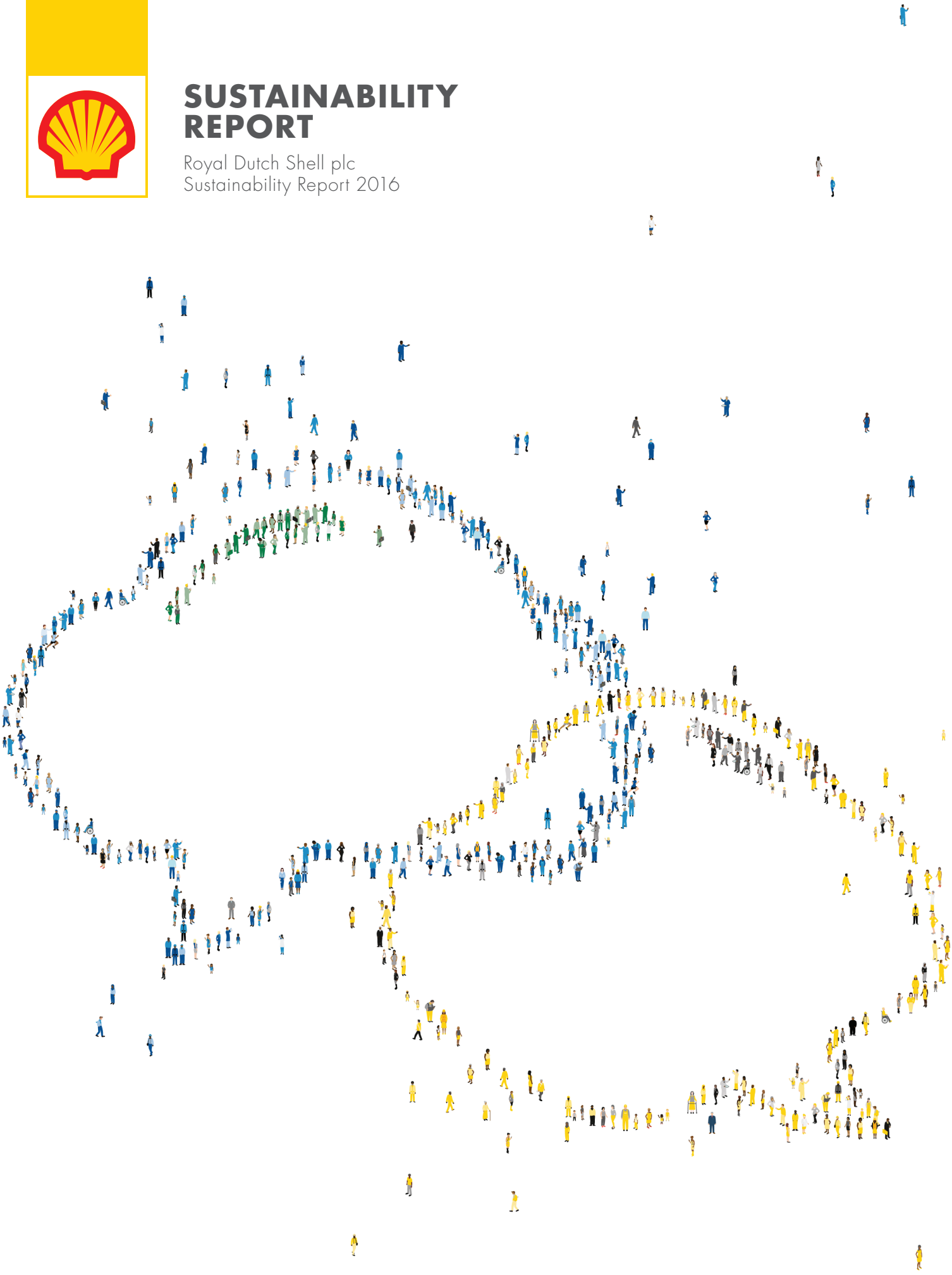
SUSTAINABILITY REPORT

Royal Dutch Shell plc
Sustainability Report 2016



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COVER IMAGE
The cover shows how collaborations and discussions with communities, customers and partners worldwide help Shell provide more and cleaner energy solutions.

DIGITAL
The Sustainability Report has moved to an online digital report reports.shell.com. The digital version includes further information such as an interactive GRI index to enhance usability for and the experience of the readers of the report. In the event of any conflict, discrepancy or inconsistency between the digital report and this hardcopy report of the Sustainability Report then the information contained in the digital report will prevail. This hardcopy report is provided for the readers' convenience only.

NEW LENS SCENARIOS
This publication contains data from Shell's New Lens Scenarios. The New Lens Scenarios are a part of an ongoing process used in Shell for 40 years to challenge executives' perspectives on the future business environment. We base them on plausible assumptions and quantifications, and they are designed to stretch management to also consider 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.

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, 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.

CAUTIONARY NOTE
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 subsidiaries in general or to those who work for them. These expressions are also used where no useful purpose is served by identifying the particular company or companies. "Subsidiaries", "Shell subsidiaries" and "Shell companies" as used in this publication refer to companies 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 (for example, through our 23% shareholding in Woodside Petroleum Ltd.) ownership interest held by Shell in a venture, partnership or company, after exclusion of all third-party interest.

This report contains forward-looking statements 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 "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 20-F for the year ended December 31, 2016 (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, 12 April 2017. 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.

This report contains references to Shell's website. These references are for the readers' convenience only. Shell is not incorporating by reference any information posted on www.shell.com.

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.

INTRODUCTION

Welcome to the 2016 Shell Sustainability Report, which covers our performance in 2016 and significant changes and events during the year. The report includes an introduction from Shell's Chief Executive Officer Ben van Beurden and an opinion from the External Review Committee.

70+
Countries Shell operates in

92,000
Average number of people employed by Shell in 2016

2%
Our approximate share of world oil production

3%
Our approximate share of world gas production

1%
Our share of the global supply of energy

INTRODUCTION FROM THE CEO

"We need to fulfil the growing demand for energy, with more natural gas and cleaner energy products."

In 2016, the world took significant steps towards building a low-carbon energy future. The United Nations (UN) Paris Agreement and the UN's sustainable development goals came into force, setting new targets for tackling climate change, promoting sustainable economic growth and providing access to modern energy.

It was also a significant year for Shell. Against a backdrop of low oil prices, we acquired BG, which added to our operations and opportunities in natural gas, the cleanest-burning hydrocarbon, and in deep water.

As part of a refreshed business strategy, we set long-term environmental and social ambitions: to reduce our carbon intensity and to deliver shared value for society. This includes creating jobs and investing in communities. But it also means providing more and cleaner energy solutions.

ENVIRONMENT AND SAFETY

In 2016, we reduced greenhouse gas (GHG) emissions from the facilities we operate, even with the addition of BG projects to our portfolio.

We achieved this partly by reducing flaring in our operations and through our Quest project in Canada, where we safely captured and stored deep underground more than 1 million tonnes of carbon dioxide (CO_2) from our oil sands operations. The sale of some of our businesses also contributed to the reduction.

Our goal is to work without causing harm to people and the environment. However, we had three fatalities in 2016, which is unacceptable. Our company must continue its efforts to ensure safety wherever we work. We must encourage staff and contractors to be alert to their own safety, to care about the safety of their colleagues, and to look out for any potential safety risks in all our operations, however small.

Overall, we continued to reduce the number of process safety incidents in our operations, such as leaks or spills of hazardous materials.

SHAPING SHELL

Our business strategy includes creating a world-class investment case for shareholders and strengthening our leadership in the oil and gas industry, while positioning the company for growth as the world transitions to a low-carbon energy system.

From 2017, employee bonuses, including those of Shell's Executive Committee, will also reflect our progress in managing GHG intensity, in particular CO_2 and methane. Here, we will focus on three operational areas: refining, chemical plants and flaring in upstream projects.

The choices we make to shape our portfolio should take into account the shift to a world of lower GHG emissions. We will specifically consider the carbon intensity of projects when taking decisions about which assets we decide to invest in.

In 2016, we created a New Energies business to continue to explore investment opportunities in areas including biofuels, hydrogen and renewable energy. This business will also look for opportunities in energy solutions that combine wind and solar power with gas, for example, and new ways to connect customers to energy.

ENABLING THE ENERGY TRANSITION

The Paris Agreement has set targets for tackling climate change. I want Shell to promote and play a role in the energy transition to a low-carbon future when there is clear commercial value. A world of net-zero emissions of GHGs is both technically and economically feasible towards the end of the century, according to our Scenarios team, which considers possible futures.

Government policy will be critical to creating the conditions for making the transition to cleaner energy across all sectors of the economy commercially possible. Shell continues to call for effective government-led carbon-pricing mechanisms, which would support the commercial development of technologies that can reduce emissions, such as carbon capture and storage.

We are currently working with some countries to help them shape their energy future. For example, we are helping policy makers in the Netherlands in their efforts to explore the energy mix the country would need to reduce its GHG emissions.

It is also important that we work with coalitions, both within industry and more broadly, to help meet the challenge of climate change. In late 2016, for example, we were one of 10 oil and gas companies that jointly pledged to invest $1 billion in technologies with the potential to reduce GHG emissions. We are a founding member of the Energy Transitions Commission that brings together energy companies, investors, public and academic institutions, and foundations.

SHARED VALUE

What is shared value? Our work at Shell helps to create jobs. We pay taxes, invest in communities close to our operations, develop local supply chains and train local people.

But that is not enough. We need to build on this to fulfil the growing demand for energy, with more natural gas and cleaner energy products. There are still more than 1 billion people without access to electricity; those who use basic materials, such as firewood, for heating their homes or cooking meals.

Shell has a part to play in improving access to energy. We can offer new supply models for communities that are underserved, where sufficient commercial value is available. For example, we can provide cleaner energy solutions, by offering energy powered by a combination of natural gas and renewable energy. That is why we have made creating shared value a strategic aspiration for Shell.

THE 2016 SUSTAINABILITY REPORT

This Sustainability Report details our social, safety and environmental performance during 2016. Once again, we appreciate the input of the External Review Committee, which consists of leading sustainability experts, as we develop our thinking in this area. They also play an important role in developing our reporting.

Shell is a founding member of the UN Global Compact that aims to promote environmental protection, human rights, better labour practices and anti-corruption standards through good corporate governance.

Today, we continue to build on that work as we reshape our company and work with others to help deliver the energy that the world needs.

Ben van Beurden
Chief Executive Officer

TOPIC SELECTION FOR 2016

The Shell Sustainability Report 2016 focuses on the key sustainability challenges the company faces and explores the many ways that we are responding. The topic selection identifies the sustainability subjects that were relevant or prominent in 2016.

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 impacts around the world, particularly in relation to the environment and society.

This includes speaking with community representatives, business partners, customers, non-governmental organisations, investors, the media, academics, contractors and suppliers, ratings agencies and members of the public. We also talk to teams within Shell. We gather opinions and advice in various ways including formal and informal meetings, workshops and online surveys. We also considered the acquisition of BG in our topic selection. Given the extent of the similarities between the two companies, particularly our working practices, safety standards and controls, and global portfolio in deep water and liquefied natural gas, the review did not lead to any new topics being added to the report.

We have listed the selected topics in alphabetical order rather than prioritising them. The topics consistently ranked as of high importance in 2016 were energy transition and climate change; we have sections dedicated to these topics.

THE MAIN STEPS INVOLVED IN SELECTING THE TOPICS ARE:

Step 1: identifying and understanding topics that are important to our stakeholders;

Step 2: identifying topics that are important to Shell's business strategy;

Step 3: collating all the topics identified as of high importance by our stakeholders – these topics determine the report's content;

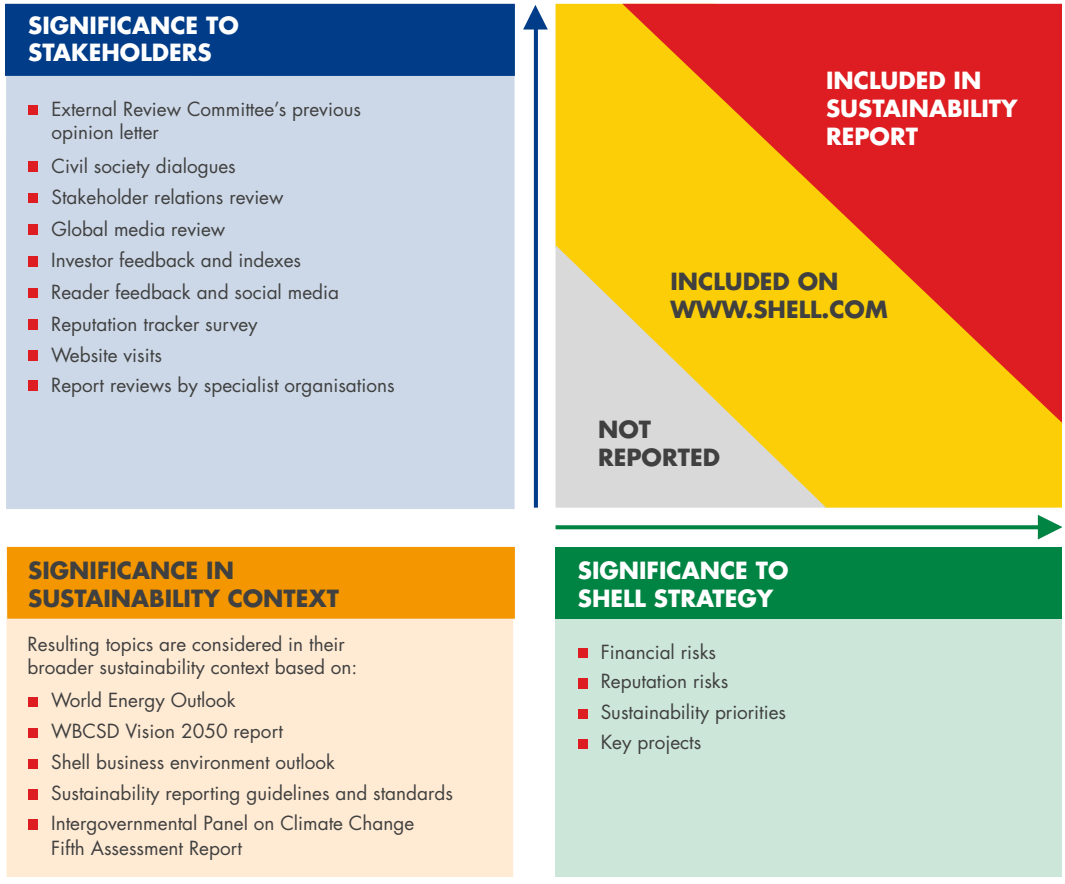
Step 4: identifying the topics for 2016 that will be covered elsewhere on www.shell.com;

Step 5: submitting details of the topic selection process for review and approval by the External Review Committee to ensure that coverage is balanced, relevant and complete; and

Step 6: informing Shell's Executive Committee of the chosen topics, for their endorsement.

We report in accordance with the Global Reporting Initiative (GRI) version G4 and in line with the oil and gas industry guidelines developed by IPIECA – the global oil and gas industry association for environmental and social issues. We also use the guidance on voluntary reporting from the American Petroleum Institute and the International Association of Oil and Gas Producers.

Topic selection diagram



The GRI content index is available under GRI Index. Shell supports the United Nations Global Compact and its 10 principles covering human rights, labour, the environment and anti-corruption. Sections of this sustainability report cover Shell's performance in 2016 across these areas. We continue to follow the progress of the United Nations' sustainable development goals through our membership of IPIECA, and have provided an overview of our activities in relation to some of these goals in this report.

More detailed information about Shell's approach to sustainability, our processes and work around the world is available on www.shell.com. Links to specific topics discussed in the report are published at the end of the web page under "More on other Shell websites".

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ABOUT SHELL

Royal Dutch Shell plc is an international energy company with expertise in the production, refining and marketing of oil and natural gas.

Shell is one of the world's largest independent energy companies in terms of market capitalisation, operating cash flow and production. The company explores for oil and gas worldwide, both from conventional fields and from sources such as shales and deep water. We work to develop new oil and gas supplies, and have a global network of refineries and chemical plants. Shell transports and trades oil, gas and other energy-related products, such as carbon-emission rights, and continues to invest in new business models in renewable energy enabled by digital technology. We serve around 30 million customers every day through our global network of 43,000 Shell-branded retail stations.

OUR BUSINESS STRATEGY

Our strategy seeks to create a world-class investment case for shareholders. This strategy is underpinned by Shell's outlook for the energy sector and the need to adapt to substantial changes in the world around us. Rising global population and standards of living should continue to drive demand growth for oil and gas for decades to come. At the same time, there is a transition under way to: a lower-carbon energy system, a world with increased customer choice, and continued energy price volatility. Safety and environmental and social responsibility are at the heart of our activities and continue to be a driver for our strategic ambitions.

In February 2016, Shell completed the acquisition of BG, adding significantly to our activities in liquefied natural gas (LNG) worldwide and deep-water oil and gas production in Brazil.

At the end of 2016, the underlying operating cost of the combined group was below $40 billion, lower than that used to run Shell previously, and 2017 is expected to be lower again. After the acquisition, three-quarters of BG employees have moved to a role in Shell.

IN 2016, SHELL

- produced **3,668 thousand** barrels of oil equivalent per day in 2016
- sold **57.1 million tonnes** of LNG
- used around **9.5 billion** litres of biofuels in petrol and diesel we sold in 2016
- produced **1,232 gigawatt-hours** of energy from its wind business; mainly in the USA and the Netherlands
- invested **$26.9 billion** in capital projects around the world

Shell has four strategic ambitions:

- create a world-class investment case, by reshaping Shell to grow free cash flow per share and increase our returns, all underpinned by a conservative financial framework;
- reduce our carbon intensity as part of the energy transition by shaping our portfolio and business strategy to ensure Shell's resilience for the future; looking at cost-effective ways to manage greenhouse gas emissions (GHG) and the commercial opportunities these solutions bring; and linking remuneration for all employees to the management of GHG emissions;
- maintain a position of leadership and influence in our industry and have the largest value share among our competitors; and
- create shared value by working with communities, countries and global organisations. We invest in communities living close to our operations, develop local supply chains, create jobs and train local people.

BG AND RESHAPING SHELL

Delivering the BG deal required swift and effective integration in 2016, while learning from their best working practices.

A team made up of employees from both companies identified more than 100 different practices, for example, engineering standards and contractor requirements, that were incorporated into Shell's operating model.

Staff at all former BG facilities, which are now operated by Shell, have reviewed their health, safety, security, environment and social performance (HSSE&SP) plans against Shell's HSSE&SP Control Framework, and now comply with the Shell framework or have plans to close any gaps.

BRAZIL GROWTH

Brazil has been key to Shell for over a century and, since the BG-Shell combination, is now a bigger part of our portfolio.

Shell has a diverse operated and non-operated portfolio in Upstream in Brazil - including exploration and production equity in several deep-water fields. Our Downstream footprint includes Shell's largest investments in biofuels globally through its Raízen joint venture; a lubricants blending plant and a 17% stake in Comgás, one of Latin America's largest natural gas distributors.

After the acquisition our average daily production in Brazil grew tenfold in 2016, from 30,000 to more than 300,000 barrels of oil equivalent (boe). Today, Shell is Brazil's second largest oil and gas producer, with production expected to grow over the next decade. Shell's current position in Brazilian deep-water includes Petrobras-operated facilities and Shell-operated facilities.

In 2016, we continued to fund social investment projects coming from both Shell and BG in Brazil and launched the first Shell Eco-marathon Brazil. Shell LiveWIRE has helped develop more than 600 new businesses in Brazil over the past 15 years.

OUR BUSINESS

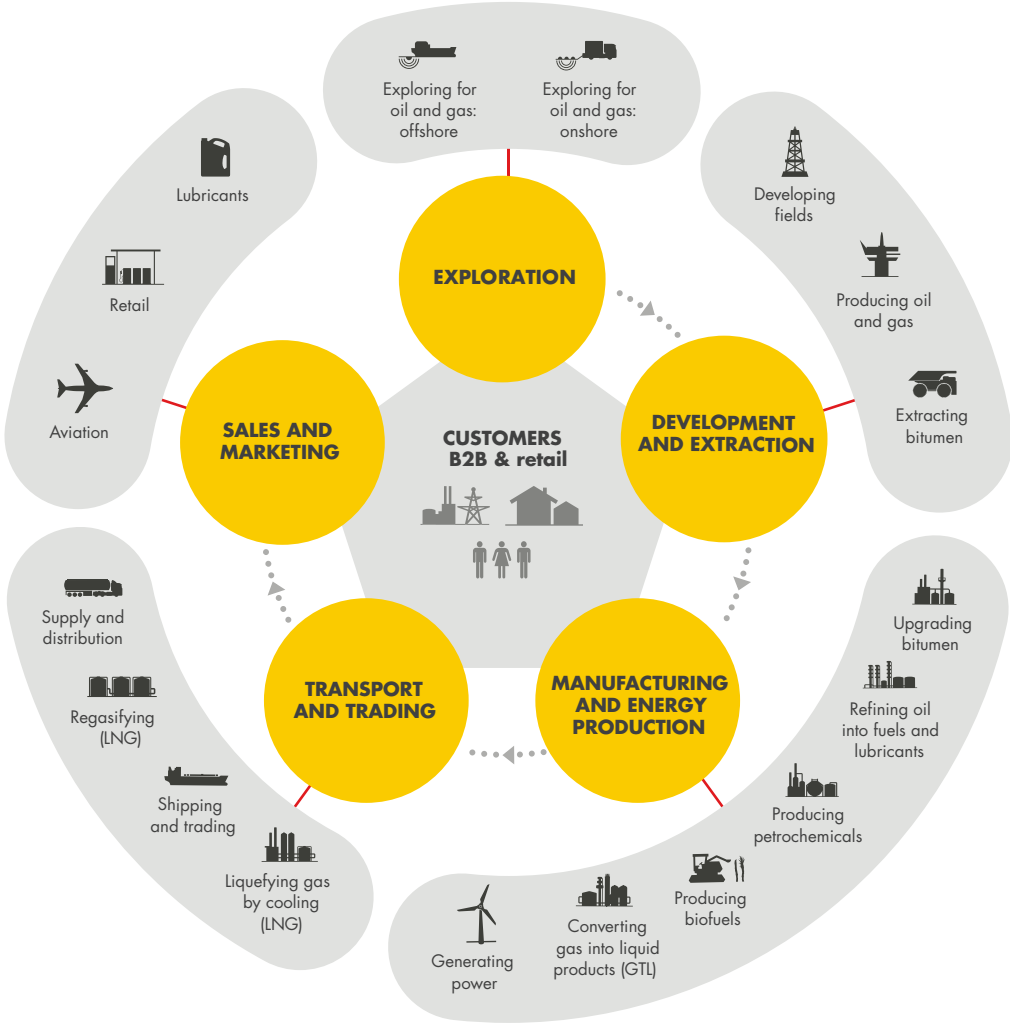
Shell's business is divided into three areas: Upstream, Integrated Gas and Downstream:

- **Upstream** is responsible for Shell's conventional oil and gas businesses around the world, including deep water as well as shale oil and gas. It explores for and recovers crude oil and natural gas, and develops major new projects.
- **Integrated Gas** manages Shell's manufacturing and distribution of liquefied natural gas (LNG) and gas-to-liquids products. It includes natural gas exploration and extraction and the operation of the upstream and midstream infrastructure necessary to deliver gas to market. It also includes the New Energies business, created in 2016, which invests in low-carbon energy solutions such as biofuels, hydrogen, wind and solar power.
- **Downstream** manages Shell's refining and marketing activities for oil products which are sold around the world for domestic, industrial and transport use. It also produces and sells chemicals for industrial customers. Shell's oil sands mining activities in Canada are also part of the Downstream business.

STRATEGIC THEMES

As part of its refreshed strategy, Shell manages its portfolio around three time horizons: cash engines for today, growth priorities for the medium term and future opportunities for the longer term:

- **Cash engines:** conventional oil and gas, integrated gas and oil products are the activities that we expect to provide strong returns and free cash flow. They will fund distributions to shareholders and reduce debt, as well as investments in our growth priorities and future opportunities. In March 2017, Shell announced our agreement to sell the majority of our interests in oil sands in Canada. As a result, oil sands mining no longer features as a strategic theme.
- **Growth priorities:** deep-water oil and gas and chemicals are Shell's growth priorities. They are our future cash engines, with expected improved returns and cash flow from around 2020. We are developing deep-water fields in Brazil and the Gulf of Mexico, and chemicals projects in the USA and China; and
- **Future opportunities:** We see shale oil and gas and our New Energies business as future opportunities. Our current shale portfolio is centred on the USA, Canada and Argentina. In the New Energies business, we are building our portfolio around our existing activities in low-carbon biofuels and hydrogen, and exploring investments in solar and wind energy. Future opportunities should provide us with material growth in free cash flow in the next decade or beyond.



HOW SUSTAINABILITY WORKS AT SHELL

Sustainability at Shell means providing energy in a responsible manner, respecting people, their safety and the environment.

Our approach to sustainability starts with our goal to run a safe, efficient, responsible and profitable business. We work to share wider benefits where we operate. Shell's core values of honesty, integrity and respect for people – first laid out in the Shell General Business Principles 40 years ago – underpin everything we do. A commitment to contribute to sustainable development was added in 1997. These principles apply to the way we do business and to our conduct with the communities where we operate.

INTEGRATING SUSTAINABILITY

When we invest in energy projects, we seek to balance the short- and long-term interests of our business. For investment decisions, we consider the economic, social and environmental risks and opportunities as well as the political and technical risks. Our commitment to safety, the environment and communities plays a crucial role in how we plan, design and operate projects and facilities.

Our approach to sustainability is integrated across our business activities on three levels.

RUNNING A SAFE, EFFICIENT, RESPONSIBLE AND PROFITABLE BUSINESS

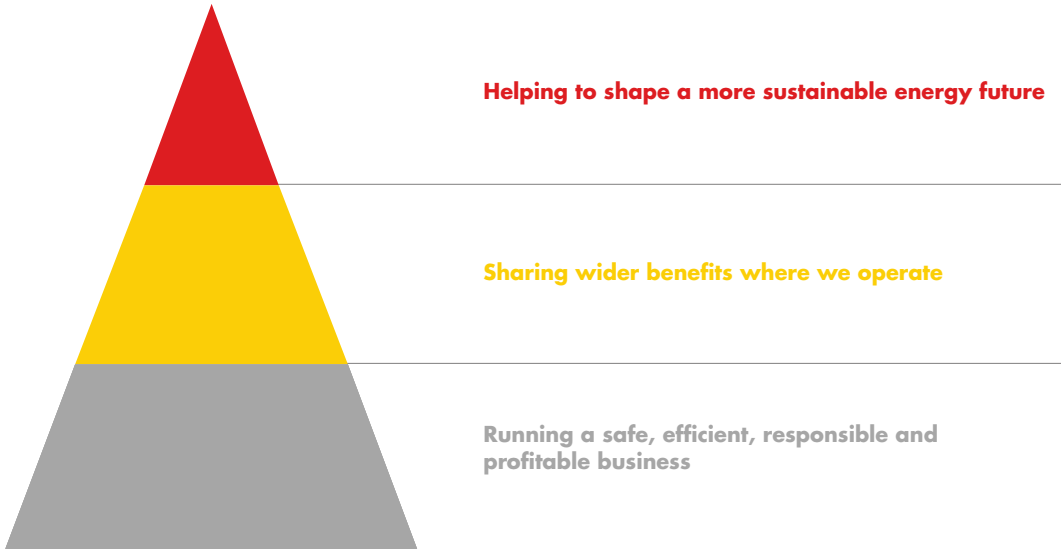
Safeguarding and respecting people – our employees, contractors and neighbours – is fundamental to how we do business. This includes having global standards, processes and tools in place to manage safety, the environment and how we engage with communities. We aim to continuously improve the way we operate to prevent incidents and to identify, avoid where possible and minimise adverse environmental and social impacts.

SHARING WIDER BENEFITS WHERE WE OPERATE

We plan our business for the long term, which means we can be part of a community for decades. We help to develop local economies by creating jobs, sourcing from local suppliers, and paying taxes and royalties. We support community projects that are based on the needs of the local communities.

HELPING TO SHAPE A MORE SUSTAINABLE ENERGY FUTURE

In the coming decades, more and cleaner energy will be needed for economic development in the face of growing environmental pressures. We are investing in low-carbon energy solutions and advanced technologies, such as those that increase energy efficiency and reduce emissions. We continue to contribute to the public dialogue on energy and climate policy. Yet the scale of the global challenges that the world faces are too great for one company, or one sector, to resolve. We advocate that businesses, governments and civil society work together to shape a more sustainable energy future.

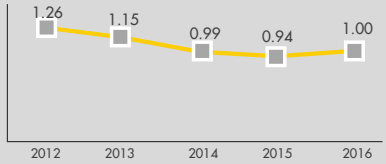
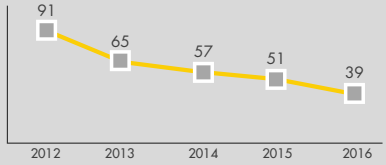
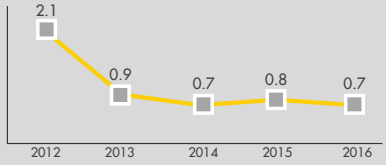
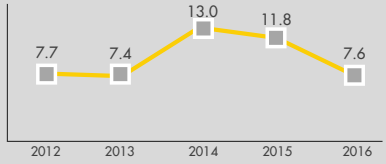
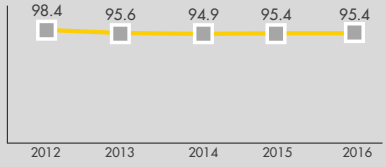


REPORTING AGAINST ASPIRATIONS

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 our operations on people and the environment. We used them to set our goals and measure progress in 2016 and to define priorities for 2017.

We review the metrics we use regularly to ensure that we capture the information needed to improve our performance. For example, Shell introduced Goal Zero for personal safety 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 data and Social and safety data sections.

Goals and performance for 2016 and priorities in 2017

	2016 Goal	Progress in 2016	Priorities in 2017
PERSONAL SAFETY	**Achieve total recordable case frequency (TRCF) – the number of injuries per million working hours – below 0.96 for employees and contractors.** Goal Zero has been our ambition for personal safety since 2007 In 2016, TRCF slightly increased compared to 2015. (See Safety performance).	Total recordable case frequency (TRCF)  	■ For road safety, continue to replicate proven practices from existing programmes across all lines of business. ■ Support application of common industry safety standards. ■ Continue to leverage insights from assurance and investigations of incidents with potential to cause harm.
PROCESS SAFETY	**Achieve a number of operational leaks below 54 (classified as "operational Tier 1 process safety events").** Since 2011, we have extended our ambition of Goal Zero to process safety. In 2016, the number of process safety events has decreased again for both categories – Tier 1 and Tier 2 – to our lowest reported total. (See Safety).	Number of operational process safety Tier 1 events  	■ Keep a strong focus on asset integrity and operational task execution. ■ Improve learning from process safety events with high potential impact.
ENVIRONMENT	**Achieve operational spills below a volume of 0.7 ('000 tonnes) (classified as "hydrocarbons reaching soil or water").** Goal Zero also extends to the environment with our goal of no operational spills. The volume of operational spills decreased slightly. We continued to reduce the number of operational spills significantly in 2016 (72) compared to 2015 (108). (See Operational Spills).	Volume of operational spills in '000 tonnes  	■ Keep focus on improving the reliability of our facilities to reduce the number and volume of operational spills. ■ Continue to work with the oil and gas industry to further develop effective oil-spill emergency response capacities.
GHG & ENERGY	**Reduce flaring in our upstream business (million tonnes CO_2 equivalent).** Our policy is to reduce any continuous flaring or venting to as low a level as reasonably practical. We are a signatory of the World Bank's "Zero Routine Flaring 2030" initiative. With measures implemented in 2016, we reduced routine flaring at our facilities significantly, even though we increased production and number of facilities. (See Flaring).	Flaring in million tonnes CO_2 equivalent  	■ Link all Shell staff performance bonuses to the management of greenhouse gas emissions, including the reduction of flaring. ■ Work with the World Bank and focus on finding solutions to host-government funding for flaring projects.
GHG & ENERGY	**Achieve a refinery energy intensity below 92.2 (based on the Refineries Energy Index).** We aim to achieve top level energy-efficiency performance in our refineries. Improve energy efficiency to reduce our greenhouse gas emissions. The energy intensity of our refineries remained at similar levels to 2015. This was due to operational issues and improvement initiatives not fully delivering against plans. (See Energy efficiency).	Refinery energy intensity as Refineries Energy Index  	■ Link all Shell staff performance bonuses to the management of greenhouse gas emissions, including the reduction of refining GHG intensity. ■ Continue to focus on maintenance measures that enhance the reliability of our equipment. ■ Ensure sharing of tools and practices across Shell.
SOCIAL	**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 implemented our online community feedback tool across almost all our upstream operations. At the refineries in our Downstream business, we introduced the full range of community feedback categories. As a result, we are now able to evaluate data in the categories beyond environmental complaints, including, for example, stakeholder engagement, property issues and local benefit sharing. (See Social performance).	■ Implementation of our online community feedback tool across all major operational sites and projects under development in different lines of business: Upstream, Downstream and Integrated Gas and New Energies. ■ Perform a pilot project to assess the effectiveness of our CFM against the UN Guiding Principles on Business and Human Rights effectiveness criteria.

OUR EXECUTIVE SCORECARD

In 2016, sustainable development continued to account for 20% of the company scorecard, which helps determine the annual bonus levels for all our employees, including members of the Shell Executive Committee.

The Executive Committee's sustainable development measures were split evenly between Shell's safety and environmental performance in 2016. Our environmental measures covered operational spill volume, energy efficiency and use of fresh water. The safety measures cover, with an equal weighting, process safety events, such as leaks or spills of hazardous material, and personal safety. These measures reflect Shell's Goal Zero ambition of no harm and no leaks.

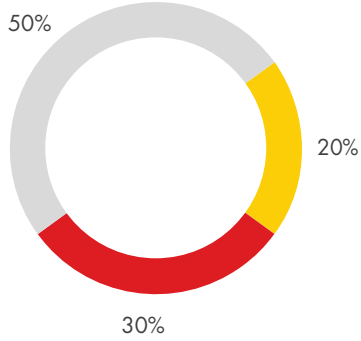
Targets covering all employees are set each year by the Board's Remuneration Committee to incentivise continuous and sustained improvement.

Sustainable development will continue to account for 20% of the 2017 annual bonus scorecard. The safety component will still cover process safety events and personal safety, but based on recommendations from the Corporate and Social Responsibility Committee, the Remuneration Committee has focused the environmental component on greenhouse gas (GHG) emissions in three specific business areas: refining, chemical plants and flaring in upstream assets. This goes beyond carbon dioxide to include other GHGs such as methane.

Scorecard Structure

Operational excellence

	2016	2017
Liquified natural gas sales	6%	12.5%
Production	12%	12.5%
Refinery and chemical plant availability	12%	12.5%
Project delivery	25%	12.5%



Sustainable development

		2016		2017	
Safety 10%	Process safety	5%		Process safety	5%
	Personal safety	5%		Personal safety	5%
Environment 10%	Water use	2%		GHG management: Refining, Chemicals and flaring	10%
	Oil spills volumes	4%			
	Energy intensity	4%			

Operational excellence | Cash flow from operating activities | Sustainable development

THE SUSTAINABLE DEVELOPMENT GOALS

In 2016, the United Nations adopted 17 sustainable development goals. These goals build on the preceding Millennium Development Goals and seek to tackle the world's economic, social and environmental issues by 2030.

Achieving the sustainable development goals (SDGs) will require action by governments, non-governmental organisations and the private sector. Companies can contribute to the achievement of the SDGs by reducing the negative impact of their operations and seeking to contribute positively to the environments and communities in which they work.

SHELL AND THE SDGS

The goals highlighted below are most closely related to the topics that were identified as most relevant or prominent for Shell in 2016, which are covered in this report. See how we selected the topics for the Sustainability Report 2016.

GOAL 6: CLEAN WATER AND SANITATION

We work to protect and preserve water and manage its use in a responsible and sustainable way. We invest in new technologies to use this valuable resource more efficiently. Fresh water is an important part of our environmental standards. (See Natural gas, Oil sands, Environment).

GOAL 7: ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY

Shell's purpose is to provide more and cleaner energy solutions. We do this by investing in the production and distribution of oil and natural gas, as well as in lower-carbon technology and sources of energy. We also invest in local projects to help communities gain access to energy. In the Philippines, for example, we are using hydro and solar power to provide energy to an off-grid community. (See Towards a low-carbon future, Social performance).

GOAL 8: DECENT WORK AND ECONOMIC GROWTH

Our activities create jobs, use local suppliers and support local businesses. We contribute to economic growth by paying taxes and royalties to local governments. Our projects create demand for a range of goods and services, such as construction. We assess those we work with to ensure they adhere to principles supporting the eradication of forced labour and modern slavery and the protection of labour rights. We have social investment projects to help create opportunities for individuals. Shell LiveWIRE, for example, helps young people start their own businesses. These local programmes operate in 15 countries including Oman, Brazil, Nigeria, Indonesia, Saudi Arabia and Pakistan. (See Living by our principles, Contractors and suppliers).

GOAL 9: INDUSTRY, INNOVATION AND INFRASTRUCTURE

We work with governments, academics and industry specialists, and partner with companies and organisations to help meet the world's growing energy needs. We share ideas and expertise with partners inside and beyond the energy sector to help encourage innovation. We have programmes in various countries to support small- and medium-sized businesses. (See Our business partners).

GOAL 11: SUSTAINABLE CITIES AND COMMUNITIES

The Shell Scenarios team has partnered with local authorities in three emerging Asian cities to help them explore new approaches to urban development and to help make these cities more resilient.

GOAL 12: RESPONSIBLE CONSUMPTION AND PRODUCTION

We have codes, policies and assurance processes to help define how we can protect the environment, respect our neighbours and cause no harm to people. We have voluntarily reported on our environmental and social performance since 1997. Energy efficiency is carefully considered in the life cycle of our fuels and lubricants, from managing energy consumption in their production to providing customer advice on optimum fuel efficiency. (See Environment)

GOAL 13: CLIMATE ACTION

We continue to work to manage greenhouse gas emissions from our operations and have signed up to the World Bank's "Zero Routine Flaring by 2030" initiative. Our major projects have energy management plans and we monitor and manage our emissions using, for example, methane emissions detection technology. We work with governments, other companies and international organisations to help advance the transition to a low-carbon future. In 2016, in its first operating year, our Quest carbon capture and storage project in Alberta, Canada, captured and safely stored more than 1 million tonnes of carbon dioxide. (See Our greenhouse gas emissions, Managing methane emissions, Carbon capture and storage).

GOAL 14: LIFE BELOW WATER

Shell is working with governments, non-governmental organisations and other experts to find ways to protect marine biodiversity. We aim to avoid impacts on biodiversity when developing new projects. We carry out impact assessments to minimise the extent to which local biodiversity and communities might be affected by operations. Shell is also involved in research programmes to help increase understanding of marine mammals. One example is our collaboration with the International Union for Conservation of Nature off the east coast of Russia. (See Environment, Environmental partners).

GOAL 15: LIFE ON LAND

We aim to minimise the impact our operations may have on natural environments and on people near our projects. This includes any impacts on local communities' health, safety and access to fresh water, food or income. Our standards help reduce any impact our operations may have in areas that are rich in biodiversity or under environmental protection. We work with conservation organisations to restore natural habitats and ecosystems close to our operations. We also support rigorous sustainability standards to help ensure that our biofuels come from sustainable sources.

GOAL 16: PEACE, JUSTICE AND STRONG INSTITUTIONS

Our core values of honesty, integrity and respect for people underpin how we work. We promote inclusion, fairness and sustainability through our corporate governance structure, which is designed to support the responsibilities and commitments set out in the Shell General Business Principles. Through Shell's own activities, including support for employee networks, and by collaborating with communities, we work to strengthen mechanisms that uphold human rights, the rule of law, accountability and transparency.

GOAL 17: PARTNERSHIPS FOR THE GOALS

We collaborate and work in partnership in many areas, for example, to deliver more and cleaner energy and to help us reduce our environmental impact. We share our knowledge, experience and understanding of the energy system with policymakers. (See Environmental partners, Social partners).

The sustainable development goals

SUSTAINABILITY GOVERNANCE

Shell has strong governance structures, supported by standards, policies and controls. These are the foundations of our decisions and actions at every level of the company.

We have put clear and effective governance structures in place throughout Shell, along with many performance standards and other controls. These influence the decisions we make and the actions we take, at every level of our company.

Our governance procedures involve the Board of Royal Dutch Shell plc, four Board Committees, our Executive Committee (EC), and the teams and individuals who work in our operations. We take rigorous care to ensure decisions are cascaded within the business.

The overall accountability for sustainability within Shell lies with the Chief Executive Officer and the EC. They are assisted by the health, safety, security, environment and social performance (HSSE&SP) executive team. Our standards are set out in our HSSE&SP Control Framework and apply to every Shell company. The process safety and HSSE&SP assurance team, with a mandate from the Corporate and Social Responsibility Committee (CSRC), provides independent assurance on compliance with the Control Framework.

CORPORATE AND SOCIAL RESPONSIBILITY COMMITTEE

One of the four Board Committees is our CSRC. It reviews and advises on our sustainability policies and practices to ensure that these are discussed, understood, owned and promoted at Board level. This can include advising on areas as broad as climate change and human rights through to process safety management.

The CSRC also visits different Shell operations each year to speak with Shell employees, contractors and suppliers, as well as with community members and external stakeholders. After each visit, the CSRC shares its observations with the Board and with the management responsible for that project. The Committee's work strengthens sustainability within our operations around the world.

THE CSRC TODAY

The CSRC's role is to review and advise Shell about our policies and performance against the Shell General Business Principles, our Code of Conduct and our mandatory HSSE&SP standards.

The CSRC meets regularly throughout the year. It reviews and discusses a wide range of sustainability-related topics and assesses our sustainability performance, audit results and the sustainable development metrics that apply to the Executive Committee. It also monitors major issues of public concern that may be relevant to Shell.

CSRC MEMBERS

The CSRC had three members in 2016. Each was a non-executive director:

- in 2016, the Chairman of the CSRC was Hans Wijers, former Chief Executive and Chairman of Akzo Nobel (Chairman of the Committee with effect from May 20, 2015);
- Sir Nigel Sheinwald, a former British diplomat; and
- Patricia A. Woertz, a business leader with extensive oil industry experience.

In 2016, the CSRC visited the Karachaganak facilities in Kazakhstan, jointly operated by Shell (Shell interest 29.25%). During the visit, the CSRC engaged with local stakeholders including employees and government representatives. The CSRC also dedicated a session in 2016 to Nigeria and individual CSRC members visited the Moerdijk chemical plant and one of the Nederlandse Aardolie Maatschappij (NAM) gas fields in the Netherlands.

In 2016, the Corporate and Social Responsibility Committee visited the Karachaganak facilities in Kazakhstan.

ENERGY TRANSITION

A transition is underway to a global lower-carbon energy system. Managing this transition is complex: all types of energy will be required to meet the needs of a growing population with rising living standards, yet that energy needs to be less carbon-intensive.

50%
Share of our production that was natural gas in 2016

70 MILLION TONNES
Direct GHG emissions from facilities we operate on a CO_2 equivalent basis in 2016

1 MILLION TONNES
Amount of CO_2 captured by Quest

TOWARDS A LOW-CARBON FUTURE

The energy transition will require providing much more energy to meet rising global demand, while at the same time significantly reducing carbon dioxide emissions.

Energy is essential to the global economy. From fuels to fertilisers, and manufacturing to transportation, energy enables the lifestyles that many enjoy today. Access to reliable energy can transform lives and enables economic growth.

However, around 20% of the global population lives in OECD countries but uses 40% of the world's energy. Billions of people still lack access to energy that many take for granted: modern, affordable energy for heating, lighting, cooking, refrigeration and sanitation.

The world's primary energy demand, driven by a growing population and rising living standards, is expected to rise by 30% between 2015 and 2040, according to the main scenario in the International Energy Agency's World Energy Outlook 2016. At the same time, there is a critical need to address environmental stresses, from local air pollution to climate change.

Today, oil and gas make up around half the world's primary energy mix, and coal provides around 30%. The rest comes from sources such as hydropower, biofuels, solar, wind and nuclear. More energy from this current energy mix means more greenhouse gas emissions, which in turn leads to climate change.

The transition to a low-carbon future will unfold at different paces in different places, and across all sectors of economic activity – creating new risks and opportunities. New technologies, business models and partnerships, supported by policy and regulatory frameworks, will be needed.

Shell will play its role in a way that is commercially competitive as well as environmentally and socially responsible, in oil and gas, as well as in low-carbon and renewable energy sources. Our success depends on our ability to anticipate the types of energy that people will need.

Most of the world's energy consumption comes from coal, oil and gas sources, but only around a fifth of energy consumption is electricity.

TRANSFORMING THE GLOBAL ECONOMY

The Shell Scenarios publication, *A Better Life with a Healthy Planet: Pathways to Net-Zero Emissions*, sets out a plausible route for the world to achieve, during this century, economic development for most people coupled with net-zero greenhouse gas emissions from energy. In a net-zero world, emissions in some sectors are offset by efforts to remove carbon dioxide (CO_2) from the atmosphere, including reforestation and large-scale industrial facilities built to capture and store CO_2.

Making this transition will take significant efforts to boost energy efficiency. A transformation of the global economy is also required, especially in the power, transport, buildings and industry sectors, where a significant proportion of energy-related emissions of CO_2 occurs.

The power sector, for example, must evolve into a combination of more renewable sources of energy, nuclear, and natural gas – the cleanest-burning hydrocarbon – with carbon capture and storage (CCS) technology. In the transport sector, passenger road travel increasingly needs to be electrified or to rely on hydrogen. For the foreseeable future, longer-distance freight shipping and aviation will continue to rely on energy-dense liquid fuels, including oil, biofuels and liquefied natural gas.

Towards a low-carbon future

Shell is working to meet the energy challenge in many different ways:

LOOKING BEYOND ELECTRICITY

Increasing use of renewable sources of energy is essential for a transition to a low-carbon future. However, renewables are mainly used to produce electricity, which today only meets 18% of global energy demand. For renewables to have a bigger impact, electricity has to play a large part in other key sectors of the economy.

The switch to using electricity powered by low-carbon or renewable sources will be easier for some sectors, such as the manufacture of clothes and food, which require relatively low temperatures.

Other sectors, such as industries that produce iron, steel, cement, plastics and chemicals, rely on hydrocarbons to provide extremely high temperatures, chemical reactions or dense energy storage. Many of these cannot be electrified at all, or only at a high cost. In the transport sector, oil currently supports more than 90% of demand. In the coming decades, passenger road travel will increasingly need to be electrified, powered by batteries or hydrogen.

Petrochemicals, the building blocks of products people use every day, such as solvents, detergents and plastics, will also continue to play a vital role in meeting the demands of a growing population and in some cases can improve energy efficiency. Replacing metal car parts with lighter plastics, for example, helps lower fuel consumption and therefore reduces emissions.

SECURING A SMOOTH TRANSITION

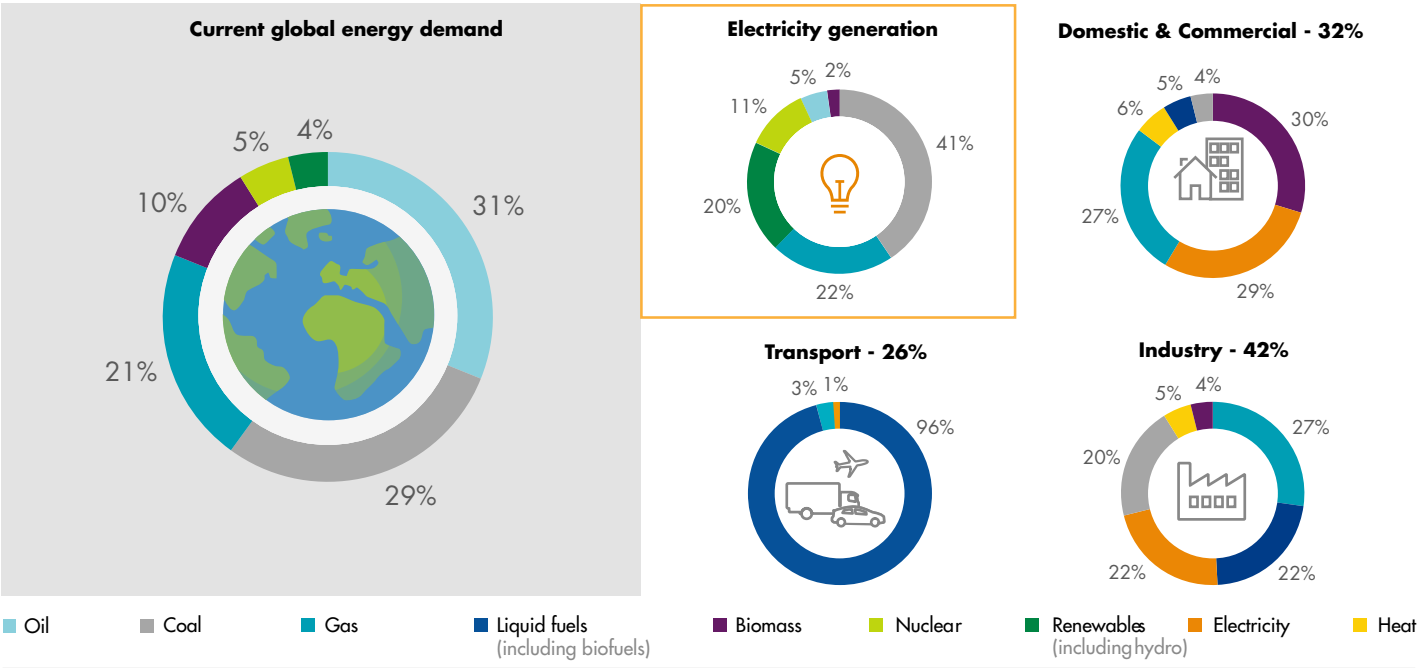
The transformation to a low-carbon energy system requires urgent action. It will take realism, investment, innovation and collaboration between policymakers, business executives, non-governmental organisations and energy consumers.

Government-led carbon pricing mechanisms are one essential policy tool that can drive efficiencies and provide an incentive for lower-carbon choices by businesses and consumers.

Other policies should focus on city and transport planning to improve energy efficiency; accelerating the switch from coal to gas to reduce power-sector emissions; sustaining the rapid growth of renewables; and establishing the widespread use of CCS, which can significantly reduce emissions from industrial sectors by safely storing CO_2 deep underground.

Today's energy needs

The world today currently consumes most of its energy from coal, oil and gas sources. Around a fifth of total energy consumption is electricity. Energy sources differ across the sectors of industry, transport, and domestic use which all need to transition to low-carbon energy options.



Source: International Energy Agency, Key world energy statistics 2015 and World energy outlook 2015.

Energy challenge

There is more demand for energy globally as the world's population and living standards increase.

A successful energy transition requires substantial investment across all energy sources, including oil and gas production, to meet growing demand for energy.

Growing population
Global population will increase from around 7.4 billion today to nearly 10 billion by 2050, with 67% living in cities.

Rising demand
Global energy demand will likely be almost 60% higher in 2060 than today, with 2 billion vehicles on the road (800 million today).

Ongoing supply
Renewable energy could triple by 2050, but we will still need large amounts of oil and gas to provide the full range of energy products we need.

Mitigating climate change
Net-zero emissions is a potentially achievable societal ambition.

Source: UN Population Fund; UN World Population Prospects (2015 revision); World Urbanization Prospects (2014 revision); International Energy Agency, Energy Technology Perspectives 2015; Shell New Lens Scenarios.

OUR WORK TO ADDRESS CLIMATE CHANGE

There are clear, practical steps that could help tackle climate change while continuing to provide energy to meet the world's present and future needs.

We welcomed the United Nations Paris Agreement on climate change and its entering into force on November 4, 2016. The agreement seeks to limit global warming to well below 2 °C by managing climate and environmental pressures while ensuring economic development.

It highlights the urgent need for policies that can help build a low-carbon future. In particular, Article 6 of the Paris Agreement introduces the necessary foundation to support the development of a global carbon emissions market. However, as noted by the International Energy Agency (IEA), implementing the current Nationally Determined Contributions (NDCs) will not limit global warming to well below 2 °C.

Shell is looking at cost-effective ways to manage greenhouse gas (GHG) emissions and the commercial opportunities these solutions will bring. Our four main contributions to reducing global GHG emissions are: supplying more natural gas to replace coal for power generation; progressing carbon capture and storage (CCS) technologies; developing alternative energies; and implementing energy-efficiency measures in our operations. To support this, we continue to advocate the introduction of effective government-led carbon pricing mechanisms.

We work with governments and industry representatives to help society transition to a low-carbon energy future. We have invested in cleaner-burning natural gas and low-carbon biofuels and are also working on new fuels for transport. Shell shapes its portfolio and strategy to take into account the shift to lower-carbon energy, ensuring our company's resilience for the future.

A GREATER ROLE FOR NATURAL GAS

Natural gas, the cleanest-burning hydrocarbon, produces around half the carbon dioxide (CO_2) and just one-tenth of the air pollutants compared to coal when used for power generation. We convert natural gas into products, such as liquid fuels, hydraulic fluids and lubricants, and are always working to make them as efficient and reliable as possible. Natural gas can also act as a partner for intermittent renewable energy, such as solar and wind, to maintain a steady supply of electricity, because gas-fired plants can start and stop relatively quickly. The IEA estimates that global demand for gas will grow by 1.5% every year in the period to 2040.

Shell is one of the world's leading suppliers of natural gas and liquefied natural gas (LNG), through our operated and non-operated joint ventures, and is safely tapping into resources of natural gas known as shale gas.

GOVERNMENT-LED CARBON PRICING MECHANISMS

Shell has long called for governments to create carbon-pricing mechanisms that place a meaningful cost on CO_2 emissions.

These mechanisms offer an effective way to stimulate the development of low-carbon technologies, generate revenue for governments and, ultimately, give consumers new energy choices. They could encourage the deployment of renewable energy and CCS.

CARBON CAPTURE AND STORAGE

According to the IEA, CCS remains the only technology capable of delivering significant reductions in emissions from the use of hydrocarbons.

CCS will be essential for meeting the goal of limiting global warming to well below 2°C. According to the IEA, reaching this goal will require 6,000 million tonnes of CO_2 to be stored by 2050, equivalent to about 100 times the global CCS capacity expected by the end of 2017. The IEA also estimates that without CCS, the transformation to a low-carbon power sector will cost at least $3.5 trillion more.

Shell is playing a leading role in the demonstration of CCS technology at the Quest CCS project in Canada. We are working on CCS research programmes with partners around the world, and sharing knowledge with working groups and coalitions.

LOW-CARBON ENERGY AND BIOFUELS

Low-carbon biofuels are one of the most viable ways to reduce CO_2 from transport fuels in the coming years.

Our Raízen joint venture (Shell interest 50%) in Brazil produces low-carbon biofuel from sugar cane. We are also investing in research to help develop and commercialise advanced biofuels.

In 2016, we created a New Energies business to continue to explore investment opportunities in areas including biofuels, hydrogen and renewable energy. This business will also look for opportunities in energy solutions that combine wind and solar power with gas, for example, and new ways to connect customers to energy.

PORTFOLIO RESILIENCE

We continually assess Shell's portfolio and strategy against a wide range of outlooks, taking into account the long timescales in our industry and the potential for shifts in the economic landscape. This is how we identify new business opportunities and possible divestments, and ensure the resilience of the company in the future. Our refreshed company strategy reflects our recognition that we are in an era of transition and volatility for the energy industry. The Energy Transitions and Portfolio Resilience report explains how Shell is investing in low-carbon energy, and creating a strategy to succeed through changing times. Shell: Energy Transitions and Portfolio Resilience (PDF, 2.7 MB)

Shell has a rigorous approach to understanding, managing and mitigating climate risks in our facilities. We reflect future regulatory costs by typically applying a common $40 per tonne project screening value (PSV) to the CO_2 emissions associated with investments. This means that new projects are assessed for the financial impact if a government imposed price or levy of $40 per tonne for GHG emissions is implemented. For projects with a high exposure to government imposed carbon pricing or legislation, we apply several other forms of GHG management including GHG design standards and stress testing.

The screening value can affect our project design in several ways. Some projects may be stopped at an early stage if the GHG footprint is too high or a design may be altered to reduce GHG emissions at start-up. We also maintain energy management plans for all assets and projects to identify opportunities to reduce GHG emissions and consider the potential for CCS in the design of our new projects.

We also evaluate options to integrate readiness for CCS into the design of our new projects.

Singapore featured in Shell's New Lenses on Future Cities supplement, which looked at choices that may be needed to build sustainable cities in the future.

The 2017 Executive scorecard focuses on GHG emissions in three specific business areas: refining, chemical plants and flaring in upstream assets. This goes beyond carbon dioxide and specifically includes methane, which is also a GHG.

ADAPTATION

The effects of climate change mean that governments, businesses and local communities are adapting their infrastructure to the changing environment. At Shell, we are taking steps at our facilities around the world to ensure that they are resilient to climate change. This reduces the vulnerability of our facilities and infrastructure to potential extreme variability in weather conditions.

We take different approaches to adaptation for existing facilities and new projects. We progressively adjust our design standards for new projects while, for existing assets, we identify those that are most vulnerable to climate change and take appropriate action.

WORKING WITH COUNTRIES TO HELP SHAPE ENERGY TRANSITIONS

Shell is working with some countries as they shape their energy future. Each country has its own opportunities and challenges depending on factors such as wealth, population density, and level of industrialisation. Our discussions with governments include ways to improve energy efficiency, as well as ways to increase the use of natural gas and low-carbon fuels such as biofuels, wind, solar and hydrogen. We discuss how to develop compact city designs and public transit systems, and policy options including carbon pricing to help bring through technologies such as CCS.

In the Netherlands, for example, we are working with policymakers and industry representatives to help determine the shape and speed of the transition to a low-carbon energy future. The Netherlands has large wind resources, but also a large petrochemical and industrial sector, and has set itself a target of reducing GHG emissions by between 80% and 95% by 2050. Such ambitious targets will require significant shifts in the way energy is produced and consumed across the economy.

In 2016, Dutch energy company Eneco, the Port of Rotterdam, German engineering group Siemens, Dutch contracting company Van Oord and Shell initiated a coalition to accelerate the energy transition in the Netherlands. At the National Climate Summit in Rotterdam in October 2016, the coalition called on the Dutch government to prioritise the international climate goals set during the climate summit in Paris and decide on a long-term policy framework to support them. By the end of the year, the coalition had more than 50 member companies.

The coalition believes accelerating the energy transition in the Netherlands will require the active involvement of individuals and companies, as well as long-term government policies on climate, energy and the economy.

OUR GREENHOUSE GAS EMISSIONS

Shell tracks emissions released by our upstream and downstream facilities and works to reduce air pollution from our operations.

We report our greenhouse gas (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. For example, our environmental standards include the requirement to set up GHG and energy management plans.

OUR PERFORMANCE

The direct GHG emissions from facilities that we operate were 70 million tonnes on a CO_2-equivalent basis in 2016, down from 72 million tonnes of CO_2 equivalent in 2015.

Our 2015 base year GHG emissions were recalculated from 72 million to 76 million tonnes CO_2 equivalent to reflect the impact of the former BG facilities and other structural changes. Therefore, on a like-to-like basis, the direct GHG emissions have decreased from 76 million tonnes in 2015 to 70 million in 2016.

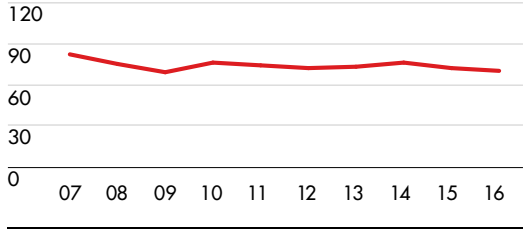
Our overall GHG emissions decreased for the following reasons:

- overall reduction in flaring;
- Quest carbon capture and storage project in Canada's oil sands safely injecting more than 1 million tonnes of CO_2 per year;
- divestments, for example in Nigeria and the UK; and
- operational improvements across many facilities;

These decreases were partially offset by the inclusion of emissions from former BG facilities in our inventory as of February 1, 2016.

In 2016, around 45% of our GHG emissions came from the refineries and chemical plants in our Downstream business. The production of oil, gas and gas-to-liquids products accounted for slightly more than 50% of our GHG emissions, and our shipping activities for less than 2%. We continue to work on improving operational performance and energy efficiency to manage GHG emissions.

Direct greenhouse gas emissions
million tonnes CO_2 equivalent

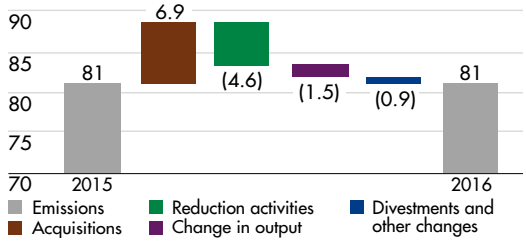


The indirect GHG emissions from the energy that we purchased (electricity, heat and steam) increased to 11 million tonnes on a CO_2-equivalent basis in 2016, from 9 million tonnes in 2015, mainly due to the inclusion of former BG facilities in our portfolio. These emissions were calculated using a market-based approach, as defined by the World Resources Institute GHG Protocol.

We estimate that the CO_2 emissions from the use of our refinery and natural gas products by others were around 600 million tonnes in 2016, which represents less than 2% of the world's emissions.

(See more on www.shell.com/ghg)

GHG movements from 2015 to 2016 [A]
million tonnes CO_2 equivalent



[A] Direct and energy indirect greenhouse gas emissions.
Numbers have been rounded so some totals may not agree exactly.

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.

When oil is extracted from a reservoir, gas is also produced as the oil is brought to the surface. This is known as associated gas. This gas can be captured and used alongside the oil. When there are no facilities to gather the gas, or they have insufficient capacity, it is sometimes flared, or burned. Flaring is also carried out for safety reasons to relieve pressure in the production system. Flaring wastes valuable energy resources and releases greenhouse gas into the atmosphere.

Shell's policy is to reduce any routine flaring or venting of associated gas at our operations to a level as low as technically and financially feasible. We also aim to minimise operational flaring required for safety reasons such as during the start-up of a new facility. Our flaring policy is set out in our Health, Safety, Security, Environment and Social Performance (HSSE&SP) Control Framework. It includes the requirement for all facilities to be designed to export, use or reinject associated gas that is produced, and all facilities have to meet strict performance criteria.

Shell has been an active member of the World Bank-sponsored "Global Gas Flaring Reduction" (GGFR) partnership since 2002. This public-private partnership helps reduce flaring by working collaboratively to find alternative uses for gas that would otherwise be flared. As part of the partnership, the World Bank has developed the "Zero Routine Flaring by 2030" initiative, which Shell signed up to in 2015. This encourages governments, companies and development organisations to work together to end the disposal of gas by flaring. The initiative aims to identify ways to use gas from oil production – for example, to generate electricity for local communities.

OUR PERFORMANCE

More than 70% of flaring from Shell-operated fields in 2016 occurred in Iraq, Nigeria, Malaysia and Qatar. New facilities brought online in Malaysia and Iraq have helped reduce our flaring from 11.8 million tonnes of carbon (CO_2) equivalent in 2015 to 7.6 million tonnes in 2016, including the additional fields added to our portfolio from the acquisition of BG in 2016. Work continues to bring additional gas gathering facilities online in Iraq and Nigeria to reach our goal of no routine flaring by 2030, while continuous improvement efforts will reduce operational flaring.

In Iraq, Shell Iraq Petroleum Development (Shell interest 45%) safely delivered the second phase of a gas-capturing system at our Majnoon facilities. The system captured about 65% of the gas that would otherwise be flared in 2016, which was around 90 million standard cubic feet per day. The delivery of this phase marks a significant milestone in our efforts to reduce gas flaring at Majnoon and deliver natural gas for power generation in Iraq.

Basrah Gas Company (BGC, Shell interest 44%) is a joint venture with Iraq's South Gas Company and Japan's Mitsubishi. It captures gas that would otherwise be flared from three non-Shell-operated oil fields in southern Iraq (Rumaila, West Qurna 1 and Zubair) for use in the domestic market. In 2016, BGC processed an average of 574 million standard cubic feet of gas each day from these fields. This is equivalent to the amount of energy needed to power more than 4.5 million homes.

These projects are helping to improve the electrical infrastructure of the country and deliver much-needed energy to the population. They required collaboration with the Iraqi government, joint-venture partners, domestic companies and non-governmental organisations.

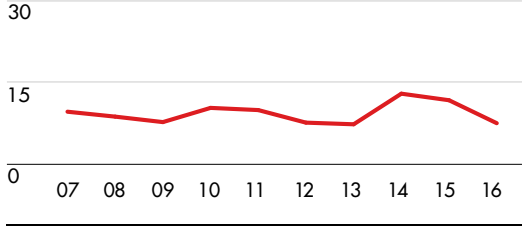
In Nigeria, flaring from Shell Petroleum Development Company's (SPDC) joint-venture facilities fell by more than 90% between 2002 and 2016. Flaring from SPDC facilities decreased further in 2016, mainly due to production outages as well as to operational improvements. Progress was also made on several gas-gathering projects. However, the planned start-up dates for two major gas-gathering projects continue to be delayed by security issues and a lack of adequate joint-venture funding from our government partner.

In Malaysia, the associated gas flaring reported in 2015 at the Gumusut (Shell interest 29%) and Kikeh fields has been eliminated by the introduction of a fully operational system in 2016 that injects gas back into the hydrocarbon reservoir. This will maximise production from the oil field.

In Qatar, at our Pearl gas-to-liquids plant (Shell interest 100%), flaring takes place for operational reasons. In 2016, further enhancements to the plant took place, to reuse more waste gas. (See Natural gas).

At Shell, we continue to develop solutions that eliminate flaring while, where possible, bringing gas to markets for domestic and international use.

Flaring – Upstream
million tonnes CO_2 equivalent



MANAGING METHANE EMISSIONS

We are working to detect and lower our methane emissions to reduce our impact on the environment.

Shell has a range of initiatives in place to reduce our methane emissions. These include programmes to detect and repair methane leaks in our operations. We also implement energy-efficiency measures, as well as flaring and venting reduction programmes.

Efforts to further reduce our emissions will continue to be a focus over the coming years.

METHANE FROM OIL AND GAS PRODUCTION

Methane is a more potent greenhouse gas (GHG) than carbon dioxide (CO_2); it has 34 times the global warming potential of CO_2 over a 100-year time frame, according to the Intergovernmental Panel on Climate Change AR5 report. Reductions in methane emissions today will help to slow the short-term rate of global temperature rise, as methane remains in the atmosphere for a much shorter time than CO_2.

Methane emissions associated with oil and natural gas production tend to occur in four main areas: combustion (emissions of unburnt methane from fuel combustion); flaring (where the flaring itself fails to burn all the methane); venting (for example, from tanks and equipment); and unintended emissions (for example, small leaks sometimes called fugitive emissions).

Natural gas emits less CO_2-equivalent than coal when burnt at a power plant, but methane leakage in the natural gas system could reduce this benefit. The US Environmental Protection Agency (EPA) estimates that total methane emissions in the natural gas supply chain – as a percentage of the global total volume of natural gas produced – were around 1.3% in 2014. This takes into account methane leaks during gas processing and transmission through pipelines for power generation.

At this leak rate, the average life cycle GHG emissions from US natural gas power plants is around half of those from US coal power plants. Shell continues to work to manage and reduce our methane emissions so that the emissions from gas remain lower than coal. Liquefied natural gas emits around 40% less GHG emissions than coal when burnt to generate electricity.

COLLABORATING ON EMISSIONS REDUCTION

Shell works with others to manage methane emissions. We have participated in several initiatives, such as the EPA Natural Gas STAR programme, for many years. This programme encourages oil and gas companies to adopt technologies and practices that reduce methane emissions. In early 2017, we joined the Climate and Clean Air Coalition Oil & Gas Methane Partnership, which brings together industry, governments and non-governmental organisations to improve our understanding of methane emissions and work to reduce them.

We are also collaborating on research to better understand methane emissions. This includes studies by Eurogas, the association representing the European gas industry, and the Natural and bio Gas Vehicle Association, on methane emissions in the gas supply chain in Europe.

As a member of the Oil and Gas Climate Initiative (OGCI), we are working with experts to improve methane data collection and our understanding of the natural gas life cycle.

Shell is working with governments, the oil and gas sector and regulators, to help find a way to effectively manage methane emissions. We advocate government policies that will support the reduction of methane emissions across all sectors of the economy.

In our onshore unconventional operations, we regularly use leak detection and repair (LDAR) programmes, which have infrared cameras to identify and repair fugitive leaks. We use LDAR in countries including the USA, Canada, the Netherlands and Tunisia. We continue to extend the implementation of LDAR across our operations.

We are actively testing new technologies for the detection and measurement of methane emissions, such as optical gas imaging through our membership of OGCI Climate Investments. This partnership, that launched in 2016, will invest $1 billion over 10 years in low-carbon technologies.

OUR PERFORMANCE

In 2016, methane emissions contributed less than 5% of Shell's GHG emissions on a CO_2-equivalent basis. More than 60% of our reported methane emissions in 2016 came from flaring and venting in our upstream operations.

We report our methane emissions from these sources according to regulations and industry standards. We also engage in industry-wide work on more accurate reporting methods, such as through IPIECA, the global oil and gas industry association for environmental and social issues.

CARBON CAPTURE AND STORAGE

Carbon capture and storage is the name given to a combination of technologies that captures and stores carbon dioxide deep underground, preventing its release into the atmosphere.

The world will need carbon capture and storage (CCS) to achieve the ambition of net-zero greenhouse gas emissions. CCS technology can be used to capture carbon dioxide (CO_2) from a range of industries including steel, chemicals and power.

There are 21 large-scale CCS projects in operation or under construction globally, with a combined capacity to capture around 40 million tonnes of CO_2 each year. All projects presently in construction (five as of January 2017) are expected to be operational by the end of 2017.

Shell is sharing the knowledge and experience gained in CCS through various working groups. The Oil and Gas Climate Initiative's (OGCI) Climate Investments partnership – comprising 10 major oil and gas companies, including Shell – has made CCS one of its priority areas. It plans to invest in finding ways to make CCS commercially viable by reducing the cost of the technology and exploring ways to deploy CCS in a wide range of industrial sectors including power, iron and steel.

We work with the Zero Emissions Platform, which brings together energy companies, academics and non-governmental organisations to support the development of CCS. In 2016, we launched an app to share information about CCS and to explain how it works.

Shell is also investing in the future Gorgon CO_2 injection project in Australia, the CCS Test Centre in Mongstad, Norway, and the Qatar Carbonates and Carbon Storage Research Centre in the UK.

QUEST, CANADA

In Alberta, Canada, Shell operates a joint venture (Shell interest 60% in 2016) that has developed the first commercial-scale CCS facility for CO_2 extracted from our oil sands operations. The Quest facility is designed to capture up to 35% of the current CO_2 emissions from the Scotford Upgrader – a plant where bitumen is processed into synthetic crude oil. The captured CO_2 is stored in a porous rock layer about 60 kilometres away and more than 2 kilometres under ground. The provincial government of Alberta and the federal government of Canada have provided C$865 million to support the development of Quest.

In 2016, in its first full year of operation, Quest safely captured and stored more than 1 million tonnes of CO_2 ahead of schedule. This is equivalent to the emissions from about 250,000 cars. Shell and our joint-venture partners are freely sharing any data or intellectual property generated by the Quest project to help others advance CCS projects and demonstrate the technology's value on an industrial scale.

In March 2017, Shell agreed to sell to Canadian Natural Resources Limited (Canadian Natural) its 60% interest in the Athabasca Oil Sands Project (AOSP), its 100% interest in the Peace River Complex in-situ assets including Carmon Creek, and a number of undeveloped oil sands leases, all in Alberta, Canada. In a related transaction, Shell and Canadian Natural have agreed to jointly acquire Marathon Oil Canada Corporation, which has a 20% interest in the AOSP. Following these transactions, Shell will continue as operator of the Scotford Upgrader and Quest.

MONITORING QUEST

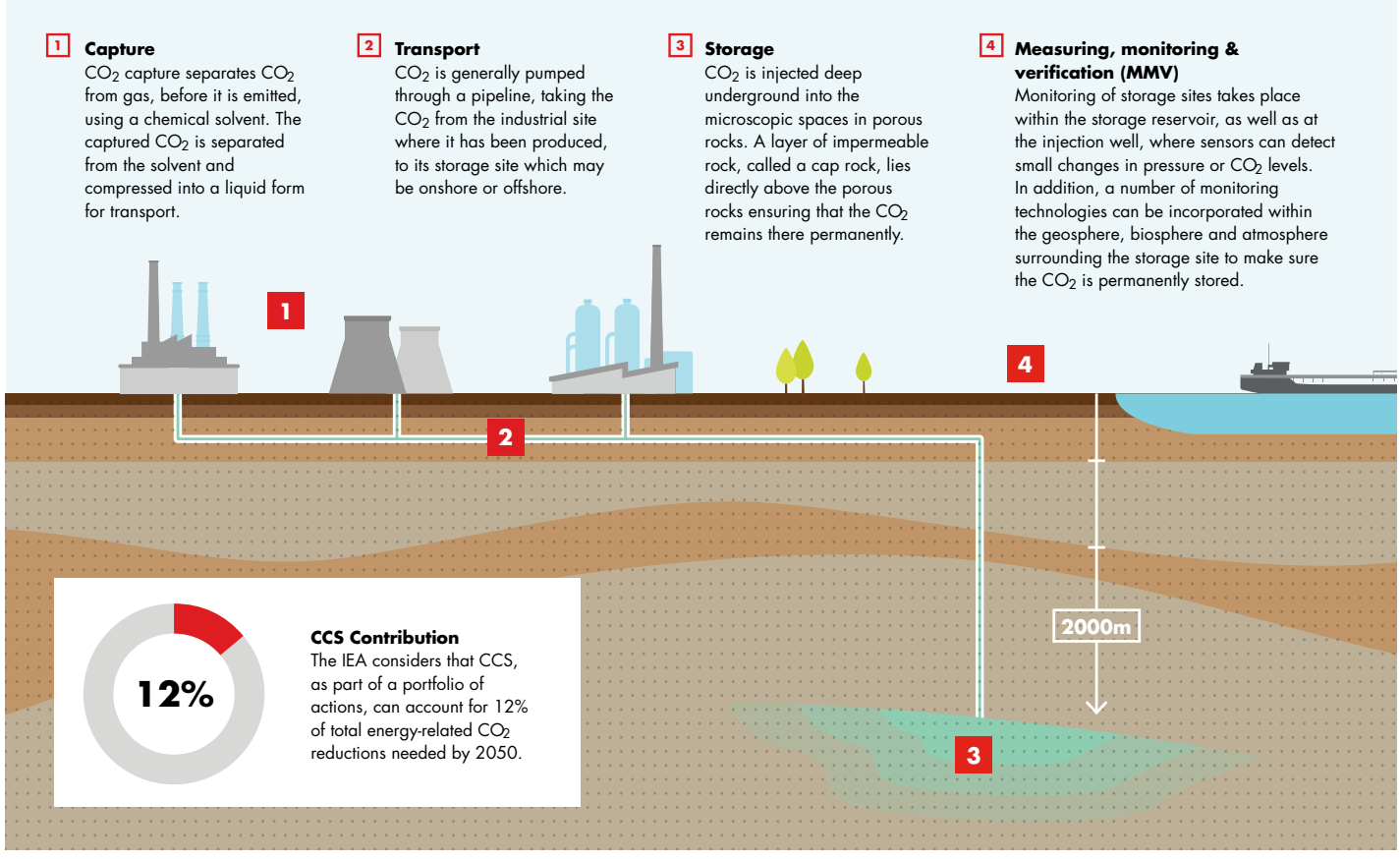
Quest is designed to meet all the requirements for the safe and permanent storage of CO_2. We have developed a rigorous monitoring programme, agreed by the government and verified by a third party, to ensure that the CO_2 remains safely and securely underground. This includes continuous pipeline monitoring and early-warning systems, groundwater sampling and 3D seismic surveying. Throughout the development of Quest, we conducted an extensive consultation programme with nearby communities. We share results from our monitoring programme with them.

SHELL CANSOLV

CCS technology developed by Shell Cansolv, a subsidiary of Shell, is used at the power station Boundary Dam in Saskatchewan, Canada. It is SaskPower's largest coal-fired power station and a significant source of power for the region. Both sulphur dioxide and CO_2 are captured from the power station. We continue to support SaskPower to improve the application of the technology.

How carbon capture and storage works

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



NATURAL GAS

Natural gas – the cleanest-burning hydrocarbon – comprises about half of Shell's total production.

Natural gas provides a readily available solution to meeting rising global demand for energy with fewer emissions if used instead of coal for power generation. There are enough recoverable natural gas resources to last more than 220 years at current levels of consumption, according to the International Energy Agency. Natural gas can be transported by pipeline or in liquid form to countries in need of energy. It is also one of the few energy sources that can be used economically across most energy applications – from electricity to heating to transport fuels – and its uses are diversifying, as an alternative to diesel in trucks, heavy fuel oil in transport and oil for lubricants. As such, Shell expects it to play an increasingly prominent role in the future energy mix, both in its own right and as a partner for renewables.

LOWER EMISSIONS

Natural gas produces around half the greenhouse gas (GHG) emissions of coal when burnt to generate electricity. This includes methane emissions.

Using natural gas instead of coal in power generation will also significantly improve air quality. Compared to coal-fired plants, modern natural gas plants emit less than one-tenth of sulphur oxides, nitrogen oxides, particulates and heavy metals that impact hundreds of millions of people all over the world, especially in Asia.

Natural gas can also be used in combination with carbon capture and storage (CCS) to further reduce GHG emissions. CCS can remove up to 90% of CO_2 emissions from power plants, according to the UN Intergovernmental Panel on Climate Change.

PEARL GAS-TO-LIQUIDS PROJECT

The Pearl gas-to-liquids (GTL) project – 80 kilometres north of Doha, Qatar – is the world's largest plant to turn natural gas into fuels and lubricants (Shell interest 100%).

The plant relies on a heavy paraffin synthesis (HPS) catalyst. It accelerates the reaction that converts synthesis gas, a mixture of hydrogen and carbon monoxide, into hydrocarbons that can be broken down into shorter chain molecules and then turned into finished GTL products. These include paraffin for detergents and kerosene for blending into aviation fuel.

In 2016, Shell reduced heavy paraffin synthesis off-gas operational flaring at the plant to zero by using the gas as a fuel to power the plant. As a result, less energy is used to make the same products, which results in reduced CO_2 intensity.

In addition, the flared gas was used to generate electricity, which was exported to Doha-based Kahramaa, Qatar's national Electricity and Water Company.

A PARTNER FOR RENEWABLES

Natural gas is flexible and offers significant advantages as a partner with renewables, which will be essential in a transition to a low-carbon future.

Using gas as a partner ensures steady power supplies when the sun does not shine or the wind does not blow. Modern gas-fired power plants also take less than a third of the time a coal plant needs to ramp up to full operation.

Increasing use of renewables will be vital in the energy transition. However, renewables are mostly used to produce electricity which due to the high temperature needed in the manufacture of materials such as iron, steel and cement, will struggle to replace oil and gas on a practical scale. This means gas will complement renewables by continuing to play a core role in industry and construction. Our New Energies business is looking at how new technologies could work more effectively together, for example, combining wind and solar power with gas.

CHINA'S FUTURE ENERGY MIX

Since 2011, Shell has worked closely with the Chinese government's Development Research Centre (DRC) of the State Council on the country's medium- to long-term energy development strategy. The ongoing collaboration has identified the key energy challenges facing the country and suggested detailed, practical solutions.

The second phase of the collaboration examined the important role natural gas can play in helping China diversify its energy mix, boost economic development, improve air quality, and help meet China's Intended Nationally Determined Contribution for reducing carbon emissions.

In 2016, Shell and the DRC presented the outcomes from Phase 2 at the China Development Forum. Phase 3 focuses on the future development of China's energy system to help the country transition to a lower-carbon economy.

Kroonborg is the first offshore vessel in the world to sail on GTL fuel, a liquid fuel made of natural gas with less emissions than conventional fuels for vessels.

LIQUEFIED NATURAL GAS

Shell is involved in every stage of the LNG value chain: from finding the fields and extracting the gas to liquefying it, shipping, turning the LNG back into gas and distributing it to customers. In February 2016, Shell's acquisition of BG added significantly to our activities in LNG.

The LNG process enables natural gas to be easily transported from areas where it is abundant to places where it is needed. To create LNG, natural gas is cooled to –162°C, turning it into liquid form and shrinking its volume by 600 times. At its destination, the LNG is converted back into gas for conventional use. Even after liquefying, transporting and turning it back into a gas, LNG emits around 40% less greenhouse gas emissions than coal when burnt to generate electricity. Innovations, for example, floating import terminals that convert LNG back into natural gas, mean LNG can reach new customers in developing markets, such as India, Pakistan, Egypt, Jordan and Ghana. In the next few years, countries including the Philippines, Vietnam, Myanmar and Bangladesh are expected to become LNG importers.

The World Health Organisation estimates that exposure to smoke emissions from household solid fuels, such as coal, dung and wood, causes more than 4 million deaths a year. Replacing these solid fuels with cleaner-burning gas will improve the quality of the air people breathe. Gujarat, for example, where Shell and French oil and gas company Total operate the Hazira LNG terminal (Shell interest 74%), is the first state in India to connect some of its villages to piped gas. This has helped reduce indoor air pollution in these rural homes and saved people in some cases up to five hours of their day collecting firewood.

QGC PROJECT

As a result of the BG acquisition, we have a majority interest in the QGC Project in Queensland, Australia. The Shell-operated project consists of onshore production areas piping natural gas to a two-train LNG facility. Shell holds a 50% interest in train one and a 97.5% interest in train two, and a 100% interest in the common facilities on the LNG plant.

In 2014, the QGC Project started producing LNG from natural gas sources from coal seams, which can produce up to 8.5 million tonnes of LNG a year. It supplies natural gas to both the domestic market and LNG to international customers. In December 2016, the 200th cargo of LNG was delivered to customers.

At the QGC Project, Australia, the central water treatment plant recycles salty underground water extracted during gas production.

We are managing our environmental impact, including our water use. There are two treatment plants, which recycle salty underground water extracted during gas production. This treated water is then used by irrigators, industries and communities in the Surat region. The plants have a combined capacity to treat the equivalent of about 25 Olympic-sized swimming pools during peak production.

FLOATING LIQUEFIED NATURAL GAS

Floating liquefied natural gas (FLNG) facilities enable LNG to be produced, liquefied, stored and transferred at sea. This makes it possible to reach offshore gas fields previously considered too expensive or too difficult to develop. FLNG also reduces the local impact of LNG infrastructure and decreases the disturbance to land and marine life.

Shell is constructing the Prelude FLNG (Shell interest 67.5%), which will be located 475 kilometres off the coast of Western Australia. Once completed, Prelude FLNG will be the largest floating offshore facility in the world.

In 2016, the project began the transition from construction to commissioning and start-up activities at the shipyard in Geoje, South Korea. The undersea infrastructure has also been completed in preparation for the arrival of Prelude.

The project continues to work toward the finalisation of the required regulatory approvals, with the Prelude environment plan accepted by the regulator at the end of 2016.

LNG FOR TRANSPORT

Cleaner vehicles and fuels are needed to meet increasing demand for transport with less greenhouse gas emissions.

Cleaner-burning LNG is a fuel for heavy-duty road transport, shipping and rail. It is virtually free of sulphur emissions and has lower levels of nitrogen oxides and particulates. It can be used as an alternative transport fuel to diesel and heavy fuel oil.

Shell has created a network of five LNG truck refuelling stations in the Netherlands. One of the stations, located on the premises of one of the largest Dutch supermarket chains, is used by 150 LNG delivery trucks a day.

In shipping, LNG is already used as a fuel with around 100 vessels in use today. Using LNG as a fuel for shipping on a wide scale would lead to significant reductions in marine emissions.

In 2016, Shell signed an agreement with one of the world's biggest cruise operators, Carnival, to supply LNG to fuel two of the world's largest passenger cruise ships. These will be the world's first LNG-powered cruise ships, due to start sailing in north-west Europe and the Mediterranean in 2019.

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In 2016, Shell and Keppel Offshore & Marine Ltd won a bid for Singapore's first licence to fuel ships with LNG.

Read more about LNG for transport on www.shell.com.

RESEARCH AND DEVELOPMENT

Innovation will be critical for Shell to provide more energy with less environmental impact as the world transitions to a lower-carbon energy system.

Shell continues to invest in research and development (R&D) to improve the efficiency of our products, processes and operations, and to develop new technology solutions for the energy transition. In 2016, we invested $1,014 million in R&D.

We operate a global network of technology centres, with major hubs in Houston, USA, Amsterdam, the Netherlands, and Bangalore, India. These hubs carry out a range of activities, from building on existing technologies to designing breakthrough innovations.

COLLABORATING FOR INNOVATION

We have programmes, partners and funding methods to help us develop new technologies.

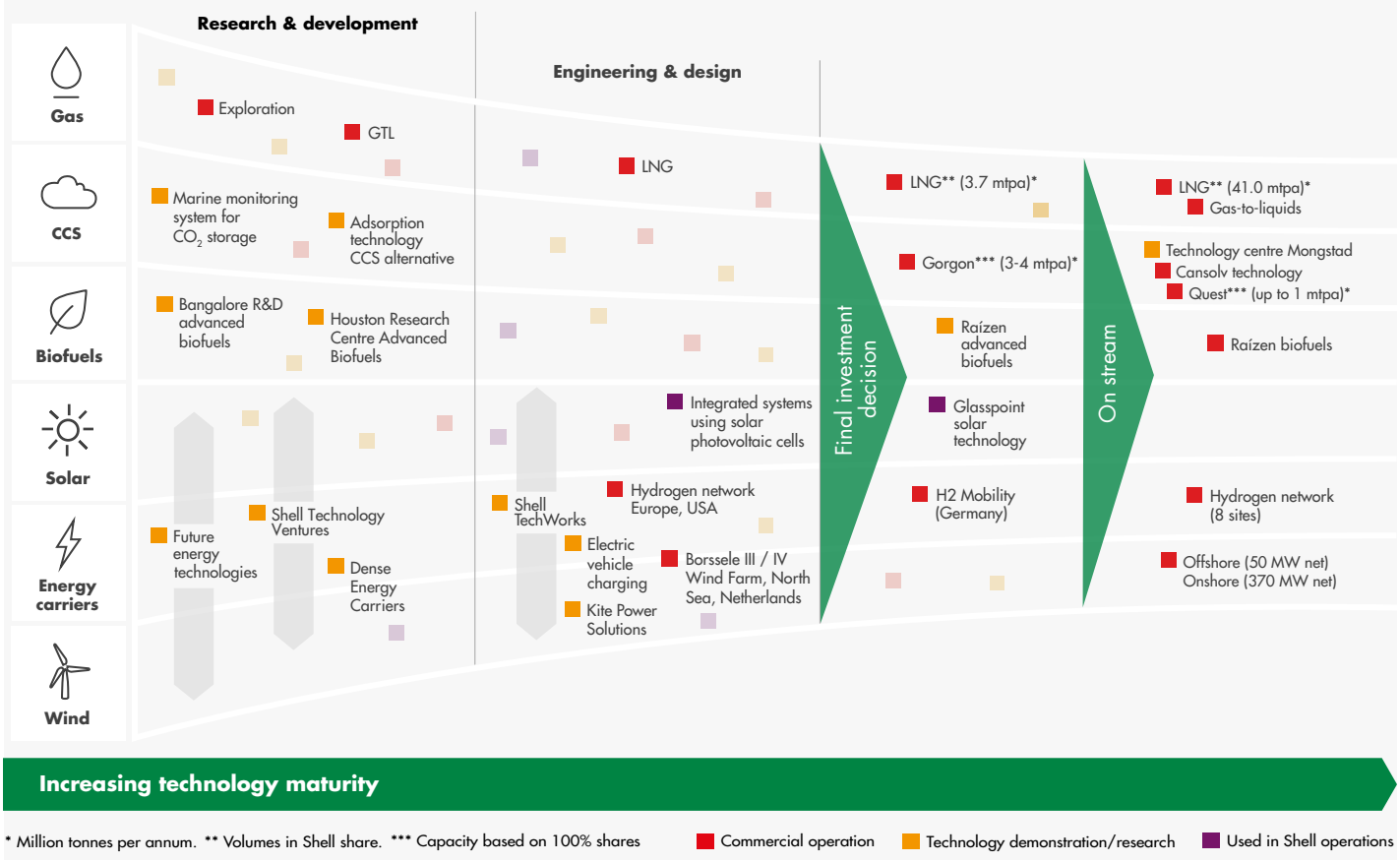
Our R&D activities are complemented by research and technology collaborations with leading universities including the Massachusetts Institute of Technology in the USA, Imperial College in the UK, and the Shanghai Advanced Research Institute of the Chinese Academy of Sciences.

In 2016, Shell Technology Ventures invested in Kite Power Systems, a UK company developing high-altitude wind power generation technology.

We have three main collaborative programmes that support the development of future energy technology:

- **Shell GameChanger:** this programme provides financial and technical support to prove the commercial and technical viability of ideas within the oil and gas sector including new energies. Since 1996, GameChanger has interacted with more than 5,000 innovators and helped turn more than 150 ideas into reality.
  Many ideas currently in operation or under development in Shell were initiated through GameChanger. For example, the programme evaluated the feasibility of building a floating liquefied natural gas (FLNG) facility to produce and liquefy natural gas at sea. Shell is now constructing Prelude FLNG, which will be located off the coast of Western Australia.
  GameChanger connects with early-stage start-ups, incubators and accelerators (schools for start-ups) globally. One of these is Cyclotron Road, a California-based energy entrepreneurship programme which recruits people to work at Lawrence Berkeley National Laboratory, to research potential new energy technologies. Opus 12, a start-up at Cyclotron Road, won the 2016 Shell GameChanger Innovation Challenge. Opus 12 is researching recycling carbon dioxide into chemicals and fuels using an electrochemical process.
- **Shell Technology Ventures (STV):** is our corporate venturing arm that is both an investor and a partner in companies that are developing promising technologies which complement Shell's business. STV invests mainly in oil and gas, new energy technologies and information technology.
  STV's investments in 2016 included California-based Growing Energy Labs which provides software to design, connect and operate energy storage and micro-grid projects. Another investment was Sense Labs, a Cambridge, Massachusetts-based company which has developed a device enabling households to monitor the energy use of any home appliance from mobile devices. In 2016, STV also invested in the UK company Kite Power Systems (KPS). Following Shell's early-stage support to KPS through GameChanger, this latest investment will support the technical and commercial development of KPS's high-altitude wind power generation technology. This is cheaper to manufacture and needs less construction and installation materials than conventional wind turbines.
- **Shell TechWorks (STW):** based in Cambridge, Massachusetts, STW aims to accelerate the introduction and adoption of proven technologies from other industries and apply these to our sector. Since its founding in 2013, STW has collaborated with companies, universities, research institutes and start-ups to help develop and deploy technology quickly and cost-effectively. For example, STW collaborated with other companies to develop a system for robot submarines to detect hydrocarbons that seep naturally from the seabed. This gives it the potential to identify new reservoirs of hydrocarbon exploration, but also detect leaks at existing operations.

Low-carbon research & development investment



* Million tonnes per annum. ** Volumes in Shell share. *** Capacity based on 100% shares

Commercial operation | Technology demonstration/research | Used in Shell operations

LOWER-CARBON ALTERNATIVES

Shell invests in a portfolio of lower-carbon energy opportunities, including technologies and fuels.

In our fuels and lubricants business, we continue to look for ways to improve energy efficiency for our customers.

We created a New Energies business in 2016 to further explore opportunities in alternative transport fuels, such as biofuels and hydrogen, along with new ways to connect energy producers and consumers, including through increased use of digital technology.

BIOFUELS

Shell is one of the largest blenders and distributers of biofuels worldwide. In 2016, we used around 9.5 billion litres of biofuels in the petrol and diesel we sold worldwide.

In the coming decades, we expect biofuels to play a valuable part in the changing energy mix. They can be a cost-effective way to reduce carbon dioxide (CO_2) emissions in the transport sector, as long as their production is managed in a responsible way. In addition to closely understanding their emissions, we want to ensure other environmental impacts from their production are well managed (such as impacts on soil, air and water) and that social impacts are beneficial for local communities.

SUSTAINABILITY STANDARDS

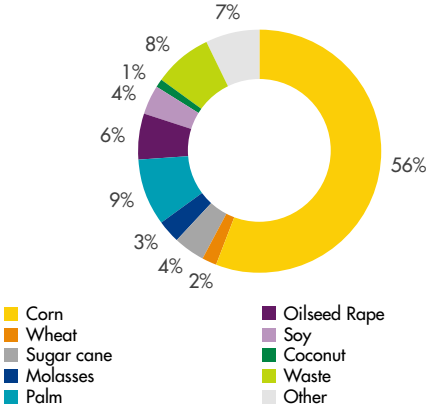
Shell purchases biofuels to blend into our fuels in line with country specific regulations. We continue to support the adoption of international sustainability standards including the Round Table on Responsible Soy, the Roundtable for Sustainable Palm Oil (RSPO) and Bonsucro, a non-profit organisation, for sugar cane. We also support the Roundtable for Sustainable Biomaterials and the International Sustainability and Carbon Certification (ISCC) scheme both of which can be used for any feedstocks.

The majority (75%) of the biofuels we purchase are from feedstocks that come from North America or Europe. In addition to good agricultural practices, both regions have sustainability rules that include land-use restrictions and set controls for greenhouse gas emissions.

We have specific purchasing policies for biofuels made from palm oil, soy from South America or sugar cane, to increase our use of independently certified sustainable biofuels. Every year, 100% of the palm oil that Shell blends is either independently certified by RSPO or the ISCC, or covered by offsets from the RSPO certificate trading system. In Argentina, we have assessed several of our cane suppliers against the Bonsucro standard and are encouraging their full certification. We are also setting up several projects in the country, aiming to increase the amount of sustainable soy and cane.

At the end of 2016, 30% of the sugar-cane ethanol and South American soy biodiesel used in biofuels that Shell blended was either independently certified as sustainable, audited against robust standards, or offset by purchasing soy or cane sustainability credits.

Global bio-component purchase [A]
by feedstock



[A] Does not include purchases by Raízen or Motiva.

PRODUCING BIOFUELS WITH RAÍZEN

In 2016, our joint venture Raízen (Shell interest 50%) produced more than 2 billion litres of low-carbon ethanol from Brazilian sugar cane. Around 40% of Raízen's production was certified as sustainable to the standards set by Bonsucro.

Raízen's production process is designed to minimise its environmental impact. The company's harvesting process is already 98% mechanised which improves worker conditions and operational efficiency. By the end of 2016, 16 of Raízen's 24 sugar-cane mills were certified to the Bonsucro standard.

Raízen purchases around half of the sugar cane it uses as a raw material from independent suppliers. The company is working in partnership with two non-governmental organisations, Imaflora and Solidaridad, to support these suppliers to become more sustainable producers. The suppliers complete a confidential self-assessment against a list of sustainability criteria which enables Solidaridad to prepare individual improvement guides. Since the programme started in 2014, more than 1,300 suppliers have completed the assessments and are working on improvements.

In 2015, Raízen opened its first cellulosic ethanol plant at its Costa Pinto mill in Brazil. Production in 2016 was almost 6.9 million litres, and over time the mill is expected to produce around 40 million litres a year of advanced biofuels from sugar-cane residues.

DEVELOPING ADVANCED BIOFUELS

We continue to invest in new ways to produce biofuels from sustainable feedstocks such as waste and cellulosic biomass from non-food plants. Shell has two pilot plants in the USA, which convert cellulosic biomass into a range of products, including petrol, diesel, aviation fuel and ethanol.

Another pilot plant is being installed in Bangalore, India, that will demonstrate a technology called IH^2 that turns waste into fuel using a two-stage catalytic reaction. The technology was developed by a USA-based research centre, the Gas Technology Institute.

ENERGY-EFFICIENT TRANSPORT

Shell invests in a range of lower-carbon technologies and fuels, sometimes working with partners.

Energy efficiency is an important consideration in the development of our fuels and lubricants. Shell is taking part in several initiatives to encourage the adoption of hydrogen electric transport, and is developing a service that supports the charging of electric vehicles.

EFFICIENT FUELS

Shell supplies fuels to millions of drivers around the world every day. For more than a century, our scientists have worked to develop products to improve the driving experience and energy efficiency of our customers. For example, Shell FuelSave Diesel contains ingredients designed to improve fuel-efficiency for our customers.

Shell GTL Fuel uses a gas-to-liquids (GTL) technology that converts cleaner-burning natural gas into alternative diesel fuels. Shell GTL Fuels are virtually sulphur-free, odourless and help to improve local air quality. They can be used as a diesel fuel without requiring changes to the engine or investment in new heavy-duty road transport infrastructure, and as a fuel for shipping.

In 2016, the European Committee for Standardisation approved a new European standard for paraffinic diesel fuel, helping develop the market for these fuels. Paraffinic fuels are synthetic liquid fuels such as Shell's GTL Fuel that are made from natural gas, biomass or vegetable oil. This new generation of cleaner transport fuels are colourless and odourless and contain almost none of the impurities – sulphur, aromatics and nitrogen – that are found in crude oil. Shell GTL Fuel is commercially available to customers in the Netherlands, Germany, the UK, Denmark and France.

ADVANCED LUBRICANTS

Lubricants are designed to increase the efficiency of equipment – including engines - and reduce fuel consumption. Shell is one of the largest investors among international energy companies in the research and development of lubricants for motorists, commercial vehicles and industrial sectors. We employ more than 200 scientists and engineers in lubricant research and development.

In 2016, Shell introduced a new range of heavy-duty engine oils in the USA, under the Shell Rotella brand. These were developed to meet the requirements of new American Petroleum Institute specifications for lubricants, which include reducing engine emissions.

We also produce motor oils that can improve the fuel efficiency of passenger cars and motorcycles. These include products manufactured using Shell PurePlus Technology, which applies the GTL process to produce a clear base oil. This has much lower levels of impurities than other base oils, and lubricants produced with this technology can help improve engine performance.

In Germany, the government is supporting the development of a national network of hydrogen electric fuelling stations.

ENERGY CHALLENGE

Our annual Shell Eco-marathon competition challenges students worldwide to design and build energy-efficient vehicles. Held in the Americas, Africa, Asia and Europe, the events inspire young engineers to develop vehicles that can travel the furthest on the least amount of energy. The 2016 competition showcased a vehicle capable of travelling more than 2,600 kilometres on the equivalent of one litre of fuel.

SHELL CONCEPT CAR

In 2016, Shell unveiled an energy-efficient city car called the Shell Concept Car. This is a collaboration between three companies: Shell, engine specialists Geo Technology and automotive engineers Gordon Murray Design.

In tests, the Shell Concept Car demonstrated a 34% reduction in primary energy use over its entire life cycle compared to a typical city car available in the UK.

In test results, the car runs at 38 kilometres (km) per litre at 70km/h. In formal testing (using the European Union's New European Driving Cycle laboratory test), the Shell Concept Car produced lower CO_2 emissions than a petrol-powered city car (28%).

HYDROGEN

Hydrogen has the potential to be an important low-carbon transport fuel and Shell is part of several initiatives to encourage the adoption of hydrogen electric energy.

Hydrogen fuel-cell electric cars do not emit greenhouse gases from their tailpipe – the only emission is water vapour. If the hydrogen comes from renewable sources of energy, and if it is produced at retail sites, then the fuel-cell vehicles have almost no emissions.

Hydrogen electric vehicles are quick to refuel and can drive a similar range to conventional cars. Energy is stored in compressed hydrogen fuel, rather than a battery, which means that hydrogen-powered cars can potentially drive up to 700 kilometres without refuelling. The cars take only three minutes to refuel – similar to current refuelling times for petrol and diesel cars.

Hydrogen electric transport can succeed if vehicle manufacturers and fuel suppliers, with the support of governments, work together. There needs to be sufficient refuelling infrastructure to attract customers, as well as incentives for businesses to build this infrastructure.

In Germany, for example, the government is supporting the development of a national network of hydrogen electric fuel stations across the country by 2023. We are working on this project with our joint-venture partners in H2 Mobility Germany – 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. The hydrogen will be delivered by truck as a gas to retail sites. Under the terms of the partnership, at least 50% of the hydrogen sold must be produced without emitting greenhouse gases. In 2016, the first two stations in the H2 Mobility network opened in Germany.

Outside this network, we also have three hydrogen filling stations in Germany and two in Los Angeles, California. In the UK, we are partnering with ITM Power, a company specialising in hydrogen fuel-cell products, to make hydrogen fuel available at three Shell retail sites in the southeast of the country. The first of the UK stations opened in February 2017. Shell is assessing the potential for similar projects in the USA, Canada, Switzerland, Austria, France, Belgium, Luxembourg and the Netherlands. For example, in California, USA, we are working with Toyota and the state government to build hydrogen refuelling stations, which Shell will own and operate when completed.

In January 2017, Shell and 12 other companies launched the Hydrogen Council, an initiative to raise the profile of hydrogen and its role in the energy transition. A report (PDF, 5.3MB) entitled *How hydrogen empowers the energy transition* further details hydrogen's potential.

ELECTRIC MOBILITY

Shell is looking into how we can serve the increasing number of people driving electric vehicles and the potential to introduce electric vehicle charging points at our retail sites in several countries.

We have also been developing technology that can support the integration of electric vehicles with the power grid. This technology explores how to charge electric vehicles at times when the cost of using power is low, and therefore cheaper for customers.

Since 2013, Shell has worked with partners in the power sector and commercial customers who have electric vehicles in their fleet to test this technology. We are now looking at introducing it in places such as California, USA, to help local governments push forward their goals for vehicles with zero emissions.

External opinion

"Hydrogen plays a crucial role in sustainable mobility, providing a convenient fuel for transport, as well as flexibility and storage for the power and heat sectors.

"Refuelling with hydrogen is safe, fast and customer-friendly"

Public-private activities such as the Clean Energy Partnership (CEP) in Germany have successfully demonstrated that refuelling with hydrogen is safe, fast and customer-friendly. This, along with the long range and the silent and powerful performance of fuel-cell cars and buses from various manufacturers, will encourage widespread acceptance by customers. That's why companies have started selling fuel-cell electric vehicles and hydrogen fuel in key global markets.

Shell continues to help provide the transport sector with this sustainable fuel as a partner in the CEP and as a driving force behind the creation of H_2 Mobility Germany – a joint venture that includes car manufacturers and oil and gas companies – and which is developing a network of hydrogen refuelling stations."

Klaus Bonhoff
Managing Director, National Organization Hydrogen and Fuel Cell Technologies, Berlin, Germany

SOLAR AND WIND TECHNOLOGIES

Solar and wind power are playing a growing part in meeting global energy demand.

We expect an emerging low-carbon energy system to include traditional fuels such as oil and natural gas alongside renewable energy and carbon capture and storage.

SOLAR POWER

Shell is exploring the possibilities offered by solar power and continues to install the technology at facilities to lower carbon intensity while also reducing operating cost.

In Canada and Gabon, for example, we have used solar photovoltaic (PV), wind turbines and batteries in remote, off-grid well sites to power monitoring and control systems, so avoiding the need for diesel generators.

At some offshore platforms in the North Sea, we use solar PV and batteries to provide 100% renewable power generation, cutting costs, and reducing refuelling trips to the platforms.

We use small-scale solar power systems in some retail stations. In Thailand, for example, we fitted two Shell retail stations and the Shell office in Bangkok with solar panels. In pilot projects in Pakistan, solar power is also helping oil product storage facilities continue to operate despite outages in the local power grid.

Petroleum Development Oman (PDO, Shell interest 34%) is constructing a solar thermal steam plant called Project Miraah. Once completed in 2020, Miraah will be the world's largest solar thermal steam plant, providing about a third of the Amal oil field's steam requirements. It will potentially be capable of producing up to1 gigawatt of thermal energy. This solar technology, developed by GlassPoint with investment from Shell Technology Ventures (STV), will replace gas-fired steam generation and free the gas for other uses, to reduce the CO_2 intensity of the oil production.

WIND POWER

In 2001, Shell entered the onshore wind business in the USA. We have interests in six operational wind power projects in North America and one in Europe. At the end of 2016, our share of the energy capacity from these projects was about 420 megawatts (MW).

In late 2016, a consortium of Shell, Dutch energy company Eneco, Dutch contracting company Van Oord and Mitsubishi's power-producing subsidiary Diamond Generating Europe, won a tender to construct and operate two wind farms in the Borssele Wind Farm Zone off the coast of the Netherlands. These are designed to have a capacity of 680MW, enough to power 825,000 Dutch homes.

Our Shell Energy Europe marketing and trading organisation is planning to buy half the power generated from this windfarm. Shell also committed to buy 100% of the power generated from the offshore wind farm Egmond aan Zee (OWEZ), the Netherlands' first large-scale offshore wind farm. From 2017, Shell will take the power generated from the wind farm and offer it to customers in Europe. In 2016, Shell Energy North America managed more than 9,500MW of power, with over one third of that power produced by renewable methods.

STV is also investing in wind-related technologies, including the UK company Kite Power Systems (KPS). Through our GameChanger programme, Shell and KPS have worked to develop KPS's high-altitude wind power generation technology, which uses two kites tethered to a spool and flying in figure eights to generate electricity.

Solar panels are installed on the rooftop of a Shell service station in Thailand.

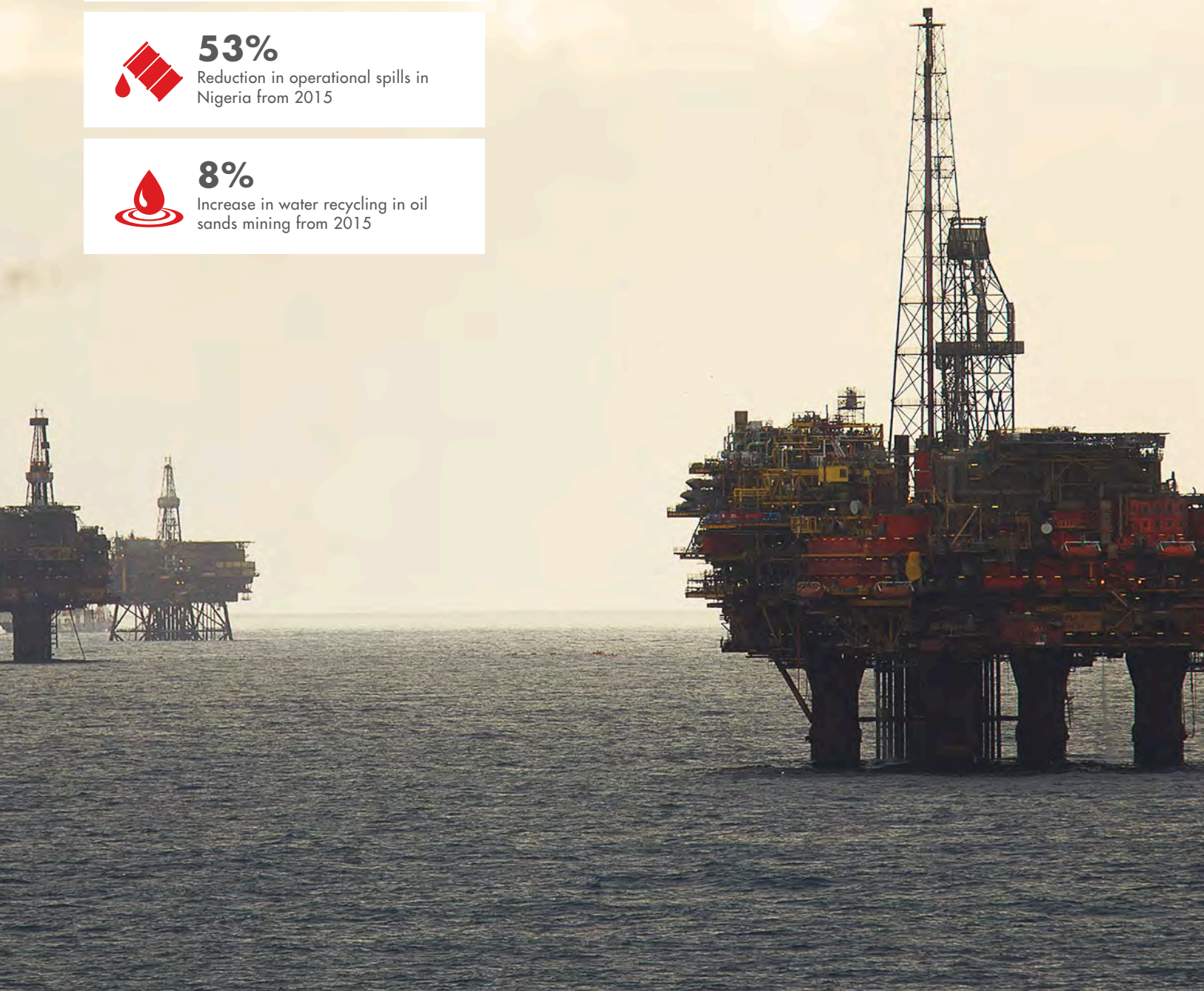
MANAGING OPERATIONS

The nature of the energy industry means that we often operate in challenging environments. We work to reduce our environmental impact and manage our operations safely and responsibly, wherever they may be.

50%
Improvement in our process safety events in our shales operations from 2015

53%
Reduction in operational spills in Nigeria from 2015

8%
Increase in water recycling in oil sands mining from 2015



OUR ACTIVITIES IN NIGERIA

Safety and security remain top priorities in Nigeria, where acts of sabotage and vandalism caused a reduction in onshore oil and gas production in 2016.

Shell has interests in several companies in Nigeria and they are major contributors to the economy. They produce oil and natural gas, distribute gas to industries in the country, produce liquefied natural gas (LNG) for export, generate revenues for the government and provide social investment. The Shell companies are also working with federal and state government agencies, communities and civil society to try to create a safe operating environment.

Shell Companies in Nigeria continue to operate both onshore and offshore oil activities in the country, while investing in oil and gas production. Shell Companies in Nigeria are also working with the government and other partners to increasingly focus on developing gas production onshore and delivering gas to power plants and other industrial customers in order to drive economic growth.

SECURITY IN THE NIGER DELTA

The Shell Petroleum and Development Company of Nigeria Ltd (SPDC), the operator of the SPDC Joint Venture (SPDC interest 30%), had a challenging 2016 due to further acts of sabotage and vandalism on oil and gas facilites in parts of the Niger Delta. As a result, oil and gas production from domestic and international operators declined sharply in the year.

Export operations at the SPDC-operated Forcados oil terminal were disrupted after three sabotage incidents in 2016. This resulted in loss of revenue, particularly for domestic producers who rely on the terminal for export. Reduced oil and gas production in the Niger Delta also led to lower revenues for state and federal government and major disruptions to gas supply needed to power electricity for industry, businesses and public sector services.

SAFETY OF STAFF AND CONTRACTORS

The safety of staff and contractors in Nigeria remains the top priority. The Shell Companies in Nigeria aim to mitigate security risks that may impact people, the environment and facilities. We only carry out operations where it is safe to do so. We also continue to engage with the government and non-governmental organisations (NGOs), as well as local communities, to help promote human rights and a peaceful and safe operating environment.

Despite a challenging security environment, the safety performance of Shell Companies in Nigeria improved in 2016. There were no recorded fatalities in the year, compared to seven in 2015. We shared findings from investigations into the 2015 incidents in sessions with employees and contractors and produced a safety video with senior Shell leaders to encourage discussions on lessons learned. Although there were no recorded fatalities in 2016, we recorded a significant number of high-potential incidents, indicating the situation remains fragile and requires sustained intervention at all levels.

HELPING SUPPLIERS DEVELOP

Access to financing has been a challenge for suppliers to Shell Companies in Nigeria. In collaboration with leading banks in the country, the SPDC Joint Venture (SPDC JV) and the Shell Nigeria Exploration and Production Company Limited (SNEPCo) have created a funding mechanism that offers local contractors faster access to loans and at cheaper interest rates. The Organisation for Economic Co-operation and Development has recognised the programme as best practice for shared value creation and local content. Since the scheme started in 2011, 220 small- and medium-sized Nigerian enterprises have received loans worth a total of around $1 billion with no recorded defaults on the loans.

External opinion

"The collaboration between the Federal Road Safety Corps (FRSC) and SPDC is the key to achieving the goals of the United Nations Decade of Action for Road Safety in Nigeria. The National Community Post Crash Care Initiative (NCPCCI), has 27 centres in 13 states with 540 volunteers. These initiatives and the crash care efforts recorded have led to its adoption by the West African Road Safety Organisation to be replicated in other West African countries.

"SPDC has supported the use of speed radar devices and breathalysers for road safety"

SPDC has also helped the FRSC by supporting the use of speed radar devices, breathalysers and extricating equipment. The annual National Road Safety Quiz for senior secondary school students, the marathon race and support for crash victim remembrance day have also helped promote awareness of road safety. The FRSC appreciates the expansion of the NCPCCI to cover all the critical road corridors in Nigeria, in addition to sponsoring campaigns for safe tyres and the installation of speed-limiting devices."

Ojeme Ewhrudjakpor fdc
Deputy Corps Marshal (Operations), Federal Road Safety Commission, Abuja, Nigeria

ENTREPRENEURSHIP, EDUCATION, HEALTH AND ROAD SAFETY

Shell companies in Nigeria work with government, communities and civil society to implement programmes that could positively impact people's lives. The Niger Delta Development Commission (NDDC) Act requires all oil companies operating in Nigeria to contribute 3% of their annual budgets to NDDC. The commission is a federal government agency tasked with the sustainable development of the Niger Delta region. In 2016, the SPDC JV and SNEPCo contributed $106.8 million (Shell share $48.5 million) to the NDDC. Over the last five years Shell Companies in Nigeria's contribution to the NDDC totalled more than $800 million (Shell share around $340 million).

Since 2003, the SPDC JV has invested in training more than 6,550 young people in the Niger Delta in enterprise development and provided business start-up grants to more than 3,300 people.

Shell Companies in Nigeria have long supported education in the country. Since launching in the 1950s, the Shell scholarship scheme has supported thousands of students in their careers in Nigeria. In 2016, Shell Companies in Nigeria awarded grants to 911 secondary school students and 530 university undergraduates.

The SPDC JV and SNEPCo continue to invest in the Cradle-to-Career scholarship programme, which pays for less priviliged children from rural communities to attend some of the country's top secondary schools. Since 2010, 420 students have received Cradle-to-Career scholarships from the SPDC JV and 164 from SNEPCo. The SPDC JV also funds a Centre of Excellence in Geosciences and Petroleum Engineering at the University of Benin.

Shell Companies in Nigeria have supported community health projects and programmes since the 1980s. Today, SNEPCo and the SPDC JV support 20 health centres including the SOS Village near Lagos and Obio Cottage Hospital in Port Harcourt.

Road safety is another area of social investment. Shell Companies in Nigeria have launched several road safety programmes in 2016, focusing on defensive driving, road rules, safe tyres, seat belt use and pedestrian safety. The Shell-sponsored National Community Post Crash Care Initiative, which trains and equips volunteers in accident victim rescue, has been replicated in other East and West African countries.

SPILL PREVENTION AND RESPONSE

Regrettably, 90% of the number of oil spills of more than 100 kilograms in 2016 from SPDC JV facilities in the Niger Delta were caused by theft and sabotage. SPDC works with government agencies, NGOs and communities to prevent and minimise spills from illegal activity. These include air and ground surveillance, awareness campaigns and alternative livelihood programmes.

In 2015, SPDC, on behalf of the SPDC JV, and the Bodo community signed a memorandum of understanding (MOU) granting SPDC access to begin the clean-up of areas affected by two operational spills in 2008. The MOU also provided for the selection of two contractors to conduct the clean-up and to be overseen by an independent project director.

An engineer carries out regular checks on board the Bonga production storage and offloading facility in deep water Nigeria.

Contractors for the first phase of the clean-up were sent to the location in September 2015, and they trained 400 Bodo youths in clean-up techniques. Unfortunately, the contractors were subsequently denied access by the community in late September 2015. In 2016, discussions continued with the Bodo community under the Bodo Mediation Initiative to allow contractors to proceed with the clean-up but no resolution had been achieved by the end of December 2016. SPDC remains committed to the clean-up of identified areas of Bodo when access is granted.

CLEAN-UP PROGRAMME IN OGONILAND

In August 2016, Nigeria's President Buhari accelerated the implementation of the 2011 United Nations Environmental Programme (UNEP) Report on Ogoniland with the inauguration of two governance bodies to oversee the clean-up process. The SPDC JV is represented on both bodies and will continue to actively support the process within the framework established by the federal government.

Since 2011, SPDC has taken action on all recommendations in the UNEP report that were specifically addressed to it as operator of the SPDC JV, and has completed the majority of these recommendations. SPDC has re-assessed the 15 SPDC JV sites mentioned by UNEP. When further remediation was required because of acts of vandalism and oil theft, those sites have been remediated and certified by government regulators. SPDC has completed a review of its oil spill response and remediation techniques, and made several improvements in line with industry practices.

SHELL'S ECONOMIC CONTRIBUTION

SPDC and SNEPCo hold interests in several offshore licences (*) including the Shell-operated Bonga field (Shell interest 55%). Shell Nigeria Gas Limited (SNG) is a wholly-owned subsidiary of Shell.

$29 billion: economic contribution from the SPDC JV partners to the Nigerian government from 2012–2016.

$1.4 billion: Shell share of royalties and corporate taxes paid to the Nigerian government in 2016 (SPDC $1billion; SNEPCo $0.4 billion).

94%: Shell Companies in Nigeria contracts awarded to Nigerian companies.

$0.74 billion: Shell Companies in Nigeria spend on contracts awarded to Nigerian companies.

96%: employees of Shell Companies in Nigeria are Nigerian.

$106.8 million: SPDC JV and SNEPCo contribution to Niger Delta Development Commission in 2016 (Shell share $48.5 million).

$29.8 million SPDC JV, SNEPCo and Shell Nigeria Gas direct spending on social investment projects in 2016 (Shell share $10 million).

(*) Authorities in various countries are investigating our investment in Nigerian oil block OPL 245 and the 2011 settlement of litigation pertaining to that block. On February 14, 2017, we received notice of the request of indictment from the Italian prosecution office in Milan with respect to this matter.

SPDC has worked with the International Union for Conservation of Nature since 2012 to improve remediation techniques and protect biodiversity at sites affected by oil spills in the Niger Delta.

The UNEP Report also recommended coordinated action by all parties to achieve a sustainable clean-up and to prevent further pollution from crude oil theft and illegal refining. SPDC is working on alternative livelihood programmes, including training in Ogoniland as part of Shell's youth entrepreneurship programme, Shell LiveWIRE.

SPDC remains fully committed to supporting the Nigerian government in the clean-up of Ogoniland.

SPILLS AND RESPONSE DATA

Oil spills due to crude oil theft and sabotage of facilities, as well as illegal refining, cause most of the environmental damage from oil and gas operations in the Niger Delta. Irrespective of cause, the SPDC JV cleans and remediates areas affected by spills originating from its facilities.

Theft of the SPDC JV's crude oil from the pipeline network amounted to around 5.6 thousand barrels of oil per day (bpd) in 2016. This reduction from 25 thousand bpd in the previous year is partly due to continued air and ground surveillance and antitheft mechanisms on equipment. Since 2012, SPDC has removed more than 880 illegal theft points.

The number of operational spills from Shell companies in Nigeria fell from16 in 2015 to seven in 2016. The volume of oil spilled in operational incidents remained at 0.2 thousand tonnes. This includes one spill of 0.15 thousand tonnes caused by unintentional third-party damage to a SPDC JV pipeline.

The number of sabotage-related spills in 2016 decreased to 45 from 93 in 2015. This was despite a resurgence in attacks on oil and gas facilities in parts of the Niger Delta. Theft and sabotage caused 90% of spills of more than 100 kilograms from SPDC JV pipelines.

At the start of 2016, there were 270 sites identified for remediation and certification, of which 92 have been remediated and certified, with 31 in Ogoniland (representing a net reduction of 22% in remediation sites in that area during 2016). During 2016, 73 new sites requiring remediation were identified, of which nine were in Ogoniland. In total, there are 251 oil spill sites that require remediation.

OIL SANDS

Canada's oil sands in Alberta and Saskatchewan are among the largest oil reserves in the world.

Oil sands are a mixture of sand, water, clay and heavy oil called bitumen. In 2016, Shell was the operator and majority shareholder of the Athabasca Oil Sands Project (AOSP), a joint venture between Shell Canada (60%), Chevron Canada Limited (20%) and Marathon Oil Canada Corporation (20%). The AOSP consists of the Albian Mines (Muskeg River and Jackpine mines), the Scotford Upgrader, which processes bitumen into synthetic crude oil and Quest Carbon Capture and Storage.

A heavy hauler driver safely navigates around the Shell Albian Sands' Athabasca Oil and Sands Project, Canada.

MANAGING EMISSIONS

Crude oils produced from oil sands emit more greenhouse gas (GHG) emissions than the average crude oil used in the USA, according to data and analytics company IHS Markit. However, the GHG intensity of Shell's oil sands operations has been on an improving trend due to performance enhancements and the launch of our Quest carbon capture and storage (CCS) project.

In 2016, its first full year of operation, Quest exceeded its annual target of capturing 1 million tonnes of CO_2 and storing it safely underground.

Compared to 2015, we reduced our energy intensity by around 5% in 2016. A pilot programme at Shell Albian Sands has led to improvements in energy efficiency and emissions reduction by removing lower quality materials, such as clay, from the oil production process. This allows for lower temperatures to be used to release the oil from the ore, reducing energy consumption. As members of Canada's Oil Sands Innovation Alliance we are exploring advanced energy-efficiency techniques with other oil sands producers.

We have also supported the Government of Alberta's climate leadership plan, which includes a carbon pricing regime, a cap on oil sands emissions, and a reduction in methane emissions.

WATER USE AND RECYCLING

Oil sands mining operations use water to separate bitumen from the sand and generate steam for utilities. We explore ways to use less water. For example, we work to eliminate steam leaks and to reuse water and steam condensate from the production process. We manage our tailings and the storage systems, such as ponds, to increase the volume of water we recycle and capture and to prevent impacts to local watercourses and groundwater.

In 2016, these various approaches helped us increase water recycling in our mines by almost 8%. Our total fresh water intake for 2016 increased slightly. This was because we needed more water to dilute the higher calcium concentrations in our recycled water, the result of lower-than-average precipitation and snow melting in the region.

TAILINGS TECHNOLOGY

The separation of bitumen from oil sands creates tailings - a mixture of water, sand, clay, residual hydrocarbons, trace heavy metals and other chemicals. These tailings are stored in ponds that allow the solids to settle so the water can be recycled.

The total area used for storing tailings at the Muskeg River and Jackpine mines was around 46 square kilometres at the end of 2016. This is in line with government-approved mine development plans as the tailings areas increase to support ongoing production and to help fill mined areas with solid tailings for future reclamation.

Shell supports the Alberta government Tailings Management Framework, which aims to minimise fluid fine tailings and accelerate the process of reclaiming the land. Over the past decade, we have invested around C$474 million to develop technologies that speed up the treatment process for fluid tailings. In 2016, we processed around 3.7 million cubic metres of fluid fine tailings at our Albian site.

INDIGENOUS COMMUNITIES

Shell continues to work closely with indigenous communities in Canada to reduce the impact of oil sands development on traditional land use and culture, while bringing benefits to these communities.

The Canadian Council of Aboriginal Business has certified Shell for its work in aboriginal relations across four areas: employment, business development, community investment, and community engagement. The certification was decided by an independent jury made up of represenatatives from aboriginal businesses.

One example of our aboriginal engagement in 2016 involved the Fort McKay community advisory group. As part of this collaboration, elders joined us to plant trees at a Muskeg River Mine reclamation site.

Since 2005, Shell has spent nearly C$1.9 billion with local indigenous contracting companies.

RECLAMATION

Reclamation is an important part of the development of our oil sands mines. Before mining, the surface soils are removed and stockpiled for future reclamation. We reclaim the land by refilling the mined-out areas with tailings and restoring the contours of the disturbed land. We then replace surface soil and plant native vegetation on the sites.

By the end of 2016, Shell had permanently reclaimed a total of 221 hectares of land and planted almost 1 million trees and shrubs at the Albian mine sites.

In March 2017, Shell agreed to sell to Canadian Resources Limited (Canadian Natural) its 60% interest in the AOSP, accounted for as a joint operation, its 100% interest in the Peace River Complex in-situ assets including Carmon Creek, and a number of undeveloped oil sands leases, all in Alberta, Canada. The consideration is approximately $8.5 billion, comprising $5.4 billion in cash and around 98 million Canadian Natural shares currently valued at $3.1 billion. The transaction is estimated to result in a post-tax impairment loss of $1.3 billion to $1.5 billion, subject to adjustments. In a related transaction, Shell and Canadian Natural have agreed to jointly (50:50) acquire Marathon Oil Canada Corporation (MOCC), which has a 20% interest in the AOSP, for $1.25 billion each. Following these transactions, Shell will continue as operator of the Scotford upgrader and the Quest CCS project. Subject to regulatory approvals, the transactions are expected to close in mid 2017. Subject to closing of these transactions and additional further conditions, Shell may swap its purchased interest in MOCC for a 20% interest in the Scotford Upgrader and Quest. If the swap were to occur, Shell would fully exit AOSP mining operations and have a 20% interest in the Scotford Upgrader and Quest.

WILDFIRE EMERGENCY RESPONSE

In May 2016, a wildfire spread across around 590,000 hectares in northern Alberta, Canada, triggering a state of emergency and destroying portions of the Regional Municipality of Wood Buffalo, including parts of Fort McMurray near our oil sands operations.

We temporarily suspended the Shell Albian Sands mining operations to focus our resources on the safety of our people and the wider community. This included feeding and sheltering thousands of people and their pets at our Albian Village work camp, and the safe evacuation of 9,920 displaced employees, contractors and community members took place from Shell's Albian Aerodrome. At about 80 kilometres north of the city, our mining site remained safe and secure from the wildfire. Shell emergency response teams in Fort McMurray provided support to local and provincial fire crews and Shell donated fuel to first responders in the region.

SHALES

Shales – also known as tight gas and oil – continue to play an important role in meeting global energy demand. We use advanced, proven technologies, including hydraulic fracturing, and follow our operating principles to unlock these resources safely and responsibly.

Tight gas and oil resources are trapped in microscopic pores of dense shale or sandstone rock, normally thousands of metres underground. Hydraulic fracturing has been used for decades in the oil and gas industry to extract tight gas and oil. The process fractures the rock and releases the gas and oil into the well.

The Shell Groundbirch asset, located in Northeast British Columbia, Canada, uses hydraulic fracturing to unlock tight gas trapped in rock underground.

The shales portfolio within Shell's Upstream business is currently focused on the Americas. We see shales as a future opportunity, one that we expect to become a significant growth priority for Shell beyond 2020. In 2016, we reduced spending by 20% but grew our portfolio value by 13%. From 2015 to 2016, our personal safety performance measured as total recordable case frequency, improved by 40% and our process safety events reduced in number by 50%. The number of spills has also reduced by 50%.

PROTECTING THE ENVIRONMENT WHILE SAVING ON COST

In 2016, we converted the hydraulic fracturing fleet in our Appalachia operations in Pennsylvania, USA, to electric power. In collaboration with oil and gas services company US Well Services, Shell deployed a technology for fracturing that required no diesel fuel. This significantly cut our air emissions and saw a reduction in noise and water use – all while saving costs and improving efficiency and reliability.

RAISING THE BAR WITH DIFFERENTIATING PRINCIPLES

Shell upholds a set of five global principles, the Onshore Operating Principles, that govern the onshore tight or shale gas and oil activities where we operate and where hydraulic fracturing is used. The principles cover safety, air quality, water protection and use, land use and engagement with local communities. We support regulations that set comparable standards. We review and update our Onshore Operating Principles as new technologies, challenges and regulatory requirements emerge. In 2016, we updated the Principles to include how we manage any potential induced seismic events from our water injection or hydraulic fracturing activities. There have been no seismic events felt on the surface that were attributed to Shell's onshore operations in the Americas.

COLLABORATION, INNOVATION AND CONTINUOUS IMPROVEMENT

In our own operations, we continue to take actions to address air quality and control fugitive emissions, reducing the potential for our impact on the environment. We strive to be transparent in our activities and work in partnership with communities and others in the industry to bring about improvements in the sector.

Shell remains an active member and certified operator under the Center for Responsible Shale Development. Through our commitments, we replaced or upgraded valves linked to methane leaks – known as high-bleed pneumatic controllers - that resulted in reduced methane intensity at our Appalachia operations.

Shell continues to participate in the Environmental Defense Fund's "Methane Detectors Challenge", a technology collaboration which focuses on improving the techniques and tools to detect methane leaks. In 2016, we screened several methane detection technologies and have chosen a Canadian facility for a technology pilot.

DECOMMISSIONING AND RESTORATION

Decommissioning is part of the normal life cycle of every oil and gas structure and must be done safely and responsibly when a facility reaches the end of its life.

When we decommission a well pad, for example, we safely seal the well, remove the production equipment and reinstate the land. We use expertise from the decommissioning industry to help us.

Some of our more complex decommissioning projects take place offshore. For example, our largest decommissioning project to date is the Brent oil and gas field, which lies in the North Sea between Scotland and Norway. Preparation for decommissioning the four Brent platforms, called Alpha, Bravo, Charlie and Delta, started more than a decade ago. During this period, around 300 scientific and technical studies explored the options for decommissioning the Brent field. This included consultation with more than 180 interested parties and an independent review group to help validate the science and engineering. Shell's recommendations for the decommissioning programme include closing down and making safe the four platforms, the wells and the undersea infrastructure. We launched a 60-day public consultation in February 2017 to allow anyone with an interest to access our full recommendations.

There are four platforms in the Brent field - Alpha, Bravo, Charlie and Delta.

In 2015, the UK regulator approved the Brent Delta decommissioning programme to remove the topside of the platform in a single lift. This will be the largest ever lift of its kind offshore, and is planned to take place in the summer of 2017. The topside will be transported onshore where we estimate around 97% will be recycled.

Restoring project sites is also an important element of the decommissioning process. In early 2016, Shell decided to exit the Jinqiu tight gas exploration project in Sichuan province, China. After consultation with the land owners and local authorities, Shell restored the site and established a decommissioning fund, which was used to provide seeds and soil fertiliser. The restoration also included recycling materials to pave a local road and build eight irrigation systems for the community.

MEASURING THE IMPACT OF EARTHQUAKES IN GRONINGEN

The NAM joint venture operates the Groningen gas field in the Netherlands. Since a significant earthquake in 2012, the NAM has studied the impact of earthquakes associated with the gas production on the residents. The studies have helped the NAM to implement and improve measures that address the impact on the residents.

Since 1963, the NAM joint venture (Shell interest 50%, ExxonMobil interest 50%) in partnership with the Dutch government, has operated the Groningen gas field in the Netherlands, one of the largest onshore gas fields in the world.

Regrettably, gas production caused a large number of earthquakes in the area, which have damaged homes and buildings, and caused anxiety for people locally. Various measures are in place for this impact, such as improvements to damage claim handling and a value loss compensation scheme. As a result of the earthquakes, the Netherlands Ministry of Economic Affairs has significantly limited gas production in Groningen since 2014. The measures included production limits in areas where the earthquakes caused the greatest damage and highest social impacts. Earthquakes in Groningen are becoming less frequent. In September 2016, the ministry approved the production of 24 billion cubic metres of gas per year in Groningen until October 1, 2021, and will review these production levels each year.

IMPROVING QUALITY OF LIFE

Shell supports NAM and the government as they take the necessary steps to improve the situation. This includes ensuring production levels are safe; repairing damage and where necessary strengthening houses; and supporting regional programmes to improve quality of life and economic development. As part of this, NAM is also working closely with local residents and other relevant parties including the National Coordinator for Groningen (NGC), Centrum Veilig Wonen, the Ministry of Economic Affairs and experts on these subjects. The various roles continue to evolve. As an example of this is that on 30 March 2017 NCG announced to introduce a new damage claim system as per 1 July and that NAM will no longer be involved in this process.

During a Dutch Parliament hearing in 2016, the President of Shell Netherlands, Marjan van Loon, apologised to the residents of Groningen. She recognised that Groningen was having to deal with most of the problems caused by the earthquakes, while the whole country had benefited from the gas production with an increase in prosperity.

SOCIAL IMPACT ASSESSMENT

In order to get an overview of the social impacts of the earthquakes, NAM commissioned Dutch consultants Royal HaskoningDHV to carry out a social impact assessment in 2015. The report was updated in 2016 and has been published in 2017. The impact assessment provides an understanding of the effectiveness of the steps that have been taken and what should be improved or changed.

Frits and Ada Indri, who live near the Groningen gas field in the Netherlands, had their house rebuilt to be earthquake-proof after it was severely damaged due to an earthquake.

External opinion

"In Loppersum, we see the impacts on our inhabitants of the earthquakes caused by gas production every day. There are feelings of powerlessness and anxiety, feelings of being unsafe, struggles with handling the repairs and concerns about the value of private property. Many people feel as if they've lost control of their lives.

The study on the social impact of earthquakes in north-east Groningen has mapped the consequences of living in an earthquake zone. It has become a transparent review of the effectiveness of measures that have already been taken. That's a good start. The challenge now is to improve and complete the measures so that they will help restore trust, which is badly needed. In order to achieve that, we need to move from thinking to acting."

Drs. Jacolien Masselink
Programme Manager Gas extraction and Earthquakes, Municipality of Loppersum, the Netherlands

The social impact assessment analyses eight themes. These include the damage caused by earthquakes and the way it is acknowledged and restored, and the safety of the residents in north-east Groningen, impact on value of houses and broader economic consequences. From August 2012 until December 2016, 76,694 damage claims were submitted.

Among its observations, the report said there could be financial consequences such as a decrease in the value of properties. There could also be positive consequences such as the creation of new jobs in the construction industry as a result of the repairs and the strengthening of buildings. It also found that there is still room for improvement regarding communications with residents.

The recommendations made in the report have been used to improve measures currently in place such as compensation for damage and temporary resettlement and to develop new research. The University of Groningen and the Delft University of Technology, for example, have researched the health of people living in Groningen and the liveability of the region, building on the findings of the report.

In addition, the report provides a useful overview of the situation at a time when roles and responsibilities are still evolving. NAM's aim with these assessments is to improve the quality of life in the area, by monitoring the effects of the earthquakes in a transparent and structured way.

OUR PERFORMANCE

Each year, we assess the safety of our operations and our impact on the environment, including our greenhouse gas emissions. We also work closely with communities near our operations to address concerns and we contribute in areas such as local employment and education.

1.00
Our total recordable case frequency of injuries and safety incidents per million working hours in 2016

71
Our number of operational spills in 2016

$102 MILLION
Spent on voluntary social investment in 2016

SAFETY

We work to deliver energy responsibly and safely, while looking after our employees, contractors, local communities and the environment. We strive to help improve safety performance throughout the energy industry.

Shell's Goal Zero ambition is to achieve no harm and no leaks across our operations. To accomplish this, we focus on the three areas of safety with the highest risks in our activities: personal, process and transport.

We work relentlessly to strengthen our safety culture and leadership: this means caring for people, and includes a focus on learning from incidents within Shell and other companies.

2016 HIGHLIGHTS

- A process safety incident is any leak or spill of hazardous material. In 2016, we achieved our lowest ever total for both Tier 1 and 2 operational process safety events. (See also Safety performance).
- In 2016, we continued to work with contractors to improve our safety performance and learn from incidents. (See also Contractors and suppliers).

SAFETY LEADERSHIP AND CULTURE

OUR STANDARDS

Employees and contractors, wherever they work, must meet our safety standards and requirements. We strive to reduce risks as far as is technically and financially feasible, and to minimise the potential impact of any incident. These standards also apply to any joint ventures that we operate.

Shell employees and contractors must follow our 12 Life-Saving Rules, which cover the most critical safety hazards that have caused loss of life in our activities. Since their introduction in 2009, the rules have helped achieve a notable reduction in fatalities and injuries.

EMBEDDING A SAFETY CULTURE

Shell has made great progress in improving our safety performance and Goal Zero is firmly embedded in all our work. However, incidents and near misses still occur.

We work relentlessly to strengthen our safety culture, focusing on caring for people and leadership commitment. A strong safety culture is complemented by a skilled workforce. We ensure that people responsible for tasks involving a significant safety hazard have the necessary training and skills. Our safety experts work in networks to share and implement best practices around the world.

LEARNING FROM INCIDENTS

We investigate all incidents and endeavour to learn from them. Since 2014, more than 80,000 employees and contractors have participated in learning sessions that focus on an incident which presented potential risks to safety. Participants discussed how incidents could have been prevented and ways to apply lessons in their line of work.

We also learn from what we call high-potential incidents - incidents with no consequences but which, under slightly different circumstances, could have led to people or facilities being harmed. For example, an analysis of high-potential incidents in our wells organisation has led to a focus on preventing dropped objects. This has helped to achieve a 40% reduction in high-potential incidents involving dropped objects in 2016.

CONTRACTOR SAFETY

We employ a large number of contractors who often perform activities with high safety risks. We work with our contractors to ensure they understand our safety requirements and we help them build skills and expertise to improve their safety performance where needed.

Since 2014, executives from Shell have partnered with the chief executive officers of 14 major contracting companies to identify practical steps for safety improvements and strategies for achieving our Goal Zero ambition. The executive pairs have sponsored new safer ways of working in project delivery and facilities maintenance. Senior leaders at engineering company Amec Foster Wheeler and Shell, for example, worked together to simplify safety processes on North Sea platforms.

Crew members consult at the Shelburne Basin deep-water exploration project, Canada

CARING FOR SAFETY IN NIGERIA

Leaders in Shell recognise that safe assets are often those where people care about one another. This encourages people to intervene in potentially dangerous situations because they want colleagues to be safe.

In Nigeria, for example, we are doing this by dividing our production operations into what we call 50 families – groups of people who work closely together regardless of role or rank - covering around 8,500 staff and contractors. We are working with around 25 people who have the most influence in each of these families, through discussions and workshops, to help them understand their work culture, reflect on their leadership, and suggest areas of improvement. By the end of 2016, more than half the families had taken part in these workshops, with the rest to follow in 2017.

With our shipping and maritime partners, we have taken steps to improve safety since 2012, including the quality and consistency of their safety management tools. Between 2011 and the end of 2016, the number of serious or potential incidents across Shell Shipping & Maritime's contracted companies was reduced by more than half.

RAISING INDUSTRY STANDARDS

Shell strives to help improve safety performance throughout the energy industry. We share our safety experience and standards with other operators, contractors and professional groups. These include the International Association of Oil & Gas Producers (IOGP), the American Petroleum Institute and the Energy Institute.

For example, Shell is leading a task force within the IOGP to develop a set of standardised safety requirements in construction projects in the oil and gas sector.

SAFETY IN DEEP WATER

Shell has a long history of working safely in deep water - that is, offshore oil and gas production at depths greater than 300 metres. Today, technological advances enable us to work in water up to 10 times that depth.

At Shell, we continually review our procedures to keep our deep-water operations safe and reliable. These include the onshore surveillance of wells using advanced sensors that measure ocean conditions, and high standards of training.

For example, our training centre in Louisiana, USA, has equipment that replicates conditions on an offshore deep-water platform. Operators are trained in global and US health, safety and environment procedures. In Nigeria, our focus on deep-water training has helped launch the first generation of Nigerian energy engineers.

OIL-SPILL RESPONSE

We regularly test our oil-spill emergency response procedures and capability to ensure employees and contractors can respond rapidly to an incident. We continue to work with the oil and gas industry to further develop effective oil-spill emergency response capabilities.

During drilling operations, we gather and analyse information about deep-water wells to better understand the geology of the area. Real-time pressure and temperature sensors track conditions so that we can immediately detect any changes. Shell-operated drilling activities are monitored from a global network of onshore operating centres which allows oversight and timely technical support.

External opinion

"Simply sharing incident information with people is not enough for effective learning. We need to understand more about exactly how adults learn from incidents. With this in mind, Shell and the UK industry body Energy Institute sponsored us to observe Shell employees at refinery sites in the UK and Canada.

"We pinpointed a critical learning stage that's often missed"

We pinpointed a critical learning stage that is often missed: considering how incidents specifically relate to your line of work and how you can adapt your practices to prevent future incidents.

We developed a toolkit that encourages reflection and allows sites to improve the measurement of incidents. The Open University is now working with Shell to investigate the impact on learning of informal communication networks, such as talking with colleagues on site, and other ways to improve the flow of incident information for safer working."

Allison Littlejohn
Professor of Learning Technology and Academic Director of Digital Innovation, The Open University, UK

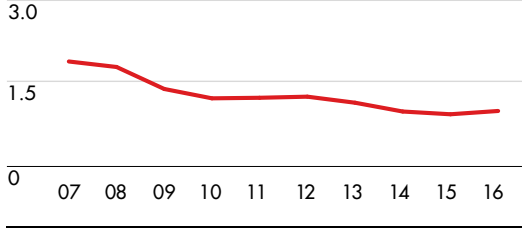
SAFETY PERFORMANCE

PERSONAL SAFETY

Everyone who works for us, or with us, has an important part to play in making Shell a safer place to work. We are aiming for more than a culture of compliance, one in which people feel listened to and cared for. Our aim is to have a more motivated, productive, healthier and safer workforce.

For example, at the Pernis refinery in the Netherlands, we have worked on creating a positive work culture, where ideas from workers are welcomed, rewarded and implemented when feasible.

Total recordable case frequency (TRCF)
injuries per million working hours

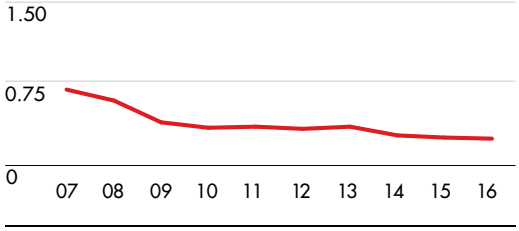


We run an annual safety day that gives our employees and contractors the opportunity to learn how they can manage the safety hazards in their work and share ideas with each other.

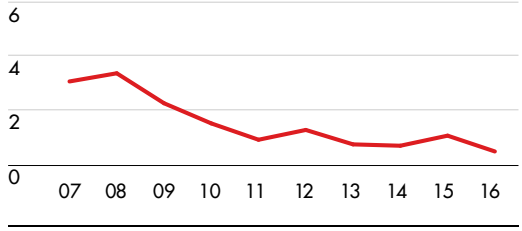
Overall, in 2016, following steady and significant improvements in our safety performance over the past decade, the number of injuries per million working hours – the total recordable case frequency – has increased slightly compared to 2015. We achieved our lowest ever level of injuries that led to time off work in 2016, measured as lost time injury frequency.

Our fatal accident rate – the number of fatalities per 100 million working hours – decreased in 2016 to the lowest ever level, but we still need to do more in this area. Sadly, three people lost their lives while working for Shell in 2016.

Lost time injury frequency (LTIF)
injuries per million working hours



Fatal accident rate (FAR)
fatalities per 100 million working hours



PROCESS SAFETY

A process safety incident is any leak or spill of hazardous material. Process safety management is about keeping our hazardous substances in the pipes, tanks and vessels so they do not cause any harm to people or the environment. It starts with designing and building projects and is implemented throughout the life cycle of these facilities to ensure they are operated safely, well-maintained and regularly inspected. With our technical and operational safety standards, we aim to avoid the release of hazardous material, and minimise the consequences if any releases do occur. If an incident occurs, we investigate and learn from it.

We make sure that we have the necessary resources to deal with spills, leaks, fires and explosions. Our emergency-response plans are routinely tested and improved after simulation exercises.

In line with industry standards, we measure and report according to the significance of the incidents, with Tier 1 as the most significant. In 2016, we achieved our lowest ever total for both Tier 1 and 2 operational process safety events. There were 39 Tier 1 events in 2016, compared to 51 in 2015 and 107 Tier 2 events in 2016, compared to 169 in 2015. This is a reduction of more than 30% compared to last year.

Process safety events related to sabotage and theft in Nigeria are recorded separately. There was an improvement during 2016 with fewer incidents: 17 Tier 1 and 0 Tier 2 events, compared to 28 Tier 1 and 17 Tier 2 in 2015.

In 2016, the four most significant operational incidents were:

- a fatality at our Fox Creek operations in Canada;
- a gas release at the Moerdijk chemical plant in the Netherlands;
- a gas release from the offshore wellhead pipeline in India; and
- a crude oil spill from a subsea flow line in the USA.

TRANSPORT SAFETY

Moving large numbers of people, products and equipment by road, rail, sea and air brings safety risks with it. We work closely with specialist contractors and industry bodies to find ways of reducing these risks.

ROAD SAFETY

Traffic accidents claim around 1.25 million lives every year, according to the World Health Organisation. Shell is working to ensure our employees and professional drivers have the best safety skills possible and behave responsibly on the road. Our approach to road safety applies to all the countries where we operate.

Since the introduction of our first global driver safety programmes in 2008, there has been a significant decline in fatal road incidents across Shell. We sadly recorded one road fatality in 2016, when one of our contractors was involved in a vehicle roll-over at our QGC venture operation in Australia.

Outside our own operations, we also work to improve road safety through social investment in communities. Shell Malaysia, for example, has worked to improve road safety culture for nearly 60 years and its current campaign, the Shell Road Safety Movement, targets school children, college students and local communities.

SECURITY

The management of security risks is part of our efforts to protect our staff and contractors, 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 our assets and provide a secure working environment for our 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. Greater threats are mostly due to increased geopolitical volatility in certain parts of the world.

An employee enters security gates at the Shell offices in Doha, Qatar.

HUMAN RIGHTS AND SECURITY

We create security risk management plans as part our aim to prevent harm to communities and the environment. We work alongside governments, companies and non-governmental organisations, which are involved in the Voluntary Principles on Security and Human Rights (VPSHR) initiative, to increase adoption of the principles.

Our security plans are validated by independent audits and assurance checks.

For more details on how we implement these principles see our VPSHR report.

ENVIRONMENT

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

HIGHLIGHTS IN 2016

- In 2016, we reduced the direct greenhouse gas emissions from facilities that we operate to 70 million tonnes on a CO_2-equivalent basis. We also reduced our flaring from 11.8 million tonnes CO_2-equivalent in 2015 to 7.6 million tonnes in 2016. (See also Our greenhouse gas emissions, Flaring).
- We had 71 operational spills in 2016, down from 108 in 2015, continuing year-on-year improvements in this area since 2006.
- The International Union for Conservation of Nature (IUCN) Niger Delta Panel - focused on enhanced remediation techniques and protection of biodiversity at sites affected by oil spills in Shell Petroleum Development Company's (SPDC) areas of operation in the Niger Delta - completed its work in 2016. (See also Environmental partners, Our activities in Nigeria).
- We joined the Climate and Clean Air Coalition Oil & Gas Methane Partnership in early 2017 to continue making progress on methane management. (See also Managing methane emissions).

OUR STANDARDS

We aim to comply with all 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 the International Finance Corporation, to inform our approach.

Our global environmental standards include a focus on managing our emissions, minimising our use of fresh water and conserving biodiversity. Within our operations, we also focus on reducing our energy use, flaring less gas and preventing spills and leaks.

When planning new projects, we carry out detailed assessments of the potential environmental, social and health impacts. These assessments help us manage and reduce impacts on the environment and communities during construction, operation and, when relevant, decommissioning.

We require major installations including refineries, chemical plants, gas plants and permanently staffed oil and gas production facilities to certify their environmental management system to an internationally recognised standard, such as ISO 14001, which sets out the criteria for environmental management systems.

MANAGING ENVIRONMENTAL IMPACTS IN IRAQ

Shell is the operator of Majnoon, one of the world's largest oil fields (Shell interest, 45%). In 2016, Majnoon was certified to ISO14001, making Shell the first international oil company to achieve this certification in the country.

The UNESCO World Heritage Committee has recognised the area of the Mesopotamian marshes north of Majnoon as a World Heritage Site. Shell works with conservation organisations such as Wetlands International and IUCN, as well as local stakeholders and international consultants, to ensure projects are developed in a way that avoids negative impacts.

SENSITIVE AREAS AND OCEANS

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

We develop biodiversity action plans when operating in areas that are rich in biodiversity, areas also known as critical habitats. These assess and mitigate the impact of our plans on local biodiversity and dependent communities. We partner with major conservation organisations to understand how to protect these critical habitats and the benefits that people derive from them.

PROTECTING OCEANS

Increased industrial activity in seas and oceans around the world is leading to environmental concerns. Marine spatial planning - a process which identifies natural resources and habitats in an area and plans how best to use them - is increasingly being used to improve decision-making where competing human activities occur. This includes managing the effects on the marine environment of fisheries, shipping and oil and gas exploration.

For example, Shell is supporting an initiative in Gabon where the government and the Wildlife Conservation Society are working to create Gabon Bleu. This will create protected marine areas, zones for traditional fishing methods, and sites where oil and gas activity and conservation coexist. Shell is providing data, information and expertise.

We are also working with scientists to explore the depths of the ocean. Our Stones deep-water project in the Gulf of Mexico, USA, for example, will share the data we collect from sensors with marine scientists. Shell is also a member of the International Association of Oil and Gas Producers (IOGP) Joint Industry Programme on Sound and Marine Life. This supports research to help understand and mitigate the effects of sounds on marine life generated by oil and gas exploration and production activity. The research helps the industry reduce its impact on the environment by, for instance, developing software to detect marine mammals near seismic operations.

NATURAL CAPITAL

Natural capital is the value of nature to people, society, businesses, and the economy. The concept of natural capital - and measuring, valuing and accounting for it - is evolving and a topic of interest to many, including governments, non-governmental organisations, financial institutions and businesses.

Shell is involved in several initiatives to learn more about natural capital, including its measurement and valuation, and to better understand its potential applications. Natural capital assessments can provide extra insights into Shell's impact and dependency on the environment to help us manage this in a sustainable way and inform our business decisions.

In June 2015, we joined the Natural Capital Coalition, that brings together a broad range of global stakeholders, including organisations from business and finance, government, academia and civil society. As a member of the technical group developing the Natural Capital Protocol, a framework designed to help companies include natural capital in their decision-making, we have offered insights into how the Protocol could help businesses. Shell, with the support of our environmental partner IUCN, is one of the companies piloting the Natural Capital Protocol. We are part of a working group within IPIECA, the global oil and gas industry association for environmental and social issues, looking at water valuation, and exploring its application for the oil and gas sector.

CONSERVATION IN CANADA

Where our operations have affected biodiversity, we take measures to restore habitats or ecosystems. For example, at our oil sands mining operations in Canada, we are reclaiming the land as it becomes available. This means returning the land to conditions similar to those before mining, providing habitat for wildlife and plants, and supporting traditional activities such as hunting and berry picking. In 2016, Shell Albian Sands reclaimed 34.8 hectares of land. Our work in this area has been recognised by the Wildlife Habitat Council, an international non-profit organisation that promotes and certifies habitat conservation and management on lands owned by companies.

Elsewhere in Canada, Shell has donated its exploration rights to an area of more than 860,000 hectares in the waters of Baffin Bay to the Nature Conservancy of Canada. This supports government and Inuit aspirations to expand a proposed conservation area off the coast of Nunavut, a territory in northern Canada.

ENVIRONMENTAL PERFORMANCE

We improved or maintained our environmental performance across many business areas during 2016. This was due to operational improvements as well as reduced activity and divestments. Details about our environmental performance are provided below and under the greenhouse gas emissions, managing methane emissions and flaring sections.

MANAGING WATER USE

The availability of fresh water is a growing challenge in some regions of the world. We manage our water use responsibly, and because water constraints tend to affect people at the local or regional level, we tailor our use of fresh water to local conditions.

In water-scarce areas, we develop water management plans. These plans describe the long-term risks to water availability and define measures to minimise our use of fresh water or recommend alternatives to fresh water, such as recycled water, processed sewage water and desalinated water. Waste water from our operations is treated before it is released into the environment. Where appropriate, we look for ways to treat waste water using natural solutions such as constructed wetlands. This also helps us to reduce the energy use associated with water management.

In Doha, Qatar, for example, our research and technology centre is working on a pilot programme to test whether constructed wetlands can remove chemicals from water generated as a by-product of oil and gas production. At our joint venture operations in the Omani desert, we use reed beds to naturally clean the water that is extracted alongside oil production.

We are also involved in a number of working groups with different organisations, such as the World Business Council for Sustainable Development and IPIECA.

In 2016, our intake of freshwater increased to 195 million cubic metres of fresh water, compared to 186 million cubic metres in 2015, mainly due to higher water demand in our oil sands mining operations. Around 65% of our fresh water consumption was for manufacturing oil products and chemicals and a further 22% was used by oil sands mining operations.

Internal opinion

"Our global centre of excellence for water at the Shell Technology Centre in Bangalore allows us to share ideas, innovations and technologies across Shell to improve our water efficiency. For example, we develop technologies that enable the reuse and recycling of fresh water to manage our water footprint in a responsible way while meeting environmental standards. Shell participates in a join industry project with partners including the Dutch government and universities to find new ways of using saline water to minimise freshwater intake.

"We map where fresh water is scarce"

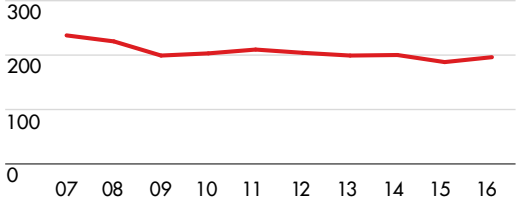
We also map where fresh water is scarce to understand the tension between freshwater demand and supply. This helps us improve our knowledge of the subsurface to manage our use of fresh water in our facilities.

Having a better understanding of the ways water and hydrocarbons separate helps us design projects more efficiently and improve our environmental footprint.

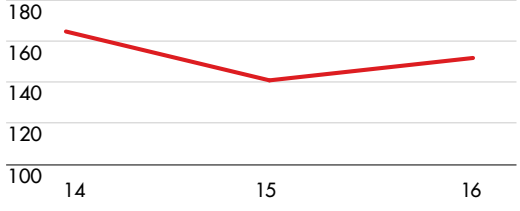
Shell continues to explore ways to reduce the potential cost of water risks to our facilities. With advanced chemistry and engineering, we can improve our current performance in line with best practice and prepare for future legislation."

Albert Janssen
Manager Water Technology, Shell, Bangalore, India

Fresh water withdrawn
million cubic metres



Fresh water consumed
million cubic metres



SPILLS

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

There were 71 operational oil spills in 2016, down from 108 in 2015. The volume of operational spills of oil and oil products in 2016 was 0.7 thousand tonnes, 11% less than in 2015.

The number of spills caused by sabotage and theft fell to 46 from 94 in 2015. The volume of these spills decreased to 1.4 thousand tonnes in 2016 from 2.2 thousand tonnes in 2015. In 2016, sabotage and oil theft remained a significant cause of spills in the Niger Delta, Nigeria.

We investigate and learn from all spills to improve our performance and we clean up the areas near our operations that are affected by spills, irrespective of the cause. As of the end of March 2017, there were five spills under investigation in Nigeria that may result in adjustments to our figures.

ENERGY EFFICIENCY

One of the ways we manage our greenhouse gas (GHG) emissions is to work on improving the energy efficiency of the facilities we operate. The main metric that we use to measure our energy efficiency is energy intensity – that is, the amount of energy consumed for every unit of output.

Shell produces GHG and energy management plans with annual updates for Shell-operated facilities that account for more than 50,000 tonnes of GHG emissions per year, and for each proposed project that will account for more than 500,000 tonnes of GHG emissions per year.

These plans must include the sources of GHG emissions, as well as a forecast of expected emissions at the site for at least 10 years, and it must outline options for improving energy efficiency or reducing emissions.

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

The overall energy intensity index of our chemical plants and refineries in 2016 was similar to the year before. For our chemicals plants, it improved slightly to 91.0 in 2016, compared to 91.6 in 2015. For our refineries, it was unchanged at 95.4.

External opinion

"In 2006, the Rotterdam district of Hoogvliet started exploring the idea of using waste heat from the nearby Shell refinery in Pernis for its district heating network. Eventually there was a plan that was technically feasible, but not economical because of the raise of the foreseen investments.

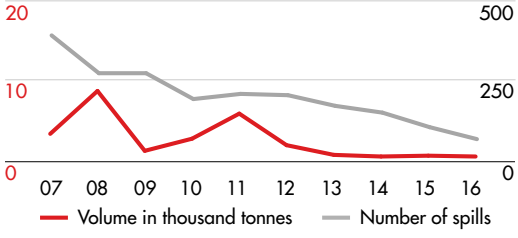
"Sending heat from the refinery to the city"

The breakthrough came when we visited the MiRO refinery, which supplies heat to the city of Karlsruhe, Germany. As supplier of waste heat heating company, there were two important insights for us. You should not recover waste heat from the primary production process of a refinery. And, as partners, you should start with the solutions that are relatively easy to realise, technically and for your organisation. Because of the security of supply of the current heat transport network from Pernis, Warmtebedrijf Rotterdam is looking for a second heat supplier. In 2016, we signed a contract with Shell and expect to start taking heat from the Pernis refinery at the end of 2018."

Co Hamers
Director, Warmtebedrijf Rotterdam, Rotterdam, Netherlands

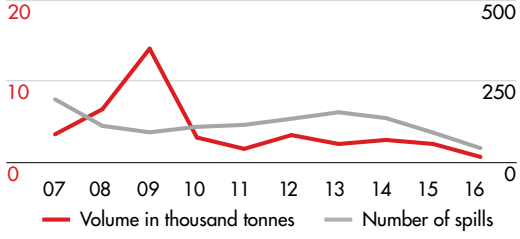
In 2016, chemical plants and refineries continued to focus on operational improvements, including how to reduce unplanned shut downs, which require significant amounts of extra energy to start up again. Together, these measures had a cumulative effect on the amount of energy we use to produce energy and chemical products, and ultimately our energy intensity. For example, the combined heat and power plant at our Bukom refinery and chemical plant in

Spills – Operational [A]



[A] Over 100 kilograms.

Spills – Sabotage [A]



[A] Sabotage and theft-related spills over 100 kilograms.

Singapore had its first full year of operation in 2016. It is expected to reduce total energy consumption at Bukom by between 4% and 5%, saving more than 200,000 tonnes of CO_2 a year. Other sites have strengthened the integration and monitoring of energy efficiency in their daily operational routine, ensuring that energy use is optimised.

In our oil sands operations, energy intensity improved to 5.5 gigajoules in 2016, from 5.8 gigajoules for every tonne of production in 2015, due to improvements in operational efficiency. This was our best result in nearly a decade. Combined with Quest carbon capture storage, we reduced the GHG emissions intensity from oil sands activities by more than 15%.

In 2016, 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) worsened compared with 2015, mainly due to inclusion of former BG assets in our portfolio. We expect it will be difficult to maintain the energy-efficiency 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.

Our Downstream and Upstream operations are learning from each other to improve performance. For example, our energy-efficiency surveillance tool enhances real-time data availability enabling corrective actions to be become part of a daily routine. The tool was developed by Downstream, and was deployed at our offshore oil and gas field Bonga, Nigeria (Shell interest 55%), in 2015. In 2016, it was implemented at other sites in Nigeria, Norway and the UK, and plans are in place for Malaysia.

AIR 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 oxides emissions in 2016 continued to fall compared to the previous year.

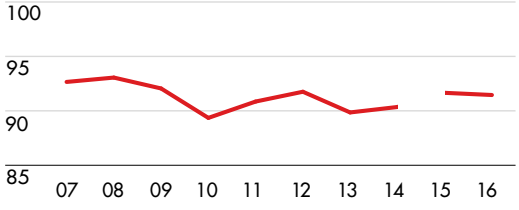
Our nitrogen oxides emissions increased from 104 thousand tonnes in 2015 to 122 thousand tonnes in 2016. The increase was primarily driven by the inclusion of former BG facilities in our portfolio.

Our emissions of volatile organic compounds (VOCs) increased to 146 thousand tonnes in 2016 compared with 125 thousand tonnes in 2015. This was mostly due to an increase of venting at our facilities in Majnoon, Iraq. We expect our VOC emissions to decrease in the coming years as a result of our efforts to reduce flaring and venting.

WASTE

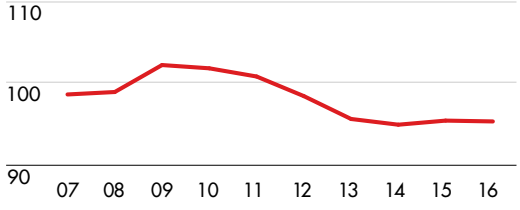
We aim to reduce the amount of waste we generate and to reuse or recycle materials, wherever possible. For example, in 2016, nine of our downstream manufacturing sites sent more than 50% of their waste generated during the year for recycling or reuse. Of these nine, five sites sent for recycling and reuse over 80% of their waste.

Energy intensity – Chemical plants
chemicals energy index [A]



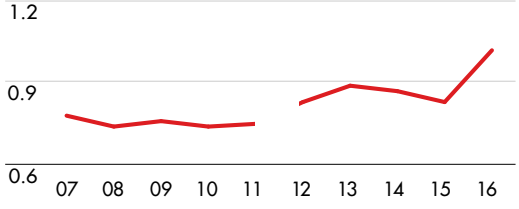
[A] CEI calculation methodology changed in 2015; therefore, data for prior years are not directly comparable.

Energy intensity – Refineries
refinery energy index [A]



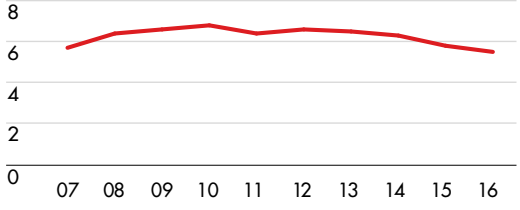
[A] Indexed to 2002; based on 2006 Solomon EIITM methodology.

Energy intensity – Upstream
(excluding Oil Sands and GTL)
gigajoules/tonne production [A]



[A] 2012-2016 data are reported in accordance with IPIECA/API/OGP guidance 2010.

Energy intensity – Oil Sands
gigajoules/tonne production [A]



[A] Includes mining and upgrading operations.

SOCIAL PERFORMANCE

Many of our operations are located close to communities. We work with them to understand their priorities and concerns. Managing our impact on people is essential to being a responsible company.

HIGHLIGHTS IN 2016

- Shell co-funded pilot projects in China with the Global Alliance for Clean Cookstoves to give 250,000 households access to clean cooking fuels. (See also Investing in communities)
- Entrepreneurs behind a Shell LiveWIRE-funded UK start-up, which gives communities in Africa access to safe drinking water using profits from the sale of bottles, pitched their idea to the US President. (See also Investing in communities)
- Shell successfully completed the resettlement of around 1,850 people close to operations in Kazakhstan after consulting with local communities. (See also Investing in communities)

Our projects and operations can impact 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. The team also contributes to building skills in the communities where we operate by supporting education and training programmes, and by encouraging the development of local businesses.

We apply both local laws and the principles of international law in our work. Shell's Control Framework uses international standards as a benchmark, such as those set out by the International Finance Corporation.

ASSESSING OUR IMPACT

Shell conducts an environmental, social and health impact assessment for all major projects to understand the positive and negative effects that the project is likely to have on the surrounding environment and the local communities. Shell's internal specialists as well as consultants and scientific advisors help project teams understand the impact on land, livelihood and culture, to respect human rights, and to interpret and apply local and international standards.

LISTENING AND RESPONDING

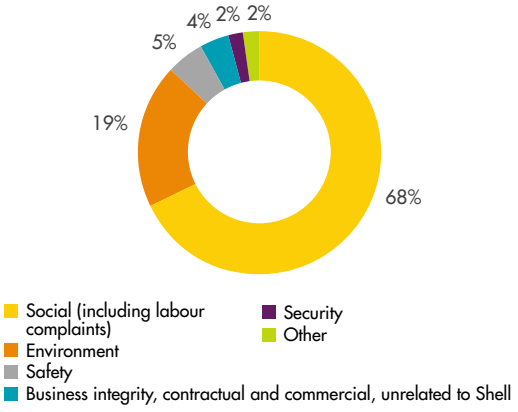
Respectful engagement with local communities is critical to the success of projects and long-term operations. We need to understand the priorities and address the concerns or grievances people may have.

We have implemented community feedback mechanisms at all of 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.

In South Korea, for example, the local community was concerned about noise levels from the construction of the Prelude floating LNG plant. Shell responded by installing industrial silencers to reduce disturbance from the shipyard.

The large Rhineland refinery in Germany is situated close to urban areas. Before the construction of a rail-loading facility, the refinery consulted with communities living next to the railway track. Initially, more than 400 people raised concerns mainly about noise from the additional transport.

Total complaints received in 2016



As a result of the engagement, Shell decided to use a fleet of low-noise freight wagons with silent brakes. The solution was accepted by the community and supported by the municipality. In September 2016, construction was completed without further complaints from the community.

COMMUNITY FEEDBACK IN 2016

Shell uses data from our community feedback mechanisms as a performance indicator at both the local community and global levels. Community complaints are registered in different categories to identify common issues across Shell and share knowledge on how they were resolved.

Complaints are recorded and consolidated on a quarterly basis to track performance of complaint management in a timely manner. In 2016, the profile of complaints was consistent with the previous three years, in which the largest number of complaints received related to social and environmental issues. Concerns about local job opportunities, allocation of benefits from social investment and the impact of our operations on people's land, property or livelihoods comprise most of the social issues. Most environmental complaints are related to nuisances, such as noise, odours or dust.

RESETTLEMENT

Our 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 support them as they establish alternative livelihoods.

As a result of the acquisition of BG, Shell became joint operator of Karachaganak Petroleum Operating BV (KPO, Shell interest 29.25%) in north-west Kazakhstan. In 2015, the government approved an expansion of the safety perimeter around the Karachaganak field, which required two villages to relocate. Led by the regional government and funded by KPO, around 1,850 people from these villages were resettled in line with international best practice.

In late 2015, the first 82 households were successfully resettled to new housing and compensated for moving costs and loss of assets. In the second phase of resettlement, we are working with the government to ensure that the remaining 373 households from the village of Berezovka have comparable or better housing and that their livelihoods are restored. Shell has funded the construction of a new school and kindergarten where half the places are available to local residents. We continue to consult with affected people, local leaders and representatives to ensure they thrive in their new location.

INDIGENOUS PEOPLES

Our activities in certain parts of the world affect indigenous peoples who hold specific rights for the protection of their culture, traditional way of life and special connections to lands and waters.

In line with Shell's General Business Principles, and in support of the UN Declaration on the Rights of Indigenous Peoples, our approach is to continue seeking the support and agreement of indigenous peoples potentially affected by our projects. We do this through mutually agreed, transparent and culturally appropriate consultation and impact management processes. It requires open dialogue, good faith negotiations, and, where appropriate, the development of agreements that address the needs of indigenous peoples.

We recognise the principle of free, prior and informed consent, as interpreted by the International Finance Corporation Performance Standards, as a safeguard for indigenous peoples' rights. We believe our approach is consistent with the application of this principle, while respecting the laws of the jurisdictions in which we operate.

For example, in Russia's Far East Sakhalin Island, Sakhalin Energy (Shell interest, 27.5% minus one share) signed its third Sakhalin Indigenous Minorities Development Plan (SIMDP) for 2016 –2020. Under the plan, decision-making about the selection of projects to support economic and social development involves elected indigenous representatives. The plan is implemented in partnership with the Sakhalin regional government and the Regional Council of Indigenous Peoples. Over the past decade, more than 500 projects have been developed and approved for implementation under the plan, such as wood carving workshops and fishing schools.

Internal opinion

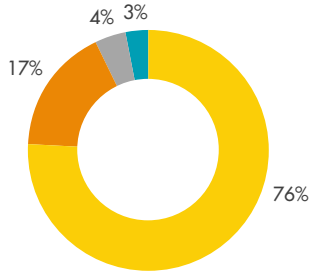
"The cultural heritage resources of Majnoon in Iraq and the surrounding marshes provide an interesting chapter in the human story. It was here in southern Mesopotamia that humanity witnessed a marked rise in social complexity that led to the development of cities, social classes, writing and craft specialisation. Our archaeological work at Majnoon aims to uphold Shell's commitment to social performance by integrating the protection of cultural heritage into the development of one of the world's largest oil fields. We were hired to bring global expertise in cultural heritage management. We work to follow international best practice under the International Financial Corporation's Performance Standards for cultural heritage because the protection of cultural heritage is the responsible and right thing to do."

"Protecting cultural heritage is the right thing to do"

Matthew Whincop
Whincop Archaeology PTY Ltd., Director, Australia

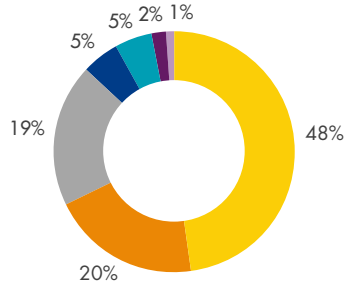
In 2014, Bolivia changed compensation for new hydrocarbon projects on collective indigenous land and farmland. This meant that a fixed percentage of the cost of the activity should be invested in social programmes. Previously, regulations required companies to compensate through cash payments. The following year, the then BG campaign to explore for oil and gas in the Huacareta area was the first project to apply this new regulation. Initially, local communities had opposed the move away

Social complaints received in 2016



- Local content, social investmentand benefits sharing
- Land, livelihood and property
- Stakeholder engagement
- Physical impacts

Environmental complaints received in 2016



- Nuisance
- Flaring
- Spill
- Water
- Impact-Natural amenity
- Soil/Water contamination
- Air quality

from cash compensation. Over the past two years, the local Shell team has worked to establish a relationship with these communities and identify and implement social projects that meet community needs and objectives. These programmes focused on technical assistance for agriculture and livestock improvement. Shell is in the process of obtaining the environmental licence to launch the new phase of exploration in Bolivia, which is expected to begin in 2017.

CULTURAL HERITAGE

Cultural heritage can be represented in tangible form, such as treasured artefacts, or as intangible attributes, such as language and traditions. It may have great value for past, present and future generations. Our specialists work to preserve cultural heritage near our operations.

Shell is the operator of the Majnoon oil and gas field in Iraq. The field is the site of rich cultural heritage due to its proximity to an area considered the cradle of civilisation. In 2016, Shell – in consultation with the Ministry of Antiquities – identified two additional archaeological sites to the 10 previously identified. All sites are recorded in Shell's geographic information system. In 2017, they will be formally registered with the Ministry of Antiquities and artefacts will be handed over to the Basra Museum.

INVESTING IN COMMUNITIES

Investing in the communities where we operate enables local people to participate in the benefits that industrial development can bring, and is central to the way we do business. We develop social investment projects that are closely aligned with our business.

In 2016, following the integration of BG, we reflected on our social investment strategy and made science, technology, engineering and mathematics (STEM) education one of our three core themes, with the aim of making a more positive impact on future generations through education. The key global social investment themes are:

- access to energy;
- boosting local skills and enterprise; and
- STEM education.

Shell teams can also implement local programmes on other community topics, such as conservation, road safety and health, that are connected to our business.

ACCESS TO ENERGY

More than 1.1 billion people in the world have no electricity – and a billion more only have access to unreliable and unsafe power networks. Nearly 3 billion people rely on solid fuels for cooking. The ability to obtain reliable and safe energy enables economic and social development, and improves the health, education and livelihoods of people around the world. At Shell, we apply our core business skills and technical resources to bring energy to communities that need it and where we have a presence.

In the Philippines, through the Pilipinas Shell Foundation, we funded a micro-grid that uses hydropower and solar energy to power an indigenous village in Palawan. It provides the local Batak tribe with a continuous electricity supply. In 2016, we launched another micro-grid programme for a fishing community, mainly using wind, backed up by solar and diesel.

Shell teams hold an open house with community members in Huacareta as part of a social project in Bolivia.

In Nigeria, we created an independent, not-for-profit company to help establish the market for off-grid renewable energy in the country. Together with its partners, the company will provide investments and technical support to address energy poverty in unserved and underserved communities.

BOOSTING LOCAL SKILLS AND ENTERPRISE

Shell supports the building of new businesses to generate local employment and our LiveWIRE programme helps entrepreneurs turn their ideas into reality. The programme is active in 15 countries where we operate. In 2016, 7,889 people took part in LiveWIRE and small business development programmes, and 351 businesses were established.

Shell LiveWIRE Nigeria awarded around $124,000 in business start-up funding to 50 budding young entrepreneurs from Ogoniland who successfully completed its enterprise development programme. The entrepreneurs will use their funding to start a wide range of businesses in areas such as palm oil processing, poultry farming, solar energy and waste paper recycling.

LiveWIRE entrepreneurs continue to have an economic and social impact. In 2016, five years after Shell funded their British start-up, entrepreneurs behind the GiveMeTap bottle venture pitched their idea to US President Barack Obama. GiveMeTap gives communities across Africa access to clean, safe drinking water, through pumps installed using profits from the global sales of drinking bottles. President Obama then personally selected the company as part of a Google initiative to promote entrepreneurs.

In Saudi Arabia, where LiveWIRE is called Intilaaqah, Shell trained 823 participants in 2016 - 57% of whom were women – and supported the start-up of 69 businesses.

External opinion

"We are a consumers' club supporting local agriculture by purchasing organic products from producers. The LiveWIRE programme was essential to establishing my company's roots and preparing it for business and the market.

"LiveWIRE helped prepare my idea for market"

There is a strong network among the entrepreneurs offering knowledge and connections, facilitated by the programme staff. The *Shell Iniciativa Jovem LiveWIRE Brazil* programme also helped me control my anxiety about my professional life. Ultimately, it allowed me take an idea, put it into perspective and turn it into a successful and structured project."

Victor Piranda
Entrepreneur - Winner of LiveWIRE Brazil award, Clube Orgânico, Rio de Janeiro, Brazil

CLEAN COOKSTOVES

Shell is one of the founding partners of the Global Alliance for Clean Cookstoves, a public-private partnership that helps to create a thriving global market for clean and efficient household cooking solutions.

Since 2010, we have pledged $12 million to the alliance and provided in-kind support on leadership, business and technical skills. We have also contributed half of the alliance's Spark Fund, a grant facility that supports the development of clean cooking enterprises globally.

Shell's support to the alliance builds on the work of Shell Foundation, an independent charity that helped to set up the Alliance, together with the UN Foundation and US State Department.

In 2016, Shell co-funded seven pilot projects in China to explore a more market-driven approach to promoting clean cookstoves and fuels. This helped 75 new fuel distributors start up and gave 250,000 households access to clean cooking fuels. In India, we sponsored a workshop for 14 cookstove and fuel businesses to help them grow in a sustainable way and support their applications for future funding.

The alliance's goal is for 100 million households to gain access to clean and efficient cookstoves and fuels by 2020.

By the end of 2016, the alliance and its partners had distributed around 53 million clean stoves. The target is to reach 100 million households by 2020.

LOCAL GOODS AND JOBS

Shell also invests in communities through local employment, buying goods and services from local sources and by supporting the economic development of the community.

We prioritise buying goods and services from local suppliers that meet the standards we require. In some cases, we support local businesses and skills development to meet these standards. In 2016, we spent more than $45 billion on goods and services worldwide, of which around 64% was in Canada, Nigeria, the Netherlands, the UK and the USA. In 2016, Shell spent $4.4 billion on goods and services from local companies in countries with a gross domestic product of less $15,000 a year per person.

In the UK, for example, Shell's Upstream business spent around 47% of its contracting budget with UK companies. Around 26% of this was spent with companies based in Scotland and 21% with companies based in England and Wales.

The Nyhamna Expansion in Norway was one of Shell's biggest brownfield projects in 2016. Here, we worked with the main contractor on the project to enable local and regional small- and medium-sized companies to compete, by developing capabilities and a supplier network. Our analysis shows that more than 80% of our spending was on Norwegian content in the project and more than $58 million of total investment in businesses in central Norway. Overall, this involved more than 150 Norwegian companies.

STEM EDUCATION

Engaging children in STEM is a vital step to inspiring them to become future engineers or scientists. Shell has STEM programmes in 16 countries, including the USA, UK, Brazil, and the Netherlands.

In Brazil, we introduced a STEM education programme for less privileged children in 14 public-sector middle schools in the Rio de Janeiro and Rio Grande do Sul states. The project started in 2012 and provides teacher training, teaching aids and resources. Around 6,000 students (6–14 year-olds) and 130 teachers have taken part every year.

In the UK, Shell has invested more than £1million since 2014 in a programme called Tomorrow's Engineers, which aims to give 11–14 year olds engineering experience with employers. With Shell's investment, Tomorrow's Engineers has launched a new school programme – Energy Quest – to help students explore the science and maths curriculum in a fun and engaging way. At the end of 2016 more than 35,000 students had participated. The Shell-sponsored Girls in Energy programme is also helping to remove barriers to female participation in STEM careers and now reaches 100 young women (14–16 year olds) a year.

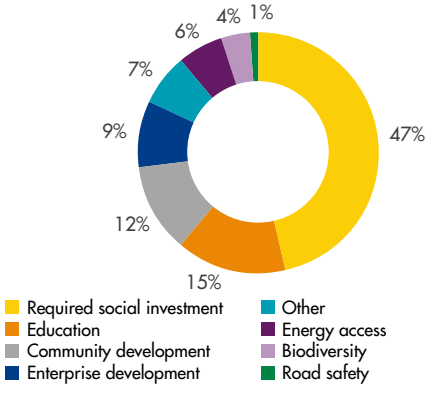
In the Netherlands, Shell launched the Generation Discover Festival to inspire children, parents and teachers in the world of science. In 2016, more than 31,000 visitors, including 10,000 schoolchildren, attended the five-day festival.

SOCIAL INVESTMENT IN 2016

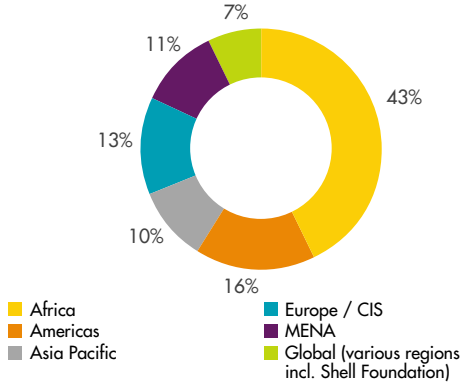
We voluntarily invest in projects that aim to benefit local communities over the long term, as well as invest in social programmes as part of contractual agreements or legal requirements with host governments. In 2016, we spent around $193 million on social investments worldwide, compared with $219 million in 2015.

In 2016, we spent $102 million on voluntary social investment, of which around $58 million was in line with our global themes - energy access, boosting local skills and enterprise, and STEM education. We spent around $44 million on local programmes for community development, disaster relief, education, health and biodiversity. We estimate that almost $96 million of our total spend in 2016 was in countries that are part of the United Nations Development Programme Human Development Index 2015, that is, those defined as having 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 donations of equipment.

Social investment in 2016
proportion of spend



Social investment in 2016
split by region



EMBEDDING SUSTAINABILITY INTO PROJECTS

Shell conducts an environmental, social and health impact assessment for every major project. This helps us to understand and manage the effects our projects could have on the surrounding environment and local communities.

ASSESSING OUR PROJECTS

When we plan or develop new facilities, or make changes to existing ones, we apply a staged project development process (see diagram) and aim for a consistent approach around the world. We embed sustainability across our projects by:

- conducting integrated assessments of the potential environmental, social and health impacts. These may include specialist studies on topics such as water use, cultural heritage or security; and
- engaging with communities to understand concerns they may have and discussing possible ways to address these concerns.

These assessments help us manage and reduce potential impacts at all stages of projects. We also draw on international standards, such as those of the World Bank and the International Finance Corporation, to guide our engagement with communities.

OUR PEOPLE

We train our teams to understand how to embed sustainability into our projects. They are supported by specialists in areas such as environmental management and health and social performance including, but not limited to:

- biodiversity, waste, energy and water management; and
- indigenous peoples' rights, cultural heritage and resettlement.

The specialists work with project teams to help manage potential impacts on communities or the environment during project design, construction and operation.

OUR PROCESS

At each review stage in the project development process, we decide if and how we are going to move forward with a project. This includes balancing short- and long-term interests, and integrating economic, environmental and social considerations into our decision-making.

The results of all assessments are documented in a mitigation plan which is approved by the manager accountable for the project. The plan is updated and its implementation is monitored and reviewed throughout the lifespan of the project.

External opinion

"Early collaboration with non-governmental organisations (NGOs) can help the energy sector more effectively manage its environmental impact, reduce project risk, and improve conservation planning. Shell's coastal and offshore operations have direct and indirect impacts on coastal areas and fisheries. Addressing these impacts early in the project cycle must be a priority.

"Shell data helped protect tuna stocks"

Investing in fisheries management, including support for monitoring and enforcement, can mitigate impacts especially if the investment is in line with the severity of the impacts and delivers desired conservation outcomes. In Gabon, Shell provided the WCS and the government of Gabon's marine conservation programme, Gabon Bleu, with data to improve planning and management of Shell's seismic surveys and the awarding of local fishing licences. All this helped to protect tuna stocks in the area.

By continuing to work closely with conservation NGOs Shell can ensure it has the expertise and exchange of scientific information to better manage the impact of its activities and contribute to biodiversity conservation and to the local economy."

Ray Victurine
Director Business and Conservation, Wildlife Conservation Society, Seattle, USA

Sustainability in the project life cycle – interactive guide

	Identify and assess	Select	Define	Execute	Operate	Decomission and restore
Identify people who may be interested in or affected by the project.	1				3	4
Engage with stakeholders (e.g. communities, host governments and NGOs) and feed responses into our risk analyses and decision-making process.	2					4
Conduct baseline studies of the local environment (e.g. water, biodiversity, social livelihoods) and consider how the project may affect it.	1					
Based on assessment of potential impacts and stakeholder engagement, **identify mitigation and enhancement measures.**		1	2			
Implement mitigation plan through project development and construction and then in ongoing operations.				2	3	

1. Myanmar: Shell took steps to avoid impacts on the environment and people following a seismic impact assessment study. For example, we adjusted seismic lines after some fishermen raised concerns they would interfere with fishing areas. Shell also planned seismic activities to ensure they would not coincide with fishing times, to avoid collisions. **2. Gibraltar:** Shell selected an onshore development for a liquefied natural gas terminal in Gibraltar after impact studies identified it as the safest and most environmentally responsible option. The terminal uses waste heat from a power station to turn LNG back into gas. This mitigates environmental impact by minimising energy and water use. **3. Philippines:** Shell helped develop and implement a resettlement action plan for 88 informal settler families living near the Philippine Ports Authority's operations and reclamation project and Shell's North Mindanao Import Facility's (NMIF) fire pumps in Cagayan de Oro City. There was a potential health and safety risk to these families. Shell and NMIF partnered with local authorities and the community to plan and coordinate resettlement. **4. China:** In early 2016, Shell decided to exit the Jinqiu tight gas project in China. We restored the land after full consultation with the land owners and local authorities to provide benefits to the community.

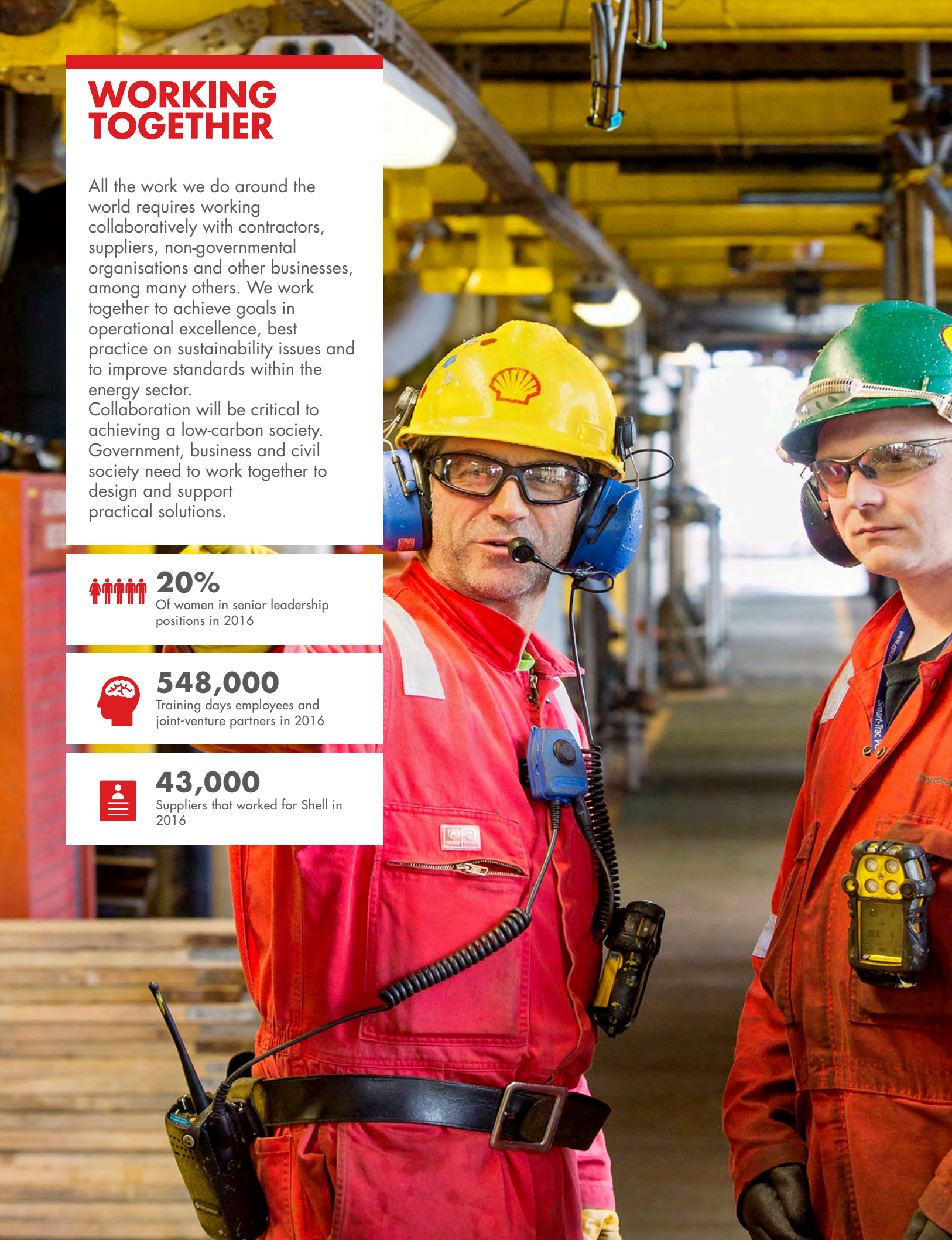
WORKING TOGETHER

All the work we do around the world requires working collaboratively with contractors, suppliers, non-governmental organisations and other businesses, among many others. We work together to achieve goals in operational excellence, best practice on sustainability issues and to improve standards within the energy sector.
Collaboration will be critical to achieving a low-carbon society. Government, business and civil society need to work together to design and support practical solutions.

20%
Of women in senior leadership positions in 2016

548,000
Training days employees and joint-venture partners in 2016

43,000
Suppliers that worked for Shell in 2016



LIVING BY OUR PRINCIPLES

The core values of honesty, integrity and respect for people are reflected in our business principles and code of conduct, which strictly govern the way we work.

OUR BUSINESS PRINCIPLES AND CODE OF CONDUCT

The Shell General Business Principles detail our responsibilities to shareholders, customers, employees, business partners and society. They set the standards for the way we conduct business with honesty, integrity and respect for people, the environment and communities. We aim to do business fairly, ethically and in accordance with laws that promote and safeguard fair competition. We do not tolerate the direct or indirect offer, payment, solicitation or acceptance of bribes in any form, including facilitation payments.

All Shell companies and joint ventures that we operate must conduct their activities in line with our business principles. We also encourage joint ventures that we do not operate to apply materially equivalent business principles.

All Shell employees and contract staff must follow our Code of Conduct which describes the behaviour Shell expects of individuals. They are also required to complete Code of Conduct training and to confirm they understand their personal responsibilities under the code. We also require individuals working on Shell's behalf, for example independent contractors or consultants, to act consistently with our Code as it applies to their work for Shell.

Employees, contract staff and contractor employees can report concerns about any potential breaches of the Code of Conduct confidentially and anonymously. This can be done through a variety of local channels, which are adapted to local regulations and customs, and one global channel, the Global Helpline, operated by an independent provider. This helpline is also available to third parties such as customers, suppliers or agents, in the event they observe misconduct by Shell staff.

Concerns or allegations are investigated by specialists within Shell. If a violation is confirmed, we take appropriate action. This may involve serious consequences, up to and including dismissal or contract termination. We maintain a stringent no retaliation policy to protect any person making a good faith allegation.

In 2016, internal investigations confirmed that 341 allegations reported through the Global Helpline were Code of Conduct violations (217 in 2015). As a result, we dismissed or terminated the contracts of 114 employees, contract staff or contractor employees (89 in 2015).

Additional information about how our ethics and compliance programme equips and supports staff to understand and follow our business principles and code of conduct is available on Shell.com.

BUSINESS INTEGRITY IN OUR SUPPLY CHAIN

The Shell Supplier Principles, along with specific contractual clauses, set out our expectations for suppliers and contractors to act with integrity. Our risk-based due diligence processes assess prospective suppliers to determine whether they can meet our expectations. We engage regularly with suppliers to reinforce these principles, offer support to help them strengthen their own practices, if needed, and hold them accountable for their performance.

HUMAN RIGHTS

We respect human rights; our approach applies to all our employees and contract staff. It is informed by the Universal Declaration of Human Rights, the core conventions of the International Labour Organization (ILO), and the United Nations (UN) Guiding Principles on Business and Human Rights. Respect for human rights and provision of remedy are ways in which we uphold our business principles.

We consult with international organisations, companies, civil society and other relevant bodies to understand and respond to current and emerging human rights issues that are relevant to our business. We collaborate closely with the Danish Institute of Human Rights to assess and improve our approach to human rights. We participate in IPIECA - the global oil and gas industry association for environmental and social issues - and through its working groups develop guidance and implementation tools to improve respect for human rights across the industry.

All Shell employees and contract staff must follow our Code of Conduct.

Our human rights approach focuses on four key areas:

COMMUNITIES

We assess and manage the potential environmental, health and community impacts of our projects in line with international standards, such as the International Finance Corporation's performance standards on environmental and social sustainability. Impact assessments are embedded in our project process from the identification and assessment phases through to operation, decommissioning and restoration.

Our community engagement mechanisms allow our neighbours to raise any concerns about the impacts of our activities and enable us to respond to those concerns through credible and effective non-judicial processes, informed by the UN Guiding Principles on Business and Human Rights. When our operations are near indigenous peoples, we seek advice from our experts to identify any additional activities or measures that may be required to accommodate these communities.

SECURITY

We aim to keep employees, contract staff and facilities safe, while respecting the human rights and security of local communities. The Voluntary Principles on Security and Human Rights (VPSHR) are implemented across Shell operations where there is an identified threat and are included in our private security contracts and our engagements with public security forces. We conduct annual risk assessments in our relevant operations and provide training to employees and contract staff.

LABOUR RIGHTS

We respect the principles of freedom of association, the right to collective bargaining, non-discrimination and equal opportunity, along with adequate work conditions, adequate remuneration and the elimination of forced or child labour. We respect the rights of our employees, contract staff and suppliers by working in alignment with ILO conventions and the UN Global Compact, an initiative that aims to encourage businesses to adopt sustainable and socially responsible policies.

SUPPLY CHAIN

We seek to work with contractors and suppliers who are committed to acting in an environmentally and socially responsible way. In line with our business principles, the Shell Supplier Principles include specific expectations for contractors and suppliers concerning labour and human rights.

ENVIRONMENTAL AND SOCIAL PARTNERS

Shell works in partnership with environmental and developmental organisations. These collaborations bring important insights to our work.

We work in partnerships to help reduce our environmental and societal impact, to improve the quality of land and water around our operations and to enhance benefits to local communities by implementing social investment programmes.

The map below shows an overview of how we work with our partners around the world. You can read about this work in detail over the next two pages.

Worldmap to our partnerships

International Union for Conservation of Nature | Wetlands International | The Nature Conservancy | Earthwatch | Social partners

ENVIRONMENTAL PARTNERS

Shell has environmental partnerships with the International Union for Conservation of Nature (IUCN), Wetlands International, The Nature Conservancy and Earthwatch. Our environmental partners can bring specific expertise to our projects in areas such as biodiversity, while at the same time advancing their own scientific or conservation knowledge by working on our projects.

MANAGING ENVIRONMENTAL IMPACT

We have worked with IUCN since 1999. As part of our collaboration, IUCN has set up two independent scientific panels to help us mitigate environmental impacts.

At the end of 2016, the Niger Delta Panel concluded its work with Shell Petroleum and Development Company Limited of Nigeria (SPDC), the operator of the SPDC Joint Venture. The work focused on restoring biodiversity at sites affected by oil spills and on enhanced remediation techniques within the SPDC JV areas of operation in the Niger Delta. IUCN and SPDC will continue to work together to improve the recovery of biodiversity at sites within SPDC JV's areas of operation.

In Russia, the Western Gray Whale Advisory Panel has been advising Sakhalin Energy (Shell interest 27.5% minus one share) since 2004. A report issued at the 2016 IUCN World Conservation Congress stated that over the last 12 years Sakhalin Energy has made important efforts to limit the impact of its operations on whales and their fragile environment. During this period, the western gray whale population has grown between 3% and 4% annually, from an estimated 115 animals in 2004 to 174 in 2015.

SUPPORTING BIODIVERSITY AND LIVELIHOODS

Shell has worked with Wetlands International for nine years. Since 2010, we have sponsored a Wetlands International project to help three communities in the Niger Delta - the Abobiri, Obia-yagha and Opume - change the way they manage their wetland environment. To stop the unsustainable use of wetlands, such as mangrove cutting, community members were given access to micro-credits, to adopt more sustainable livelihoods, like fish and snail farming. One of the conditions for getting access to the micro-credits was participation in wetland restoration activities, such as planting wetland trees and clearing overgrown waterways.

In the Majnoon oil field in southern Iraq, Shell is working with Wetlands International, IUCN and others to ensure that oil and gas development does not cause harm to the Mesopotamian Marshes and to contribute to their restoration. Parts of the marshes that lie outside of the Majnoon field were designated a UNESCO World Heritage Site in 2016.

In 2016, Shell Development Oman supported a Wetlands International's survey of birds at Barr Al Hikman wetlands, a globally significant wetland for water birds.

Earthwatch team preparing for field work, Churchill, Manitoba, Canada.

BIODIVERSITY AND REHABILITATING COASTLINES

Shell and The Nature Conservancy are working together to help protect the environment and to build knowledge about conservation in industry and government.

A previous joint project in the Louisiana coastal zone, USA, focused on developing a nature-based approach to control pipeline erosion. In 2016, Shell constructed a pilot living shoreline in the area by bringing in soil and rock and planting native vegetation. Within nine months, the constructed shoreline appeared more stable, and vegetation is reclaiming the area, helping to protect the pipeline and coastal area. We will continue to monitor the site to assess its long-term performance.

ENGAGING EMPLOYEES

Shell employees from 49 countries have contributed nearly 44,000 hours to environmental research and conservation projects since the start of our employee volunteer partnership with Earthwatch, Project Better World, 19 years ago.

Earthwatch expeditions enable Shell employees to deepen their understanding of environmental issues and make a contribution to scientific research. The Enhanced Learning Programme allows Shell participants to hone their sustainability leadership skills and create sustainability action plans to implement at work or at home. In 2016, Shell employees from 21 countries took part in these programmes.

On the Earth Skills Network programme, employees share their knowledge and expertise by mentoring managers of protected areas. This gives participants the opportunity to sharpen their professional skills and further their understanding of how business decisions can impact the environment. Shell has supported 45 protected areas since 2009, including six in 2016.

Also in partnership with Earthwatch, FreshWater Watch is a global research project that aims to safeguard the quality and supply of fresh water for the future.

SOCIAL PARTNERS

In 2016, Shell's shipping business supported a programme in Somalia aimed at steering young people away from piracy and developing the local economy by funding infrastructure projects. Shell worked alongside the United Nations Development Programme, UK oil and gas company BP, Danish shipping group Maersk, Swedish shipping business Stena, Japanese shipping companies NYK, "K"-Line and MOL. We contributed $500,000 to the total $2.5 million the partnership spent on projects for roads, healthcare facilities and training centres.

In Iraq, we have worked in partnership with the AMAR International Charitable Foundation to build a girls' school in Al Nashwa, close to our Majnoon operations near Basrah in southern Iraq. Together with AMAR, we have also established health projects including four mobile clinics that currently serve more than 30 remote villages. In addition, we have supported a primary health-care centre in Al Dayr that trains 40 women volunteers to deliver health awareness sessions in their local communities.

We have a global partnership with Mercy Corps, an international organisation that helps people to recover from crises, build better lives and transform their communities. In 2016, the partnership focused on creating jobs and promoting entrepreneurship to strengthen local economies. In Myanmar, for example, we worked with Mercy Corps to increase incomes and the resilience of households in Rakhine State, one of the nation's poorest areas. We trained 1,782 vegetable farmers from households in 32 villages to improve their agricultural practices. We also provided access to advice and new technologies to an additional 1,399 commercial farmers.

In quarter four 2016 we commenced discussions about providing funds to support internally displaced persons affected by the conflict in North-Eastern Nigeria. This resulted in a donation in February 2017 of $2.2 million to Mercy Corps to support their humanitarian relief in the region.

Since 2011, Shell has funded a programme run by Shell Foundation and finance company Grofin that invests in small- and medium-sized enterprises (SMEs) in the Middle East and North Africa. The Nomou programme's approach includes linking these businesses to the supply chains of large companies. Over the last five years it has made 103 investments worth $53 million and created more than 4,000 jobs.

We also continue to work with the Danish Institute of Human Rights to understand and respond to current and emerging human rights issues relevant to our business.

Through our partnership with Mercy Corps, Shell helps people in China recover from crises or build better lives and transform their communities.

COLLABORATIONS

Shell's work with organisations around the world gives us insight into our business, while the sharing of knowledge and experience with others contributes to better practices.

We define collaboration as all forms of working with organisations outside Shell. These collaborations range from working with another organisation on a project to sponsoring a particular group.

As a member of IPIECA, the global oil and gas industry association for environmental and social issues, we take part in discussions on topics including biodiversity, climate change and resettlement. By working with others, we are able to assess issues, such as climate change, from different perspectives within the industry.

Shell works with various associations in the chemical industry to address life-cycle management issues both for raw materials and finished products derived from them. We also work closely with customers and suppliers, monitor any changes in the science behind our products and support research if it helps us to reduce risks even further.

Some of the views of the organisations with which we participate 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 on certain policies.

Collaborations Overview

The table shows some of the organisations that we collaborate with globally on topics such as environmental sustainability, climate change 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)	■		■	■	■
Bonsucro	■	■			
Canada's Oil Sands Innovation Alliance (COSIA)	■			■	
Center for Sustainable Shale Development (CSSD)	■	■			
Danish Institute for Human Rights (DIHR)		■			
Energy Institute (EI)			■	■	
Energy Transitions Commission (ETC)	■				
Extractive Industries Transparency Initiative (EITI)					■
Global Alliance for Clean Cookstoves	■	■			
Global Business Initiative on Human Rights (GBI)		■			
Global Gas Flaring Reduction Partnership (GGFR)	■				■
Global Road Safety Partnership (GRSP)			■		
International Association of Oil and Gas Producers (IOGP)	■	■	■	■	■
International Audit Protocol Consortium (IAPC)	■		■		
International Emissions Trading Association (IETA)	■				
IPIECA (industry association for environmental and social issues)	■	■	■		■
Network of Employers for Traffic Safety (NETS)			■		
Roundtable for Responsible Soy (RTRS)	■	■			
Roundtable on Sustainable Palm Oil (RSPO)	■	■			
UN Global Compact	■	■			■
Oil and Gas Climate Initiative (OGCI)	■				
World Business Council for Sustainable Development (WBCSD)	■	■	■		■

SHELL FOUNDATION

Shell Foundation is an independent charity that applies a business approach to global development challenges that constrain job creation, access to energy and urban mobility.

Shell Foundation (SF) provides a mix of business support, grant funding and market links to help entrepreneurs prove their business models, achieve financial independence and expand into new markets. The Foundation applies business thinking to major social and environmental issues linked to the energy sector.

Since 2000, SF has deployed $263 million of grant funding to social enterprises and new market builders operating in Africa, Asia and Latin America.

2016 SOCIAL ENTERPRISE PARTNER HIGHLIGHTS

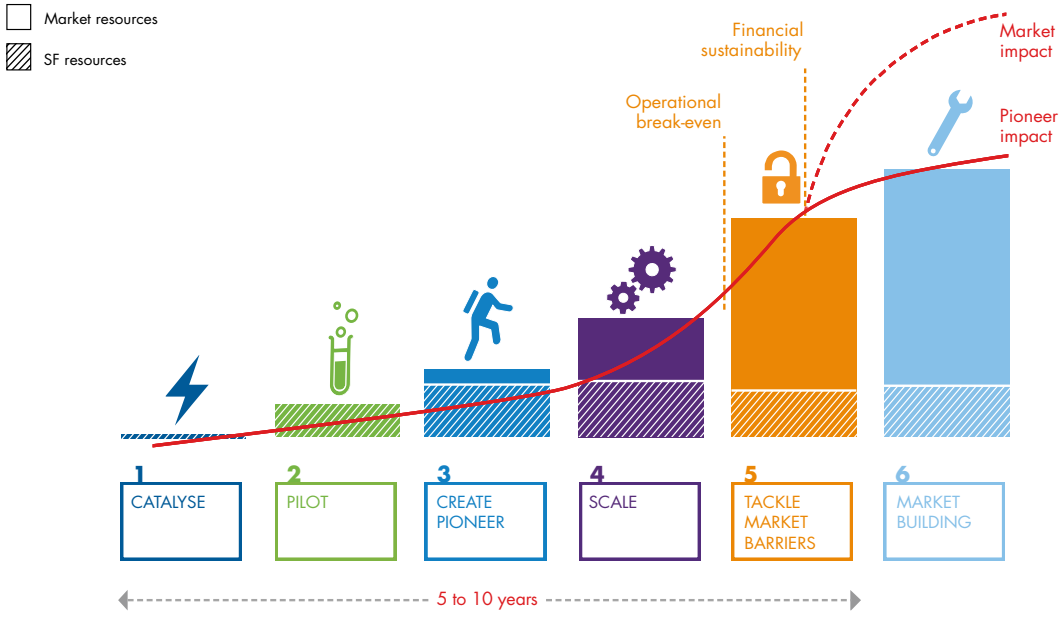
SafeBoda operates a network of trained motorcycle taxi drivers in Uganda. Safety is a major issue in the capital Kampala where 40% of trauma cases are estimated to be caused by motorcycle taxi accidents. SafeBoda customers can access transport on-demand using their mobile phone to book and pay for a driver. The start-up has rapidly grown its network in the city from 100 to more than 1,100 drivers. In 2016, its customers made over 4.5 million trips.

Dharma Life provides people in rural India with access to social-impact products such as cleaner cookstoves and solar lights. The business works with village entrepreneurs, offering skills training, logistics support and awareness campaigns to build demand. In 2016, its entrepreneur network in villages grew by 150% to 10,758 entrepreneurs across 12 states in India. To date, more than 4 million people have gained access to the products.

Shell Foundation has partnered with solar company d.light to help people without access to reliable electricity.

GroFin provides finance and business support to small- and medium-sized enterprises (SMEs) to spur job creation in emerging markets. The company has provided $286 million of growth finance to small and growing businesses in Africa and the Middle East. In 2015, a GroFin report stated an estimated $469 million of economic value is generated each year from its support of more than 500 SMEs.

Shell Foundation's six-step theory of change



Shell Foundation's impact to date

66,267 jobs created

14.24 million tonnes of carbon reduction

$5.75 billion funding leveraged

70.02 million livelihoods improved

CONTRACTORS AND SUPPLIERS

In 2016, Shell spent $45 billion on goods and services from 43,000 suppliers globally.

Shell aims to work with contractors and suppliers that behave in an economically, environmentally and socially responsible way, as stated in our Shell General Business Principles. The Shell Supplier Principles cover what is required from our suppliers regarding business integrity, health and safety, social performance, and labour and human rights.

ASSESSING OUR SUPPLIERS

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. In these cases, we use a defined set of criteria to identify potential supply chain risks and, where we see risk, we ask suppliers to undertake due diligence studies before considering awarding a contract. A successful example of this is the retailer Abenson Ventures in the Philippines (see external opinion). In 2016, 1,436 suppliers who worked to deliver Shell projects and help run our operations, were required to register with our Supplier Qualification System (SQS). Of these suppliers, several hundred were flagged for second stage qualification for one of our risk filters, 70 of which were flagged for labour risks analysis (see the infographic below for further detailed analysis).

The results of our supplier assessments are summarised in a green/amber/red rating depending on the number and significance of any gaps between our requirements and the supplier's policies or performance.

We work with each of these suppliers to ensure they have a plan to correct serious gaps. These are the most common gaps found during our supplier assessments, which typically relate to policy rather than performance gaps.

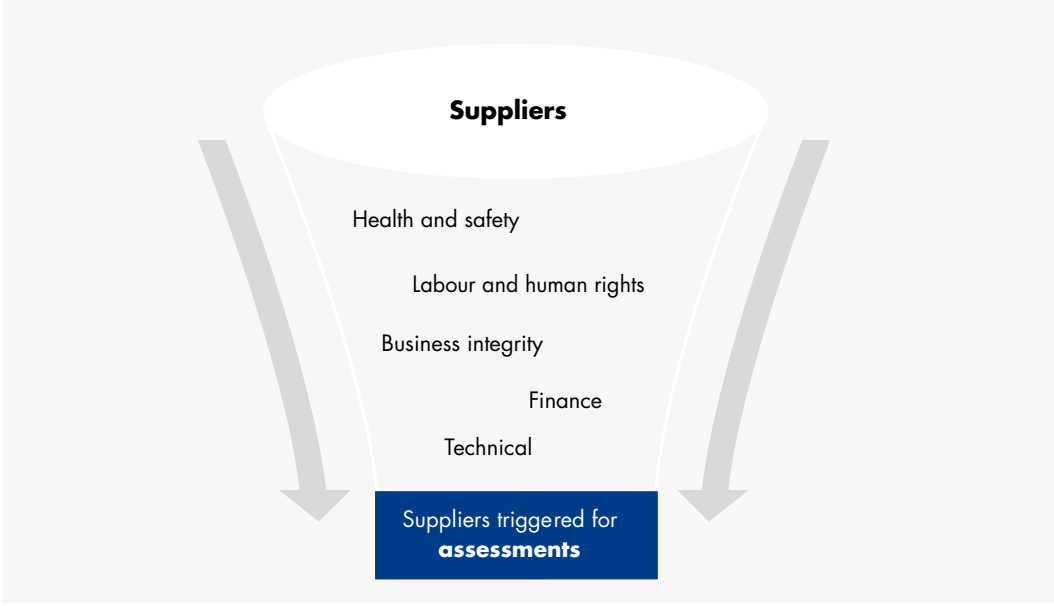
- freely chosen employment;
- child labour avoidance;
- working hours, wages and benefits;
- dormitory, housing and working conditions;
- equal opportunities and freedom of association; and
- supply chain and performance management.

CONTRACTOR SAFETY LEADERSHIP

Senior leaders from Shell and 14 contractors developed the Contractor Safety Leadership Initiative Declared Future. This outlines a joint vision for safety leadership with the ambition of no harm and no leaks achieved through collaboration.

Applying risk filters

When we assess our suppliers, we use a combination of the type of work they do and the country in which the work will be delivered to identify suppliers we consider "high-risk" for potential labour rights violations.



Applying our labour rights risk criteria during our sourcing process in 2016, we identified and assessed 70 high-risk suppliers. Of those, 23 were awarded contracts.

Labour rights risk analysis 2016

Performance can be improved by aligning the health, safety, security and environment (HSSE) frameworks of a contractor and Shell, by empowering the contractor to deliver using their own HSSE controls and by visiting sites together to listen to the workforce. Teams are encouraged to jointly attend talks, conduct risk assessments and oversee the completion of projects.

LOCAL SUPPLIER DEVELOPMENT

Shell aims to contribute to the economic development of countries where we operate through employment and by helping local companies develop, either by employing people directly or through our government and business partners. At the start of a project, as well as throughout the project life cycle, we consider how we can employ local suppliers and use community knowledge. If needed, we help them build capabilities that meet our safety and quality standards. We also support the growth of local businesses in many countries where we work. In many countries, a plan to support the growth of local businesses forms part of the selection criteria against which potential suppliers are assessed.

For example, Qatar Shell spends more than 50% of its annual procurement budget with local companies. Fourteen contracts have been awarded to small- and medium-sized local companies since 2013 (with six awarded in 2016) worth around $19 million.

External opinion

"As a retailer, we supply corporate merchandise to companies like Shell. Their Supplier Qualification System (SQS) helps us align our policies to the international standards Shell expects. It is important we provide stakeholders with clear policies that improve our way of doing business. We take pride in providing our customers with the best products and services, which would not be possible without a sophisticated platform designed for suppliers, like SQS.

"We expect to reduce cost and time"

We have several business units in the Philippines and SQS enables us to standardise and streamline the way we engage with Shell companies in different locations. We expect this will reduce costs, time and avoid duplication of effort. We are delighted that improving our policies merits a green banding."

CJ Barrion
Abenson, Philippines

OUR PEOPLE

The quality of our people is essential to the success of our company. During 2016, we employed an average of 92,000 staff in more than 70 countries.

We work to maintain an effective and healthy organisation, resource talented people across the business, accelerate development of our people, grow and strengthen our leadership capabilities, and enhance employee performance through strong engagement. We recruit, train and recompense people to ensure our continued business success.

OUR WORKFORCE

Around 40% of our workforce is in countries outside of Europe and North America. In 2016, we recruited around 800 graduates, 800 experienced professionals and 2,800 people in our Shell Business Operations. Close to 40% of graduate recruits came from universities outside of Europe and the Americas.

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

Following the acquisition of BG, we successfully transferred three quarters of BG employees to a role in Shell.

Employees review computer-generated designs at Shell's offices in Doha, Qatar.

COMMUNICATION AND ENGAGEMENT

We strive to maintain strong relations with our employees. Dialogue between management and employees is integral to our work practices; it takes place directly and, where appropriate, through employee representative bodies. Management briefs employees on operational and financial results regularly through a variety of channels. The annual Shell People Survey is one of the main tools used to measure employees' views on a range of topics. For example, the average employee engagement score in 2016 was 79% favourable and 6% unfavourable (80% favorable and 5% unfavorable in 2015). The survey also measures employees' views on the inclusiveness of their workplace. In 2016, 71% felt positive about this, while 12% felt negative about inclusion in the workplace, the same figures as in 2015.

We promote the safe expression and reporting of views about our processes and practices. 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.

DIVERSITY AND INCLUSION

Embedding the principles of diversity and inclusion in the way we do business gives us a better understanding of the needs of our staff and our stakeholders.

A diverse workforce and an inclusive environment that respects and nurtures different people is a way to improve our business performance. 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 we measure representation of women and local nationals in senior leadership positions. Diverse teams led by inclusive leaders are more engaged, and thus deliver better business performance.

At the end of 2016, the proportion of women in senior leadership positions was 20% compared to 19% in 2015.

The representation of senior local nationals is monitored in 20 principal countries. We measure the percentage of senior nationals employed in Shell compared with the number of senior positions in their home country. The reporting shows two categories: local national coverage greater than 80% (10 countries in 2016) and less than 80% (10 countries in 2016).

TRAINING AND DEVELOPMENT

In 2016, we provided 548,000 training days for our employees and joint-venture partners. We focused on growing our leadership capability, improving skills in technical, safety and commercial areas, and increasing our expertise in specialist areas such as cultural heritage and indigenous peoples.

OUR BUSINESS PARTNERS

We often work in joint ventures with national and other international energy companies. Our business partners bring important skills and experiences to a joint venture.

NON-OPERATED VENTURES

More than half of Shell's joint ventures (JVs) are not operated by Shell. For these ventures, our Shell JV representatives and the Shell-appointed JV board require our partners to adopt the Shell commitment and policy on Health, Safety, Security and Environment and Social Performance (HSSE&SP) or one materially equivalent to our own. They are also required to put in place standards to adequately address HSSE&SP risks.

When these JV's implement our control framework, or a similar approach, Shell teams carry out independent audits or participate in the JVs own auditing programmes. This provides assurance on the JV's compliance. We also offer to review the effectiveness of the framework's implementation, overseen by the JV's board of directors.

We periodically evaluate the health, safety, environment and community risks of the JV. If the JV is falling below expectations, plans will be put in place, in agreement with the other partners, to improve performance.

SHARING KNOWLEDGE

Another advantage of working with our business partners – who are often located in different parts of the world – is that they offer an opportunity to share knowledge and insights and learn from each other's experience. As a result, we can work together to tackle specific social, environmental, safety or technical challenges.

An employee working at the Salym Petroleum JV in Russia.

We encourage and support our JV partners in implementing similar standards to our own for the management of greenhouse gas (GHG) emissions. In 2016, we engaged with several partners in workshops to share practices and explore opportunities for reducing GHG emissions from our joint operations.

Since 2014, we have helped Petroleum Development Oman (PDO, Shell interest 34%) reduce its GHG emissions by sharing our work to reduce flaring, as well as our approach to energy and methane management. We also raised awareness about voluntary GHG reduction initiatives, such as the World Bank's "Zero Routine Flaring by 2030" initiative. PDO endorsed the initiative in January 2017.

TAX AND TRANSPARENCY

Tax binds governments, communities and businesses together. Revenue transparency provides citizens with important information to hold their government representatives accountable and to advance good governance. Shell is committed to transparency.

Our operations generate revenue through taxes and royalties for governments around the world. In 2016, Shell paid more than $55.6 billion to governments. We paid $4.4 billion in income taxes and $2.3 billion in government royalties, and collected $48.9 billion in excise duties, sales taxes and similar levies on our fuel and other products on behalf of governments.

OUR APPROACH

For Shell, paying taxes in the countries where we operate is about more than complying with the law. It is about showing that extraction of natural resources provides governments with an opportunity to generate revenues, support economic growth and enhance social development.

We comply with applicable tax laws wherever we operate. We are transparent about our tax payments to governments and we strive for an open dialogue with them. This approach helps us to comply with both the letter and the spirit of the laws.

PRINCIPLES

In line with the Shell General Business Principles, we support several external voluntary codes, which include 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.

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 onwards, Shell makes mandatory disclosures under the Reports on Payments to Governments Regulations 2014, and files its Payments to Governments Report with the UK's Companies House instead. The report covering calendar year 2016, which will integrate BG figures, will be published on www.shell.com/payments by the end of June 2017.

TAX STRATEGY

It is the right of governments to determine tax policies and tax rates and to draft tax laws accordingly. They do so against strong competition for capital and investment, which is internationally mobile. It is not the role of business to form views on what level of taxation is adequate or required. 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.

Chairman Chad Holliday delivers his keynote speech at Shell's 2016 Annual General Meeting.

GOVERNANCE OF TAX

Shell'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. Annually, 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 a cooperative compliance relationship in the UK, the Netherlands and Singapore. In Italy, we have filed an application for a cooperative compliance relationship; in Austria, we have a pilot relationship, and we continue to explore establishing similar relationships with other countries.

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.

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 (EITI). Consistent with the EITI 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.

Shell is actively involved in the revenue transparency discussion and we are working with stakeholders to develop an approach that takes into account the views of the relevant stakeholders involved, i.e. industry, governments and civil society.

DATA AND REPORTING

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. Our External Review Committee assesses the Sustainability Report 2016 and offers an objective view on our progress in sustainability.

ABOUT OUR REPORTING

We began reporting voluntarily on our environmental and social performance with the first Shell Report in 1997. We support transparency and share information and data in this report and on our company website.

We also provide regular information to the Carbon Disclosure Project, Dow Jones Sustainability Index, FTSE4Good Index and other organisations that assess the economic, environmental and social performance of companies.

ABOUT OUR DATA

There are inherent limitations to the accuracy of environmental and social data. We recognise that our data will be affected by these limitations and continue to improve data integrity by strengthening our internal controls.

All non-financial data in this report are reported on a 100% basis for companies and joint ventures where we are the operator. Environmental data pertain to our direct emissions 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 2016 are included only for the period of our ownership. Our reporting includes equivalent data from BG from February 1, 2016, following a review to ensure all data are aligned with Shell's health, safety, security, environment & social performance (HSSE&SP) Control Framework.

Other data are collected from external sources, staff surveys and other internal sources as indicated.

We only include data in this report that were confirmed by the end of March 2017. 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. 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.

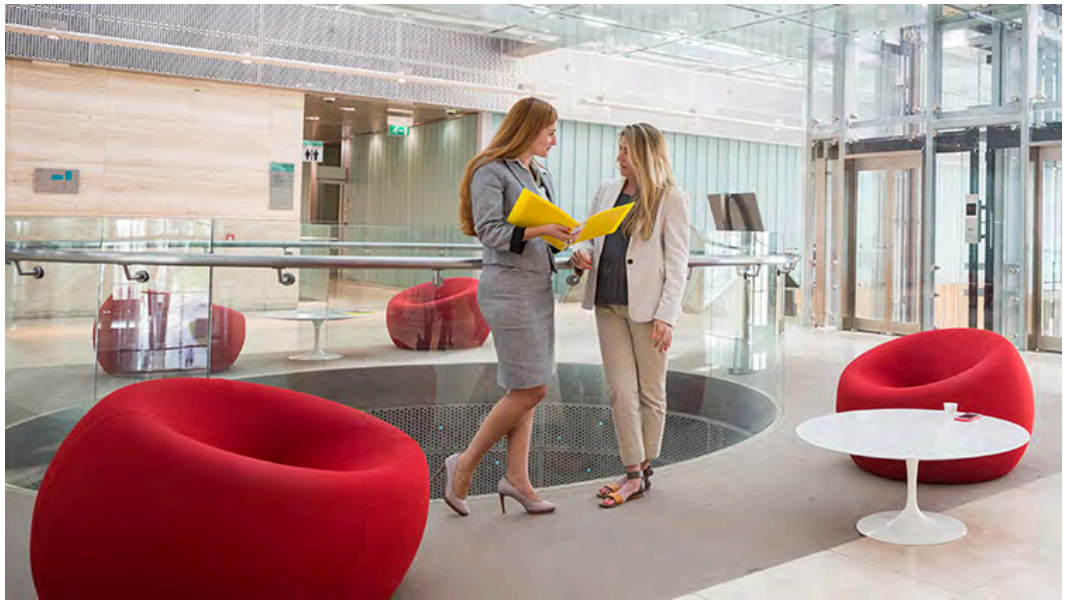
ASSURANCE

We have clear standards and reporting requirements for our HSSE&SP data. This is supported by internal controls such as audit trails and statistical checks to help ensure the accuracy of the Shell Sustainability Report.

The External Review Committee of independent experts helps to 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 2016. Limited assurance means nothing has come to the auditor's attention that would indicate that the data are not correct.

Conversions into US and Canadian dollars are based on the average exchange rates for 2016.



Employees at the Qatar Shell Research and Technology Center, part of Shell's wider research and development community which includes technology centres in Amsterdam and Houston.

ENVIRONMENTAL DATA

Environmental data

	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Greenhouse gas emissions (GHGs)										
Direct total GHGs (million tonnes CO_2 equivalent) [A]	70	72	76	73	72	74	76	69	75	82
Carbon dioxide (CO_2) (million tonnes)	67	68	73	71	69	71	72	66	72	79
Methane (CH_4) (thousand tonnes)	123	119	126	120	93	133	128	127	126	119
Nitrous oxide (N_2O) (thousand tonnes)	1	1	1	1	1	1	2	2	2	2
Hydrofluorocarbons (HFCs) (tonnes)	21	18	16	17	23	22	23	25	23	28
Energy indirect total GHGs (million tonnes CO_2 equivalent) [B]	11	9	10	10	9	10	9	9	n/c	n/c
Flaring										
Flaring (Upstream) (million tonnes CO_2 equivalent) [C]	7.6	11.8	13.0	7.4	7.7	10.0	10.4	7.8	8.8	9.7
Flaring (Upstream) (million tonnes hydrocarbon flared) [C]	2.3	3.5	3.8	2.1	2.3	3.4	3.6	2.6	2.8	3.4
Nigeria [D]	0.5	0.9	1.3	1.1	1.5	2.0	2.4	1.9	2.3	2.5
Rest of the world [E]	1.8	2.6	2.5	1.0	0.8	1.4	1.2	0.7	0.5	0.9
Energy intensity										
Upstream excl. oil sands, LNG and GTL (gigajoules per tonne production) [C], [F]	1.02	0.83	0.87	0.89	0.83	0.75	0.74	0.76	0.74	0.78
Oil sands (gigajoules per tonne production) [G]	5.5	5.8	6.3	6.5	6.6	6.4	6.8	6.6	6.4	5.7
Refineries: Refinery Energy Index [H]	95.4	95.4	94.9	95.6	98.4	100.8	101.8	102.2	98.9	98.6
Chemical plants: Chemicals Energy Index	91.0	91.6	90.3	89.8	91.7	90.8	89.3	92.0	93.0	92.6
Acid gases and VOCs										
Sulphur oxides (SO_x) (thousand tonnes SO_2)	83	88	97	99	113	136	139	141	175	212
Nitrogen oxides (NO_x) (thousand tonnes NO_2) [I]	122	104	146	156	147	146	159	142	150	145
Volatile organic compounds (VOCs) (thousand tonnes)	146	125	151	89	89	129	147	126	130	148
Ozone-depleting emissions										
CFCs/halons/trichloroethane (tonnes)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.4	0.6
Hydrochlorofluorocarbons (HCFCs) (tonnes)	8	8	6	8	8	12	21	24	26	27
Spills and discharges [J] [K]										
Sabotage spills – volume (thousand tonnes) [L]	0.6	2.2	2.7	2.2	3.3	1.6	3.0	14.0	6.5	3.4
Sabotage spills – number [L]	46	94	139	157	137	118	112	95	115	197
Operational spills – volume (thousand tonnes)	0.7	0.8	0.7	0.9	2.1	6.0	2.9	1.4	8.8	3.5
Nigeria [M]	0.2	0.2	0.3	0.4	0.2	5.3	0.7	0.3	7.1	1.6
Rest of the world	0.5	0.7	0.4	0.5	1.9	0.7	2.2	1.1	1.7	1.9
Operational spills – number	71	108	153	174	207	211	195	275	275	392
Nigeria [N]	7	16	38	31	37	64	32	37	42	52
Rest of the world	64	92	115	143	170	147	163	238	233	340
Hurricane spills – volume (thousand tonnes)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil in effluents to surface environment (thousand tonnes)	0.9	1.0	0.9	1.0	1.0	1.3	1.6	1.5	1.7	1.6
Water										
Fresh water withdrawn (million cubic metres)	195	186	199	198	203	209	202	198	224	235
Fresh water consumed (million cubic metres)	152	141	165	n/c	n/c	n/c	n/c	n/c	n/c	n/c
Waste disposal										
Hazardous (thousand tonnes)	658	455	529	770	820	740	1,048	962	688	907
Non-hazardous (thousand tonnes)	1,491	1,680	1,674	2,065	2,295	1,850	1,079	1,139	996	1,899
Total waste (thousand tonnes) [O]	2,148	2,135	2,203	2,835	3,115	2,590	2,127	2,101	1,684	2,806

[A] Greenhouse gas emissions 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 (IPIECA/API/IOGP) indicate that a number of sources of uncertainty can contribute to the overall uncertainty of a corporate emissions inventory. 2015 and 2016 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 approach 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, Integrated Gas and Oil Sands.

[D] Nigeria includes SPDC onshore operations (0.4 million tonnes flared in 2016) and SNEPCo offshore operations (0.1 million tonnes flared in 2016).

[E] Flaring from the Majnoon field in Iraq and from Malaysia amounted to 0.9 and 0.1 million tonnes of hydrocarbons respectively in 2016.

[F] Since 2012, data are prepared in accordance with IPIECA/API/IOGP guidance 2010. Data for prior years are not directly comparable.

[G] The data include mining and upgrading operations. The data do not include in-situ production.

[H] Data are indexed to 2002, based on Solomon Associates Energy Intensity Index 2006 methodology.

[I] Increase in NO_x emissions in 2016 was primarily driven by inclusion of former BG assets in our portfolio as of February 1st, 2016.

[J] All spill volumes and numbers are for spills over 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.

[K] As of the end of March 2017, there were five spills under investigation in Nigeria that may result in adjustments.

[L] All sabotage- and theft-related spills have occurred in Nigeria except in 2016 (0.001 thousand tonnes), 2015 (0.005 thousand tonnes), and 2007 (0.7 thousand tonnes).

[M] 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.

[N] Nigeria includes SPDC onshore operations (5 operational spills in 2016) and SNEPCo offshore operations (2 operational spills in 2016).

[O] In 2016, we sent waste offsite for recycling or reuse, or sold around 650 thousand tonnes of material that would otherwise have been disposed of as waste.

n/c = not calculated.

SOCIAL AND SAFETY DATA

Social and safety data

	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Fatalities										
Total number	3	7	5	5	8	6	12	20	26	21
Employees	0	1	3	0	3	1	0	1	2	1
Contractors	3	6	2	5	5	5	12	19	24	20
Fatal accident rate (FAR)	0.53	1.11	0.74	0.79	1.32	0.96	1.56	2.3	3.4	3.1
Fatalities per 100 million working hours (employees and contractors)										
Injuries and process safety incidents										
Total recordable case frequency (TRCF)	1.00	0.94	0.99	1.15	1.26	1.24	1.23	1.4	1.8	1.9
Injuries per million working hours (employees and contractors)										
Lost time injury frequency (LTIF)	0.25	0.26	0.28	0.36	0.34	0.36	0.35	0.4	0.6	0.7
Lost time injuries per million working hours (employees and contractors)										
Operational process safety events										
Tier 1 [A]	39	51	57	65	91	n/c	n/c	n/c	n/c	n/c
Tier 2 [A]	107	169	194	246	308	n/c	n/c	n/c	n/c	n/c
Illnesses										
Total recordable occupational illness frequency (TROIF)	0.40	0.60	0.96	0.77	0.51	0.66	0.76	0.6	1.2	1.5
Illnesses per million working hours (employees only)										
[S] **Security**										
Using armed security (% of countries)	17	19	24	19	17	14	9	17	17	16
Using armed company security (% of countries)	1	1	1	3	0	1	1	1	1	2
Using armed contractor security (% of countries)	7	8	10	8	10	9	6	10	9	12
Gender diversity [B]										
In supervisory/professional positions (% women)	28.0	28.0	29.0	28.8	28.1	27.3	26.3	26.4	24.7	24.6
In management positions (% women)	21.0	20.0	21.0	18.8	18.2	17.6	17.0	16.1	15.3	17.7
In senior leadership positions (% women)	20.0	19.0	18.2	17.2	16.2	16.6	15.3	14.0	13.6	12.9
[S] **Staff forums and grievance procedures**										
% countries with staff access to staff forum, grievance procedure or other support system	100	100	100	100	100	99	100	99	100	100
[S] **Child labour (% countries with procedures in place)**										
Own operations	100	100	100	100	100	100	99	98	100	99
Contractors	100	100	100	100	100	97	96	97	99	98
Suppliers										96
[S] **Forced labour (% countries with procedures in place)**										
Own operations	100	100	100	100	100	100	99	98	n/c	n/c
Contractors and suppliers	100	100	100	100	100	97	95	89	n/c	n/c
Integrity										
Code of Conduct violations [C]	341	217	267	181	209	226	205	165	204	361
[$] **Contracting and procurement**										
Estimated expenditure on goods and services in lower-income countries ($ billion) [D] [E]	4.4	6	14	12	14	12	13	12	12	13
Social investment [F]										
[$] Estimated voluntary social investment (equity share) ($ million)	102	122	160	159	149	125	121	132	148	170
[$] Estimated social investment spend (equity share) in lower-income countries ($ million) [G]	96	43	73	74	67	45	61	54	61	65

[A] Process safety events are classified based on guidance from the IOGP and API. In 2016, there were 16 Tier 1 and 0 Tier 2 sabotage-related events.

[B] Diversity data obtained from our human resources system.

[C] 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.

[D] 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.

[E] From 2013 onwards, this figure only includes the amount spent on goods and services by Shell group companies.

[F] 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.

[G] 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 2015). As the countries included in the UNDP index change, this affects our spend numbers. In 2015, the UNDP index update no longer includes some of the countries in which Shell invests, which impacts on our reported spend amount.

[$] Social investment and contracting and procurement data collected via our financial system since 2007.

[S] Data obtained from an internal survey completed by the senior Shell representative in each country.

EXTERNAL REVIEW COMMITTEE

In 2005, Shell established an External Review Committee to help evaluate the quality and credibility of the annual Shell Sustainability Report and to recommend improvements to our sustainability performance.

Members of the External Review Committee (ERC) come from a range of professional backgrounds, but they share the following expertise and experience:

- globally respected, independent and pragmatic in their approach;
- familiar with, and able to convey, the perspectives of Shell stakeholder groups or are experts in the main sustainability challenges that Shell faces;
- broadly representative of regions of strategic importance to Shell;
- reasonably familiar with the oil and gas industry, Shell, and related sustainability issues; and
- capable of adding fresh perspectives to Shell's thinking and reporting on sustainability.

Committee members are asked to serve for three years, with two or three new members appointed each year. This is long enough to develop the necessary understanding of the issues and process, without diminishing the independence or external perception of independence critical to the ERC's effectiveness. The intention is that the Committee should bring a balance of experience and perspectives.

ERC RECOMMENDATIONS IN 2015

Each year, the ERC is asked to present its independent opinion on the Shell Sustainability Report. An example is provided below of some of the recommendations included in the ERC's letter in the Shell Sustainability Report 2015 and Shell's response. The ERC recommendations have been fundamental in shaping this current report. (See table).

REVIEW PROCESS

The Committee meets in person three times annually (in The Hague, the Netherlands), and on other occasions by teleconference. It holds meetings with Shell senior management, including Shell's Executive Committee, to discuss Shell's approach to sustainability and our reporting. When reviewing the sustainability report, the ERC focuses on three main questions:

- Has Shell selected the most important topics for the report?
- How well has the report dealt with these topics and responded to stakeholder interests?
- Has Shell provided sufficient information and access for the ERC to do its job effectively?

This review does not include the verification of performance data in the sustainability report, or the information on which the case studies in the report are based. Separately, the ERC provides Shell with its observations on the company's strategy and sustainability performance.

To acknowledge the ERC's time and expertise an honorarium is offered, payable either to the individual members, their organisation or their charity of choice. They are also offered reimbursement for their expenses.

ERC recommendations and our responses

ERC recommendation in 2015	How Shell responded in the 2016 report
Future reporting The ERC would like to see a more strategic conversation on the role of fossil fuels, and the challenges posed by volatility of the oil price. The ERC is also anticipating a commentary on the acquisition of BG Group.	In About Shell and Energy transition, we outline the role of fossil fuels in the energy transition and how our refreshed strategy will make Shell a more resilient company. Details on the BG integration can be found in About Shell and How sustainability works at Shell.
Energy transition and climate change The ERC encourages Shell to disclose more precisely how its strategy aligns with this global ambition as stated at the COP21 in Paris and to provide more disclosures on Shell's thinking about the role of natural gas (and other fossil fuels) beyond 2050.	In 2016, Shell published the Shell: Energy Transitions and Portfolio Resilience report and the Scenarios supplement A Better Life with a Healthy Planet: Pathways to Net-Zero Emissions. Shell's refreshed strategy is detailed in About Shell, Natural gas and Lower-carbon alternatives.
Natural gas and methane The ERC believes that the report understates the magnitude of the climate problem posed by methane and the risk this represents to Shell. The report would benefit from greater clarity on how managing methane emissions and the related risks within its operations are reflected in Shell's business strategy.	The Natural gas and Managing methane emissions sections of this report set out our efforts in detecting and managing our methane emissions.
Nigeria In light of the fatalities in 2015, the ERC urges Shell to disclose more details on measures taken to avoid future incidents. They also ask Shell to be more transparent around the measures taken to implement the UNEP report recommendations.	In Our activities in Nigeria and Safety, we explain our safety approach and focus. This report includes an update on our activities in relation to spill prevention and clean up in Nigeria and the Ogoniland region.

ERC OPINION

The External Review Committee (the ERC or the Committee) is pleased to share its independent opinion on Shell's Sustainability Report 2016 (the report).

As in past years, the ERC benefited from structured engagement with Shell's senior leadership and from participation in the report topic selection process. In our opinion, the report appropriately covers the main issues relevant to Shell and its stakeholders with the exception of one emerging issue which we note below.

The ERC commends Shell for updating the report format this year by embracing a web-first, interactive design approach for the narrative as well as for the presentation of performance data.

SHARED VALUE AND SOCIAL PERFORMANCE

The ERC has long advocated for Shell to improve its reporting on social performance. We see improvements in the 2016 report, such as increased disclosure on indigenous people and resettlement. Social performance reporting could be further strengthened by discussing the challenge of applying social performance standards uniformly worldwide.

We welcome the addition of shared value as one of company's four strategic ambitions. However, the report provides little information on how Shell plans to create and deliver shared value. Given it is one of Shell's four strategic ambitions, a clear and consistent definition and a framework for measuring progress on shared value needs articulating. For stakeholders to understand shared value and see its impact, future reporting needs to describe how it is embedded throughout Shell's business and overall sustainable development agenda.

ENERGY TRANSITION AND CLIMATE CHANGE

The 2016 report describes more clearly the company's intended contribution to the transition to a low-carbon future. However, the ERC finds the report ambiguous on the necessary pace of change, plus how Shell discusses the evolution of its business sometimes seems at odds with the report's own commentary on the urgency implied by the science of climate change as well as trends in many other sectors. There is a lack of discussion about how exploration and production will change over time or how in these two areas Shell will prioritise investments and activities. The report would also benefit from more detail on the key nations where Shell is partnering with governments to plan and execute pathways through the energy transition.

The report describes the activities planned under the New Energies portfolio but is silent on how Shell plans to win investor support for progressively increasing and accelerating investment in low-carbon alternatives, which today often offer different or lower returns than traditional oil and gas investments.

We are encouraged to see that the Quest carbon capture and storage (CCS) project exceeded its annual target to safely capture and store 1 million tonnes of CO_2 in its first full year. Looking forward, we recommend more disclosure on how Shell will develop more CCS projects, especially as part of gas and downstream operations, as well as more detail on how Shell will share Quest-related learning. More importantly, future reporting should discuss the implications for Shell's strategy if broad deployment of CCS on the scale envisioned in Shell's scenarios were significantly delayed.

External Review Committee: (from left to right)
Ed Whittingham, Executive Director, Pembina Institute, Canada
Bernice Lee, Head of Climate Change and Resource Security Initiatives, World Economic Forum, Hong Kong
John Gardner, Vice President and Chief Sustainability Officer, Novelis Inc, UK
Seema Arora (Chair), Executive Director, Confederation of Indian Industry, India
Mark Brownstein, Vice President, Climate and Energy Program, Environmental Defense Fund, USA
Lavinia Hollanda, Senior Energy Consultant and Advisor, Brazil

As in previous years, the report does not share with readers any targets to indicate the intended pace of Shell's transition to a lower carbon portfolio. The ERC recommends the report include such goals in future.

NATURAL GAS AND METHANE

The ERC is encouraged by the steps Shell is taking to eliminate venting and flaring of natural gas, especially now gas plays an even bigger part in Shell's portfolio following the BG acquisition. The report makes clear Shell's commitment to natural gas, and how Shell sees it as an important fuel in the journey towards an energy transition. However, natural gas cannot play a constructive role in a low-carbon transition without minimisation of methane emissions.

The ERC is pleased that Shell has now joined the Climate and Clean Air Coalition's "Oil and Gas Methane" partnership, but suggests further action and disclosure are needed. Given Shell's advocacy and emphasis on natural gas, it is important for Shell to articulate a comprehensive plan for methane reduction. This should address the operating practices and regulatory requirements that are needed for the oil and gas industry to deal effectively with the problem of methane leakage from the production, transportation and use of natural gas.

PRODUCT STEWARDSHIP AND CIRCULAR ECONOMY

The report lacks comprehensive information on Shell's approach to product stewardship, particularly end of life responsibility and circular economy initiatives. The ERC recommends that the company share more in the report about the policies and plans that will guide development of Shell thinking on product stewardship including end of life as well as the ways that the circular economy may affect Shell's businesses.

ADVOCACY, PARTNERSHIPS AND COLLABORATIONS

The report describes various partnerships and collaborations through which Shell advocates its position on sustainability issues, including on climate change. There is growing global concern that oil and gas companies have advocated against stronger climate regulations though their trade associations and in private discussions with governments. The ERC suggests that future reports clarify when and how Shell's public positions on material issues differ from those of its trade associations.

DIVESTMENTS

In 2016, Shell announced a $30 billion divestment programme, which will raise capital and has the potential to shift the carbon intensity of the company's portfolio. The ERC believes the report should explain to stakeholders how Shell addresses the environmental and social liabilities associated with divested assets.

NIGERIA

The ERC recognises the security challenges and complexity of operating in Nigeria and notes Shell's safety record there improved in 2016. The ERC suggests future reporting should explain in more detail the steps Shell is taking to minimise harm to communities from spills and the timeline for major remediation commitments.

CONCLUSION

The Committee recognises Shell's commitment to transparency and reporting best practice and to stakeholder engagement, including with the ERC. There is progress in the 2016 report, particularly the prominent disclosure of changes to the sustainability elements of the executive scorecard and compensation, as well as the inclusion of more strategic topics. In the 2017 report, the ERC hopes to see clearer description of quantifiable and time-bound sustainability goals and ambitions, which will enhance the reader's ability to judge progress.

Concept and implementation by nexxar
Design by Conran Design Group

SHARE YOUR OPINION

If you have any views on issues described in this report, or on the report itself, please email us at: sustainabilityreport@shell.com

All our reports are available at
http://reports.shell.com

- Comprehensive financial information on our activities throughout 2016
- Detailed operational information including maps
- Report on our progress in contributing to sustainable development

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