo community and other stakeholders, managed by the Bodo Mediation Initiative, the first phase of clean-up activities started in September 2017. The clean-up consists of three phases: removal of free-phase surface oil; remediation of soil; and planting of mangroves and monitoring. The first phase was completed in August 2018 and the preparation for phase two has commenced.

We saw further progress in 2018 with vital clean-up work in Bodo, an area affected by oil spills from various sources, entering its next phase.

Should activities continue uninterrupted, phase two (remediation of soil) is expected to take around two years. However, for it to be successful, the repeated re-contamination of cleaned-up sites from illegal third-party activities such as crude oil theft and illegal refining, must stop.

CLEAN-UP EFFORTS IN OGONILAND

SPDC is working with the relevant stakeholders to implement the 2011 UN Environmental Programme (UNEP) report on Ogoniland. Over the last seven years, SPDC has taken action on all, and completed most, of the UNEP recommendations addressed specifically to it as operator of the joint venture.

The UNEP report recommended the creation of an Ogoni Trust Fund with \$1 billion capital, to be co-funded by the Nigerian government, the SPDC JV and other operators in the area. The SPDC JV remains fully committed to contributing its share of \$900 million over

five years to the fund and made \$10 million available in 2017 to help set up the Hydrocarbon Pollution and Remediation Project (HYPREP), a government-led body. In July 2018, the SPDC JV deposited a further \$170 million into the escrow account to fund HYPREP's activities, which completes its first-year contribution of \$180 million.

HYPREP has issued contract award letters for phased remediation activities and is aiming for contractors to be in place at sites in early 2019.

SPILLS AND RESPONSE PERFORMANCE

Crude oil theft from SPDC JV's pipeline network amounted to around 11,000 barrels of oil a day (bpd) in 2018, an increase from around 9,200 bpd in the previous year. The increase in 2018 can in part be explained by increased availability of our production facilities following the repair of a major export line in 2017. Since 2012, SPDC has removed more than 1,160 illegal theft points.

The number of operational spills from Shell companies in Nigeria increased from 10 in 2017 to 15 in 2018. The volume of oil spilled in operational incidents also increased to around 0.4 thousand tonnes compared to 0.1 thousand tonnes in 2017. The number of sabotage-related spills in 2018 over 100 kilograms increased to 111 from 62 in 2017. Theft and sabotage caused around 90% of the number of spills of more than 100 kilograms from SPDC JV pipelines, with the balance being operational spills. The increase can in part be explained by increased availability of our production facilities following the repair of a major export line in 2017; crude theft activities in a pre-election year; and the price of crude oil and refined products that is seen as an opportunity for more illegal refining.

At the beginning of 2018, 202 sites required remediation. During the year, 116 sites were remediated and 46 certified, while 148 new sites requiring remediation were identified. At the end of 2018, there were 234 oil spill sites requiring remediation.

Sustainable energy future

Society faces a dual challenge: how to make a transition to a low-carbon energy future, while also extending the economic and social benefits of energy to everyone on the planet.

IN THIS CHAPTER

- 44** Climate change and energy transition
- 46** Net Carbon Footprint
- 47** Managing greenhouse gas emissions
- 52** Lower-carbon energy
- 62** Developing technology



Climate change and energy transition

As the global population grows and living standards rise, society will need to meet increasing energy demand with a lower carbon footprint. To play our part in a cleaner energy future, we will offer customers more low-carbon products and services, including lower-carbon fuels for drivers, and solutions such as forests and wetlands to act as natural carbon sinks.

Shell is determined to help provide more and cleaner energy solutions. We fully support the Paris Agreement and we are driving our business strategy in the context of the energy transition and climate-related risks and opportunities.

Thriving through the energy transition requires working with society, including helping to advance the UN sustainable development goals. To help achieve the energy transition and ensure opportunities to achieve better living standards for all, the world needs to transform the way it produces and uses energy.

We believe more renewable energy like solar and wind is critical for a cleaner energy future, and that increasingly how people live, work and play is going to need to be powered by lower-carbon electricity. But we also recognise that not everything can be easily, swiftly or cost-effectively electrified.

We see continuing, changing roles for oil and gas alongside new energies and new technologies, in co-ordination with complementary approaches like carbon capture and storage and nature-based solutions to manage the difficult-to-avoid emissions that will remain in the system for years to come.



Making cities sustainable is one of the world's biggest challenges (see [UN sustainable development goals](#)).

CLIMATE CHANGE

Governments took a great stride forward in 2015, when they reached agreement in Paris to tackle climate change by limiting the rise in global average temperatures this century to well below two degrees Celsius above pre-industrial levels. We fully support this goal.

But there are tough challenges ahead that society will need to address because the transition to a lower-carbon energy system will require enormous levels of investment, and profound changes in consumer behaviour. For Shell, it could mean significant changes in the long term. We will learn, and adapt our approach over time.

EXTERNAL VOICE

The Rocky Mountain Institute seeks to transform global energy use to create a clean, prosperous and secure low-carbon future.

"Shell's 2018 Energy Transition Report outlines the company's ambition to reduce the full scope of its Net Carbon Footprint by 50% in 2050, in line with society's drive to meet the Paris Agreement. This is a bold promise as it looks not just at emissions from Shell's own operations, but also at the resultant emissions from use of the products the company produces and sells. However, current commitments to the Paris Agreement are inadequate to meet a 2°C future, and mounting evidence makes clear the need to move even faster toward a net-zero energy future. As one of the leading energy multinationals in the world, Shell will also need to increase its ambitions, seizing the opportunity to lead the way in the energy transition and helping shape global decarbonisation ambitions."



Jules Kortenhorst

Chief Executive Officer, Rocky Mountain Institute

In 2018, we published our second Shell Energy Transition Report, which sets out how our strategy should allow us to thrive in this energy transition. It also provided information about our medium-term resilience and examples of how we are already active in many of the growth areas that will drive our continued success.

WORKING WITH OTHERS

To advance solutions to the energy and climate challenge, we continue to work with others (see [Collaborations](#)), including the Oil and Gas Climate Initiative (OGCI), a voluntary CEO-led group taking practical actions on climate change. The OGCI's billion-dollar plus investment arm, OGCI Climate Investments, aims to combine the expertise and reach of 13 oil and gas majors with the potential of groundbreaking start-ups (see [Methane emissions](#)). We also work with the Energy Transitions Commission (ETC), whose report Mission Possible: Reaching net-zero carbon emissions from harder-to-abate sectors by mid-century, was published in November 2018.

PORTFOLIO RESILIENCE

At Shell, we are confident that our strategy, portfolio and strong financial framework give us the sources of resilience to potential changes in the energy system to 2030, and the flexibility to adapt as the energy system changes over the long term. We are reshaping our portfolio to provide the energy, and related products and services, that consumers will need through the transition.

We have set a long-term ambition to reduce the Net Carbon Footprint of our energy products, measured in grams of carbon-dioxide equivalent per megajoule consumed, by around 20% by 2035 and by around 50% by 2050, in pace with society.

The key will be to adapt to develop new opportunities in areas that will be essential in the energy transition, and where we see growth in demand over the coming decades. We seek to build a diverse portfolio – both geographically and across different parts of the energy industry.

SHELL SCENARIOS

We have been developing energy-focused scenarios for almost 50 years, helping generations of Shell leaders, academics, governments and business leaders to consider possible pathways when making decisions. They stretch our thinking and help us to make crucial choices in times of uncertainty and transitions as we grapple with tough energy and environmental challenges.

In 2018, we published our Sky scenario, which illustrates a technically possible, but challenging pathway for society to achieve the goals of the Paris Agreement. Sky builds on previous Shell Scenarios publications, Mountains and Oceans, and is our most optimistic scenario in terms of climate outcomes.



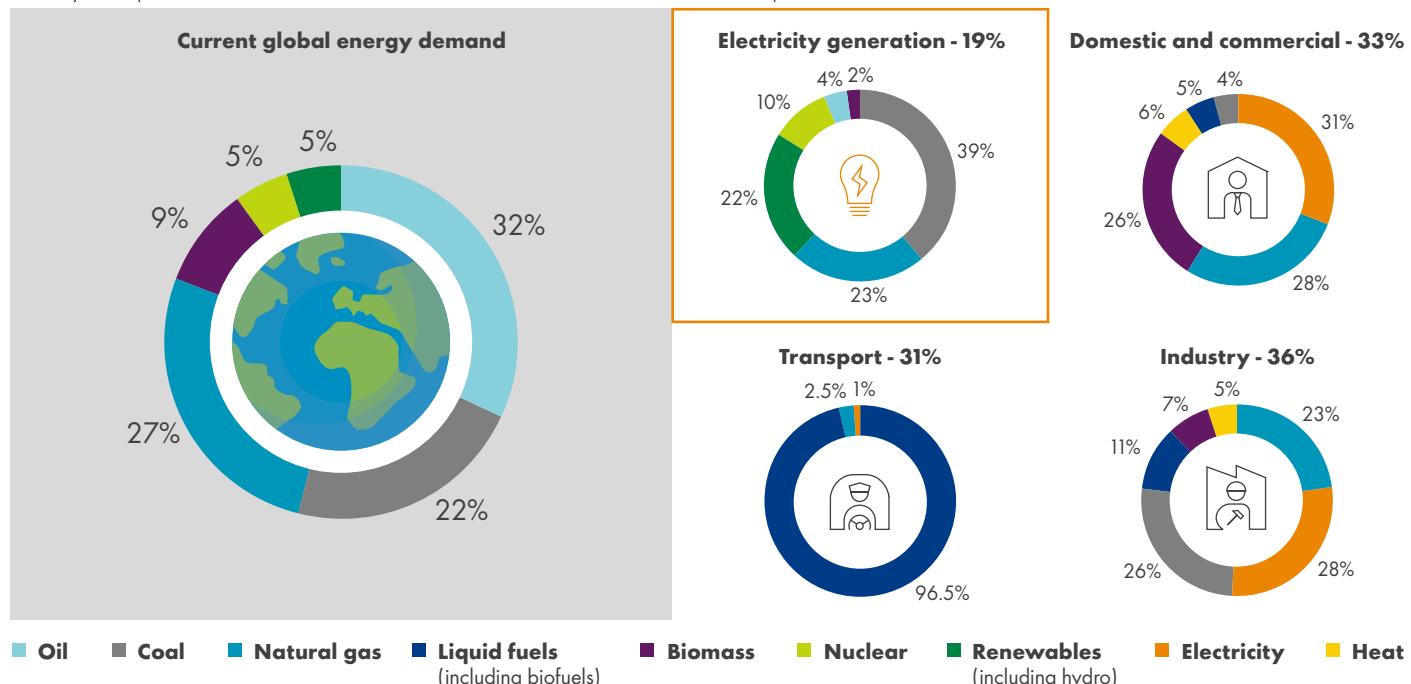
Shell's Sky scenario, published in early 2018, is part of an ongoing process used in Shell for over 40 years to challenge executives' perspectives on the future business environment.

Sky results in a balance of net-zero global emissions by 2070 and meets the goal of the Paris Agreement, to hold the increase in the global average temperature this century to well below two degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 degrees Celsius above pre-industrial levels. If very large-scale reforestation of an area the size of Brazil is added to the scenario storyline, it would result in limiting warming to 1.5 degrees Celsius. By adopting a modelling approach that is grounded in the current reality of the energy system and combined with a specific long-term goal, Sky is intended to be both an ambitious scenario and a realistic tool to inform dialogue.

In October, the Intergovernmental Panel on Climate Change (IPCC) released its report on the impact of 1.5 degrees Celsius warming and referenced Sky. The IPCC report finds that limiting global warming to 1.5 degrees Celsius would require "rapid and far-reaching" transitions in land use, energy, industry, buildings, transport and cities.

Today's energy needs

The world gets most of its energy from coal, oil and gas, with around a fifth of all energy used to generate electricity. Energy sources differ across industry, transport and domestic use, which all need to transition to low-carbon options.



Source: Shell Scenarios Team Extended Policies and Technologies 2018 (EPTS18) scenario and the International Energy Agency

Net Carbon Footprint

In 2017, Shell announced a long-term ambition to reduce the Net Carbon Footprint of the energy products we sell - a carbon intensity measure that takes into account their full life-cycle emissions including customers' emissions when they use these products - in step with society's drive to meet the goal of the Paris Agreement on climate change. In December 2018, we also announced our intention to set short-term Net Carbon Footprint targets. In early 2019, we decided to set a Net Carbon Footprint target for 2021 of 2-3% lower than our 2016 Net Carbon Footprint of 79 grams of carbon-dioxide (CO₂) equivalent per megajoule. We have linked nearer-term Net Carbon Footprint targets to executive remuneration.

Shell supports the goal of the Paris Agreement of limiting the rise in global average temperature this century to well below two degrees Celsius above pre-industrial levels. In pursuit of this goal, we also support the vision of a transition towards a net-zero emissions energy system. But society faces a dual challenge: how to make the transition to a low-carbon energy future to manage the risks of climate change, while also extending the economic and social benefits of energy to everyone.

Meeting this ambition requires changes in the way energy is produced, used and made accessible to more people while drastically cutting emissions.

We believe that the need to reduce greenhouse gas (GHG) emissions, which are largely caused by burning fossil fuels, will transform the energy system in this century. This transformation will generate both challenges and opportunities for our existing and future portfolio.

By 2050, our ambition is to align Shell's Net Carbon Footprint with the footprint of the energy mix in the global energy system. We aim to reduce the Net Carbon Footprint of the energy products we sell - expressed in grams of CO₂ equivalent per megajoule consumed - by around 50% by 2050. As an interim step, by 2035, and predicated on societal progress, we aim for a reduction of around 20% compared with our 2016 level.

We need to go faster than society to achieve this ambition. Our starting point is higher than society's because our portfolio has a different energy mix compared to the overall energy system. We do not have the large quantities of nuclear power, hydro power, wind,

solar and large-scale primary biomass that the global energy system has.

Our approach to calculating the Net Carbon Footprint covers:

- emissions directly from Shell operations (including from the extraction, transportation and processing of raw materials, and transportation of products);
- emissions generated by third parties who supply energy to us for production; and
- our customers' emissions from their use of our energy products.

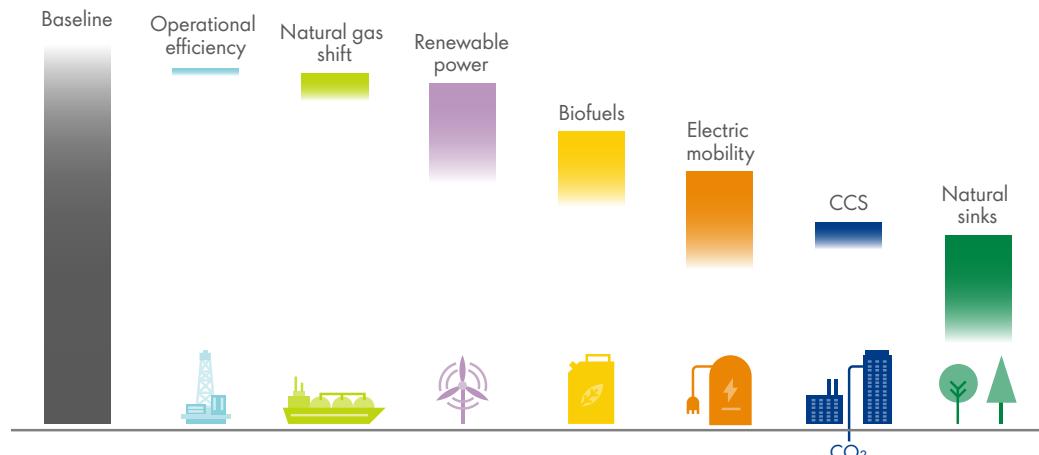
Also included are emissions from elements of this life cycle not owned by Shell, such as oil and gas processed by Shell but not produced by Shell, or from oil products and electricity marketed by Shell that have not been processed or generated at a Shell facility. The calculation also includes biofuels, as well as emissions that we offset by using carbon capture and storage or natural carbon sinks, such as forests and wetlands.

Chemicals and lubricants products, which are not used to produce energy, are excluded from the scope of this ambition.

To meet the decarbonisation goals of the Paris Agreement, society needs an increasing supply of energy products that produce lower or zero greenhouse gas emissions over their full life cycle, to use those products more efficiently and to store emissions that cannot be avoided in sinks. Within this framework, our strategy is to keep increasing the share of low-carbon energy products in our portfolio, such as natural gas, biofuels, electricity and hydrogen. We will also develop carbon sinks. By broadening our focus to the full life-cycle emissions from the energy products that we sell to our customers, instead of solely on our operational emissions, we believe we will be better aligned with societal need and growing customer demand for more energy with lower life-cycle greenhouse gas emissions.

For more information on these areas, see [Managing greenhouse gas emissions](#), [Lower carbon options](#) and [Developing technology](#).

Lowering our Net Carbon Footprint



Shell's Net Carbon Footprint value is determined by first estimating the emissions intensity for each of the energy product supply chains in Shell's portfolio. The individual intensities are then combined into a single value, with the weighting for each product determined by its sales volume. Emissions captured in sinks are deducted to give the final net value. Sales volumes are determined on an energy basis. Electricity is represented as fossil equivalents.

Shell's Net Carbon Footprint values for 2016, 2017 and 2018 are shown in the table below. We express our Net Carbon Footprint in grams of CO₂ equivalent per megajoule (gCO₂e/MJ) produced for each unit of energy delivered to, and used by, a consumer.

	2018	2017	2016
Net Carbon Footprint (gCO ₂ e/MJ)	79	79	79

The initial communication of Shell's Net Carbon Footprint ambition in 2017 was based on the 2016 Net Carbon Footprint value and therefore 2016 is taken as the baseline year for future comparisons. Any previously published Net Carbon Footprint values were preliminary estimates. The values published in this report are the assured values and replace any previously communicated values.

Lloyd's Register Quality Assurance Ltd has provided limited assurance for our Net Carbon Footprint assertion for 2016, 2017 and 2018. Limited assurance means nothing has come to the auditor's attention that would indicate that the Net Carbon Footprint data and information as presented in the Net Carbon Footprint Assertions were not materially correct.

Shell's Net Carbon Footprint remained unchanged between 2016 and 2018 at 79 gCO₂e/MJ. This was due to our higher oil product sales (primarily from gasoline sales in the USA) being balanced by growth in liquefied natural gas (LNG) and electricity sales. Oil products have a higher carbon intensity compared to the LNG and electricity sales.

Read more about our Net Carbon Footprint at www.shell.com/ncf.

DATA SOURCES FOR NET CARBON FOOTPRINT

The Net Carbon Footprint calculation uses production and product sales data taken from the [Annual Report](#) and [Form 20-F](#). Any other product sales data used for the Net Carbon Footprint calculation but not disclosed in the Annual Report are disclosed in the Sustainability Report. This includes the gas and power data given below.

SALES OF GAS AND POWER PRODUCED BY THIRD PARTIES

Gas and power produced or generated by third parties but sold by Shell are included in the Net Carbon Footprint Calculation. The figures in the table below show the global volumes of third-party gas and power sold by Shell between 2016 and 2018.

	2018	2017	2016
Gas (tbtu)	3,246	3,276	3,298
Power (TWh)	179	165	169

In certain cases, it is not possible to disaggregate sales of Shell and third-party gas volumes. To avoid double counting these sales volumes are not included in the above figures.

GREENHOUSE GAS MANAGEMENT

GHG and energy management plans must include the sources of GHG emissions, as well as a forecast of expected emissions at the site for at least 10 years.

Projects under development that are expected to have a material GHG footprint must meet carbon intensity performance standards or industry benchmarks.

To assess the resilience of proposed projects, we consider potential costs associated with operational GHG emissions. Consistent with our desire to stay in step with society's progress towards the goals of the Paris Agreement, in 2018 we moved away from using a flat project screening value (PSV) of \$40/tonne of carbon dioxide (CO₂) equivalent to country-specific estimates of future carbon costs. These estimates were developed using the current Nationally Determined Contributions submitted by countries as part of the Paris Agreement. Accordingly, we believe they more accurately reflect society's current implementation of the Paris Agreement rather than a flat \$40/tonne PSV. By 2050, our estimates for some countries increase to \$85/tonne of GHG emissions. For more details, see [Climate change and energy transition](#) in our Annual Report.

Shell has also developed and implemented a comprehensive CO₂ and energy management information system (CEMIS) that supports our facilities, for example, by analysing real-time data to highlight maintenance gaps and monitor performance. CEMIS is primarily deployed in liquefied natural gas and targeted Upstream facilities.

GREENHOUSE GAS EMISSIONS

We are taking action to manage the emissions from our own operations and the emissions from the energy we use in our operations.

Greenhouse gas (GHG) and energy management plans for facilities and projects help drive our emissions performance through a range of actions. These include using more energy-efficient equipment and installing power from renewable sources, and considering the potential for carbon capture and storage in the design of our new and largest projects (see [Energy efficiency in our operations](#)).

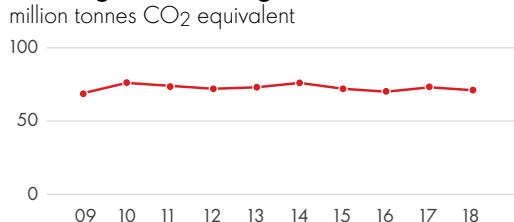
For example, the Moerdijk chemicals site in the Netherlands has installed a solar power plant with a peak capacity of around 27 megawatts from 76,000 solar panels, comparable to the electricity use of about 9,000 Dutch households.



The Moerdijk solar power plant in the Netherlands

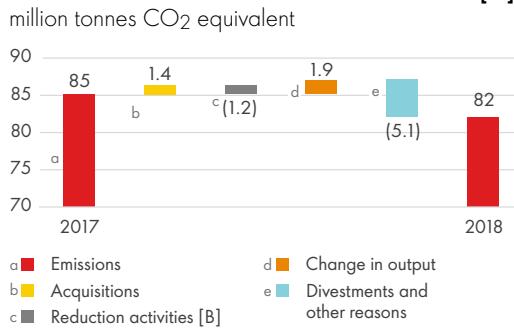
GREENHOUSE GAS EMISSION PERFORMANCE
 Shell tracks emissions released by our facilities and works to reduce emissions from our operations. We report our GHG emissions in line with the recommendations of the Intergovernmental Panel on Climate Change. Shell's Health, Safety, Security, Environment and Social Performance (HSSE&SP) Control Framework defines standards and accountabilities at each level of the organisation and sets out the procedures people are required to follow.

Direct greenhouse gas emissions



Our direct GHG emissions decreased from 73 million tonnes of CO₂ equivalent in 2017 to 71 million tonnes of CO₂ equivalent in 2018.

GHG movements from 2017 to 2018 [A]



[A] Direct and indirect GHG emissions from imported energy

[B] Does not include 1 million tonnes of CO₂ captured and sequestered by our Quest CCS project in Canada in 2018

The main reasons for the decrease in our greenhouse gas emissions in 2018 were divestments (for example in Argentina, Canada, Gabon, Iraq, Malaysia and the UK). These decreases were partly offset by inclusion of the assets previously operated by the Motiva Enterprises LLC joint venture in our data for the full year in 2018, increased production at the Pearl gas-to-liquids plant in Qatar and the start-up of the Prelude floating liquefied natural gas facility in Australia.

In 2018, more than 55% of our direct greenhouse gas emissions came from our refineries and chemical plants. The production of oil, gas and gas-to-liquids products accounted for around 40% of our greenhouse gas emissions, and our shipping activities accounted for around 3%. We continue to work on improving operational performance and energy efficiency to manage greenhouse gas emissions.

The indirect greenhouse gas emissions associated with the generation of the energy we purchased (electricity, heat and steam) were 11 million tonnes on a CO₂-equivalent basis in 2018 compared with 12 million tonnes CO₂ equivalent in 2017. The decrease was in part driven by the exclusion of oil sands mining when operatorship was transferred to another company, Canadian Natural, in

2017. These emissions were calculated using a market-based approach, as defined by the World Resources Institute Greenhouse Gas Protocol.

We estimate that the CO₂ equivalent emissions from the use of our refinery and natural gas products by others were around 599 million tonnes in 2018. Read more about our Net Carbon Footprint at www.shell.com/ncf.

We use the previous year's GHG emissions as our base year to compare our performance over time. To maintain a meaningful and consistent year-to-year comparison, we may need to recalculate the base year if it is affected by major changes, for example, if significant emissions-generating activities are transferred to another company as a result of a divestment. Our 2017 base year GHG emissions did not change by more than 5% in 2018 and therefore the base year emissions have not been recalculated.

Read more at www.shell.com/ghg.

METHANE EMISSIONS

Methane is a potent greenhouse gas. When it is released into the atmosphere, it has a much higher global warming impact than carbon dioxide (CO₂). Efforts to address climate change therefore require the industry to reduce both deliberate and unintended methane emissions from the gas value chain, from production to the final consumer.

Methane from the flaring and venting of gas (including equipment venting) in our upstream oil and gas operations was the largest contributor to our reported methane emissions in 2018.

Methane leaks in the natural gas system reduce the lower-carbon benefits of gas. For example, a small number of leaks that account for a high percentage of methane emissions could significantly reduce the overall environmental benefits of natural gas. Limiting leaks from Shell's own operations will contribute to our ambition to cut our Net Carbon Footprint. At the same time, preventing or reducing methane leaks makes good commercial sense because methane is the largest component of natural gas – the less that leaks, the more we can sell to market.



Infrared cameras can be used to detect methane leaks.

Shell has formed an industry coalition, supported by organisations like the Environmental Defense Fund, UN Environment, leading universities and the World Bank, to develop a set of methane guiding principles. In November 2017, eight companies, including Shell, signed up to these principles. In 2018, we succeeded in encouraging a further 10 companies to sign up. The principles focus on ways to reduce emissions throughout the gas industry – from production to the final consumer.

EXTERNAL VOICE

The Environmental Defense Fund seeks to create solutions to the most serious environmental problems through science, economics, law and private-sector partnerships.

"Shell's industry-leading target makes clear that the race to combat methane emissions is on. Strong commitments like this suggest to investors, governments and business partners alike that an operator is serious about its positioning in a cleaner energy economy. Company leadership on methane does not stop with setting targets. By engaging joint venture partners and strongly supporting tightened methane regulation, Shell is making important contributions to progress industry-wide."



Ben Ratner

Senior Director, EDF+Business, Environmental Defense Fund

In 2018, Shell also announced a target to keep our own methane emissions intensity, for both oil and gas, below 0.2% by 2025. This target covers all Upstream and Integrated Gas oil and gas facilities for which Shell is the operator.

The intensity baseline and target are presented as percentage figures, which represent the estimated amount of methane emissions for Shell's operated gas and oil assets as a percentage of the amount of the total gas marketed or, for those assets that have no marketed gas, the amount of marketed oil and condensate (e.g. assets that reinject produced gas).

The methane emissions include those from fugitives, venting and incomplete combustion, for example in flares and turbines. In 2018, our methane intensity was 0.08% for assets with marketed gas and 0.01% for assets without marketed gas. Shell's methane emissions intensity in 2018 ranged from below 0.01% to 0.9%.

Our methane emissions are calculated using the best currently available methods: a combination of standard emission factors (established emissions rates per throughput or per piece of equipment), engineering calculations and some actual measurements. There is data uncertainty associated with methane emissions data quantification, and these figures may change based on data reporting.

To reduce these uncertainties, our Upstream and Integrated Gas businesses are rolling out methane improvement programmes that focus on further improving data quality and reporting, and on our continued implementation of leak detection and repair programmes (LDAR) and methane abatement opportunities. By 2025, all Shell-operated assets are expected to have implemented more robust quantification methodologies.

We have a range of technologies and work practices in place to help find and address unintended - or fugitive - methane emissions in our operations. This includes next-generation technologies like drones. We also implement flaring and venting reduction programmes.

We use LDAR programmes, for instance, in Australia, Canada, the Netherlands, Trinidad and Tobago, Tunisia and the USA, and this approach will be extended across Shell globally.

We also collaborate with technology developers, civil society groups and academia to test and develop new detection technologies that can provide more accurate and continuous data and enable quicker repair of leaks. In July 2018, Shell launched a project with Avitas Systems to test drone-based remote inspection of facilities in the Permian Basin.

A project team at Shell's Groundbirch facility (Shell interest 80%), in British Columbia, Canada, has introduced a new design of well pad which includes electric valve actuators instead of pneumatic ones to reduce methane emissions from the well site. The new design is also expected to increase production capacity by 40% and decrease costs by 15%. The first new well-pad came on-stream in January 2018.



Workers at a Groundbirch well site in Canada

Shell is one of 13 members of the Oil and Gas Climate Initiative (OGCI), a CEO-led initiative to lead the industry's response to climate change. One of OGCI's focus areas is methane management. In September 2018, OGCI announced a target to reduce the collective average methane intensity of its members' aggregated upstream gas and oil operations by one fifth to below 0.25% by 2025, with an ambition to achieve 0.20%, corresponding to a reduction of one-third.

OGCI is supporting independent research, for example, with the UN Climate and Clean Air Coalition and the Environment Defense Fund, to better understand and improve measurement of methane emissions in different regions and types of operations around the world. In 2018, OGCI's investment arm, OGCI Climate Investments, invested in methane leak detection and prevention technologies, including GHGSat, which uses satellites to provide accurate, low-cost greenhouse gas monitoring data and services covering any facility in the world.

METHANE EMISSIONS PERFORMANCE

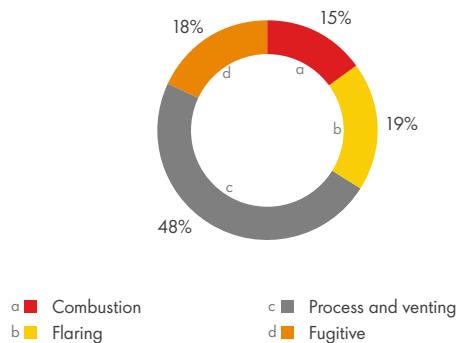
In 2018, our total methane emissions were 92 thousand tonnes compared with 123 thousand tonnes in 2017, in part driven by divestments (for example in Gabon, Iraq, Malaysia) in 2017 and 2018 and the exclusion of oil sands mining when operatorship was transferred to another company, Canadian Natural, in 2017. Methane emissions were less than 5% of Shell's greenhouse gas emissions on a CO₂-equivalent basis. More than 60% of our reported methane emissions in 2018 came from flaring and venting in our upstream and midstream operations.

Methane (CH₄) emissions

thousand tonnes



2018 Methane emissions by source



We report our methane emissions in accordance with applicable regulations and industry standards. We also engage in industry-wide work on developing more accurate reporting methods, such as through IPIECA, the global oil and gas industry association for environmental and social issues.

CARBON CAPTURE AND STORAGE

Shell invests in carbon capture and storage (CCS) projects, which use a combination of technologies to capture and store carbon dioxide (CO₂) deep underground. We also work with partners to find new ways of using CO₂ once it has been captured.

We believe CCS must play a significant role in the global climate response. CCS projects are happening around the world and the technology is proven but more projects need to be built.

The Intergovernmental Panel on Climate Change (IPCC) has said in its latest report in 2018 that the early scaling up of industry CCS is essential to achieving the stringent global warming target of 1.5 degrees Celsius. CCS technology can capture CO₂ from existing power infrastructure and heavy, energy-intensive industries like cement and steel.

CCS IN CANADA

We operate the Quest CCS project (Shell interest 10%) in Canada, which captures and stores CO₂ from the Scotford Upgrader. In its first three years of operations, Quest captured and safely stored more than 3 million tonnes of CO₂, and achieved this ahead of schedule.

Technology developed by Shell Cansolv is used to capture both sulphur dioxide and CO₂ at SaskPower's Boundary Dam power station in Saskatchewan, Canada. We continue to support SaskPower to improve the application of the technology.

DEVELOPING CCS

We are working with our partners to develop new ways to capture CO₂ from exhaust gases from industrial facilities. In 2018, we helped launch a pilot project at a biomass power plant in Austria to separate CO₂ from flue gases in a lower-cost way. Once captured, the CO₂ can be used as, for example, a fertiliser in agriculture. We are working on the project with Wien Energie, the utility that operates the power plant; TU Wien, which developed and ran the pilot project; the University of Natural Resources and Life Sciences; and Bertsch, which built the project.

At the Technology Centre Mongstad (TCM), Shell – together with the Norwegian government, Equinor and Total – is undertaking further research and development into CCS to help reduce the technology's costs. In 2017, we reaffirmed our involvement in continued testing at TCM until 2020. Shell and its TCM partners are also working on a full-scale project that includes the capture of CO₂ from industrial facilities in Eastern Norway. The CO₂ would then be transported by ship to an onshore receiving plant before being injected into an offshore saline aquifer.

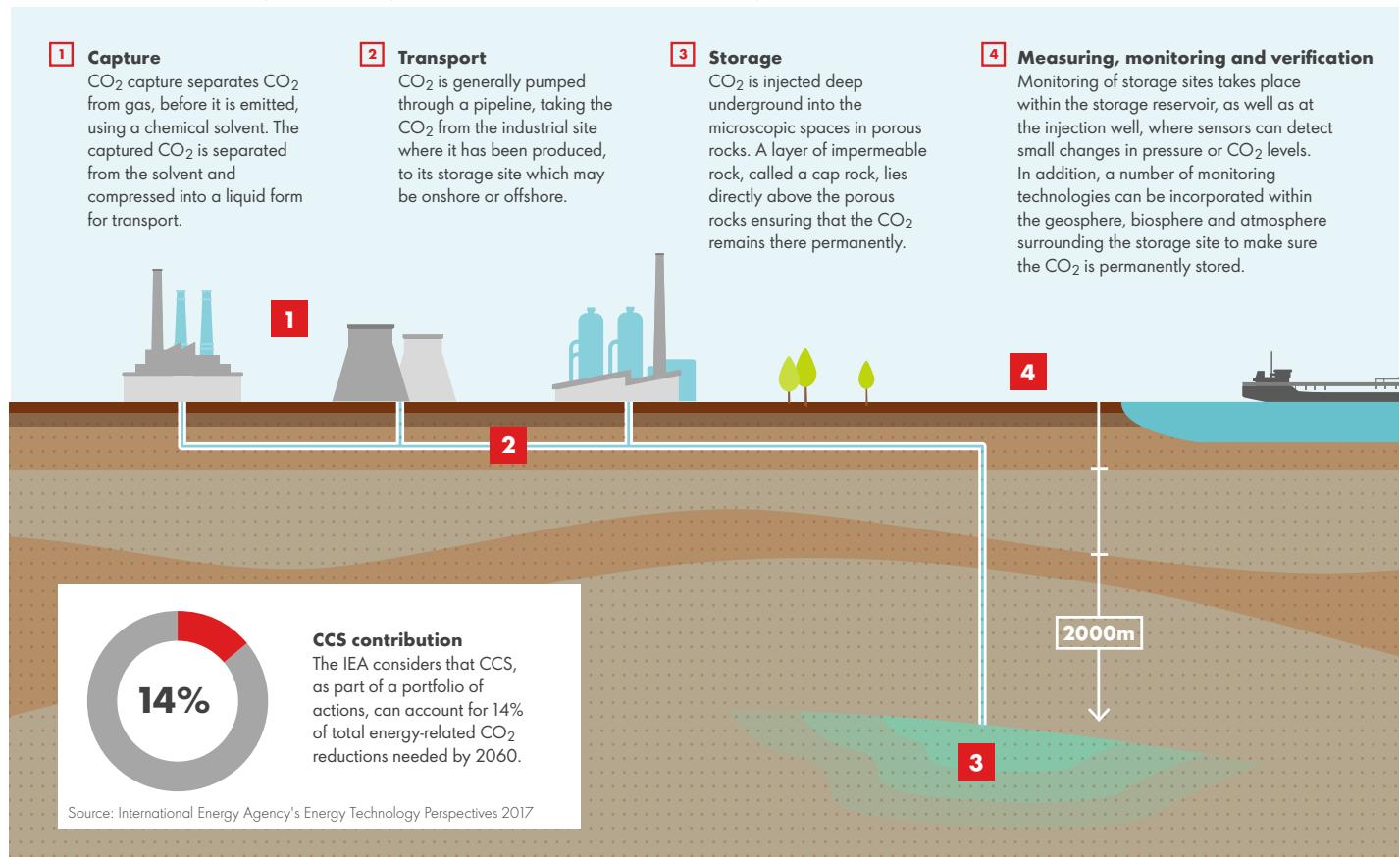
In 2018, the Oil and Gas Climate Initiative investment-arm, Climate Investments, announced that it is entering into a strategic partnership with Shell and other oil and gas companies to analyse the potential development of the UK's first commercial full-chain carbon capture utilisation and storage (CCUS) project in Teesside. Climate Investments also invested in three innovative companies involved in CCUS, including Solidia Technologies, which has developed systems for producing lower-emissions cement and concrete cured with CO₂ rather than water.

We also announced we will provide a monetary contribution to support the work of the International Energy Agency over the next three years to enable the agency to increase its focus on partnerships, and more specifically, work with its partner countries to identify how to accelerate CCUS deployment.

We are involved in the Gorgon CO₂ injection project (Shell interest 25%) in Australia, which is due to start up in 2019. It will be the world's largest CCS operation when completed. The project plans to separate and inject between 3.4 million and 4 million tonnes of reservoir CO₂ each year. Over the life of the project, it is expected that around 100 million tonnes of reservoir CO₂ will be captured and stored. During the pre-start up and commissioning checks of the injection project, some issues were identified that are being rectified before injection begins.

How carbon capture and storage works

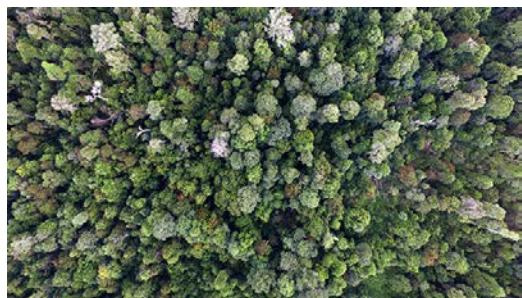
See what is involved in the process of capturing and storing carbon dioxide deep underground



NATURE-BASED SOLUTIONS

Nature will play an important role in the transition to a lower-carbon world. Using nature to capture carbon from the atmosphere is an immediate opportunity to help bridge the gap until other low-carbon solutions are deployed at scale, or to compensate for emissions which cannot be avoided.

Nature-based solutions are expected to be one of Shell's tools to reduce the Net Carbon Footprint of our energy products by around half by the middle of the century.



We will be working increasingly with nature, such as forests, to create sinks for emissions that are hard to avoid.

Nature-based projects typically involve the protection or redevelopment of natural ecosystems such as forests and wetlands, allowing those ecosystems to capture and store more carbon on our behalf. These projects, which also support local communities and conserve biodiversity, generate carbon-emission rights – each right representing one tonne of carbon dioxide not emitted – that then can be bought by energy consumers around the world. We offer carbon offsetting to our business customers in some countries including Belgium, France, Germany, Luxembourg, the Netherlands and Hong Kong.

Most nature-based projects we work with are certified by the Verified Carbon Standard, currently the largest voluntary greenhouse gas certification programme, and the Climate, Community & Biodiversity Standard, which verifies that projects not only address climate change, but also support local communities and conserve biodiversity. One project we are involved with is the Cordillera Azul National Park project in Peru, which is supported and financed by the natural capital investment fund, the Althelia Climate Fund, and protects 1.5 million hectares of threatened forest.

Over the last decade, we have worked with The Nature Conservancy to find new ways to address global and local environmental challenges. This includes using the organisation's research on nature-based solutions to help us develop business strategies that reduce the Net Carbon Footprint of our products (see Environmental partners).

SHELL AND EMISSIONS TRADING

Our environmental product trading business, one of the largest in the world, has been operating in compliance and voluntary emissions markets since 2003. The team is active in key emissions markets globally and has four main hubs in London, Singapore, Shanghai and San Diego.

We completed the first trade on the European Union Emissions Trading Scheme (EU ETS) in 2003 and have been an active participant in the European CO₂ market for the past 16 years. Today, Shell is active in the EU ETS, Western Climate Initiative, Regional Greenhouse Gas Initiative, Chinese pilot markets in Shanghai, Beijing and Guangdong, South Korean ETS, New Zealand ETS and the Australian Safeguard Mechanism.

Lower-carbon energy

Our experience, partnerships and technical know-how can help find new ways to provide energy that people need and want – and do this responsibly to help shape a more sustainable energy future.

Natural gas will play a key role in the transition to a lower-carbon global energy system over the next few decades. It is likely to be the cleanest source of energy for parts of the economy where it is hard to reduce emissions, such as heavy-duty transport and the steel and cement industries. When used instead of higher-carbon fuels such as coal and diesel for generators, it can help to meet increasing demand while lowering greenhouse gas emissions and air pollution.

Our New Energies business, established in 2016, is also strengthening the way we approach lower-carbon alternatives through its focus on new fuels and power.

Transport accounts for nearly 30% of the world's total energy use and around a quarter of global energy-related carbon dioxide (CO₂) emissions. This means that a range of different fuels and vehicle technologies will be required to meet the growing demand for mobility, while reducing emissions. Shell is investing in a range of lower-

We also work with a carefully selected group of environmental project developers around the world to offer our customers voluntary carbon credits. We ensure that our selected projects comply with high-quality accreditation standards. In this way, we are building a global portfolio of nature-based projects through which we can help our customers to offset carbon emitted from the fuels they use.

Shell's global environmental products trading business is also working with businesses across Shell to identify opportunities to support the reduction of our own Net Carbon Footprint.

carbon energies including biofuels, hydrogen for transport, and charging for electric vehicles.

We believe that low-carbon biofuels will continue to play a valuable part in reducing CO₂ emissions in the transport sector in the coming decades, provided their production is managed in a responsible way.

Hydrogen also has the potential to be an important low-carbon transport fuel. Hydrogen fuel-cell electric vehicles produce no greenhouse gases from the exhaust pipe – the only emission is water vapour.

Electric mobility will also help meet growing demand for transport in a lower-carbon world. And Shell is exploring how best to serve an increasing number of electric vehicle drivers, both in and beyond our service stations.

Reducing emissions is not just about developing new technologies. It is also about making established technologies more efficient. In fact, according to the International Energy Agency's Perspectives for the Energy Transition: The Role of Energy Efficiency report, energy efficiency can deliver up to 35% of what is needed by 2050 to keep global warming below two degrees

New Energies – investments, acquisitions and ventures

2001–2015	2016	2017	2018
US 5 onshore wind USA, since 2001	Borssele 3&4 Netherlands	First Utility UK	NewMotion Europe Europe
NoordzeeWind Netherlands, since 2002	FitCar* USA	Solar Now* Uganda/Kenya	Silicon Ranch* USA
Raizen advanced biofuels Brazil, 2011	Sense Home Monitor USA	Steamaco* Africa/Asia	Cleantech Solar* Singapore
Hydrogen stations Germany, 2015	Kite Power Systems UK	Stockton on-site USA	Moerdijk solar Netherlands
New Energies business established			
Energy solutions	Digital businesses	Energy access	Wind
Solar	New fuels	NewMotion Europe	Sonnen*
New fuels	First Utility UK	Hydrogen stations UK & California	GI Energy USA
Wind	FitCar* USA	SBI BioEnergy Canada	Rheinland Hydrogen Electrolyser Germany
Solar	Solar Now* Uganda/Kenya	IH2 India	Shell Energy Inside** USA
New fuels	Steamaco* Africa/Asia	Sunseap Singapore	Husk Power* India/Tanzania
Wind	Kite Power Systems UK	Innovatts USA	SunFunder* Kenya
Solar	Stockton on-site USA	Greentown Labs USA	Light and heavy-duty hydrogen stations Canada and USA
New fuels	Fare Pilot** UK	TetraSpar* Norway	Junction City biogas plant USA
Wind	Connected Freight** Philippines	HyET NL	Axiom Exergy USA
Solar	NewMotion Europe	Ample USA	Ample USA
New fuels	Hydrogen stations UK & California	Sonnen*	Sonnen*
Wind	Moerdijk solar Netherlands	Cleantech Solar* Singapore	Shell Ventures
Solar	IH2 India	Sunseap Singapore	* Minority investment
New fuels	SunFunder* Kenya	Innovatts USA	** Product launch date
Wind	Light and heavy-duty hydrogen stations Canada and USA	TetraSpar* Norway	HyET NL
Solar	Junction City biogas plant USA	Ample USA	Axiom Exergy USA
New fuels	Axiom Exergy USA	Sonnen*	Ample USA
Wind	Ample USA	HyET NL	Sonnen*

Celsius. At Shell, we are continuing to develop a range of lubricants and other products which, because they provide greater energy efficiency, can reduce our customers' CO₂ emissions.

Electricity, now the fastest growing part of the global energy system, is a crucial element in the ongoing transition to a lower-carbon world. We aim to make electricity a significant business for Shell, one that in the future could sit alongside oil, gas and chemicals. This means being involved at almost every stage of the process, from generating electricity, to buying and selling it, to supplying it directly to customers. Our approach to providing electricity involves developing lower-carbon energy sources, such as wind and solar, along with natural gas.

Shell aims to help make electricity available to more people. Having a reliable supply of energy is critical to economic and social development but, globally, around 1 billion people are without access to electricity. In 2018, we outlined our new ambition: to bring a reliable electricity supply to 100 million people in the developing world by 2030. We continue to work on developing a longer-term strategy to achieve this ambition.

NATURAL GAS

Natural gas – the cleanest-burning hydrocarbon – comprises about half of Shell's total production and is key to our aim to provide more and cleaner energy. Using natural gas for power generation, for example, can play a key role in developing a cleaner global energy system.

Gas is one of the few energy sources that can be used across all sectors of the global economy. It can be used to generate electricity, provide heat for essential industrial processes and homes, as well as fuel for heavy-duty road transport, shipping and rail. Natural gas emits between 45% and 55% less greenhouse gas emissions than coal when used to generate electricity, according to the International Energy Agency.

Gas can also act as a partner for intermittent renewable energy, such as solar and wind, by helping to maintain a steady supply of electricity, because gas-fired plants can start and stop relatively quickly.

MEETING DEMAND FOR LNG

As one of the industry leaders in liquefied natural gas (LNG), we sell LNG to customers in over 25 countries.

In 2018, we took a final investment decision with our joint venture partners on the LNG Canada project, which is now being built. The project will improve the availability and affordability of natural gas for Asian markets. LNG Canada is projected to have one of the lowest greenhouse gas emission profiles for a project of its kind, in part because of the decision to use hydro-electric power at the site.

LNG can also be used as a fuel for heavy-duty transport and burns more cleanly than diesel. In the shipping industry alone in 2018, there were around 200 sea-going vessels powered by LNG. The International Maritime Organization has agreed to limit sulphur oxide and nitrogen oxide emissions from all ships from January 2020. LNG fuel can help ship operators reduce emissions.

Natural gas



We provide 3% of the world's natural gas

LNG shipping



We manage one of the world's largest fleets of LNG carriers



The Cardissa LNG bunker vessel refuels the Gagarin Prospect tanker at the Gate terminal in Rotterdam, the Netherlands.

Delivering natural gas in Canada

Our LNG Canada joint venture (Shell interest 40%) and Shell Canada's Groundbirch asset in British Columbia, Canada, illustrate our firm belief that the key to success is engaging constructively with local communities and contributing to their economic development.

We have been operating in Canada since 1911. Today, we are working with our partners to responsibly deliver natural gas by keeping safety, communities and the environment at the heart of a major new liquefied natural gas (LNG) project and connected business activities.

In October, 2018, LNG Canada, the first large-scale LNG export project in the country, moved into its construction phase. LNG Canada is a non-operated joint venture (JV) between Shell, Petronas, PetroChina, Mitsubishi and Korea Gas. Gas from north-eastern British Columbia will be transported through the planned third-party 670-kilometre Coastal GasLink pipeline. It will then be liquefied for export from the community of Kitimat on the west coast.

Shell secondees, who make up around 75% of LNG Canada's employees, are working in a range of areas, including in technical, financial and commercial roles. Safety is central to delivering the project, with every employee and contractor required to meet Shell's standards, including following our 12 Life-Saving Rules. The JV partners have also agreed to adopt our Health, Safety, Security, Environment and Social Performance Control Framework.



ENGAGING COMMUNITIES

The liquefaction plant at Kitimat in British Columbia is within the traditional territory of the Haisla First Nation. It will be built on an industrial site near an existing port, transport links and power supplies. Since 2012, the LNG Canada team has worked closely with local communities, First Nations and governments to better understand how the project could help achieve their economic, environmental and community aspirations. The team's efforts led to strong support from key stakeholders, for example, from 25 elected First Nations bands along the pipeline route, at the facility and along the shipping route.



The LNG Canada team has worked closely with local communities, First Nations and governments to better understand how the project could help achieve their economic, environmental and community aspirations.

Each year, LNG Canada invests in a range of community programmes. This investment includes support for a community foundation and a training fund designed to support apprenticeships and industry training, with a focus on women.

Building the facility and pipeline is expected to create 10,000 jobs. We expect around 20,000 people will have worked in some way for LNG Canada by 2025.

Many of the local opportunities will come in the form of contracts ranging from civil work, such as laying foundations, to operating and maintaining the facilities.

PROTECTING THE ENVIRONMENT

Avoiding impacts on biodiversity and ecosystem services is a central aim of LNG Canada. Where this is not possible, the aim is to minimise impact and help restore impacted habitats or ecosystems.

Each JV participant will be responsible for providing its own natural gas supply and will individually market its share of LNG. Shell Canada's Groundbirch operations in north-east British Columbia are positioned to provide the majority of Shell's equity share of natural gas from more than 500 producing wells and four natural gas processing plants.

At Groundbirch, we work with local communities to minimise our environmental impact. Since 2014, we have reclaimed 60 hectares to their natural landscape, in part through a collaboration with the local Twin Sisters native plants nursery. Twin Sisters, established by the Saulteau First Nations and West Moberly First Nations, enables us to reclaim the land using local traditional knowledge and native plant species. Restoring the habitat also contributes to the success of conservation efforts by encouraging natural wildlife migration and behaviour.



At Groundbirch, we work with local communities to reclaim land to its natural landscape.

As part of its design, LNG Canada developed a series of environmental management plans to avoid, manage or mitigate potential effects on the environment. The project's wetland compensation plan includes establishing 17 hectares of wetlands to help balance the project's physical presence. The plan includes hiring an environmental specialist contractor to restore, enhance or create another 65 hectares of wetlands.

LNG Canada also plans to offset project-related impact on fish and fish habitats by maintaining or increasing the availability and quality of rearing, migratory and winter habitats for the local salmon, trout, and char populations.

MANAGING EMISSIONS

LNG Canada's export plant has been designed to achieve the lowest carbon intensity of any large-scale export facility operating in the world today, achieved through a combination of using renewable hydropower and highly efficient gas turbines. It also supports Shell's ambition to reduce the Net Carbon Footprint of the energy products it sells.

Groundbirch has already reduced greenhouse gas emissions by about 25% over the past three years. This result is due to a voluntary leak detection and repair programme that uses methods such as infrared cameras to identify and repair fugitive methane leaks. We are also testing several methane detection technologies to provide real-time monitoring.

By electrifying its main gas plants in 2016, Groundbirch reduced emissions equal to removing about 37,500 cars from the road each year. We have also installed specially-designed multi-well pads with electric actuator technology to significantly reduce methane emissions. It now takes around 700-1,000 watts to run these well pads, about the same as powering a hair dryer. By using natural fuel gas instead of diesel on rigs, we have cut greenhouse gas emissions in our drilling and completions operations by 28% since 2014.

At the end of 2018, Shell and six other Canadian natural gas producers came together to announce \$3 million in funding through the Natural Gas Innovation Fund (NGIF) to advance clean technology solutions to reduce greenhouse gas emissions in natural gas production.

WATER USE

We aim to minimise our use of fresh water and, wherever possible, recycle and reuse water from our activities. In 2012, Shell collaborated with the City of Dawson Creek to build a reclaimed water facility. The [Dawson Creek Reclaimed Water Project](#) virtually eliminated the need to draw on fresh water for our Groundbirch operation. The project also treats a volume of municipal waste water that was previously released into the Dawson Creek to a standard suitable for industrial and municipal uses.

In 2018, we started testing a technology to dehydrate waste water and evaporate clean water back into the hydrologic cycle, reducing waste water volumes for disposal. Today, around 97% of the water used in our Groundbirch operations is recycled.

In addition, water pipelines built throughout our field help us distribute water between our Groundbirch sites, minimise trucks on the road, reduce emissions, noise and dust, and improve road safety.



Workers prepare to sample water in pasture land near Groundbirch operations.

ELECTRICITY



ELECTRICITY

We aim to make electricity a major business for Shell, one that could sit alongside oil, gas and chemicals. This means being involved at almost every stage of the power supply system, from generating electricity, to buying and selling it, to supplying it directly to customers.

Electricity from renewable sources, such as wind and solar, can be combined with the electricity produced from natural gas. Together, they can provide cleaner sources of power.

We are expanding our existing electricity businesses and moving into new areas, building on the strength of both our brand and our global presence.

Shell already plays a significant role as an electricity trader and wholesale supplier in North America. We manage more than 10,000 megawatts (MW) of power generation in the continent, enough to power around 5 million homes, with more than a third coming from renewables. We have a growing trading business in Europe and we are entering other markets. For example, in 2018, Shell Energy Australia executed our first power trade at the Australian Securities Exchange and we are also preparing to start an electricity trading business in Japan in 2019.

In the USA and Europe, we are involved in electricity generation through wind and solar projects.

For the residential market, we are starting to supply directly to customers and providing charging points to electric vehicle drivers both in and outside our retail stations.

In addition, we are developing ways to provide electricity to those who have unreliable access, or none at all. Shell's ambition is to provide a reliable electricity supply to 100 million people in the developing world by 2030. We continue to work on developing a longer-term strategy to achieve this ambition.

WIND

We first entered the wind business in 2001, in the USA. Today, we have five onshore wind farms in operation in the USA, and one offshore wind farm in operation in the Netherlands. We also have interests in three wind projects under development – two in the USA and one in the Netherlands. Once built, these projects will have a total installed capacity of more than 5 gigawatts (GW).



Shell has five onshore wind farms in operation in the USA.

The Netherlands wind project is led by the Blauwind consortium (Shell interest 20%), which will build and operate Borssele III and IV wind farms. These wind farms are designed to have a total installed capacity of 731.5 MW, enough to power around 825,000 Dutch households. Half of the electricity generated from this wind farm will be marketed by Shell Energy Europe Limited to supply customers with renewable power.

In 2018, we made a move into US offshore wind, announcing two joint ventures to develop wind farms off New Jersey and Massachusetts, both 50% Shell-owned, which would have a total installed capacity of 4 gigawatts.

SOLAR

In 2018, we acquired a 44% interest in Silicon Ranch Corporation, a US developer, owner and operator of solar assets; this includes about 1.4 GW capacity of operational or contracted projects.

Shell has also acquired a 49% interest in Cleantech Solar, which provides solar power to commercial and industrial customers across South East Asia and India. This Singapore-based solar developer owns more than 120 solar power projects, with most in operation and the rest under construction or development. In total, its installations, once fully built, represent up to 200 MW of power.



The Silicon Ranch solar power project is located in Nashville, Tennessee, USA.

We have also invested in the Sunseap Group through our corporate venturing arm Shell Ventures. Sunseap has around 160 MW of distributed solar contracts, an electricity retailer licence in Singapore and large-scale solar projects.

In the UK, we increased our position in renewable power in 2018 after Shell Energy Europe signed a five-year deal with British Solar Renewables to buy all the electricity generated by the Bradenstoke solar power plant in Wiltshire. The plant generates around 65 mega-watt hours a year.

Shell Energy Europe also signed a five-year deal with Octopus to buy electricity from its 70.5 MW portfolio of Italian solar assets.

In the USA, Shell Energy North America signed a 15-year agreement to purchase solar power from EDF Renewables North America in California and a 12-year agreement to purchase solar power from the Phoebe solar photovoltaic project in Texas.

We are starting to deploy solar photovoltaic in our own operations, including offices, retail sites, distribution terminals, refineries and offshore installations. In California, USA, for example, we have delivered a photovoltaic project to provide on-site solar power to the Stockton fuels distribution terminal. Shell is also developing a solar power plant at its Moerdijk chemicals site in the Netherlands.

DISTRIBUTED AND HOUSEHOLD ENERGY

In 2018, we started supplying energy to residential customers directly in the UK for the first time when we acquired First Utility (Shell Petroleum Company Limited), an energy provider that supplies around 720,000 homes. It is also active in Germany.

The residential market is changing fast, with new technologies such as smart meters, smart thermostats and other intelligent appliances. These devices allow people to monitor and control their consumption better – for instance, by programming large appliances to run at a time when electricity is cheaper. This helps to balance the electricity grid at peak times when supplies are most stressed.

One further trend is known as distributed energy. This is when customers, big and small, begin to generate their own on-site power through solar panels or wind turbines, store it and potentially redistribute it back into the grid.

In 2018, Shell acquired a majority interest in GI Energy, a US company that focuses on the integration of distributed energy resources. GI Energy builds microgrids and on-site energy systems for commercial and industrial customers. In February 2019, we acquired sonnen, which provides smart energy storage systems and innovative energy services for households.

ACCESS TO ENERGY

Around 1 billion people live without access to electricity and a billion more only have access to unreliable power supplies.

In 2018, we outlined our new ambition to provide a reliable electricity supply by 2030 to 100 million people in the developing world. We plan to do this by investing in commercial businesses and by supporting innovation. In this way, we help to achieve the UN's sustainable development goal 7, which calls for access to affordable, reliable, sustainable and modern energy for all. We continue to work on developing a longer-term strategy to achieve our ambition.

We see a commercial opportunity to invest in energy access solutions in Africa and Asia. Our approach focuses on proven technologies and business models that can be deployed on a large scale. These include mini-grids and decentralised solar energy systems that can power homes, businesses and communities.

We have invested in several companies that provide electricity systems to residential, commercial and industrial sectors.

In 2018, we invested in Husk Power Systems, a mini-grid company with experience in India that has recently expanded into Tanzania. Husk uses a hybrid solar photovoltaic and biomass gasification system with battery storage to provide reliable and affordable electricity 24 hours a day to customers on a pay-as-you-go basis.



Husk Power Systems serves a mix of rural households and businesses.

We have invested in SolarNow, a business which provides decentralised solar energy solutions to unserved and underserved customers in East Africa. SolarNow operates through a network of branches in Kenya and Uganda, offering customers a range of solar home systems and appliances.

In addition to investing in companies that are bringing more reliable electricity to customers, we are also investing in those that support the broader energy access ecosystem. For example, SteamaCo is an off-grid smart metering technology company, providing utilities in frontier markets with the tools to automate the management of decentralised energy assets. The company automates hundreds of distributed energy assets, which in turn bring electricity to tens of thousands of homes and businesses across Africa.

We also invested in SunFunder, a solar debt financing firm that supports the growth of commercial businesses improving energy access. Sunfunder has loaned more than \$55 million to different solar companies.

In addition to commercial energy access activities, we help to provide reliable and safe energy through our social investment programmes. For example, when Shell started to look for potential business opportunities in Myanmar, we also explored ways to deliver the benefits of reliable energy to communities in the Tanintharyi region. Working with Pact, a non-profit organisation, to provide access to sustainable energy, we have improved the livelihoods of around 35,000 people since 2015.

In the Philippines, we launched a project in 2018 at the Logpan village near our Palawan offshore activities to help the remote and off-grid community access energy and clean water. We developed a community-run solar-powered energy kiosk that offers small solar home systems for households and operates a solar-powered water pump to provide safe, filtered water.

We also worked in Malaysia with non-governmental organisations Tonibung and PACOS Trust to bring electricity to Saibbingkol community in Sabah. The pilot programme uses solar panels and a hydro turbine to give 42 households access to a reliable source of electricity. We also set up a socioeconomic development centre in the village for people to use the electricity for income-generating activities, such as sewing or more efficient drying of tapioca chips and flour milling. We plan to scale up these efforts to bring electricity to at least two more villages in 2019.

FUELLED MOBILITY

BIOFUELS

During the transition to a lower-carbon world, different transport fuels will coexist. Shell is investing in biofuels, which can be blended with existing fuels such as petrol and diesel. When used in vehicles, they can be a cost-effective way of reducing CO₂ emissions.

Sugar-cane ethanol in Brazil, for example, can reduce CO₂ emissions by around 70% compared with conventional petrol, from cultivation of the sugar cane to using the ethanol as fuel.

Shell is one of the largest blenders and distributors of biofuels. In 2018, we used around 9.5 billion litres of biofuels in the petrol and diesel we sold worldwide in order to meet specific regulations. Raízen, our joint venture in Brazil (Shell interest 50%), produces ethanol from sugar cane, with an annual production capacity of more than 2 billion litres. In addition to understanding blended biofuel emissions, we want to ensure that other environmental impacts from biofuel production are well managed – such as the effect on soil, air and water – and that there are benefits for the livelihoods of local communities.

Read more on our approach to biofuels at www.shell.com/biofuels.

Key developments in biofuels

When purchasing biofuels, we require that they are produced in a way that is environmentally and socially responsible. Where possible, we source biofuels that have been certified against internationally recognised sustainability standards.

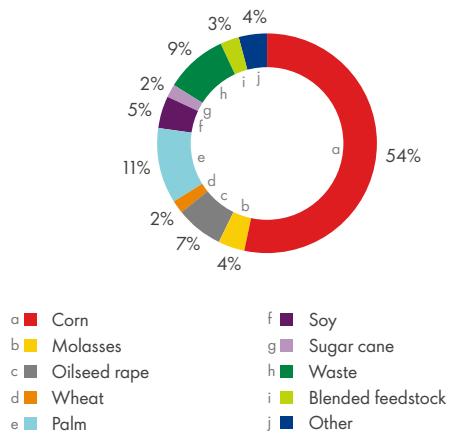
We support the adoption of international sustainability standards including the Round Table on Responsible Soy (RTRS), the Roundtable for Sustainable Palm Oil (RSPO) and Bonsucro, an organisation for the certification of sugar cane. We also support the Roundtable for Sustainable Biomaterials and the International Sustainability and Carbon Certification (ISCC) for feedstocks.

Shell aims to have 100% of the sugar-cane ethanol and South American soy biodiesel used in Shell-blended or traded biofuels certified as sustainable by 2020. In 2018, 60% was certified as sustainable.

All the palm oil that we blend is certified by RSPO or the ISCC or covered by offsets from the RSPO certificate trading system. We continue to participate in the RSPO and support its latest set of standards for sustainable palm oil production adopted in 2018.

In the Philippines, coconut oil is the primary feedstock for biodiesel. In 2018, Pilipinas Shell announced the launch of a sustainability project with coconut farmers in collaboration with JNJ, one of our major suppliers of coconut methyl ester. The project will help train farmers in more sustainable farming practices, which can also enable them to improve yields and increase their income.

Global bio-component purchase [A][B] by feedstock



[A] Does not include purchases by Raízen.

[B] Percentages do not add up to 100% due to rounding.

Raízen

Raízen, our joint venture in Brazil (Shell interest 50%), produces ethanol from sugar cane, with an annual production capacity of more than 2 billion litres; exports sugar, with an annual production of about 4.2 million tonnes; and manages a retail network.

Raízen opened its first cellulosic ethanol plant at its Costa Pinto mill in Brazil in 2015. When fully operational, the plant is expected to produce around 40 million litres a year of advanced biofuels from sugar-cane residues.



Our joint venture in Brazil, Raízen, produces ethanol from sugar cane.



Through Raízen, we produce one of the lowest CO₂ biofuels available today.

Around 42% of Raízen's ethanol and 45% of its sugar production were certified as sustainable to the standards set by Bonsucro. Raízen alone accounts for 39% of the world's Bonsucro-certified sugar cane. By the end of 2018, 21 of its 26 mills were certified.

Raízen purchases around half of the sugar cane it uses as a raw material from independent suppliers. Since 2014, the company has worked with two non-governmental organisations, Imaflora and Solidaridad, on a programme to help its suppliers become more sustainable. Based on volumes, the programme covered 96% of third-party sugar cane in 2018.

With 1 gigawatt of installed power capacity, Raízen is also Brazil's largest producer of electricity from biomass – straw and bagasse – which are by-products of ethanol and sugar cane production.

For more details, see [Raízen's sustainability report](#).

Developing advanced biofuels

We continue to invest in new ways to produce advanced biofuels from sustainable raw materials, such as waste and cellulosic biomass from non-food plants.

We have a demonstration plant at the Shell Technology Centre Bangalore, India, which features an advanced biofuel process called IH2, a technology that can turn waste into transport fuel. The plant can process around five tonnes a day of feedstock, such as agricultural waste, and aims to demonstrate the technology for possible scaling up and commercialisation.

In August 2018, we announced plans to expand and upgrade the JC-Biomethane plant in Junction City, Oregon, USA, which we acquired in May 2018. The plant transforms organic waste into renewable natural gas through a process called anaerobic digestion. Once upgraded, the facility is expected to produce up to 700,000 British thermal units of gas a year.

In the UK, we are working with renewable fuels company Velocys and British Airways to develop and install a waste-to-renewable jet fuel plant. If installed, the plant would use post-recycled waste, destined for landfill or incineration, and convert it into cleaner-burning fuels.

More sustainable fuel for aviation

We are exploring long-term opportunities for lower-carbon fuels in aviation. In 2018, Shell Aviation (Shell International Petroleum Co. Ltd) and SkyNRG announced a long-term strategic collaboration to promote and develop the use of more sustainable fuel in aviation supply chains. SkyNRG blends and distributes sustainable aviation fuel as well as developing regional supply chains.

In November 2018, Shell Aviation and SkyNRG initiated the supply of sustainable aviation fuel to KLM, Scandinavian Airlines and Finnair at San Francisco Airport. The initial phase of the arrangement aims to pave the way for longer term, more resilient supply chains for sustainable aviation fuels and reduce the carbon emissions of flights from San Francisco and other airports. The fuel is produced by World Energy, currently the world's only sustainable aviation fuel refinery.

The fuel sourced by SkyNRG from World Energy's Paramount refinery in Los Angeles is made from used cooking oil, resulting in a fuel that has significantly lower life-cycle carbon emissions than conventional jet fuel.

E-MOBILITY

We are exploring how best to serve an increasing number of electric vehicle drivers, both in and beyond our forecourts. We want to ensure that customers can choose from a range of recharging options over the coming decades.

By 2030, there could be 125 million electric vehicles on the road according to the International Energy Agency's New Policies Scenario, compared to around 3 million today. An adequate recharging infrastructure needs to be developed, to ensure customers can charge their vehicles and continue their journeys smoothly.

Vehicle charging networks are a relatively new area for Shell. In 2017, we acquired NewMotion, one of Europe's largest charging providers, which operates more than 40,000 private electric charge points in the Netherlands, Germany, France and the UK. NewMotion also has more than 80,000 public charge points across 28 countries in Europe and is developing solutions to provide customers with the flexibility to charge their vehicles at home and at work.



Shell is working to meet the charging needs of electric vehicle drivers – at home, at work or on the road.

We also offer electric vehicle fast-charging, a service called Shell Recharge, which takes around 30 minutes, at forecourts in the UK, the Netherlands and China. And we are working with high-powered charging network operator IONITY to offer even faster charge points in 10 European countries.

In 2018, Shell Ventures invested in electric car-charging company Ample. Ample has used autonomous robotics and smart battery technology to develop an economical, rapidly deployable and widely accessible platform that delivers a full charge to any electric car in minutes.

Shell Foundation has provided support to start-up business Aceleron which is exploring, among other things, how to use waste car batteries in the off-grid sector as storage or a power source. After being taken off the road, these batteries could reportedly have another seven to 10 years of useful life. Read more about Aceleron at www.shell.com/aceleron.

In 2018, we launched a Formula E partnership with Nissan, which will help us to further research and develop ways to improve the driving experience for electric vehicle drivers.

As the number of electric vehicles on the road grows, Shell is also working to provide more electricity from sources such as wind and solar power that will allow them to run on low-carbon power sources.

Read more about electric mobility at Shell at www.shell.com/electricmobility.

EXTERNAL VOICE

Wilson Smith, from the Department of Chemical Engineering at Delft University of Technology, has been working with Shell on how microscopic phenomena can be best harnessed in various industrial processes.

"The increasing supply of low-cost renewable electricity points towards large-scale electrification of the world. Consequently, the discipline of electrochemistry, which underlies both electric batteries and hydrogen fuel cells, is experiencing a renaissance and there's a huge opportunity to electrify many parts of industry. I believe Shell can lead this transition. It knows how to integrate and scale up the processes related to electrification to help accelerate the technological development of electrochemistry."



Professor Wilson Smith

Associate Professor, Delft University of Technology

HYDROGEN

Hydrogen has great potential to help meet growing demand for transport, while reducing emissions and improving air quality. We are helping to build the infrastructure that will be needed if it is to realise this potential.

Hydrogen fuel cell vehicles produce no greenhouse gases from their exhaust pipe – the only emission is water vapour. Taking into account factors from production to distribution, if the hydrogen is produced using renewable energy, then the fuel for these vehicles is virtually emission-free.

Hydrogen is also an option in parts of the transport sector where other low-carbon alternatives are not suitable or where technology has been slower to develop. The high energy density of hydrogen makes it particularly suitable for transport that carries heavy goods over long distances, such as trucks.

Read more about hydrogen as a transport fuel in [A drive for cleaner air](#).



Hydrogen cars could play a key role in the future of transport.

In Germany, through our participation in the H₂ Mobility Germany joint venture, we are working with the government to develop a national network of around 400 hydrogen-electric fuelling stations across the country by 2023 – with 54 currently open, 20 of which are located at Shell retail sites. We are working on this project with our joint-venture partners French gas supplier Air Liquide, German car manufacturer Daimler, Austrian oil and gas company OMV, German engineering firm Linde and French oil and gas company Total.

In 2018, we opened the first retail hydrogen fuelling station in Vancouver, Canada, and our third in California, USA. As part of a consortium led by the Port of Los Angeles to develop the first hydrogen refuelling network for trucks in California, we will also develop three new large capacity heavy-duty hydrogen truck refuelling stations. One of these will produce hydrogen from 100% renewable biogas. Together, they are being designed to support a fleet of 12 trucks each day.

We are also assessing the potential for similar projects in other parts of the USA as well as in Belgium, France, Luxembourg, the Netherlands, Switzerland, the UK and China.

Hydrogen also has many possible applications beyond the transport sector as a versatile and clean energy carrier. For example, it has a role to play in reducing emissions as a fuel for power plants and as a feedstock for industry, as well as to store energy for longer and at much greater scale than is currently possible with rechargeable batteries.

In 2018, Shell started building an electrolyser, the largest of its kind, to produce hydrogen from water for our Rhineland refinery in Germany. We are also working with our partners to build and operate the world's first liquid hydrogen ship, which will deliver hydrogen to international markets.

In heating, a difficult sector to decarbonise, alongside efforts to improve energy efficiency, there is a role for hydrogen to be blended into the gas grid.

ENERGY-EFFICIENT PRODUCTS

Energy efficiency can deliver up to 35% of what is needed to keep global warming below two degrees Celsius by 2050, according to the International Energy Agency.

Today, we serve more than 30 million customers every day at 44,000 Shell-branded service stations and by 2025 we plan for 40 million customers daily at 55,000 stations.

We offer customers products that can help boost the efficiency of their engines by burning fuels more cleanly and reducing friction and wear. We also supply lower-carbon fuels such as liquefied natural gas, compressed natural gas, liquefied petroleum gas and hydrogen, along with electric vehicle charging points.



Starship is designed to show how trucks can be more fuel efficient.

Shell PurePlus Technology converts natural gas into a pure base oil – which can form up to 90% of a finished motor oil – to improve and protect an engine's performance. For example, the technology is used in the Shell Helix 0W range of lubricants and can help to reduce CO₂ emissions from a car's operation by up to 3%. The Shell Advance motorcycle oil range, which also uses the technology, can minimise the build-up of engine deposits, allowing for more efficient power transmission. This can lead to better fuel economy, with some motorcycles travelling up to five kilometres more per litre of fuel.

For heavy transport journeys, we helped pioneer a new vehicle to show how trucks can be more fuel efficient. We collaborated with AirFlow Truck Company to build and test a hyper-efficient concept truck. The Starship Initiative truck explores what is possible in truck design, fuel economy and CO₂ reduction.

On completion of a trial drive in the USA from the east coast to the west coast, the truck recorded a 248% improvement in freight tonne efficiency compared to the average North American truck. If all 2 million trucks in the USA reached the overall fuel economy and freight tonne efficiency performance of the Starship Initiative, they would emit an estimated 229 million tonnes of CO₂ less each year.

We are actively seeking to make road surfaces smarter and the products used in their construction, such as bitumen, more energy efficient and cleaner. Using our clear bitumen in a light coloured asphalt, for example, we can reduce the need for lighting in tunnels by up to 40% without affecting driver visibility.

We are also helping to ensure the efficiency of wind power through products and digital services so that its contribution to the energy mix can continue to grow.



The Starship truck recorded a 248% improvement in freight tonne efficiency on its trial drive.

Developing technology

We invest in research and development (R&D) to improve the quality of our products and efficiency of our projects, processes and operations – and to commercialise new technologies for the transition to a low-carbon energy future.

We have a global technology-development network, with major centres in the USA, the Netherlands and India. We also have R&D sites in countries such as China and Germany. Hundreds of scientists work at our facilities, running R&D projects that seek to, among other things, turn natural gas into cleaner fuels and energy-saving lubricants; to bring crude oil up from under the sea safely, economically and efficiently; and to reduce the Net Carbon Footprint of the energy products we sell.

In 2018, we spent \$986 million on R&D, compared with \$922 million in 2017.



We are using advanced digital data to improve the efficiency of our ships.

Our R&D projects often involve collaborations with public or private entities, including business partners, universities, government laboratories, technology start-ups and incubators.

In 2018, we started work on 260 R&D projects with universities. Many of these focus on areas crucial for low-carbon energy systems, such as biomass, renewable power and electrochemical batteries. Our association with universities enables students and faculty to tackle technological challenges beyond foundational scientific insights, and consider how to scale up their work from the laboratory to commercial application in the energy industry.

For example, we are participating in a pilot project with the Technical University of Vienna and others to implement a new carbon capture process at a biomass power plant (see [Carbon capture and storage](#)).

We are also improving the performance and efficiency of our liquefied natural gas carriers and gas plants by using advanced digital data. For example, by letting captains know exactly what the optimal sailing conditions for their ships are, fuel consumption (and therefore CO₂ emissions) can be reduced by as much as 8%.

In 2018, we announced a new programme that will help start-ups working on emerging clean-energy technologies to accelerate their path to market. Shell GameChanger Accelerator focuses on technologies related to long-term energy storage and power grid management. The programme works with the US Department of Energy's National Renewable Energy Laboratory and has so far identified four companies to support.

Globally, we support innovation in a number of ways, including:

- Shell GameChanger, which works with start-ups and businesses on unproven early-stage ideas with the potential to impact the future of energy;
- Shell Ventures, which invests in companies that are developing promising technologies that complement Shell's businesses; and
- Shell TechWorks, a programme that brings into the oil and gas sector proven technologies from other industries.

Find out more about how Shell innovates at www.shell.com/energy-and-innovation and at www.shell.com/energy-and-innovation-news.

EXTERNAL VOICE

The Chinese Academy of Sciences and Shell have developed a strategic proposal for a hybrid energy system.

"To be a leader in energy, Shell is directly supporting research and development related to a low-carbon future. However, energy and issues such as climate change are global topics that are closely related to natural resources and technology advancements. This makes things challenging because different countries have differing energy structures. Attention must be paid to suitable integrated energy solutions for every region. For example, nuclear coupled with technologies that convert coal into other hydrocarbon products, or renewables integrated with gas conversion. The education and training of youth are also important. This is a major opportunity, for Shell and for all of society."



Professor Yuhan Sun
Chinese Academy of Sciences, China

Contribution to society

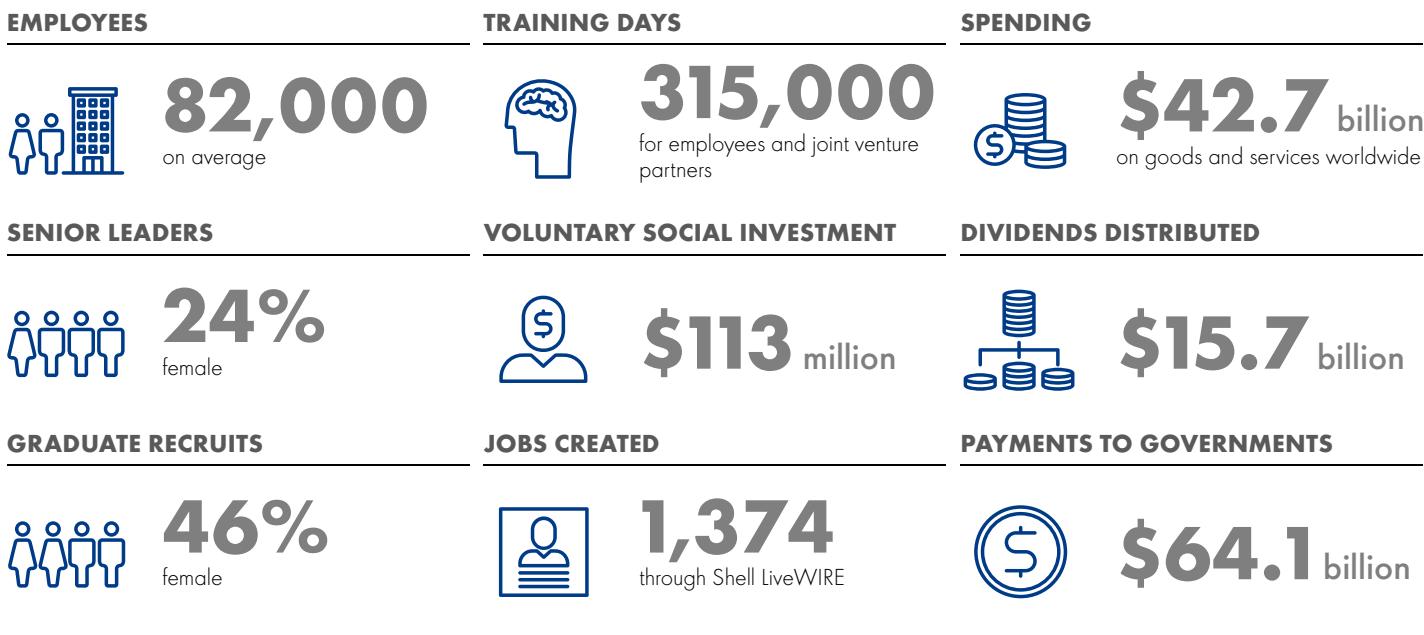
Our contribution to society comes in many forms. It includes providing energy that millions of people rely on. We also contribute through paying taxes which support public services, creating jobs and supporting communities through our social investment programmes.

IN THIS CHAPTER

- 64** Working for Shell
- 66** Revenue transparency and tax
- 67** Social performance
- 71** Working together



In 2018:



Working for Shell

OUR PEOPLE

Our people are essential to Shell's success. We work to maintain a productive and healthy organisation by employing and developing talented people, continually strengthening our leadership, and enhancing employee performance by fostering strong engagement.

In 2018:

- we recruited around 460 graduates, 2,160 experienced professionals, and 3,440 people for Shell Business Operations centres;
- 46% of our graduate recruits were female; and
- we provided almost 315,000 formal training days for employees and joint-venture partners.

During 2018, we employed an average of 82,000 people in more than 70 countries, with around 43% of our people operating in countries outside Europe and North America. Dialogue between management and our people takes place directly and through employee representative bodies where appropriate. We offer multiple channels for employees to report, confidentially and anonymously, breaches of the Shell General Business Principles or our Code of Conduct, or other concerns.



In Oman a team of female operatives refuel planes for Shell Aviation.

We provide equal opportunity in recruitment, career development, promotion, training and reward for all employees, regardless of gender, ethnicity, sexual orientation or physical ability. We actively monitor diversity on a global level and measure the representation of women and local nationals in senior leadership positions and have processes in place to identify and mitigate biases.

Shell aims to manage the impacts of business changes on people respectfully, honestly and with integrity. Affected employees are supported in their search for alternative employment as appropriate by country law and policy.

EMPLOYEE ENGAGEMENT

The Shell People Survey is one of the principal tools used to measure employee engagement, motivation, affiliation and commitment to Shell. It provides insights into employees' views and has had a consistently high response rate. In 2018, the response rate was 82%, which was an increase of 2% compared with 2017, and the average employee engagement score was 77 points out of 100, which was an increase of one point compared with 2017.

In 2018, we launched an initiative called "I'm Not OK" to promote open and honest conversations about mental health. The initiative is designed to help employees support each other, create awareness about how to access the professional counselling available through Shell's employee benefits, and to empower teams to create a workplace where it is safe to say 'I'm Not OK'.

WORKFORCE DIVERSITY

Our diversity and inclusion approach focuses on hiring, developing and retaining the best people.

Embedding the principles of diversity and inclusion in the way we do business gives us a better understanding of the needs of our people, partners, suppliers and customers. A diverse workforce, and an inclusive and caring environment that respects and nurtures diverse people, is a way to improve our safety and business performance.

At the end of 2018, the percentage of women in senior leadership positions was 24%, compared with 22% at the end of 2017. We continue to measure and work to improve our gender balance by making female leaders more visible and accessible as role models, by providing leadership programmes for women and by embedding diversity and inclusiveness in our policies and processes. In 2018, Shell became the first major integrated oil and gas company to set a global minimum standard of 16 weeks' paid maternity leave.

In 2018, our CEO joined the Catalyst CEO Champions for Change, a group of more than 50 CEOs who pledge to support women's advancement at all levels of leadership. We also launched a global campaign on closing the gender gap in engineering and technology – joining forces with the UK's Royal Academy of Engineering to inspire the next generation of engineers, challenge associated stereotypes and showcase how rewarding and fulfilling such careers can be.

In 2018, we introduced our workplace accessibility service, which currently serves 62 locations globally. The service is designed to ensure that all employees have access to reasonable physical workplace or other adjustments so that they can work effectively and productively.

At Shell, we support and enable remarkable people from every background, and strive to be a pioneer of lesbian, gay, bisexual, transgender and intersexed (LGBTI) inclusion in the workplace. In 2018, we were recognised as one of the top three organisations in the Workplace Pride global LGBTI inclusive workplace benchmark and

In 2018:

Shell global helpline



1,584

Reports to the helpline

Taking action



266

Employees or contractor staff subject to disciplinary action



Shell employees in Canada proudly wear the rainbow colours, the universal symbol for equality.

earned a 100% score in the Human Rights Campaign Foundation's Corporate Equality Index. We have also pledged support for the UN LGBTI Standards of Conduct for Business.

LIVING BY OUR PRINCIPLES

Our core values of honesty, integrity and respect for people underpin our work with employees, contractors, suppliers, non-governmental organisations and others.

The **Shell General Business Principles** describe the company's core values, its responsibilities, and the principles and behaviours by which we do business. They also include Shell's commitment to contribute to sustainable development – the need to balance short- and long-term interests, integrating economic, environmental and social considerations into business decision-making. We aim to do business fairly, ethically and in accordance with all applicable laws.

All Shell employees and contract staff must follow our Code of Conduct, which guides employees on how to apply the Shell General Business Principles in line with our core values. Employees and contract staff are also required to complete Code of Conduct training regularly and to confirm they understand their personal responsibilities under the Code of Conduct. Contractors must also follow the Code of Conduct when acting on our behalf.

Read our Code of Conduct at www.shell.com/values.

Code of Conduct



370

Substantiated allegations

Taking action



92

Contract terminations or dismissals

SPEAKING UP

Shell employees, contractors and any third party can report any potential breaches of the Code of Conduct confidentially and anonymously through several channels, including a global helpline, which is operated by an independent provider.

Shell has specialists who investigate concerns or allegations about a breach of our Code of Conduct. If a violation is confirmed, the appropriate Shell company will take appropriate action up to and including a contract termination or dismissal. We maintain a stringent no retaliation policy to protect any person making a good faith allegation. In 2018, we carried out extensive sessions for managers on harassment awareness and prevention to help ensure people in their team feel comfortable speaking up.

Internal investigations confirmed 370 substantiated breaches of the Code of Conduct in 2018 compared with 261 in 2017. As a result, we dismissed or terminated the contracts of a total of 92 employees and contract staff, compared with 73 in 2017. Most Code of Conduct violations related to protection of assets, conflicts of interest and harassment.

TACKLING PRODUCT THEFT

In August 2017, after an internal investigation, we reported to the Singapore authorities a suspected substantial product theft from our Pulau Bukom manufacturing site. The authorities arrested and subsequently charged several individuals in 2018, including eight former Shell employees. We have been working closely with the Singapore police force during its investigations, which are still ongoing.

What we uncovered is unacceptable and we are taking significant steps to prevent a similar incident from happening again. We are focusing on areas including the monitoring of products moving in and out of Pulau Bukom, the vessel management process, and ethics and compliance training. We are also working with government authorities and industry associations to address the issue of oil theft more broadly in the region.

ETHICAL BEHAVIOUR

In 2018, we focused on simplifying the ethics and compliance tools and resources available to everyone at Shell. This also included giving senior leaders better insight into how well their teams are performing.

Tax binds governments, communities and businesses together. Public funds support healthcare, education, transport and other essential services. Revenue transparency provides citizens with important information to hold their government representatives accountable and to advance good governance.

In 2018:

- we paid more than \$64.1 billion in taxes and royalties to governments around the world;
- we paid \$10.1 billion in income taxes. Our government royalties were \$5.8 billion; and
- we collected \$48.2 billion in excise duties, sales taxes and similar levies on our fuel and other products on behalf of governments.

Our Ethics and Compliance Office worked to consolidate the existing internal manuals, bringing content together into a single manual, simplifying the language and redesigning the layout for digital publishing. In 2018, we launched our integrated ethics and compliance manual, at the same time making it publicly available (see [Ethics and compliance manual](#))

Additionally, an ethics and compliance dashboard was developed for use by senior leaders, giving them easy visibility of their organisation's compliance with selected metrics, such as overdue training.

We launched an ethical leadership expectations programme for senior executives to explore and reinforce what Shell requires of leaders at this level. It focuses on values, behaviours, business pressures and leadership practice.

Read more at www.shell.com/codeofethics.

ANTI-BRIBERY AND CORRUPTION

Shell has clear rules on anti-bribery and corruption and these are included in our Code of Conduct for all employees. There is no place for bribery or corruption at Shell. Read more about our values at www.shell.com/values.

Various national and international laws prohibit business involvement with certain individuals, entities and organisations. Our anti-bribery and corruption and anti-money laundering and trade compliance programmes set out the requirements for screening business partners. Using a risk-based approach, we screen potential business partners before and during the contractual relationship. In 2018, we carried out 7,759 enhanced pre-screenings for higher-risk contracts. Additionally, around 10 million counterparties are screened on a continuous basis against a range of trade compliance, anti-bribery and corruption and anti-money laundering watch lists.

Authorities in various countries are investigating our investment in Nigerian oil block OPL 245 and the 2011 settlement of litigation pertaining to that block (see [Note 25 to the Consolidated Financial Statements](#) in our Annual Report).

OUR APPROACH

We comply with applicable tax laws wherever we operate. We are transparent about our tax payments to governments and strive for an open dialogue with them. This approach helps us to comply with both the letter and the spirit of the laws. For Shell, being transparent is also about showing how developing energy resources provides governments with an opportunity to generate revenues, support economic growth and enhance social development.

PRINCIPLES

In line with the Shell General Business Principles, we support several external voluntary codes, including the Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises and the Business and Industry Advisory Committee to the OECD Statement of Tax Principles for International Business. We endorse the responsible tax principles set out by The B Team, a non-profit initiative formed by a group of global business leaders, and we work towards full implementation of these principles.

Revenue transparency and tax

TRANSPARENCY

In 2012, we were one of the first energy companies to voluntarily publish revenues that our operations generate through income taxes, royalties and indirect taxes for governments around the world. As of 2016, we make mandatory disclosures under the UK's Reports on Payments to Governments Regulations 2014, and we file our Payments to Governments Report with the UK's Companies House. The report covering calendar year 2018 has been published at www.shell.com/payments.

Transparency is only effective if all parties in a country follow the same disclosure standards. Shell is a founder and board member of the Extractive Industries Transparency Initiative. Consistent with the initiative's requirements, we continue to advocate mandatory country-by-country global reporting, as most tax payments are made at the corporate level to national governments. We support unified revenue reporting rules and standards applicable to all multinationals, irrespective of their ownership or place of business.

EXTERNAL VOICE

The B Team seeks to catalyse a better way of doing business, for the well-being of people and the planet.

"Since 2012, Shell has been advancing its tax transparency, providing voluntary disclosures about its payments to government and economic contribution. Over time, this has enabled key stakeholders, in particular civil society, to better understand the approach it takes to responsible tax governance and management. Shell's commitment to strengthening both its practices and leadership in tax transparency, which is reflected in the company's commitment to The B Team Responsible Tax Principles, extends to supporting effective institutions. Shell has engaged in constructive multi-stakeholder dialogues to help grow responsible tax into a better understood and more widely practiced business norm."



Robin Hodess

Director Governance & Transparency, The B Team

Shell is actively involved in revenue transparency discussions and we are working to develop an approach that takes into account the views of the relevant parties involved, including industry, governments and civil society.

TAX STRATEGY

It is the right of governments to determine tax policies and tax rates and to draft tax laws accordingly. They do so under strong competition for capital and investment, which is internationally mobile. We use legitimate tax incentives and exemptions designed by governments to promote investment, employment and economic growth.

When considering the viability of investments, tax is one of the factors we examine. Income tax is just one part of the overall tax regime considered. We expect to pay tax on our income in the country where activities take place, and believe double taxation of the same activity by different jurisdictions should be avoided. Shell supports efficient, predictable and stable tax regimes that incentivise long-term investment. We expect the laws to be applied consistently, creating a level playing field for all.

GOVERNANCE OF TAX

Royal Dutch Shell plc's Board of Directors is responsible for maintaining a sound system of risk management and internal control, and for regularly reviewing its effectiveness. This system also covers taxation, which forms an integral part of the Shell Control Framework. Each year, the Board conducts a review of the effectiveness of Shell's system of risk management and internal control, including financial, taxation, operational and compliance controls.

COLLABORATING WITH OTHERS

Shell supports cooperative compliance relationships with tax authorities on the basis of the framework proposed by the OECD Forum on Tax Administration. We have these relationships in the UK, the Netherlands, Singapore and Italy, and a pilot relationship in Austria. Shell is also part of the OECD pilot International Compliance Assurance Programme, which aims to facilitate open and cooperative engagements between multinational companies and tax administrations.

We provide the authorities with timely and comprehensive information on potential tax issues. In return, we receive treatment that is open, impartial, proportionate, responsive and grounded in an understanding of our commercial environment. This approach improves the transparency of our tax affairs and allows Shell to better manage its tax-related risks throughout the life cycle of each project.

supporting education and training programmes, and by encouraging the development of local businesses.

To achieve continuous performance improvement, Shell applies a comprehensive set of standards that define how we expect Shell companies to operate socially and environmentally. These standards are set out in our Health, Safety, Security, Environment and Social Performance Control Framework ([HSSE&SP Control Framework](#)). We conduct detailed assessment reviews – jointly carried out by senior leaders and social performance teams – to provide assurance and visibility

Social performance

Social performance means building strong relationships with people, understanding their priorities and concerns, and managing our impact. It is essential to being a responsible organisation and plays a crucial role in delivering Shell's business strategy at the community level.

We assess and manage the potential social impact of all our projects as part of integrated environmental, social and health impact assessments. We also contribute to building skills in the communities where we operate by

of the risks and achievements of our activities. These reviews were piloted in 2016 and took place in 25 countries in 2018.

ENGAGING COMMUNITIES

Shell has community feedback mechanisms at all major operations and projects to receive, track and respond to questions and complaints from community members, as part of our approach to managing human rights and providing access to remedy.

Our network of around 100 community liaison officers acts as a bridge between the local community and the business. During 2018, they were offered special opportunities to meet each other and collaboratively develop their skills. Together, the officers and the business that they represent aim to continually improve the effectiveness of community engagement, impact management and how we share benefits with the community.

For example, we have worked with the Weenhayek indigenous people near our La Vertiente operations in Villa Montes, Bolivia, since 2009, to implement a strategic development plan. The plan includes capacity building and improvements to infrastructure that improve community food security and support income-generating projects. To date, Weenhayek families have increased productive land from eight hectares to 29, and 72 community members have been formally certified as technicians in agriculture and beekeeping.



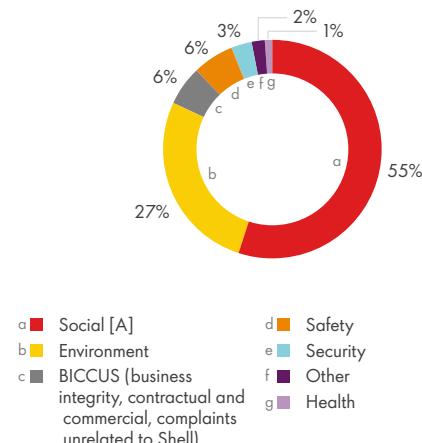
We are helping community members maintain beehives and produce honey at the Jaguar Camp, Tarija, Bolivia. Ivan, pictured, is part of the beekeeping project through the compensation scheme run by Shell.

Our work with the Weenhayek has also informed how we work with remote subsistence farmers near the Huacareta exploration project in Entre Ríos, Bolivia. In 2018, we began developing sustainable social investment projects with 47 families. These projects aim to improve livestock security and health, and increase the production of fruit and vegetables through improved agricultural methods, including water storage and drip irrigation. We have also introduced beekeeping to 32 families, which we hope will generate a sustainable income through the sale of honey.

COMMUNITY FEEDBACK

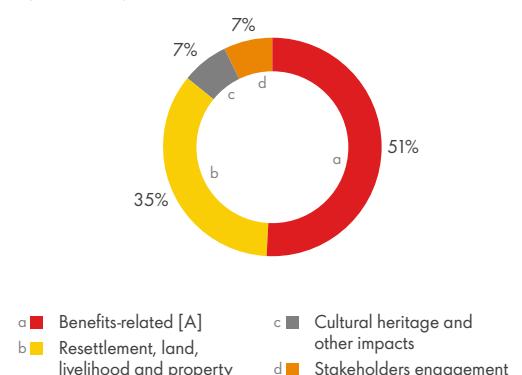
We have community feedback mechanisms at our operations and projects to receive, track and respond to questions and complaints from community members. This enables us to capture and resolve concerns quickly in a transparent way, and to track our performance locally and at a Shell group level.

Types of complaints received in 2018 by category



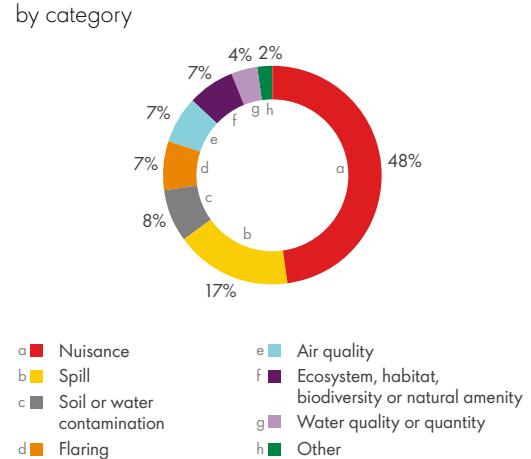
[A] Social also includes labour, local content complaints

Social complaints received in 2018 by category



[A] Benefits include Labour, Social Investment, Allegation of Unfair Treatment and Services provided by Shell or Contractor

Environmental complaints received in 2018 by category



LOCAL CONTENT AND SKILLS DEVELOPMENT

We support job creation and buy goods and services from local suppliers that meet our standards. This is one way for us to share the benefits of oil and gas development with the wider economy. We also offer our support to governments when they are designing legislative frameworks to promote local economic growth.

To ensure we comply with legislation and contribute to people's standard of living, our supplier principles integrate social considerations in the contracting and procurement processes.

In 2018, we spent \$42.7 billion on goods and services worldwide, of which around 61% was in the USA, Canada, the UK, the Netherlands and Australia. In 2018, we estimate around \$4.1 billion was spent in countries that, according to the UN Development Programme Human Development Index 2017, have a gross domestic product of less than \$15,000 a year per person. In these countries, Shell companies spent 80%, or around \$3.3 billion, with local companies.

In Malaysia, Sarawak Shell Berhad collaborated with the Sarawak State Oil and Gas Unit to identify 400 East Malaysian vendors offering services including drilling, inspection and maintenance. We shortlisted 30 companies and some have already been invited to participate in our ongoing tendering process.

In Trinidad and Tobago, four community contractors from the transport, catering, maintenance and facilities management sectors provide services to Shell Trinidad and Tobago Limited. In 2018, an event we hosted to encourage more companies to join our supply chain was attended by 31 local contractors, of which 10 were community suppliers.

In 2018, Shell Philippines Exploration B.V. and its contractor Helicopters New Zealand launched an initiative to increase the number of Filipinos in technical positions as part of efforts to transfer specialist skills to Filipinos and promote local talent in the energy industry. Of the 22 technical roles that were previously filled by expatriates, 10 are now filled by Filipinos – four aircraft engineers and six pilots.

COMMUNITY SKILLS AND ENTERPRISE DEVELOPMENT

Our enterprise development and skills programmes create opportunities for local people and communities, while adding value to our supply chain. We support the building of diverse new businesses that generate local employment and the Shell LiveWIRE programme helps local entrepreneurs turn their ideas into reality.

Shell LiveWIRE marked its 36th anniversary in 2018 and operates in 18 countries and 10 languages. In 2018, we launched new programmes in Trinidad and Tobago, France, Kazakhstan and China. We trained 2,686 people and supported 1,463 businesses, while 1,374 jobs were created. In addition, 43 businesses entered the Shell supply chain.



The Shell LiveWIRE programme helps local entrepreneurs turn their ideas into reality. In 2018, three entrepreneurs from the UK, Malaysia and Indonesia received the top prizes in the 2018 Shell LiveWIRE Top Ten Innovators Awards, a global competition which highlights and rewards entrepreneurs that demonstrate excellence in innovation.

Shell LiveWIRE entrepreneurs increasingly focus on energy solutions, such as affordable and cleaner energy for low-income communities. For example, *Aceleron* from the UK recycles waste batteries into low-cost energy storage and launched pilots in the Caribbean and Africa in 2018. Alternate Energy from Nigeria provides solar and wind powered community solutions.



Carlton Cummins, co-founder of Aceleron, is pioneering low-cost energy storage from waste lithium batteries.

The winner of this year's Shell LiveWIRE Top Ten Innovators award for energy solutions was *Metronome Energy* from the UK. Metronome Energy has developed low-cost technology to balance demands on the national power grid during peak times by managing when electricity is delivered to farming equipment.

Read more about Shell LiveWIRE winners at www.shell.com/shell-livewire.

Social investment



\$175 million
overall

Social investment



\$102 million
in lower-income countries

SOCIAL INVESTMENT

We invest in community projects so that local people may benefit from social and economic development. This investment is sometimes voluntary and sometimes required by governments, or part of a contractual agreement.

The intent of our social investment programmes is to benefit Shell as well as society or the environment. We have three global social investment themes:

- access to energy;
- science, technology, engineering and mathematics (STEM) education; and
- community skills and enterprise development.

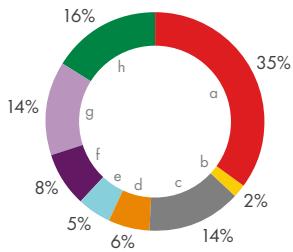
Social investment programme focus areas are determined by local community needs and priorities.

In 2018, we spent almost \$175 million on social investment, of which 35% was required by government regulations or contractual agreements. We spent \$113 million on voluntary social investment, of which around \$66 million was in line with our global themes. The remaining \$47 million was spent on local programmes for community development, disaster relief, road safety, health and biodiversity.

More than \$102 million of our total social investment spend in 2018 was in countries that are part of the UN Development Programme's Human Development Index 2017. These countries have a gross domestic product of less than \$15,000 a year per person. Significant support is also provided in the form of voluntary work by Shell employees and equipment donations.

Social investment in 2018

proportion of spend

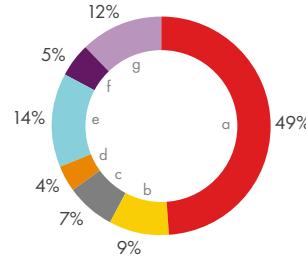


- a ■ Required SI
- b ■ Road safety
- c ■ Community development
- d ■ Other (including health and disaster relief)

- e ■ Biodiversity and ecosystem services
- f ■ Community skills and enterprise development
- g ■ Energy access
- h ■ Education

Social investment in 2018

by region



a ■ Africa

b ■ Middle East and North Africa

c ■ Asia Pacific

d ■ Europe/Central Asia

e ■ Latin America

f ■ Multiple regions

g ■ USA and Canada

STEM EDUCATION
We actively support science, technology, engineering and mathematics (STEM) education. Our industry needs talented people with knowledge and skills in these areas, and through our STEM programmes we aim to inspire future generations.

NXplorers, our global STEM programme, introduces young people to the challenges of solving complex problems, equipping them with the tools and skills needed to create sustainable change. We are helping to deliver a growing, diverse and talented population of future innovators and leaders.

In 2018, we launched NXplorers in a further 12 countries, including Australia, China, Kazakhstan, India and Trinidad and Tobago. We now support STEM programmes in more than 20 countries.

Read more about NXplorers at nxplorers.com and Shell's approach to education at www.shell.com/education.

AUSTRALIA

In Australia, students from schools in Perth and Broome were taught the NXplorers methodology to explore challenges and design their own sustainability ideas. At events, students exhibited projects aimed at improving food and energy sustainability issues in their communities. We plan to roll out NXplorers to more schools in Western Australia in 2019.

In 2018, we also renewed our 33-year partnership with Questacon in Australia with the launch of a new and improved Shell Questacon Science Circus designed to inspire a passion and curiosity for science in people of all ages.

TRINIDAD AND TOBAGO

We hosted the first Trinidad and Tobago STEM Education National Consultation with more than 200 key stakeholders, including students, parents, teachers and government representatives. Participants discussed how to better integrate STEM into the curriculum and we provided training in NXplorers to more than 40 teachers and representatives from the Ministry of Education. We plan further training and a wider roll-out to schools in 2019. Read more at www.shell.com/stem.



Teachers and representatives from the Ministry of Education participated in NXplorers training in Trinidad and Tobago.

KAZAKHSTAN

In Kazakhstan, we trained 100 teachers from Nazarbayev Intellectual Schools (NIS) in Astana as part of the Solar for Schools project. This helped us identify teachers who can train the NXplorers methodology as it is rolled out in schools. We also trained students and young entrepreneurs at the Astana Business Campus of Nazarbayev University.

SHELL FOUNDATION

Shell Foundation is an independent charity that applies business thinking to the global development challenges of access to energy and transport services.

Shell Foundation provides business support, grants and market connections to help pioneering social entrepreneurs prove new business models in low-income communities. The charity selects partners with the potential to benefit 10 million people within a 10-year time frame, achieve financial independence and spur international replication.

Since 2000, Shell Foundation has deployed \$310 million in grants to early-stage businesses and new market builders operating in Africa, Asia and Latin America. Shell Foundation has long-term strategic partnerships with UK and US international development agencies to incubate new ideas, demonstrate the viability of market-based solutions and support the growth of new inclusive markets.

In 2018, the charity continued to support BBOXX, a UK company that designs, manufactures, distributes and finances solar energy systems to improve access to energy across the developing world. After a successful pilot in the Democratic Republic of Congo, one of the world's least electrified countries, BBOXX signed a contract with the government to supply 2.5 million people with electricity by 2020. Currently, 77% of the country's 62 million people are not connected to the grid. Read more at www.shellfoundation.org/learning/the-drc-the-best-payg-solar-market-in-the-world.

Shell Foundation has supported Aceleron, a start-up that aims to give used batteries a second life, by connecting the company with off-grid energy product providers in Kenya. The success of the pilot in Kenya has seen orders received for 2,000 additional battery packs. Aceleron continued to expand in developing regions during 2018. Read more about Aceleron in Shell's Inside Energy story at www.shell.com/aceleron.

In Varanasi, India, Shell Foundation supported social venture company SMV Green Solutions to supply a range of e-rickshaws that provide safe, clean and affordable mobility to commuters and help drivers improve their business, health and lifestyle in four cities in northern India. The 2018 cohort of drivers included 32 women, who were provided with training and asset finance to help them establish their businesses.

Read more about the impact of Shell Foundation at www.shellfoundation.org/impact.

Working together

COLLABORATIONS

Shell is part of numerous energy-related collaborations all over the world, such as the Oil and Gas Climate Initiative. We collaborate with governments, national oil and gas companies and many other businesses. We define collaboration as all forms of working with organisations outside Shell. These collaborations range from working together on a project to sponsoring a particular group.

We have close ties with universities in numerous countries and maintain relationships with a range of non-governmental organisations. We also play an active role in many trade organisations and industry groups across the world on a wide range of topics.

Our work with organisations around the world gives us greater insight into our business. Sharing knowledge and experience with others also contributes to developing better practices.

For example, as a member of IPIECA, the global oil and gas industry association for environmental and social issues, we discuss and share industry best practice on topics, such as biodiversity, climate change and resettlement.

In 2018, we joined forces with our industry peers to create a Common Framework for Supplier Labour Rights Assessment, as a result of which all participants will use one common framework to assess their suppliers. The outcomes of the assessments will then be shared with peers.

The views of those we collaborate with may differ from our own. For example, we may not always agree with their opinions on topics such as climate change. In these cases, we make our views known within the organisation and seek to influence its position.

Shell's Industry Associations Climate Review, released in April 2019, assesses for the first time Shell's alignment with 19 key industry associations on climate-related policy. The report also details new governance principles to improve how Shell manages its memberships of industry associations on climate-related topics. Read the full review at www.shell.com/public-advocacy-and-political-activity.

Collaborations overview

The table shows some of the organisations that we collaborate with globally on topics such as environmental sustainability and technology. Shell also works with many community-based organisations.

	Environmental sustainability	Human rights and social responsibility	Safety and technical standards	Technology and innovation	Transparency and governance
American Petroleum Institute (API)	⌚	👤	✓	💡	📄
B Team Responsible Tax Principles					📄
Bonsucro	⌚	👤			
Building Responsibly		👤	✓		
Business for Social Responsibility		👤			
Center for Responsible Shale Development (CRSD)	⌚		✓		📄
Clean Cooking Alliance	⌚	👤			
Danish Institute for Human Rights (DIHR)		👤			
Earthwatch	⌚				
Energy Institute (EI)			✓	💡	
Energy Transitions Commission (ETC)	⌚				
Extractive Industries Transparency Initiative (EITI)					📄
Global Gas Flaring Reduction Partnership (GGFR)	⌚				📄
Global Road Safety Partnership (GRSP)			✓		
International Association of Oil & Gas Producers (IOGP)	⌚	👤	✓	💡	📄
International Audit Protocol Consortium (IAPC)	⌚		✓		
International Emissions Trading Association (IETA)	⌚				📄
International Sustainability and Carbon Certification (ISCC)	⌚				
International Union for Conservation of Nature (IUCN)	⌚				
IPIECA (industry association for environmental and social issues)	⌚	👤	✓		📄
Network of Employers for Traffic Safety (NETS)			✓		
Oil and Gas Climate Initiative (OGCI)	⌚				📄
Roundtable for Responsible Soy (RTRS)	⌚	👤			
Roundtable for Sustainable Biomaterials (RSB)	⌚			💡	
Roundtable on Sustainable Palm Oil (RSPO)	⌚	👤			
The Nature Conservancy (TNC)	⌚			💡	
Transparency International UK Business Integrity Forum					📄
UN Global Compact	⌚	👤			📄
Voluntary Principles Initiative		👤			
WBCSD/TCFD Oil and Gas Preparer Forum	⌚				📄
World Business Council for Sustainable Development (WBCSD)	⌚	👤	✓		📄

Working for solutions in Groningen

The NAM joint venture with ExxonMobil (Shell interest 50%) in partnership with the Dutch government operates the Groningen gas field in the Netherlands. Regrettably, production has caused earthquakes that damaged houses and other properties, and caused many people in Groningen to feel unsafe. We are working with our partners to help people affected by earthquakes caused by gas production.

NAM has worked hard in recent years to reduce the impact on people, taking steps such as improving the handling of damage claims, running a programme to strengthen houses and public buildings, as well as socioeconomic development programmes. Public acceptance of gas production decreased rapidly as earthquakes continued to affect the region. In 2017, this led to the realisation that a new approach was required.

HANDLING DAMAGE CLAIMS

In early 2018, the Dutch Ministry of Economic Affairs and Climate introduced a new policy to manage damage claims. This included setting up a public body to address a backlog of claims and process new claims. The ministry also required NAM to finalise 6,000 outstanding damage claims, and in July 2018 NAM sent final offers for compensation to these residents.



As part of the new policy, all claims since March 31, 2017, are now the responsibility of the Temporary Committee for Mining Damage, an independent public organisation. NAM was, and will remain, responsible for all earthquake-related costs. Shell has provided a guarantee that it will fund these costs, up to a maximum of 30% in the NAM, which equals Shell's indirect interest in the Groningen production system.



A range of actions have been taken to improve safety, liveability and economic prospects in the Groningen region.

AGREEING A WAY FORWARD

The Dutch government has decided to phase out all production from the Groningen gas field by 2030. Shell and ExxonMobil, as shareholders of NAM, reached an agreement with the government that confirmed clear roles and responsibilities for all parties, including NAM as operator.

The Dutch government is responsible for setting production rates and balancing the risk of earth tremors with the supply of gas needed to meet energy demand from the field. The government is also responsible for all issues related to damage claims handling and the strengthening of buildings. NAM remains responsible for operating the field and paying all earthquake-related costs.

It was also agreed that NAM will contribute around \$560 million to a fund to strengthen the economy and improve the quality of life of people in the Groningen region.

EXTERNAL VOICE

The Klim-op school is in the Groningen area affected by earthquakes.

"In our case, making the school earthquake-proof and improving quality of life, were done simultaneously by NAM. There were a few cracks in the walls of our Klim-op elementary school in Middelstum, a small village in Groningen. With this occurrence and the fact that other buildings nearby were in danger of collapse, the 75 children and their parents no longer felt safe in the school. Obviously, we took this feeling seriously. The school, local government and the NAM agreed a new building was the only way to restore trust. With the new building, the parents and children feel safe again and the teachers have a state-of-the-art school that is powered by renewables. Also, NAM could use our school as a test case. And they should, because I manage eight other schools that have been affected by earthquakes. For us, Klim-op is a good starting point."



Roelof van den Berg

Director of 33 elementary schools in Groningen

SOCIAL PARTNERS

Our partners help us respond to a range of community or human rights topics and address specific priorities such as boosting local employment and improving access to energy.

We work with local and global organisations, including the Danish Institute of Human Rights, humanitarian organisations such as Mercy Corps and non-governmental organisations such as Pact, which help us understand and address the needs of the communities where we operate. With some of them, like the Clean Cooking Alliance, we build long-standing relationships that can adapt to changing priorities and benefit both sides.

IMPROVING LIVING STANDARDS

Our work with Pact in Myanmar aims to increase access to cleaner and reliable energy, establish local governance systems and implement savings and livelihood programmes. These efforts have helped to improve the living standards of around 35,000 people in the central dry zone and Thandintharyi Region. By September 2018, more than 8,000 households had purchased solar systems for their homes and community areas, giving around 20,000 people access to renewable energy.

Pact set up three funds with a total starting capital of around \$310,000 that communities can use to help meet local development needs such as health emergencies, public infrastructure and education. Around 2,100 women in Myanmar have benefited from Pact's micro-banking programme WORTH, which brings women and older girls together in small groups to save money, access credit and start small businesses. Around 85 WORTH savings groups have been set up so far and they manage in total about \$138,000 in funds, which the women can use to finance their own businesses.

CLEAN COOKING

With our partners from the Clean Cooking Alliance, we co-funded the launch of a campaign to educate rural populations in India about the health benefits of cleaner cooking solutions. The campaign, which focuses on Gujarat and Uttar Pradesh provinces, employs innovative communication channels and technologies, and aims to reach up to 70,000 people.

In China, Shell and the Clean Cooking Alliance have worked together to implement a market-based clean cooking programme in Liaoning, Henan, Hebei, Hubei, Sichuan, Chongqing and Gansu provinces. A new programme in Zhejiang province aims to help small businesses and households make the switch to cleaner and more efficient cookstoves and fuels.

We continue to fund the Alliance's advisory and financial support to clean cooking enterprises around the world to unlock the commercial opportunities of this market for social entrepreneurs, whose start-up businesses focus on solving social, cultural, or environmental problems.

BUSINESS MENTORING

In 2018, we worked with Mercy Corps to launch the [Shell MicroMentor platform](#), which facilitates business mentoring for entrepreneurs in Brazil, Italy, Nigeria, Pakistan, South Africa, the UK and Trinidad and Tobago. We aim to develop local business skills in the communities where we operate through volunteer support from Shell employees. Through the collaboration, around 20 entrepreneurs were supported with accounting, finance, management and human resource training.

BETTER ACCESS TO JOBS AND TRAINING

In Tanzania and Kenya, we support a programme called Employment and Skills for Eastern Africa (or E4D/SOGA) in partnership with the German, British and Norwegian governments. This programme aims to improve access to jobs and economic opportunities for local people in natural resource-based industries and related sectors through supplier development, vocational skills development, matching and career guidance, and upskilling training institutions and qualifications.

By the end of 2018, 12,887 people participated in E4D/SOGA-supported training courses, of whom 40% were women. So far, 2,719 people found employment and a further 3,658 have increased their income by an average of 48.3%. In addition, 314 small- and medium-sized enterprises and 6,899 small-scale farmers were supported through E4D/SOGA's enterprise development measures.

EXTERNAL VOICE

Shell is working with the Clean Cooking Alliance to achieve universal access to clean cooking solutions by 2030, in line with the UN Sustainable Development Goals.

"We are working with partners to build an industry that makes clean cooking accessible to families around the world. Shell is one of our founding partners and has supported important Alliance initiatives to strengthen clean cooking markets in China, Ghana, India, Kenya and Nigeria. Shell has also supported the development of a new international laboratory standard for cookstove testing, a critical benchmark for countries looking to implement clean cooking policies. Through this partnership, we are supporting businesses to grow, attract private sector investment and reach women and their families everywhere with affordable, high-quality and appropriate clean cooking products."



Dymphna van der Lans
CEO, Clean Cooking Alliance

HUMAN RIGHTS

We consult with international organisations, companies and civil society to understand and respond to current and emerging human rights issues relevant to our business. We have collaborated closely with the Danish Institute for Human Rights since 1999 to assess and improve our approach. In 2018, the institute provided insight into emerging human rights issues and advice on employee communications material, along with critical thinking and constructive challenge in discussions at our annual human rights meeting.

ENVIRONMENTAL PARTNERS

Shell works with environmental organisations to understand how to protect areas that are rich in biodiversity and contribute to the well-being of communities where we operate.

These organisations bring specialist expertise to our projects, while at the same time advancing their own knowledge by working with us. Together, we share our scientific and conservation knowledge with industry and environmental stakeholders.

Since 1999, we have worked with the International Union for Conservation of Nature (IUCN) on biodiversity policy and projects, including in Nigeria, Russia and Iraq. IUCN has also facilitated two independent scientific and technical advisory panels to help us mitigate environmental impacts.

NIGER DELTA

In 2018, the IUCN published the report [IUCN Niger Delta Panel: Stories of Influence](#). The report documents the achievements of the independent panel, which was set up at the request of Shell Petroleum Development Company of Nigeria Limited (SPDC) to enhance remediation techniques and protect biodiversity at sites affected by oil spills in its areas of operation in the Niger Delta. IUCN also published a panel report, Developing a biodiversity conservation strategy for the Niger Delta: Integrating biodiversity considerations into SPDC's operation, in 2018. While the panel's formal work ended in 2016, their recommendations continue to inform the current work of SPDC.

SPDC and IUCN have continued to collaborate and in 2018, the Niger Delta Biodiversity Technical Advisory Group was formed, consisting of representatives from the Nigerian Conservation Foundation, IUCN and Wetlands International, to assess the efficacy of SPDC's revised remediation standard and to monitor biodiversity recovery at remediated sites.

BRUNEI

Together with Wetlands International, Brunei Shell Petroleum Sendirian Berhad, a joint venture (Shell interest 50%) with the Brunei government, delivered a project in Brunei in May 2018 to restore local habitats and prevent erosion. In the peat swamp forest of Jalan Badas, an area of around 300 square kilometres, we constructed peat blocks at intervals along a seven-kilometre canal and planted vegetation to prevent erosion. The aim is to raise the water table to protect the peat from decomposing, and as a result, conserve the habitat for a diversity of species. We continue to monitor the restoration and the water table in the area.

OMAN

Shell Development Oman worked with Wetlands International to support the [first full spring bird](#) migration count of the Wetlands Reserve in Al Wusta Governorate, which includes the Barr Al Hikman peninsula. The survey was carried out in partnership with the Ministry of Environment and Climate Affairs. Results showed that more than 300,000 birds of about 80 different species made the intertidal wetland on the coast of Oman their home for resting and feeding during their annual migration.



The spring migration bird count at the Wetlands Reserve in Oman.

ENGAGING EMPLOYEES

We continue to partner with Earthwatch through Project Better World, an employee volunteer scheme that enables Shell employees to make a meaningful contribution to global science and conservation. The programme, which gives employees a more strategic and informed understanding of sustainability, celebrated its 20th anniversary in 2018.

In 2018, 84 Shell employees from 20 countries took part in Earthwatch expeditions to South Africa, Canada, the UK and the USA, which included a learning programme to hone their sustainability leadership skills. Over the past 20 years, more than 1,000 programme participants have contributed more than 53,000 work hours to environmental research.

Through the Earth Skills Network programme, Earthwatch continues to help Shell employees build leadership skills by enabling them to take on a mentoring role in IUCN or UNESCO protected areas. We supported an additional six protected areas in 2018, bringing the total to 57 since 2009. In 2018, we included Batiyura National Park, our first park in Nigeria.

Read more about our partnership with Earthwatch at www.shell.com/earthwatch.

NATURE-BASED SOLUTIONS

We work with The Nature Conservancy to better understand how investing in natural climate solutions can help address the global climate challenge. This includes exploring how nature-based projects, such as large-scale reforestation, can reduce CO₂ levels in the atmosphere while improving the livelihoods of local communities and preserving biodiversity and wildlife (see [Nature-based solutions](#)).

EXTERNAL VOICE

Shell partners with Earthwatch to offer employees the chance to participate in environmental research and conservation projects.

"2018 marked the 20th anniversary of our partnership with Shell. In that time, we have built an integrated model of employee engagement, environmental science and community-based conservation initiatives. We have worked together to build Shell's capacity and knowledge around key sustainability themes, while creating a positive impact on the environment and communities. Shell can play a significant role in supporting the energy sector, and wider sectors, to transition to a sustainable future. While we recognise Shell has taken some important steps so far, more urgent action is required and we strongly encourage the company to set more ambitious targets to support a global transition to cleaner energy solutions."



Lucian J. Hudson
Chair, Earthwatch Europe

SUPPLY CHAIN

Shell aims to work with contractors and suppliers that behave in an economically, environmentally and socially-responsible manner.

Our approach to suppliers and contractors is clearly set out in our [Shell General Business Principles](#) and [Shell Supplier Principles](#). These principles cover requirements such as business integrity, health and safety, and human rights. Working with suppliers and contractors in this way is central to maintaining a strong societal licence to operate.

In 2018, Shell spent \$42.7 billion on goods and services from around 32,000 suppliers globally.

Our suppliers and contractors are critical to our ability to run our business. They are involved in almost every step of our operations – and are often key to achieving successful outcomes and having a positive impact on the community.

Ensuring we have robust and healthy supply chains is essential to our financial strength and resilience. Our supply chains also represent important commercial and employment opportunities for the countries and communities in which we operate. At the same time, suppliers and contractors have a key contribution to make to Shell's response to the energy transition. Their skills and innovation are part of what can make it possible for us to adapt for a lower-carbon future.

We strive to simplify and clarify what we expect from our suppliers and contractors. We work hard to help them comply with our requirements, improve their practices and together raise industry standards.

We closely monitor risks and are clear in our expectations of suppliers when it comes to managing them. We use technology and digital tools to help us monitor compliance and improve our joint and own processes.

Certain areas of our supply chain may pose a higher risk to labour rights due to their location and the nature of the goods and services we procure. We use a defined set of criteria to identify potential supply chain risks and, where we see risk, we ask suppliers and contractors to respond to our due diligence assessments before awarding a contract.

This assessment requires our suppliers and contractors to declare whether they have a process in place to assess and manage social risks with their own suppliers. If gaps are identified, we may work with suppliers and contractors to help them understand how to close these gaps, implement corrective action – which may include on-site audits from Shell – or we may consider terminating the contract.

We have made several external regulatory declarations that describe how we manage human rights risks in our supply chains, including our response to the UK Modern Slavery Act 2015. Shell companies expect contractors and suppliers to obey the national laws and international standards that require them to treat workers fairly, and to provide a safe and healthy work environment. Read more at www.shell.com/humanrights.

In 2018, we joined forces with our industry peers to create a Common Framework for Supplier Labour Rights Assessment. This means that all the industry participants will use one common assessment for all suppliers. The outcomes of the assessments will then be shared with the other initiative participants, who will use this information to take their own procurement decisions.

A major cause of forced labour in global supply chains is the charging of recruitment fees and related costs from migrant workers. In 2018, we reviewed our supplier principles statements and found there was an opportunity to include the explicit prohibition of such fees, sending an unequivocal message about our expectation to suppliers.

Recognising the impact suppliers can have on local communities where we operate, we have also expanded our social performance requirements. The updated supplier principles include the requirements for contractors to respect their neighbours, to manage the social impacts of their activities, to enhance local benefits, and to listen and respond honestly and responsibly to local communities – including responding to community feedback as a means of providing access to remedy.

Good working and living conditions help to bring about a safer and more productive working environment. Our approach to worker welfare means supporting the needs of the individual worker, many of whom are contractors, their relationship with their family and connections with colleagues. We aim to provide a home away from home for people by delivering a standard of accommodation and facilities that supports their quality of life and well-being.

Our Contractor Safety Leadership programme pairs senior executives from 19 of our major contractors with a Shell leader. In 2018, Shell and all 19 signed up to a set of worker welfare principles developed by Building Responsibly, a Business for Social Responsibility collaboration with a group of leading engineering and construction companies promoting the rights and welfare of workers. The principles aim to establish a global baseline in areas such as labour practices, living and working conditions and grievances. We plan to assess the principles against our practices and integrate them into our engagement with contractors.

We are also aiming to work with our contractors in many areas to help transition to a lower-carbon future. We can support the energy transition through the procurement choices we make and by helping to facilitate technology solutions in partnership with others. We work with our logistics suppliers and contractors to improve how we track and measure our Net Carbon Footprint. We also partner with suppliers and contractors to reduce our environmental impact and to help us to change how we do things – reducing waste, for example, from the packaging of our products.

NON-OPERATED VENTURES

Shell often works in joint ventures with national and other international energy companies. These organisations bring important skills and experience to a joint venture.

More than half of Shell's joint ventures are not operated by Shell. We do not have direct control over how these ventures embed sustainability in their operations but seek instead to exert a positive influence on their operations and offer our support. For instance, our Shell joint venture representatives and the Shell-appointed member(s) of the joint venture's board expect our partners to adopt the Shell commitment and policy on health, safety, security, environment and social performance (HSSE&SP) or one materially equivalent to our own. They are also expected to put in place standards to adequately address HSSE&SP risks.

When these joint ventures implement our control framework, or a similar approach, Shell teams carry out independent audits or participate in the joint venture's own auditing programmes, which helps to assure the joint venture's compliance. We also offer to review the effectiveness of the framework's implementation, overseen by the joint venture's board of directors.

We periodically evaluate the health, safety, environment and community risks of the joint venture. If the joint venture is falling below expectations, plans will be put in place, in agreement with the other partners, to improve performance.

In 2018, we continued to work with our partners on adoption of our greenhouse gas and energy management processes. For example, we supported Badr Petroleum Company in Egypt (Bapetco, Shell interest 50%) to assess its greenhouse gas emissions to a reasonable level of assurance as well as to identify several solar and gas-saving opportunities.

Petroleum Development Oman (PDO, Shell interest 34%) has just awarded a contract to build a 100 megawatt solar photovoltaic independent power producer project. The plant will provide power for PDO's own operations and be the first of its kind in Oman.

We also helped build capability within PDO to conduct carbon and energy benchmarking of their assets and collaborated on the implementation of the energy efficiency surveillance software, resulting in annual energy and cost savings to their processes. A deployment of the software has also recently been initiated in Karachaganak Petroleum Operating B.V. (KPO, Shell interest 29.25%).

In 2018, we trained around 875 people on four large-scale oil spill exercises – one of them in Kazakhstan with the Kashagan joint venture (NCOC, Shell interest 16.81%). Read more in [Preparing for emergencies](#).

DIVESTED VENTURES

In 2018, we successfully completed our three-year \$30 billion divestment programme, a key part of our strategy to strengthen our financial framework and reshape Shell into a world-class investment case. Our efforts to refresh and upgrade our assets will continue. We expect to sell at least \$5 billion of assets in 2019 and 2020 to contribute to our ongoing portfolio optimisation programme.

In 2018, completed divestments meant that we exited Downstream in Argentina, Upstream in Ireland, and Integrated Gas in Thailand and New Zealand. We also completed sales of our interest in Canadian Natural Resources Limited, LNG Tiga in Malaysia, the West Qurna 1 field in Iraq, the Draugen and Gjøa fields in Norway and our liquefied petroleum gas marketing business in Hong Kong and Macau.

We also announced sales of our upstream subsidiary in Denmark and the Greater Sunrise fields in Timor Leste.

While we carry out extensive due diligence in each transaction to ensure that buyers have the capabilities to maintain standards in respect of safety, security, the environment and responsibilities to neighbouring communities, we may be held liable for past acts, failures to act or liabilities that are different from those foreseen.

Our performance data

Each year, we measure our global performance and report on the safety of our operations, our impact on the environment and our contribution to communities.

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About our data

We began reporting voluntarily on our environmental, safety and social performance with the first Shell Report in 1997. We support transparency and share information and data in this report and on www.shell.com.

There are inherent limitations to the accuracy of environmental and social data. We recognise that our data will be affected by these limitations, so we continue to improve data integrity by strengthening our internal controls.

We provide all non-financial data in this report on a 100% basis for companies and joint ventures where we are the operator. Environmental data pertain to direct Shell company operations unless otherwise stated. We report in this way, in line with industry practice, because these are the data we can directly manage and affect through operational improvements. We refer to the number of people employed or contracted on a full-time equivalent basis.

Operations acquired or divested during 2018 are included only for the period in which we operated these assets. Other data are collected from external sources, employee surveys and other internal sources as indicated. Data marked in the social data table come from an internal survey completed by the senior Shell representative in each country. The accuracy of environmental and social data may be lower than that of data obtained through our financial systems.

We only include data in this report for 2018 that were confirmed by the end of March 2019. If incidents are reclassified or confirmed, or if significant data changes occur after preparation of this report, they will be updated in the following year's publication.

ASSURANCE

We have clear standards and reporting requirements for our health, safety, security, environment and social performance (HSSE&SP) data.

Shell facilities are required to adopt these standards, which define management roles and responsibilities, the scope of data at facilities and how data are calculated and collected. These standards are part of our HSSE&SP Control Framework.

To ensure we provide accurate information, our assurance process of HSSE&SP data is also a key element of the HSSE&SP Control Framework. The process flows from the facility all the way up to group level. Some examples of the assurance mechanisms in this process are:

- self-assessments at the facility level;
- internal audits at all levels of Shell;
- quarterly reviews and assessments of the data at all levels;
- an annual series of meetings between leaders at group level and senior business managers to discuss outcomes and reporting parameters; and
- formal sign-off by Shell's senior country leaders.

The Report Review Panel of independent experts helps make sure our reporting is balanced, relevant and responsive to stakeholders' interests.

Lloyd's Register Quality Assurance Ltd has provided limited assurance of our direct and indirect greenhouse gas emissions data for 2018. Limited assurance means nothing has come to the auditor's attention that would indicate that the greenhouse gas data and information as presented in the Greenhouse Gas Assertion were not materially correct. The assurance statements are available at www.shell.com.

Conversions into US and Canadian dollars are based on the average exchange rates for 2018.

Environmental performance data

	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
Greenhouse gas emissions (GHGs)										
Net Carbon Footprint (gCO ₂ e/MJ)	79	79	79							
Direct total GHGs (million tonnes CO ₂ equivalent) [A]	71	73	70	72	76	73	72	74	76	69
Carbon dioxide (CO ₂) (million tonnes)	68	70	67	68	73	71	69	71	72	66
Methane (CH ₄) (thousand tonnes)	92	123	138	132	126	120	93	133	128	127
Nitrous oxide (N ₂ O) (thousand tonnes)	1	1	1	1	1	1	1	1	2	2
Hydrofluorocarbons (HFCs) (tonnes)	31	23	21	18	16	17	23	22	23	25
Energy indirect total GHGs (million tonnes CO ₂ equivalent) [B]	11	12	11	9	10	10	9	10	9	9
GHG emissions associated with exported energy (subset of direct GHGs)	3	3	3	2	3					
Flaring										
Flaring (upstream) (million tonnes CO ₂ equivalent) [C]	5.2	8.2	7.6	11.8	13.0	7.4	7.7	10.0	10.4	7.8
Flaring (upstream) (million tonnes hydrocarbon flared) [C]	1.5	2.5	2.3	3.5	3.8	2.1	2.3	3.4	3.6	2.6
Nigeria [D]	0.6	0.8	0.5	0.9	1.3	1.1	1.5	2.0	2.4	1.9
Rest of the world [E]	1.0	1.7	1.8	2.6	2.5	1.0	0.8	1.4	1.2	0.7
Energy intensity										
Upstream excl. oil sands, LNG and GTL (gigajoules per tonne production) [C], [F]	1.06	1.05	1.02	0.83	0.87	0.89	0.83	0.75	0.74	0.76
Refineries: Refinery Energy Index [G]	94.3	94.8	95.4	95.4	94.9	95.6	98.4	100.8	101.8	102.2
Chemical plants: Chemicals Energy Index	88.5	88.2	91.0	91.6	90.3	89.8	91.7	90.8	89.3	92.0
Acid gases and VOCs										
Sulphur oxides (SO _x) (thousand tonnes SO ₂)	69	81	83	88	97	99	113	136	139	141
Nitrogen oxides (NO _x) (thousand tonnes NO ₂)	111	107	122	104	146	156	147	146	159	142
Volatile organic compounds (VOCs) (thousand tonnes)	59	95	146	125	151	89	89	129	147	126
Ozone-depleting emissions										
CFCs/halons/trichloroethane (tonnes)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Hydrochlorofluorocarbons (HCFCs) (tonnes)	9	7	8	8	6	8	8	12	21	24
Spills and discharges [H] [I]										
Sabotage spills - volume (thousand tonnes) [J]	1.6	1.4	3.9	2.3	2.7	2.2	3.3	1.6	3.0	14.0
Sabotage spills - number [J]	111	62	49	95	139	157	137	118	112	95
Operational spills - volume (thousand tonnes)	0.8	0.4	0.8	0.8	0.7	0.9	2.1	6.0	2.9	1.4
Nigeria [K]	0.4	0.1	0.3	0.2	0.3	0.4	0.2	5.3	0.7	0.3
Rest of the world	0.4	0.3	0.5	0.7	0.4	0.5	1.9	0.7	2.2	1.1
Operational spills - number	92	104	72	108	153	174	207	211	195	275
Nigeria [L]	15	10	8	16	38	31	37	64	32	37
Rest of the world	77	94	64	92	115	143	170	147	163	238
Hurricane spills - volume (thousand tonnes) [M]	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil in effluents to surface environment (thousand tonnes)	1.4	1.2	1.0	1.0	0.9	1.0	1.0	1.3	1.6	1.5
Water [N]										
Fresh water withdrawn (million cubic metres)	199	201	195	186	199	198	203	209	202	198
Fresh water consumed (million cubic metres)	147	150	152	141	165	n/c	n/c	n/c	n/c	n/c
Waste disposal										
Hazardous (thousand tonnes)	592	638	658	455	529	770	820	740	1,048	962
Non-hazardous (thousand tonnes)	1,407	1,382	1,491	1,680	1,674	2,065	2,295	1,850	1,079	1,139
Total waste (thousand tonnes) [O]	1,999	2,020	2,148	2,135	2,203	2,835	3,115	2,590	2,127	2,101

[A] Greenhouse gas emissions (GHG) comprise carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride. The data are calculated using locally regulated methods where they exist. Where there is no locally regulated method, the data are calculated using the 2009 API Compendium, which is the recognised industry standard under the GHG Protocol Corporate Accounting and Reporting Standard. There are inherent limitations to the accuracy of such data. Oil and gas industry guidelines ([PIECA/API/IOPG]) indicate that several sources of uncertainty can contribute to the overall uncertainty of a corporate emissions inventory. We have estimated the overall uncertainty of our direct GHG emissions to be around 2%. 2015-2018 emissions are calculated using Global Warming Potential factors from the IPCC's Fourth Assessment Report. Data for prior years were calculated using Global Warming Potential factors from the IPCC's Second Assessment Report.

[B] These emissions were calculated using the market-based method in line with the GHG Protocol Corporate Accounting and Reporting Standard.

[C] The term upstream in this context includes assets and activities from our Upstream and Integrated Gas businesses.

[D] Nigeria includes SPDC onshore operations (0.5 million tonnes flared in 2018) and SNEPCo offshore operations (0.3 million tonnes flared in 2018).

[E] Flaring from the Majnoon field in Iraq and from Malaysia amounted to 0.4 and 0.1 million tonnes of hydrocarbons respectively in 2018.

[F] Methodology was updated in 2012. Data for prior years are not directly comparable.

[G] Data are indexed to 2002, based on Solomon Associates Energy Intensity Index 2006 methodology.

[H] All spill volumes and numbers are for spills of more than 100 kilograms. Due to the rounding of numbers, spill volumes for Nigeria and the rest of the world might not add up to the exact total volume of spills.

[I] As of the end of March 2019, there was 1 spill under investigation in Nigeria that may result in adjustments.

[J] All sabotage- and theft-related spills have occurred in Nigeria except in 2016 (0.001 thousand tonnes) and 2015 (0.005 thousand tonnes).

[K] Nigeria includes SPDC onshore operations and SNEPCo offshore operations. A single spill at the Bonga field offshore Nigeria amounted to 4.8 thousand tonnes in 2011.

[L] Nigeria includes SPDC onshore operations (15 operational spills in 2018) and SNEPCo offshore operations (0 operational spills in 2018).

[M] 2017 data reflect 4 spills caused by Hurricane Harvey in the USA.

[N] Freshwater figures do not include once-through cooling water.

[O] In 2018, we sent waste off-site for recycling or reuse, or sold around 400 thousand tonnes of material that would otherwise have been disposed of as waste.

n/c = not calculated.

Safety performance data [A]

	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
Fatalities										
Total number	2	2	3	7	5	5	8	6	12	20
Employees	0	0	0	1	3	0	3	1	0	1
Contractors	2	2	3	6	2	5	5	5	12	19
Fatal accident rate (FAR)	0.4	0.4	0.5	1.1	0.7	0.8	1.3	1.0	1.6	2.3
Fatalities per 100 million working hours (employees and contractors)										
Injuries and process safety incidents										
Total recordable case frequency (TRCF)	0.9	0.8	1.0	0.9	1.0	1.2	1.3	1.2	1.2	1.4
Injuries per million working hours (employees and contractors)										
Lost time injury frequency (LTIF)	0.3	0.2	0.3	0.3	0.3	0.4	0.3	0.4	0.4	0.4
Lost time injuries per million working hours (employees and contractors)										
Operational process safety events										
Tier 1 [B]	35	49	39	51	57	65	91	n/c	n/c	n/c
Tier 2 [B]	86	117	107	169	194	246	308	n/c	n/c	n/c
Illnesses										
Total recordable occupational illness frequency (TROI)	0.4	0.3	0.4	0.6	1.0	0.8	0.5	0.7	0.8	0.6
Illnesses per million working hours (employees only)										
i Security										
Using armed security (% of countries)	21	14	17	19	24	19	17	14	9	17
Using armed company security (% of countries)	3	1	1	1	1	3	0	1	1	1
Using armed contractor security (% of countries)	10	3	7	8	10	8	10	9	6	10

[A] In line with industry standards, we distinguish three contract modes. Mode 1: contractor/supplier performs work under Shell's HSSE Management System (HSSE MS); Mode 2: contractor/supplier performs work under its own HSSE MS, which is materially equivalent to Shell's HSSE MS; Mode 3: contractor/supplier performs work under its own HSSE MS. Also in line with industry standards, we report on safety performance only for contract modes 1 and 2.

[B] Process safety events classified according to guidance from the IOGP and API. In 2018, there were nine Tier 1 sabotage-related events. We did not track the number of Tier 2 sabotage-related events in 2018.

[i] Data obtained from an internal survey completed by the senior Shell representative in each country.

n/c = not calculated.

Social performance data

	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
Gender diversity [C]										
In supervisory/professional positions (% women)	29.9	29.1	28.0	28.0	29.0	28.8	28.1	27.3	26.3	26.4
In management positions (% women)	23.7	22.3	21.0	20.0	21.0	18.8	18.2	17.6	17.0	16.1
In senior leadership positions (% women)	24.0	22.2	20.0	19.0	18.2	17.2	16.2	16.6	15.3	14.0
i Staff forums and grievance procedures										
% countries with staff access to staff forum, grievance procedure or other support system	100	100	100	100	100	100	100	99	100	99
i Child labour (% countries with procedures in place)										
Own operations	100	100	100	100	100	100	100	100	99	98
Contractors										
Suppliers	100	100	100	100	100	100	100	97	96	97
i Forced labour (% countries with procedures in place)										
Own operations	100	100	100	100	100	100	100	100	99	98
Contractors and suppliers	100	100	100	100	100	100	100	97	95	89
Integrity										
Code of Conduct violations [D]	370	261	341	217	267	181	209	226	205	165
s Contracting and procurement										
Estimated expenditure on goods and services in lower-income countries (\$ billion) [E] [F]	4.1	4.9	4.4	6	14	12	14	12	13	12
Social investment [G]										
s Estimated voluntary social investment (equity share) (\$ million)	113	111	103	122	160	159	149	125	121	132
s Estimated social investment spend (equity share) in lower-income countries (\$ million) [H]	102	107	96	43	73	74	67	45	61	54

[C] Diversity data obtained from our human resources system.

[D] Code of Conduct violations represent the number of reported incidents in the Shell Global Helpline (excluding queries or customer service queries), which have been investigated and closed during the relevant period and where the allegation was found to be (at least partially) true.

[E] Estimated expenditure in countries where gross domestic product amounts to less than \$15,000 per year per person (source: UNDP Human Development Index 2015). In 2015, the UNDP index update no longer includes some of the countries in which Shell invests, which impacts on our reported spend amount.

[F] From 2013 onwards, this figure only includes the amount spent on goods and services by Shell group companies.

[G] Social investment spending varies from year to year depending on business climate, locations and type of activities under way. This is voluntary social investment and does not include social investments made through contractual agreements with host governments, voluntary work by Shell employees and donations of equipment.

[H] Estimated voluntary social investment spending in countries where gross domestic product amounts to less than \$15,000 a year per person (source: UNDP Human Development Index 2016).

[s] Social investment and contracting and procurement data collected via our financial system since 2007.

[i] Data obtained from an internal survey completed by the senior Shell representative in each country.

n/c = not calculated.

DEFINITIONS AND CAUTIONARY NOTE

Divestments is a measure used to monitor the progress of our divestment programme. This measure comprises proceeds from sale of property, plant and equipment and businesses, joint ventures and associates, and other Integrated Gas, Upstream and Downstream investments in equity securities, adjusted onto an accruals basis and for any share consideration received or contingent consideration initially recognised upon the related divestment, as well as proceeds from sale of interests in entities while retaining control (for example, proceeds from sale of interests in Shell Midstream Partners, L.P.).

The companies in which Royal Dutch Shell plc directly and indirectly owns investments are separate legal entities. In this report, "Shell", "Shell Group" and "Royal Dutch Shell" are sometimes used for convenience where references are made to Royal Dutch Shell plc and its subsidiaries in general. Likewise, the words "we", "us" and "our" are also used to refer to Royal Dutch Shell plc and its subsidiaries in general or to those who work for them. These terms are also used where no useful purpose is served by identifying the particular entity or entities. "Subsidiaries", "Shell subsidiaries" and "Shell companies" as used in this report refer to entities over which Royal Dutch Shell plc either directly or indirectly has control. Entities and unincorporated arrangements over which Shell has joint control are generally referred to as "joint ventures" and "joint operations" respectively. Entities over which Shell has significant influence but neither control nor joint control are referred to as "associates". The term "Shell interest" is used for convenience to indicate the direct and/or indirect ownership interest held by Shell in an entity or unincorporated joint arrangement, after exclusion of all third-party interest. Shell subsidiaries data include their interests in joint operations.

We also refer to "Shell's Net Carbon Footprint" in this report. This includes Shell's carbon emissions from the production of our energy products, our suppliers' carbon emissions in supplying energy for that production and our customers' carbon emissions associated with their use of the energy products we sell. Shell only controls its own emissions but, to support society in achieving the Paris Agreement goals, we aim to help and influence such suppliers and consumers to likewise lower their emissions. The use of the terminology "Shell's Net Carbon Footprint" is for convenience only and not intended to suggest these emissions are those of Shell or its subsidiaries.

This report contains forward-looking statements (within the meaning of the US Private Securities Litigation Reform Act of 1995) concerning the financial condition, results of operations and businesses of Royal Dutch Shell. All statements other than statements of historical fact are, or may be deemed to be, forward-looking statements.

Forward-looking statements are statements of future expectations that are based on management's current expectations and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in these statements. Forward-looking statements include, among other things, statements concerning the potential exposure of Royal Dutch Shell to market

risks and statements expressing management's expectations, beliefs, estimates, forecasts, projections and assumptions. These forward-looking statements are identified by their use of terms and phrases such as "aim", "ambition", "anticipate", "believe", "could", "estimate", "expect", "goals", "intend", "may", "objectives", "outlook", "plan", "probably", "project", "risks", "schedule", "seek", "should", "target", "will" and similar terms and phrases. There are a number of factors that could affect the future operations of Royal Dutch Shell and could cause those results to differ materially from those expressed in the forward-looking statements included in this report, including (without limitation):

(a) price fluctuations in crude oil and natural gas; (b) changes in demand for Shell's products; (c) currency fluctuations; (d) drilling and production results; (e) reserves estimates; (f) loss of market share and industry competition; (g) environmental and physical risks; (h) risks associated with the identification of suitable potential acquisition properties and targets, and successful negotiation and completion of such transactions; (i) the risk of doing business in developing countries and countries subject to international sanctions; (j) legislative, fiscal and regulatory developments including regulatory measures addressing climate change; (k) economic and financial market conditions in various countries and regions; (l) political risks, including the risks of expropriation and renegotiation of the terms of contracts with governmental entities, delays or advancements in the approval of projects and delays in the reimbursement for shared costs; and (m) changes in trading conditions. No assurance is provided that future dividend payments will match or exceed previous dividend payments. All forward-looking statements contained in this report are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. Readers should not place undue reliance on forward-looking statements. Additional risk factors that may affect future results are contained in Royal Dutch Shell's Form 20-F for the year ended December 31, 2018 (available at www.shell.com/investor and www.sec.gov). These risk factors also expressly qualify all forward-looking statements contained in this report and should be considered by the reader. Each forward-looking statement speaks only as of the date of this report, April 2, 2019. Neither Royal Dutch Shell plc nor any of its subsidiaries undertake any obligation to publicly update or revise any forward-looking statement as a result of new information, future events or other information. In light of these risks, results could differ materially from those stated, implied or inferred from the forward-looking statements contained in this report.

We may have used certain terms, such as resources, in this report that the United States Securities and Exchange Commission (SEC) strictly prohibits us from including in our filings with the SEC. US investors are urged to consider closely the disclosure in our Form 20-F, File No 1-32575, available on the SEC website www.sec.gov.

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- Detailed operational information including maps
- Report on our progress in contributing to sustainable development