1.1 Presentation of the Group and its governance

1.1.1 A major energy player underpinned by stable governance

1.1.1.1 4th largest international oil and gas major with consolidated sales of $209,363 million in 2018

TOTAL, a producer of oil and gas for nearly a century with a presence in more than 130 countries on 5 continents, is a major energy player[1] that produces and markets fuels, natural gas and low-carbon electricity.

The Group's activities include the exploration and production of oil and gas, refining, petrochemicals and the distribution of energy in various forms to the end customer. More than 104,000 employees are committed to contributing to supply to as many people as possible, a more affordable, more available and cleaner energy.

Energy, an essential resource, accompanies the development of society. In view of the major challenges of today's world, energy producers have a key role to play.

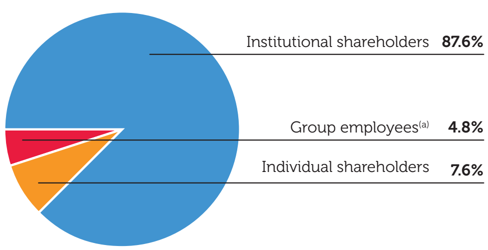
Thanks to the support provided by its governance and a diverse shareholder base, the Group is able to support its collective ambition to become the responsible energy major.

1.1.1.2 A diverse shareholder base

The shareholder base of TOTAL S.A. is diverse and spread throughout the world. It comprises institutional investors, individual shareholders and employee shareholders committed to the Company project. For more information, refer to point 6.4 of chapter 6.

Shareholding structure by shareholder type

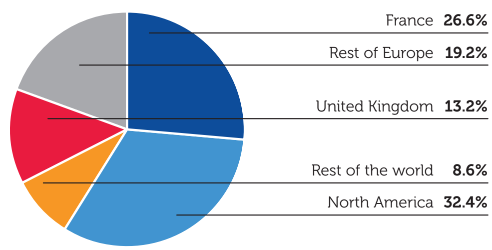
Estimates below are as of December 31, 2018, excluding treasury shares, based on the survey of identifiable holders of bearer shares conducted on that date.



(a) On the basis of employee shareholding as defined in Article L. 225-102 of the French Commercial Code, treasury shares excluded (4.8% of the total share capital, refer to point 6.4.1 of chapter 6).

Shareholding structure by area

Estimates below are as of December 31, 2018, excluding treasury shares, based on the survey of identifiable holders of bearer shares conducted on that date.



The number of individual and institutional shareholders of TOTAL S.A. is estimated at approximately 450,000.

(1) TOTAL S.A., a French limited liability company (*société anonyme*), currently constitutes with all the Group's companies the world's fourth largest publicly traded integrated oil and gas group based on market capitalization (in dollars) as of December 31, 2018.

1.1.1.3 A Board of Directors that is fully committed and able to determine the Company's strategic orientations

As of March 13, 2019

12 directors	**1** Lead Independent Director	**1** director representing employee shareholders	**1** director representing employees	**90%** independent directors (a)
6 nationalities represented	**45.5%** women (b)	**54.5%** men (b)	**5.2** years average seniority of the Board	**61** average age of directors

(a) Excluding the director representing the employee shareholders and the director representing employees, in accordance with the recommendations of the AFEP-MEDEF Code (point 8.3). For more information, refer to point 4.1.1.4 of chapter 4.
(b) Excluding the director representing employees, in accordance with Article L. 225-27-1 of the French Commercial Code.

The Board of Directors determines the strategic orientations of TOTAL and supervises their implementation. It approves investment and divestment operations when they concern amounts that exceed 3% of the Group's equity and examines all matters related to the proper running of the Company. It monitors the management of both financial and non-financial matters and ensures the quality of information provided to shareholders and to financial markets.

The Board of Directors relies on the work of four Committees that it has constituted: the Audit Committee, the Governance and Ethics Committee, the Compensation Committee and the Strategy & CSR Committee.

Composed as of March 13, 2019, of 12 directors, including 9 independent members, the Board of Directors reflects diversity and complementarity of experience, expertise, nationalities and cultures necessary to take account of the interests of all the Group's shareholders and stakeholders.

Since December 2015, Mr. Patrick Pouyanné has held the position of Chairman and Chief Executive Officer of TOTAL S.A. His term of office having been renewed at the General Shareholders' Meeting on June 1, 2018 for a three-year period, the Board of Directors has reappointed Mr. Pouyanné as Chairman and Chief Executive Officer for an equal period to that of his mandate as a director. The decision to uphold the combined functions of Chairman of the Board of Directors and Chief Executive Officer was made following work undertaken by the Governance and Ethics Committee, in the interest of the Company and in compliance with the traditions of the Group. The Board of Directors deemed that the unified Management Form was most appropriate to the Group's organization, *modus operandi* and business, and to the specificities of the oil and gas sector. In its decision, the Board in particular noted the advantage of having unified management in strategic negotiations with States and the Group's partners. The Board of Directors regularly examines whether maintaining the unified Management Form remains appropriate.

Attentive to the concerns of investors and stakeholders, the Board of Directors pays specific attention to the balance of power within the Group. Consequently, every year, the Board examines desirable changes to its composition to ensure it is maintaining a high level of independence and the full involvement of the directors in the work of the Board and of the Committees. It was also for these reasons that the Board of Directors, at its meeting on December 16, 2015, amended the provisions of its Rules of Procedure to provide for the appointment of a Lead Independent Director in case of the combination of the positions of Chairman of the Board of Directors and Chief Executive Officer. The Lead Independent Director's duties, resources and rights are described in the Rules of Procedure of the Board of Directors. Aside from these duties, the Chairman and Chief Executive Officer and the Lead Independent Director strive to maintain permanent contact on any important matter concerning the running of the Company.

Since 2016, the Lead Independent Director has organized executive sessions with the independent directors so that they may discuss the Group's strategic challenges and working practices. The directors are also in regular contact with the members of the Group's management team, whether members of the Executive Committee during Board Meetings or operational managers during Group site visits. These interactions between directors and managers enable the directors to gain a practical understanding of the Group's activities.

The balance of power within the Company's bodies is thereby ensured by a stable and structured governance.

Overview of the Board of Directors

Appendix 3 of the AFEP-MEDEF Code

	Personal information				Experience	Position on the Board				Participation in Board Committees
	Age	Gender	Nationality	Number of shares	Number of directorships held at listed corporations (a)	Indepen-dence	Initial date of appointment	Term of office expires	Length of service on the Board	
Patrick Pouyanné Chairman and Chief Executive Officer	55	M		127,617	1		2015	2021	4	✔
Patrick Artus	67	M		1,000	2	✔	2009	2021	10	✔
Patricia Barbizet Lead Independent Director	63	F		1,050	4	✔	2008	2020	11	✔
Marie-Christine Coisne-Roquette	62	F		4,472	1	✔	2011	2020	8	✔
Mark Cutifani	60	M		2,000	1	✔	2017	2020	2	✔
Maria van der Hoeven	69	F		1,000	2	✔	2016	2019	3	✔
Anne-Marie Idrac	67	F		1,250	4	✔	2012	2021	7	✔
Gérard Lamarche	57	M		3,064	4	✔	2012	2019	7	✔
Jean Lemierre	68	M		1,042	1	✔	2016	2019	3	✔
Renata Perycz Director representing employee shareholders	55	F		549	0	n/a	2016	2019	3	✔
Christine Renaud Director representing employees	50	F		200	0	n/a	2017	2020	2	✔
Carlos Tavares	60	M		1,000	2	✔	2017	2020	2	✔

(a) Number of directorships held by the director at listed companies outside his or her group, including foreign companies, assessed in accordance with the recommendations of the AFEP-MEDEF Code, point 18 (refer to point 4.1.1.3 of chapter 4).

Overview of the Committees

As of March 13, 2019

Audit Committee	Governance and Ethics Committee	Compensation Committee	Strategy & CSR Audit Committee
4 members	**4 members**	**5 members**	**6 members**
100% independent	**100% independent**	**100% independent (a)**	**80% independent (a)**
Marie-Christine Coisne-Roquette*	Patricia Barbizet*	Gérard Lamarche*	Patrick Pouyanné*
Patrick Artus	Mark Cutifani	Patricia Barbizet	Patrick Artus
Maria van der Hoeven	Anne-Marie Idrac	Marie-Christine Coisne-Roquette	Patricia Barbizet
Gérard Lamarche	Jean Lemierre	Renata Perycz (b)	Anne-Marie Idrac
		Carlos Tavares	Jean Lemierre
			Christine Renaud (c)

(a) Excluding the director representing employee shareholders and the director representing employees, in accordance with the recommendations of the AFEP-MEDEF Code (point 8.3).
(b) Director representing employee shareholders.
(c) Director representing employees.
* Chairperson of the Committee.

Activities of the Board of Directors and of the Committees in 2018

10 meetings of the Board of Directors

95% average Board meeting attendance rate of the directors

1 executive session chaired by the Lead Independent Director

7 Audit Committee meetings
100% attendance

3 Governance and Ethics Committee meetings
91.7% attendance

2 Compensation Committee meetings
100% attendance

3 Strategy & CSR Committee meetings
100% attendance

The duties and work of the Board of Directors and of its Committees are described in point 4.1.2 of chapter 4.

1.1.2 The Group in a few figures

1.1.2.1 2018 key figures

As of December 31, 2018[a]

Present in more than **130** countries	**104,460** employees	**€121.9 billion** market capitalization on Euronext Paris	**€2.56** dividend per share in 2018[b]
$13.6 billion adjusted net income – Group share	**$26.1 billion** debt adjusted cash flow (DACF)	**$15.6 billion** net investments	**$1.0 billion** R&D costs
> 8% growth in production of Exploration & Production	**12.2%** return on equity (ROE)	**11.8%** return on average capital employed (ROACE)	**15.5%** gearing ratio

(a) For a definition of the various performance indicators, refer to point 1.4.1.2 of this chapter and to Note 3 to the Consolidated Financial Statements (point 8.7 of chapter 8).
(b) Subject to approval by the Shareholders' Meeting on May 29, 2019.

1.1.2.2 Key figures by segment

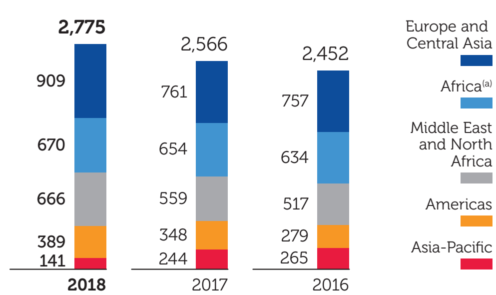
Exploration & Production

Hydrocarbon production

	2018	2017	2016
Combined production *(kboe/d)*	2,775	2,566	2,452
Oil (including bitumen) *(kb/d)*	1,378	1,167	1,088
Gas (including Condensates and associated NGL) *(kboe/d)*	1,397	1,399	1,364

	2018	2017	2016
Combined production *(kboe/d)*	2,775	2,566	2,452
Liquids *(kb/d)*	1,566	1,346	1,271
Gas *(Mcf/d)*	6,599	6,662	6,447

Hydrocarbon production by geographic area *(kboe/d)*



(a) Excluding North Africa.

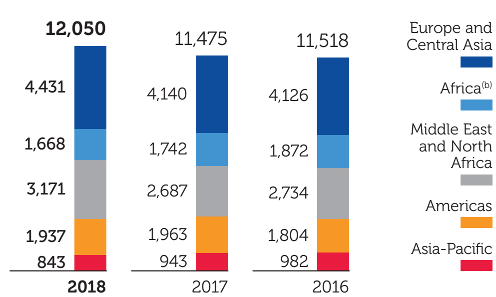
Hydrocarbon proved reserves[a]

	2018	2017	2016
Hydrocarbon reserves *(Mboe)*	12,050	11,475	11,518
Oil (including bitumen) *(Mb)*	5,203	4,615	4,543
Gas (including Condensates and associated NGL) *(Mboe)*	6,847	6,860	6,975

(a) Proved reserves based on SEC rules (Brent at $71.43/b in 2018, $54.36/b in 2017 and $42.82/b in 2016).

	2018	2017	2016
Hydrocarbon reserves *(Mboe)*	12,050	11,475	11,518
Liquids *(Mb)*	6,049	5,450	5,414
Gas *(Mcf)*	32,325	32,506	32,984

Hydrocarbon proved reserves[a] **by geographic areas** *(Mboe)*



(a) Proved reserves based on SEC rules (Brent at $71.43/b in 2018, $54.36/b in 2017 and $42.82/b in 2016).
(b) Excluding North Africa.

Gas, Renewables & Power

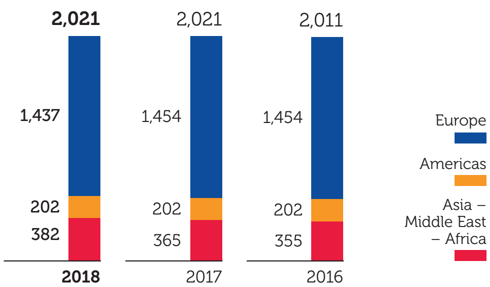
Managed LNG volumes *(Mt)*	**2018**	**2017**	**2016**
Managed LNG volumes	21.8	15.6	12.9

Installed power capacities by gas or renewables [(a)] *(GW)*	**2018**	**2017**	**2016**
Installed power capacities by gas or renewables	2.7	0.9	0.8

(a) Group share.

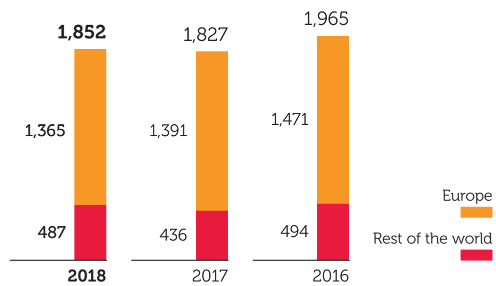
Refining & Chemicals and Marketing & Services

Crude oil refining capacity [(a)] *(kb/d)*



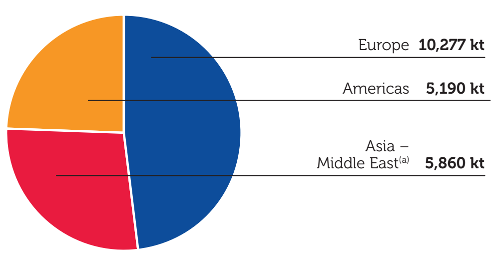
(a) Capacity data based on crude distillation unit stream-day capacities under normal operating conditions, less the average impact of shutdowns for regular repair and maintenance activities.

Refinery throughput [(a)] *(kb/d)*



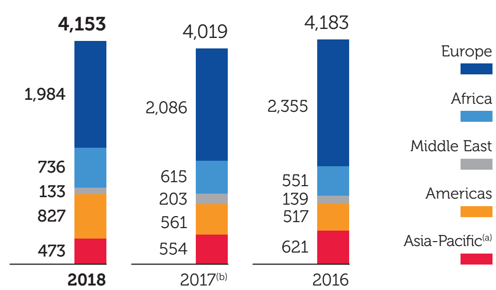
(a) Includes share of TotalErg (sold in 2018), as well as refineries in Africa that are reported in the Marketing & Services segment.

Petrochemicals production capacity by geographic area as of December 31, 2018



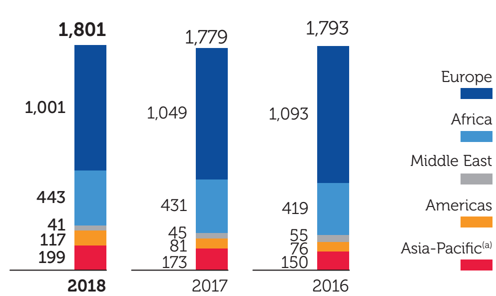
(a) Including interests in Qatar, 50% of Hanwha Total Petrochemicals Co. Limited and 37.5% of SATORP in Saudi Arabia.

Petroleum product sales *(kb/d)*



(a) Including Indian Ocean islands.
(b) 2017 data restated. Sales in Turkey, Libanon, Jordan and Israel were reclassified from Europe to the Middle East. Sales in Morocco, Algeria and Tunisia were reclassified from Europe to Africa.

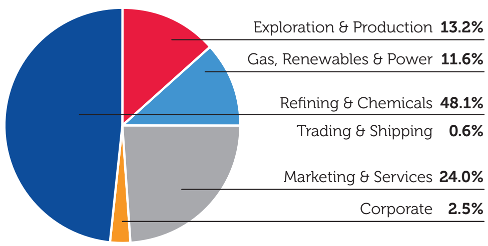
Marketing & Services petroleum product sales by geographic area *(kb/d)*



(a) Including Indian Ocean islands.

1.1.2.3 Workforce

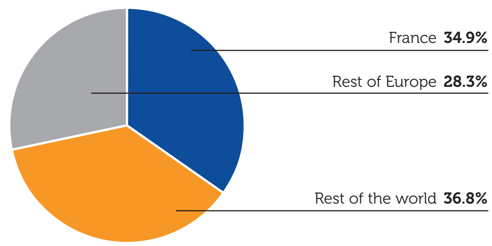
Employees by segment [(a)]



(a) Refer to point 5.3 of chapter 5.

Workforce as of December 31, 2018: 104,460.

Employees by region [(a)]



(a) Refer to point 5.3 of chapter 5.

Workforce as of December 31, 2018: 104,460.

1.2 An ambition that goes hand in hand with sustainable growth: "become the responsible energy major"

1.2.1 A collective ambition to meet the challenges facing the energy sector

TOTAL is an integrated energy group and one of the world's largest. Through its international presence and its activities, TOTAL's goal is to make its development a vehicle of progress that benefits as many people as possible.

The United Nations, which adopted in 2015 the 17 Sustainable Development Goals (SDGs) originally aimed for States, have called upon corporations' contribution to collectively find solutions to sustainable development challenges. TOTAL has committed since 2016 to contributing to the SDGs and has endorsed the United Nations' recommendations [(1)] and worked on better identifying the scope of its contribution to the SDGs.

Through its activities, the Group is concerned by all of the SDGs. However, TOTAL has identified certain SDGs as those on which it can have the most significant contribution, such as decent work and human rights, climate change and access to energy.

Access to energy is a source of progress and the condition for economic and social development as well as for the improvement of the standard of living of people around the world. In most countries, and in the developing countries in particular, access to low-cost energy is thus a priority.

The Group's vocation is to produce the energy that the world needs, and will need in the future, and to make it accessible to as many people as possible. This is a real challenge; close to one billion individuals [(2)] still have no access to electricity.

This vocation is to be accomplished in a responsible manner and by working to make an effective contribution to the climate change challenge, in particular.

Meeting the energy needs of a growing global population, providing tangible solutions to contribute limiting global warming, adapting to new patterns of energy production and consumption and changes to the expectations of customers and stakeholders constitute the challenges that a major energy player like TOTAL can help to tackle.

To meet these challenges, TOTAL's ambition is to become the responsible energy major by contributing to supply to as many people as possible a more affordable, more available and cleaner energy:

— more affordable – as low-cost energy is essential to favor the economic development of billions of people who seek to improve their living conditions;

— more available – as people expect energy to be continuously available and accessible on a daily basis;

— cleaner – as the Group aims to both reduce the environmental footprint and the CO_2 emissions of its operations, and to actively contribute to finding solutions to limit the impact of climate change, particularly by providing its customers with a mix of energy products whose carbon intensity is expected to decrease regularly.

1.2.2 A clear strategy for sustainable growth

To fulfill this ambition, TOTAL implements a clear strategy that is based on four main priorities and that integrates the challenges of climate change:

— drive profitable and sustainable growth in Exploration & Production activities, with priority given to the production of gas in particular of liquefied natural gas (the fossil fuel that emits the least amount of carbon dioxide) and constant concern on producing at a competitive cost by ensuring strict investment discipline;

— further develop the competitiveness of the large integrated refining and petrochemical platforms and expand sustainable biofuels and recycling activities;

— increase the distribution of petroleum products, particularly in high-growing regions, and offer innovative solutions and services that meet the needs of customers above and beyond the supply of petroleum products; and

(1) According to SDG Compass: Understanding the SDGs, defining priorities, setting goals, integrating, reporting and communicating.
(2) Source: Energy Access Outlook 2018 published by the International Energy Agency (IEA).

— expand along the full gas value chain by unlocking access to new markets and boost profitable growth in the low carbon electricity businesses, from production based on gas and renewable energies to electricity and gas distribution to end customers.

In addition, TOTAL intends to promote a better use of natural resources by supporting the circular economy, and implement a program of actions, particularly in the following areas: waste management, new ranges of polymers, solarization of service stations, improved efficiency energy and purchasing.

1.3 Advantages that allow the Group to stand out in a changing energy world

To become the responsible energy major and to help provide specific solutions to major challenges that are to come over the next decades, TOTAL can rely on several advantages: its strong identity and values, the know-how of employees committed to better energy, its integrated business model and its geographic presence.

1.3.1 A long-standing energy player that draws on its strong identity

Energy is rooted in TOTAL's history.

A producer of oil and gas for almost a century, the Group's history started in 1924 with the creation of *Compagnie française des Pétroles* (CFP), which began its oil production activities in the Middle East at this time. Over the years, the Group has diversified its activities and opened sites around the world by positioning itself in the gas, refining and petrochemical segments and the distribution of petroleum products, solar power, sustainable biofuels and electricity.

1.3.1.1 Key dates in the Group's history

1920	Creation in Brussels by an Antwerp-based group of bankers and investors of *Compagnie Financière belge des Pétroles*, known as PetroFina
1924	**Creation of *Compagnie française des Pétroles* (CFP) by Raymond Poincaré, French Prime Minister**
1927	Initial discovery of the Kirkuk field in Iraq; the field's reserves are considerable
1933	Commissioning of the Gonfreville refinery in Normandy (France) with an annual capacity of 900,000 t of crude oil
1939	Discovery in France of the Saint Marcet gas field by *Centre de recherches de pétrole du Midi* Creation of *Régie Autonome des Pétroles* (RAP), which later became the Elf Group
1941	Creation of *Société nationale des pétroles d'Aquitaine* (SNPA)
1945	Creation of *Bureau de recherches de pétroles* (BRP)
1947	Creation of *Compagnie française de Distribution des Pétroles en Afrique*
1951	Discovery of the Lacq gas field (France) by SNPA
1954	Launch of the TOTAL brand by CFP
1956	Discovery of the Edjeleh, Hassi R'Mel (gas) and Hassi Messaoud (oil) fields in the Algerian Sahara
1960	Construction of the Gonfreville steam cracker (France) to respond to the growing demand for plastic
1961	Discovery of the first offshore fields in Gabon; the Anguille field was the first one found
1965	TOTAL acquires Desmarais Frères, an important player in the distribution market
1966	Creation of *Entreprise de recherches et d'activités pétrolières* (ERAP) following the merger of BRP and RAP
1967	Launch of the ELF brand
1970	Elf takes control of Antar
1971	The Ekofisk field in the North Sea starts production Creation of GIE ATO, a joint-venture between SNPA and TOTAL in the chemicals industry
1974	Hutchinson-Mapa joins the Group
1976	Creation of *Société nationale Elf Aquitaine* (SNEA) following the merger of ERAP and SNPA
1980	Creation of Chloé Chimie, a joint-venture between Elf Aquitaine, CFP and Rhône Poulenc
1982	Drilling by CFP of the first deep-offshore well in the Mediterranean Sea
1983	Birth of the company Atochem, an SNEA subsidiary, following the merger of ATO Chimie, Chloé Chimie and a part of Péchiney Ugine Kuhlmann Opening of the first self-service station in France
1985	CFP becomes Total-CFP and then TOTAL in 1991
1994	Disposal by the French state of its majority stake in the capital of Elf Aquitaine
1996	Disposal by the French state of its remaining stake in the capital of Elf Aquitaine
2000	Following the incorporation of Fina in 1999, TOTAL acquires Elf Aquitaine. The new Group is called TotalFinaElf and is the world's 4th largest oil major
2001	The Girassol field on Block 17 in Angola starts production
2003	TotalFinaElf changes its name to TOTAL
2006	Spin-off of Arkema

2011	Investment in the solar energy segment with the acquisition of 60% of the US company, SunPower
2016	Acquisition of Saft Groupe, a battery manufacturer, and of Belgian company Lampiris, a supplier of green electricity and natural gas
2017	Announcement of the acquisition of Mærsk Oil & Gas A/S in a share and debt transaction Announcement of the acquisition of Engie's LNG business
2018	Acquisition of Direct Énergie, electricity producer and distributor

1.3.1.2 Five strong values at the heart of the Group

Safety, Respect for Each Other, Pioneer Spirit, Stand Together and Performance-Minded represent, just as its history, the part of TOTAL's identity shared by all employees. These values guide the daily actions and relations of the Group with its stakeholders.

> *"These values describe and unite us. They are the levers on which we rely to achieve our ambition of becoming the responsible energy major."*
>
> Patrick Pouyanné, Chairman and Chief Executive Officer

These five strong values also require all of TOTAL's employees to act in an exemplary manner in priority in the following areas: safety, security, health, environment, integrity in all of its forms (particularly, the prevention of corruption, fraud and anti-competitive practices) and human rights.

It is through strict adherence to these values and to this course of action that the Group intends to build strong and sustainable growth for itself and for all of its stakeholders, and thereby deliver on its commitment to better energy.

1.3.2 Employees committed to better energy

As of December 31, 2018

104,460
employees

35.1%
women employees

21.8%
women Management Committee members
(head office and subsidiaries)

over
1,800
training courses available

over
150
nationalities represented

52%
international members on the subsidiaries' Management Committees

over
650
industrial, commercial and support job-related skills within the Group

316
active agreements
(including 190 in France)
signed with employee representatives

1.3.2.1 Employee diversity, a competitive edge

The Group is an image of its employees: diverse. The diversity of talents within TOTAL is crucial to its competitiveness, innovative capacity and attractiveness.

With over 150 nationalities represented, a presence in over 130 countries, and more than 650 business-related competencies, the Group is a global player. Women make up 35.1% of the workforce and 27.7% of managers. A wide range of opinions and backgrounds enable innovative solutions and new opportunities to arise.

Such diversity is an essential asset for the Group. The capacity of the Group's employees to mobilize themselves and act in an entrepreneurial spirit is vital. It enables ambitious projects to be completed and offers everyone the opportunity to give meaning to their work and grow professionally.

Diversity is embodied, in particular, by the presence of 21.8% women members on the Management Committees (head office and subsidiaries), 52% international members on the subsidiaries' Management Committees and 24% international members on the head office Management Committees. In order to strengthen the representation of women in governing bodies, the Executive Committee set a goal in late 2018 to reach 20% of women members of Management Commitees of branches and large operational divisions. This reality attests to the Group's desire to strengthen diversity in all its forms as a vector of innovation and progress. The Diversity policy is promoted by the Diversity Council, which is chaired by a member of the Group's Executive Committee.

> *"Women and men are at the heart of our collective project. Our employees – in all corners of the planet and thanks to their individual commitment – are the energy that drives our Group forward. This diversity is an invaluable asset that makes it possible to accomplish ambitious projects."*
>
> Namita Shah, President, People & Social Responsibility

1.3.2.2 Employee commitment is essential to the success of the Company project

The Group addresses its challenges thanks to the commitment of its employees. It is for this reason that the Group strives to ensure that the most demanding safety, ethics and integrity, management and social performance practices are implemented wherever it operates. The aim of this process is to create the conditions that enable everyone to fulfill his or her potential and TOTAL to pursue its development.

TOTAL has adopted a proactive approach by subscribing to the principles of numerous national and international agreements that fight against all forms of discrimination and by striving to ensure the safety and security of its employees and the respect of their fundamental rights. The Group has a long-standing commitment to promoting equal opportunity and diversity, which constitute, for everyone, a source of development where only expertise and talent count. In 2018, the Group decided to sign the Global Business and Disability Network Charter of the International Labour Organization (ILO) and is gradually implementing these principles in its subsidiaries.

The Group is also committed to social dialogue, which is one of the vectors used to modernize companies. Among the numerous stakeholders with which TOTAL maintains regular dialogue, the Group's employees and their representatives have a privileged position and role.

This approach is illustrated by several commitments made by the Group, such as its adhesion on December 21, 2017, to the Global Deal initiative, alongside some 60 partners, states, trade unions, companies and international organizations. This international multi-party initiative aims at fighting against inequalities, encouraging social dialogue and promoting fairer globalization. It states that social dialogue, collective bargaining and trade-union freedom play an essential role in the fulfillment of the Sustainable Development Goals (SDGs 8, 10 and 17) of the United Nations. Similarly, the signing of a global agreement with the trade union federation IndustriALL in 2015 guarantees for the Group's employees a high level of commitment to social matters in countries where the Group operates. The goal is to maintain the partnership and renegotiate this agreement for 2019 and beyond. The Group had 316 active agreements (including 190 in France) with employee representatives in place at the end of 2018.

TOTAL encourages a managerial policy that favors commitment, accountability and performance evaluation and is built on promoting functional and geographic mobility and training to ensure each person's skills development and employability (76% of employees within the scope of the WHRS [1] took at least one on site training course in 2018).

The technical and commercial know-how of employees and their ability to manage large projects underpin the Group's operational excellence and are essential for the Group's development. It is thanks to the recognized expertise of its employees that TOTAL is able to form partnerships of trust with the world's main producing and consuming nations in the most demanding areas, such as deep offshore, liquefied natural gas (LNG), low carbon energy, refining and petrochemicals, which are also areas in which the Group has developed some of the most high-performance platforms. It is for this reason that all employees, regardless of their function, are encouraged to build on their expertise and competencies by accessing a wide range of trainings.

In order to improve the Group's social performance, the expectations of employees are regularly listened to and discussed. Examples include the Total Survey, which compiles the views and suggestions for improvement of tens of thousands of employees every two years. Initiatives that have allowed employees to participate in building the "*One Total*" Company project since 2016 are initiated.

This approach testifies to the Group's desire to entrench a continuous improvement process that benefits everyone. For more information, refer to point 5.3 of chapter 5.

1.3.3 The strength of the Group's integrated business model

1.3.3.1 A resilient integrated business model

Oil and gas are commodities that are traded on markets that are known for their volatility. To manage this constraint as well as possible, TOTAL opted for an integrated business model with activities throughout the oil and gas value chain. It extends from exploration and production, refining, liquefaction, petrochemicals and trading to, finally, the distribution of products to the end customer.

This business model enables the Company to benefit from synergies between different activities and from price volatility. It also enables the Company to manage the bottom of the cycle better and capture margin when the market improves. Thanks to an integrated business model, the Group's Upstream activities, which are more dependent on the price of oil, can complement its Downstream activities, which – at the bottom of the cycle – enable the Group to benefit from added value untapped by the Upstream part of the business.

> *"It is thanks to the effectiveness of our integrated business model for the oil chain that we were able to withstand high oil price volatility. And it is the same model that we apply to gas and renewable energies, both intended for the generation of electricity."*
>
> Patrick Pouyanné, Chairman and Chief Executive Officer

(1) The Worldwide Human Resources Survey (WHRS) is an annual survey which comprises approximately 211 indicators. Refer to point 5.11.2 of chapter 5.

1.3.3.2 A relevant, integrated business model under development on the gas-renewables-electricity chain

In the coming years, according to the IEA, the growth in demand for electricity is expected to outstrip global demand for energy. In light of the digitization of the economy, the mobility revolution, and decentralized generation, many products and services are going to be "electrified" while, at the same time, a growing share of the world's population will benefit from access to electricity.

To fulfill its ambition, the Group intends to apply this integrated business model to the electricity chain, from the production of low carbon energy to the generation of electricity.

Preference will be given to three main priorities:

- integration on the gas chain from production to liquefaction and distribution;
- the generation of electricity using gas or renewable energies and its storage; and
- the trading and the sale of gas or electricity as the producer, or not.

1.3.4 Geographic presence: key to the Group's future growth

It is thanks to its pioneer spirit and sense of solidarity that TOTAL has become a worldwide oil and gas major and that it has forged partnerships of trust with its host countries. Remaining loyal to these principles means being continuously open to forming new alliances, key to the Group's development, and creating new opportunities in the energy sector despite geopolitical uncertainty.

It is thanks to a strong and lasting geographic presence that the Group will be able to meet its goal of becoming a recognized partner in the sustainable economic and social development of the communities and regions in which it operates for the creation of shared value.

1.3.4.1 From one history to one ambition

The Group is present in over 130 countries and on five continents. There are three geographic regions in particular that represent the historical foundations of TOTAL's strategy and today stand out thanks to the quality of the on-site teams and solid partnerships forged over time:

- Europe: The core of the Group's knowledge. Europe is home to the Group's decision-making center; it is the hub of its research and innovation work and constitutes a strong industrial base;
- Middle East: the Group began its production activities in this region and is recognized in the Middle East as a partner of choice among producing nations and their national oil companies. The aim of the Group is to develop its activities in all business lines in this region, even when geopolitical tension rises;
- Africa: TOTAL is the largest integrated major notably thanks to the volume of hydrocarbon production and the number of Group-branded service stations on the African continent[(1)]. TOTAL generates electricity from renewable sources. The Group intends to remain the continent's partner of choice and to contribute to its economic and social development through the creation of shared value.

Today, new regions which are vital for the Group have appeared, particularly the Americas, which represent a strong growth opportunity for all of the Group's businesses, Asia, in order to benefit from this market's high rate of growth, and Russia, where TOTAL is working on major industrial projects and maintains a special and long-term relationship with local industrial players.

(1) Source: Company data.

1.3.4.2 Managing geopolitical uncertainty

The world is confronted by political and geopolitical uncertainty characterized by tension connected to conflict and war in countries such as Syria, Iraq, Yemen and Libya. It is exacerbated by international terrorism.

In this context, TOTAL intends to develop its activities by putting its competencies to the benefit of each of the countries where it operates, by complying with applicable laws and international economic sanctions where imposed. The Group also ensures that the capital invested in the most sensitive countries remains at a level limiting its exposure in each of them.

This is the approach TOTAL intends to pursue and which was materialized following its decision to carry on investing in Russia while complying with the economic sanctions imposed by the United States and Europe, or by its decision to stop its operational activities in Iran following the re-imposition of U.S. secondary sanctions (refer to point 3.1.9.1 of chapter 3). The Group, if necessary, stops its activities in countries that become too risky (such as Yemen and Syria).

Loyalty to its partners, particularly during such kind of situations, is also a strong characteristic of the Group.

TOTAL's activities, wherever they are, are carried out in strict adherence to applicable laws and the Group's Code of Conduct and within the framework of compliance and risk management procedures.

By continuing to invest and to supply energy, the Group helps to maintain conditions that favor the economic development of these regions.

For more information on risk factors, internal control and risk management procedures and reasonable vigilance measures implemented by the Group, refer to points 3.1, 3.3 and 3.5 of chapter 3.

> *"During these troubled times, our industry can and must be a stabilizing factor."*
>
> Patrick Pouyanné, Chairman and Chief Executive Officer

1.3.4.3 A local socio-economic development partner

Safety, integrity, respect for human rights, and societal and environmental responsibility are principles and values that form part of the Group's operating processes. If TOTAL is able to build and develop partnerships throughout the world, it is also because it has incorporated a local value creation process into its development model. This process is systematic, professional and a major competitive advantage.

Based on dialogue with the local population and public and private players, this process is used to identify development priorities and create synergies. The Group intends to apply this approach over the long term to ensure that its major projects create shared prosperity.

Beyond the societal initiatives that are directly related to the Group's industrial and commercial activities, TOTAL is commited to general interest measures in the countries where it operates. In the face of growing inequality and environmental challenges, the Group intends to strengthen its public interest initiatives and has implemented a new civic commitment policy in line with its history, its values and its businesses. It wishes to act in a way that ensures the vitality and sustainability of the territories in which the Group is present by favouring actions that benefit young people first.

In order for its corporate citizenship initiatives to have a greater impact, four areas of focus have been defined as part of the Total Foundation program driven by the *Fondation d'entreprise Total* in France and supported by the Group:

- road safety: committed to safer mobility;
- forests and climate: committed to a more beneficial environment for humans;
- education and integration of young people: committed to empowering young people in socially vulnerable situations; and
- dialogue on cultures and heritage: committed to cultural openness and appreciation of heritage.

Since the end of 2018, the Group has launched Action!, the Group's Employee Volunteering Program, through which TOTAL gives its employees the time and means to get involved and contribute to the development of the areas where the Group is present. It thus allows employees, on a voluntary basis, the possibility to support, up to three days per year during their working time, or outside of it, local solidarity projects within the scope of the Total Foundation program.

1.4 Strong results driven by strong hydrocarbon production growth and discipline on spend

1.4.1 2018 results

1.4.1.1 Outlook for the 2018 fiscal year

Benefiting from the rise of oil prices to $71/b on average in 2018 compared to $54/b in 2017, while remaining volatile, the Group reported adjusted net income of $13.6 billion in 2018, an increase of 28%, a return on average capital employed close to 12%, the highest among the majors, and a pre-dividend breakeven below 30 $/b.

These excellent results reflect the strong growth of more than 8% for the Group's hydrocarbon production, which reached a record level of 2.8 Mboe/d in 2018 and led to a 71% increase in Exploration & Production's adjusted net operating income. The year was highlighted by the start-up of Ichthys in Australia, Yamal LNG in Russia, deep-water projects Kaombo Norte in Angola and Egina in Nigeria, as well as the counter-cyclical acquisitions of Maersk Oil and new offshore licenses in the United Arab Emirates.

In addition, the Group maintained its financial discipline. Net investments were $15.6 billion in 2018, in line with its objective, and $4.2 billion in cost reduction was achieved. Debt-adjusted cash flow (DACF) (1) was $26 billion in 2018, driven largely by the 31% increase in cash flow from Exploration & Production. The Group's balance sheet was solid with a gearing ratio of 15.5%, below the target limit of 20%.

The Group is continuing to expand along the value chain of integrated gas and low-carbon electricity. With its acquisition of Engie's LNG assets TOTAL is the second largest publicly-traded player in the LNG business, and its position will be strengthened with the 2019 start-up of the Cameron LNG project. In addition, the Group accelerated its growth in low-carbon electricity, notably with the acquisition of Direct Énergie.

In an environment of lower European refining margins, the Downstream relied on the availability of its units and the diversity of its portfolio to generate $6.5 billion of cash flow and profitability of more than 25%. The Group is continuing to implement its strategy for growth in petrochemicals by launching projects in the United States, Saudi Arabia, South Korea and Algeria. TOTAL has also continued to expand Marketing & Services in fast-growing areas, notably in Mexico, Brazil and Angola.

Conforming to the shareholder return policy announced in February 2018, the Group increased the 2018 dividend by 3.2% and bought back $1.5 billion of its shares in 2018. Given the solid financial position, which is benefiting from growing cash flow, the Board of Directors confirmed the shareholder return policy for 2019. It plans to increase the interim dividend by 3.1% to 0.66 euro per share, end the scrip dividend option following the general assembly, and continue the share buyback policy in the amount of $1.5 billion in a 60 $/b environment.

"An ajusted net income of $13.6 billion, with oil prices averaging $71, is better than in 2014, when it had reached $99. These excellent results reflect the strong growth of more than 8% for the Group's hydrocarbon production, and our financial discipline."

Patrick de La Chevardière, Chief Financial Officer

(1) DACF = debt adjusted cash flow which is defined as cash flow from operating activities, at replacement cost, before changes and financial charges.

1.4.1.2 Group 2018 results

Consolidated data in millions of dollars, except for earnings per share, dividends, number of shares and percentages.

(M$)	2018	2017	2016
Adjusted net operating income from business segments [(a)]	15,997	11,936	9,410
Net income (Group share)	11,446	8,631	6,196
Adjusted net income (Group share) [(a)]	13,559	10,578	8,287
Fully diluted weighted-average shares *(millions)*	2,624	2,495	2,390
Adjusted fully-diluted earnings per share *(dollars)* [(a) (b)]	5.05	4.12	3.38
Dividend per share *(euros)* [(c)]	2.56	2.48	2.45
Gearing ratio [(d)] (as of December 31)	15.5%	11.9%	21.1%
Return on average capital employed (ROACE) [(e)]	11.8%	9.4%	7.5%
Return on equity (ROE)	12.2%	10.1%	8.7%
Gross investments [(f)]	22,185	16,896	20,530
Divestments [(g)]	7,239	5,264	2,877
Net investments [(h)]	15,568	11,636	17,757
Organic investments [(i)]	12,426	14,395	17,484
Operating cash flow before working capital changes [(j)]	24,529	21,135	16,988
Operating cash flow before working capital changes w/o financial charges (DACF) [(k)]	26,067	22,183	17,581
Cash flow from operations	24,703	22,319	16,521

(a) Adjusted results are defined as income using replacement cost, adjusted for special items, excluding the impact of changes for fair value (refer to Note 3 to the Consolidated Financial Statements, point 8.7 of chapter 8).
(b) Based on fully diluted weighted-average number of common shares outstanding during the fiscal year. In accordance with IFRS norms, adjusted fully diluted earnings per share is calculated from the adjusted net income less the perpetual subordinated bond.
(c) 2018 dividend subject to approval at the Annual Shareholders' Meeting on May 29, 2019.
(d) Net Debt/(Net debt + shareholders equity Group share + Non-controlling interests).
(e) Based on adjusted net operating income and average capital employed at replacement cost (refer to Note 3 to the Consolidated Financial Statements, point 8.7 of chapter 8).
(f) Including acquisitions and increases in non-current loans.
(g) Including divestments and reimbursements of non-current loans.
(h) Net investments = gross investments – divestments – repayment of non-current loans – other operations with non-controlling interests.
(i) Organic investments = net investments excluding acquisitions, asset sales and other operations with non-controlling interests.
(j) Operating cash flow before working capital changes is defined as cash flow from operating activities before changes in working capital at replacement cost. The inventory valuation effect is explained in Note 3 of the Consolidated Financial Statements (refer to point 8.7 of chapter 8).
(k) DACF = debt adjusted cash flow. Cash flow from operating activities before changes and financial charges.

Market environment	2018	2017	2016
Exchange rate €-$	1.18	1.13	1.11
Brent *($/b)*	71.3	54.2	43.7
European refinery margin indicator (ERMI) [(a)] *($/t)*	32.3	40.9	34.1

(a) The ERMI (European Refining Margin Indicator) is a Group indicator intended to represent the margin after variable costs for a hypothetical complex refinery located around Rotterdam in Northern Europe (for additional information, refer to the glossary).

Adjustments items to net income [(a)] (Group share) *(M$)*	2018	2017	2016
Special items affecting net income (Group share)	(1,731)	(2,213)	(2,567)
Gain (loss) on asset sales	(16)	2,452	267
Restructuring charges	(138)	(66)	(32)
Impairments	(1,595)	(3,884)	(2,097)
Other items	18	(715)	(705)
Effect of changes in fair value	38	(16)	(3)
After-tax inventory effect FIFO vs. replacement cost	(420)	282	479
TOTAL ADJUSTMENTS AFFECTING NET INCOME (GROUP SHARE)	**(2,113)**	**(1,947)**	**(2,091)**

(a) For details on adjustments to operational income, refer to Note 3C of the Consolidated Financial Statements (point 8.7 of chapter 8).

Adjusted net operating income from the business segments

The adjusted net operating income from the business segments was $15,997 million for the full-year 2018, an increase of 34% over one year, mainly due to the 71% increase in the contribution from Exploration & Production which fully benefited from the increase in hydrocarbons prices and the strong production growth.

Adjusted net income (Group share)

Adjusted net income was $13,559 million in 2018, an increase of 28% compared to 2017. The increase was mainly the result of a strong increase in the contribution from Exploration & Production.

Adjusted net income excludes the after-tax inventory effect, special items and the impact of changes in fair value [(1)].

The effective tax rate for the Group was 38.7% in 2018, compared to 31.1% in 2017, mainly due to the higher tax effective rate for the Exploration & Production segment in relation to higher hydrocarbon prices and the larger share of Exploration & Production in the Group's annual results.

Divestments – Acquisitions

Assets sales completed were $5,172 million in 2018, essentially comprised of the sale of a 4% interest in the Ichthys project in Australia and the sale of the Group's share of the LNG re-gas terminal at Dunkirk, as well as the sale of Joslyn in Canada, Rabi in Gabon, the Martin Linge and Visund fields in Norway, an interest in Fort Hills in Canada, SunPower's sale of its interest in 8point3, the marketing activities of TotalErg in Italy, the Marketing & Services network in Haiti, and the contribution of the Bayport polyethylene unit in the United States to the joint venture formed with Borealis and Nova in which TOTAL holds 50%.

Acquisitions completed were $8,314 million in 2018, mainly comprised of the extension of licenses in Nigeria and the acquisition of a network of service stations in Brazil, as well as notably the acquisitions of Direct Énergie, Engie's LNG business, the increase in the share of Novatek to 19.4%, interests in the Iara and Lapa fields in Brazil, two new 40-year offshore concessions in Abu Dhabi and the acquisition of offshore assets from Cobalt in the Gulf of Mexico.

Profitability

Return on equity for the twelve months ended December 31, 2018 was 12.2%, an increase compared to 2017.

(M$)	January 1, 2018 December 31, 2018	January 1, 2017 December 31, 2017
Adjusted net income	13,964	10,762
Average adjusted shareholders' equity	114,183	106,078
Return on equity (ROE)	**12.2%**	**10.1%**

Return on average capital employed increased to 11.8% in 2018 from 9.4% in 2017.

(M$)	January 1, 2018 December 31, 2018	January 1, 2017 December 31, 2017
Adjusted net operating income	15,691	11,958
Average capital employed	133,123	127,575
Return on average capital employed [(a)] (ROACE)	**11.8%**	**9.4%**

(a) Based on adjusted net operating income and average capital employed at replacement cost (refer to Note 3 to the Consolidated Financial Statements, point 8.7 of chapter 8).

1.4.1.3 Exploration & Production segment results

Environment – liquids and gas price realizations [(a)]	2018	2017	2016
Brent *($/b)*	71.3	54.2	43.7
Average liquids price *($/b)*	64.2	50.2	40.3
Average gas price *($/Mbtu)*	4.78	4.08	3.56
Average hydrocarbon price *($/boe)*	51.0	38.7	31.9

(a) Consolidated subsidiaries, excluding fixed margins.

In 2018, market conditions were more favorable than in 2017. The average realized price of liquids increased by 28% and the average realized gas price by 17%.

Hydrocarbon production

	2018	2017	2016
Combined production *(kboe/d)*	2,775	2,566	2,452
Oil (including bitumen) *(kb/d)*	1,378	1,167	1,088
Gas (including condensates and associated LPG) *(kboe/d)*	1,397	1,398	1,364

	2018	2017	2016
Combined production *(kboe/d)*	2,775	2,566	2,452
Liquids *(kb/d)*	1,566	1,346	1,271
Gas *(Mcf/d)*	6,599	6,662	6,447

(1) For details on adjustments to operational income, refer to Note 3C of the Consolidated Financial Statements (point 8.7 of chapter 8).

In 2018, hydrocarbon production was 2,775 kboe/d, an increase of more than 8% compared to last year, due to:

— +9% for start-ups and ramp-ups on new projects, notably Yamal LNG, Moho Nord, Fort Hills, Kashagan, Kaombo Norte and Ichthys;

— +3% portfolio effect, mainly the addition of Mærsk Oil, Al Shaheen in Qatar, Waha in Libya, Lapa and Iara in Brazil as well as the acquisition of an additional 0.5% of Novatek, were partially offset by the expiration of the Mahakam permit at the end of 2017 and the sales of Visund in Norway and Rabi in Gabon;

— -4% for natural field declines and PSC price effect.

Results *(M$)*	**2018**	**2017**	**2016**
Adjusted net operating income [(a)]	10,210	5,985	3,217
Gross investments [(b)]	15,282	12,802	16,085
Divestments [(c)]	4,952	1,918	2,187
Organic investments [(d)]	9,186	11,310	14,464
Operating cash flow before working capital changes w/o financial charges (DACF) [(e)]	19,374	14,753	10,592
Cash flow from operations [(f)]	19,803	12,821	9,866

(a) Adjusted results are defined as income using replacement cost, adjusted for special items, excluding the impact of changes for fair value. (refer to Note 3 to the Consolidated Financial Statements, point 8.7 of chapter 8).
(b) Including acquisitions and increases in non-current loans.
(c) Including divestments and reimbursements of non-current loans.
(d) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests.
(e) DACF = debt adjusted cash flow. Cash flow from operating activities before changes in working capital at replacement cost, without financial charges.
(f) Excluding financial charges.

In 2018, the Exploration & Production segment's operating cash flow before working capital changes without financial charges was $19,374 million, an increase of 31% year-on-year. The Group benefited fully from the increase in hydrocarbon prices and strong production growth.

The Exploration & Production segment's adjusted net operating income was $10,210 million for the full-year 2018, an increase of 71% compared to 2017, for the same reasons and despite an increase in the tax rate in line with the increase in hydrocarbon prices.

Technical costs for the consolidated subsidiaries, calculated in accordance with ASC932 [(1)] standards, continued decreasing to 18.9 $/boe in 2018, including 5.7 $/boe of operational costs, compared to 19.5 $/boe in 2017.

1.4.1.4 Gas, Renewables & Power segment results

Results *(M$)*	**2018**	**2017**	**2016**
Adjusted net operating income [(a)]	756	485	439
Gross investments [(b)]	3,539	797	1,221
Divestments [(c)]	931	73	166
Organic investments [(d)]	511	353	270
Operating cash flow before working capital changes w/o financial charges (DACF) [(e)]	513	294	176
Cash flow from operations [(f)]	(670)	1,055	589

(a) Adjusted results are defined as income using replacement cost, adjusted for special items, excluding the impact of changes for fair value. (refer to Note 3 to the Consolidated Financial Statements, point 8.7 of chapter 8).
(b) Including acquisitions and increases in non-current loans.
(c) Including divestments and reimbursements of non-current loans.
(d) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests.
(e) DACF = debt adjusted cash flow. Cash flow from operating activities before changes in working capital at replacement cost, without financial charges.
(f) Excluding financial charges.

Adjusted net operating income for the Gas, Renewables & Power segment was $756 million in 2018, notably thanks to the good performance of LNG and gas/power trading activities. The acquisitions of Direct Énergie and the LNG business of Engie account for the increase in investments to $3.5 billion in 2018. The increase in working capital related to the consolidation of the acquisitions of Direct Énergie and the LNG business of Engie was mainly responsible for the negative cash flow from operations in 2018.

(1) FASB Accounting Standards Codification Topic 932, Extractive industries – Oil and Gas.

1.4.1.5 Refining & Chemicals segment results

Operational data [(a)]	2018	2017	2016
Total refinery throughput *(kb/d)*	1,852	1,827	1,965

(a) Includes shares in TotalErg as well as refineries in Africa that are reported in the Marketing & Services segment.

Refinery throughput was stable in 2018 compared to 2017. Lower throughput in Europe linked to planned maintenance, notably at Antwerp during the second quarter, was offset by higher throughput outside Europe.

Results *(M$)*	2018	2017	2016
Adjusted net operating income [(a)]	3,379	3,790	4,195
Gross investments [(b)]	1,781	1,734	1,861
Divestments [(c)]	919	2,820	88
Organic investments [(d)]	1,604	1,625	1,642
Operating cash flow before working capital changes w/o financial charges (DACF) [(e)]	4,388	4,728	4,873
Cash flow from operations [(f)]	4,308	7,411	4,584

(a) Adjusted results are defined as income using replacement cost, adjusted for special items, excluding the impact of changes for fair value. (refer to Note 3 to the Consolidated Financial Statements, point 8.7 of chapter 8).
(b) Including acquisitions and increases in non-current loans.
(c) Including divestments and reimbursements of non-current loans.
(d) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests.
(e) DACF = debt adjusted cash flow. Cash flow from operating activities before changes in working capital at replacement cost, without financial charges.
(f) Excluding financial charges.

The European Refining Margin Indicator (ERMI) for the Group decreased by 21% to 32.3 $/t in 2018, mainly due to rising crude oil prices. The petrochemicals environment remained favorable in 2018 although margins in Europe were lower than last year, affected by the higher price of raw materials.

In this context, Refining & Chemicals adjusted net operating income was resilient at $3,379 million in 2018, a decrease of 11% compared to the previous year.

1.4.1.6 Marketing & Services segment results

Operational data [(a)]	2018	2017	2016
Refined products sales *(kb/d)*	1,801	1,779	1,793

(a) Excludes international trading and bulk Refining sales, includes share of TotalErg.

Petroleum product sales increased by 1% in 2018 compared to 2017. The sale of TotalErg in Italy was offset by higher sales in the rest of the world.

Results *(M$)*	2018	2017	2016
Adjusted net operating income [(a)]	1,652	1,676	1,559
Gross investments [(b)]	1,458	1,457	1,245
Divestments [(c)]	428	413	424
Organic investments [(d)]	1,010	1,019	1,003
Operating cash flow before working capital changes w/o financial charges (DACF) [(e)]	2,156	2,242	1,966
Cash flow from operations [(f)]	2,759	2,221	1,833

(a) Adjusted results are defined as income using replacement cost, adjusted for special items, excluding the impact of changes for fair value. (refer to Note 3 to the Consolidated Financial Statements, point 8.7 of chapter 8).
(b) Including acquisitions and increases in non-current loans.
(c) Including divestments and reimbursements of non-current loans.
(d) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests.
(e) DACF = debt adjusted cash flow. Cash flow from operating activities before changes in working capital at replacement cost, without financial charges.
(f) Excluding financial charges.

Marketing & Services adjusted net operating income was stable in 2018 at $1,652 million.

1.4.1.7 TOTAL S.A. 2017 results

Net income for TOTAL S.A., the parent company, was €5,485 million in 2018 compared to €6,634 million in 2017.

1.4.1.8 Proposed dividend

The Board of Directors met on February 6, 2019 and decided to propose to the Combined Shareholders' Meeting, which will be held on May 29, 2019, an annual dividend of €2.56/share for 2018, a 3.2% increase compared to 2017 conforming to the shareholder return policy announced in February 2018.

In the context of the solid financial position of the Group, the Board of Directors also decided not to propose to the Combined Shareholders' Meeting which will be held on May 29, 2019, the renewal of the scrip dividend option.

The Board of Directors will thus propose to the General Meeting, which will be held on May 29, 2019, to approve the final dividend payment, exclusively in cash, for the 2018 fiscal year as well as for the interim dividends that the Board of Directors may decide for the 2019 fiscal year.

1.4.1.9 Shareholder return policy

Given the solid financial position, the Board of Directors, at its meeting on February 6, 2019, confirmed for 2019, the shareholder return policy announced in February 2018 and plans the following measures:

— distribution of interim dividends for fiscal year 2019 of €0.66 per share, increased by 3.1% compared to the interim dividends for fiscal year 2018, and a full-year 2019 dividend of €2.64 per share, to be proposed to the Shareholders' Meeting;

— buyback of all shares issued in 2019 for the payment of the 2018 interim dividends;

— buyback of shares, in a $60/b Brent environment, of $1.5 billion for 2019 as part of the $5 billion buyback program over the period 2018-2020.

1.4.2 Liquidity and capital resources

1.4.2.1 Long-term and short-term capital

Long-term capital as of December 31, *(M$)*	**2018**	**2017**	**2016**
Shareholders' equity	118,114	114,037	101,574
Non-current financial debt	40,129	41,340	43,067
Hedging instruments of non-current debt	(680)	(679)	(908)
TOTAL NET NON-CURRENT CAPITAL	157,563	154,698	143,733

Short-term capital as of December 31, *(M$)*	**2018**	**2017**	**2016**
Current financial debt	13,306	11,096	13,920
Net current financial assets	(3,176)	(3,148)	(4,221)
NET CURRENT FINANCIAL DEBT	**10,130**	**7,948**	**9,699**
Cash and cash equivalents	(27,907)	(33,185)	(24,597)

1.4.2.2 Cash flow

(M$)	**2018**	**2017**	**2016**
Cash flow from operations	24,703	22,319	16,521
Gross investments	(22,185)	(16,896)	(20,530)
Total divestments	7,239	5,264	2,877
Other operations with non-controlling interests	(622)	(4)	(104)
NET CASH FLOW [(a)]	**9,135**	**10,683**	**(1,236)**
Dividends paid	(5,010)	(2,784)	(2,754)
Share buybacks	(4,328)	0	0
Net-debt-to-capital ratio at December 31 [(b)]	15.5%	11.9%	21.1%

(a) Net cash flow = cash flow from operating activities before working capital changes at replacement cost – net investments (including other transactions with non-controlling interests).
(b) Net debt/(Net debt + shareholders equity Group share + Non-controlling interests).

The Group's net cash flow after working capital changes was $9,135 million in 2018 compared to $10,683 million in 2017. This variation is mainly due to the increase in cash flow from operations driven by the rise in hydrocarbon prices, the strong hydrocarbon production growth in the Exploration & Production's segment offset by the increase in investments, net of divestments, in 2018 compared to 2017. The Group confirmed its financial strength with a gearing ratio of 15.5% at the end of 2018.

1.4.2.3 Borrowing requirements and funding structure

The Group's policy consists of incurring long-term debt at a floating rate or at a fixed rate depending on the Group's general corporate needs and interest rates. Debt is incurred mainly in dollars or euros. Long-term interest rate and currency swaps may be used to hedge bonds at their issuance in order to create a variable or fixed rate synthetic debt. In order to partially modify the interest rate structure of the long-term debt, TOTAL may also enter into long-term interest rate swaps.

The non-current financial debt is generally raised by the corporate treasury entities either directly in dollars or euros, or in other currencies which are then exchanged for dollars or euros through currency swaps at issuance, depending on general corporate needs.

As of December 31, 2018, the Group's long-term financial debt, after taking into account the effect of currency and interest rate swaps, was 97% in dollars and 54% at floating rates. In 2017, these ratios were 95% and 55%, respectively.

In addition to its ongoing bond issuance programs, in 2015 and 2016 TOTAL S.A. issued perpetual subordinated notes in several tranches: on February 19, 2015, €5 billion in two tranches; on May 11, 2016, €1.75 billion in one tranche; and on September 29, 2016, €2.5 billion in two tranches.

In accordance with IAS 32 provisions "Financial instruments – Presentation", given the nature of these notes, they have been recognized in the accounts as equity.

In addition, on November 25, 2015, TOTAL S.A. issued a $1.2 billion bond combining cash-settled convertible bonds indexed on TOTAL's share performance and the purchase of stock options to hedge the risk of additional costs related to this indexation. This combination creates a non-dilutive synthetic instrument equivalent to a standard bond. At maturity, all flows are settled in cash and limited to the nominal amount.

The Group has established standards for market transactions under which bank counterparties must be approved in advance, based on an assessment of the counterparty's financial soundness (multi-criteria analysis including a review of the market capitalization and of the Credit Default Swap (CDS), its ratings with Standard & Poor's and Moody's, which must be of high quality, and its overall financial condition).

An overall authorized credit limit is set for each bank and is allocated among the subsidiaries and the Group's central treasury entities according to their needs.

To reduce the market valuation risk on its commitments, in particular for swaps put in place on the back of bond issues, the Group also entered into margin call contracts with its counterparties. In addition, since December 21, 2018, pursuant to Regulation (EU) No. 648/2012 on OTC derivatives, central counterparties and trade repositories (EMIR), some of the interest rate swaps entered into by the Group are now being centrally cleared.

1.4.2.4 External financing available

As of December 31, 2018, the aggregate amount of the major committed credit facilities granted by international banks to the Group's companies (including TOTAL S.A.) was $13,191 million (compared to $12,323 million on December 31, 2017), of which $12,599 million were unused (compared to $12,205 million unused on December 31, 2017).

TOTAL S.A. has committed credit facilities granted by international banks allowing it to benefit from significant liquidity reserves. As of December 31, 2018, these credit facilities amounted to $11,515 million (compared to $11,478 million on December 31, 2017), of which $11,515 million were unused (compared to $11,478 million unused on December 31, 2017).

The agreements for credit facilities granted to TOTAL S.A. do not contain conditions related to the Company's financial ratios, to its financial ratings from specialized agencies, or to the occurrence of events that could have a material adverse effect on its financial position.

Credit facilities granted to Group companies other than TOTAL S.A. are not intended to finance the Group's general corporate needs; they are intended to finance either the general needs of the borrowing affiliate or a specific project.

As of December 31, 2018, no restrictions applied to the use of the Group companies' funding sources (including TOTAL S.A.) that could significantly impact the Group's activities, directly or indirectly.

1.4.2.5 Anticipated sources of financing

Investments, working capital, dividend payments and buybacks of its own shares by the Company are financed by cash flow from operations, asset disposals and, if necessary, by net borrowings.

For the coming years and based on the current financing conditions, the Company intends to maintain this approach to the financing of the Group's investments and activities.

1.4.3 Trends and outlook

1.4.3.1 Outlook

Since the start of 2019, Brent has traded around $60/b in a context of oil supply and demand near the record-high level of 100 Mb/d. In a volatile environment, the Group is pursuing its strategy for integrated growth along the oil, gas and low-carbon electricity chains.

The Group has clear visibility on its 2019 cash flow, supported by the strong contribution of project start-ups in 2018 and recent acquisitions.

The Group maintains financial discipline to reduce its breakeven to remain profitable across a broader range of environments. In particular, it is targeting cost reductions of $4.7 billion, projected net investments of $15-16 billion in 2019 and a production cost target of 5.5 $/boe.

In Exploration & Production, production is expected to grow by more than 9% in 2019, thanks to the ramp-ups of Kaombo Norte, Egina and Ichthys plus the start-ups of Iara 1 in Brazil, Kaombo South in Angola, Culzean in the UK and Johan Sverdrup in Norway. Determined to take advantage of the favorable cost environment, the Group plans to launch projects in 2019, notably including Mero 2 in Brazil, Tilenga and Kingfisher in Uganda and Arctic LNG 2 in Russia.

The Group is pursuing its strategy for profitable growth along the integrated gas and low-carbon electricity chains. Effective 2019, the Group will report the new iGRP segment (integrated Gas, Renewables & Power) which combines the Gas, Renewables & Power segment with the upstream gas and LNG activities currently reported within the Exploration & Production segment.

Affected by an abundance of available products, European refining margins have been very volatile since the start of the year. In 2019, the Downstream will continue to rely on its diversified portfolio, notably its integrated Refining & Chemical platforms in the U.S. and Asia-Middle East as well as its non-cyclical Marketing & Services segment.

In this context, the Group will continue to implement its shareholder return policy announced in February 2018, by increasing the dividend in 2019 by 3.1%, in line with the objective to increase the dividend by 10% over the 2018-20 period. Taking into account its strong financial position, the Group will eliminate the scrip dividend option from June 2019. Within the framework of its program to buy back $5 billion of shares over the 2018-20 period, the Group expects to buy back $1.5 billion of its shares in 2019 in a 60 $/b Brent environment.

1.4.3.2 Risks and uncertainties

Due to the nature of its business, the Group's activities remain subject to the market risks (sensitivity to the environmental parameters of the oil and financial markets), industrial and environmental risks related to its operations, and to political or geopolitical risks stemming from the global presence of most of its activities.

Detailed information is given in the Risk Factors section (point 3.1 of chapter 3) of this Registration Document. For more information on internal control and risk management procedures, also refer to point 3.3 of chapter 3.

1.4.4 Significant changes

Except for the events mentioned above in point 1.4, in the Business overview (chapter 2), and in the description of legal and arbitration procedures (point 3.2 of chapter 3), no significant changes to the Group's financial or commercial situation have occurred since December 31, 2018, the end of the last fiscal year for which audited financial statements have been published by the Company.

1.5 Strong commitments that benefit sustainable growth

1.5.1 Committed R&D

- $986 million invested in 2018
- 4,288 employees dedicated to R&D in 2018
- 18 R&D centers around the world
- 1,000 agreements with partners
- over 200 patent applications filed in 2018

The Group relies on a dynamic R&D policy to conduct and develop its activities. The portfolio of programs is divided into five priority areas: safety, operational efficiency, new services and products including smart electricity grids, an energy mix focused on low-carbon energies and digital technology.

The portfolio includes transverse programs developed at all the R&D centers and programs specific to the various businesses. For example, the purpose of the CCUS (carbon capture, usage and storage) transverse program is to enable the Group to become a major player in this area and throughout the value chain so that it can contribute to the reduction in global CO_2 emissions and prepare new business opportunities.

The Group is committed to optimizing R&D resources in terms of human talent, infrastructure and regional centers of excellence, and to working with selected partners that bring specific, high-level skills to every project.

For more information, refer to point 2.6 of chapter 2.

1.5.2 A targeted investment policy

- $12.5 billion in organic investments[(1)] in 2018
- $8.3 billion in targeted acquisitions in 2018, including $4.5 billion in resource acquisitions
- $5.2 billion in asset disposals in 2018

Since the fall in oil prices in 2014, the Group continues to select its investments very carefully, in line with its strategy. These investments are dedicated to:

- the development of new upstream and downstream facilities in order to benefit from a favorable cost environment;
- the adding of attractive resources to the portfolio through the exploration or acquisition of resources that have already been discovered, thereby benefiting from favorable market conditions;
- strong growth in its low-carbon activities in the gas and electricity sectors; and
- the growth of its Marketing & Services business in buoyant markets.

The Group also strives to continuously improve its portfolio by selling its least strategic assets.

For more information, refer to point 2.5 of chapter 2.

1.5.3 A continuous improvement dynamic

TOTAL commited in 2016 to contributing to the Sustainable Development Goals (SDG) adopted by the United Nations. Given the nature of the Group's businesses and its geographic presence, TOTAL is concerned by all the SDGs. However, the Group has identified the most significant SDGs for its activities in order to focus its efforts on the segments in which it is able to make a direct contribution. TOTAL therefore considers the SDGs an opportunity to better measure and assess its contribution to society as a whole. The Group manages its activities and assesses its performance on the basis of the three sustainable development pillars, namely financial results (Profit), value creation for stakeholders (People) and preservation of ecosystems (Planet) (refer also to chapter 5).

1.5.3.1 Commitments and indicators of progress

Safety, health, climate, the environment and also shared development, in every country where the Group is present, TOTAL steers its operations with the aim of working in a sustainable, active and positive manner. The Group was one of the first in the industry to publish measurable improvement targets in these areas.

(1) Organic investments = net investments excluding acquisitions, divestments and other operations with non-controlling interests.

Safety/Health

For TOTAL, being committed to better energy means, first and foremost, ensuring the safety of its employees, stakeholders and facilities. It also means protecting the health of all those related directly or indirectly to its activities.

Safety

Target		What has been accomplished
To be recognized as a benchmark for safety in its industry and achieve zero fatalities	>	**4 fatalities in 2018** **A TRIR (1) of 0.91 in 2018, at majors' level**

Health

Commitment		What has been accomplished:
Protect the health of employees, customers and communities in close proximity to the Group's activities	>	**In 2018, 98% of employees with specific occupational risks benefitted from regular medical monitoring (2)**

Environment

The Group places the environment at the heart of its ambition of being a responsible company with a goal to improve the environmental performance of the facilities and products.

Air

Target		What has been accomplished
Decrease SO_2 (3) air emissions by **50%** between 2010 and 2020	>	**More than 50% reduction in SO_2 air emissions reached since 2017**

Water

Targets		What has been accomplished
Maintain hydrocarbon content of water discharges below **30 mg/l** for offshore sites and **15 mg/l** for onshore and coastal sites	>	**100% of the Group's oil sites have met the target for the quality of onshore discharges since 2016 and 96% of the Group's oil sites have met the target for the quality of offshore discharges in 2018**

Waste

Target		What has been accomplished
Valorize more than **50%** of the waste produced by the sites operated by the Group	>	**More than 50% of the waste produced by the sites operated by the Group was valorized in 2018**

Volunteering Program

Since the end of 2018, the Group has launched Action!, the Group's Employee Volunteering Program, through which TOTAL gives its employees the time and means to get involved and contribute to the development of the areas where the Group is present. It thus allows employees, on a voluntary basis, the possibility to support, up to three days per year during their working time, or outside of it, local solidarity projects within the scope of the Total Foundation program.

(1) TRIR (Total Recordable Injury Rate): number of recorded injuries per million hours worked.
(2) Data provided by WHRS.
(3) SO_2: sulfur dioxide produced by the combustion of fossil energies.

1

Climate

Targets		What has been accomplished
Reduce the routine flaring [1] by **80%** on operated facilities between 2010 and 2020 in order to eliminate it by 2030	>	More than 80% reduction in routine flaring between 2010 and 2018
Improve the energy efficiency of an average of **1%** per year of operated facilities between 2010 and 2020	>	More than 10% improvement in energy efficiency between 2010 and 2018
Sustainably reduce the intensity of methane emissions of the Exploration & Production segment's operated facilities to less than **0.20%** of the commercial gas produced by 2025	>	An intensity of the methane emissions below 0.25% of the commercial gas produced in 2018
Reduce the GHG emission (Scopes 1 & 2) on operated oil & gas facilities from 46 Mt CO_2e in 2015 to less than **40 Mt CO_2e** in 2025	>	A GHG emission reduction (Scopes 1 & 2) on operated oil & gas facilities from 46 Mt CO_2e to 42 Mt CO_2e between 2015 and 2018

Ambition		What has been accomplished
Reduce the carbon intensity of energy products used by its customers by **15%** between 2015, the date of the Paris agreement, and 2030	>	A carbon intensity reduced from 75 g CO_2/kbtu in 2015 to 71 g CO_2/kbtu in 2018, i.e., a reduction of more than 5%

Biodiversity

Commitments		What has been accomplished
Systematically develop biodiversity action plans for production sites located in protected areas [2]	>	5 biodiversity action plans deployed or in preparation in 2018
Not conducting oil and gas exploration or production operations in the area of natural sites listed on the UNESCO World Heritage List [3]	>	No oil and gas exploration or production activity in the area of natural sites listed on the UNESCO World Heritage List [3]
Not conducting exploration in oil fields under sea ice in the Arctic	>	No exploration activity in oil fields under sea ice in the Arctic

Diversity/Gender equality

The Group implements a gender diversity policy and promotes equality between men and women. In terms of compensation, specific measures have been in place since 2010 to prevent and correct unjustified salary gaps.

Targets		What has been accomplished in 2018
25% women senior executives by 2020	>	21.6% women senior executives
40% non-French senior executives by 2020	>	32.1% non-French senior executives
More than **20%** women members on the Management Committees (head office and subsidiaries)	>	21.8% women members on the Management Committees (head office and subsidiaries)
20% women members on Management Committees of branches and large operational divisions	>	13.1% women members on Management Committees of branches and large operational divisions

(1) Routine flaring, as defined by the working group of the Global Gas Flaring Reduction program within the framework of the World Bank's Zero Routine Flaring initiative.
(2) Sites located in an IUCN I to IV or Ramsar convention protected area.
(3) Natural sites included on the UNESCO World Heritage List of December 31, 2017.

1.5.3.2 Support for global initiatives

Aside from complying with national regulations in force in every country where the Group operates, TOTAL reiterates each year, since 2002, its support for the United Nations Global Compact, of which it is one of the companies recognized as LEAD. The Group also made a commitment to respect the UN Guiding Principles for Business and Human Rights following their adoption in 2011.

The challenges posed by climate change require a collective effort. The Group has played an active role in various international initiatives that involve the private and the public sectors to bring about notably:

- carbon pricing (the World Bank's Carbon Pricing Leadership Coalition, Caring for Climate – United Nations Global Compact, Paying for Carbon call: TOTAL and five other industry leaders);
- the end of routine flaring of associated gas (the World Bank's Zero Routine Flaring by 2030 initiative);
- control over methane emissions (Oil & Gas Methane Partnership of the Climate and Clean Air Coalition, the Oil & Gas Climate Initiative in cooperation with UN Environment and EDF, etc.); and
- greater transparency: support of the recommendations from the G20 Financial Stability Board Task Force on Climate-related Financial Disclosures (TCFD).

TOTAL also actively supports collaborative and multi-stakeholder initiatives in areas in which the coordinated involvement of governments, companies and civil society is key to global progress, particularly:

- financial transparency: the Group has adhered to the Extractive Industries Transparency Initiative (EITI) since its launch in 2002;
- the fight against corruption: TOTAL joined the Partnering Against Corruption Initiative (PACI) in 2016 and the Chairman and Chief Executive Officer now sits on the Board of PACI ("PACI Vanguard");
- the challenge of security and respect for human rights by being a member of the Voluntary Principles on Security and Human Rights (VPSHR) since 2012;
- diversity: TOTAL signed in 2010 the "Women's Empowerment Principles – Equality Means Business" set out by the United Nations Global Compact, and in 2018 it signed the pledge for diversity as part of the European Roundtable of Industrialists;
- biodiversity: TOTAL joined in 2018 the Act4Nature initiative and made commitments to protect biodiversity;
- the circular economy: TOTAL is a founding member of the Alliance to End Plastic Waste, launched in 2019, which brings together companies in the plastics and consumer goods value chain to provide solutions for the disposal of plastic waste in the environment, especially in oceans, and to promote their recycling in a circular economy;
- better access to energy for populations of emerging countries through a partnership with SE4All;
- the reduction of inequalities through the development of social dialogue to favor more inclusive economic growth: TOTAL was one of the first French companies to adhere to the Global Deal initiative at the end of 2017.

1.6 An organizational structure to support the Group's ambition

1.6.1 TOTAL S.A., parent company of the Group and its subsidiaries

TOTAL S.A. is the Group's parent company. It acts as a holding company and drives the Group's strategy.

The Group's operations are conducted through subsidiaries that are directly or indirectly owned by TOTAL S.A. and through stakes in joint-ventures which are not necessarily controlled by TOTAL. TOTAL S.A. has two secondary establishments in France, located in Lacq and Pau. It also has branch offices in the United Arab Emirates and Oman.

Corporate name: TOTAL S.A.

Head office: 2, place Jean Millier, La Défense 6,
92400 Courbevoie, France

Registered in the French trade registry in Nanterre under no. 542 051 180 RCS

LEI (Legal Entity Identifier): 529900S21EQ1BO4ESM68

EC Registration Number: FR 59 542 051 180

Term of the Company: extended for 99 years from March 22, 2000

Fiscal year: from January 1 to December 31 of each year

APE Code (NAF): 7010Z

The scope of consolidation of TOTAL S.A. as of December 31, 2018, consisted of 1,191 companies, of which 1,046 fully consolidated companies or companies whose assets are jointly controlled and 145 equity affiliates. The principles of consolidation are described in Note 1.1 to the Consolidated Financial Statements and the list of companies included in the scope of consolidation can be found in Note 18 to the Consolidated Financial Statements (refer to point 8.7 of chapter 8).

The situation of the direct subsidiaries and shareholdings of TOTAL S.A., and in particular those with a gross value exceeding 1% of the Company's share capital, is shown in the table of subsidiaries and affiliates in point 10.4.1 of chapter 10.

Interests in listed companies

TOTAL holds stakes in a limited number of companies that issue financial instruments in France or abroad or whose financial instruments are listed in France or abroad. These companies are mainly the Group's financing vehicles (Total Capital, Total Capital International, Total Capital Canada Ltd) or the operational subsidiaries in its business segments, in particular in Africa, such as Total Gabon[1].

TOTAL also holds a majority stake in SunPower (55.66% on December 31, 2018), an American company listed on NASDAQ, and minority interests in other companies, including PAO Novatek (19.4% on December 31, 2018), a Russian company listed on the Moscow Interbank Currency Exchange and the London Stock Exchange.

(1) Total Gabon is a company under Gabonese law which is listed on Euronext Paris and owned by TOTAL (58.28%), the Republic of Gabon (25%) and the public (16.72%).

The changes in the composition of the Group during fiscal year 2018 are explained in Note 2 of the Consolidated Financial Statements (refer to point 8.7 of chapter 8). In 2018, TOTAL S.A., the Group's parent company, acquired 100% of the shares of Direct Énergie SA, following a takeover bid following an initial acquisition, 100% of the shares of Pont-sur-Sambre Power SAS and 100% of the shares of Toul Power SAS.

TOTAL S.A. has not taken any other stake in companies with their registered office in France representing more than one-twentieth, one-tenth, one-fifth, one-third or one-half of the capital of these companies or has not obtained control of such companies.

1.6.2 An operational structure

On an operational level, the Group's businesses are organized in business segments, which receive assistance from the corporate functional divisions.

As of December 31, 2018, the Group's organization was centered around four business segments, i.e., Exploration & Production, Gas, Renewables & Power, Refining & Chemicals and Marketing & Services:

— the Exploration & Production segment encompasses the Group's exploration and production activities in more than 50 countries. The Group produces oil and gas in approximately 30 countries;

— the Gas, Renewables & Power segment spearheads the Group's ambition in low-carbon energies. It comprises gas activities that are conducted downstream of the production process and concerns natural gas, liquefied natural gas (LNG) and liquefied petroleum gas (LPG), as well as power generation, gas and power trading and marketing. It also develops the Group's renewable energy activities (excluding biotechnologies) and the power storage. Energy efficiency activities are represented through a dedicated Innovation & Energy Efficiency division;

— the Refining & Chemicals segment is a large industrial segment that encompasses refining and petrochemical activities and Hutchinson's operations. It also includes oil Trading & Shipping activities;

— the Marketing & Services segment includes worldwide supply and marketing activities in the oil products and services field.

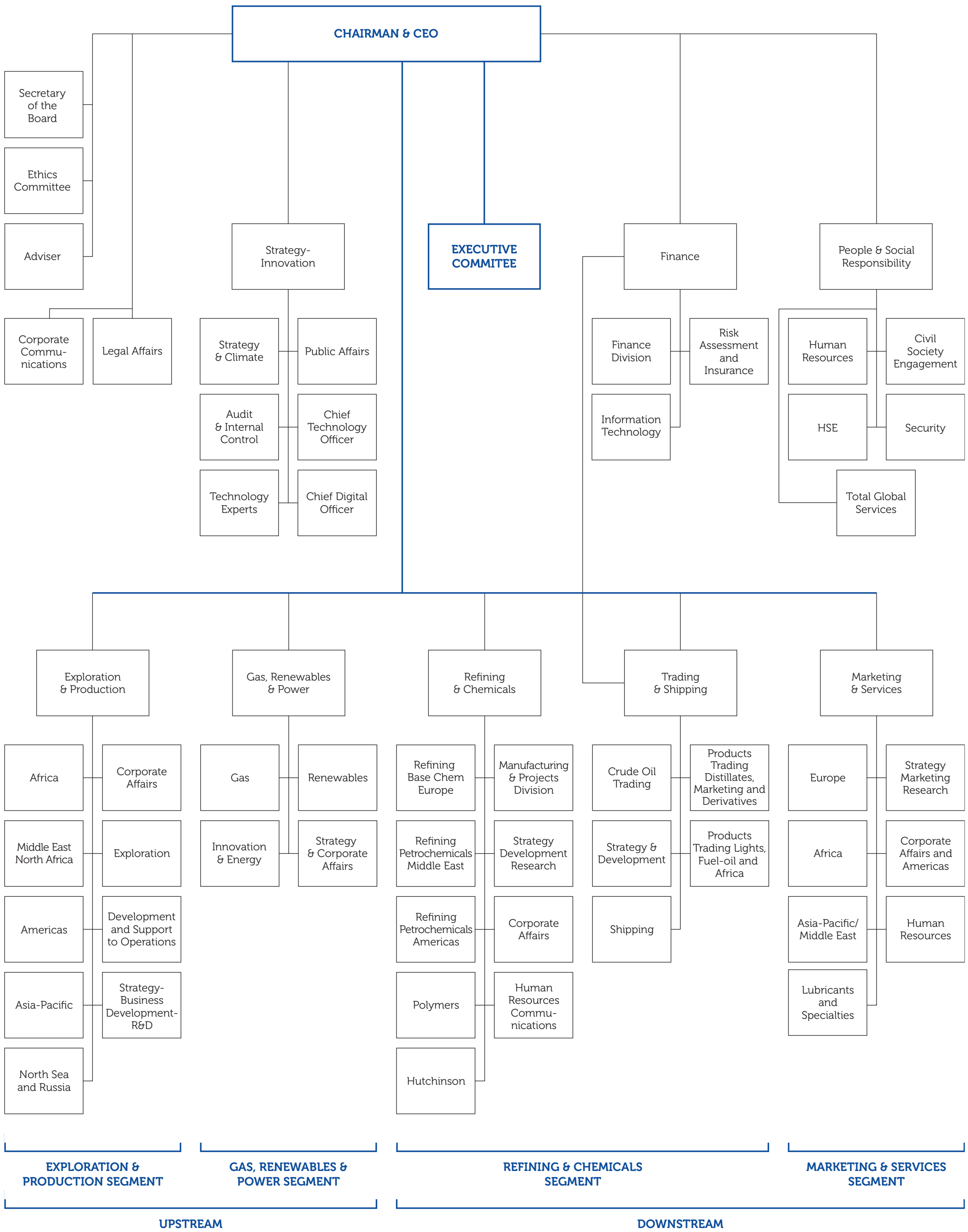
In order to improve efficiency, reduce costs and create value within the Group, a specific branch, Total Global Services (TGS), pools the various segments' support services (Accounting, Purchasing, Information Systems, Training, Human Resources Administration and Facilities Management). The entities that make up TGS operate as service companies for internal clients across the business segments and Holding.

Finally, the various Corporate entities are mainly grouped into two divisions:

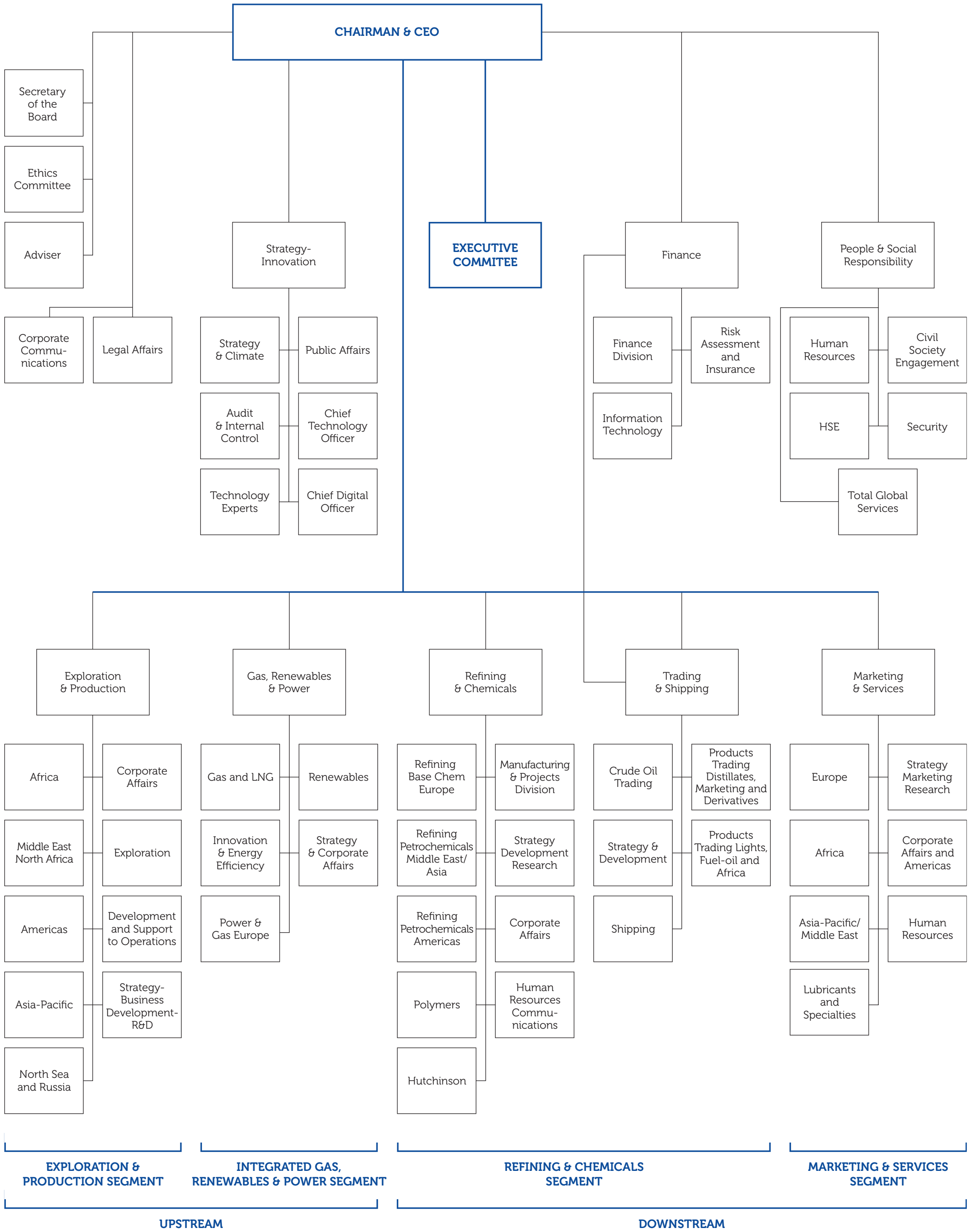
— the People & Social Responsibility division consists of: the Human Resources division, the Health, Safety and Environment division, which combines HSE departments across the different segments to establish a strong, unified environmental and safety model, the Security division, and the Civil Society Engagement Division;

— the Strategy-Innovation division is made of: the Strategy & Climate division (responsible notably for ensuring that climate is incorporated in the strategy), the Public Affairs division, the Audit & Internal Control division, the Research & Development division (which coordinates all of the Group's R&D activities and notably transversal programs), the Technology Experts division and the Digital division.

Organization chart as of January 1, 2018



Organization chart as of January 1, 2019



New reporting structure as of January 1, 2019

The Group is pursuing its strategy for profitable growth along the integrated gas and low-carbon electricity chains. Effective 2019, the Group will report the new Integrated Gas, Renewables & Power (iGRP) segment which combines the Gas, Renewables & Power segment with the upstream gas and LNG activities currently reported within the Exploration & Production segment.

2

BUSINESS OVERVIEW FOR FISCAL YEAR 2018

2.1 Exploration & Production segment

The Exploration & Production (E&P) segment encompasses the Group's oil and gas exploration and production activities in more than 50 countries.

2.8 Mboe/d hydrocarbons produced in 2018	**12.1 Bboe** of proved hydrocarbon reserves as of December 31, 2018 [(1)]	**$9.2 B** of organic investments [(2)] in 2018	**12,801** employees present

Exploration & Production segment financial data [(3)]

(M$)	2018	2017	2016
Adjusted net operating income [(a)]	10,210	5,985	3,217
Operating cash flow before working capital changes w/o financial charges (DACF) [(b)]	19,374	14,753	10,592
Cash flow from operations [(c)]	19,803	12,821	9,866

(a) Adjusted results are defined as income using replacement cost, adjusted for special items, excluding the impact of changes for fair value.
(b) DACF = debt adjusted cash flow. The operating cash flow before working capital changes w/o financial charges is defined as cash flow from operating activities before changes in working capital at replacement cost, without financial charges.
(c) Excluding financial charges.

The Group benefitted fully from the increase in hydrocarbon prices and strong production growth. Exploration & Production adjusted net operating income was $10,210 million in 2018, an increase of 71% compared to 2017. Operating cash flow before working capital changes was $19,374 million in 2018, an increase of 31% for the same reasons.

The effective tax rate increased from 41.2% in 2017 to 46.5% in 2018, in line with the rebound in oil prices.

Technical costs [(4)] for the consolidated subsidiaries, calculated in accordance to ASC932 [(5)] standards, continued decreasing to $18.9/boe in 2018 (of which 5.7 $/boe production costs in 2017) compared to $19.5/boe in 2017.

Price realizations [(a)]	2018	2017	2016
Average liquids price *($/b)*	64.2	50.2	40.3
Average gas price *($/Mbtu)*	4.78	4.08	3.56

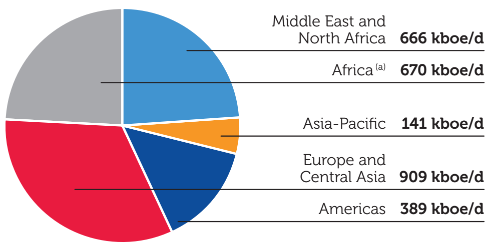
(a) Consolidated subsidiaries, excluding fixed margins.

(1) Based on a Brent crude price of 71.43 $/b (reference price in 2018), according to the rules established by the Securities and Exchange Commission (refer to point 2.1.3 of this chapter).
(2) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests (refer to point 2.5.1 of this chapter).
(3) The data for the 2016 financial year has been restated to take into account the change in the organization of the Group that has been fully effective since January 1, 2017.
(4) (Production costs + exploration expenses + depreciation + depletion and amortization and valuation allowances)/production of the year.
(5) *FASB Accounting Standards Codification 932*, Extractive industries – Oil and Gas.

Production

Hydrocarbon production	2018	2017	2016
Combined production *(kboe/d)*	2,775	2,566	2,452
Oil (including bitumen) *(kb/d)*	1,378	1,167	1,088
Gas (including Condensates and associated NGL) *(kboe/d)*	1,397	1,399	1,364

Hydrocarbon production	2018	2017	2016
Combined production *(kboe/d)*	2,775	2,566	2,452
Liquids *(kb/d)*	1,566	1,346	1,271
Gas *(Mcf/d)*	6,599	6,662	6,447



(a) Excluding North Africa.

In 2018, hydrocarbon production was 2,775 kboe/d, an increase of more than 8% compared to last year, due to:

— +9% for start-ups and ramp-ups on new projects, notably Yamal LNG, Moho Nord, Fort Hills, Kashagan, Kaombo Norte and Ichthys;

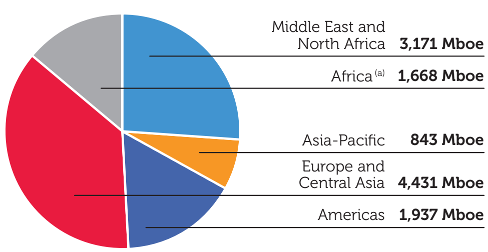
— +3% portfolio effect. The addition of Mærsk Oil, Al Shaheen in Qatar, Waha in Libya, Lapa and Iara in Brazil, as well as the acquisition of an additional 0.5% of Novatek, were partially offset by the expiration of the Mahakam permit at the end of 2017 and the sales of Visund in Norway and Rabi in Gabon;

— -4% for natural field declines and PSC price effect.

Proved reserves

As of December 31,	2018	2017	2016
Hydrocarbon reserves *(Mboe)*	12,050	11,475	11,518
Oil (including bitumen) *(Mb)*	5,203	4,615	4,543
Gas (including Condensates and associated NGL) *(Mboe)*	6,847	6,860	6,975

As of December 31,	2018	2017	2016
Hydrocarbon reserves *(Mboe)*	12,050	11,475	11,518
Liquids *(Mb)*	6,049	5,450	5,414
Gas *(Bcf)*	32,325	32,506	32,984



(a) Excluding North Africa.

Proved reserves based on SEC rules (Brent at $71.43/b in 2018) were 12,050 Mboe at December 31, 2018. The proved reserve replacement rate[1], based on SEC rules (Brent at $71.43/b in 2018), was 157% in 2018 and 117% over three years.

At year-end 2018, TOTAL had a solid and diversified portfolio of proved and probable reserves[2] representing approximately 20 years of reserve life based on the 2018 average production rate.

(1) Change in reserves excluding production: (revisions + discoveries, extensions + acquisitions – divestments)/production for the period.
(2) Limited to proved and probable reserves covered by Exploration & Production contracts on fields that have been drilled and for which technical studies have demonstrated economic development in the price scenario retained by the Group, including projects developed by mining.

2.1.1 Presentation of the segment

Exploration & Production (E&P)'s mission is to discover and develop oil and gas fields in order to meet a growing energy demand driven by non-OECD countries. Safety is a core value for that mission.

In an environment marked by the strong volatility of hydrocarbon prices, E&P's strategy is to develop an oil and gas production model that is resilient (i.e., able to withstand a long period of low oil and gas prices), profitable and sustainable.

The deployment of the strategy is based on three main levers:

- increase profitability: E&P strives to maximize the value of its assets through operational excellence and to ensure strict investment discipline by being selective in the sanctioning of new projects. In addition, E&P continues to restructure or sell the least efficient assets in its portfolio;
- develop operational excellence: in order to ensure its resilience, E&P continues to reduce costs, improve the efficiency of its facilities and start up projects on time and within budget. E&P also seeks to minimize the environmental impact of its activities; and
- renew reserves, through exploration as well as by accessing already discovered resources, building on E&P's competitive advantages in terms of geographical spread and technical skills.

E&P put 10 major projects into production in 2018. Thanks to a significant decrease of its capital investments, which peaked in 2013, E&P restored some flexibility that enabled it to take some opportunities, with, in particular, in 2018 the acquisition of assets in Brazil, Libya and the United States, the extension of assets in Abu Dhabi and the acquisition of Mærsk Olie og Gas A/S, (Mærsk Oil), which has assets in ten countries, and to launch new projects, taking advantage of the lower costs in the current environment.

For the period 2018-2020, E&P has already launched, or plans to launch, numerous projects with a potential aggregate output in excess of 700 kboe/d.

All these actions are expected to increase production by an average of 6-7% per year for the period 2017-2020, in line with the production growth target of 5% per year on average between 2017 and 2022.

In order to take account of issues related to climate change in its strategy, E&P is focusing its oil investments on low break-even projects, developing the production of gas, integrating a CO_2 price in its investment decisions and developing expertise in technologies for carbon capture, use and storage.

2.1.2 Exploration and development

TOTAL evaluates exploration opportunities based on a variety of geological, technical, political, economic (including tax and contractual terms) environmental and societal factors.

The exploration strategy deployed since 2015 aims to prioritize the most promising drill targets with a view to creating value. The Group plans balanced exploration investments:

- 50% for emerging basins, where the presence of hydrocarbons is already proven;
- 35% for exploration in mature hydrocarbon plays; and
- 15% for high-potential frontier basins.

In 2018, exploration expenditure by all E&P subsidiaries was $1.2 billion, mainly in the United States, Guyana, the United Kingdom, Norway, Myanmar, French Guiana, Mexico, South Africa, Azerbaijan and Nigeria compared to $1.2 billion in 2017 and $1.4 billion in 2016.

Organic investments[1] by all E&P subsidiaries were $9.2 billion[2] in 2018, compared to $11.3 billion[2] in 2017 and $14.5 billion in 2016, and were mainly in Australia, Norway, Angola, the United Kingdom, the Republic of Congo, the United Arab Emirates, Brazil, Nigeria, Canada, the United States, Iraq, Italy and Uganda.

2.1.3 Reserves

The definitions used for proved, proved developed and proved undeveloped oil and gas reserves are in accordance with the United States Securities & Exchange Commission (SEC) Rule 4-10 of Regulation S-X as amended by the SEC Modernization of Oil and Gas Reporting release issued on December 31, 2008. Proved reserves are estimated using geological and engineering data to determine with reasonable certainty whether the crude oil or natural gas in known reservoirs is economically producible under existing regulatory, economic and operating conditions.

TOTAL's oil and gas reserves are consolidated annually, taking into account, among other factors, levels of production, field reassessments, additional reserves from discoveries and extensions, disposal and acquisitions of reserves and other economic factors.

Unless otherwise indicated, any reference to TOTAL's proved reserves, proved developed reserves, proved undeveloped reserves and production reflects the Group's entire share of such reserves or such production. TOTAL's worldwide proved reserves include the proved reserves of its consolidated entities as well as its proportionate share of the proved reserves of equity affiliates. The reserves estimation process involves making subjective judgments. Consequently, estimates of reserves are not exact measurements and are subject to revision under well-established control procedures.

(1) For Exploration & Production, organic investments include exploration investments, net development investments and net financial investments (excluding acquisitions).
(2) Excluding the Group's Gas activities.

The reserves booking process requires, among other actions:

- that an internal peer review of technical evaluations is carried out to ensure that the SEC definitions and guidance are followed; and
- that management makes the necessary funding commitments to their development prior to booking.

For further information concerning the reserves and their evaluation process, refer to points 9.1 and 9.2 of chapter 9.

2.1.3.1 Proved reserves for 2018, 2017 and 2016

In accordance with the amended Rule 4-10 of Regulation S-X, proved reserves at December 31 are calculated using a 12-month average price determined as the unweighted arithmetic average of the first-day-of-the-month price for each month of the relevant year, unless prices are defined by contractual arrangements, excluding escalations based upon future conditions. The average reference prices for Brent crude for 2018, 2017 and 2016 were, respectively, $71.43/b, $54.36/b and $42.82/b.

As of December 31, 2018, TOTAL's combined proved reserves of oil and gas were 12,050 Mboe (70% of which were proved developed reserves). Liquids (crude oil, condensates, natural gas liquids and bitumen) represented approximately 50% of these reserves and natural gas 50%. These reserves were located in Europe and Central Asia (mainly in Kazakhstan, Norway, The United Kingdom and Russia), Africa (mainly in Angola, Nigeria and the Republic of Congo), the Americas (mainly in Argentina, Brazil, Canada, the United States and Venezuela), the Middle East and North Africa (mainly in the United Arab Emirates, Qatar, and Yemen), and Asia-Pacific (mainly in Australia).

Gas and associated products (condensates and natural gas liquids) represented approximatively 57% of the reserves whilst crude oil and bitumen the remaining 43%.

Discoveries of new fields and extensions of existing fields added 1,421 Mboe to TOTAL's proved reserves during the three years 2016, 2017 and 2018 before deducting production and sales of reserves and adding any reserves acquired during this period. The net level of reserve revisions during this 3-year period is +1,383 Mboe, which was mainly due to the overall positive revisions in field behaviors and to the net impact of the changes in hydrocarbon prices in 2016 (decrease), in 2017 (increase) and in 2018 (increase) that led either to a reserves decrease or increase resulting from shorter or longer producing life of certain producing fields and from partial debooking or rebooking of proved undeveloped reserves due to economic reasons, partially offset by reserves increase or decrease on fields with producing sharing or risked service contracts.

As of December 31, 2017, TOTAL's combined proved reserves of oil and gas were 11,475 Mboe (61% of which were proved developed reserves) compared to 11,518 Mboe (58% of which were proved developed reserves) as of December 31, 2016.

2.1.3.2 Reserve sensitivity to oil and gas prices

Changes in the price used as a reference for the proved reserves estimation result in non-proportionate inverse changes in proved reserves associated with production sharing and risked service contracts (which together represent approximately 18% of TOTAL's reserves as of December 31, 2018). Under such contracts, TOTAL is entitled to a portion of the production, the sale of which is meant to cover expenses incurred by the Group. The more the oil prices decrease, the more the number of barrels necessary to cover the same amount of expenses. Moreover, the number of barrels economically producible under these contracts may vary according to criteria such as cumulative production, the rate of return on investment or the income-cumulative expenses ratio. This increase in reserves is partly offset by a reduction of the duration over which fields are economically producible. However, the effect of a reduction of the duration of production is usually inferior to the impact of the drop in prices in production sharing contracts or risked service contracts. As a result, lower prices usually lead to an increase in TOTAL's reserves, and vice versa. In Canada, a decrease in the reference price per barrel leads to a decrease in the volume of royalties and, therefore, an increase of the reserves.

Finally, for any type of contract, a significant decrease in the reference price of petroleum products that negatively impacts projects' profitability may lead to a reduction of proved reserves, and vice versa.

2.1.4 Production

The average daily production of liquids and natural gas was 2,775 kboe/d in 2018 compared to 2,566 kboe/d in 2017 and 2,452 kboe/d in 2016. Liquids represented approximately 56% and natural gas approximately 44% of TOTAL's overall production in 2018.

Gas and associated products (condensates and natural gas liquids) represented approximately 50% of TOTAL's overall production in 2018, whilst crude oil and bitumen the remaining 50%.

The tables on the following pages set forth TOTAL's annual and average daily production of liquids and natural gas by geographic area and for each of the last three fiscal years.

Consistent with industry practice, TOTAL often holds a percentage interest in its fields rather than a 100% interest, with the balance being held by joint-venture partners (which may include other international oil companies, state-owned oil companies or government entities). The Group's entities may frequently act as an operator (the party responsible for technical production) on the acreage in which it holds an interest. For further information, refer to the table on producing assets by geographical zone in point 2.1.8 of this chapter.

The Trading & Shipping division of TOTAL's Refining & Chemicals segment marketed in 2018, as in 2017 and 2016, substantially all of the liquids production from TOTAL's Exploration & Production segment(refer to table regarding Trading's crude oil sales and supply and petroleum products sales in point 2.3.2.1 of this chapter).

2.1.5 Delivery commitments

The majority of TOTAL's natural gas production is sold under long-term contracts. However, most of its North American and United Kingdom production, and part of its production from Denmark, the Netherlands, Norway and Russia, is sold on the spot market.

The long-term contracts under which TOTAL sells its natural gas usually provide for a price related to, among other factors, average crude oil and other petroleum product prices, as well as, in some cases, a cost-of-living index. Though the price of natural gas tends to fluctuate in line with crude oil prices, a slight delay may occur before changes in crude oil prices are reflected in long-term natural gas prices.

Some of TOTAL's long-term contracts, such as in Bolivia, Nigeria, Norway, Thailand and Qatar, specify the delivery of quantities of natural gas that may or may not be fixed and determinable. Such delivery commitments vary substantially, both in duration and scope, from contract to contract throughout the world. For example, in some cases, contracts require delivery of natural gas on an as-needed basis, and, in other cases, contracts call for the delivery of varied amounts of natural gas over different periods of time. Nevertheless, TOTAL estimates the fixed and determinable quantity of gas to be delivered over the period 2019-2021 to be

4,751 Bcf. The Group expects to satisfy most of these obligations through the production of its proved reserves of natural gas, with, if needed, additional sourcing from spot market purchases (refer to points 9.1 and 9.2 of chapter 9).

2.1.6 Contractual framework of activities

Licenses, permits and contracts governing the Group entities' ownership of oil and gas interests have terms that vary from country to country and are generally granted by or entered into with a government entity or a state-owned company or sometimes with private owners. These agreements usually take the form of concessions or production sharing contracts.

In the framework of oil concession agreements, the oil company (or consortium) owns the assets and the facilities and is entitled to the entire production. In exchange, the operating risks, costs and investments are the oil company's or the consortium's responsibility and it agrees to remit to the relevant host country, usually the owner of the subsoil resources, a production-based royalty, income tax, and possibly other taxes that may apply under local tax legislation.

The production sharing contract ("PSC") involves a more complex legal framework than the concession agreement: it defines the terms and conditions of production sharing and sets the rules governing the cooperation between the company (the contractor) or consortium (the contracting group) in possession of the license and the host country, which is generally represented by a state-owned company. The latter can thus be involved in operating decisions, cost accounting and production allocation. The contractor (or contractor group) undertakes the execution and financing, at its own risk, of all exploration, development or operational activities. In exchange, it is entitled to a portion of the production, known as "cost oil", the sale of which is intended to cover its incurred expenses (capital and operating costs). The balance of production, known as "profit oil", is then shared in varying proportions, between the contractor (or the contracting group), on the one hand, and the host country or state-owned company, on the other hand.

Today, concession agreements and PSCs can coexist, sometimes in the same country. Even though there are other contractual models, TOTAL's license portfolio is comprised mainly of concession agreements.

On most licenses, the partners and authorities of the host country, often assisted by international accounting firms, perform joint-venture and PSC cost audits and ensure the observance of contractual obligations.

In some countries, TOTAL has also signed contracts called "risked service contracts", which are similar to PSCs. However, the profit oil is replaced by a defined or determinable cash monetary remuneration, agreed by contract, which depends notably on field performance parameters such as the amount of barrels produced.

Oil and gas exploration and production activities are subject to authorization granted by public authorities (licenses), which are granted for specific and limited periods of time and include an obligation to relinquish a large portion, or the entire portion in case of failure, of the area covered by the license at the end of the exploration period.

TOTAL pays taxes on income generated from its oil and gas production and sales activities under its concessions, PSCs and risked service contracts, as provided for by local regulations. In addition, depending on the country, TOTAL's production and sales activities may be subject to a number of other taxes, fees and withholdings, including special petroleum taxes and fees. The taxes imposed on oil and gas production and sales activities are generally substantially higher than those imposed on other industrial or commercial businesses.

2.1.7 Production by geographical zone

The following table sets forth the Group's annual liquids and natural gas production by geographical zone in 2018.

	2018			2017			2016		
	Liquids Mb [(a)]	Natural gas Bcf [(b)(c)]	Total Mboe	Liquids Mb [(a)]	Natural gas Bcf [(b)(c)]	Total Mboe	Liquids Mb [(a)]	Natural gas Bcf [(b)(c)]	Total Mboe
Europe and Central Asia	**122**	**1,131**	**332**	**98**	**976**	**278**	**91**	**1,002**	**277**
Denmark	9	36	15	-	-	-	-	-	-
Italy	< 1	-	< 1	-	-	-	-	-	-
Kazakhstan	20	26	26	11	19	15	1	2	1
Norway	38	211	77	46	234	88	44	226	86
Netherlands	-	36	7	-	41	7	-	52	9
United Kingdom	28	206	65	15	201	52	18	218	58
Russia	27	616	142	26	481	116	28	504	123
Africa (excl. North Africa)	**187**	**287**	**245**	**183**	**277**	**239**	**186**	**227**	**232**
Angola	68	48	77	73	47	83	84	25	89
Republic of the Congo	47	12	50	36	12	38	31	11	33
Gabon	13	4	14	19	5	20	20	5	21
Nigeria	59	223	104	55	213	98	51	186	89
Middle East and North Africa	**190**	**294**	**243**	**153**	**282**	**204**	**137**	**291**	**189**
Algeria	11	34	17	1	21	5	2	33	8
United Arab Emirates	102	21	105	102	24	107	102	25	107
Iraq	7	1	7	6	-	6	6	< 1	7
Libya	22	3	23	11	-	11	5	-	5
Oman	9	25	14	9	23	13	10	23	14
Qatar	39	210	77	24	214	62	11	210	49
Americas	**67**	**423**	**142**	**48**	**442**	**127**	**40**	**346**	**102**
Argentina	3	147	29	2	141	27	3	143	29
Bolivia	2	74	15	2	79	17	1	59	12
Brazil	7	-	7	< 1	-	< 1	-	-	-
Canada	35	-	35	22	-	22	12	-	12
Colombia	< 1	-	< 1	< 1	-	< 1	-	-	-
United States	12	176	44	11	192	45	11	111	31
Venezuela	8	26	12	11	30	16	12	33	17
Asia-Pacific	**6**	**273**	**51**	**10**	**455**	**89**	**11**	**494**	**97**
Australia	1	66	12	-	41	7	-	33	6
Brunei	2	26	7	1	32	8	1	29	7
China	-	32	6	< 1	29	5	-	19	4
Indonesia	-	5	1	6	190	41	7	240	51
Myanmar	-	49	6	-	55	7	-	60	8
Thailand	3	95	19	3	108	21	3	112	22
TOTAL PRODUCTION	**572**	**2,408**	**1,013**	**492**	**2,432**	**937**	**465**	**2,360**	**897**
INCLUDING SHARE OF EQUITY AFFILIATES	**90**	**832**	**245**	**103**	**700**	**232**	**91**	**694**	**220**
Angola	2	30	7	2	29	7	-	7	2
United Arab Emirates	15	16	18	42	19	46	42	19	45
Oman	9	25	13	8	23	13	9	23	13
Qatar	30	143	58	16	144	42	2	139	28
Russia	26	616	141	24	483	112	25	503	120
Venezuela	8	2	8	11	2	12	12	3	12

(a) Liquids consist of crude oil, bitumen, condensates and natural gas liquids (NGL).
(b) Including fuel gas (166 Bcf in 2018, 173 Bcf in 2017 and 163 Bcf in 2016).
(c) Gas conversion ratio: 1 boe = 1 b of crude oil = 5,460 cf of gas in 2018 (5,461 cf in 2017 and 5,460 cf in 2016).

The following table sets forth the Group's average daily liquids and natural gas production by geographical zone in 2018.

	2018			2017			2016		
	Liquids kb/d [(a)]	Natural gas Mcf/d [(b)(c)]	Total kboe/d	Liquids kb/d [(a)]	Natural gas Mcf/d [(b)(c)]	Total kboe/d	Liquids kb/d [(a)]	Natural gas Mcf/d [(b)(c)]	Total kboe/d
Europe and Central Asia	**334**	**3,099**	**909**	**265**	**2,674**	**761**	**249**	**2,737**	**757**
Denmark	25	99	42	-	-	-	-	-	-
Italy	< 1	-	< 1	-	-	-	-	-	-
Kazakhstan	56	70	70	31	53	42	3	6	4
Norway	104	577	211	121	640	239	121	618	235
Netherlands	-	98	18	-	112	20	-	141	25
United Kingdom	75	566	179	42	551	142	49	595	158
Russia	74	1,689	389	71	1,318	318	76	1,377	335
Africa (excl. North Africa)	**513**	**786**	**670**	**502**	**759**	**654**	**509**	**621**	**634**
Angola	186	132	211	204	130	229	230	68	243
Republic of the Congo	130	32	136	98	32	104	84	29	90
Gabon	36	12	39	51	14	54	55	15	58
Nigeria	161	610	284	149	583	267	140	509	243
Middle East and North Africa	**520**	**805**	**666**	**419**	**771**	**559**	**373**	**795**	**517**
Algeria	30	94	47	4	58	15	6	90	23
United Arab Emirates	276	57	288	278	63	290	279	67	291
Iraq	18	1	19	15	1	16	17	1	18
Libya	62	9	63	31	-	31	14	-	14
Oman	26	67	38	25	64	37	26	62	37
Qatar	108	577	211	66	585	170	31	575	134
Americas	**183**	**1,161**	**389**	**132**	**1,212**	**348**	**109**	**944**	**279**
Argentina	7	402	79	6	388	76	8	391	78
Bolivia	5	204	42	5	216	46	4	160	34
Brazil	18	1	19	< 1	-	< 1	-	-	-
Canada	95	-	95	59	-	59	34	-	34
Colombia	1	-	1	< 1	-	< 1	-	-	-
United States	35	483	119	31	527	123	31	304	86
Venezuela	22	71	34	31	81	44	32	89	47
Asia-Pacific	**16**	**748**	**141**	**28**	**1,247**	**244**	**31**	**1,350**	**265**
Australia	3	181	34	-	114	19	-	91	16
Brunei	5	72	19	3	87	21	3	78	18
China	-	88	16	< 1	80	15	-	53	10
Indonesia	-	14	3	16	519	112	19	657	140
Myanmar	-	133	17	-	151	19	-	165	21
Thaïland	8	260	52	9	296	58	9	306	60
TOTAL PRODUCTION	**1,566**	**6,599**	**2,775**	**1,346**	**6,663**	**2,566**	**1,271**	**6,447**	**2,452**
INCLUDING SHARE OF EQUITY AFFILIATES	**247**	**2,281**	**671**	**284**	**1,914**	**639**	**247**	**1,894**	**600**
Angola	4	81	20	5	80	20	1	20	5
United Arab Emirates	41	45	49	115	53	125	114	51	123
Oman	24	67	37	23	64	35	24	62	36
Qatar	85	395	157	43	395	114	7	379	76
Russia	71	1,689	385	67	1,317	313	69	1,375	327
Venezuela	22	4	23	31	5	32	32	7	33

(a) Liquids consist of crude oil, bitumen, condensates and natural gas liquids (NGL).
(b) Including fuel gas (454 Mcf/d in 2018, 473 Mcf/d in 2017 and 448 Mcf/d in 2016).
(c) Gas conversion ratio: 1 boe = 1 b of crude oil = 5,460 cf of gas in 2018 (5,461 cf in 2017 and 5,460 cf in 2016).

2.1.8 Producing assets by geographical zone

The table below sets forth, as of December 31, 2018[a] and by geographical zone, TOTAL's producing assets, the year in which TOTAL's activities started, the Group's interest in each asset (Group share in %) and whether TOTAL is operator of the asset.

Europe and Central Asia

Denmark (2018)	**Operated:** Danish Underground Consortium (DUC) zone (31.20%), comprising the Dan/Halfdan, Gorm and Tyra fields, and all their satellites.
Kazakhstan (1992)	**Operated:** Dunga (60.00%)
	Non-operated: Kashagan (16.81%)
Norway (1965)	**Operated:** Atla (40.00%), Skirne (40.00%)
	Non-operated: Åsgard (7.68%), Ekofisk (39.90%), Eldfisk (39.90%), Embla (39.90%), Flyndre (6.26%), Gimle (4.90%), Heimdal (16.76%), Islay (5.51%)[b], Kristin (6.00%), Kvitebjørn (5.00%), Mikkel (7.65%), Oseberg (14.70%), Oseberg East (14.70%), Oseberg South (14.70%), Snøhvit (18.40%), Troll (3.69%), Tune (10.00%), Tyrihans (23.15%)
Netherlands (1964)	**Operated:** F6a oil (65.68%), J3a (30.00%), K1a (40.10%), K3b (56.16%), K4a (50.00%), K4b/K5a (36.31%), K5b (50.00%), K6 (56.16%), L1a (60.00%), L1d (60.00%), L1e (55.66%), L1f (55.66%), L4a (55.66%)
	Non-operated: E16a (16.92%), E17a/E17b (14.10%), J3b/J6 (25.00%), K9ab-A (22.46%), Q16a (6.49%)
United Kingdom (1962)	**Operated:** Alwyn North (100.00%), Dunbar (100.00%), Ellon (100.00%), Forvie North (100.00%), Grant (100.00%), Jura (100.00%), Nuggets (100.00%), Elgin-Franklin (46.17%), West Franklin (46.17%), Glenelg (58.73%), Islay (94.49%)[b], Laggan Tormore (60.00%), Edradour and Glenlivet (60.00%), Dumbarton, Balloch and Lochranza (100.00%), Gryphon (86.50%), Maclure (38.19%), South Gryphon (89.88%), Tullich (100.00%), Flyndre (65.94%)
	Non-operated: Bruce (1.00%), Markham unitized field (7.35%), Golden Eagle, Peregrine and Solitaire (31.56%), Scott (5.16%), Telford (2.36%), Harding (30.00%)
Russia (1991)	**Non-operated:** Kharyaga (20.00%), Termokarstovoye (49.00%)[c], Yamal LNG (20.02%)[d], several fields through the participation in PAO Novatek (19.40%)

Africa (excl. North Africa)

Angola (1953)	**Operated:** Girassol, Dalia, Pazflor, CLOV (Block 17) (40.00%), Kaombo (Block 32) (30.00%)
	Non-operated: Cabinda Block 0 (10.00%), Kuito, BBLT, Tombua-Landana (Block 14) (20.00%)[e], Lianzi (Block 14K) (10.00%)[e], Angola LNG (13.60%)
Gabon (1928)	**Operated:** Anguille Marine (100.00%), Anguille Nord Est (100.00%), Baliste (100.00%), Baudroie Marine (100.00%), Baudroie Nord Marine (100.00%), Grand Anguille Marine (100.00%), Lopez Nord (100.00%), Mérou Sardine Sud (100.00%), N'Tchengue (100.00%), Port Gentil Océan (100.00%), Torpille (100.00%), Torpille Nord Est (100.00%)
	Non-operated: Barbier (65.28%), Girelle (65.28%), Gonelle (65.28%), Grondin (65.28%), Hylia Marine (37.50%), Mandaros (65.28%), Pageau (65.28%)
Nigeria (1962)	**Operated:** OML 58 (40.00%), OML 99 Amenam-Kpono (30.40%), OML 100 (40.00%), OML 102 (40.00%), OML 130 (24.00%)
	Non-operated: Shell Petroleum Development Company (SPDC 10.00%), OML 118 – Bonga (12.50%), OML 138 (20.00%), Nigeria LNG (15.00%)
The Republic of the Congo (1968)	**Operated:** Kombi-Likalala-Libondo (65.00%), Moho Bilondo (53.50%), Moho Nord (53.50%), Nkossa (53.50%), Sendji (55.25%), Yanga (55.25%)
	Non-operated: Lianzi (26.75%), Loango (42.50%), Zatchi (29.75%)

(a) The Group's interest in the local entity is approximately 100% in all cases except for Total Gabon (58.28%), Total E&P Congo (85.00%) and certain entities in Abu Dhabi and Oman (see notes b through m below).
(b) The Islay field extends partially into Norway. Total E&P UK holds a 94.49% stake and Total E&P Norge 5.51%.
(c) TOTAL's interest in the joint-venture ZAO Terneftegas with PAO Novatek.
(d) TOTAL's interest in the joint-venture OAO Yamal LNG with PAO Novatek, China National Oil & Gas Exploration and Development (CNODC), a subsidiary of China National Petroleum Corporation (CNPC), and Silk Road Fund.
(e) Stake in the company Angola Block 14 BV (TOTAL 50.01%).

Middle East and North Africa

Algeria (1952)	**Non-operated:** TFT II (26.40%), Timimoun (37.75%), 404a & 208 (12.25%)
U.A.E. (1939)	**Operated:** Abu Al Bukhoosh (100.00%)
	Non-operated: ADNOC Onshore (10.00%), ADNOC Offshore: Umm Shaif/Nasr (20.00%), Lower Zakum (5.00%), ADNOC Gas Processing (15.00%), ADNOC LNG (5.00%)
Iraq (1920)	**Non-operated:** Halfaya (22.5%)[f], Sarsang (18.00%)
Libya (1959)	**Non-operated:** zones 15, 16 & 32 (75.00%)[g], zones 129 & 130 (30.00%)[g], zones 130 & 131 (24.00%)[g], zones 70 & 87 (75.00%)[g], Waha (16.33%)
Oman (1937)	**Non-operated:** various onshore fields (Block 6) (4.00%)[h], Mukhaizna field (Block 53) (2.00%)[i]
Qatar (1936)	**Operated:** Al Khalij (40.00%)
	Non-operated: North Field-Block NF Dolphin (24.50%), North Field-Qatargas 1 Upstream (20.00%), North Field-Qatargas 1 Downstream (10.00%), North Field-Qatargas 2 Train 5 (16.70%), Al Shaheen (30.00%)

Americas

Argentina (1978)	**Operated:** Aguada Pichana Este – Mulichinco (27.27%), Aguada Pichana Este – Vaca Muerta (41.00%), Aguada San Roque (24.71%), Rincon La Ceniza (45.00%), Aries (37.50%), Cañadon Alfa Complex (37.50%), Carina (37.50%), Hidra (37.50%), Kaus (37.50%), Vega Pleyade (37.50%)
	Non-operated: Aguada Pichana Oeste (25%), Aguada de Castro (25%), Sierra Chata (2.51%)
Bolivia (1995)	**Operated:** Incahuasi (50.00%)
	Non-operated: San Alberto (15.00%), San Antonio (15.00%), Itaú (41.00%)
Brazil (1999)	**Operated:** Lapa (35.00%)[j]
	Non-operated: Libra (20.00%), Iara (22.50%)
Canada (1999)	**Non-operated:** Surmont (50.00%), Fort Hills (24.58%)
Colombia (2006)	**Non-operated:** Niscota (71.43%)
United States (1957)	**Operated:** several assets in the Barnett Shale area (90.92% in average)
	Non-operated: several assets in the Utica Shale area (25.00%)[k], Chinook (33.33%), Tahiti (17.00%), Jack (25.00%)
Venezuela (1980)	**Non-operated:** PetroCedeño (30.32%), Yucal Placer (69.50%)

Asia-Pacific

Australia (2005)	**Non-operated:** several assets in UJV GLNG (27.50%)[l], Ichthys (26.00%)[m]
Brunei (1986)	**Operated:** Maharaja Lela Jamalulalam (37.50%)
	Non-operated: Block CA 1- Unit (4.64%)
China (2006)	**Non-operated:** South Sulige (49.00%)
Indonesia (1968)	**Non-operated:** Block Sebuku (15.00%)
Myanmar (1992)	**Operated:** Blocks M5/M6 (Yadana, Sein, Badamyar) (31.24%)
Thailand (1990)	**Non-operated:** Bongkot (33.33%)

(f) TOTAL's interest in the joint-venture.
(g) TOTAL's stake in the foreign consortium.
(h) TOTAL's indirect stake (4.00%) in the concession through its 10.00% stake in Private Oil Holdings Oman Ltd. TOTAL also has a direct interest (5.54%) in the Oman LNG facility (trains 1 and 2), and an indirect participation (2.04%) through OLNG in Qalhat LNG (train 3).
(i) TOTAL's direct interest in Block 53.
(j) TOTAL signed in December 2018 an agreement to acquire an additional 10% stake in the Lapa project in Brésil. The transaction, which remains subject to the approval of the Brazilian authorities, increases TOTAL's interest in this asset from 35% to 45%
(k) TOTAL's interest in the joint-venture with Chesapeake.
(l) TOTAL's interest in the unincorporated joint-venture.
(m) TOTAL disposed in December 2018 of a 4% interest in the Ichthys project in Australia, thus reducing its interest in the asset from 30% to 26%.

2.1.9 Activities by geographical zone

The information below describes the Group's main exploration and production activities presented by geographical zone[(1)], without detailing all of the assets held by TOTAL. In each zone, the countries are presented in decreasing order of production. The capacities referred to herein are expressed on a 100% basis, regardless of the Group's stake in the asset[(2)].

2.1.9.1 Europe and Central Asia

In 2018, TOTAL's production in the zone of Europe and Central Asia was 909 kboe/d, representing 33% of the Group's total production, compared to 761 kboe/d in 2017 and 757 kboe/d in 2016. The two main producing countries in this zone in 2018 were Russia and Norway.

In **Russia**, where the largest percentage of TOTAL's proved reserves are located (21% as of December 31, 2018), the Group's production was 389 kboe/d in 2018, compared to 318 kboe/d in 2017 and 335 kboe/d in 2016. This production comes from TOTAL's stake in PAO Novatek[(3)], as well as from the Termokarstovoye[(4)] and Kharyaga fields (20%) and, since the end of 2017, the Yamal LNG project (20%). Since 2015, Russia has been the leading country to the Group's production.

TOTAL participates in the Yamal LNG project. In 2013, the company OAO Yamal LNG[(5)] launched this project aimed at developing the onshore field of South Tambey (gas and condensates) located on the Yamal Peninsula, and at building a three-train gas liquefaction plant with a total LNG capacity of 16.5 Mt/y. The Yamal LNG project's financing was finalized in 2016 in compliance with applicable regulations. At the end of 2017, the Yamal LNG plant started production with the first shipment aboard "Christophe de Margerie". The second liquefaction train of the Yamal plant, with a capacity of 5.5 Mt/y, produced its first shipment of LNG in August 2018. The third liquefaction train started production in November 2018, more than one year ahead of the schedule planned when the project was launched. A fourth liquefaction train at small capacity (0.9 Mt/y), using PAO Novatek proprietary technology, is under construction.

In May 2018, TOTAL signed an agreement with Novatek to acquire a stake in Arctic LNG 2, the giant new LNG project led by Novatek. The agreement provides for the acquisition by TOTAL of a direct 10% interest in the project, which could be increased to 15% under certain conditions. The interest acquisition is effective further to the signing of the final contracts beginning of March 2019. Located on the Gydan Peninsula, facing Yamal, Arctic LNG 2 will have a production capacity of 19.8 Mt/y, and will use the hydrocarbon resources from the giant Utrenneye onshore gas and condensate field. The project will use the new gravity-based structures technology, with the installation of three gravity-based structures in Ob Bay that will host the three liquefaction trains of 6.6 Mt/y capacity each. It should benefit from possible synergies with the Yamal LNG project. The agreement also enables TOTAL to acquire a direct stake of between 10% and 15% in all future Novatek LNG projects on the Yamal and Gydan peninsulas.

In September 2018, TOTAL increased its stake from 18.9% to 19.4% of Novatek's share capital, which is the maximum set forth in the initial 2011 agreement.

For further information on international economic sanctions applicable in Russia, refer to point 3.1.9 of chapter 3.

In **Norway**, the Group's production was 211 kboe/d in 2018, compared to 239 kboe/d in 2017 and 235 kboe/d in 2016. This production comes from a multitude of fields, notably Ekofisk (39.9%), Snøhvit (18.4%) and Troll (3.69%). TOTAL has equity stakes in 66 production licenses on the Norwegian maritime continental shelf, 14 of which it operates. The Group also holds an 18.4% stake in the gas liquefaction plant of Snøhvit (capacity of 4.2 Mt/y). This plant, located in the Barents Sea, is supplied with production from the Snøhvit and Albatross gas fields.

As part of the continual improvement of its North Sea portfolio, the Group has made a number of acquisitions and sales:

- the acquisition of an 8.44% interest in the Johan Sverdrup field, further to the acquisition of Mærsk Oil in March 2018;
- the announcement of the acquisition of a 12.35% interest of the Teesside terminal on Ekofisk in June 2018, increasing TOTAL's interest from 32.87% to 45.22%;
- the finalization of the disposal of its interest in Polarled and Nyhamna in the Norwegian Sea zone in October 2018;
- the disposal of a 51% interest with the operatorship in the Martin Linge field, and of a 40% interest of the Garantiana discovery in the Greater Hild zone in March 2018;
- the finalization of the disposal of an interest with the operator's role in the Trell (40%), Trine (64%), Rind (62.13%) and Alve Nord (100%) discoveries in the Heimdal and Haltenbanken areas, in November 2018;
- the disposal of a 7.7% interest in the Visund field in January 2018 and of a 57% interest in the Victoria discovery in January 2019; and
- the disposal of 7.65% interest in the Mikkel field in the Haltenbanken area, approved by the authority in December 2018, and closed in 2019.

In the **United Kingdom**, the Group's production in 2018 was 179 kboe/d, compared with 142 kboe/d in 2017 and 158 kboe/d in 2016. This increase was driven in particular by the assets held in the Quad 9 and 15 areas of the eastern North Sea and Quad 30 in the Central Graben, integrated following the finalization of the acquisition of Mærsk Oil in March 2018.

- In the Alwyn area (100%), production from the Alwyn and Dunbar fields represents 45% of this area. The rest of the production comes from satellites linked to these fields. The drilling of an infill well in Alwyn is in progress.
- In the Central Graben, TOTAL holds stakes (46.17%, operator) in the Elgin, Franklin and West Franklin fields and (58.73%, operator) in the Glenelg field. The West Franklin Phase II project was completed in 2016. The Elgin redevelopment project includes the drilling of five wells. Four wells have been completed since 2016 and the fifth is in progress. Elsewhere, the drilling of a new infill well in Elgin is also in progess. In the Quad 30 area, the Group holds a stake in the Flyndre field (65.94%). The Culzean field (49.99%, operator) is under development and is expected to come into production in 2019. TOTAL announced a discovery on the Glengorm prospect (25%), close to existing infrastructures operated by TOTAL, in January 2019.
- In the West of Shetland area, TOTAL hold stakes (60%, operator) in the producing fields Laggan and Tormore, and Edradour and Glenlivet. In September 2018, the Group announced a discovery of gas in the Glendronach prospect, which is under appraisal. The total capacity of the Shetland gas treatment plant is 90 kboe/d.

(1) The geographical zones are as follows: Europe and Central Asia; Africa (excluding North Africa); Middle East and North Africa; Americas; and Asia-Pacific.
(2) For information on asset impairments, refer to Note 3 to the Group's Consolidated Financial Statements (point 8.7 of chapter 8).
(3) A Russian company listed on the Moscow and London stock exchanges and in which the Group held an interest of 19.4% as of December 31, 2018.
(4) The development and production license of Termokarstovoye onshore gas and condensates field is held by ZAO Terneftegas, a joint-venture between Novatek and TOTAL (49%).
(5) OAO Yamal LNG is held by PAO Novatek, Total E&P Yamal (20.02%), China National Oil & Gas Exploration and Development (CNODC), a subsidiary of China National Petroleum Corporation (CNPC), and Silk Road Fund.

- In the Quad 9 area in the eastern North Sea, the Group holds stakes and the role of operator in the Gryphon (86.5%), Maclure (38.19%), South Gryphon (89.88%) and Tullich (100%) fields. In the Quad 15 area, the Group holds a 100% stake in the Dumbarton, Balloch, and Lochranza fields.

In 2018, TOTAL maintained its interests in the PEDL 273, 305 and 316 shale gas exploration and production licenses (20%), after sales of interests in various licenses and leases in 2017.

In November 2018, the Group disposed of 42.25% interests in the Bruce field retaining 1% and its entire interest in Keith field (25%).

In **Kazakhstan**, the Group's production was 70 kboe/d in 2018, compared with 42 kboe/d in 2017 and 4 kboe/d in 2016. This comes mainly from the Kashagan field operated by the North Caspian Operating Company (NCOC) in the North Caspian license (16.81%). The production of the first phase of the Kashagan field and of the corresponding plant started in 2016, and the ramp-up of the production is underway in order to reach the planned capacity of 370 kb/d. Following the finalization of the acquisition of Mærsk Oil in March 2018, the Group holds an interest in the Dunga field (60%, operator).

In **Denmark**, TOTAL is present through its 31.2% stake with an operator's role in the assets operated by the Danish Underground Consortium (DUC), following the finalization of the acquisition of Mærsk Oil in March 2018. In September 2018, TOTAL also signed an agreement to acquire the entire capital of Chevron Denmark Inc. This acquisition, which is expected to be closed in 2019, will increase the Groupe's interest in DUC to 43.2%. In 2018, the Group's production was 42 kboe/d. The 100%-operated production comes from two main DUC assets: the Dan/Halfdan and Gorm/Tyra fields. The Tyra field facilities constitute the main gas treatment hub in Denmark. The Tyra field must be redeveloped due to subsidence problems, and is expected to restart in 2022.

In the **Netherlands**, the Group's production was 18 kboe/d in 2018 compared to 20 kboe/d in 2017 and 25 kboe/d in 2016. This decrease is due to natural field decline. In 2018, TOTAL holds interests in 22 offshore production licenses, including 18 that it operates. In 2017, production on platforms L7 and F15 stopped and the platforms will be dismantled.

In **Italy**, TOTAL holds stakes in the Tempa Rossa field (50%, operator) located on the Gorgoglione concession (Basilicate region), as well as three exploration licenses. Construction works and commissioning activities are finalized and the start of production is expected in 2019 subject to the Basilicata region's authorities authorization.

In **Azerbaijan**, TOTAL signed an agreement in 2016 establishing the contractual and commercial conditions for a first phase of production of the Absheron gas and condensate field (50%), which is located in the Caspian Sea and was discovered by TOTAL in 2011. The production capacity of this high pressure field is expected to be 35 kboe/d and the gas produced will supply Azerbaijan's domestic market. Drilling operations started in February 2018 and the main facilities construction contracts were awarded in July and October 2018. The role of operator was transferred to the joint TOTAL and SOCAR company (JOCAP) in August 2018.

In **Bulgaria**, where TOTAL has been present since 2012, the Group drilled the Polshkov deep offshore exploration well in 2016 on the Han Asparuh Block (40%, operator), with a surface area of 14,220 km², 100 km offshore in the Black Sea, which revealed the presence of oil. The second and third wells drilled in 2017 and 2018 accordingly were expensed in 2018.

In **Greece**, TOTAL (50%, operator) and its partners have held the exploration license for the offshore Block 2 in the Ionian Sea since March 2018. TOTAL undertook geological and seismic analysis, after which the Group will decide to continue or not the works on this license. Elsewhere, TOTAL (40%, operator) and its partners were chosen to explore two offshore blocks south-west of Crete. The license is expected to be attributed definitively in 2019.

Rest of the Europe and Central Asia area

TOTAL also holds interests (33.35%) in an exploration license without activity in Tajikistan. In October 2018, the Group signed a cooperation agreement in Uzbekistan with the state-owned company UzbekNefteGas to appraise the exploration potential of six blocks in the north-east of the country.

2.1.9.2 Africa (excluding North Africa)

In 2018, TOTAL's production in the Africa zone[1] was 670 kboe/d, representing 24% of the Group's total production, compared with 654 kboe/d in 2017 and 634 kboe/d in 2016. The two main producing countries in this zone in 2018 were Nigeria and Angola.

In **Nigeria**, the Group's production, primarily offshore, was 284 kboe/d in 2018 compared to 267 kboe/d in 2017 and 243 kboe/d in 2016. This increase in production comes from additional opportunities for gas exports to Nigeria LNG Ltd (NLNG) and from the development of Ofon phase 2 (OML 102).

TOTAL operates five production licenses (OML) on the 33 leases in which the Group has interests (including one exploration licenses).

TOTAL has offshore operations (production was 183 kboe/d in 2018) notably on the following leases:

- on OML 130 (24%, operator), the production from the Egina field started in December 2018. At plateau, the Egina field is expected to produce 200 kboe/d. The Preowei field development plan was filed with partners and authorities in 2018;
- on OML 139 (18%), the plan to develop the Owowo discovery, made in 2012, is under study. This discovery is near the OML 138 license (20%), where the Usan field is in production;
- on OML 102 (40%, operator), the drilling of the 23 additional wells (Ofon, phase 2) was completed in 2018;
- on OML 99 (40%, operator), the engineering studies for the development of the Ikike have been completed and the tender process for the construction is in progress; and
- on OML 118 (12.5%) the tender phase of the Bonga South West Aparo project (10% unitized) has been launched in February 2019.

TOTAL also has onshore operations (production was 102 kboe/d in 2018), notably:

- on OML 58 (40%, operator), as part of the joint-venture with the Nigerian National Petroleum Corporation (NNPC). It has been supplying gas to NLNG and on the domestic Nigerian market since 2016; and
- in relation to the SPDC joint-venture (10%), which holds 20 production licenses (of which 17 are located onshore), the 2018 production was 58 kboe/d (of which 54 kboe/d was onshore). The sale process of OML 25 is underway. TOTAL has obtained an extension of 16 licences for a 20-year period.

TOTAL is also developing LNG activities with a 15% stake in NLNG, which owns a liquefaction plant with a 22 Mt/y total capacity. The tender process for the engineering works for the construction of about 7 Mt/y of additional capacity started in mid-2018.

(1) Excluding North Africa, which is reported in the zone of the Middle East and North Africa.

In **Angola**, where TOTAL is the leading oil operator in the country[1], the Group's production was 211 kboe/d in 2018 compared to 229 kboe/d in 2017 and 243 kboe/d in 2016. It comes from Blocks 17, 14, 0 and 32:

- deep offshore Block 17 (40%, operator), TOTAL's main asset in Angola, is composed of four major producing hubs: Girassol, Dalia, Pazflor and CLOV. In 2018, TOTAL and its partners decided to launch three brownfield projects: Zinia Phase 2, Clov Phase 2 and Dalia Phase 3. These projects are satellite developments of the Pazflor, CLOV and Dalia FPSOs, and are expected to start up production in 2020 and 2021;
- on the ultra deep offshore Block 32 (30%, operator), production of the Kaombo project started in July 2018 with the start-up of the Kaombo Norte FPSO (capacity of 115 kb/d). The start-up of the second Kaombo Sul FPSO, with the same capacity, is expected in 2019. The discoveries in the central and northern parts of the Block (outside Kaombo) offer additional potential and are currently being assessed;
- on Block 14 (20%)[2], production comes from the Tombua-Landana and Kuito fields as well as the BBLT project, comprising the Benguela, Belize, Lobito and Tomboco fields;
- Block 14K (36.75%) is the offshore unitization area between Angola (Block 14) and the Republic of the Congo (Haute Mer license). TOTAL's interest in the Lianzi field is held at 10% through Angola Block 14 BV and 26.75% through Total E&P Congo;
- on Block 0 (10%), the second phase of the Mafumeira field development project started production in 2017;
- on Block 48 (50%, operator), TOTAL obtained the licence in 2018. The first phase of this program is expected to last for two years with the drilling of one exploration well; and
- TOTAL is also operator of the blocks 25 and 40 (35% and 40% respectively) in the offshore Kwanza basin. Exploration works did not enabled to confirm the basin's potential.

TOTAL is also developing its LNG activities through the Angola LNG project (13.6%), which includes a gas liquefaction plant with a total capacity of 5.2 Mt/y near Soyo, supplied by gas associated with production from Blocks 0, 14, 15, 17, 18 and 32. LNG production resumed in 2016. Following work to increase the reliability of the facilities, the plant has been capable of processing all of the gas supplied since 2017.

In the **Republic of the Congo**, the Group's production, through its subsidiary Total E&P Congo[3], was 136 kboe/d in 2018 compared to 104 kboe/d in 2017 and 90 kboe/d in 2016.

- Two major assets are in production on the Moho Bilondo license: the Moho Bilondo field (53.5%, operator), of which phase 1b came into production in 2015, and the Moho Nord field, which reached its production plateau at the end of 2017. The Moho Nord field has been producing more than its capacity of 100 kboe/d since the start of 2018 due to the strong productivity of the wells.
- Block 14K (36.75%) is the offshore unitization area between Angola (Block 14) and the Republic of the Congo (Haute Mer license). TOTAL's interest in the Lianzi field is held at 10% through Angola Block 14 BV and 26.75% through Total E&P Congo.
- Total E&P Congo is operator of Djéno (63%), the sole oil terminal in the country.
- At the end of 2016, Total E&P Congo returned its interests in the Tchibouela, Tchendo, Tchibeli and Litanzi fields (65%) to the Republic of the Congo, as the licenses have expired.

In the **Democratic Republic of Congo**, after the seismic delineation works, TOTAL notified in January 2019 the authorities its withdrawal from Block III.

In **Gabon**, the Group's production was 39 kboe/d in 2018 compared to 54 kboe/d in 2017 and 58 kboe/d in 2016. In September 2018, TOTAL finalized the sale of a residual interest of 32.9% in the Rabi-Kounga onshore field, thereby completing a strategic shift of its activities to offshore Nord, following the sale in 2017 of interests in certain onshore and offshore fields representing production of 13 kboe/d.

The Group's activities in Gabon are exclusively carried out by Total Gabon[4]. Total Gabon wholly owns and operates the Anguille and Torpille sector offshore fields, the Mandji Island sector onshore fields and the Cap Lopez oil terminal. In November 2018, Total Gabon launched a drilling campaign on Torpille, as part of the first phase of the redevelopment of the field.

In **Uganda**, TOTAL is present in the Lake Albert project, a major project for the Group, via a stake in licenses EA-1, EA-1A, EA-2 and EA-3 (Kingfisher). TOTAL is the operator of licenses EA-1 and EA-1A. In January 2017, TOTAL signed an agreement to acquire 21.57% of the 33.33% interest held by Tullow in the licenses. TOTAL will take over operatorship from Tullow of the northern portion of license EA-2, enabling significant efficiency gains and synergies for the development of the northern part of the project (known as Tilenga). China National Offshore Oil Corporation (CNOOC) has exercised its pre-emption right on 50% of the interest acquired. The agreement remains subject to approval by the Ugandan authorities. Following the finalization of the transaction, TOTAL is expected to own a 44.1% stake in the Lake Albert project. The State of Uganda retains the right to take a stake of 15% in the four licences (when the final investment decision is made). The exercise of this right would reduce TOTAL's interest to 37.5%.

The tender process for the front end engineering and design (FEED) work for the upstream part of the project was launched in 2018 and the construction contract for surface installations is expected to be awarded in 2019. Similarly, drilling work was the subject of competitive bidding in 2018 and award of the contracts is expected in 2019. The pipeline engineering works were finalized at the end of 2017, and the calls for tender for the construction of the facilities are in progress.

In **Mauritania**, TOTAL strengthened its exploration position through the signature of four new deep offshore licenses (Blocks C7 and C18 in 2017 and Blocks C15 and C31 in 2018). These licenses added to TOTAL's portfolio, which already contained Block C9 since 2012.

In **Senegal**, TOTAL signed two agreements to explore the country's deep offshore potential in 2017 through the acquisition of the deep offshore Block Rufisque and a technical evaluation contract of ultra deep offshore ultra deep offshore.

In **Kenya**, TOTAL holds 45% of the offshore licenses L11A, L11B and L12 and 25% of the onshore licenses 10BA, 10BB and 13T where oil discoveries have been made.

In **South Africa**, TOTAL has entered several agreements to step up its exploration efforts in the country, and the drilling of an exploration well started in December 2018 in the offshore11B/12B exploration license (45%, operated), located on the southern coast. In February 2019, TOTAL announced a gas condensate discovery on the Brulpadda prospect.

Rest of the zone of Africa

TOTAL also holds interests in exploration licenses in Côte d'Ivoire, and in Namibia. In Guinea, TOTAL and the Office National des Pétroles de Guinée (ONAP) signed a study agreement in 2017 for deep and very deep offshore zones.

(1) Company data.
(2) Stake held by the company Angola Block 14 BV (TOTAL 50.01%).
(3) Total E&P Congo is owned by TOTAL (85%) and Qatar Petroleum (15%).
(4) Total Gabon is a company under Gabonese law, the shares of which are listed on Euronext Paris and owned by TOTAL (58.28%), the Republic of Gabon (25%) and the public (16.72%).

2.1.9.3 Middle East and North Africa

In 2018, TOTAL's production in the zone of the Middle East and North Africa was 666 kboe/d, representing 24% of the Group's total production, compared to 559 kboe/d in 2017 and 517 kboe/d in 2016. The two main producing countries in this zone in 2018 were the United Arab Emirates and Qatar.

In the **United Arab Emirates**, the Group's production was 288 kboe/d in 2018 compared to 290 kboe/d in 2017 and 291 kboe/d in 2016.

Since March 2018, the Group holds a 20% interest in the Umm Shaif/Nasr offshore concession and a 5% stake in the Lower Zakum offshore concession, for a period of 40 years operated by ADNOC Offshore, which follows the previous Abu Dhabi Marine Areas Ltd (ADMA) offshore concession.

In November 2018, TOTAL and the state-owned Abu Dhabi National Oil Company (ADNOC) signed a concession agreement to launch an exploration program for unconventional gas in the Diyab prospection zone.

In 2015, the Group had also renewed its 10% interest in the Abu Dhabi Company for Onshore Petroleum Operations Ltd concession (ADCO, renamed ADNOC Onshore in 2017) for 40 years. This concession covers the 15 main onshore fields of Abu Dhabi.

TOTAL holds 100% and is the operator of the Abu Al Bukoosh offshore field, for which the contract was extended for 3 years in March 2018.

TOTAL also holds a 15% stake in Abu Dhabi Gas Industries (GASCO, renamed ADNOC Gas Processing in 2017), which produces NGL (natural gas liquids) and condensates from the associated gas produced by ADNOC Onshore. In addition, TOTAL holds 5% of the Abu Dhabi Gas Liquefaction Company (ADGAS, renamed ADNOC LNG in 2017), which processes the associated gas produced by ADNOC Offshore in order to produce LNG, NGL and condensates, and 5% of National Gas Shipping Company (NGSCO), which owns eight LNG tankers and exports the LNG produced by ADNOC LNG.

TOTAL holds a 24.5% stake in Dolphin Energy Ltd. that sells gas from Qatar to the United Arab Emirates. The operations of Dolphin Energy were not impacted by the evolution of the diplomatic relations between the United Arab Emirates and Qatar.

In **Qatar**, the Group's production was 211 kboe/d in 2018 compared to 170 kboe/d in 2017 and 134 kboe/d in 2016.

Since 2017 TOTAL holds a 30% stake in the Al Shaheen oil field concession located 80 km offshore to the north of Ras Laffan for a period of 25 years. The Al Shaheen field is operated by the North Oil Company, held by TOTAL (30%) and Qatar Petroleum (70%).

TOTAL also holds a stake in the Al Khalij offshore field (40%, operator).

In addition, the Group participates in the production, processing and exporting of gas from the North Field through its stakes in the Qatargas 1 and Qatargas 2 LNG plants:

- Qatargas 1: TOTAL holds a 20% interest in the North Field-Qatargas 1 Upstream field and a 10% interest in the LNG plant (three trains with a total capacity of 10 Mt/y); and
- Qatargas 2: the Group holds a 16.7% stake in train 5, which has an LNG production capacity of 8 Mt/y.

TOTAL offtakes part of the LNG produced in accordance with the 2006 contracts which provides for the purchase of 5.2 Mt/y of LNG by the Group.

TOTAL holds a 24.5% stake in Dolphin Energy Ltd. that sells gas from the Dolphin Block in Qatar to the United Arab Emirates and Oman.

In **Libya**, the Group's production was 63 kboe/d in 2018 compared to 31 kboe/d in 2017 and 14 kboe/d in 2016. This production comes from the Al Jurf fields located on offshore areas 15, 16 and 32 (75%[1]) and from the El Sharara fields located on onshore areas 129-130 (30%[1]) and 130-131 (24%[1]). On these areas, production was shut-down in July and December 2018 for security reasons. The Mabruk fields, located on onshore areas 70 and 87 (75%[1]) have been shut-down since the end of 2014.

Additionally, in March 2018, TOTAL acquired Marathon Oil Libya Limited, which holds a 16.33% stake in the Waha Concessions.

In **Algeria**, the Group's production was 47 kboe/d in 2018, compared to 15 kboe/d in 2017 and 23 kboe/d in 2016. Production in 2016 and 2017 came exclusively from the fields in the TFT zone (Tin Fouyé Tabankort, 35%), while production in 2018 also includes the Timimoun field (37.75%) and the fields in the Berkine Basin (404a and 208, 12.25%). Production on the Timimoun gas field started in March 2018.

Under the terms of the Global Agreement signed in 2017, two new concession contracts and the corresponding contracts for the sale of gas were signed for TFT II (26.4%) in June 2018, and for TFT SUD (49%) in October 2018. A concession contract and a gas marketing contract for Timimoun were also signed at the end of 2017, subsituting those dated July 2002.

The finalization of the acquisition of Mærsk Oil in March 2018 allowed for the incorporation of the 404a and 208 Blocks oil assets in the Berkine Basin.

In December 2018, TOTAL was awarded two authorizations to conduct exploration works on two offshore prospective areas, with operatorship for one of them.

In **Oman**, the Group's production was 38 kboe/d in 2018 compared to 37 kboe/d in 2017 and 2016. TOTAL participates in the production of oil principally in Block 6 (4%)[2]. In December 2018, TOTAL has signed a sale agreement for its interest in Block 53 (2%), finalization is expected in 2019. The Group also produces LNG through its investments in the Oman LNG (5.54%)/Qalhat LNG (2.04%)[3] liquefaction complex, with an overall capacity of 10.5 Mt/y. In May 2018, TOTAL signed an MOU with the Oman government to develop onshore natural gas resources, on Block 6 in the Greater Barik area.

In **Iraq**, the Group's production was 19 kboe/d in 2018 compared to 16 kboe/d in 2017 and 18 kboe/d in 2016. TOTAL holds a 22.5% stake in the risked service contract for the Halfaya field, located in Missan province. Following development studies in 2016, the decision to develop phase 3 of the project to increase production to 400 kb/d was taken in 2017. The new facilities started up at the end of 2018.

Following the finalization of the acquisition of Mærsk Oil in March 2018, TOTAL holds an 18% interest in the Sarsang field in Iraqi Kurdistan.

In **Yemen**, there has been no Group production since 2016. Due to the security conditions in the vicinity of Balhaf, Yemen LNG, in which the Group holds a stake of 39.62%, stopped its commercial production and export of LNG in April 2015, when Yemen LNG declared *force majeure* to its various stakeholders. The plant is in a preservation mode.

TOTAL holds various stakes in four onshore exploration licenses, for which a situation of *force majeure* has been declared. In addition, TOTAL signed an agreement to sell its interest in Block 5 (Marib Basin, Jannah license, 15%) in 2018. This agreement remains subject to the authorities' approval.

(1) TOTAL's stake in the foreign consortium.
(2) TOTAL holds an indirect 4% stake in Petroleum Development Oman LLC, operator of Block 6, via its 10% stake in Private Oil Holdings Oman Ltd.
(3) TOTAL's indirect stake via Oman LNG's stake in Qalhat LNG.

In **Iran**, following the withdrawal of the United States from the Joint Comprehensive Plan of Action on May 8, 2018, TOTAL withdrew from the project SP11 of the giant South Pars gas field and finalized its withdrawal on October 29, 2018, before the re-imposition of US secondary sanctions on the oil industry as of November 5, 2018. TOTAL was the operator and had a 50.1% interest alongside the Chinese state-owned company CNPC (30%) and Petropars (19.9%); a wholly-owned subsidiary of National Iranian Oil Company (NIOC). TOTAL ceased all operational activity in Iran before November 4, 2018. For information on international economic sanctions concerning Iran, refer to point 3.1.9 of chapter 3.

In **Syria**, TOTAL has had no production and no activity since December 2011. The Group has a 100% stake in the Deir Ez Zor license, which was operated by the joint-venture company DEZPC, in which TOTAL and the state-owned company SPC each have a 50% share. Additionally, TOTAL is holder of the Tabiyeh contract which came into effect in 2009. For information on international economic sanctions concerning Syria, refer to point 3.1.9 of chapter 3.

In **Lebanon**, TOTAL entered two exploration Blocks 4 and 9 (40%, operator) located offshore Lebanon in February 2018.

Rest of the zone of the Middle East and North Africa

TOTAL also holds interests in exploration licenses in Cyprus and Egypt.

2.1.9.4 Americas

In 2018, TOTAL's production in the zone of the Americas was 389 kboe/d, representing 14% of the Group's total production, compared to 348 kboe/d in 2017 and 279 kboe/d in 2016. The two main producing countries in this zone in 2018 were the United States and Canada.

In the **United States**, the Group's production was 119 kboe/d in 2018 compared to 123 kboe/d in 2017 and 86 kboe/d in 2016.

In the Gulf of Mexico, TOTAL holds interests in the Tahiti (17%) and Chinook (33.33%) deep offshore fields, and, thanks to the acquisition of Mærsk Oil in March 2018, in the Jack (25%) field. The Tahiti Vertical Expansion (TVEX) project, launched in 2016, started production in June 2018, enabling the field to maintain a level of production of about 100 kboe/d. Since the end of 2014, the Jack field has been sending its production to a semi-submersible platform shared with the Saint-Malo and Julia fields.

In January 2018, TOTAL acquired 12.5% of the Anchor discovery, when it took over Samson Offshore Anchor LLC. As part of the process to wind up Cobalt International Energy in April 2018, TOTAL increased its stake in the North Platte and Anchor deep offshore discoveries by 20%. TOTAL now holds 60% of North Platte, which it now operates, and 32.5% of Anchor. FEED development activities on Anchor commenced in 2018.

The Group has also launched the appraisal program of the Ballymore discovery, announced in January 2018, in which it holds a 40% interest.

In its Barnett shale gas assets (90.92%), TOTAL has stabilized the level of operated production through a program of works in 2017 and 2018.

TOTAL also has an interest of 25% in a Chesapeake-operated asset that produces shale gas operated by Chesapeake in the Utica Basin (on an acreage mainly located in Ohio). TOTAL has not taken part in any drilling during the last three years.

In **Canada**, the Group's production increased to 95 kboe/d in 2018 compared to 59 kboe/d in 2017 and 34 kboe/d in 2016. This increase is due:

- to the start-up in January 2018 and the rapid ramp-up during the year of production of the Fort Hills oil sands mining extraction project. In the fourth quarter of 2018, the project reached levels close to its plateau of 180 kboe/d. Following several interest disposals in 2015 and 2017, TOTAL now holds a 24.58% stake in Fort Hills; and
- to the strong operational performance of the Surmont SAGD(1) oil sands project, in which TOTAL holds a 50% stake.

In September 2018, TOTAL sold its 38.25% stake in the Joslyn project, which was suspended in 2014.

In **Argentina**, TOTAL operated approximately 30%(2) of the country's gas production in 2018. The Group's production was 79 kboe/d in 2018, compared to 76 kboe/d in 2017 and 78 kboe/d in 2016:

- in Tierra del Fuego, on the CMA-1 concession, TOTAL operates the Ara and Cañadon Alfa Complex onshore fields and the Hidra, Carina and Aries offshore fields (37.5%). In 2016, TOTAL started production on the Vega Pleyade offshore gas and condensates field (37.5%, operator), which has a production capacity of 350 Mcf/d; and
- in the Neuquén onshore Basin, the Group holds interests in 10 licenses and operates 6 of them, including Aguada Pichana Este and San Roque, where production has already started. Three shale gas and oil pilot projects were launched: the first on the Aguada Pichana Block, where production started mid-2015 in order to produce gas; the second on the Rincón la Ceniza Block, located on the gas and condensate portion of Vaca Muerta (45%, operator), where production started in 2016; and the third on the Aguada San Roque Block (24.71%, operator), which was launched in 2017 to produce oil.

Following the good results of the Aguada Pichana pilot project and a reduction in drilling costs, the first phase of development of the giant Vaca Muerta shale play was launched in 2017 in the eastern part of the Block. In this project, all the partners of Aguada Pichana, Total Austral S.A. (27.27%, operator), YPF S.A. (27.27%), Wintershall Energia S.A. (27.27%) and Panamerican Energy LLC (18.18%) have signed an agreement to split the Block in two. This agreement has enabled TOTAL to remain the operator of the Aguada Pichana Este Block, with 27.27% of the conventional part (Mulichinco), and 41% of the Unconventional part (Vaca Muerta), and to adjust its interest in the Aguada Pichana Oeste, which is now non-operated, to 25%.

A second development phase was launched on the Aguada Pichana Este – Vaca Muerta Block in July 2018. It should allow the production plateau to reach 500 Mcf/d, which corresponds to the capacity of the existing plant.

On the Aguada Pichana Oeste Block, TOTAL (25%) is taking part in the pilot, which came into production in 2017.

The wells of the first pilot on San Roque have been in production since July 2018 and the drilling of a second series of wells started in July 2018.

The initial results of the pilot development on the Rincón la Ceniza Block are encouraging at this stage. The delineation well drilled in 2016 on the La Escalonada Block in order to test the oil portion of the formation has also demonstrated good productivity.

In **Bolivia**, the Group's production, mainly gas, was 42 kboe/d in 2018 compared to 46 kboe/d in 2017 and 34 kboe/d in 2016. TOTAL is present on six licenses. Five of them have fields in production: San Alberto (15%), San Antonio (15%), Block XX Tarija Oeste (41%), and Aquio and Ipati (50%, operator), where the Incahuasi gas field started production in August 2016.

(1) Steam Assisted Gravity Drainage: production by injection of recycled water vapor.
(2) Source: Department of Federal Planning, Public Investment and Services, Energy Secretariat.

On the Aquio and Ipati Blocks of the Incahuasi field, the decision was taken to connect the ICS-3 well in 2017, and the increase of the plant's capacity to 390 Mcf/d was approved in June 2018.

An exploration well is expected to be drilled on the Azero exploration license (50%) in 2019.

In **Venezuela**, the Group's production was 34 kboe/d in 2018 compared to 44 kboe/d in 2017 and 47 kboe/d in 2016. It comes from the Group's interests in PetroCedeño (30.32%) and Yucal Placer (69.5%). The development of the extra heavy oil field of PetroCedeño continues (26 wells were drilled in 2018, compared to 49 in 2017 and 39 in 2016), as well as the debottlenecking project for the water separation and treatment facilities. For information on international economic sanctions concerning Venezuela, refer to point 3.1.9 of chapter 3.

In **Brazil**, the Group's production totaled 19 kboe/d in 2018, which was the Group's first full year of production in the country. The production comes from the Libra (20%) field, where the part in production was renamed Mero in 2017, and the Lapa (35%, operator) and Iara (22.5%) fields. The Mero field is located in the Santos Basin in very deep waters (2,000 m), approximately 170 km off the coast of Rio de Janeiro. At year-end 2018, 15 wells had been drilled and the production started in 2017 with the FPSO Pioneiro de Libra (50 kb/d capacity) designed to carry out the long-term production tests necessary for optimizing future development phases. The first development phase (17 wells connected to an FPSO with a capacity of 150 kb/d) also started in 2017.

In 2017, TOTAL and Petrobras signed definitive contracts in relation to a package of assets in Brazil contemplated by their strategic alliance agreed in 2016. As part of this strategic alliance, in January 2018, TOTAL acquired a 22.5% interest in the concession Iara, located in Block BM-S-11A, which is currently under development, as well as a 35% interest and the operatorship in the Lapa field concession area, located in Block BM-S-9A, which started up in 2016. TOTAL holds a 35% interest in Lapa field. TOTAL is expected to increase to 45% following the finalization of the acquisition of an additional interest of 10%, which is subject to approval by the relevant Brazilian authorities. The agreements provide for the strengthening of technical cooperation between the two companies, in particular by the joint assessment of the exploration potential of promising areas in Brazil and by the development of new technologies, in particular in deep offshore. On Iara, the declaration of the commerciality of two developments has been made, one for the development of the two Berbigao and Sururu-West fields, and the other for the development of the Atapu field. On the Sururu field, a six-month production test has been completed and the drilling of an appraisal well has revealed the highest oil column in the pre-salt in Brazil (530 m).

The acquisition of Mærsk Oil in March 2018 allowed for the incorporation of new assets in TOTAL's portfolio in Brazil: Wahoo (28.6%) and Itaipu (40%) respectively on the BMC-30 and BMC-32 Blocks in the Campos Basin.

In addition, the Group holds 17 exploration licenses located in the Barreirinhas, Ceará, Espirito Santo, Foz do Amazonas and Pelotas basins.

In **Colombia**, TOTAL started production on the Niscota field (71.4%) in 2017. The commerciality of the development of the field was declared In November 2018. The Group's production totaled 1 kboe/d in 2018.

In **Mexico**, TOTAL was awarded exploration licenses in 2016 on three blocks in offshore Mexico, following the country's first competitive deep water bid round. Located in the Perdido Basin, Block 2 (50%, operator) covers an area of 2,977 km² at depths of between 2,300 and 3,600 meters. TOTAL also holds stakes in Blocks 1 (33.33%) and 3 (33.33%), located in the Salina Basin, and in Block 15 (60%, operator). In March 2018, TOTAL obtained three exploration blocks in the shallow waters of the Campeche Basin: Block 32 (50%), Block 33 (50%, operator) and Block 34 (42.5%).

In **Guyana**, TOTAL finalized in 2018 the acquisition of a 35% stake in the Canje Block, 25% of the Kanuku Block and 25% of the Orinduik Block, as part of the exploration of the prolific offshore Guyana Basin. The acquisition of these interests has been approved by the authorities.

Rest of the Americas zone

At the end of 2018, TOTAL disposed of its interests in the Aruba exploration license. The Group holds an interest in the Guyane Maritime license in French Guiana (100%, operator), on which plug and abandonmet operations of the negative exploration well GMES-6 are in progress.

2.1.9.5 Asia-Pacific

In 2018, TOTAL's production in the zone of Asia-Pacific was 141 kboe/d, representing 5% of the Group's overall production, compared to 244 kboe/d in 2017 and 265 kboe/d in 2016. The two main producing countries in this zone in 2018 were Thailand and Australia.

In **Thailand**, the Group's production was 52 kboe/d in 2018 compared to 58 kboe/d in 2017 and 60 kboe/d in 2016. This production comes from the Bongkot offshore gas and condensate field (33.33%). The Thai state-owned company PTT purchases all of the natural gas and condensate production. New platforms were installed in 2018 to maintain the production plateau.

In **Australia**, the Group's production was 34 kboe/d in 2018 compared to 19 kboe/d in 2017 and 16 kboe/d in 2016. It comes from Gladstone LNG (GLNG) (27.5%) and Ichthys LNG, project for which the start of the offshore production began in July 2018 and the first export of LNG occured in October 2018. The Ichthys LNG project involves the development of a gas and condensate field located in the Browse Basin. This development includes a platform for the production, processing and export of gas, an FPSO for processing and exporting the condensate, an 889 km gas pipeline and an onshore liquefaction plant in Darwin. When running at full capacity, the two trains of the gas liquefaction plant will supply 8.9 Mt/y of LNG, 100,000 barrels of condensates per day and 1.65 Mt/y of LPG. The LNG has already been sold, mainly on the Asian market, under long-term contracts. TOTAL disposed in December 2018 of a 4% interest in the Ichthys LNG project in Australia, thus reducing TOTAL's interest in the asset from 30% to 26%.

GLNG is an integrated production, transportation and liquefaction project from the Fairview, Roma, Scotia and Arcadia fields with a capacity of 7.8 Mt/y located on Curtis Island, Queensland. The plant's two trains are in production.

In **Brunei**, the Group's production was 19 kboe/d in 2018 compared to 21 kboe/d in 2017 and 18 kboe/d in 2016. It comes from the Maharaja Lela Jamalulalam condensate gas field on Block B (37.5%, operator) and from the unitized Gumusut-Kakap field, of which the part in Brunei is located on Block CA1 (86.9%, operator). The signing of the unitization agreements in July 2018 gives TOTAL access to 4.64% of the Gumusut-Kakap field, which started in 2012 and produced 155 kboe/d of oil in 2018. The gas from the Maharaja Lela Jamalulalam field is delivered to the Brunei LNG liquefaction plant.

On the CA1 deep offshore exploration Block (86.9%, operator), the exploration license was extended for two years in October 2018.

In **Myanmar**, the Group's production was 17 kboe/d in 2018 compared to 19 kboe/d in 2017 and 21 kboe/d in 2016.

The Yadana field (31.24%, operator), located on the offshore Blocks M5 and M6, primarily produces gas for delivery to PTT for use in Thai power plants. The Yadana field also supplies the domestic market via an offshore pipeline built and operated by MOGE, a Myanmar state-owned company. In 2017, TOTAL started production on the Badamyar field, a satellite of the Yadana field. This project is expected to make it possible to extend production on this gas field, which is 8 Bcf/y, beyond 2020.

In 2015, the Group entered exploration license A6 (40%) located in the deep offshore area west of Myanmar, where a gas discovery has been made. A delineation well drilled in 2018 has produced encouraging results. These discoveries are currently being assessed.

In 2015, TOTAL signed a production sharing contract on the deep offshore YWB Block (100%, operator). The 2016 2D seismic survey was followed by a 3D seismic survey in 2018.

In **China**, the Group's production was 16 kboe/d in 2018 compared to 15 kboe/d in 2017 and 10 kboe/d in 2016. This production comes from the South Sulige Block (49%) in the Ordos Basin of Inner Mongolia, where the drilling of tight gas development wells is ongoing.

In 2017, TOTAL signed a production sharing contract on the Taiyang exploration Block (49%, operator), located in both Chinese and Taiwanese waters in the China Sea. A 2D seismic survey was carried out in 2018.

In **Indonesia**, Group production was 3 kboe/d in 2018, compared with 112 kboe/d in 2017 and 140 kboe/d in 2016, given the expiry of the Mahakam license and the transfer of the corresponding activities to Pertamina (operator) on January 1, 2018. The Group still holds an interest in the Sebuku license (15%), production from the Ruby gas field is routed by pipeline for processing and separation at the Senipah terminal.

In **Papua New Guinea**, the Group owns a stake in Block PRL-15 (40.1%, operator since 2015). The State of Papua New Guinea retains the right to take a stake in the license (when the final investment decision is made) at a level of 22.5%. In this case, TOTAL's stake would be reduced to 31.1%. Block PRL-15 includes the two discoveries Elk and Antelope. The delineation program of these discoveries was completed in 2017 and the results of the wells drilled confirmed the resource levels of the fields. Development studies continued in 2018.

TOTAL holds interests in the PPL339 (35%), PPL589 (100%) and PPL576 (100%) exploration licenses. The interpretation of the multi-client seismic survey performed in late 2016 on PPL576 revealed some promising prospects.

TOTAL and its partners signed on November 2018 a Memorandum of Understanding with the Independent State of Papua New Guinea defining the key terms of the Gas Agreement for the Papua LNG Project. The proposed Gas agreement is expected to be finalized in the first half of 2019.

Rest of the Asia-Pacific zone

TOTAL also holds interests in exploration licenses in Malaysia and the Philippines. In Cambodia, TOTAL is working to implement an agreement entered into in 2009 with the Cambodian government for the exploration of Block 3 located in an area of the Gulf of Thailand disputed by the governments of Cambodia and Thailand. This agreement remains subject to the establishment by both countries of an appropriate contractual framework. In Sri Lanka, in 2016 TOTAL signed an agreement to proceed with surveys on the offshore JS-5 and JS-6 Blocks off the east coast.

2.1.10 Oil and gas acreage

As of December 31 *(in thousands of acres)*		2018	
		Undeveloped acreage [(a)]	Developed acreage
Europe and Central Asia (excl. Russia)	Gross	19,649	923
	Net	7,450	221
Russia	Gross	3,733	619
	Net	685	127
Africa (excl. North Africa)	Gross	77,537	718
	Net	55,174	198
Middle East and North Africa	Gross	31,406	3,037
	Net	6,068	427
Americas	Gross	24,595	1,102
	Net	13,355	509
Asia-Pacific	Gross	42,332	668
	Net	24,566	204
TOTAL	**GROSS**	**199,252**	**7,067**
	NET [(b)]	**107,298**	**1,686**

(a) Undeveloped acreage includes leases and concessions.
(b) Net acreage equals the sum of the Group's equity stakes in gross acreage.

2.1.11 Productive wells

As of December 31 *(number of wells)*		2018	
		Gross productive wells	Net productive wells [(a)]
Europe and Central Asia (excl. Russia)	Oil	767	261
	Gas	314	98
Russia	Oil	337	65
	Gas	627	113
Africa (excl. North Africa)	Oil	1,533	429
	Gas	75	14
Middle East and North Africa	Oil	11,189	711
	Gas	190	40
Americas	Oil	1,066	352
	Gas	3,528	2,052
Asia-Pacific	Oil	8	7
	Gas	2,289	743
TOTAL	**OIL**	**14,900**	**1,825**
	GAS	**7,023**	**3,060**

(a) Net wells equal the sum of the Group's equity stakes in gross wells.

2.1.12 Net productive and dry wells drilled

As of December 31 *(number of wells)*	2018 Net productive wells drilled (a) (b)	2018 Net dry wells drilled (a) (c)	2018 Net total wells drilled (a) (c)	2017 Net productive wells drilled (a) (b)	2017 Net dry wells drilled (a) (c)	2017 Net total wells drilled (a) (c)	2016 Net productive wells drilled (a) (b)	2016 Net dry wells drilled (a) (c)	2016 Net total wells drilled (a) (c)
Exploration									
Europe and Central Asia (excl. Russia)	0.9	0.8	1.7	0.1	1.8	1.9	1.1	1.0	2.1
Russia	-	-	-	-	-	-	-	-	-
Africa (excl. North Africa)	0.1	1.0	1.1	0.2	0.5	0.8	0.7	-	0.7
Middle East and North Africa	0.5	-	0.5	0.6	0.5	1.1	0.8	-	0.8
Americas	0.5	1.6	2.1	1.3	0.5	1.7	2.1	0.8	2.9
Asia-Pacific	0.8	-	0.8	1.2	0.7	1.9	1.6	-	1.6
TOTAL	**2.8**	**3.4**	**6.2**	**3.4**	**4.0**	**7.4**	**6.3**	**1.8**	**8.1**
Development									
Europe and Central Asia (excl. Russia)	10.1	-	10.1	8.8	-	8.8	13.6	0.5	14.1
Russia	13.4	-	13.4	21.5	-	21.5	18.7	-	18.7
Africa (excl. North Africa)	13.0	0.1	13.1	14.4	-	14.4	14.6	-	14.6
Middle East and North Africa	68.8	-	68.8	82.0	-	82.0	49.3	1.1	50.4
Americas	38.8	0.3	39.1	29.2	0.5	29.7	35.4	-	35.4
Asia-Pacific	116.3	-	116.3	132.4	-	132.4	151.0	-	151.0
TOTAL	**260.4**	**0.4**	**260.8**	**288.3**	**0.5**	**288.8**	**282.6**	**1.6**	**284.2**
TOTAL	**263.2**	**3.8**	**267.0**	**291.7**	**4.5**	**296.2**	**288.9**	**3.4**	**292.3**

(a) Net wells equal the sum of the Group's equity stakes in gross wells.
(b) Includes certain exploratory wells that were abandoned, but which would have been capable of producing oil in sufficient quantities to justify completion.
(c) For information: service wells and stratigraphic wells are not reported in this table.

2.1.13 Wells in the process of being drilled (including wells temporarily suspended)

As of December 31 *(number of wells)*	2018 Gross	2018 Net (a)
Exploration		
Europe and Central Asia (excl. Russia)	-	-
Russia	-	-
Africa (excl. North Africa)	2	0.5
Middle East and North Africa	1	0.4
Americas	3	2.0
Asia-Pacific	-	-
TOTAL	**6**	**2.9**
Other wells (b)		
Europe and Central Asia (excl. Russia)	138	71.4
Russia	26	3.9
Africa (excl. North Africa)	65	13.7
Middle East and North Africa	180	26.2
Americas	50	21.3
Asia-Pacific	579	137.7
TOTAL	**1,038**	**274.2**
TOTAL	**1,044**	**277.1**

(a) Net wells equal the sum of the Group's equity stakes in gross wells. Includes wells for which surface facilities permitting production have not yet been constructed. Such wells are also reported in the table "Number of net productive and dry wells drilled", above, for the year in which they were drilled.
(b) Other wells are developments wells, service wells, stratigraphic wells and extension wells.

2.1.14 Interests in pipelines

The table below shows the main interests held by Group entities[1] in pipelines on December 31, 2018.

Pipeline(s)	Origin	Destination	(%) interest	Operator	Liquids	Gas
EUROPE AND CENTRAL ASIA						
Azerbaijan						
BTC	Baku (Azerbaijan)	Ceyhan (Turkey, Mediterranean)	5.00		X	
Norway						
Frostpipe (inhibited)	Lille-Frigg, Froy	Oseberg	36.25		X	
Heimdal to Brae Condensate Line	Heimdal	Brae	16.76		X	
Kvitebjorn Pipeline	Kvitebjorn	Mongstad	5.00		X	
Norpipe Oil	Ekofisk Treatment center	Teesside (United Kingdom)	45.22		X	
Oseberg Transport System	Oseberg, Brage and Veslefrikk	Sture	12.98		X	
Troll Oil Pipeline I and II	Troll B and C	Vestprosess (Mongstad refinery)	3.71		X	
Vestprosess	Kollsnes (Area E)	Vestprosess (Mongstad refinery)	5.00		X	
Netherlands						
Nogat Pipeline	F3-FB	Den Helder	5.00			X
WGT K13-Den Helder	K13A	Den Helder	4.66			X
WGT K13-Extension	Markham	K13 (via K4/K5)	23.00			X
United Kingdom						
Alwyn Liquid Export Line	Alwyn North	Cormorant	100.00	X	X	
Bruce Liquid Export Line	Bruce	Forties (Unity)	1.00		X	
Graben Area Export Line (GAEL) Northern Spur	ETAP	Forties (Unity)	9.58		X	
Graben Area Export Line (GAEL) Southern Spur	Elgin-Franklin	ETAP	32.09		X	
Ninian Pipeline System	Ninian	Sullom Voe	16.36		X	
Shearwater Elgin Area Line (SEAL)	Elgin-Franklin, Shearwater	Bacton	25.73			X
SEAL to Interconnector Link (SILK)	Bacton	Interconnector	54.66	X		X
AFRICA (EXCL. NORTH AFRICA)						
Gabon						
Mandji Pipes	Mandji fields	Cap Lopez Terminal	100.00[a]	X	X	
Nigeria						
O.U.R	Obite	Rumuji	40.00	X		X
NOPL	Rumuji	Owaza	40.00	X		X
MIDDLE EAST AND NORTH AFRICA						
Qatar						
Dolphin	North Field (Qatar)	Taweelah-Fujairah-Al Ain (United Arab Emirates)	24.50			X
AMERICAS						
Argentina						
TGM	Neuquén (TGN) / Porto alegre (Brazil)	Paso de Los Libres (Brazil border)	32.68			X
Brazil						
TBG	Bolivia-Brazil border	Porto Alegre via São Paulo	9.67			X
TSB	Argentina-Brazil border (TGM)/ Porto Alegre	Uruguyana (Brazil) Canoas	25.00			X
ASIA-PACIFIC						
Australia						
GLNG	Fairview, Roma, Scotia, Arcadia	GLNG (Curtis Island)	27.50			X
Myanmar						
Yadana	Yadana field	Ban-I Tong (Thai border)	31.24	X		X

(a) 100% interest held by Total Gabon. The Group holds an interest of 58.28% in Total Gabon.

(1) Excluding equity affiliates, except for the Yadana and Dolphin pipelines.

2.2 Gas, Renewables & Power segment

The Gas, Renewables & Power segment carries the Group's ambition in low carbon activities through the development of downstream gas and low carbon electricity as well as the energy efficiency businesses.

The segment employs an integrated business model along the full gas and power value chain. The LNG business is growing in particular following the acquisition of the LNG business of Engie in 2018. The number of customers grows as well strongly, notably in B2C, following the acquisition of Direct Énergie in 2018 and Lampiris in 2016.

2.7 GW installed low carbon power capacity (1) at the end of 2018	21.8 Mt of LNG managed in 2018	$0.5 B organic investments (2) in 2018	12,011 employees present	> 5 M sites, of which 80% are B2C

Gas, Renewables & Power segment financial data (3)

(M$)	2018	2017	2016
Adjusted net operating income (a)	756	485	439
Operating cash flow before working capital changes w/o financial charges (DACF) (b)	513	294	176
Cash flow from operations (c)	(670)	1,055	589

(a) Adjusted results are defined as income using replacement cost, adjusted for special items, excluding the impact of changes for fair value.
(b) DACF = debt adjusted cash flow. The operating cash flow before working capital changes w/o financial charges is defined as cash flow from operating activities before changes in working capital at replacement cost, without financial charges.
(c) Excluding financial charges.

Adjusted net operating income for the Gas, Renewables & Power segment was $756 million in 2018, notably thanks to the good performance of LNG and gas/power trading activities. The increase in working capital related to the consolidation of the acquisitions of Direct Énergie and the LNG business of Engie was mainly responsible for the negative cash flow from operations in 2018.

TOTAL integrates the climate change in its strategy and anticipates the new trends on the energy market. Thus, the Group strengthens its development in the natural gas value chain and intends to develop profitable activities in low-carbon electricity.

The activities of TOTAL in the gas business contribute to the growth of the Group by ensuring market outlets for its current and future natural gas production. In addition to its activities in liquefied natural gas (LNG) (refer to point 2.1.8 in this chapter), TOTAL is also present in the trading of natural gas and liquefied petroleum gas (LPG).

TOTAL is present along the entire electricity value chain, from the production of low carbon electricity to marketing activities. TOTAL's activities in electricity production rely on its subsidiaries Direct Énergie, Quadran, Total Solar and its shareholdings in SunPower and Total Eren. TOTAL is also involved in electricity storage (Saft Groupe), as well as in services to reduce the energy consumption of its customers and the environmental footprint, in particular through its Greenflex subsidiary or through projects to capture, store or use CO_2.

As part of its strategy aiming to develop low carbon activities, several major acquisitions were made in 2018. In July 2018, the finalization of the acquisition of Engie's LNG business enabled TOTAL to consolidate its position as a leading actor in LNG. This acquisition strengthens TOTAL's positions in the production of LNG, increases the number of long-term purchase and sales agreements, and its regasification capacities, in particular in Europe, and adds a fleet of LNG tankers, thereby offering more flexibility to its portfolio.

TOTAL also signed an agreement with KKR-Energas for the acquisition of two combined-cycle natural gas power plants in France. In September 2018, TOTAL finalized the acquisition of Direct Énergie (France's top alternative energy supplier (4)) and its subsidiary Quadran (developer and owner of renewables assets), thereby speeding up its strategy to integrate the gas-electricity chain in Europe. In December 2018, TOTAL and EPH also signed an agreement allowing TOTAL, subject to authorisation by the competent authorities, to acquire in 2020 two gas power turbines in France.

(1) In Group's equity stake.
(2) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests (refer to point 2.5.1 of this chapter).
(3) The data for the 2016 financial year has been restated to take into account the change in the organization of the Group that has been fully effective since January 1, 2017.
(4) Source: Company data.

2.2.1 LNG

A pioneer in the LNG industry, TOTAL is today one of the world's leading players[1] in the sector and has solid and diversified positions both in the upstream and downstream of the LNG chain. LNG development is a key element of the strategy of the Group, which is strengthening its positions in most major production regions and main markets.

2.2.1.1 LNG production

Through its interests in liquefaction plants in Angola, Australia, Egypt, the United Arab Emirates, Nigeria, Norway, Oman, Qatar, Russia and Yemen[2], the Group sells LNG across markets worldwide. In 2018, the share of LNG production was 11.1 Mt, compared to 11.2 Mt in 2017 and 11 Mt in 2016. In 2018, the Ichthys (Australia) and Yamal LNG (Russia) plants started producing LNG. The growth of LNG production sold by TOTAL over the coming years is expected to be ensured by the Group's liquefaction projects under construction (in the United States and Russia), or by projects currently under study (Papua New Guinea, Nigeria, Russia, Oman, Mexico and the United States[3]).

Thereby, in March 2019, Total has signed the definitive agreement with PAO Novatek[4] for the acquisition of a direct 10% interest in Arctic LNG 2. Furthermore, a Memorandum of Understanding (MOU) signed with the government of Oman is expected to enable the Group to develop a regional hub for the delivery of an LNG bunker service to ships, using the natural gas resources from Block 6. Finally, TOTAL has signed an MOU with Sempra Energy for the development of projects for the export of North American LNG, including the expansion of Cameron LNG in Louisiana and the Energia Costa Azul project in Baja California, Mexico.

2.2.1.2 Long-term Group LNG sales and purchases

TOTAL acquires long-term LNG volumes mainly from liquefaction projects in which the Group holds an interest (Egyptian LNG in Egypt, Ichthys in Australia, Qatargas 2 in Qatar, Nigeria LNG in Nigeria, Snøhvit in Norway, Yamal LNG in Russia and Yemen LNG in Yemen). Furthermore, TOTAL also acquired long-term LNG volumes from American projects in which the Group has no equity (Sabine Pass, Corpus Christi, Cove Point). These volumes support the expansion of the Group's worldwide LNG portfolio. Since 2009, a growing portion of the long- term volume purchased by the Group that was initially intended for delivery to North American and European markets has been diverted to Asian markets, benefitting from a better price environment.

New LNG sources arising from, among others, the acquisition of Engie's LNG assets in the United States (Cameron LNG) are expected to ensure the growth of the Group's LNG portfolio. The Group is developing new LNG markets by launching projects of Floating Storage and Regasification Units (FSRU) for the import of LNG, for example in Myanmar or Côte d'Ivoire, in addition to the two FSRUs already in operation following the acquisition of Engie's LNG activities.

TOTAL holds several significant contracts for the long-term sale of LNG in Chile, China, South Korea, Spain, the United States, Indonesia, Japan, Panama, the Dominican Republic, Singapore and Taiwan.

2.2.1.3 LNG shipping

As part of its LNG shipping activities, TOTAL uses a fleet of 15 LNG vessels, 12 of which come from the acquisition of Engie's LNG portfolio. In addition to the fleet, TOTAL may also charter extra vessels on a spot and short-term basis to meet trading needs.

2.2.1.4 LNG trading

The Group's activities are developing in LNG trading through major sale and purchase contracts and are reinforced by the acquisition of Engie's portfolio of LNG activities. In 2018, these LNG trading activities represented a volume of 17.1 Mt compared with 7.6 Mt in 2017 and 5.1 Mt in 2016.

The portfolio focuses, in particular, on Asian markets (China, South Korea, India, Indonesia, Japan and Taiwan) and is made up of spot and long-term contracts that enable TOTAL to supply gas to its main customers worldwide, while keeping sufficient flexibility to seize market opportunities.

In 2018, the trading teams were located in London, Paris, Houston and Singapore.

In 2018, TOTAL bought 173 shipments under long-term contracts from Algeria, Australia, Egypt, the United States, Nigeria, Norway, Qatar and Russia and 97 spot or medium-term shipments, compared with 59 and 49 in 2017, and 51 and 19 in 2016 respectively. Deliveries from Yemen LNG have been halted since 2015.

2.2.1.5 LNG regasification

TOTAL has entered agreements that provide a long-term access to LNG regasification capacity worldwide, through existing assets or projects under development in Europe (Belgium, France and the United Kingdom), the Americas (the United States, Panama and Mexico), Asia (India and Myanmar) and Africa (Côte d'Ivoire). TOTAL also charters two FSRUs.

In 2018, TOTAL has an LNG regasification capacity in the range of 27 Bcm/y, of which 20 Bcm/y comes from the acquisition of Engie's LNG activities.

In **France**, TOTAL holds a 27.5% interest in Fosmax LNG. The terminal received 65 vessels in 2018, compared with 55 in 2017 and 54 in 2016.

In October 2018, TOTAL sold its 9.99% stake in the Dunkerque LNG terminal, with a capacity of 13 Bcm/y.

In the **United Kingdom**, through its equity interest in the Qatargas 2 project, TOTAL holds an 8.35% stake in the South Hook LNG regasification terminal, with a total capacity of 21 Bcm/y.

In the **United States**, in 2004, TOTAL has reserved a regasification capacity of approximately 10 Bcm/y in the Sabine Pass terminal (Louisiana) for a 20-year period until 2029. In 2012, TOTAL and Sabine Pass Liquefaction (SPL) signed agreements allowing TOTAL's reserved regasification capacity to gradually be transferred by TOTAL to SPL in return for a payment.

In **India**, TOTAL disposed of its 26% stake in the Hazira terminal in January 2019. The terminal received 67 vessels in 2018, compared with 44 in 2017 and 61 in 2016. Furthermore, in October 2018, TOTAL and Adani Group signed an agreement to develop several LNG regasification terminals, including Dhamra LNG on the east coast of India, and to develop the marketing of LNG in India. Thus, TOTAL relies on a recognized local partner to break into the Indian market.

In **Myanmar**, a consortium led by TOTAL has been tasked with the responsibility of developing an integrated project, including an FSRU LNG regasification terminal at Kanbauk, a 1,230 MW production plant and the supply of electricity as far as Yangon, which is expected to start up in 2023.

(1) Publicly available information: upstream and downstream LNG portfolios in 2018.
(2) The Yemen LNG plant has been halted since 2015. For more information, refer to point 2.1.8 of this chapter.
(3) TOTAL holds since 2017 an interest in Tellurian Inc. which is listed on the NASDAQ, (18.38% on December 31, 2018).
(4) A Russian company listed on the Moscow and London stock exchanges and in which the Group held an interest of 19.4% as of December 31, 2018.

In **Côte d'Ivoire**, a consortium led by TOTAL (34%, operator) has been assigned responsibility for developing and operating an FSRU-type LNG regasification terminal in Abidjan, which is expected to start up in 2021.

2.2.2 Trading and transport (excluding LNG)

2.2.2.1 Trading excluding LNG

Following the sale in 2015 of its subsidiary Total Coal South Africa, the Group ceased its coal production activities. Moreover, in 2016, the Group stopped its coal sales and trading activities.

A) LPG

In 2018, TOTAL traded and sold nearly 5.2 Mt of LPG (propane and butane) worldwide, compared to 4.9 Mt in 2017 and 5.3 Mt in 2016. Nearly 30% of these quantities came from fields or refineries operated by the Group. This trading activity was conducted by means of seven long-term chartered vessels. In 2018, 255 journeys were necessary for transporting the negotiated quantities, including 156 journeys carried out by TOTAL's long-term chartered vessels and 99 journeys by spot-chartered vessels.

B) Petcoke and sulfur

TOTAL sells petcoke coming from the Port Arthur refinery in the United States and the Jubail refinery in Saudi Arabia. Petcoke is sold to cement producers and electricity producers mainly in India, as well as in Mexico, Brazil, other Latin American countries and Turkey. 2.2 Mt of petcoke were sold on the international market in 2018, compared to 2.1 Mt in 2017 and 1.9 Mt in 2016.

TOTAL also sells sulfur, mainly from the production of its refineries. In 2018, 1.4 Mt was sold, compared with 0.9 Mt in 2017 and 0.7 Mt in 2016.

C) Natural gas and electricity

TOTAL is pursuing gas and electricity trading operations in Europe and North America in order to sell the Group's production and to supply the marketing subsidiaries and other entities of the Group.

In **Europe**, TOTAL sold 46.4 Bcm of natural gas in 2018, compared with 33.3 Bcm in 2017 and 32.9 Bcm in 2016[1]. The Group also traded 65.4 TWh of electricity in 2018, compared to 70.2 TWh in 2017 and 49.1 TWh in 2016, mainly from external sources.

In **North America**, TOTAL sold 13.7 Bcm of natural gas in 2018 from its own production or from external resources, compared to 12.1 Bcm in 2017 and 10.1 Bcm in 2016.

2.2.2.2 Transport of natural gas

The Group holds interests in gas pipelines (refer to point 2.1.14 of this chapter) located in Brazil and Argentina.

2.2.3 Low carbon electricity production

In the second half of 2018, TOTAL accelerated its strategy to integrate the gas-electricity chain in Europe and to develop low-carbon electricity by acquiring Direct Énergie and two combined-cycle natural gas power plants in France from KKR-Energas. Consequently, TOTAL has the capacity to produce 2.7 GW of low-carbon electricity from gas and renewables (in Group share) worldwide.

2.2.3.1 Electricity production from natural gas

The construction of a portfolio of combined-cycle gas power plants in Europe is part of the strategy to integrate the gas and electricity value chain, from production to marketing, and compliments well the sources of production of intermittent renewable electricity. Furthermore, the flexible production of these power plants enables the Group to optimize its customers' electricity supply costs.

In **France** and **Belgium**, TOTAL owns four combined-cycle natural gas (CCGT) power plants. The global installed capacity is 1.6 GW. TOTAL holds a 60% stake in project to build a fifth 0.4 GW CCGT power plant in Landivisiau, France. The agreement signed in December 2018 with EPH will bring to TOTAL portfolio two additional gas power turbines (0.8 GW) from 2020, subject to authorisation by the competent authorities.

In **Abu Dhabi**, the Taweelah A1 gas power plant, which is owned by the Gulf Total Tractebel Power Company (TOTAL, 20%), combines electricity generation and water desalination. The plant has a net power generation capacity of 1.6 GW and a water desalination capacity of 385,000 m^3 per day. The plant's production is sold to Abu Dhabi Water and Electricity Company (ADWEC) as part of a long-term agreement.

In **Brazil**, TOTAL and Petrobras pursue the study of new business opportunities in the natural gas.

2.2.3.2 Electricity production from renewables

As part of its development in low-carbon electricity, TOTAL relies on its Quadran and Total Solar subsidiaries and its shareholdings in SunPower and Total Eren.

A) SunPower

TOTAL has held, since 2011, a majority interest in SunPower (55.66% as of December 31, 2018), an American company listed on NASDAQ and based in California.

Since 2017, SunPower has focused its activities on two segments: on the one hand, the design, production and international sale of very high-efficiency solar cells and panels, and, on the other hand, the sale of photovoltaic systems, that increasingly include storage, in the United States. SunPower had a capacity to produce Inter-digitated Back Contact (IBC) cells of almost 1.2 GW/y at the end of 2018. The cells are then assembled into solar panels in plants located mainly in France and Mexico. To enlarge its commercial offering, SunPower has marketed, since 2016, a new range of panels to target the most competitive market sectors while continuing to hold a technological edge over its competitors. SunPower is finalizing the development of its future highly efficient technology, which significantly reduces costs, and has launched its industrial deployment.

SunPower markets its panels worldwide for applications ranging from residential and commercial roof tiles to solar power plants.

(1) The data for 2017 and 2016 financial years have been restated and include the supply of the marketing subsidiaries.

In 2018, the worldwide photovoltaic market remained dynamic, with estimated growth of 14% (compared with 30% in 2017) of newly installed capacities[1]. SunPower installed more than 1.5 GW in 2018, compared to 1.4 GW in 2017 and 1.3 GW in 2016.

In the American market, SunPower is one of the leading players on the residential, industrial and commercial markets, and is driving the development of smart energy offerings (a combination of photovoltaic solar power, storage and other services).

As part of its recentering strategy, SunPower sold, in June 2018, its stake in 8point3 Energy Partners to an investment fund in the energy sector. In 2018, SunPower also sold its inverters activity and its last solar farm projects that were under development, mainly in the Americas.

In October 2018, SunPower acquired certain assets of SolarWorld Americas, in particular the Hillsboro plant in Oregon, thereby strengthening its position in the production of solar panels in the United States. In September 2018, the American government exempted the IBC technology of the customs tariffs imposed by the American authorities on imports of cells and panels in January 2018.

B) Quadran

In 2018, TOTAL maintained its policy of investing in low-carbon businesses with the acquisition of Direct Énergie, which owns Quadran. This company enables the Group to speed up its development in solar and wind power, biogas and in hydroelectricity in France.

This acquisition adds 0.7 GW gross installed capacity (in 100%). At the end of 2018, Quadran operates a portfolio of 213 onshore wind, solar, hydroelectric and biogas assets in France, and develops a series of renewable electricity projects that have reached different stages of maturity.

C) Total Eren

In December 2017, TOTAL acquired a 23% interest in Eren Renewable Energy, which has since been renamed Total Eren. TOTAL will be able to take control of Total Eren after a period of five years. Through its partnerships with local developers, Total Eren today manages numerous energy projects in countries and regions where renewable energies represent an economically viable response to a growing demand for energy, such as Asia-Pacific, Africa and Latin America.

Total Eren has a diversified set of assets in renewable energies (wind, solar and hydraulic), representing a gross installed capacity of about 1.3 GW (in 100%) in operation or under construction around the world.

D) Total Solar

Total Solar, which is 100% owned by the Group, contributes to the development of activities in solar power, with a focus on two market segments:

- decentralized photovoltaic systems aimed at industrial or commercial customers (B2B) entering into private PPAs (power purchase agreements); and
- ground-mounted solar power plants in targeted geographical areas: Europe, the Middle East, Japan and South Africa.

2.2.4 Natural gas and electricity marketing

With a customer portfolio in excess of 5 million sites delivered and 133 TWh, TOTAL is now targeting 15% market share in France and Belgium within 5 years in the residential segment.

In **France**, TOTAL operates in the natural gas and electricity markets for industrial and commercial customers through its Total Énergie Gaz and, Direct Énergie since 2018, marketing subsidiaries, whose global gas sales totaled 1.8 Bcm in 2018, compared with 1.9 Bcm in 2017 and 2.2 Bcm in 2016. TOTAL also operates on the domestic market through its subsidiary Total Spring (previously known as Lampiris France) and Direct Énergie. The sales of Total Spring and Direct Énergie in the residential segment (electricity and gas) totaled 17.9 TWh in 2018, compared with 3.8 TWh in 2017.

In the **United Kingdom**, TOTAL sells natural gas and electricity in the industrial and commercial segment through its subsidiary Total Gas & Power Ltd. In 2018, the volume of gas sales totaled 4.2 Bcm, compared with 4.3 Bcm in 2017 and 4.0 Bcm in 2016. Electricity sales were nearly 10.1 TWh in 2018, compared to 9.1 TWh in 2017 and 7.4 TWh in 2016.

In **Germany**, Total Energie Gas GmbH, a marketing subsidiary of TOTAL, marketed 1.2 Bcm of gas in 2018 to industrial and commercial customers, compared to 1.2 Bcm in 2017 and 0.9 Bcm in 2016. Electricity sales were 0.5 TWh in 2018, compared with 0.3 TWh in 2017.

In the **Netherlands**, TOTAL operates in the natural gas and electricity markets for industrial and commercial customers through its subsidiary Total Gas & Power Nederland B.V. The volumes delivered in 2018 were 0.4 Bcm of gas and 0.4 TWh of electricity, compared with 0.3 Bcm and 0.2 TWh in 2017.

In **Belgium**, TOTAL operates on the natural gas and electricity supply markets through its subsidiaries Lampiris and Direct Énergie. The Lampiris and Poweo by Direct Énergie brands are present in the residential segment, while Total Gas & Power Belgium operates in the industrial and commercial segments. In 2018, the volumes of gas delivered amounted to almost 0.8 Bcm, compared with 0.7 Bcm in 2017, while electricity sales totaled almost 3.7 TWh, compared with 3.7 TWh in 2017.

In **Spain**, TOTAL Gas y Electricidad España markets electricity to the industrial and commercial segments since January 2018. In 2018, the volume of electricity sales reached 0.1 TWh. The Group sold its 35% stake in Cepsa Gas Comercializadora in 2017.

In **Argentina**, the subsidiary Total Gas Marketing Cono Sur is in charge of marketing the gas produced by Total Austral, the Group's production subsidiary, as well as marketing the gas produced by third parties. In 2018, the volume of gas sales reached 4.3 Bcm, compared to 4.2 Bcm in 2017 and 4.0 Bcm in 2016.

The Group holds stakes in the marketing companies that are associated with the LNG regasification terminals located at Altamira in **Mexico** and Hazira in **India**. In early 2019, TOTAL closed the sale of its stake in the regasification company in India that also owned the marketing activity.

2.2.5 Energy storage

Energy storage is a major challenge for the future of power grids and a vital accompaniment to renewable energies, which are intermittent by nature. Large-scale electricity storage is essential to promote the growth of renewables and enable them to make up a significant share of the electricity mix.

The acquisition of 100% of the shares of Saft Groupe S.A. ("Saft"), completed in August 2016 following a successful voluntary takeover bid, fully aligned with TOTAL's goal to develop in low-carbon businesses.

(1) Source: BNEF.

Saft is a French company that celebrated its 100th anniversary in 2018 and specializes in the design, manufacture and marketing of high technology batteries for industry.

Saft develops batteries based on nickel, lithium-ion and primary lithium technologies. The company is active in transport, telecommunications, industrial infrastructures, civil and military electronics, space, defense and energy storage. Building on the strength of its technological know-how, and through its energy storage activities, Saft is well placed to benefit from the growth in renewable energies beyond its current activities, by offering massive storage capacities, combined with renewable electricity, which is intermittent by nature. This is one of Saft's main sources of growth.

As part of a European alliance, Saft and its partners launched, in 2018, an R&D program that aims to develop the future generations of lithium-ion batteries (Gen 3A and Gen 3B), and then the solid electrolyte lithium battery technology. As of year-end 2018, Saft is present in 18 countries worldwide (historically in Europe and the United States) and has over 4,300 employees. Saft is achieving growth in emerging countries, in particular in Asia, South America and Russia, and has 14 production sites and approximately 30 sales offices. In 2018, Saft's turnover amounted to $788 million.

2.2.6 Innovation and energy efficiency

2.2.6.1 Energy efficiency services

The energy efficiency services market is experiencing strong growth, which is expected to accelerate in the coming years. In this context, the Group is investing in this market, with the aim of helping customers optimize their consumption and emissions, in particular by choosing between the best energy sources.

In 2017, the Group finalized the acquisition of GreenFlex, a French company founded in 2009 with over 700 customers. GreenFlex employs around 400 people and recorded sales of €410 million at year-end 2018, compared to €359 million at year-end 2017.

This acquisition is fully aligned with the Group's strategy for growth in the energy performance sector, in priority in major European countries.

2.2.6.2 Total Energy Ventures

Total Energy Ventures (TEV) invests in the initial development phases of companies that offer technologies or economic models of strategic interest to TOTAL. These areas of interest include renewable energies, digital energy, energy storage and mobility services. Whereas historically TEV invested predominantly in Europe and the United States, the company started investing in 2018 in China. In particular, TEV signed an agreement with NIO Capital to cooperate and invest in the mobility segment.

TEV also launched its investment platform dedicated to emerging markets, and in particular to companies developing business models for access to energy for people who are not connected to the grid. Initially, this activity will be focused on Africa.

2.2.6.3 Carbon capture, use and storage

In order to promote a new industry in the field of carbon capture, utilization and storage (CCUS), the Group is examining the possibility of developing new businesses to enable its industrial, domestic or electricity producing customers to capture, store, utilize or neutralize their CO_2 emissions.

TOTAL considers CCUS to be one of the key drivers to tackle the challenge of the climate change and is particularly interested in the development of new business and industrial models associated with this value chain.

In this area, the Group intends to participate directly or indirectly (via the OGCI fund in particular) in large-scale pilot projects. TOTAL thus launched, in 2017, studies with Equinor and Royal Dutch Shell for developing the transport and storage aspects of the first industrial commercial project in the world for the capture, transport and storage of CO_2, with a capacity of 1.5 Mt of CO_2/y. The project aims to store the emissions from two industrial sites near Oslo, Norway, and will also be able to collect emissions from other emitters. TOTAL also supports the feasibility studies conducted by the OGCI fund, with 5 other partners, on a project located in Teesside (United Kingdom). This project combines gas based power generation with capture of the related CO_2, the collection of the CO_2 emissions from neighboring industries, its offshore storage and its possible recovery in other uses.

2.2.6.4 Access to energy

First launched in 2011 in four pilot countries, TOTAL's solar solutions for access to energy were distributed in 40 countries by 2018. By the end of 2018, 2.7 million lamps and solar kits had been sold, improving the day-to-day lives of nearly 12 million people. The distribution channels used are both TOTAL's traditional networks (service stations) and "last mile" networks built with local partners to bring these solutions to isolated areas. Reseller networks are set up and economic programs developed with the support of external partners to recruit and train young solar resellers.

In addition, in 2018, around 10 incubation projects were launched with start-ups in the nano-grid, mini-grid, recycling and Wi-Fi terminals segments. More than 20 business partnerships were also deployed in the field, with organizations ranging from NGOs and development agencies, to professional customers (distributors, major TOTAL accounts, etc.) and international organizations.

2.3 Refining & Chemicals segment

Refining & Chemicals is a large industrial segment that encompasses refining, base petrochemicals (olefins and aromatics), polymer derivatives (polyethylene, polypropylene, polystyrene and hydrocarbon resins), the transformation of biomass and the transformation of elastomers (Hutchinson). This segment also includes the activities of Trading & Shipping.

Among the world's **10** largest integrated producers [(1)]

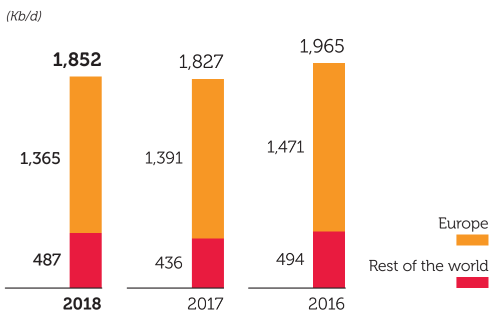
Refining capacity of **2.0 Mb/d** at year-end 2018

One of the leading traders of oil and refined products worldwide

$1.6 B of organic investments [(2)] in 2018

49,883 employees present

Refinery throughput [(a)]



(a) Includes share of TotalErg (sold in 2018), as well as refineries in Africa that are reported in the Marketing & Services segment.

Refinery throughput was stable in 2018 compared to 2017. Lower throughput in Europe linked to planned maintenance, notably at Antwerp during the second quarter, was offset by higher throughput outside Europe.

Refining & Chemicals segment financial data [(3)]

(M$ except ERMI)	2018	2017	2016
European Refining Margin Indicator (ERMI) *($/t)*	32.3	40.9	34.1
Adjusted net operating income [(a)]	3,379	3,790	4,195
Operating cash flow before working capital changes w/o financial charges (DACF) [(b)]	4,388	4,728	4,873
Cash flow from operations [(c)]	4,308	7,411	4,584

(a) Adjusted results are defined as income using replacement cost, adjusted for special items, excluding the impact of changes for fair value.
(b) DACF = debt adjusted cash flow. The operating cash flow before working capital changes w/o financial charges is defined as cash flow from operating activities before changes in working capital at replacement cost, without financial charges.
(c) Excluding financial charges.

The European Refining Margin Indicator (ERMI) for the Group decreased by 21% to 32.3 $/t for the full-year 2018, mainly due to rising oil prices. The petrochemicals environment remained favorable although margins in Europe were lower than last year, affected by the higher price of raw materials.

In this context, Refining & Chemicals adjusted net operating income was resilient to $3,379 million for the full-year 2018, a decrease of 11% compared to the previous year.

(1) Based on publicly available information, production capacities at year-end 2017.
(2) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests (refer to point 2.5.1 of this chapter).
(3) Data for the 2016 financial year have been restated to take into account the change in the organization of the Group that has been fully effective since January 1, 2017.

2.3.1 Refining & Chemicals

Refining & Chemicals includes refining, base petrochemicals (olefins and aromatics), polymer derivatives (polyethylene, polypropylene, polystyrene and hydrocarbon resins), biomass conversion and elastomer processing (Hutchinson). The electroplating chemistry (Atotech) and adhesives (Bostik) activities were sold in 2017 and 2015, respectively. The volume of its Refining & Chemicals activities places TOTAL among the top 10 integrated producers worldwide[1].

The strategy of Refining & Chemicals integrates a constant requirement for safety, a core value of the Group, and the priority given to the management of its environmental footprint. In a context of rising worldwide demand for oil and petrochemicals driven by non-OECD countries and the entry of new capacities into the market, the strategy involves:

- improving competitiveness of refining and petrochemicals activities by making optimal use of industrial means of production and concentrating investments on large integrated platforms;
- developing petrochemicals in the United States and the Middle East by exploiting the proximity of cost-effective oil and gas resources in order to supply growing markets, in particular Asia; and
- innovating in low carbon activities by developing biofuels, biopolymers and plastics recycling solutions as well as materials contributing to the energy efficiency of the Group's customers, in particular in the automotive market.

2.3.1.1 Refining and petrochemicals

TOTAL's refining capacity was 2,021 kb/d as of December 31, 2018, same as at year-end 2017 and compared to 2,011 kb/d at year-end 2016. The Refining & Chemicals segment managed a capacity of 1,993 kb/d at year-end 2018, or 99% of the Group's total capacity.

TOTAL has equity stakes in 18 refineries (including nine operated by companies of the Group), located in Europe, the Middle East, the United States, Asia and Africa[2].

The petrochemicals businesses are located mainly in Europe, the United States, Qatar, South Korea and Saudi Arabia. Most of these sites are either adjacent to or connected by pipelines to Group refineries. As a result, TOTAL's petrochemical operations are integrated within its refining operations, thereby maximizing synergies.

Between 2011 and 2016, the Group reduced its production capacities in Europe by 20%, thereby fully meeting the target it had set for 2017. Since then, the major investment project launched in 2013 on the Antwerp platform in Belgium has been completed, with the aim of improving the site's conversion rate and increasing the flexibility of the steam crackers. The project to transform the La Mède refinery into a biorefinery continues.

A) Activities by geographical area

a) Europe

TOTAL is the second largest refiner and petrochemist in Western Europe[3].

Western Europe accounts for 71% of the Group's refining capacity, i.e., 1,437 kb/d at year-end 2018, compared with 1,454 kb/d at year-end 2017 and year-end 2016.

The Group operates eight refineries in Western Europe (one in Antwerp, Belgium, five in France in Donges, Feyzin, Gonfreville, Grandpuits and La Mède, one in Immingham, United Kingdom, and one in Leuna, Germany) and owns a 55% stake in the Vlissingen refinery (Zeeland) in the Netherlands. In the first quarter of 2018, the Group sold its stake in TotalErg, which held a stake in the Trecate refinery in Italy.

The Group's main petrochemical sites in Europe are located in Belgium, in Antwerp (steam crackers, aromatics, polyethylene) and Feluy (polyolefins, polystyrene), and in France, in Carling (polyethylene, polystyrene, polypropylene compounds), Feyzin (steam cracker, aromatics), Gonfreville (steam crackers, aromatics, styrene, polyolefins, polystyrene) and Lavéra (steam cracker, aromatics, polypropylene). Europe accounts for 48% of the Group's petrochemicals capacity, i.e., 10,277 kt at year-end 2018, compared to 10,293 kt at year-end 2017 and 10,383 kt at year-end 2016.

- In **France**, the Group continues to improve its operational efficiency in a context of stagnation in the consumption of petroleum products in Europe.

  In 2018, TOTAL continued the significant modernization plan announced in 2015 for its refining facilities in France, in particular at La Mède, with an investment decision made in 2015 for around €275 million to transform the site and in particular create the first biorefinery in France. The first step of this investment took place at the end of 2016 when the processing of crude oil ended. The industrial transformation of La Mède will contribute to respond to the growing demand for biofuels in Europe as from the first half of 2019. Other activities, such as a logistics and storage platform, a solar energy farm and a training center were developed on the site since 2017, in addition to an AdBlue[4] production plant, which started up in August 2018.

  In Donges, the €400 million investment project for the construction of intermediate feedstock desulfurization units and hydrogen production units is under study. This program requires the re-routing of the railroad track that currently crosses the refinery. A three-party memorandum of intent to fund this re-routing work between the French State, local authorities and TOTAL was signed at the end of 2015.

  In petrochemicals, the Group reconfigured the Carling platform in Lorraine. Since the shutdown of the steam cracking activity in 2015, new hydrocarbon resins and compound polypropylene production units have been in activity.

- In **Germany**, TOTAL operates the Leuna refinery (100%), where a new benzene extraction unit (approximately 60 kt/y) started up late 2017. In 2015, the Group completed the sale of its stake in the Schwedt refinery (16.7%) and acquired a majority stake in Polyblend, a manufacturer of polyolefin compounds that are mainly used in the automotive industry.
- In **Belgium**, the Group finalized a major project in 2017 to modernize its Antwerp platform, with:
  - new conversion units in response to the shift in demand towards lighter petroleum products with a very low sulfur content, and
  - a new unit to convert part of the combustible gases recovered from the refining process into raw materials for the petrochemical units.

  In addition, the Group has developed a project to enable greater flexibility on one of the steam-cracking units and has thus been processing ethane since 2017.

- In the **United Kingdom**, TOTAL decreased the capacity of the Lindsey refinery by half in 2016, reducing it to 5.5 Mt/y. The investment plan also focuses on improving the conversion ratio, adapting logistics and simplifying the refinery's organization, thereby lowering the site's break-even point.

(1) Based on publicly available information, refining and petrochemicals production capacities at year-end 2017.
(2) Earnings related to certain refining assets in Africa and to the TotalErg joint-venture, sold during the first quarter of 2018, which held a stake in the Trecate refinery in Italy, are included in the results of the Marketing & Services segment.
(3) Based on publicly available information, 2017 refining capacities.
(4) Fuel additive intended for road transport and designed to lower nitrogen oxide (NO_x) compound emissions.

b) North America

The Group's main sites in North America are located in Texas, at Port Arthur (refinery, steam cracker), Bayport (polyethylene), La Porte (polypropylene) and in Louisiana, at Carville (styrene, polystyrene).

At Port Arthur, TOTAL holds at the same site a 100% interest in a 178 kb/d capacity refinery and a 40% stake in BASF Total Petrochemicals (BTP), which has a condensate splitter and a steam cracker. The Group continues to work on strengthening the synergies between these two plants. The BTP cracker can produce more than 1 Mt/y of ethylene, of which more than 85% on ethane, propane and butane, which are produced in abundance locally.

At La Porte, TOTAL operates a large polypropylene plant, with a capacity of 1.2 Mt/y.

At Carville, TOTAL operates a styrene plant with a capacity of 1.2 Mt/y, in a 50% joint-venture with SABIC and a polystyrene unit with a capacity of 700 kt/y, which is 100% owned.

Finally, in partnership with Borealis and Nova Chemicals, TOTAL started construction in 2017 of a new ethane cracker with an ethylene production capacity of 1 Mt/y on the Port Arthur site for an investment of $1.7 billion. The partners in the joint-venture (TOTAL, 50%) decided in September 2018 to develop a new polyethylene unit downstream of the cracker, in addition to the capacities of the Bayport site which TOTAL contributed to the joint-venture. This integrated development is expected to more than double the site's polyethylene capacity to 1.1 Mt/y and to thus maximize synergies with the existing assets at Port Arthur and Bayport.

c) Asia, the Middle East and Africa

TOTAL is continuing to expand in growth areas and is developing sites in countries with favorable access to raw materials. The Group has first-rate platforms in these markets, which are ideally positioned for growth.

In **Saudi Arabia**, TOTAL has a 37.5% stake in SATORP (Saudi Aramco Total Refining and Petrochemical Company), which operates the Jubail refinery. It has been fully operational since mid-2014. This refinery, situated close to Saudi Arabia's heavy crude oil fields, increased its capacity by 10% to 440 kb/d following the debottlenecking in early 2018 during its first major shutdown. The refinery's configuration enables it to process these heavy crudes and sell fuels and other light products that meet very strict specifications and are mainly intended for export. The refinery is also integrated with petrochemical units: an 800 kt/y paraxylene unit, a 200 kt/y propylene unit, and a 140 kt/y benzene unit. In addition, TOTAL and Saudi Aramco signed in October 2018 an agreement to jointly develop the engineering studies for the construction of a petrochemicals complex adjacent to the refinery. This gigantic project will include a mixed-load steam cracker (50% ethane and refinery gas) with a capacity of 1.5 Mt/y and polyethylene units.

In **China**, TOTAL holds a 22.4% stake in WEPEC, a company that operates a refinery located in Dalian. The sale of this stake to one of the Chinese partners of the joint-venture is in the process of being finalized. During the first quarter of 2019, the Group sold its polystyrene activity in China, which notably included two plants in Foshan (Guangdong province) and Ningbo (Zheijiang province) in the Shanghai region, each with a capacity of 200 kt/y.

In **South Korea**, TOTAL has a 50% stake in Hanwha Total Petrochemicals Co., Ltd. (HTC), which operates a petrochemical complex in Daesan (condensate splitter, steam cracker, styrene, paraxylene, polyolefins). Following the launch in 2014 of new aromatics (paraxylene and benzene) and polymer units (EVA2), HTC continued to expand its activities and the steam cracker now has an ethylene production capacity of 1.1 Mt/y and a styrene production capacity of 1.1 Mt/y. The EVA2 and ARO2 units were debottlenecked in 2016 and 2017 respectively. In addition, investments totaling $750 million were decided in 2017 to increase the ethylene production capacity by 30% and the polyethylene production capacity by more than 50%. At the end of 2018, the decision was taken to make an additional investment of $500 million to increase the polypropylene production capacity by nearly 60% by 2020 to reach 1.1 Mt/y, and to increase its ethylene production capacity by 10% to reach 1.5 Mt/y.

In **Qatar**, the Group holds interests[(1)] in two ethane-based steam crackers (Qapco, Ras Laffan Olefin Cracker-RLOC) and four polyethylene lines operated by Qapco in Messaied, including the Qatofin linear low-density polyethylene plant with a capacity of 550 kt/y and a Qapco 300 kt/y low-density polyethylene line which started up in 2012.

TOTAL holds a 10% stake in the Ras Laffan condensate refinery, the capacity of which increased to 300 kb/d following completion of the project to double the refinery's capacity; the new facilities were commissioned in late 2016.

In the **United Arab Emirates**, in November 2018, TOTAL sold a 33.3% stake that it held in ADNOC Fertilizers, which operates a plant producing 2 Mt/y of urea in Ruwais.

In **Algeria**, in October 2018, the Group signed a shareholders' agreement with Sonatrach to create the joint-venture (Sonatrach 51% and TOTAL 49%) to implement a joint petrochemicals project in Arzew, in western Algeria. This project includes the construction of a propane dehydrogenation plant and a polypropylene production unit with a capacity of 550 kt/y. The joint-venture was incorporated in January 2019.

In Africa, the Group also holds interests in four refineries (South Africa, Cameroon, Côte d'Ivoire, Senegal) after the sale of its interest in the refinery in Gabon in 2016. Refining & Chemicals provides technical assistance for two of these refineries: the Natref refinery with a capacity of 109 kb/d in South Africa and the SIR refinery with a capacity of 80 kb/d in Côte d'Ivoire.

(1) TOTAL shareholdings: Qapco (20%); Qatofin (49%); RLOC (22.5%).

B) Crude oil refining capacity

The table below sets forth TOTAL's crude oil refining capacity [(a)]:

As of December 31 *(kb/d)*	2018	2017	2016
Nine refineries operated by Group companies			
Normandy-Gonfreville (100%)	253	253	253
Provence-La Mède (100%)	- [(b)]	- [(b)]	- [(b)]
Donges (100%)	219	219	219
Feyzin (100%)	109	109	109
Grandpuits (100%)	101	101	101
Antwerp (100%)	338	338	338
Leuna (100%)	227	227	227
Lindsey-Immingham (100%)	109	109	109
Port Arthur (100%) and BTP (40%) [(c)]	202	202	202
SUBTOTAL	**1,558**	**1,558**	**1,558**
Other refineries in which the Group has equity stakes [(d)]	463	463	453
TOTAL	**2,021**	**2,021**	**2,011**

(a) Capacity data based on crude distillation unit stream-day capacities under normal operating conditions, less the average impact of shutdowns for regular repair and maintenance activities.
(b) Crude oil processing stopped indefinitely at the end of 2016.
(c) The condensate splitter held by the joint-venture between TOTAL (40%) and BASF (60%) located in Port Arthur refinery has been taken into account since end 2015.
(d) TOTAL's share as of December 31, 2018 in the nine refineries in which it has equity stakes ranging from 7% to 55% (one each in the Netherlands, China, South Korea, Qatar, Saudi Arabia and four in Africa). TOTAL sold, in December 2016, its stake in the SOGARA refinery in Gabon. In 2017, TOTAL also sold a portion of its interests in the SIR refinery in Côte d'Ivoire and SAR refinery in Senegal. In 2018, the Group sold its stake in TotalErg, which held a stake in the Trecate refinery in Italy.

C) Refined products

The table below sets forth by product category TOTAL's net share [(a)] of refined quantities produced at the Group's refineries:

(kb/d)	2018	2017	2016
Gasoline	291	283	324
Aviation fuel [(b)]	210	196	182
Diesel and heating oils	732	726	795
Heavy fuels	99	115	140
Other products	461	438	430
TOTAL	**1,793**	**1,758**	**1,871**

(a) For refineries not 100% owned by TOTAL, the production shown is TOTAL's equity share in the site's overall production.
(b) Avgas, jet fuel and kerosene.

D) Utilization rate

The table below sets forth the average utilization rates of the Group's refineries:

	2018	2017	2016
On crude and other feedstock [(a)(b)]	92%	91%	87%
On crude [(a)(c)]	88%	88%	85%

(a) Including equity share of refineries in which the Group has a stake.
(b) Crude + crackers' feedstock/distillation capacity at the beginning of the year.
(c) Crude/distillation capacity at the beginning of the year.

E) Petrochemicals: breakdown of TOTAL's main production capacities

				2018	2017	2016
As of December 31 *(in kt)*	Europe	North America	Asia and Middle East [(a)]	Worldwide	Worldwide	Worldwide
Olefins [(b)]	4,296	1,555	1,579	7,430	7,378	7,468
Aromatics [(c)]	2,874	1,512	2,581	6,967	6,909	6,844
Polyethylene	1,120	223	792	2,135	2,357	2,338
Polypropylene	1,350	1,200	400	2,950	2,950	2,950
Polystyrene	637	700	408	1,745	1,745	1,745
Other [(d)]	-	-	100	100	63	63
TOTAL	**10,277**	**5,190**	**5,860**	**21,327**	**21,401**	**21,407**

(a) Including interests in Qatar, 50% of Hanwha Total Petrochemicals Co. Ltd. and 37.5% of SATORP in Saudi Arabia.
(b) Ethylene + propylene + butadiene.
(c) Including monomer styrene.
(d) Mainly monoethylene glycol (MEG), polylactic acid polymer (PLA) and cyclohexane.

F) Developing new avenues for the production of fuels and polymers

TOTAL is exploring new ways to monetize carbon resources, conventional or otherwise (natural gas, biomass, waste). These projects are part of the Group's commitment to building a diversified energy mix generating lower CO_2 emissions.

Regarding biomass development, TOTAL is pursuing several industrial and exploratory projects. The scope of these developments is broad since they entail defining access to the resource (nature, sustainability, location, supply method, transport), the nature of the molecules and target markets (fuels, petrochemicals, specialty chemicals) and the most appropriate, efficient and environmentally friendly conversion processes.

a) Biomass to fuels

In Europe, TOTAL produces biofuels, notably hydrotreated vegetable oils (HVO) for incorporation into diesel, and ether produced from ethanol and isobutene (ETBE) for incorporation into gasoline.

As part of the La Mède refinery transformation program announced in 2015, the Group will build the first biorefinery in France. Operations are expected to restart in the first half of 2019 with a view to reaching a production capacity of almost 500 kt/y of biofuel, mainly high-quality biodiesel (HVO), but also biojet and petrochemical bio-feedstocks.

TOTAL continued extensive research activity in 2018, which targeted the emergence of new biofuel solutions. The BioTFuel consortium's construction of a pilot demonstration unit on the Dunkerque (France) site led to the commencement in 2017 of a gasification test program for synthesis of biomass into fungible, sulfur-free fuels.

b) Biomass to polymers

TOTAL is actively involved in developing activities associated with the conversion of biomass to polymers. The main area of focus is developing drop-in solutions for direct substitutions, by incorporating biomass into the Group's existing units, for example HVO or other hydrotreated vegetable oil co-products in a naphtha cracker, and developing the production of new molecules such as polylactic acid polymer (PLA) from sugar. In 2017, the Group thus set up a joint-venture with Corbion for the production and marketing of PLA from a site in Thailand containing existing lactide units and PLA units, which started production in December 2018 and have a production capacity of 75 kt/y.

c) Biotechnologies and the conversion of biomass

TOTAL is exploring a number of opportunities for developing biomass and has launched numerous collaborative R&D projects for the development of bio-sourced molecules with various academic partners (the Joint BioEnergy Institute, United States, the University of Wageningen, Netherlands and the Toulouse White Biotechnology consortium, France) or through its Novogy subsidiary (Massachusetts, United States). In addition, TOTAL holds an interest in Amyris Inc. [(1)], an American company listed on NASDAQ.

On its R&D platform in Solaize (France), TOTAL develops new biocomponents derived from the transformation of the biomass by using a methodology based on predictive modeling and chemical transformation into high added-value biomolecules.

In the longer term, the Group is also studying the potential for developing a cost-effective phototrophic process for producing biofuels through bioengineering of microalgae and microalgae cultivation methods. It has several European partners in this field (CEA, Wageningen).

d) Plastics recycling and circular economy

TOTAL is commited to developing recycling and end of life solutions for plastics.

In France, TOTAL, Saint-Gobain, Citeo and Syndifrais founded a partnership to develop an industrial polystyrene recycling value chain by 2020 which aims to incorporate the polystyrene gathered and sorted in the Group's plastics production units in Carling and Feluy.

In February 2019, TOTAL acquired French company Synova, a leader in manufacturing high-performance recycled polypropylene for the automotive sector, and which current production capacity in 20 kt/y of polypropylene produced from recycled plastic material gathered from wastes and industrial scraps.

TOTAL is also a founding member of the Alliance to End Plastic Waste, created in January 2019 to eliminate plastic waste in the environment, especially in the oceans. Created in January 2019, this international alliance has received commitments of over $1 billion from the nearly 30 members to date to develop and bring to scale solutions that will minimize and manage plastic waste and promote solutions for used plastics by helping to enable a circular economy.

(1) 13.00% on December 31, 2018.

2.3.1.2 Elastomer processing (Hutchinson)

Hutchinson actively contributes to the mobility of the future by addressing its customers' needs (automotive, aerospace and major industries – defense, rail, energy) in order to offer a greater level of safety, comfort and energy performance, as well as more responsible solutions.

The company draws on wide-ranging expertise and employs its know-how from the custom design of materials to the integration of connected solutions: structural sealing solutions, precision sealing, management of fluids, materials and structures, anti-vibration systems and transmission systems.

To serve its customers, Hutchinson had 87 production sites across the world (of which 55 are located in Europe and 18 in North America) and approximately 37,000 employees at December 31, 2018.

2.3.2 Trading & Shipping

The activities of Trading & Shipping are focused primarily on serving the Group's needs, and notably include:

- selling and marketing the Group's crude oil production;
- providing a supply of crude oil for the Group's refineries;
- importing and exporting the appropriate petroleum products for the Group's refineries to be able to adjust their production to the needs of local markets;
- chartering appropriate ships for these activities; and
- trading on various derivatives markets.

In addition, with its acquired expertise, Trading & Shipping is able to extend its scope beyond the aforementioned activities.

Trading & Shipping conducts its activities worldwide through various wholly-owned subsidiaries established on strategically important oil markets in Europe, Asia and North America.

2.3.2.1 Trading

Oil prices progressively strengthened until October 2018 with backwardation[1] structures on most oil indices, before declining in the last quarter of the year. TOTAL is one of the world's largest traders of crude oil and petroleum products on the basis of volumes traded[2]. The table below presents Trading's worldwide crude oil sales and supply sources and petroleum products sales for each of the past three years. Trading of physical volumes of crude oil and petroleum products amounted to 6.6 Mb/d in 2018, compared to 6.1 Mb/d in 2017 and to 5.6 Mb/d in 2016.

Trading's crude oil sales and supply and petroleum products sales[a]

(kb/d)	2018	2017	2016
Group's worldwide liquids production	1,566	1,346	1,271
Purchased from Exploration & Production	1,167	1,120	1,078
Purchased from external suppliers	3,193[b]	2,870	2,444
TOTAL OF TRADING'S CRUDE SUPPLY	**4,360**	**3,990**	**3,522**
Sales to Refining & Chemicals and Marketing & Services segments	1,480	1,527	1,590
Sales to external customers	2,880	2,463	1,932
TOTAL OF TRADING'S CRUDE SALES	**4,360**	**3,990**	**3,522**
PETROLEUM PRODUCTS SALES BY TRADING	2,286	2,154	2,105

(a) Including condensates.
(b) Including inventory variations.

Trading operates extensively on physical and derivatives markets, both organized and over the counter. In connection with its Trading activities, TOTAL, like most other oil companies, uses derivative energy instruments (futures, forwards, swaps and options) in order to adjust its exposure to fluctuations in the price of crude oil and petroleum products. These transactions are entered into with a wide variety of counterparties.

For additional information concerning derivatives transactions by Trading & Shipping, see Note 16 (Financial instruments related to commodity contracts) to the Consolidated Financial Statements (refer to point 8.7 of chapter 8).

All of TOTAL's Trading activities are subject to strict internal controls and trading limits.

2.3.2.2 Shipping

The transportation of crude oil and petroleum products necessary for the activities of the Group is coordinated by Shipping. These requirements are fulfilled through the balanced use of spot and time-charter markets. Additional transport capacity can also be used to transport third-party cargo. Shipping maintains a rigorous safety policy, mainly through a strict selection of chartered vessels.

In 2018, Shipping chartered approximately 3,000 voyages (slightly higher than 2017 and 2016) to transport 143 Mt of crude oil and petroleum products, compared to 133 Mt in 2017 and 131 Mt in 2016. On December 31, 2018, the mid-term and long-term chartered fleet amounted to 56 vessels (including 8 LPG vessels), compared to 59 in 2017 and in 2016. Shipping only charters vessels satisfying the best international standards and the average age of the fleet is approximately six years.

As part of its Shipping activity, the Group, like other oil companies and ship owners, uses freight rate derivative contracts to adjust its exposure to market fluctuations.

(1) Backwardation is the price structure where the prompt price of an index is higher than the future price.
(2) Company data.

2.4 Marketing & Services segment

The Marketing & Services segment includes worldwide supply and marketing activities of oil products and services.

2nd largest retail distribution outside of North America (1)

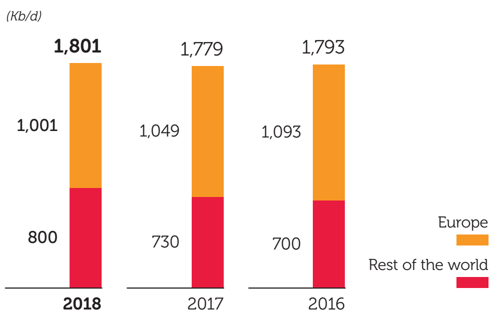
4th worldwide **distributor** of inland lubricants (2)

14,311 branded service stations Groupe (3) at December 31, 2018

$1.0 B of organic investments (4) in 2018

24,630 employees present

Petroleum products sales (a)



(a) Excludes trading and refining bulk sales, including share of TotalErg (sold in 2018).

Petroleum product sales increased by 1% in 2018 compared to 2017. The sale of TotalErg in Italy was offset by higher sales in the rest of the world.

Marketing & Services segment financial data (5)

(M$)	2018	2017	2016
Adjusted net operating income (a)	1,652	1,676	1,559
Operating cash flow before working capital changes w/o financial charges (DACF) (b)	2,156	2,242	1,966
Cash flow from operations (c)	2,759	2,221	1,833

(a) Adjusted results are defined as income using replacement cost, adjusted for special items, excluding the impact of changes for fair value.
(b) DACF = debt adjusted cash flow. The operating cash flow before working capital changes w/o financial charges is defined as cash flow from operating activities before changes in working capital at replacement cost, without financial charges.
(c) Excluding financial charges.

Marketing & Services' adjusted net operating income was stable in 2018 at $1,652 million compared to $1,676 million in 2017.

(1) Source IHS, number of service stations for TOTAL, BP, Chevron, Exxon and Shell.
(2) Source IHS.
(3) TOTAL, Total Access, Elf, Elan and AS24, including service stations owned by third parties.
(4) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests (refer to point 2.5.1 of this chapter).
(5) The data for the 2016 financial year has been restated to take into account the change in the organization of the Group that has been fully effective since January 1, 2017.

2.4.1 Presentation of the segment

The Marketing & Services (M&S) business segment is dedicated to the development of TOTAL's petroleum products distribution activities and related services throughout the world.

Present in more than 130 countries, M&S conveys TOTAL's brand image to its customers, both individual and professional. TOTAL's ambition is to be a leading brand recognized for its proximity to its customers and the value that it brings to each of them. M&S achieves this ambition by creating solutions aimed at performance, energy efficiency, mobility, new energies for mobility (1) and digital transformation. It promotes the brand awareness through significant advertising campaigns and a strong presence on the ground, with more than 14,000 service stations around the world. To best meet its customers' current and future needs, M&S continues its efforts in R&D in order to design and develop new products, in particular for the engine technologies of the future.

M&S pursues a proactive, primarily organic development strategy focused on large growing markets. In 2018, organic investments were approximately $1 billion, stable compared to 2017, and focused mainly on retail activity. M&S continues to consolidate its market share in key Western European markets (2), where it has reached critical mass and is one of the main distributors of petroleum products. M&S continues to develop its activities in Africa, where it is the market leader (3).

M&S is implementing a dynamic portfolio management strategy. In 2018, it continued to make targeted acquisitions and enter targeted partnerships in order to support the development of its activities on growth and promising markets. After acquisitions in the Philippines and Vietnam in 2016, M&S continues to grow in the largest Asian markets, with the signature in 2018 of a major partnership with an Indian conglomerate, with an objective to build over time a retail network of 1,500 service stations in India. In February 2019, Saudi Aramco and TOTAL signed a joint venture agreement to develop a network of fuel and retail services in Saudi Arabia. Following the acquisition of a network in the Dominican Republic in 2016, it is pursuing its growth in the Americas zone, in countries such as Brazil and Mexico, respectively the largest and second-largest petroleum products distribution markets (4) in Latin America, and on the natural gas vehicles market in the United States. In 2018, TOTAL also launched a fuel retail network with the national company in Angola.

In January 2018, M&S exited the fuel distribution and commercial sales businesses in Italy by selling its interest in the TotalErg joint-venture, while maintaining its lubricants activities in the country. M&S finalized the sale of its mature LPG distribution assets in Italy, Belgium, Luxembourg and Germany in 2017. It also sold in 2017 its stake in Société du Pipeline Méditerranée Rhône (SPMR), which operates a network of petroleum product pipelines in the South of France.

M&S's three main business areas are:

— **Retail**, with a network of more than 14,000 Group-branded service stations (5). The Group is refocusing on its key markets in Western Europe and continues to develop in Africa, where it is present in almost 40 countries, as well as in major growing markets in Asia and the Americas. It sells high-performance fuels and petroleum products and new energies for mobility (NGV, hydrogen, electric charging for vehicles). M&S proposes a fuel cards offer that provides fuel payment solutions and vehicle fleet management services to businesses of all sizes. M&S is developing partnerships with leading brands in restauration and convenience stores, and new services built on digital innovations to capture and retain new customers. It is also pursuing its growth in the car wash market through its TOTAL WASH brand. These offers support customers in their mobility by providing them with all of the products and services they need at "One Stop Shop" service stations. The Group also addresses the road freight transport sector through the specialized AS24 network in Europe;

— the production and sale of **lubricants**, a sector that accounts for a significant share of M&S's adjusted net operating income. TOTAL intends to maintain the growth dynamic of its position by strengthening in particular the growth of its premium products with higher unit margins. M&S is pursuing its commercial and technological partnerships with car manufacturers. Investments in R&D enable the Group to supply high-quality premium lubricants to its customers worldwide. TOTAL has 43 production sites (blending plants); and

— the distribution of products and services for **professional markets**. Based on the diversity of its product ranges and its worldwide logistics network deployed in proximity to its customers, TOTAL is a partner of choice and a local supplier of products (mainly bulk fuels, aviation fuel, special fluids, LPG, bitumens, heavy fuels and marine bunkers), in particular for major multinational industrial groups. The Group also offers solutions that help its customers to manage all their energy needs with new digital platforms such as the management of on-site facilities and the reduction of their environmental footprint.

As part of its business, M&S owns stakes through its subsidiaries in four refineries in Africa, following the sale of its minority interest in a refinery in Gabon in 2016. Following the sale of its interest in the TotalErg joint-venture in early 2018, M&S has exited Italian refining.

(1) Electro-mobility, natural gas vehicle (NGV), hydrogen, LNG bunker.
(2 France, Germany, Belgium, Luxembourg and the Netherlands.
(3) Publicly available information, based on the number of Group-branded service stations in Africa in 2017.
(4) Source IHS 2018.
(5) This figure takes into account close to 500 stations licensed under the TOTAL brand in Turkey and excludes more than 2,500 TOTAL service stations sold in Italy at the start of 2018.

2.4.2 Sales of petroleum products

The following table presents M&S petroleum products sales[a] by geographical area:

(kb/d)	2018	2017	2016
Europe	1,001	1,049	1,093
France	517	519	541
Europe, excluding France	484	530	552
Africa	443	431	419
Middle East	41	45	55
Asia Pacific[b]	199	173	150
Americas	117	81	76

(a) In addition to M&S's petroleum product sales, the Group's sales also include international trading (1,777 kb/d in 2018, 1,659 kb/d in 2017 and 1,690 kb/d in 2016) and bulk refining sales (575 kb/d in 2018, 581 kb/d in 2017 and 700 kb/d in 2016).
(b) Including Indian Ocean islands.

2.4.3 Service stations

The table below presents the geographical distribution of the Group's branded[a] service stations:

As of December 31	2018	2017	2016
Europe[b]	5,625	8,194	8,309
of which France	3,490	3,548	3,593
of which TotalErg	0	2,519	2,585
Africa	4,449	4,377	4,167
Middle East	877	821	809
Asia-Pacific[c]	1,951	1,864	1,790
Americas	561	555	585
AS24 network (dedicated to heavy-duty vehicles)	848	819	801
TOTAL	**14,311**	**16,630**	**16,461**

(a) TOTAL, Total Access, Elf, Elan and AS24. Including service stations owned by third-parties.
(b) Excluding AS24 network.
(c) Including Indian Ocean islands.

2.4.4 Activities by geographical area

The information below describes Marketing & Services' (M&S) principal activities presented by geographical zone and main business areas.

2.4.4.1 Europe

A) Retail

M&S is responding to changing markets in Western Europe by developing an innovative and diversified line of products and services with the objective to maintain its market shares. The network is made up of almost 6,500 Group-branded service stations[1], mainly divided among its key markets, which are France, Belgium, the Netherlands, Luxembourg and Germany, where M&S reached an average market share of 16% in 2018.

— In **France**, the dense retail network of almost 3,500 stations includes over 1,600 TOTAL-branded service stations, nearly 690 Total Access-branded stations (service stations combining low prices and high-quality fuels) and nearly 1,100 Elan-branded stations (located in rural areas), of which 560 are expected to be rebranded as TOTAL stations by the end of 2019. The Group is diversifying its offering of new energies for mobility by extending the roll-out of electric charging points and NGV stations. In 2018, it took over G2Mobility, one of France's leading suppliers of charging solutions for electric vehicles for public authorities and on professional markets[2]. In addition, TOTAL launched the roll-out of its NGV offering, which should be available in nearly 100 TOTAL-branded and AS24-branded stations by 2022.

The Group-branded service stations enjoy close relationships with their local customers, meeting their everyday needs with a multi-service, multi-product offering developed through services in restaurants, convenience stores and car washes provided by leading brands such as *Bonjour* and TOTAL WASH, as well as partnerships tailored to local requirements.

TOTAL has interests in 28 depots in France, 7 of which are operated by Group companies. In 2017, TOTAL acquired a stake in the share capital of Dépôt Rouen Petit-Couronne (DRPC).

(1) Including the AS24 network and after the sale of the network of TotalErg service stations in Italy.
(2) Company data based on the number of installed charging points in France for public authorities.

— In **Germany**, TOTAL is the country's third-largest operator[1] with nearly 1,200 Group-branded service stations at the end of 2018.

— In **Belgium**, TOTAL is the country's top operator[1] with nearly 530 Group-branded service stations.

— In **the Netherlands**, TOTAL made successful bids in 2018 during the annual auctions for three new highway stations, including one of the largest stations in the country.

In 2016, TOTAL also finalized the sale of its network of 450 service stations in Turkey, which will continue to use the TOTAL brand under the terms of a brand licensing agreement (today, there are 500 TOTAL-branded stations). TOTAL is maintaining its lubricants activities in the country.

TOTAL is rolling out a dedicated offering for the growing freight transport sector. The AS24 brand has a network of over 800 service stations aimed at heavy-duty vehicle customers in 28 European countries. AS24 seeks continued growth, primarily in the Mediterranean basin and Eastern Europe and through its toll payment card service which covers nearly 20 countries. AS24 is also addressing the future needs of the freight transport sector by diversifying its offering with the gradual introduction of NGV to its network in France and certain other European countries and new digital services.

In addition, the acquisition in 2017 of PitPoint B.V., which specializes in the distribution of new energies for mobility (NGV, hydrogen, electric charging points), enables the Group to pursue the development of its low-carbon activities in Europe. This company has a network of around 100 NGV stations in the Netherlands, Germany and Belgium.

TOTAL is also a major player in the European market for fuel payment cards with nearly 3.5 million cards, enabling companies of all sizes to improve fuel cost management and access an ever-increasing number of services. TOTAL is expanding its fuel card offering for professional customers, with an electric charging service across Europe and new digital applications. The acquisition of the French start-up WayKonect enables the Group to reinforce its company vehicle fleet management services by integrating a series of tools combining digital data processing solutions, an application for drivers and an on-board box.

B) Lubricants

TOTAL continues its development in Europe, where it relies mainly on its lubricants production sites in Rouen (France) and Ertvelde (Belgium). During the course of 2018, the European production system was completed by a new lubricants production plant in Russia.

In addition, TOTAL resumed in 2017 the distribution of its lubricants in Portugal. In Italy, the Group is reinforcing its position following the purchase from Erg of its shares in the lubricants business previously operated by TotalErg.

C) Professional markets and other specialties

In Europe, TOTAL produces and markets specialty products and relies on its industrial facilities to produce special fluids (Oudalle in France) and bitumen (Brunsbüttel in Germany).

TOTAL promotes in France a wide range of fuels and services to 135,000 vehicle fleet managers. Fuel sales (heavy fuels, domestic fuels, etc.) reach nearly one million customers.

2.4.4.2 Africa

A) Retail

TOTAL is the leading marketer of petroleum products in Africa, with a 17% share of the retail market in 2018[2]. It is pursuing a strategy of profitable growth aiming at outpacing market expansion.

In the Africa zone, the retail network in 2018 was made up of up to 4,500 Group-branded service stations in nearly 40 countries. The Group has major retail networks in South Africa, Nigeria, Egypt and Morocco. In 2018, TOTAL also launched in Angola a fuel retail network with the national company Sonangol.

In order to achieve its goal of gaining market share in all of the countries where it is present in Africa, and in addition to its organic growth strategy, TOTAL acquires independent petroleum networks in certain countries. The Group finalized in 2017 the purchase of assets in Kenya, Uganda and Tanzania, enabling it to strengthen its supply and logistics activities in East Africa and boost the growth of the retail network with nearly 100 additional service stations, notably in Tanzania.

M&S is diversifying its offering at service stations and is deploying a range of products and new services in food services, stores and car wash. To this end, the Group is developing partnerships, particularly with African start-ups, in order to introduce new electronic payment solutions capable of improving customer experience at the point of sale.

B) Lubricants

TOTAL is the leading distributor[2] of lubricants on the African continent and continues its growth strategy. M&S relies in particular on its lubricant production plants in Nigeria, Egypt and South Africa. A new production site is under construction in Algeria. In Tanzania, TOTAL acquired a lubricants production plant and the associated commercial activities will enable it to grow in the country and in neighboring countries.

C) Professional markets and other specialties

TOTAL is a leading partner, notably for mining customers in Africa, by delivering complete supply chain and management solutions for fuels. TOTAL is also developing innovative, low-carbon energy solutions as part of hybrid offerings by incorporating solar energy into its existing portfolio of products and services.

M&S also offers a diverse range of products and services aimed at professionals in Africa. Industrial customers receive support from TOTAL for the maintenance of on-site facilities with a lubricants in-service analysis solution, for example. In mining, construction and agriculture, it offers its Optimizer digital platform, which enables customers to cut their costs through better control of their energy consumption using the data sent from sensors installed on their facilities and equipment.

2.4.4.3 Asia-Pacific – Middle East

M&S markets its products and services in more than 20 countries in this zone.

A) Retail

TOTAL has more than 2,000 Group-branded service stations over the Asia-Pacific – Middle East zone at year-end 2018, with service station networks in Cambodia, China, Indonesia, Jordan, Lebanon, Pakistan and the Philippines. The Group is also a significant player in the Pacific islands.

While pursuing its growth in Pakistan, the Philippines and China, TOTAL continues to grow on the major markets by joining forces with an Indian conglomerate to build a retail network of 1,500 service stations over 10 years in India. The two companies are aiming, in particular, to grow on the country's main roads, such as highways and inter-city connections.

In February 2019, Saudi Aramco and Total signed a Joint Venture Agreement to develop a network of fuel and retail services in Saudi Arabia. The two companies have also signed an agreement to acquire two companies, thereby jointly acquiring their existing network of 270 service stations and their fuel tanker fleet. Saudi Aramco and Total plan to modernize this network and build high-quality service stations at selected locations. This operation is subject to prior approval of the competent administrative authorities.

(1) Source: IHS 2017.
(2) Company data.

TOTAL is also pursuing its growth in the zone by offering TOTAL EXCELLIUM premium fuels, which are now available in China, Fiji, New Caledonia, Pakistan and the Philippines.

B) Lubricants

The lubricants business is contributing to M&S's expansion in Asia. The lubricants blending capacity in this zone is spread over 11 production sites, and in particular the plants in Singapore, Tianjin and Dubai. M&S proposes a premium product and services offering through its network of service centers. It is also developing partnerships with leading Asian car manufacturers, other industries and major actors in online commerce in order to grow its sales and develop new services.

C) Professional markets and other specialties

TOTAL has signed several partnership agreements with **industrial customers**, enabling it to expand its operations on a number of markets, such as mining and construction, in several countries in the zone. The Group now supplies lubricants to one of the world's leading mining industry service providers on more than 20 mining sites mostly in Australia, Indonesia and Mongolia. In 2018, TOTAL also signed a preferred supplier agreement with a Chinese partner that is a world major company in construction and public works, in order to extend their partnership, which currently focuses on Africa, to a worldwide scale.

In **specialty products**, TOTAL confirmed its position as number two[1] on the LPG market in Vietnam. In India, TOTAL also conducts LPG activities, including a network of service stations providing LPG fuels.

2.4.4.4 Americas

In **retail**, the Group operates on several Caribbean islands and has at year-end 2018 more than 550 Group-branded service stations.

At the end of 2018, TOTAL entered the fuel distribution sector in Brazil, Latin America's largest petroleum products distribution market[2], by acquiring from a Brazilian company a network of 280 service stations, along with its petroleum products distribution, resale and import activities. M&S is already present in Brazil in lubricants.

In 2018, TOTAL also expanded in new energies for mobility by acquiring a 25% stake in the American NASDAQ-listed company Clean Energy Fuels Corp., which is a leading supplier of natural gas fuel in North America. TOTAL is now a reference shareholder in this company.

Benefitting from the reform and liberalization of the Mexican energy market, TOTAL entered into a partnership in 2017 with a local service station group and will gradually switch a network of nearly 250 service stations in Mexico over to the TOTAL brand. At the end of 2018, the Group had 90 TOTAL-branded service stations in the country.

The Group acquired, in January 2016, a 70% stake in the fuel marketing leader in the Dominican Republic, which operates a network of 130 service stations, commercial sales and lubricants activities. Furthermore, TOTAL sold its network of 92 stations and its general commercial activities in Haiti in 2018, as well as its network of almost 20 service stations in Costa Rica in 2017.

In **lubricants and other specialty products**, TOTAL is pursuing its strategy of growth across the region, mainly in lubricants, aviation fuel and special fluids. To strengthen its special fluids business, the Group has built a production plant in Bayport, Texas, which has been operational since early 2016.

2.4.5 Products and services development

The Group develops technologically advanced products, some of which are formulated for use in motor sports competition before being generally released on the market, and continues its technical partnerships. The Group is notably associated with the PSA group, with which a cooperation agreement was renewed in late 2016 relating to R&D, business relations with the three PSA brands (Peugeot, Citroën, DS) and automobile racing. In 2018, TOTAL continued to supply DS Performance with lubricants specifically developed for the Formula E[3] championship. In addition, in 2018, TOTAL became the official supplier of fuels to various endurance championships[4], including the Le Mans 24 Hours, for the next five years. These partnerships demonstrate TOTAL's technical excellence in the formulation of fuels and lubricants under extreme conditions, subject to requirements to reduce fuel consumption, for the engines of the future.

In order to respond to developments in world markets and prepare for tomorrow's growth opportunities, TOTAL develops products and services in collaboration with its customers that optimize their energy consumption, such as the products under the Total Ecosolutions label, which include TOTAL EXCELLIUM fuels and Fuel Economy lubricants. These solutions include a diversified range of energy supplies (fuels, gas, solar and wood pellets) as well as consumption auditing, monitoring and management services, particularly through innovative digital platforms for industrial customers, such as the Optimizer solution, developed for customers in mining, construction and public works and agriculture.

Overall, TOTAL is accelerating its digital innovation strategy in order to develop new offerings for its customers and improve operational efficiency. In Europe, after having developed a digital solution with a car-sharing company that allows drivers to pay for their fuel directly from a connected car, TOTAL has launched its TOTAL eWallet mobile payment solution, which is available for professional customers in Germany and being launched in Belgium. In Africa, TOTAL is continuing to develop new electronic payment solutions that will enable it to extend its money transfer and smartphone payment services. In addition, the Total Services mobile application has been launched in 47 countries. Using a centralized digital tool, close to 6 million customers in 13 countries can receive personalized offers from the Group.

(1) Company data.
(2) Source IHS 2018.
(3) Formula E: motor racing championship using single-seater electrically-powered cars.
(4) As of 2018, official supplier of fuel for the FIA World Endurance Championship, together with the 24 Hours of Le Mans, the European Le Mans Series and the Asian Le Mans Series.

The Group is also continuing to carry out research of and launch IoT [1] applications for logistics, maintenance and security. Transporter customers can now use a new service to geolocalize their trailers. In addition, TOTAL offers online domestic heating oil orders in France via the fioulmarket.fr web site, as well as its online platform Bitume Online for fixed-price bitumen purchases aimed at its professional customers.

For the longer term, TOTAL intends to expand into alternatives to traditional fuels and has comprehensive commercial offerings in this area.

— **Natural gas for land transportation**: As of today, TOTAL has more than 350 stations [2] supplying NGV to individual and professional customers in Asia, Africa and Europe, a decrease following the streamlining of the network of NGV stations in Pakistan. Following the takeover of PitPoint B.V. in 2017, TOTAL started deploying new NGV stations in Europe in its TOTAL-branded and AS24-branded network. The Group intends to accelerate the development of this network to quickly establish coverage that meets its customers' expectations, and will initially target the freight transportation segment on its key European markets (Germany, Belgium, France, Luxembourg, the Netherlands). TOTAL is also positioned on the American NGV market following the acquisition of a 25% stake in Clean Energy Fuels Corp., which is a leading supplier of natural gas fuel in North America. Clean Energy Fuels Corp. has launched an innovative leasing program that is expected to place thousands of new heavy-duty vehicles powered by natural gas on the road. This program enables freight operators to acquire trucks equipped with a cleaner natural gas engine at no extra cost compared with diesel engines.

— **Electro-mobility**: TOTAL has more than 100 service stations equipped with charging points in Germany, Benelux and France at year-end 2018. The equipment of stations with higher power charging points on major roads will continue in the coming years, with the aim of covering the Group's key European markets with a network of charging points every 150 km. A total of nearly 300 stations should be equipped with more than 1,000 charging points by 2022. The Group offers greater access for its customers to other operators' networks of charging points through specific partnerships. The acquisition of G2Mobility will enable the Group to also offer more efficient charging solutions to its individual and professional customers.

— **Hydrogen**: TOTAL continues to rollout hydrogen stations under the *H_2 Mobility Germany* joint-venture. This partnership was created in 2015 with Air Liquide, Daimler, Linde, OMV and Shell, to build a network that could reach 400 hydrogen stations in Germany. The joint-venture aims to create an initial network of around 100 stations by 2019, a third of which will be TOTAL stations. In 2018, TOTAL's hydrogen stations represented nearly one third of the around 50 stations rolled out by *H_2 Mobility Germany*.

— **Natural gas for shipping**: In order to meet the new emission standards for marine fuels that will come into effect in 2020, TOTAL is supporting its customers through this transition with its subsidiary Total Marine Fuel Global Solution, which offers a diversified range of marine fuels and associated services. The Group is expanding its product portfolio with marine bunker fuels, which have a sulfur content of 0.5%, and LNG bunker. To promote the establishment of LNG as a marine fuel, TOTAL signed in 2017 its first partnership agreements in Europe and Asia notably with the shipping companies CMA CGM and Brittany Ferries. The Group is also reinforcing its logistics systems to meet the needs of its customers in the major supply centers in Amsterdam-Rotterdam-Antwerp, Singapore and Oman. In particular, TOTAL and Pavilion Energy have signed an agreement in order to jointly develop an LNG supply chain in the port of Singapore. This agreement provides for the long-term joint chartering of a new-generation bunker vessel that the partner will bring into service in 2020.

(1) Internet of Things: connected objects.
(2) Including PitPoint B.V. NGV stations and excluding NGV stations in Italy. Hosted or operated stations.

2.5 Investments

2.5.1 Major investments over the 2016-2018 period [1]

Gross investments [a] *(M$)*	2018	2017	2016
Exploration & Production	15,282	12,802	16,085
Gas, Renewables & Power	3,539	797	1,221
Refining & Chemicals	1,781	1,734	1,861
Marketing & Services	1,458	1,457	1,245
Corporate	125	106	118
TOTAL	**22,185**	**16,896**	**20,530**

Net investments [b] *(M$)*	2018	2017	2016
Exploration & Production	10,330	10,886	13,895
Gas, Renewables & Power	3,230	726	1,162
Refining & Chemicals	862	(1,086)	1,773
Marketing & Services	1,030	1,044	821
Corporate	116	66	106
TOTAL	**15,568**	**11,636**	**17,757**

(M$)	2018	2017	2016
Acquisitions	7,692	1,476	2,033
including resource acquisitions [c]	*4,493*	*714*	*780*
Divestments	5,172	4,239	1,864
Other operations with non-controlling interests	(622)	(4)	(104)

Organic investments [d] *(M$)*	2018	2017	2016
Exploration & Production	9,186	11,310	14,464
Gas, Renewables & Power	511	353	270
Refining & Chemicals	1,604	1,625	1,642
Marketing & Services	1,010	1,019	1,003
Corporate	115	88	105
TOTAL	**12,426**	**14,395**	**17,484**

(a) Including acquisitions and increases in non-current loans. The main acquisitions for the 2016-2018 period are detailed in Note 2 of the Consolidated Financial Statements (point 8.7 of chapter 8).
(b) Net investments = gross investments – divestments – repayment of non-current loans – other operations with non-controlling interests. The main divestments for the 2016-2018 period are detailed in Note 7 of the Consolidated Financial Statements (point 8.7 of chapter 8).
(c) Resource acquisitions = acquisition of a participating interest in an oil and gas mining property by way of an assignment of rights and obligations in the corresponding permit or license and related contracts, with a view to producing the recoverable oil and gas.
(d) Organic investments = net investments excluding acquisitions, divestments and other operations with non-controlling interests.

In the Exploration & Production segment, most of the organic investments were dedicated to the development of new hydrocarbon production facilities, the maintenance of existing facilities as well as exploration activities. Development investments related in particular to the 10 major projects that started up in 2018 (Fort Hills in Canada, Vaca Muerta in Argentina, Timimoun in Algeria, Yamal LNG trains 2 & 3 in Russia, Kaombo Norte in Angola, Ichthys LNG trains 1 & 2 in Australia, Halfaya 3 in Iraq, and Egina in Nigeria), and the other major projects under construction, for which an investment decision has been taken or that are expected to start in the years to come (Tempa Rossa in Italy, Iara 1 & 2 and Libra 1 in Brazil, Kaombo South in Angola, Culzean in the United Kingdom, Johan Sverdrup 1 & 2 in Norway, Yamal LNG train 4 in Russia, Absheron in Azerbaijan and Zinia 2 in Angola).

In the Gas, Renewables & Power segment, organic investments were made mainly in the development of the project for three trains for Cameron LNG in the United States, which entered the Group's scope following the acquisition of Engie's upstream LNG business, as well as the projects to build solar power plants, managed by Total Solar and the industrial activities of Saft Groupe and SunPower.

In the Refining & Chemicals segment, organic investments were made, on the one hand, in the safety and maintenance of facilities, and, on the other hand, in projects aimed at improving the competitiveness of plants. In 2018, the Group continued the transformation of the French refinery at La Mède into a biorefinery. In addition, significant investments were approved, with the development of petrochemical activities in Texas (United States) as part of a joint-venture with Borealis and Nova, and a project to increase the capacity of the Daesan integrated platform in South Korea.

(1) Following the reorganization of the Group, which has been fully effective since January 1, 2017, the 2016 data has been restated on this basis.

In the Marketing & Services segment, organic investments in 2018 mainly concerned retail networks in growing regions in Africa and Asia, logistics and specialty products production and storage facilities.

The Group's acquisitions in 2018 amounted to $8.3 billion, of which $4.5 billion in resource acquisitions, compared to $1.5 billion in 2017 and $2 billion in 2016.

The Group took advantage of favorable market prices to extend its Exploration & Production portfolio by finalizing in 2018, on the one hand, the acquisition of interests held by Petrobras in the Iara and Lapa concessions in Brazil under the terms of a strategic alliance between the two groups, and, on the other hand, the acquisition, as part of a transaction of equity and debt, of Mærsk Olie og Gas A/S, which has a portfolio located mainly in OECD countries. In addition, TOTAL strengthened its presence in the Gulf of Mexico with the finalization of the acquisition of interests in the North Platte and Anchor offshore discoveries in the United States. Finally, TOTAL consolidated its presence in the Middle East with the acquisition of interests in the two new offshore concessions in Abu Dhabi and in the Waha concessions in Libya.

As part of its integrated gas strategy, the Group finalized the acquisition of Engie's upstream LNG business, thus becoming the world's second LNG actor[1]. This acquisition is expected to fully benefit from the strong growth of the LNG market. In keeping with its strategy to develop a profitable low-carbon electricity activity, TOTAL finalized the acquisition of Direct Énergie and of two gas power plants from KKR-Energas. In the Marketing & Services segment, TOTAL accelerated its growth in new energies for mobility with the acquisition of 25% of the share capital of the Clean Energy Fuels Corp.[2] in the United States and of G2Mobility in France. In the lubricants business, the Group strengthened its position in Italy by finalizing in January 2018 the purchase of Erg's 51% stake in the TotalErg joint-venture, which has been terminated.

TOTAL pursued the dynamic management of its portfolio and finalized divestments amounting to a total of $5.2 billion in 2018. In particular, the Group sold its interests in the Martin Linge and Visund fields in Norway, and in the Joslyn oil sands project. It also disposed of 1.47% of its stake in the Fort Hills oil sands mining extraction project in Canada and of 4% of the Ichthys LNG project in Australia. In the Marketing & Services segment, TOTAL sold its interests in the distribution, refining and LPG activities of TotalErg in Italy and its fuel distribution activities in Haiti.

Net investments were thus $15.6 billion in 2018 compared to $11.6 billion in 2017 and $17.8 billion in 2016.

2.5.2 Major planned investments

The Group anticipates that its net investments will be between $15 billion and $16 billion in 2019, in line with its investment targets of between $15 billion and $17 billion per year for the period 2018-2020, a range ensuring the profitable future growth for the Group.

Investments in the Exploration & Production segment are expected to mainly be in the major ongoing development projects: Iara 1 and 2 and Libra 1 in Brazil, Kaombo South in Angola, Culzean in the United Kingdom, Johan Sverdrup 1 & 2 in Norway, Yamal LNG train 4 in Russia, Absheron in Azerbaijan and Zinia 2 in Angola. The Group expects to launch by 2020 more than 20 major projects. A portion of the investments is expected to be allocated to assets already in production, in particular for maintenance capital expenditures and in-fill wells.

In the Refining & Chemicals segment, and in line with its growth strategy in petrochemicals, the Group expects to continue its investments to develop its petrochemicals activities in Texas in the United States, as part of a joint-venture with Borealis and Nova, and increase of its petrochemicals capacities on the Daesan integrated platform in South Korea. In addition, the Group has launched a major project in cooperation with Saudi Aramco in Saudi Arabia, and announced the signature of a shareholders' agreement with Sonatrach to build a petrochemicals complex in Arzew, Algeria. A significant portion of the segment's investment budget will also be allocated to safety and maintenance of the Group's facilities.

In the Marketing & Services segment, investments are expected to be allocated in particular to the service station network, logistics, and production and storage facilities of specialty products, particularly lubricants. Most of the segment's investment budget will be allocated to growing regions, notably Africa, the Middle East and Asia.

The Group expects to continue investing to grow its Gas, Renewables & Power businesses, as well as in R&D. The Group has notably signed an agreement with EPH to acquire as from January1, 2020 the two gas power plants from Uniper France's portfolio which represent a capacity of 828 MW, in line with TOTAL's low-carbon electricity strategy.

2.5.3 Financing mechanisms

TOTAL self-finances most of its investments with cash flow from operating activities and may occasionally access the bond market when financial market conditions are favorable. Investments for joint-ventures between TOTAL and external partners may be financed through specific project financing.

As part of certain project financing arrangements, TOTAL S.A. has provided guarantees. These guarantees ("Guarantees given on borrowings") as well as other information on the Group's off-balance sheet commitments and contractual obligations appear in Note 13 to the Consolidated Financial Statements (point 8.7 of chapter 8). The Group believes that neither these guarantees nor the other off-balance sheet commitments of TOTAL S.A. or of any other Group company have, or could reasonably have in the future, a material effect on the Group's financial position, income and expenses, liquidity, investments or financial resources.

(1) Based on quantities managed. Public data.
(2) A company listed on the NASDAQ, 25% owned on December 31, 2018.

2.6 Research & Development

In 2018, the Group invested $986 million in R&D, compared to $912 million in 2017 and $1,050 million in 2016. There were 4,288 people dedicated to R&D activities in 2018 compared to 4,132 in 2017 and 4,939 in 2016[1].

TOTAL's global investment to prepare the future of its oil and gas and low-carbon electricity activities was approximately $1.1 billion. This includes the entire R&D effort, as well as developments in the fields of digital technology, technology and the investments funded by Total Energy Ventures.

To achieve the Group's ambition to become the responsible energy major, TOTAL R&D engages its employees in programs in five priority areas that aim to address both the specific challenges in these segments and the Group's transverse issues:

- safety in the broadest sense, including the safety of facilities, the sustainable development of the Group's activities, control of its environmental footprint and societal impacts as well as the eco-design of products;
- operational efficiency, in terms of cost reductions, increased productivity and, ultimately, competitive advantage, in both the discovery and operation of energy resources and the integrity and performance of the Group's industrial units in terms of availability, industrial energy efficiency and the competitive performance;
- new services and products, including smart electricity grids, energy management solutions for customers, mobility solutions, the development of specific polymers, innovative and competitive multi-functional materials, or new fluids for electric and hybrid vehicles;
- an energy mix based on low-carbon energies combining gas and LNG (liquefied natural gas) technologies, sun and wind power, hybrid energy management systems, as well as battery technologies, CO_2 capture, use and storage (CCUS) technologies, bioproducts, such as biofuels and biopolymers, and recycling; and
- digital technology, in the broadest sense, including high-performance computing and blockchain technologies, data sciences, the Internet of Things (IoT), robotics and artificial intelligence applied to the Group's activities.

The Group is investing in the preparation of its future in open innovation by calling on its talents, its research infrastructures, its pilot sites and its international research centers, as well as on start-ups and top-level academic partners. Consequently, the Group has 18 R&D centers worldwide and approximately 1,000 agreements with its partners.

Additionally, the Group implements an active industrial property policy to protect its innovations, and to maximize their use and technological differentiation. In 2018, the Group filed more than 200 patent applications.

2.6.1 Transverse programs

In addition to a specific program dedicated to strategic anticipation, seven transverse programs cover new and strategic sectors, or share knowledge and infrastructures in the following areas:

- Health, Safety and Environment (HSE), with, for example, the development of the TADI (Transverse Anomaly Detection Infrastructure) platform that reproduces gas leak scenarios, ranging from crisis management to environmental surveillance. More than 20 acoustic or optical detection techniques were tested in various campaigns in 2018, providing an open innovation platform for potential suppliers and for discussions with other industrial companies to select the best available technologies for the detection and quantification of gas leaks, and of methane in particular;
- CO_2 capture, use and storage (CCUS), such as the large-scale Northern Lights research project in Norway, in which the Group is involved alongside Shell and Equinor. The first phase of the project relates to a storage capacity of approximately 1.5 Mt/y. TOTAL also participates in two CCU innovation centers in Canada with start-ups, looking into new technologies for the capture of CO_2 and the conversion of CO_2 into intermediate products for chemicals and materials. TOTAL has also joined three demonstration centers for the storage of CO_2 for geomechanical studies and studies of the control of CO_2 injection;
- energy efficiency, with, for example, the installation of the first DIESTA cooling tower in a refinery to cool a distillate. This technology was initially designed to cool and condense propane for LNG cold generators;
- gas, with, for example, an initiative that aims to map out the different emerging technologies and to compare them with baselines in terms of their carbon footprint, energy efficiency and economic performance. This initiative is also being deployed for the conversion of natural gas into high-added value molecules, such as olefins (ethylene and propylene). The first material balances produced by the partnership with GTC Technology, a leading American actor in petrochemicals process engineering on an international scale, are in line with the Group's expectations;
- digital technology, with the development of new digital seismic imaging methods, artificial intelligence algorithms to optimize the detection of hydrocarbons on surface water and refining processes, and a digital simulator of the tribological phenomena in lubricants;
- analysis and measurements, with, for example, the bases of a methodology combining physico-chemical and olfactometric analysis with digital methods in the Group's partnership with Alès Mines. This methodology is of particular interest to the improvement of the olfactory quality of materials, and of polymers and composites in particular, and provides for greater responsiveness in the event of odorous episodes in the vicinity of the Group's industrial sites;
- understanding of process and product performance, with, for example, the control of crude/water emulsions using an approach based on modeling in collaboration with ETH Zürich.

The anticipation program is carried out by forward-looking projects that aim to assess the impact on the Group's businesses of new technologies, such as nanotechnology, robotics or the mobility of the future.

(1) Figures for 2016 concerning the Group's R&D investments and employees were not restated following the sale of Atotech (finalized in January 2017).

2.6.2 Business segment-specific programs

2.6.2.1 Exploration-Production segment

All of the R&D projects aim to combine environmental performance, improved safety and economic viability of operations. A major asset for R&D lies in the remarkable high-performance computing capabilities of the Pangea supercomputer developed by the Group.

The goal of the teams in the *Frontier Exploration* program is to identify geological concepts that will enable the potential of proved basins to be reassessed and new potential basins for oil and gas exploration to be envisaged.

Remote detection, airborne multiphysical acquisition systems for the real-time imaging of steep margins, new-generation algorithms… From the acquisition to the processing of data, the *Earth Imaging* program innovates along the complete geophysical exploration chain to produce high-added value 3D ultrasound images of the subsoil more quickly and at a reduced cost.

The actions of the *Field Reservoir* program focus on our understanding of the physico-chemical phenomena in reservoirs, from pores to fields, and on the integration of all the available data. The development of a new generation of reservoir modeling tools, the continual improvement of reservoir simulation tools and the development of low-cost enhanced recovery techniques are the key themes of this program.

The *Wells* program aims to achieve the dual objectives of maximizing the safety and operational efficiency of wells, thereby increasing their profitability. This program, which provides real-time access to data from well bottoms (during drilling) and from wells (in production), is essential.

The main goals of the *Deep Offshore & Next Generation Facilities* program consist of further cutting technical costs with completely underwater development solutions, developing breakthrough technologies to economically explore and develop assets at depths of more than 3,000 meters, and designing disruptive operating modes offering higher profitability, without compromising safety.

Finally, the emphasis of the *Unconventional* program is on fundamental research (multi-scale characterization of source rock and the origins and expulsion of hydrocarbons) and on technical innovations to optimize recovery. These efforts converge to guide exploration towards the most promising geological strata and to provide the technological keys to their profitable and responsible use.

2.6.2.2 Gas, Renewables & Power segment

Today, the R&D activities concentrate on the testing and qualification of solar panels and on photovoltaic electricity management systems.

In 2018, TOTAL's private laboratory, located on the premises of the Institut Photovoltaïque d'Île-de-France (IPVF) on the Paris-Saclay cluster, was commissioned with a 1,000 m² clean room environment. This leading-edge technological platform covers a large part of the solar value chain, from the manufacture of solar cells and modules, to the qualification and testing of technologies and systems under real-life conditions. Its missions are to support the Group's subsidiaries and to work on the development of competitive cells and modules, in partnership with the IPVF in particular.

SunPower is pursuing its research, development and innovation efforts to improve the performance of photovoltaic cells and modules, while also cutting costs. Once its feasibility had been demonstrated, the NGT (*New Generation Technology*) of photovoltaic cells was integrated on a first production line. The module assembly technology has also been transferred.

In addition, 2018 saw the ramp-up of work on smart electricity grids, focusing on two key themes:

— the control and optimization of hybrid sites that combine several energy sources and are used to store energy, and to control electric loads in order to supply energy that is safer, more affordable and cleaner in terms of CO_2 emissions;

— the launch of the *Energy Management Platform* (EMP) project, a transverse center of excellence in the processing, acquisition (IoT) and presentation of data (user experience), and in data science and artificial intelligence. The EMP is cooperating closely with Digital and IT on some ten projects for different Group entities.

Finally, in the realm of electricity storage, Saft Group and its European partners have launched a program for the research, development and industrialization of new generations of solid electrolyte lithium-ion (Li-ion) batteries that are more efficient, cheaper and intrinsically safer than current Li-ion batteries. R&D investments focus on electrochemistry, new materials and improving production processes and battery management systems and software. This program targets every market segment, from electro-mobility (electric cars and buses, the railroads, maritime and aviation sectors) and energy storage, to specialized industries.

2.6.2.3 Refining & Chemicals segment

A) Refining & Chemicals (excluding Hutchinson)

The mission of R&D is to contribute to the technological differentiation of the Refining & Chemicals activities by developing and implementing new and more efficient solutions to create value. It opens the way to the industrialization of knowledge, processes and technologies.

R&D places special emphasis on the three major challenges facing Refining & Chemicals: limiting the environmental footprint; achieving excellence in processes and operations; and developing innovative products, in particular biosourced products.

Research is focused on the integrity, availability and improved energy efficiency of refining and petrochemicals facilities. As a result, advanced modeling of feedstocks and processes is used to optimize processing from the monthly supply of the platforms to the real-time monitoring of the facilities' constraints. Research conducted on catalysts and their selection is helping to increase performance, improve stability and extend their service life at a lower cost.

In order to contribute to the limitation of the carbon footprint, R&D is looking into new processes, such as in the area of electro-catalysis and biosourced raw materials. It studies the catalytic solutions of the future, paving the way for nanocatalysis.

It designs the technologies that will be used to develop new and more efficient products containing recycled materials (polystyrene in particular), while retaining all the applicative properties of the end product. Additionally, R&D draws on its knowledge of metallocenes and bimodality to develop different types of mass consumption polymers that have exceptional properties allowing them to replace heavier materials and compete with technical polymers.

Finally, Refining & Chemicals' R&D is developing technologies enabling more efficient use of biosourced molecules. The aim is to produce higher added-value chemical compounds, whether through biotechnologies or thermochemical processes. In this area, the studies focus on the processes to convert plant oils, sugar or lignocellulose in order to produce sustainable bioplastics and biofuels as well as to extend the range of feedstocks that can be used in existing facilities. R&D is also particularly mindful of issues related to blends and product quality raised by the use of biomolecules.

B) Elastomer processing (Hutchinson)

R&D is an important factor in innovation and differentiation for Hutchinson, which is present along the entire value chain, from designing custom materials (e.g., rubber, thermoplastics, composites) to incorporating connected solutions and objects (e.g., complex solutions, mechatronics, hardware, software, systems, IoT, big data, etc.).

With a corporate research and innovation center, more than 25 technical centers and a number of university partnerships worldwide, Hutchinson is equipped to rise to the challenge of contributing to a safer, more comfortable, and more responsible mobility of the future.

Weight reduction, increased energy efficiency, improved diagnostic and control functionality and greater acoustic and vibratory comfort are common preoccupations across all of Hutchinson's markets (e.g., automotive, aerospace, defense, railways). Hutchinson designs innovative solutions that put its customers ahead of the game, and transposes those solutions between markets, adopting a cross-fertilization approach.

2.6.2.4 Marketing & Services segment

The Marketing & Services segment's R&D remains focused, on the one hand, on the optimization of the competitive advantage of products on the consumer and professional markets, and, on the other, on the acquisition of skills in artificial intelligence (digital simulation, molecular modeling, data science) in order to respond to market demands more quickly.

One of R&D's main missions is the design and development of Premium fuels and lubricants offering customer benefits based on the reduction of the environmental footprint, improved energy efficiency and the greater durability of products and equipment. By way of example, the development of a new detergent for fuels selected by a world-leading partner has entered the first pilot production phase. Likewise, a new additive to improve the performance of cold road diesel is now in industrial production.

The formulation of Fuel Economy lubricants is a short- and medium-priority for all segments (automotive, marine and industry). The R&D teams are pursuing their efforts to incorporate specific new components developed with partners, such as fluid lubricating bases or polymers with a targeted rheological profile. The Fuel Economy program also includes engines for heavy goods vehicles and stationary engines. TOTAL is taking an active part in the multi-partner FALCON (Flexible & Aerodynamic truck for Low CONsumption) project led by Volvo. Regarding marine lubricants, the method developed by the Group to quantify the efficiency of lubricants in neutralizing acid combustion gases has been recognized and rewarded by the ASTM standardization organization.

The R&D teams are working on the design of ranges of lubricants adapted to natural gas, in particular in liquefied form, for long-distance heavy goods vehicles and maritime transport.

The Electric Vehicles Fluids program resulted in the launch of a pioneering range of fluids for electric and hybrid vehicles. These products, which are the fruit of major efforts made by the Group's R&D teams, were developed specially to meet the cooling and lubrication needs of the different components of these new drive systems, so that they can work under optimal conditions.

In the field of special fluids, the Group's research center in India has developed an aqueous anti-friction sludge for drilling.

In the realm of road binders, the first industrial and commercial successes have confirmed a new process to prepare chemical bitumen-polymer mixtures with a reduced environmental footprint. The I-Street innovation project led by Eiffage, in a consortium with TOTAL and other partners, won the Ademe's Route du Futur call for projects. TOTAL is also part of the GLOBE program, which is aiming to create a logistical solution for bitumen granules that stretches from the refinery to the point of use.

The Biolab biocomponents laboratory, inaugurated in 2016 and common to the Marketing & Services and Refining & Chemicals segments, acquired a new skill in biofermentation in the summer of 2018. On the one hand, a process for the synthesis of renewable components has been patented, and, on the other, the first trials of renewable multi-functional lubricants revealed some promising performances.

In 2018, Marketing & Services R&D intensified its open innovation projects and entered new partnerships in France and abroad (such as the partnership with the University of Aachen, Germany). It also received more than 1,000 visitors to present its technological innovations to partners, customers, prospects and stakeholders.

2.7 Property, plant and equipment

The companies of the Group have freehold and leasehold interests in over 130 countries throughout the world. Operations in properties, oil and gas fields or any other industrial, commercial or administrative facility, as well as the production capacities and utilization rates of these facilities, are described in this chapter for each business segment (Exploration & Production, Gas, Renewables & Power, Refining & Chemicals and Marketing & Services).

A summary of the Group's property, plant and equipment and their main related expenses (depreciation and impairment) is included in Note 7.2 to the Consolidated Financial Statements (point 8.7 of chapter 8).

Minimum royalties from finance lease agreements regarding properties, service stations, vessels and other equipment are presented in Note 13.2 to the Consolidated Financial Statements (point 8.7 of chapter 8).

Information about the objectives of the Company's environmental policy, in particular those related to the Group's industrial sites or facilities, is presented in chapter 5.

3

RISKS AND CONTROL

3.1 Risk Factors

The Group conducts its activities in an ever-changing environment and is exposed to risks that, if they were to occur, could have a material adverse effect on its business, financial condition, including its operating income and cash flow, reputation or outlook.

The Group employs a continuous process of identifying and analyzing risks in order to determine those that could prevent it from achieving its objectives. This chapter presents the significant risks to which the Group believes it is exposed as of the date of this Registration Document. However, as of such date, the Group may not be aware of, or may be underestimating the potential consequences of, other risks that could, or other risks may not have been considered by the Group as being likely to have a material adverse impact on the Group, its business, financial condition, including its operating income and cash flow, reputation or outlook.

The main internal control and risk management procedures, in particular those relating to the preparation and processing of accounting and financial information, are described in point 3.3 of this chapter.

3.1.1 Risks related to market environment and other financial risks

The financial performance of TOTAL is sensitive to a number of market environment related factors, the most significant being hydrocarbon prices, refining margins and exchange rates.

Generally, a decline in hydrocarbon prices has a negative effect on the Group's results due to a decrease in revenues from oil and gas production. Conversely, a rise in hydrocarbon prices increases the Group's results.

In 2018, at first, oil prices increased to reach their highest point in October above $80 per barrel, supported by supply tensions and geopolitics. Prices then decreased to below $60 per barrel by the end of the year, mainly driven by record production in the United States. In December, OPEC and Russia announced a production cut to mitigate the price drop. The oil and natural gas markets remain highly volatile.

For the fiscal year 2019, according to the scenarios retained below, the Group estimates that an increase of $10 per barrel in the average liquids price would increase annual adjusted net operating income[1] by approximately $2.7 billion and annual cash flow from operations by approximately $3.2 billion. Conversely, a decrease of $10 per barrel in the average liquids price would decrease annual adjusted net operating income by approximately $2.7 billion and annual cash flow from operations by approximately $3.2 billion.

The impact of changes in crude oil and gas prices on downstream operations depends upon the speed at which the prices of finished products adjust to reflect these changes. The Group estimates that a decrease in its European Refining Margin Indicator ("ERMI") of $10 per ton would decrease annual adjusted net operating income by approximately $0.5 billion and annual cash flow from operations by approximately $0.6 billion. Conversely, an increase in its ERMI of $10 per ton would increase annual adjusted net operating income by approximately $0.5 billion and annual cash flow from operations by approximately $0.6 billion.

All of the Group's activities are, for various reasons and to varying degrees, sensitive to fluctuations in the dollar/euro exchange rate. The Group estimates that a decrease of $0.10 per euro (strengthening of the dollar versus the euro) would increase annual adjusted net operating income by approximately $0.1 billion and have a limited impact on annual cash flow from operations. Conversely, an increase of $0.10 per euro (weakening of the dollar versus the euro) would decrease adjusted net operating income by approximately $0.1 billion and have a limited impact on annual cash flow from operations.

Sensitivities 2019 [(a)]	Scenario retained	Change	Estimated impact on adjusted net operating income	Estimated impact on cash flow from operations
Dollar	1.2 $/€	+/-0.1 $ per €	-/+0.1 B$	~ 0 B$
Average liquids price	60 $/b [(b)]	+/-10 $/b	+/-2.7 B$	+/-3.2 B$
European Refining Margin Indicator (ERMI)	35 $/t	+/-10 $/t	+/-0.5 B$	+/-0.6 B$

(a) Sensitivities revised once per year upon publication of the previous year's fourth quarter results. Indicated sensitivities are approximate and based upon TOTAL's current view of its 2019 portfolio. Results may differ significantly from the estimates implied by the application of these sensitivities. The impact of the $/€ sensitivity on adjusted net operating income is attributable essentially to Refining & Chemicals.
(b) Brent environment at 60 $/b.

In addition to the adverse effect on the Group's revenues, margins and profitability, a prolonged period of low oil and natural gas prices could lead the Group to review its projects and the evaluation of its assets and oil and natural gas reserves.

Prices for oil and natural gas may fluctuate widely due to many factors over which TOTAL has no control. These factors include:

- variations in global and regional supply of and demand for energy;
- global and regional economic and political developments in natural resource-producing regions, particularly in the Middle East, Africa and South America, as well as in Russia;
- the ability of the OPEC and other producing nations to influence global production levels and prices;
- prices of unconventional energies as well as evolving approaches for developing oil sands and shale oil, which may affect the Group's realized prices, notably under its long-term gas sales contracts and asset valuations, particularly in North America;
- cost and availability of new technologies;
- regulations and governmental actions;
- global economic and financial market conditions;

(1) Adjusted results are defined as income at replacement cost, excluding special items and the impact of fair value changes.

— the security situation in certain regions, the magnitude of international terrorist threats, wars or other conflicts;

— changes in demographics, notably population growth rates, and consumer preferences; and

— adverse weather conditions that can disrupt supplies or interrupt operations of the Group's facilities.

Prolonged periods of low oil and natural gas prices may reduce the economic viability of projects in production or in development and reduce the Group's liquidity, thereby decreasing its ability to finance capital expenditures and/or causing it to cancel or postpone investment projects.

If TOTAL were unable to finance its investment projects, the Group's opportunities for future revenues and profitability growth would be reduced, which could materially negatively impact the Group's financial condition, including its operating income and cash flow.

Prolonged periods of low oil and natural gas prices may reduce the Group's reported reserves and cause the Group to revise the price assumptions upon which asset impairment tests are based, which could have a significant adverse effect on the Group's results in the period in which it occurs. For additional information on impairments recognized on the Group's assets, refer to Note 3 to the Consolidated Financial Statements (point 8.7 of chapter 8).

Conversely, in a high oil and gas price environment, the Group can experience significant increases in cost and government take, and, under some production-sharing contracts, the Group's production rights could be reduced. Higher prices can also reduce demand for the Group's products.

The Group's results from its Refining & Chemicals and Marketing & Services segments are primarily dependent upon the supply and demand for petroleum products and the associated margins on sales of these products, with the impact of changes in oil and gas prices on results on these segments being dependent upon the speed at which the prices of petroleum products adjust to reflect movements in oil and gas prices. In 2018, the positive effects of higher oil and gas prices on the Group's results have been greater than the decrease of the results of the Refining & Chemicals segment. The Group's refining margins remain highly volatile.

The activities of Trading & Shipping (oil, gas and power trading and shipping activities) are particularly sensitive to market risk and more specifically to price risk as a consequence of the volatility of oil and gas prices, to liquidity risk (inability to buy or sell cargoes at market prices) and to counterparty risk (when a counterparty does not fulfill its contractual obligations). The Group uses various energy derivative instruments and freight-rate instruments to reduce its exposure to price fluctuations of crude oil, petroleum products, natural gas, power and freight-rates. Although TOTAL believes it has established appropriate risk management procedures, large market fluctuations may adversely affect the Group's activities and financial condition, including its operating income and cash flow.

For more detailed information on the impact of oil and gas prices on the Group's 2018 results, financial condition (including impairments) and outlook, refer to point 1.4 of chapter 1.

TOTAL is exposed to other financial risks related to its financing and cash management activities.

The Group is exposed to changes in interest rates and foreign exchange rates. Even though the Group generally seeks to minimize the currency exposure of each entity with regards to its functional currency (primarily the dollar, the euro, the pound sterling and the Norwegian krone), the Group's financial condition, including its operating income and cash flow, could be impacted by a significant change in the value of these currencies.

In addition, as TOTAL mostly turns to financial markets for its external financing, its financial condition and operations could be materially impacted if access to those markets were to become more difficult.

For further information on financial risks, refer to Notes 15 and 16 to the Consolidated Financial Statements (point 8.7 of chapter 8).

3.1.2 Industrial and environmental risks and risks related to climate issues

TOTAL is exposed to risks related to the safety and security of its operations.

The Group's activities involve a wide range of operational risks, such as explosions, fires, accidents, equipment failures, leakage of toxic products, emissions or discharges into the air, water or soil, that can potentially cause death or injury, or impact natural resources and ecosystems.

The industrial event that could have the most significant impact is a major industrial accident, e.g., blow out, explosion, fire, leakage of highly toxic products or massive leakage, resulting in death or injury and/or accidental pollution on a large-scale or at an environmentally sensitive site.

Acts of terrorism or malicious acts against employees, plants, sites, pipelines and transportation or computer systems of the Group's or its contractors could also disrupt the Group's business activities and could cause harm or damage to people, property and the environment and could have a material adverse effect on the Group's financial condition.

Certain activities of the Group face additional specific risks. TOTAL's Exploration & Production activities are exposed to risks related to the physical characteristics of oil and gas fields, particularly during drilling operations, which can cause blow outs, explosions, fires or other damage, in particular to the environment, and lead to a disruption of the Group's operations or reduce its production. In addition to the risks of explosions and fires, the activities of the Gas, Renewables & Power[1], Refining & Chemicals and Marketing & Services business segments entail risks related to the overall life cycle of the products manufactured, as well as the materials used. With regard to transportation, the likelihood of an operational accident depends not only on the hazardous nature of the products transported, but also on the volumes involved and the sensitivity of the regions through which they are transported (quality of infrastructure, population density, environment).

(1) Integrated Gas, Renewables & Power, as from January 1, 2019 (refer to point 2.2 of chapter 2).

TOTAL's workforce and the public are exposed to risks inherent to the Group's operations, which could lead to legal proceedings against the Group's entities and legal representatives, notably in cases of death, injury and property and environmental damage. Such proceedings could also damage the Group's reputation. In addition, like most industrial groups, TOTAL is concerned by declarations of occupational illnesses.

To manage the operational risks to which it is exposed, the Group has adopted a preventive and remedial approach by putting in place centralized HSE (health, safety and environment) and security management systems that seek to take all necessary measures to reduce the related risks (refer to points 5.4 and 5.5 of chapter 5). In addition, the Group maintains third-party liability insurance coverage for all its subsidiaries. TOTAL also has insurance to protect against the risk of damage to Group property and/or business interruption at its main refining and petrochemical sites. TOTAL's insurance and risk management policies are described in point 3.4 of this chapter. However, the Group is not insured against all potential risks. In certain cases, such as a major environmental disaster, TOTAL's liability may exceed the maximum coverage provided by its third-party liability insurance. The Group cannot guarantee that it will not suffer any uninsured loss and there can be no guarantee, particularly in the event of a major environmental disaster or industrial accident, that such loss would not have a material adverse effect on the Group's financial condition, including its operating income and cash flow, and its reputation.

Crisis management systems are necessary to effectively respond to emergencies, avoid potential disruptions to the Group's business and operations and minimize impacts on third parties or the environment.

The Group has crisis management plans in place to deal with emergencies (refer to point 5.5 of chapter 5). However, these plans cannot exclude the risk that the Group's business and operations may be severely disrupted in a crisis situation or ensure the absence of impacts on third parties or the environment. TOTAL has also implemented business continuity plans to continue or resume operations following a shutdown or incident. An inability for the Group to resume its activities in a timely manner could prolong the impact of any disruption and thus could have a material adverse effect on its financial condition, including its operating income and cash flow.

TOTAL is subject to increasingly stringent environmental, health and safety laws and regulations in numerous countries and may incur material related compliance costs.

The Group's activities are subject to numerous laws and regulations pertaining to the environment, health and safety. In most countries where the Group operates, particularly in Europe and the United States, sites and products are subject to increasingly stringent laws governing the protection of the environment (water, air, soil, noise, protection of nature, waste management and impact assessments, etc.), health (occupational safety and chemical product risk, etc.) and the safety of personnel and residents. Product quality and consumer protection are also subject to increasingly strict regulations. The Group's entities ensure that their products meet applicable specifications and abide by all applicable consumer protection laws. Failure to do so could lead to personal injury, property damage, environmental harm and loss of customers, which could negatively impact the Group's financial condition, including its operating income and cash flow, and its reputation.

TOTAL incurs and will continue to incur substantial expenditures to comply with increasingly complex laws and regulations aimed at protecting health, safety and the environment. Such expenditures could have a material adverse effect on the Group's financial condition.

The introduction of new laws and regulations could compel the Group to curtail, modify or cease certain operations or implement temporary shutdowns of sites, which could diminish productivity and have a material adverse impact on its financial condition.

Moreover, pursuant to applicable regulations, most of the Group's activities will require, at site closure, decommissioning followed by environmental remediation after operations are discontinued. Costs related to such activities may materially exceed the Group's provisions and adversely impact its operating incomes. With regard to the definitive shutdown of activities, the Group's environmental contingencies and asset retirement obligations are addressed in the "Asset retirement obligations" and "Provisions for environmental contingencies" sections of the Group's consolidated balance sheet (refer to Note 12 to the Consolidated Financial Statements, point 8.7 of chapter 8). Future expenditures related to asset retirement obligations are accounted for in accordance with the accounting principles described in the same Note.

Laws and regulations related to climate change as well as growing concern of stakeholders may adversely affect the Group's business and financial condition.

Firstly, there is a risk incurred by rapidly changing modes of energy production in favor of a lower-carbon energy mix that allows for a more limited share of fossil fuel. This could impact the Group's business model, profitability, financial situation and shareholder value.

The growing concern of certain stakeholders with regards to climate change could also have an impact on certain external financing of the Group's projects or influence certain investors involved in the oil and gas sector.

Moreover, regulations may change and require the Group to reduce, change or cease certain operations, and subject it to additional obligations with regards to the compliance of its facilities. This could have a negative effect on its activities and its financial situation, including operating income and cash flow. Regulations designed to gradually limit fossil fuel use may, depending on the GHG emission limits and time horizons set, negatively and significantly affect the development of projects, as well as the economic value of certain of the Group's assets. In Europe, for example, the Group's industrial facilities are part of the CO_2 emissions quotas market (EU-ETS), and the financial risk incurred by purchasing these quotas on the market could increase due to the reform of the system that was approved in 2018. This emission quotas market is in its third phase. The Group estimates that about 25% of emissions subjected to EU-ETS are not covered by free quotas in the period 2013-2020 (phase 3) and to 30% or more from 2021 to 2030 (phase 4). At the end of 2018, the price of these quotas was about €20/t, and the Group expects this price to be higher than €30/t in phase 4.

Internal studies conducted by TOTAL have shown that a long-term CO_2 price of $40/t[(1)] applied worldwide would have a negative impact of around 5% on the discounted present value of the Group's assets (upstream and downstream). In addition, the average lifespan of the Group's proved and probable reserves is approximately 20 years, while the discounted present value of those reserves beyond the 20 years represents less than 10% of the discounted present value of the Group's upstream assets.

(1) As from 2021 or the current price in a given country.

Finally, the Company and several of its subsidiaries have received claims issued by public entities in certain countries in view of financing the protective measures to be implemented in order to limit the consequences of climate change. The Group is subject to the risk of judicial actions in this area.

The physical effects of climate change may adversely affect the Group's business.

TOTAL's businesses operate in various regions, where the potential physical impacts of climate change, including changes in weather patterns, are highly uncertain and may adversely impact the Group's operating income.

Climate change potentially has multiple effects that could harm the Group's operations. The increasing scarcity of water resources may negatively affect the Group's operations in some regions of the world, high sea levels may harm certain coastal activities, and the multiplication of extreme weather events may damage offshore and onshore facilities. These climate risk factors are continually assessed in the risk management and prevention plans.

The Group believes that it is impossible to guarantee that the contingencies or liabilities related to the matters mentioned in this point 3.1.2 would not have a material adverse impact on its business, financial condition, including its operating income and cash flow, reputation, prospects or shareholder value, if such risks were to occur.

3.1.3 Risks related to critical IT systems security

Disruption to or breaches of TOTAL's critical IT services or information security systems could adversely affect the Group's activities.

The Group's activities depend heavily on the reliability and security of its information technology (IT) systems. The Group's IT systems, some of which are managed by third parties, are susceptible to being compromised, damaged, disrupted or shutdown due to failures during the process of upgrading or replacing software, databases or components, power or network outages, hardware failures, cyber-attacks (viruses, computer intrusions), user errors or natural disasters. The cyber threat is constantly evolving. Attacks are becoming more sophisticated with regularly renewed techniques while the digital transformation amplifies exposure to these cyber threats. The adoption of new technologies, such as the Internet of things (IoT) or the migration to the cloud, as well as the evolution of architectures for increasingly interconnected systems, are all areas where cyber security is a very important issue. The Group and its service providers may not be able to prevent third parties from breaking into the Group's IT systems, disrupting business operations or communications infrastructure through denial-of-service attacks, or gaining access to confidential or sensitive information held in the system. The Group, like many companies, has been and expects to continue to be the target of attempted cybersecurity attacks. While the Group has not experienced any such attack that has had a material impact on its business, the Group cannot guarantee that its security measures will be sufficient to prevent a material disruption, breach or compromise in the future.

As a result, the Group's activities and assets could sustain serious damage, services to clients could be interrupted, material intellectual property could be divulged and, in some cases, personal injury, property damage, environmental harm and regulatory violations could occur, potentially having a material adverse effect on the Group's financial condition, including its operating income and cash flow.

3.1.4 Risks related to the development of major projects and reserves

The Group's production growth and profitability depend on the delivery of its major development projects.

Growth of production and profitability of the Group rely heavily on the successful execution of its major development projects that are increasingly complex and capital-intensive. These major projects may face a number of difficulties, including, in particular, those related to:

- economic or political risks, including threats specific to a certain country or region, such as terrorism, social unrest or other conflicts (refer to point 3.1.6 of this chapter);
- negotiations with partners, governments, local communities, suppliers, customers and other third parties;
- obtaining project financing;
- controlling capital and operating costs;
- earning an adequate return in a low oil and/or gas price environment;
- respecting project schedules; and
- the timely issuance or renewal of permits and licenses by public agencies.

Poor delivery of any major project that underpins production or production growth could adversely affect the Group's financial condition, including its operating income and cash flow.

The Group's long-term profitability depends on cost-effective discovery, acquisition and development of economically viable new reserves; if the Group is unsuccessful, its financial condition, including its operating income and cash flow, could be materially affected.

A large portion of the Group's revenues and operating results are derived from the sale of oil and gas that the Group extracts from underground reserves developed as part of its Exploration & Production activities. The development of oil and gas fields, the construction of facilities and the drilling of production or injection wells is capital intensive and requires advanced technology. Due to constantly changing market conditions and environmental challenges, cost projections can be uncertain. For Exploration & Production activities to continue to be profitable, the Group needs to replace its reserves with new proved reserves (likely to be developed and produced in an economically viable manner).

In addition, a number of factors may undermine TOTAL's ability to discover, acquire and develop new reserves, which are inherently uncertain, including:

- the geological nature of oil and gas fields, notably unexpected drilling conditions, including pressure or unexpected heterogeneities in geological formations;
- the risk of dry holes or failure to find expected commercial quantities of hydrocarbons;

— equipment failures, fires, blow-outs or accidents;
— shortages or delays in the availability or delivery of appropriate equipment;
— the Group's inability to develop or implement new technologies that enable access to previously inaccessible fields;
— the Group's inability to anticipate market changes in a timely manner;
— adverse weather conditions;
— the inability of the Group's partners to execute or finance projects in which the Group holds an interest or to meet their contractual obligations;
— the inability of service companies to deliver contracted services on time and on budget;
— compliance with both anticipated and unanticipated governmental requirements, including U.S. and EU regulations that may give a competitive advantage to companies not subject to such regulations;
— economic or political risks, including threats specific to a certain country or region, such as terrorism, social unrest or other conflicts (refer to point 3.1.6 of this chapter);
— competition from oil and gas companies for the acquisition and development of assets and licenses (refer to point 3.1.7 of this chapter);
— increased taxes and royalties, including retroactive claims and changes in regulations and tax reassessments; and
— disputes related to property titles.

These factors could lead to cost overruns and/or could impair the Group's ability to complete a development project or make production economical. Some of these factors may also affect the Group's projects and facilities further down the oil and gas chain.

If TOTAL fails to develop new reserves cost-effectively and in sufficient quantities, the Group's financial condition, including its operating income and cash flow, could be materially affected.

The Group's oil and gas reserves data are estimates only and subsequent upward or downward adjustments are possible. If actual production from such reserves proves to be lower than current estimates indicate, the Group's financial condition, including its operating income and cash flow, could be impacted.

The Group's proved reserves figures are estimates prepared in accordance with SEC rules. Proved reserves are those reserves which, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be economically recoverable – from a given date forward, from known reservoirs and under existing economic conditions, operating methods and government regulations – prior to the time at which contracts providing the right to operate expire, unless evidence indicates that renewal is reasonably certain, regardless of whether deterministic or probabilistic methods are used for the estimation. Reserves are estimated by teams of qualified, experienced and trained geoscientists and petroleum, gas and project engineers, who rigorously review and analyze in detail all available geoscience and engineering data (for example, seismic data, electrical logs, cores, fluids, pressures, flow rates and facilities parameters). This process involves making subjective judgments, including with respect to the estimate of hydrocarbons initially in place, initial production rates and recovery efficiency, based on available geological, technical and economic data. Consequently, estimates of reserves are not exact measurements and are subject to revision.

A variety of factors that are beyond the Group's control could cause such estimates to be adjusted downward in the future, or cause the Group's actual production to be lower than its currently reported proved reserves indicate. Such factors include:

— a prolonged period of low prices of oil or gas, making reserves no longer economically viable to exploit and therefore not classifiable as proved;
— an increase in the price of oil or gas, which may reduce the reserves to which the Group is entitled under production sharing and risked service contracts and other contractual terms;
— changes in tax rules and other regulations that make reserves no longer economically viable to exploit, or disputes related to property titles; and
— the actual production performance of the Group's deposits.

The Group's reserves estimates may therefore require substantial downward revisions should its subjective judgments prove not to have been conservative enough based on the available geoscience and engineering data, or the Group's assumptions regarding factors or variables that are beyond its control prove to be incorrect over time. Any downward adjustment could indicate lower future production amounts, which could adversely affect the Group's financial condition, including its operating income and cash flow.

3.1.5 Risks related to equity affiliates and management of assets operated by third parties

Many of the Group's projects are conducted by equity affiliates or are operated by third parties. For these projects, the Group's degree of control, as well as its ability to identify and manage risks, may be reduced.

A significant number of the Group's projects are conducted by equity affiliates[(1)] or operated by third parties. In cases where the Group's company is not the operator, such company may have limited influence over, and control of, the behavior, performance and costs of the partnership, its ability to manage risks may be limited and it may, nevertheless, be prosecuted by regulators or claimants in the event of an incident.

Additionally, the partners of the Group may not be able to meet their financial or other obligations to the projects, which may threaten the viability of a given project. These partners may also not have the financial capacity to fully indemnify the Group or third parties in the event of an incident.

With respect to joint-ventures, contractual terms generally provide that the operator, whether an entity of the Group or a third party, assumes full liability for damages caused by its gross negligence or willful misconduct.

(1) For additional information, refer to Note 8 to the Consolidated Financial Statements (point 8.7 of chapter 8).

In the absence of the operator's gross negligence or willful misconduct, other liabilities are generally borne by the joint-venture and the cost thereof is assumed by the partners of the joint-venture in proportion to their respective ownership interests.

With respect to third-party providers of goods and services, the amount and nature of the liability assumed by the third party depends on the context and may be limited by contract. Contracts may also contain obligations to indemnify TOTAL or for TOTAL to indemnify partners or third parties.

3.1.6 Risks related to political or economic factors

TOTAL has significant production and reserves located in politically, economically and socially unstable areas, where the risk that the Group's operations may be materially affected is relatively high.

A significant portion of TOTAL's oil and gas production and reserves is located in countries that are not part of the Organisation for Economic Co-operation and Development (OECD). In recent years, a number of these countries have experienced varying degrees of one or more of the following: economic or political instability, civil war, violent conflict, social unrest, actions of terrorist groups and the application of international economic sanctions. Any of these conditions alone or in combination could disrupt the Group's operations in any of these regions, causing substantial declines in production or revisions to reserves estimates.

In Africa (excluding North Africa), which represented 24% of the Group's 2018 combined liquids and gas production, certain of the countries in which the Group has production have recently suffered from some of these conditions, including Nigeria, which is one of the main contributing countries to the Group's production of hydrocarbons (refer to point 2.1.9 of chapter 2).

The Middle East and North Africa zone, which represented 24% of the Group's 2018 combined liquids and gas production, has in recent years suffered increased political instability in connection with violent conflict and social unrest, particularly in Libya and Syria, where the European Union (EU) and the U.S. have enacted economic sanctions prohibiting TOTAL from producing oil and gas since 2011. In Yemen, the deterioration of security conditions in the vicinity of the Balhaf site caused the company Yemen LNG, in which the Group holds a stake of 39.62%, to stop its commercial production and export of LNG and to declare *force majeure* to its various stakeholders in 2015. The plant has been put in preservation mode. In Iran, TOTAL signed in July 2017 a 20-year contract with the National Iranian Oil Company (NIOC) relating to the development and production of phase 11 (SP11) of the giant South Pars gas field. Following the withdrawal of the United States from the Joint Comprehensive Plan of Action on May 8, 2018, TOTAL withdrew from this project and finalized its withdrawal on October 29, 2018, prior to the re-imposition of US secondary sanctions on the oil industry as of November 5, 2018. TOTAL was the operator and had a 50.1% interest alongside the Chinese state-owned company CNPC (30%) and Petropars (19.9%); a wholly-owned subsidiary of NIOC. TOTAL ceased all operational activity in Iran before November 4, 2018.

In South America, which represented 6% of the Group's 2018 combined liquids and gas production, certain of the countries in which TOTAL has production have recently suffered from political or economic instability, including Argentina, Brazil and Venezuela.

Since July 2014, international economic sanctions have been adopted against certain Russian individuals and entities, including various entities operating in the financial, energy and defense sectors. As of December 31, 2018, TOTAL held 21% of its proved reserves in Russia, from which the Group had 14% of its combined oil and gas production in 2018.

For additional information concerning international economic sanctions applicable notably to Cuba, Iran, Russia, Syria and Venezuela, refer to point 3.1.9.1 of this chapter.

Furthermore, in addition to current production, TOTAL is also exploring for and developing, or is participating in the exploration and/or development of, new reserves in other regions of the world that are historically characterized by political, social or economic instability.

The occurrence and magnitude of incidents related to economic, social or political instability are unpredictable. It is possible that they could have a material adverse impact on the Group's production and operations in the future and/or cause certain investors to reduce their holdings of TOTAL's securities.

TOTAL, like other major international energy companies, has a geographically diverse portfolio of reserves and operational sites, which allows it to conduct its business and financial affairs so as to reduce its exposure to political and economic risks. However, there can be no assurance that such events will not have negative consequences on the Group.

Intervention by host country authorities can adversely affect the Group's activities and its operating incomes.

TOTAL has significant exploration and production activities, and in some cases refining, marketing or chemicals operations, in countries whose governmental and regulatory framework is subject to unexpected change and where the enforcement of contractual rights is uncertain. The legal framework of TOTAL's exploration and production activities, established through concessions, licenses, permits and contracts granted by or entered into with a government entity, a state-owned company or private owners, is subject to risks of renegotiation that, in certain cases, can reduce or challenge the protections offered by the initial legal framework and/or the economic benefit to TOTAL.

In addition, the Group's exploration and production activities in such countries are often undertaken in conjunction with state-owned entities, for example as part of a joint-venture in which the state has a significant degree of control. In recent years, in various regions globally, TOTAL has observed governments and state-owned enterprises impose more stringent conditions on companies pursuing exploration and production activities in their respective countries, increasing the costs and uncertainties of the Group's business operations. TOTAL expects this trend to continue.

Potential increasing intervention by governments in such countries can take a wide variety of forms, including:

- the award or denial of exploration and production interests;
- the imposition of specific drilling obligations;
- price and/or production quota controls and export limits;
- nationalization or expropriation of assets;
- unilateral cancellation or modification of license or contract rights;
- increases in taxes and royalties, including retroactive claims and changes in regulations and tax reassessments;
- the renegotiation of contracts;
- the imposition of increased local content requirements;
- payment delays; and
- currency exchange restrictions or currency devaluation.

If a host government were to intervene in one of these forms in a country where TOTAL has substantial operations, including exploration, the Group could incur material costs or the Group's production or asset value could decrease, which could potentially have a material adverse effect on its financial condition, including its operating income and cash flow.

For example, the Nigerian government has been contemplating new legislation to govern the petroleum industry which, if passed into law, could have an impact on the existing and future activities of the Group in that country through increased taxes and/or operating costs and could affect financial returns from projects in that country.

3.1.7 Risks related to competition and lack of innovation

The Group operates in a highly competitive environment. Its competitiveness could be adversely impacted if the Group's level of innovation lagged behind its competitors.

TOTAL's main competitors are comprised of national (companies directly or indirectly controlled by a state) and international oil companies. The evolution of the energy sector has opened the door to new competitors and increased market price volatility.

TOTAL is subject to competition in the acquisition of assets and licenses for the exploration and production of oil and natural gas as well as for the sale of manufactured products based on crude and refined oil. In the gas sector, major producers increasingly compete in the downstream value chain with established distribution companies. Increased competitive pressure could have a significant negative effect on the prices, margins and market shares of the Group's companies.

The pursuit of unconventional gas development, particularly in the United States, has contributed to falling hydrocarbon market prices and a marked difference between spot and long-term contract prices. The competitiveness of long-term contracts indexed to oil prices could be affected if this discrepancy persists and if it should prove difficult to invoke price revision clauses.

The Group's activities are carried out in a constantly changing environment with new products and technologies continuously emerging. The Group may not be able to anticipate these changes, identify and integrate technological developments in order to maintain its competitiveness, maintain a high level of performance and operational excellence, and best meet the needs and demands of its customers. The Group's innovation policy requires significant investment, notably in R&D, of which the expected impact cannot be guaranteed.

In the field of R&D, the multiplication of research partnerships, in particular in related technical fields, may make it difficult for the Group to track technical information exchanged with research partners and monitor related contractual restrictions (e.g., confidentiality, limited use). New and increasingly complex digital technologies as well as the multiplication of partnerships are all likely to increase contamination risks, which could, as a result, limit TOTAL's ability to exploit innovations.

3.1.8 Ethical misconduct and non-compliance risks

Ethical misconduct or non-compliance of the Group or its employees with applicable laws could expose TOTAL to criminal and civil penalties and be damaging to TOTAL's reputation and shareholder value.

The Group's Code of Conduct, which applies to all of its employees, defines TOTAL's commitment to ethical standards, business integrity, human rights and compliance with applicable legal requirements. TOTAL maintains a "zero tolerance" principle for fraud of any kind, particularly bribery, corruption and influence peddling. Non-compliance with laws and regulations as well as ethical or human rights misconduct by TOTAL, its employees or a third-party acting on its behalf could expose TOTAL and/or its employees to investigations, criminal and civil sanctions and to additional penalties (such as debarment from public procurement). Further measures could, depending on applicable legislation (notably, the U.S. Foreign Corrupt Practices Act, the UK Bribery Act, the French law n° 2016-1691 dated December 9, 2016 relating to transparency, the fight against corruption and modernization of the economy or the Regulation (EU) 2016/679 with regard to the protection of personal data), be imposed by competent authorities, such as the review and reinforcement of the compliance program under the supervision of an independent third party. Any of the above could be damaging to the financial condition, shareholder value or reputation of the Group.

Generally, entities of the Group could potentially be subject to administrative, judicial or arbitration proceedings that could have a material adverse impact on the Group's financial condition and reputation (refer to point 3.2 of this chapter).

3.1.9 Countries targeted by economic sanctions

TOTAL has activities in certain countries targeted by economic sanctions. If the Group's activities are not conducted in accordance with applicable laws and regulations, TOTAL could face penalties.

Economic sanctions or other restrictive measures could target countries, such as Cuba, Iran, and Syria and/or target actors or economic sectors, such as in Russia or in Venezuela.

U.S. and European restrictions relevant to the Group and certain disclosure concerning the Group's limited activities or presence in certain targeted countries are outlined in points 3.1.9.1 and 3.1.9.2, respectively.

3.1.9.1 U.S. and European legal restrictions

TOTAL closely monitors applicable international economic sanctions regimes, including those adopted by the United States and the European Union ("EU") (collectively, "Sanctions Regimes"), changes to such regimes and possible impacts on the Group's activities. TOTAL takes steps to ensure compliance with applicable Sanctions Regimes and believes that its current activities in targeted countries do not infringe the applicable Sanctions Regimes. However, the Group cannot assure that current or future regulations related to Sanctions Regimes will not have a negative impact on its business, financial condition or reputation. A violation by the Group of applicable Sanctions Regimes could result in criminal, civil and/or material financial penalties.

A) Restrictions against Cuba

U.S. sanctions against Cuba prohibit any person subject to the jurisdiction of the United States [1] from engaging, directly or indirectly, in any activities or dealings related to Cuba, without government authorization. Therefore, the use of the U.S. dollar is prohibited for almost all transactions related to Cuba. Furthermore, it is prohibited to export and reexport to Cuba all goods subject to the Export Administration Regulations [2] without a license and with exceptions (for example, certain medical equipment), as well as to import all goods of Cuban origin into the United States. Cuba is not subject to European economic sanctions.

TOTAL has had an interest in a liquefied petroleum gas (LPG) cylinder filing plant in Cuba since 1997 and continues the development of its activities regarding lubricants, fluids and greases in Cuba.

B) Restrictions against Iran

Several countries and international organizations, including the United States and the EU, maintain Sanctions Regimes of varying degrees targeting Iran.

On July 14, 2015, the EU, China, France, Russia, the United Kingdom, the United States and Germany reached an agreement with Iran, known as the Joint Comprehensive Plan of Action (the "JCPOA"), regarding limits on Iran's nuclear activities and relief under certain U.S., EU and UN economic sanctions regarding Iran. On January 16, 2016, the International Atomic Energy Agency ("IAEA") confirmed that Iran had met its initial nuclear compliance commitments under the JCPOA. Therefore, as from that date, UN economic sanctions, most U.S. secondary sanctions (i.e., those covering non-U.S. persons [3] and for activities outside U.S. jurisdiction) and most EU economic sanctions were suspended [4].

Following the withdrawal of the United States from the JCPOA in May 2018, U.S. secondary sanctions concerning the oil industry were re-imposed as of November 5, 2018.

In July 2017, TOTAL signed a contract for a period of 20 years with the National Iranian Oil Company ("NIOC") relating to the development and production of phase 11 (SP11) [5] of the giant South Pars gas field. Following the withdrawal of the United States from the JCPOA, TOTAL withdrew from this project and finalized its withdrawal on October 29, 2018, prior to the re-imposition of U.S. secondary sanctions on the oil industry as of November 5, 2018. TOTAL ceased all operational activity in Iran before November 4, 2018.

Furthermore, certain U.S. states have adopted regulations with respect to Iran requiring, in certain conditions, state pension funds and other state-owned institutional investors to divest securities in any company that has or had business operations in Iran and state public contracts not to be awarded to such companies. Certain U.S. state regulators have adopted similar initiatives relating to investments by insurance companies. TOTAL believes the impact of these regulations to be limited due to the Group's decision to withdraw from Iran. Nevertheless, TOTAL continues to closely monitor these measures, which are generally still in effect following the withdrawal of the United States from the JCPOA.

With respect to the Group's activities conducted under the sanctions framework that was in place prior to the entry into force of the JCPOA, the U.S. Department of State made a determination on September 30, 2010 that certain historical activities would not be deemed sanctionable and that, so long as TOTAL acted in accordance with its commitments related to this determination, it would not be regarded as a company of concern for its past Iran-related activities. TOTAL's historical activities in Iran have been conducted in compliance with these Sanctions Regimes. Since 2011, TOTAL has had no production in Iran.

Refer to point 3.1.9.2 below for information concerning Section 13(r) of the Securities Exchange Act of 1934, as amended, pertaining to activities of the Group related to Iran.

C) Restrictions against Russia

Since July 2014, various Sanctions Regimes have been adopted against Russia, including prohibitions to deal with certain Russian individuals and entities or restrictions on financings, as well as restrictions on investments and exports to Russia.

The economic sanctions adopted by the EU since 2014 do not materially affect TOTAL's activities in Russia. TOTAL has been formally authorized by the French government, which is the competent authority for granting authorization under the EU sanctions regime, to continue all its activities in Russia on the Kharyaga and Termokarstovoye fields and the Yamal LNG and the Arctic 2 LNG projects.

The United States adopted various economic sanctions, some of which target PAO Novatek [6] ("Novatek"), and the entities in which Novatek (individually or with other similarly targeted persons or entities) owns an interest of at least 50%, including OAO Yamal LNG [7] ("Yamal LNG"),Terneftegas [8] and OOO Arctic 2 LNG [9]. These sanctions prohibit, in particular, U.S. persons from all transactions in, providing financing for, and other dealings in debt issued by these entities after July 16, 2014 of longer than 90 days maturity (reduced to 60 days as from the end of November 2017). The use of the U.S. dollar is therefore prohibited for these types of financings, including Yamal LNG. The Yamal LNG project's financing was finalized in successive steps in 2016 in compliance with applicable regulations. The financing of the Arctic LNG 2 project is under discussion.

In addition, the U.S. Department of Commerce has imposed restrictions on exports and reexports of certain goods to Russia under the regulation related to the U.S. export control with respect to certain oil projects, which do not materially impact TOTAL's current activities in Russia.

In August 2017, the United States adopted the Countering America's Adversaries Through Sanctions Act ("CAATSA"). This law provides for, in particular, the possibility to impose secondary sanctions against a non-U.S. person who (i) invests in certain types of crude oil projects; (ii) carries out a significant transaction with a sanctioned Russian individual or entity; (iii) carries out a significant transaction with an individual/entity party to or acting on behalf of Russian economic intelligence or defense sectors; (iv) carries out a direct and significant investment (beyond certain amounts), which contributes to the development of Russian export pipelines or (v) sells, leases or provides goods, services, technologies or information that could directly and in a significant manner facilitate the maintenance or expansion of the construction, modernization or repair of energy export pipelines by Russia. This law also, on the one hand, reduced the maturity periods of debts restricting the financing of certain entities and, on the other hand, extended, as from January 29, 2018, the prohibition applicable to certain entities to export goods and services outside of Russia in support of exploration or production projects of oil in deep water, beyond the Arctic offshore, or concerning shale formations (shale oil).

On April 6, 2018, the American Department of Treasury's Office of Foreign Assets Control (OFAC) for the first time designated and registered certain Russian oligarchs and political figures, as well as several entities owned by them, on the list of Specially Designated Nationals and Blocked Persons List. Non-U.S. persons may now be sanctioned under secondary sanctions for having carried out significant transactions with the designated persons.

TOTAL continues its activities in Russia in compliance with applicable sanctions regimes.

(1) Cuban Assets Control Regulations (CACR), 31 CFR Part. 515.
(2) Export Administration Regulations (EAR) § 734.3.
(3) "U.S. person" means any U.S. citizen and permanent resident alien wherever he/she is in the world, entity organized under the laws of the United States or any jurisdiction within the United States, including foreign branches, or any person or entity located in the United States.
(4) Certain U.S. and EU human rights-related and terrorism-related sanctions remain in force.
(5) TOTAL was an operator of the SP11 project and held 50.1% alongside the national Chinese company China National Petroleum Corporation ("CNPC") (30%) and Petropars (19.9%), a 100% owned subsidiary of NIOC.
(6) A Russian company listed on the Moscow and London stock exchanges and in which the Group held an interest of 19.4% as of December 31, 2018.
(7) A company jointly owned by PAO Novatek, Total E&P Yamal (20.02%), China National Oil and Gas Exploration Development Corporation – CNODC, a subsidiary of CNPC and Silk Road Fund.
(8) A company jointly owned by PAO Novatek and Total Termokarstovoye BV (49%).
(9) A company wholly-owned owned by PAO Novatek as of December 31, 2018.

As of December 31, 2018, TOTAL held 21% of its proved reserves in Russia, where the Group had 14% of its combined oil and gas production in 2018.

D) Restrictions against Syria

The EU adopted measures in 2011 regarding trade with and investment in Syria that are applicable to European persons and to entities constituted under the laws of an EU Member State, including, notably, a prohibition on the purchase, import or transportation from Syria of crude oil and petroleum products. The United States also has adopted comprehensive measures that broadly prohibit trade and investment in and with Syria. Since 2011, the Group ceased its activities that contributed to oil and gas production in Syria and has not purchased hydrocarbons from Syria since that time (refer to point 3.1.9.2).

E) Restrictions against Venezuela

Since 2014, different Sanctions Regimes were adopted relating to Venezuela, including prohibitions to deal with certain Venezuelan individuals and entities, as well as restrictions on financings.

In August 2017, the United States adopted economic sanctions relating to the Government of Venezuela as well as certain state-owned or controlled entities (collectively, the "Government of Venezuela"), including Petroleos de Venezuela, S.A. ("PdVSA") as well as entities in which PdVSA (individually or with other similarly targeted persons or entities collectively) owns an interest of at least 50% (which includes Petrocedeño S.A., a company in which the Group held an interest of 30.32% as of December 31, 2018). These sanctions prohibit all U.S. persons [1] from transacting in, providing financing for or otherwise dealing in debt issued by PdVSA as from August 25, 2017 of longer than 90 days maturity. The use of the U.S. dollar is therefore prohibited for these types of financings, including with Petrocedeño S.A.

Since November 13, 2017, Venezuela has also been subject to European sanctions, which mainly provide for the freezing of assets of certain individuals and entities, a military embargo as well as restrictions on the exportation of certain goods.

In May 2018, the United States adopted a new round of sanctions against the Government of Venezuela, prohibiting all U.S. persons from transacting in (i) the purchase of debts owed to the Government of Venezuelan and (ii) the sale, transfer, assignment, or pledging as collateral by the Government of Venezuelan of any equity interest in any entity in which the Government of Venezuela has a 50% or greater ownership interest.

On January 28, 2019, pursuant to Executive Order 13850, American Department of Treasury's Office of Foreign Assets Control (OFAC) designated and registered PdVSA on the list of Specially Designated Nationals and Blocked Persons List, as well as any entities in which PdVSA owns an interest of at least 50%, including Petrocedeño S.A.

To date, TOTAL has organised the management of its interest to ensure compliance with applicable sanctions.

3.1.9.2 Information concerning certain limited activities in Iran and Syria

Information concerning TOTAL's activities related to Iran that took place in 2018 provided in this section is disclosed according to Section 13(r) of the Securities Exchange Act of 1934, as amended ("U.S. Exchange Act").

In addition, information for 2018 is provided concerning the payments made by Group affiliates to, or additional cash flow that operations of Group affiliates generate for, the government of any country identified by the United States as a state sponsor of terrorism (currently, Iran, North Korea, Syria and Sudan) [2] or any entity controlled by those governments.

TOTAL believes that these activities are not sanctionable, including for activities previously disclosed. For more information on certain U.S. and EU restrictions relevant to TOTAL in these jurisdictions, refer to point 3.1.9.1 of this chapter.

A) Iran

The Group's operational activities related to Iran were stopped in 2018 following the withdrawal of the United States from the JCPOA in May 2018 and prior to the re-imposition of U.S. secondary sanctions on the oil industry as of November 5, 2018.

Statements in this section concerning affiliates intending or expecting to continue activities described below are subject to such activities continuing to be permissible under applicable international economic sanctions regimes.

a) Exploration & Production

Following the suspension of certain international economic sanctions against Iran on January 16, 2016, the Group commenced various business development activities in Iran. Total E&P South Pars S.A.S. ("TEPSP") (a wholly-owned affiliate), CNPC International Ltd. ("CNPCI") (a wholly-owned affiliate of China National Petroleum Company) and Petropars Ltd. ("Petropars") (a wholly-owned affiliate of NIOC) signed a 20-year risked service contract in July 2017, (the "Risked Service Contract") for the development and production of phase 11 of the South Pars gas field ("SP11").TEPSP (50.1%) was the operator and a partner of the project alongside CNPCI (30%) and Petropars (19.9%). These companies entered into a joint operating agreement in July 2017 (the "JOA") concerning, among other things, the governance of their obligations under the Risked Service Contract and the designation of TEPSP as the project's operator.

In 2018, TEPSP continued conducting petroleum operations on behalf of the above-mentioned consortium in accordance with the terms and conditions of the Risked Service Contract and the JOA. In particular, TEPSP: (i) held several meetings with the Iranian authorities, NIOC and other Iranian state owned/controlled entities; (ii) launched tenders for award of service contracts for the purposes of the SP11 project; (iii) negotiated various agreements (such as service and/or supply agreements and bank service agreements); and (iv) performed other activities under the Risked Service Contract and the JOA.

In 2018, TEPSP completed the technical studies, which were started in November 2016, in accordance with the technical services agreement (the "TSA") between NIOC and TEPSP, acting on behalf of the consortium.

(1) "U.S. person" means any U.S. citizen and permanent resident alien wherever he/she is in the world, entity organized under the laws of the United States or any jurisdiction within the United States, including foreign branches, or any person or entity located in the United States.
(2) In North Korea, other than fees related to trademarks and designs paid in 2018, TOTAL is not present. In this country. In Sudan, other than the payment of fees related to trademarks, the Group is not aware of any of its activities in 2018 having resulted in payments to, or additional cash flow for, the government of that country.

However, as a result of the withdrawal of the U.S. from the JCPOA in May 2018, TOTAL ceased all of its activities related to the SP11 project and finalized its withdrawal from the SP11 project on October 29, 2018, at which time it transferred its participating interest and operatorship of the project to CNPCI.

The MOU entered into between TOTAL and NIOC in January 2016 to assess potential developments in Iran (including South Azadegan) was amended to include North Azadegan and to extend its duration. NIOC provided TOTAL in 2017 with technical data on the Azadegan oil field so that it could assess potential development of this field. Representatives of TOTAL held technical meetings in 2017 with representatives of NIOC and its affiliated companies and carried out a technical review of the Azadegan (South & North) oil field as well as the Iran LNG Project (a project contemplating a 10 Mt/y LNG production facility at Tombak Port on Iran's Persian Gulf coast), the results of which were partially disclosed to NIOC and relevant affiliated companies. In addition, TOTAL signed an MOU in 2017 with an international company to evaluate jointly the Azadegan oil field opportunity with NIOC. This international company decided in February 2018 to withdraw from this technical cooperation and a MOU termination agreement was formally executed with TOTAL on May 16, 2018. Technical studies were pursued by TOTAL until March 2018 on the Azadegan area with regular contacts with NIOC. All work and contacts with NIOC on this subject ceased at the end of March 2018.

During 2018, in connection with the activities under the aforementioned Risked Service Contract and MOUs, and to discuss other new opportunities, representatives of TOTAL attended meetings with the Iranian oil and gas ministry and several Iranian companies with ties to the government of Iran. In connection with travel to Iran in 2018 by certain employees of the Group, TOTAL made payments to Iranian authorities for visas, airport services, exit fees and similar travel-related charges. In addition, representatives of TOTAL had meetings in France with the Iranian ambassador.

Neither revenues nor profits were recognized from any of the aforementioned activities under the aforementioned Risked Service Contract and MOUs in 2018.

Maersk Oil studied two potential projects with NIOC, prior to the acquisition of Maersk Oil by TOTAL in March 2018. These studies ceased after a meeting with NIOC representatives in May 2018.

The Tehran branch office of TEPSP, opened in 2017 for the purposes of the SP11 project, ceased all operational activities prior to November 1, 2018 and will be closed and de-registered in 2019. Since November 2018, Total Iran BV maintains a local representative office in Tehran with a few employees, solely for non-operational functions. Concerning payments to Iranian entities in 2018, Total Iran BV and Elf Petroleum Iran collectively made payments of approximately IRR 31.7 billion (approximately $300,000[(1)]) to the Iranian administration for taxes and social security contributions concerning the personnel of the aforementioned representative office and residual obligations related to various prior risked service contracts. In 2019, similar types of payments are to be made in connection with maintaining the representative office in Tehran, albeit in lower amounts. None of these payments has been or is expected to be executed in U.S. dollars.

Furthermore, Total E&P UK Limited ("TEP UK"), a wholly-owned affiliate, holds a 1% interest in a joint venture for the Bruce field in the United Kingdom with Serica Energy (UK) Limited ("Serica") (98%, operator) and BP Exploration Operating Company Limited ("BP") (1%), following the completion of the sale of 42.25% of TEP UK's interests in the Bruce field on November 30, 2018 pursuant to a sale and purchase agreement dated August 2, 2018 between TEP UK and Serica. Upon the closing of the transaction on November 30, 2018, all other prior joint venture partners also sold their interests in the Bruce field to Serica (BP sold 36% retaining a 1% interest; BHP Billiton Petroleum Great Britain Limited ("BHP") sold their full 16% interest and Marubeni Oil & Gas (U.K.) Limited (("Marubeni") sold their full 3.75%).

The Bruce field joint venture is party to an agreement (the "Bruce Rhum Agreement") governing certain transportation, processing and operation services provided to another joint venture at the Rhum field in the UK, co-owned by Serica (50%, operator) and the Iranian Oil Company UK Ltd ("IOC"), a subsidiary of NIOC (50%). Under the terms of the Bruce Rhum Agreement, the Rhum field owners pay a proportion of the operating costs of the Bruce field facilities calculated on a gas throughput basis. IOC's share of costs incurred under the Bruce Rhum Agreement have been paid to TEP UK in 2018 by Naftiran Intertrade Company Limited ("NICO"), the trading branch of the National Iranian Oil Company ("NIOC"). NIOC is the parent company of IOC and an Iranian government owned corporation. In 2018, based upon TEP UK's 1% interest in the Bruce field and income from the net cash flow sharing arrangement with Serica, gross revenue to TEP UK from IOC's share of the Rhum field resulting from the Bruce Rhum Agreement was approximately £8 million. This sum was used to offset operating costs on the Bruce field and as such, generated no net profit to TEP UK. This arrangement is expected to continue in 2019.

In 2018, TEP UK acted as agent for BHP and Marubeni, which faced difficulty securing banking arrangements allowing them to accept payments from IOC, and, thus, received payments from IOC in relation to BHP and Marubeni's share of income from the Bruce Rhum Agreement under the terms of an agency agreement entered into in June 2018 between BHP, Marubeni and TEP UK (the "Agency Agreement"). Payments made from IOC to BHP and Marubeni in 2018 related to the periods prior to the completion of their divestment to Serica in November 2018. Total payment received on behalf of BHP and Marubeni by TEP UK under this arrangement in 2018 was approximately £7 million. This amount relates to income due to BHP and Marubeni under the Bruce Rhum Agreement for 2017 and 2018. TEP UK transferred all income received under the Agency Agreement to BHP and Marubeni and provided the service on a no profit, no loss basis. The Agency Agreement is expected to be terminated upon receipt of all payments relating to the period up to November 30, 2018.

Prior to the re-imposition of U.S. secondary sanctions on the oil industry as of November 5, 2018, TEP UK liaised directly with IOC concerning its interest in the Bruce Rhum Agreement and it received payments directly for services provided to IOC under the Bruce Rhum Agreement. In October 2018, the U.S. Treasury Department's Office of Foreign Asset Control ("OFAC") granted a new conditional license to BP and Serica authorizing the provision of services to the Rhum field, following the reinstatement of U.S. secondary sanctions. The principal condition of the OFAC license is that the Iranian government's shareholding in IOC is transferred into a trust in order that Iran may not derive any benefit from the Rhum field or exercise any control while the U.S. secondary sanctions are in place. A Jersey based trust has been put in place with the trustee holding IOC's shares in the Rhum field. IOC's interest is now managed by a new independent management company established by the trust and referred to as the "Rhum Management Company" ("RMC") and where necessary TEP UK liaises, and expects to continue doing so in 2019, with RMC in relation to the Bruce Rhum Agreement.

TEP UK is also party to an agreement with Serica whereby TEP UK uses reasonable endeavors to evacuate Rhum NGL from the St Fergus Terminal (the "Rhum NGL Agreement"). TEP UK provides this service – subject to Serica having title to all of the Rhum NGL to be evacuated and Serica having a valid license from OFAC for the activity – on a cost basis, but for which TEP UK charges a monthly handling fee that generates an income of approximately £35,000 per annum relating to IOC's 50% stake in the Rhum field. After costs, TEP UK realizes little profit from this arrangement.TEP UK expects to continue this activity in 2019.

(1) Converted using the average exchange rate for fiscal year 2018, as published by Bloomberg.

Following the acquisition of Maersk Oil in 2018, the undeveloped Yeoman discovery is now wholly owned by the Group, under license P2158 granted to Maersk Oil North Sea UK Limited, recently renamed Total E&P North Sea UK Limited ("TEPNSUK"). Yeoman is situated adjacent to the Pardis discovery in which IOC held an interest, which it sold in October 2018. Prior to this divestment, non-legally binding technical and commercial discussions had taken place between TEPNSUK, IOC and the UK Government's Oil and Gas Authority during the first half of 2018 regarding a potential joint development of Yeoman and Pardis but no contractual arrangements were implemented in connection with such discussions. Also prior to this divestement, other discussions had taken place between TEPNSUK and IOC on an informal basis regarding a potential farm-in to Pardis by Maersk Oil.

Lastly, TOTAL S.A. paid approximately €8,000 to Iranian authorities related to various patents[1] in 2018. Similar payments are expected to be made in 2019 for such patents.

b) Other business segments

In 2018, TOTAL S.A. paid fees of approximately €1,500 to Iranian authorities related to the maintenance and protection of trademarks and designs in Iran. Similar payments are expected to be made in 2019.

Trading & Shipping

Following the suspension of applicable EU and U.S. economic sanctions in 2016, the Group commenced the purchase of Iranian hydrocarbons through its wholly-owned affiliate TOTSA TOTAL OIL TRADING SA ("TOTSA"). In 2018, the Group continued its trading activities with Iran via TOTSA, which purchased approximately 18 Mb of Iranian crude oil for nearly €1 billion pursuant to term contracts. It is not possible to estimate the gross revenue and net profit related to these purchases because the totality of this crude oil was used to supply the Group's refineries. In addition, in 2018, approximately 1 Mb of petroleum products were sold to entities with ties to the government of Iran. These activities generated gross revenue of nearly €43 million and a net profit of approximately €1 million. The Group ceased these activities in June 2018.

Gas, Renewables & Power

Saft Groupe S.A. ("Saft"), a wholly-owned affiliate, in 2018 sold signaling and backup battery systems for metros and railways as well as products for the utilities and oil and gas sectors to companies in Iran, including some having direct or indirect ties with the Iranian government. In 2018, this activity generated gross revenue of approximately €2.5 million and net profit of approximately €0.3 million. Saft ceased this activity in 2018. Saft also attended the Iran Oil Show in 2018, where it discussed business opportunities with Iranian customers, including those with direct or indirect ties with the Iranian government. Saft ceased this activity in 2018.

Total Eren, a company in which Total Eren Holding holds an interest of 68.76% (TOTAL S.A. owns 33.86% of Total Eren Holding), had preliminary discussions during January to March 2018 for possible investments in renewable energy projects in Iran, including meetings with ministries of the Iranian government. These discussions and meetings ceased as of March 2018 and neither revenues nor profits were recognized from this activity in 2018.

Refining & Chemicals

As of May 2018, Hutchinson SA and its affiliates no longer accepted orders from Iranian companies and ceased all activities, in general, with Iran and all Iranian companies prior to August 6, 2018.

Le Joint Français, a wholly-owned affiliate of Hutchinson SA, sold vehicular O-ring seals in 2018 to Iran Khodro, a company in which the government of Iran holds a 20% interest and which is supervised by Iran's Industrial Management Organization. This activity generated gross revenue of approximately €54,056 and net profit of approximately €8,108.

Paulstra S.N.C., a wholly-owned affiliate of Hutchinson SA, obtained in 2017 an order from Iran Khodro to sell vehicular anti-vibration systems over a 5-year period. This activity did not generate any gross revenue or net profit in 2018 because Paulstra did not delivery any product to Iran Khodro. The order was terminated in 2018. Paulstra S.N.C. also sold oil seals in 2018 to Iran Khodro. This activity generated gross revenue of approximately €1,078,887 and net profit of approximately €161,833.

Catelsa Caceres, a wholly-owned affiliate of Hutchinson Iberia, itself wholly-owned by Hutchinson SA, sold sealing products to Iran Khodro in 2018. This activity generated gross revenue of approximately €1,449 and net profit of approximately €217.

Hutchinson GMBH, a wholly-owned affiliate of Hutchinson SA, sold hoses for automotive vehicles to Iran Khodro in 2018. This activity generated gross revenue for approximately €257,400 and net profit of approximately €38,610. The last shipments from Hutchinson and its affiliates to Iran Khodro were in August 2018 and last payments were made in October 2018.

Hanwha Total Petrochemicals ("HTC"), a joint venture in which Total Holdings UK Limited (a wholly-owned affiliate) holds a 50% interest and Hanwha General Chemicals holds a 50% interest, purchased approximately 17 Mb of condensates from NIOC for approximately KRW 1,310 billion (approximately $1.2 billion) from January to July 2018, then HTC stopped purchasing from NIOC. These condensates are used as raw material for certain of HTC's steam crackers. HTC also chartered fifteen tankers of condensates with National Iranian Tanker Company (NITC), a subsidiary of NIOC, for approximately KRW 24 billion (approximately $22.3 million). In November 2018, South Korea was granted a significant reduction exemption waiver (the "SRE waiver") allowing it to import Iranian condensate from NIOC for six months. For 2019, based on the SRE waiver, HTC is reviewing the feasibility to resume purchases from NIOC.

Total Research & Technology Feluy ("TRTF", a wholly-owned affiliate), Total Marketing & Services ("TMS", a wholly-owned affiliate), and Total Raffinage Chimie ("TRC") paid in 2018 fees totaling approximately €1,000 to Iranian authorities related to various patents. Similar payments are expected to be made by TRTF and TRC in 2019. TMS abandoned its patent rights in Iran in 2018, thus no payments are expected by TMS in 2019.

Marketing & Services

Until December 2012, at which time it sold its entire interest, the Group held a 50% interest in the lubricants retail company Beh Tam (formerly Beh Total) along with Behran Oil (50%), a company controlled by entities with ties to the government of Iran. As part of the sale of the Group's interest in Beh Tam, TOTAL S.A. agreed to license the trademark "Total" to Beh Tam for an initial 3-year period (renewed for an additional 3 year period) for the sale by Beh Tam of lubricants to domestic consumers in Iran. Royalty payments for 2014 were received by TOTAL S.A. during the first semester of 2018 in the amount of approximately €730,000. There remain outstanding royalty payments for 2015 through 2017 in favor of TOTAL S.A. This licensing agreement was terminated in 2018. In addition, representatives of Total Oil Asia-Pacific Pte Ltd, a wholly-owned affiliate, visited Behran Oil beginning 2018 regarding the potential purchase of 50% of the share capital of Beh Tam. Discussions on this matter ended following the announcement of the re-imposition of U.S. secondary sanctions on the oil industry.

(1) Section 560.509 of the U.S. Iranian Transactions and Sanctions Regulations provides an authorization for certain transactions in connection with patent, trademark, copyright or other intellectual property protection in the United States or Iran, including payments for such services and payments to persons in Iran directly connected to intellectual property rights, and TOTAL believes that the activities related to the industrial property rights described in this point 3.1.9.2 are consistent with that authorization.

Total Marketing Middle East FZE, a wholly-owned affiliate, sold lubricants to Beh Tam in 2018. The sale in 2018 of approximately 43 t of lubricants and special fluids generated gross revenue of approximately AED 500,000 (approximately $136,000) and net profit of approximately AED 260,000 (approximately $71,000)[1]. The company stopped all transactions with this customer as of August 2018.

Total Marketing France ("TMF"), a company wholly-owned by TMS, provided in 2018 fuel payment cards to the Iranian embassy and delegation to UNESCO in France for use in the Group's service stations. In 2018, these activities generated gross revenue of approximately €32,000 and net profit of approximately €5,000. The company expects to continue this activity in 2019.

TMF also sold jet fuel in 2018 to Iran Air as part of its airplane refueling activities in France. The sale of approximately 260 cubic meters of jet fuel generated gross revenue of approximately €130,000 and net profit of approximately €570. The company stopped all transactions with this customer prior to November 5, 2018.

Total Belgium, a wholly-owned affiliate, provided in 2018 fuel payment cards to the Iranian embassy in Brussels (Belgium) for use in the Group's service stations. In 2018, these activities generated gross revenue of approximately €11,000 and net profit of approximately €4,000. The company expects to continue this activity in 2019.

B) Syria

Since early December 2011, TOTAL has ceased its activities that contribute to oil and gas production in Syria and maintains a local office solely for non-operational functions. In late 2014, the Group initiated a downsizing of its Damascus office and reduced its staff to a few employees. In 2018, TOTAL paid approximately €84,000 to the Syrian government as contributions for social security in relation to the aforementioned personnel.

In addition, the Group paid fees related to various industrial property rights (patents, trademarks and designs) in 2018.

3.2 Legal and arbitration proceedings

There are no governmental, legal or arbitration proceedings, including any proceeding of which the Company is aware that are pending or threatened against the Company, that could have, or could have had during the last 12 months, a material impact on the Group's financial situation or profitability.

Described below are the main administrative, legal and arbitration proceedings in which the Company and the other entities of the Group are involved.

Alitalia

In the Marketing & Services segment, a civil proceeding was initiated in Italy, in 2013, against TOTAL S.A. and its subsidiary Total Aviazione Italia Srl before the competent Italian civil court. The plaintiff claims against TOTAL S.A., its subsidiary and other third parties, damages that it estimates to be nearly €908 million. This proceeding follows practices that had been condemned by the Italian competition authority in 2006. The parties have exchanged preliminary findings and a request for an expert opinion has been approved by the court. The existence and the assessment of the alleged damages in this procedure involving multiple defendants remain contested.

FERC

The Office of Enforcement of the U.S. Federal Energy Regulatory Commission (FERC) began in 2015 an investigation in connection with the natural gas trading activities in the United States of Total Gas & Power North America, Inc. (TGPNA), a U.S. subsidiary of the Group. The investigation covered transactions made by TGPNA between June 2009 and June 2012 on the natural gas market. TGPNA received a Notice of Alleged Violations from FERC on September 21, 2015. On April 28, 2016, FERC issued an order to show cause to TGPNA and two of its former employees, and to TOTAL S.A. and Total Gas & Power Ltd., regarding the same facts. TGPNA contests the claims brought against it. A class action, launched to seek damages from these three companies, was dismissed by a judgment of the U.S. District court of New York issued on March 15, 2017. The Court of Appeal upheld this judgment on May 4, 2018.

Grande Paroisse

On September 21, 2001, an explosion occurred at the industrial site of Grande Paroisse (a former subsidiary of Atofina which became a subsidiary of Elf Aquitaine Fertilisants on December 31, 2004). The explosion caused the death of 31 people, including 21 workers at the site, injured many others and caused significant damage on the site and to property in the city of Toulouse.

After many years, the investigating magistrate brought charges against Grande Paroisse and the former Plant Manager before the Toulouse Criminal Court. On November 19, 2009, this tribunal acquitted both the former Plant Manager and Grande Paroisse due to the lack of reliable evidence for the explosion. The Court declared Grande Paroisse civilly liable for the damages caused by the explosion to the victims in its capacity as custodian and operator of the plant.

On September 24, 2012, the Court of Appeal of Toulouse convicted Grande Paroisse and the former Plant Manager.

On January 13, 2015, the French Supreme Court (*Cour de cassation*) fully quashed the decision of September 24, 2012. The case was referred back to the Court of Appeal of Paris, which, on October 31, 2017, convicted Grande Paroisse and the former Plant Manager. Both have decided to appeal this decision before the French Supreme Court (*Cour de cassation*).

A compensation mechanism for victims was set up immediately following the explosion. €2.3 billion was paid for the compensation of claims and related expenses amounts. A €10 million reserve remains booked in the Group's Consolidated Financial Statements as of December 31, 2018.

Iran

In 2003, the Securities and Exchange Commission (SEC) followed by the Department of Justice (DoJ) issued a formal order directing an investigation against TOTAL, and other oil companies, for alleged violations of the Foreign Corrupt Practices Act (FCPA) and the Company's accounting obligations in connection with the pursuit of business in Iran in the 1990s.

(1) Converted using the average exchange rate for fiscal year 2018, as published by Bloomberg.

In late May 2013, and after several years of discussions, TOTAL reached settlements with the U.S. authorities (a Deferred Prosecution Agreement with the DoJ and a Cease and Desist Order with the SEC). These settlements, which put an end to these investigations, were concluded without admission of guilt and in exchange for TOTAL respecting a number of obligations, including the payment of a fine and civil compensation for an aggregate amount of $398.2 million. By virtue of these settlements, TOTAL also accepted the appointment of an independent compliance monitor to review the Group's compliance program and to recommend possible improvements.

In July 2016, the monitor submitted his third and final report, in which he certified that TOTAL had devised and implemented an appropriate compliance program. As a result of this certification, the U.S. authorities, after having reviewed the monitor's report, concluded that TOTAL had fulfilled all of its obligations, thus bringing an end to the monitoring process. As a result, a Court in the State of Virginia granted a motion to dismiss on November 9, 2016, thereby terminating the procedure directed at the Company, which can no longer be pursued in the United States for these same facts.

With respect to the same facts, TOTAL was placed under formal investigation in France in 2012. In October 2014, the investigating magistrate decided to refer the case to trial. Pursuant to a judgment issued on December 21, 2018, the Paris Criminal Court convicted TOTAL of corruption of foreign official and ordered the Company to pay a €500,000 fine. Given the specific circumstances of this case, which has been already judged in the U.S. and in which none of the individuals can defend themselves, TOTAL did not want to pursue the case. This decision is thus definitive.

Italy

As part of an investigation led by the Public Prosecutor of the Potenza Court in 2007, Total Italia and also certain Group employees were the subjects of an investigation related to alleged irregularities in connection with the purchase of lands and the award of calls for tenders in relation to the preparation and development of an oil field located in the south of Italy.

Pursuant to a judgment issued on April 4, 2016, the Potenza Criminal Court found four employees to be guilty of corruption, with two of these employees also being found guilty of misappropriation in connection with the purchase of land. The procedure with respect to Total Italia was sent back to the public prosecutor due to the imprecision of the terms of prosecution. The four employees decided to challenge the judgment before the Court of Appeal.

Pursuant to a definitive judgment issued on February 20, 2018 the Court of Appeal of Potenza recorded the termination of the proceedings directed towards the four employees prosecuted for corruption because of the expiration of the statute of limitation.

Pursuant to a judgment issued on July 17, 2018, the Court of Appeal of Potenza acquitted two of the Group's employees prosecuted for misappropriation. The public prosecutor and a civil party (plaintiff) have decided to appeal this decision.

3.3 Internal control and risk management procedures

The following information was prepared with the support of several functional divisions of the Company, and in particular the Audit & Internal Control, Legal and Finance Divisions. It was examined by the Audit Committee, then approved by the Board of Directors.

3.3.1 Fundamental elements of the internal control and risk management systems

The Group is structured around its business segments, to which the Group's operational entities report. The business segments' management are responsible, within their area of responsibility, for ensuring that operations are carried out in accordance with the strategic objectives defined by the Board of Directors and General Management. The functional divisions at the Holding level help General Management define norms and standards, oversee their application and monitor activities. They also lend their expertise to the operational divisions.

The Group's internal control and risk management systems are structured around a three-level organization – Holding level, business segments, operational entities – where each level is directly involved and accountable in line with the level of delegation determined by General Management.

General Management constantly strives to maintain an efficient internal control system, based on the framework of the Committee of Sponsoring Organizations of the Treadway Commission (COSO). In this framework, internal control is a process intended to provide reasonable assurance that the objectives related to operations, reporting and compliance with applicable laws and regulations are achieved. As for any internal control system, it cannot provide an absolute guarantee that all risks are completely controlled or eliminated.

The COSO framework is considered equivalent to the reference framework of the French Financial Markets Authority (*Autorité des marchés financiers*). The Group has also chosen to rely on this framework as part of its obligations under the Sarbanes-Oxley Act. The Group's internal control and risk management systems are therefore based on the five components of this framework: control environment, risk assessment, control activities, monitoring, and information and communication.

The Group's risk management system draws on the main international standards (COSO Enterprise Risk Management integrated framework, ISO 31000: 2018 – Risk management) as well as on French standards (Reference framework of the French Financial Markets Authority). The internal Risk Management, Internal Control and Audit Charter forms the common framework on which the Group relies to ensure control of its activities.

The Group's internal control and risk management systems cover the processes of the fully consolidated entities. Regarding acquisitions, the Group's control environment is implemented in the acquired entities after a critical analysis of their own systems.

The principles of control fit into the framework of the rules of corporate governance. In particular, these rules task the Board of Directors' Audit Committee with monitoring the efficiency of the internal control and risk management systems, and of the internal audit performed to assess the risk management systems at all levels of the organization and make recommendations for their improvement. The Audit Committee also monitors the process of producing accounting and financial information, in order to guarantee its integrity.

Approximately 400 employees monitor the internal control systems within the Group. The assessment of the internal control and risk management system is mainly overseen by the Audit & Internal Control Division.

3.3.2 Control environment

Integrity and ethics – Framework

TOTAL's control environment is based primarily on its Code of Conduct, which spells out the Group's values, two of which are core values: Safety and Respect for Each Other, the latter being reflected in the areas of integrity (fraud and corruption), respect for human rights as well as environment and health. The principles of the Code of Conduct are set forth in a number of guides, such as the Business Integrity Guide and the Human Rights Guide. These documents are distributed to employees and are available on the intranet. They also set out the rules of individual behavior expected of all employees in the countries where the Group is present. Similarly, a Financial Code of Ethics sets forth the obligations applicable to the Chairman and Chief Executive Officer, the Chief Financial Officer, the Vice President of the Corporate Accounting Division and the financial and accounting officers of the principal Group activities.

As a priority of General Management, the Group deploys an integrity policy and compliance programs, in particular for the prevention of corruption, fraud and competition law infringement. These programs include reporting and control actions (review and audit missions). Ethical assessments are also conducted (refer to point 5.7 of chapter 5). In these areas, the Group relies on the Compliance network, the Ethics officers' network and the Ethics Committee, the role of which is to listen and provide assistance.

TOTAL has a framework of Group standards that is completed by a series of practical recommendations and feedback. Like the Group's organization, this framework has a three-level structure: a Group level, frameworks for each business segment, and a specific framework for each significant operational entity.

Governance, authorities and responsibilities

The Board of Directors, with the support of its Committees, ensures that the internal control functions are operating properly. The Audit Committee ensures that General Management implements internal control and risk management procedures based on the risks identified, such that the Group's objectives are achieved.

General Management ensures that the organizational structure and reporting lines plan, execute, control and periodically assess the Group's activities. It regularly reviews the relevance of the organizational structures so as to be able to adapt them quickly to changes in the activities and in the environment in which they are carried out.

The business segments and operational entities' General management are responsible for the internal control and risk management system within their scope of responsibility.

The Group has also defined central responsibilities that cover the three lines of internal control: (1) operational management, which is responsible for implementing internal control, (2) support functions (such as Finance, Legal, Human Resources, etc.), which prescribe the internal control systems, verify their implementation and effectiveness and assist operational employees, and (3) internal auditors who, through their internal control reports, provide recommendations to improve the effectiveness of the system.

An accountability system is defined and formalized at all levels of the organization, through organization notes, organization charts, appointment notes, job descriptions and delegations of powers. Each business segment has established, in accordance with the Group's instructions, clear rules applicable to its own scope.

The Group's Audit & Internal Control Division pursues a continual process aimed at strengthening the assessment of the role and involvement of all employees in terms of internal control. Training initiatives tailored to the various stakeholders involved in the internal control process are regularly launched within the Group.

Control activities and assessment

Any activity, process or management system may be the subject of an internal audit conducted by Group Audit, in accordance with the international internal audit framework of internal audits and its Code of Conduct. The Group's Audit & Internal Control Division also conducts joint audits with third parties and provides assistance (advice, analysis, input regarding methodology). The audit plan, which is based on an analysis of the risks and risk management systems, is submitted annually to the Executive Committee and the Audit Committee. The Group's Audit & Internal Control Division employs 75 people and conducted about 150 internal audit missions in 2018.

The Group regularly examines and assesses the design and effectiveness of the key operational, financial and information technology controls related to internal control over financial reporting, in compliance with the Sarbanes-Oxley Act. In 2018, this assessment was performed with the assistance of the Group's main entities and Audit & Internal Control Division. The system covers:

— the most significant entities, which assess the key operational controls of their significant processes and respond to a Group questionnaire for assessing the internal control framework; and

— other less significant entities, which respond only to the Group questionnaire for assessing the internal control system.

These two categories of entities, which include the central functions of the business segments and the corporate, account for approximately 80% and 10%, respectively, of the financial aggregates in the Group's Consolidated Financial Statements.

Direct Énergie, Quadran and Global LNG, entities acquired in 2018, are excluded from the scope of the assessment and conclusion on the effectiveness of internal control over financial reporting. These three entities represented respectively 1.34%, 0.50% and 2.15% of the Group's consolidated balance sheet as of December 31, 2018 and 0.34%, 0.04% and 0.07% of the Group's 2018 consolidated sales.

The statutory auditors also review the internal controls that they deem necessary as part of their certification of the financial statements. Pursuant to American regulations, they reviewed in 2018 the implementation of the Group's internal control framework and the design and effectiveness of key internal controls in its main entities regarding financial reporting. Based on their review, the statutory auditors stated that they had no remarks on the information presented on internal control and risk management procedures.

The reports on the work performed by the Group Audit and statutory auditors are periodically summarized and presented to the Audit Committee and, thereby, to the Board of Directors. The Senior Vice President, Audit & Internal Control attended all Audit Committee meetings held in 2018. The Audit Committee also meets with the statutory auditors at least once a year without any Company representatives present.

If areas of improvement are identified by these internal audits and operational controls, then corrective action plans are drawn up and shared with operational management, who, along with the Group's Audit & Internal Control Division, monitor their implementation closely.

Based on the internal reviews, General Management has reasonable assurance of the effectiveness of the Group's internal control.

3.3.3 Risk assessment and management

3.3.3.1 General principles

To implement its strategy, General Management ensures that clear and precise objectives are defined at the various levels of the organization with regard to operations, reporting and compliance.

Operational objectives focus on the definition and efficient use of human, financial and technical resources. In particular, they are defined during the budgetary processes and in the long-term plan, and are regularly monitored as part of the self-assessment process.

The monitoring of operational objectives (financial and non-financial) helps in decision-making and monitoring the performance of activities at each level of the organization.

The Group implements a risk-management system that is an essential factor in the deployment of its strategy, based on responsible risk-taking.

This system relies on a continuous process of identifying and analyzing risks in order to determine those that could prevent the achievment of TOTAL's goals.

The Executive Committee, with the assistance of the Group Risk Management Committee (GRMC), is responsible for identifying and analyzing internal and external risks that could impact the achievement of the Group's objectives. The main responsibilities of the GRMC include ensuring that the Group has a map of the risks to which it is exposed and that suitable risk management systems are in place. The GRMC's work focuses on continuously improving risk awareness and the risk management systems.

Risk mapping, which has been carried out since the 2000s, is a dynamic process that has taken shape over the years. The Group's risk map feeds the audit plan, which is based on an analysis of the risks and the risk management systems, and the work of the GRMC.

The GRMC relies on the work carried out by the business segments and functional divisions, which concurrently establish their own risk mapping. The business segments are responsible for defining and implementing a risk management policy suited to their specific activities. However, the handling of certain transverse risks is more closely coordinated by the respective functional divisions.

Regarding commitments, General Management exercises operational control over TOTAL's activities through the Executive Committee's approval of investments and expenses that exceed defined thresholds. The Risk Committee (CORISK) is tasked with reviewing these projects in advance, and in particular, with verifying the analysis of the various associated risks.

3.3.3.2 Implementation of the organizational framework

The Group Risk Management Committee (GRMC)

The GRMC is chaired by a member of the Executive Committee, the Group's Chief Financial Officer, and includes the Senior Vice Presidents of the corporate functions, together with the chief administrative officers or chief financial officers of the business segments. The Group's Chief Financial Officer attends all meetings of the Board of Directors' Audit Committee, thus strengthening the link between the GRMC and the Audit Committee.

The GRMC meets six times a year. At each meeting, the participants share any potential risks they have identified and presentations are given on one or more risk-related topics, during which the members of the GRMC are invited to cast a critical eye over the subject, question the work done and, if applicable, provide additional information or clarification in order to enhance the understanding of the risk and improve the risk management systems. The GRMC can request that actions be taken.

The work of the GRMC is led by the Audit & Internal Control Division, which assists contributors in preparing the presentations and acts as the committee's secretary. In this capacity, the Audit & Internal Control Division reports regularly on the work of the GRMC to the Executive Committee, and once a year to the Audit Committee in the presence of the Group's Chief Financial Officer who chairs the GRMC.

The Risk Committee (CORISK)

The Risk Committee is chaired by a member of the Executive Committee (Senior Vice President of Strategy & Innovation or Chief Financial Officer). It is made up of representatives from the corporate Strategy & Climate, Finance, Legal, Insurance and HSE divisions.

The Risk Committee meets on the same schedule as the Executive Committee. Any project submitted to the Executive Committee (and therefore giving rise to a financial commitment that exceeds certain thresholds) is first presented to the Risk Committee by the relevant operational division.

Following the review by the Risk Committee of the risks associated with the project submitted, the Strategy & Climate Division sends the Executive Committee a memorandum stating its opinion in light of the Risk Committee's comments.

The Audit & Internal Control Division

The Risk Team of the Audit & Internal Control Division is responsible for producing and continuously updating the Group's risk map. To this end, it uses all of the risk-mapping work carried out across the Group, in the business segments and in the functional divisions, the results of all audits and internal control activities, the action plans resulting from this work and the monitoring of their implementation, structured feedback, benchmarks and other external information sources, regular interviews with the Group's executive officers, and all information gathered during GRMC meetings and the preparation for these meetings.

The Audit & Internal Control Division reports regularly on its work related to the Group's risk map to the Executive Committee, which are presented annually to the Audit Committee.

3.3.3.3 Systems in place

Risk management systems are implemented in the operational and financial fields as well as in information systems and protection of intellectual assets. Specific systems are deployed to prevent risks related to ethics and non-compliance. The main risk management systems covering health, safety, industrial security, the environment and the prevention of corruption are presented in the statement of non-financial performance (chapter 5).

Financial risks

The management and conditions of use of financial instruments are governed by strict rules that are defined by the Group's General Management, and which provide for centralization by the Treasury Division of liquidity, interest and exchange rate positions, management of financial instruments and access to capital markets. The Group's financing policy consists of incurring long-term debt at a floating rate or at a fixed rate, depending on the Group's general corporate needs, and interest rates. Debt is incurred mainly in dollars or euros.

The Group's cash balances, which mainly consist of dollars and euros, are managed to maintain liquidity based on daily interest rates in the given currency. Maximum amounts are set for transactions exceeding one month, with placements not to exceed 12 months. TOTAL S.A. also has committed credit facilities granted by international banks. These credit facilities, along with the Group's net cash position, allow it to continually maintain a high level of liquidity in accordance with targets set by General Management.

In terms of counterparty risk in financial transactions, the Group adheres to a cautious policy, and only makes commitments with institutions featuring a high degree of financial soundness, as based on a multi-criteria analysis. An overall credit limit is set for each authorized financial counterparty and allocated among the subsidiaries and the Group's central treasury entities according to their needs. In addition, to reduce market value risk on its commitments, the Treasury Division has entered into margin call contracts with its counterparties. In addition, since December 21, 2018, pursuant to Regulation (EU) No. 648/2012 on OTC derivatives, central counterparties and trade repositories (EMIR), some of the interest rate swaps entered into by the Group are now being centrally cleared.

The Group seeks to minimize its currency exposure, on the one hand, by financing its long-term assets in the functional currency of the entity to which they belong and, on the other hand, by systematically hedging the currency exposure generated by commercial activity. These risks are managed centrally by the Treasury Division, which operates within a set of limits defined by General Management.

The policy for managing risks related to financing and cash management activities, as well as the Group's currency exposure and interest rate risks, are described in detail in Note 15 to the Consolidated Financial Statements (point 8.7 of chapter 8).

Risks related to information systems

In order to maintain information systems that are appropriate to the organization's needs and limit the risks associated with information systems and their data, TOTAL's IT Division has developed and distributed governance and security rules that describe the recommended infrastructure, organization and procedures. These rules are implemented across the Group under the responsibility of the various business segments. To address cyber threats, the Group conducts specific risk analyses permitting to define and put in place appropriate security controls concerning information systems.

The Group has also developed control activities at various levels of the organization relating to areas where information systems cover all or part of the processes. Information Technology General Controls aim to guarantee that information systems function and are available as required, and that data integrity and confidentiality are also ensured and changes controlled.

Information Technology Automated Controls aim to ensure the integrity and confidentiality of data generated or supported by business applications, particularly those that impact financial flows.

The outsourcing of some components of the Group's IT infrastructure to service providers poses specific risks and requires the selection and development of additional controls of the completeness, accuracy and validity of the information supplied and received from such service providers. Accordingly, to ensure continuous improvement, the Group assesses whether suitable controls are implemented by the service providers concerned and identifies the controls necessary within its own organization to maintain these risks at an acceptable level.

Furthermore, faced with rising legal and security-related risks, the Group deploys policies to retain documents and to protect personal data and the security of its information assets. The Group has also employed an Operational Security Center to detect and analyze IT system security events.

Ethical misconduct and non-compliance risks

Fraud prevention

The Group deploys an anti-fraud and fraud-prevention program and has implemented a range of procedures and programs that help to prevent and detect different types of fraud. This effort is supported by the business principles and values of individual behavior described in the Group's Code of Conduct and other standards applied by the Group's business segments.

The Group has issued a directive for handling incidents of fraud that has been widely distributed to employees, and has created an alert system that employees can use to report acts including those that may constitute fraud.

An anti-fraud compliance program has been deployed since 2015, including e-learning modules for all Group employees, a Guide to the "Prevention and the fight against fraud", a map of the risks of fraud in the Group, a guide to the types of risk of fraud that includes descriptions of the main risks and was published in 2016, and campaigns to raise awareness of the major risks of fraud, launched at the end of 2016 and 2018. This program is deployed by the network of fraud risk coordinators in the business segments and operational entities. The role of coordinator is usually performed by the Compliance Officer. Fraud risk analyses are also carried out in the subsidiaries.

For information on prevention of corruption, refer to point 5.8.1 of chapter 5.

Prevention of competition law infringement

A Group policy aimed at ensuring compliance with, and preventing infringement of, competition law has been in place since 2014 and is a follow-up to the various measures previously implemented by the business segments. Its deployment is based, in particular, on management and staff involvement, training courses that include an e-learning module, and an appropriate organization.

Prevention of conflicts of interest and market abuse

To prevent conflicts of interest, each of the Group's senior executives completes an annual statement declaring any conflicts of interest to which they may be subject. By completing this declaration, each senior executive also agrees to report to their supervisor any conflict of interest that he or she has had, or of which he or she is aware in performing his or her duties. An internal rule named "Conflicts of Interests" reminds all employees of their obligation to report to their supervisor any situation that might give rise to a conflict of interests.

The Group implements a policy to prevent market abuse linked to trading on the financial markets that is based, in particular, on internal ethics rules that are updated on a regular basis and distributed. In addition, the Group's senior executives and certain employees, in light of their positions, are asked to refrain from carrying out any transactions, including hedging transactions, on TOTAL shares or ADRs and in collective investment plans (FCPE) invested primarily in TOTAL shares (as well as derivatives related to such shares) on the day on which the Company discloses its periodic results publications (quarterly, interim and annual), as well as during the 30 calendar-day period preceding such date. An annual campaign specifies the applicable blackout periods.

Prevention of risks of non-compliance with international economic sanctions regimes

The Group's activities in relation to sanctioned countries (refer to point 3.1.9 of this chapter) are subject to an analysis of compliance with the various applicable economic sanctions regimes. With respect to Iran and until the withdrawal of the Group's business operations from this country on October 29, 2018, a specific compliance program was put in place. In-depth investigations, carried out by specialized service providers, were conducted on the Group's stakeholders in Iran, in order to identify possible links with companies or persons listed under international sanctions (Specially Designated

Nationals and Blocked Persons Lists, List of Frozen Assets of the EU and the UN, etc.). U.S. persons[1] were also excluded from any transactions related to Iran. An Iran compliance coordinator, appointed in 2016, liaised with the compliance teams of the relevant business segments and the Holding in order to ensure compliance of the Group's activities with applicable laws and regulations.

Risks related to the protection of intellectual assets

To mitigate the risks of third parties infringing its intellectual property and the leak of know-how, TOTAL protects its rights under research partnership agreements negotiated by the Group's intellectual property specialists, the terms and conditions of which are consistent with the Group's industrial and commercial strategy. The Group has a policy of filing and maintaining patents, it monitors technological developments in terms of freedom of use, and it takes, when necessary, all appropriate measures to ensure the protection of its rights.

In addition, since some of its employees have access to confidential documents while performing their duties, TOTAL has adopted internal rules concerning the management of confidential information. The Group's intellectual property specialists also carry out awareness-raising activities with Group employees, so that they are better informed about restrictions that may apply to the use of information and data.

3.3.4 Main characteristics of the internal control and risk management procedures relating to the preparation and processing of accounting and financial information

Accounting and financial internal control covers the processes that produce accounting and financial data, and mainly the financial statements processes and the processes to produce and publish accounting and financial information. The internal control system aims to:

- conserve the Group's assets;
- comply with accounting regulations, and properly apply standards and methods to the production of financial information; and
- guarantee the reliability of accounting and financial information by controlling the production of accounting and financial information and its consistency with the information used to produce the control panels at every appropriate level of the organization.

At Group level, the Finance Division, which includes the Accounting Division, the Budget & Financial Control Division and the Tax Division, is responsible for the production and processing of accounting and financial information. The scope of the internal control procedures relating to the production and processing of financial and accounting information includes the parent company (TOTAL S.A.), and all fully consolidated entities or entities whose assets are under joint control.

Refer to point 4.1.2.3 of chapter 4 for a description of the role and the missions of the Audit Committee. These missions are defined by Directive 2014/56/EU and regulation (EU) n° 537/2014 pertaining to the legal control of accounts.

3.3.4.1 Production of accounting and financial information

Organization of the Financial and Information Systems function

Dedicated teams implement the accounting and financial processes in the areas of consolidation, tax, budget and management control, financing, cash positions and information systems. The entities, business segments and General Management are respectively responsible for accounting activities.

The Accounting Division, which is part of the Finance Division, is responsible for drawing up the Consolidated Financial Statements and manages the Group's network of accounting teams.

The tax function, made up of a network of tax experts in the Holding, the business segments and the entities, monitors changes in local and international rules. It oversees the implementation of the Group's tax policy.

Management control contributes to the reinforcement of the internal control system at every level of the organization. The network of management controllers in the entities and the business segments is supervised by the Budget & Financial Control Division. This department also produces the monthly control panel, the budget and the long-term plan for the Group.

The Treasury Division implements the financial policy, and in particular the processing and centralization of cash flows, the debt and liquidity investment policy and the coverage of currency exposure and interest rate risks.

The Information Systems Division makes decisions on the choice of software suited to the Group's accounting and financial requirements. These information systems are subject to works to reinforce the task separation system and to improve the control of access rights. Tools are available to make sure that access rights comply with the Group's rules in this area.

Consolidated Financial Statements process

The Accounting Division, which reports to the Finance Division, prepares the Group's quarterly Consolidated Financial Statements according to IFRS standards, on the basis of the consolidated reporting packages prepared by the entities concerned. The Consolidated Financial Statements are examined by the Audit Committee, then approved by the Board of Directors.

The main factors in the preparation of the Consolidated Financial Statements are as follows:

- the processes feeding the individual accounts used to prepare the reporting packages for consolidation purposes are subject to validation, authorization and booking rules;
- the consistency and reliability of the accounting and control data are validated for each consolidated entity and at each appropriate level of the organization;
- a consolidation tool, supervised by the Accounting Division, is used by each consolidated entity and the Group. It guarantees the consistency and reliability of the data at each appropriate level of the organization;
- a consolidation reporting package from each entity concerned is sent directly to the Accounting Division. It is used to optimize the transmission and the completeness of the information;
- a corpus of accounting rules and methods is formally defined. Its application is compulsory for all the consolidated entities in order to provide uniform and reliable financial information. This framework is built according to IFRS accounting standards. The Accounting Division centrally distributes this framework through regular and formal communication with the business segment managers, formal procedures and a Financial Reporting Manual that is regularly updated. In particular, it specifies the procedures

(1) "U.S. person" means any U.S. citizen and permanent resident alien wherever he/she is in the world, entity organized under the laws of the United States or any jurisdiction within the United States, including foreign branches, or any person or entity located in the United States.

for the booking, identification and valuation of off-balance sheet commitments;

- new accounting standards under preparation and changes to the existing framework are monitored in order to assess and anticipate their impacts on the Consolidated Financial Statements;
- an accounts plan used by all the consolidated entities is formally set forth in the Financial Reporting Manual, specifying the content of each account and the procedures for the preparation of the reporting packages for consolidation purposes;
- the account closing process is supervised and is based mainly on the formalization of economic assumptions, judgments and estimates, treatment of complex accounting transactions and compliance with established timetables announced through Group instructions disclosed to each entity;
- in particular, the process applicable to the preparation of the accounts of the acquired entities are reviewed and, where appropriate, amended to integrate them into those applicable to the preparation of the Consolidated Financial Statements. Furthermore, the booking in the accounts of the purchase price allocation of each of these entities is based on assumptions, estimates and judgments in line with the Group's business model;
- off-balance sheet commitments, which are valued according to the Financial Reporting Manual are reported on a quarterly basis to the Audit Committee.

Processing of accounting and financial information

Internal control of accounting information is mainly focused around the following areas:

- a monthly financial report is formalized by Group and business segment control panels. This report and the Consolidated Financial Statements use the same framework and standards. In addition, the quarterly closing schedule is the same for preparing the Consolidated Financial Statements and financial reporting;
- a detailed analysis of differences as part of the quarterly reconciliation between the Consolidated Financial Statements and financial reporting is supervised by the Accounting and Budget & Financial Control Divisions, which are part of the Finance Division;
- a detailed analysis of differences between actual amounts and the yearly budget established on a monthly basis is conducted at each level of the organization. The various monthly indicators are used to continually and uniformly monitor the performances of each of the entities, business segments and of the Group, and to make sure that they are in keeping with the objectives;
- an annual reconciliation between the parent company financial statements and the financial statements based on IFRS standards is performed by entity;
- periodic controls are designed to ensure the reliability of accounting information and mainly concern the processes for preparing aggregated financial items;
- a regular process for the signature of representation letters is deployed at each level of the organization;
- an annual control system of the accounts of equity affiliates based on a questionnaire completed by each entity concerned. This system is integrated into the Group's internal control framework; and
- the Disclosure Committee (CCIP) ensures the respect of the procedures in place.

Other significant financial information is produced according to strict internal control procedures.

Proved oil and gas reserves are evaluated annually by the relevant entities. They are reviewed by the Reserves Committees, approved by Exploration & Production's general management and then validated by the Group's General Management. They are also presented to the Audit Committee each year.

The internal control process related to estimating reserves is formalized in a special procedure described in detail in point 2.1.3 of chapter 2. The reserves evaluation and the related internal control processes are audited periodically.

The strategic outlook published by the Group is prepared, in particular, according to the long-term plans drawn up at the business segment and Group levels, and on the work carried out at each relevant level of the organization. The Board of Directors reviews the strategic outlook each year.

3.3.4.2 Publication of accounting and financial information

Significant information about the Group is published externally according to formal internal procedures. These procedures aim to guarantee the quality and fair presentation of the information intended for the financial markets, and its timely publication.

The Disclosure Committee (CCIP), chaired by the Chief Financial Officer, ensures, in particular, the respect of these procedures. It meets before TOTAL's financial results press releases, strategic presentations and annual reports are submitted to the Audit Committee and the Board of Directors.

A calendar of the publication of financial information is published and made available to investors on the Group's web site (refer to point 6.6 of chapter 6). With the help of the Legal Division, Investor Relations ensures that all publications are made on time and in accordance with the principle of equal access to information between shareholders.

Assessment of the system for the internal control of accounting and financial information

The Group's General Management is responsible for implementing and assessing the internal control system for financial and accounting disclosure. In this context, the implementation of the Group's internal control framework, based on the various components of the COSO framework, is assessed internally at regular intervals within the Group's main entities.

Pursuant to the requirements introduced by Section 302 of the Sarbanes-Oxley Act, the Chairman and Chief Executive Officer and the Chief Financial Officer of the Company have conducted, with the assistance of members of certain divisions of the Group (in particular Legal, Audit & Internal Control and Corporate Communications), an evaluation of the effectiveness of the internal disclosure controls and procedures, over the period covered by the annual report on Form 20-F. For fiscal year 2018, the Chairman and Chief Executive Officer and the Chief Financial Officer concluded that the disclosure controls and procedures were effective.

In addition, a specific process is in place for reporting any information related to the Group's accounting procedures, internal control and auditing. This process is available to any shareholder, employee or third party.

Finally, the Consolidated Financial Statements undergo a limited examination by external auditors during quarterly closing, and an audit during annual closing. Almost all the audit missions in the countries are fulfilled by the members of the networks of the two statutory auditors, who, after having jointly examined all the accounts and the procedures used to produce them, proceed with the annual certification of the Group's Consolidated Financial Statements. They are informed in advance of the process for the preparation of the accounts and present a summary of their work to the Group accounting and financial managers and to the Audit Committee during the quarterly reviews and annual closing. The statutory auditors also perform those internal control audits that they deem necessary as part of their mission to certify the Financial Statements.

3.4 Insurance and risk management

3.4.1 Organization

TOTAL has its own reinsurance company, Omnium Reinsurance Company (ORC). ORC is integrated within the Group's insurance management and is used as a centralized global operations tool for covering the Group companies' insurable risks. It allows the Group's worldwide insurance program to be implemented in compliance with the specific requirements of local regulations applicable in the countries where the Group operates.

Some countries may require the purchase of insurance from a local insurance company. If the local insurer agrees to cover the subsidiary of the Group in compliance with its worldwide insurance program, ORC negotiates a retrocession of the covered risks from the local insurer. As a result, ORC enters into reinsurance contracts with the subsidiaries' local insurance companies, which transfer most of the risk to ORC.

At the same time, ORC negotiates a reinsurance program at the Group level with oil industry mutual insurance companies and commercial reinsurance markets. ORC allows the Group to better manage price variations in the insurance market by taking on a greater or lesser amount of risk corresponding to the price trends in the insurance market.

In 2018, the net amount of risk retained by ORC after reinsurance was, on the one hand, a maximum of $100 million per onshore or offshore third-party liability insurance claim and, on the other hand, $125 million per property damage and/or business interruption insurance claim. Accordingly, in the event of any loss giving rise to an aggregate insurance claim, the effect on ORC would be limited to its maximum retention of $225 million per occurrence.

3.4.2 Risk and insurance management policy

In this context, the Group risk and insurance management policy is to work with the relevant internal department of each subsidiary to:

- define scenarios of major disaster risks (estimated maximum loss);
- assess the potential financial impact on the Group should a catastrophic event occur;
- help implement measures to limit the probability that a catastrophic event occurs and the financial consequences if such event should occur; and
- manage the level of financial risk from such events to be either covered internally by the Group or transferred to the insurance market.

3.4.3 Insurance policy

The Group has worldwide property insurance and third-party liability coverage for all its subsidiaries. These programs are contracted with first-class insurers (or reinsurers and oil and gas industry mutual insurance companies through ORC).

The amounts insured depend on the financial risks defined in the disaster scenarios and the coverage terms offered by the market (available capacities and price conditions).

More specifically for:

- third-party liability: because the maximum financial risk cannot be evaluated by a systematic approach, the amounts insured are based on market conditions and oil and gas industry practice. In 2018, the Group's third-party liability insurance for any third-party liability (including potential accidental environmental liabilities) was capped at $900 million (onshore) and $850 million (offshore). In addition, the Group adopts, where appropriate, the necessary means to manage the compensation of victims in the event of an industrial accident for which it is liable; and
- property damage and business interruption: the amounts insured vary by sector and by site and are based on the estimated cost and scenarios of reconstruction under maximum loss situations and on insurance market conditions. The Group subscribed for business interruption coverage in 2018 for its main refining and petrochemical sites.

For example, for the Group's highest risks (its North Sea platforms and main refineries or petrochemical plants), in 2018 the insurance limit for the Group's share of the installations was approximately $2 billion for the Refining & Chemicals segment and approximately $2.25 billion for the Exploration & Production segment.

Deductibles for property damage and third-party liability fluctuate between €0.1 and €10 million depending on the level of risk and liability, and are borne by the relevant subsidiaries. For business interruption, coverage is triggered 60 days after the occurrence giving rise to the interruption. In addition, the main refineries and petrochemical plants bear a combined retention for property damage and business interruption of $75 million per insurance claim.

Other insurance contracts are bought by the Group in addition to property damage and third-party liability coverage, mainly in connection with car fleets, credit insurance and employee benefits. These risks are mostly underwritten by outside insurance companies.

The above-described policy is provided as an example of a situation as of a given date and cannot be considered as representative of future conditions. The Group's insurance policy may be changed at any time depending on market conditions, specific circumstances and General Management's assessment of the risks incurred and the adequacy of their coverage.

TOTAL believes that its insurance coverage is in line with industry practice and sufficient to cover normal risks in its operations. However, the Group is not insured against all potential risks. In the event of a major environmental disaster, for example, TOTAL's liability may exceed the maximum coverage provided by its third-party liability insurance. The loss TOTAL could suffer in the event of such disaster would depend on all the facts and circumstances of the event and would be subject to a whole range of uncertainties, including legal uncertainty as to the scope of liability for consequential damages, which may include economic damage not directly connected to the disaster. The Group cannot guarantee that it will not suffer any uninsured loss, and there can be no guarantee, particularly in the event of a major environmental disaster or industrial accident, that such loss would not have a material adverse effect on the Group.

3.5 Vigilance Plan

3.5.1 Introduction

3.5.1.1 Background and Group commitments

In accordance with Article L. 225-102-4 of the French Commercial Code, the vigilance plan (hereafter referred to as the "Vigilance Plan") aims to set out the reasonable measures of vigilance put in place within the Group in order to identify the risks and prevent severe impacts on human rights and fundamental freedoms, human health and safety and the environment resulting from the activities of the Company and those of the companies it controls as defined in point II of Article L. 233-16 of the French Commercial Code, directly or indirectly, as well as the activities of subcontractors or suppliers with which it has an established commercial relationship, where such activities are linked to this relationship.

TOTAL operates in over 130 countries in a variety of complex economic and socio-cultural contexts and in business areas that are likely to present risks that fall within the scope of the Vigilance Plan.

The One Total company project, which embodies the Group's ambition to become the responsible energy major, is based specifically on Safety and Respect for Each Other, the two core values central to the Group's collective principles. In addition to complying with applicable legislation in each country where the Group operates which most often aims at preventing severe impacts in the scope of Article L. 225-102-4 of the French Commercial Code, TOTAL relies on structured frameworks and stringent risk management systems for the conduct of its operations.

The Vigilance Plan and its implementation are part of a dynamic process aimed at continual improvement of the Group's practices with regard to the issues identified within each of the areas concerned.

3.5.1.2 Method and preparation of the Vigilance Plan

The Vigilance Plan covers the activities (hereafter referred to as the "Activities") of TOTAL S.A. and its fully consolidated subsidiaries as defined in II of Article L. 233-16 of the French Commercial Code (hereafter referred to as the "Subsidiaries"). Certain companies, such as Hutchinson, Saft Groupe and SunPower, have set up risk management and severe impact prevention measures specific to their organizations and activities; those measures related to Article L. 225-102-4 of the French Commercial Code are specified in the Group's Vigilance Plan. In addition, for newly acquired companies, reasonable vigilance measures are intended to be implemented progressively during the integration phase of these companies into the Group systems. They do not therefore fall within the scope of the Vigilance Plan for 2018.

The Vigilance Plan also covers the activities of suppliers of goods and services with which TOTAL S.A. and its Subsidiaries have an established commercial relationship, where such activities are associated with that relationship (hereafter referred to as the "Suppliers"). In accordance with legal provisions, suppliers with which the Group does not have an established commercial relationship do not fall within the scope of the Plan.

The Vigilance Plan sets out the rules and measures which, as part of risk management systems, enable the Group to identify and prevent actual or potential severe impacts related to its Activities and to mitigate their effects thereof, as the case may be. It does not guarantee that the risks identified will not materialize. It reflects the responsible purchasing principles applicable to relationships with Suppliers, but is not aimed at replacing the measures in place at those Suppliers.

Finally, the Vigilance Plan covers the risks set forth under Article L. 225-102-4 of the French Commercial Code.

3.5.1.3 Dialogue with stakeholders

TOTAL sets up dialogue procedures with its stakeholders at every level of its organization.

In accordance with the Group's framework on societal matters, stakeholders are identified, mapped and prioritized according to their levels of expectations and involvement. This mapping is kept up to date. A structured dialogue with the stakeholders is established and maintained, initially at local level but also at the central level.

At the local level, TOTAL has deployed since 2006 its internal Stakeholder Relationship Management (SRM+) methodology. This approach aims to list the main stakeholders of each Subsidiary and site (depots, refineries, etc.), to categorize them, to schedule consultation meetings to better understand their expectations, concerns and opinions. This approach then permits to define action plans to manage the impacts of activities and to take into account local development needs in order to build a long-term trusting relationship. This mechanism is used to explain the Group's Activities to communities and other stakeholders, and to pay particular attention to potentially vulnerable local populations. It has been integrated in almost all the Subsidiaries. The system is supplemented by a network of mediators with local communities, deployed within the Exploration & Production segment to maintain a constructive dialogue with neighboring communities.

At the central level, the relevant departments of the Holding also ensure that dialogue is maintained with the Group's stakeholders. For example, in 2018 upon publication of the Information Document on Human Rights, the Human Rights Department of the Civil Society Engagement Division consulted certain of its stakeholders on the risk map published in the 2017 Vigilance Plan. This consultation led to the conclusion that the mapping could thus be maintained.

Among these numerous stakeholders, TOTAL maintains regular dialogue with the Group's employees and their representatives who have a privileged position and role.

3.5.2 Severe impact risk mapping

The mapping work presented below was carried out using the Group's existing risk management tools. This work was supplemented with regard to Suppliers by a mapping of the risks related to procurement, by category of goods and services, on the basis of questionnaires completed by the managers of each purchasing category.

3.5.2.1 Human rights and fundamental freedoms

The risks of severe impacts on human rights and fundamental freedoms have been identified in accordance with the criteria set out in the UN Guiding Principles Reporting Framework, namely the scale, scope and remediability of the impact.

This identification work was carried out in 2016 in consultation with internal and external stakeholders. The process included in particular workshops with representatives of key functions within the Group and Subsidiaries operating in sensitive contexts or situations particularly exposed to risks related to human rights and fundamental freedoms, and a series of interviews with independent third parties (GoodCorporation, International Alert and Collaborative Learning Project).

As a result, the following risks of severe negative impacts on human rights and fundamental freedoms were identified:

- forced labor, which corresponds to any work or service which people are forced to do against their will, under threat of punishment; as well as child labor, which is prohibited for any person aged under 15, or under 18 for all types of work deemed hazardous in accordance with International Labour Organization standards;
- discrimination, characterized by unfair or unfavorable treatment of people, particularly due to their origin, sex, age, disability, sexual and gender orientation, or membership of a political or religious group, trade union or minority;
- non-compliance with fair and safe working conditions, such as for example the absence of employment contracts, excessive working hours or lack of decent compensation;
- restriction of access to land by neighboring local communities, resulting from the Group having, for some of its projects, temporary or permanent access to the land that might result in the physical and/or economic displacement and relocation of these groups;
- impacts on the right to health of local communities, such as noise and dust emissions and other impacts generated by the Activities that might have consequences for the health of local communities, their means of subsistence and their access to vital services such as drinking water, for example; and
- the risk of disproportionate use of force, when intervention by government security forces or private security companies might be necessary to protect the Group's staff and facilities.

3.5.2.2 Safety, health and environment

The Group defines the risk of a severe impact on safety, health or the environment as the probability of TOTAL's Activities having a direct and significant impact on the health or safety of employees of Group companies, employees of external contractors[1] and third parties, or on sensitive natural environments[2]. This risk can materialize gradually or suddenly.

TOTAL has developed safety, health and environment risk assessment procedures and tools applicable to operate its Activities, such as analyses performed regularly at various levels (Group, activities and/or industrial sites):

- prior to investment decisions in industrial projects of the Group, acquisition and divestment decisions;
- during operations;
- prior to releasing new substances on the market.

These analyses have highlighted the following risks of severe impacts:

- the risks to the safety of people and to the environment resulting from a major industrial accident (on an offshore site, onshore site or during the transport of products). These risks are, for example, an explosion, fire or leakage, resulting in death or injury and/or accidental pollution on a large scale or at an environmentally sensitive site;
- the risks to the safety of people and to the environment related to the physical characteristics of oil and gas fields, particularly during drilling operations, which can cause blow outs, explosions, fires or other damages;
- the risks to the safety of people and to the environment related to the overall life cycle of the products manufactured, and to the substances and raw materials used; and
- the risks associated with transportation, for which the likelihood of an operational accident depends not only on the hazardous nature of the products handled, but also on the volumes, the length of the journey and the sensitivity of the regions through which they are transported (quality of infrastructure, population density, environment).

Climate change is a global risk for the planet and results from various human actions such as energy production and consumption. As an energy producer, TOTAL seeks to reduce its direct greenhouse gas emissions resulting from its operated Activities. In addition, TOTAL implements a strategy to tackle climate change challenges and reports on this in details, notably in its statement of non-financial performance (refer to point 5.6 of chapter 5), in accordance with Article L. 225-102-1 of the French Commercial Code.

3.5.3 Action Principles

The Group has frameworks that set out the Action principles to be followed in order to respect the Group's values and prevent severe impacts on human rights and fundamental freedoms, human health and safety and the environment (the "Action Principles"). When the legal provisions applicable to the Activities provide less protection than the Group's Action Principles, TOTAL strives under all circumstances to give precedence to the latter, while seeking to ensure that it does not infringe any applicable mandatory public policy.

(1) Refer to the definition in point 5.4.1 of chapter 5.
(2) Sensitive natural environments include, in particular, remarkable or highly vulnerable natural areas, such as the Arctic, and/or areas covered by regulatory protection (integral nature reserves, central park areas, biotope orders in France, etc.), as well as areas covered by significant regulatory protection such as Protected Area Categories I to IV as defined by the International Union for Conservation of Nature (IUCN).

3.5.3.1 Code of Conduct

TOTAL's Vigilance Plan is based primarily on the Group's Code of Conduct[1], which specifies the Group's values, including the two core values of Safety and Respect for the Other, particularly declining in the areas of respect for human rights, the environment and the health and safety of persons.

The Code particularly sets forth the Group's compliance with the following international standards:

- the principles of the Universal Declaration of Human Rights;
- the United Nations Guiding Principles on Business & Human Rights;
- the principles set out in the International Labour Organization's fundamental conventions;
- the principles of the United Nations Global Compact;
- the OECD Guidelines for Multinational Enterprises; and
- the Voluntary Principles on Security and Human Rights.

The Code of Conduct, which can be consulted on the Group's website, is aimed at all employees and external stakeholders (host countries, local communities, customers, suppliers, industrial and commercial partners and shareholders). It was updated in December 2018.

3.5.3.2 Safety Health Environment Quality Charter

The Group ensures that it complies with strict safety, security, health and environment standards in the performance of its Activities. The Safety Health Environment Quality Charter sets out the principles that apply to the conduct of its operations in all of the countries where it operates.

As such, the Group's Subsidiaries[2] implement a framework incorporating occupational health and safety, security, societal commitment and environment as well as associated management systems (Management And Expectations Standards Towards Robust Operations, MAESTRO).

With regard to safety at work, the Golden Rules, which were established on the basis of feedback and restructured in 2017 into a set of "dos and don'ts", apply to all Group entities, employees and Suppliers on site. Each individual must ensure that they are adopted, strictly followed and monitored on the ground. Each individual is also authorized to use his or her "Stop Card" and stop any work under way in particular in the case of non-compliance with any of these rules.

3.5.3.3 Fundamental Principles of Purchasing

The relationship between the Group and its Suppliers is based on adherence to the principles set forth in the Code of Conduct and in the Fundamental Principles of Purchasing[3].

The Fundamental Principles of Purchasing specify the commitments that TOTAL expects from its suppliers in the following areas: respect for human rights at work, health protection, safety and security, preservation of the environment, prevention of corruption and conflicts of interest and fraud, respect for competition law, as well as the promotion of economic and social development.

The requirements specified by this document must be communicated to Suppliers and be included in or transposed into agreements. These principles are available for consultation by all suppliers in both French and English on TOTAL's website.

3.5.3.4 Internal control framework

At the Group, business segment and Subsidiary level, internal controls are based on specific procedures for organization, delegation of responsibilities and staff awareness and training, based on the framework of the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

TOTAL has a Group reference framework that is supplemented by a series of practical recommendations and feedback. Like the Group's organization, this framework has a three-level structure: a Group level, with the REFLEX Group framework and the technical framework set out by the Group Technology Committee, frameworks for each business segment, and a specific framework for each significant operational entity.

3.5.4 Organization

The Group's organization is structured around three main levels: Corporate, business segments and operational entities. The Action Principles are driven by the Executive Committee. The People and Social Responsibility Division headed by a member of the Executive Committee coordinates the Group's action in the area of Human Resources, health – safety – environment (HSE), security and societal commitments. Purchases of goods and services are under the authority of an entity in the Total Global Services Branch which also reports to the Executive Committee member responsible for this division. This organization aims to support operational managers in the implementation of the Action Principles. Each level is involved in and accountable for identifying and implementing the reasonable vigilance measures deemed appropriate.

3.5.4.1 Ethics Committee

The Ethics Committee is a central structure representing all of the Group's business segments. All its members are Group employees who collectively have good knowledge of its activities and have demonstrated the independence and impartiality necessary for carrying out their duties.

The Ethics Committee is the guarantor of compliance with the Code of Conduct and ensures its proper implementation. It is assisted in its work by the relevant departments, as well as by a network of local Ethics Officers. The Chairperson of the Ethics Committee reports to the Chairman and Chief Executive Officer of TOTAL. The Chairperson submits an annual report to the Executive Committee and the Governance and Ethics Committee of the Board of Directors.

Employees and stakeholders can refer any breach of the Code of Conduct to the Ethics Committee at any time, in accordance with the procedure described in point 3.5.7. The members of the Ethics Committee are subject to a confidentiality obligation.

3.5.4.2 Human Rights Committee and Department

The Human Rights Committee is made up of representatives from different departments (safety, purchasing and societal commitment in particular) and business segments. It meets several times a year and coordinates actions relating to human rights and fundamental freedoms led by the various business segments and Subsidiaries, in line with the Human Rights roadmap approved by the Executive Committee.

(1) SunPower, a company listed on the NASDAQ in the United States and in which TOTAL has a majority interest, has a Code of professional conduct specific to the company that sets forth its values and the ethical principles with which all employees, as well as suppliers and partners, must comply. It covers subjects relating to compliance, integrity and protection of the company's assets, as well as certain issues relating to human rights, fundamental freedoms, human health and safety and environment.
(2) Hutchinson and SunPower have developed HSE management systems specific to their activities and organization (for example, The Environmental Health Safety & Quality Management System).
(3) Saft Groupe and SunPower have defined fundamental principles of purchasing specific to their activities (for example, SunPower Supplier Sustainability Guidelines).

The Human Rights Department, within the Civil Society Engagement Division, supports the Group's operational managers with its expertise in implementing the Action Principles relating to human rights and fundamental freedoms.

3.5.4.3 Occupational Health, Safety and Environment Division

Since 2016, a single HSE Division combines the Group's Occupational Health, Safety and Environment functions. Its role is to implement a strong and unified HSE model.

Within the division, the HSE Departments of the Exploration & Production, Gas, Renewables & Power, Refining & Chemicals and Marketing & Services segments are in particular responsible for supporting the implementation of the Group's HSE policy. Specific expert units set up in 2016 cover the following areas: major risks, human and organizational factors, environmental and societal issues, transportation and storage, crisis management and pollution prevention, standards and legislation, audits and feedback.

3.5.4.4 Procurement

Since January 1, 2017, a dedicated subsidiary, Total Global Procurement centralizes management of a large part of the Group's goods and services purchasing[1], whether for categories of products or services specific to one business activity or categories shared between several business activities. In the Subsidiaries, purchasers implement framework agreements as well as manage local procurement.

A Responsible Purchasing Committee meets at least once a year and brings together the Management Committee of Total Global Procurement and the Civil Society Engagement (including the Human Rights Department), HSE and Legal Divisions as well as the Ethics Committee in order to monitor implementation of the Group's Responsible Purchasing roadmap. The roadmap sets out the strategic direction of the Responsible Purchasing working group.

Furthermore, the Vetting department of Trading & Shipping defines and applies the selection criteria for the tankers and barges used to transport the Group's liquid petroleum or chemical products and gas products, in order to ascertain their technical qualities relative to the best international standards, the crews' experience and the quality of the ship owners' technical management.

3.5.5 Assessment procedures

The Group has set up procedures for assessing its Subsidiaries and Suppliers, particularly in conjunction with independent bodies, which help identify and prevent risks of severe impacts on human rights and fundamental freedoms, human health and safety.

3.5.5.1 Procedures for assessing Subsidiaries

HSE assessments

The Audit and Feedback Unit within the central HSE Division is a key component of HSE governance. It steers the internal control mechanisms intended to verify compliance with the Group's HSE requirements.

This mechanism is organized around a self-assessment to be carried out by the Subsidiaries at least every two years and an assessment every three to five years conducted by the Audit unit and feedback based on an audit protocol. The objective is to identify potential gaps in the application of the rules by the Subsidiairies and to enable them to define and implement improvement actions.

This unit is also in charge of analysis of major incidents and management of feedback.

Additionally, the Management Committee of each of the Group's business segments performs monitoring of its major risk analyses and of the progress of the associated action plans.

Lastly, the HSE Division steers the measurement and reporting work relating to greenhouse gas emissions resulting from the Activities. These direct greenhouse gas measurements (Scope 1) are published in section 3.5.9.2 of this Chapter.

Assessments regarding human rights and fundamental freedoms

Since 2002, the Group has engaged GoodCorporation, a company specialized in ethical assessments, to verify the proper application of the principles set out in the Code of Conduct at the Subsidiary level. These assessments include criteria relating to human rights and fundamental freedoms, and corruption. As part of the process, a selection of employees and external stakeholders of the Subsidiary are questioned to understand how their Activities are perceived locally. Following the assessment, the Subsidiary in question defines and implements an action plan and a monitoring procedure.

Furthermore, TOTAL works with the Danish Institute for Human Rights (DIHR), an independent national body for the defense and promotion of human rights and fundamental freedoms, which assesses the impact on human rights and fundamental freedoms of the Group's activities in sensitive contexts.

In some cases, the Group works with independent experts such as CDA, a company specialized in preventing and managing conflict between businesses and local communities. The reports by CDA are published online on its website.

Lastly, an annual self-assessment questionnaire enables each of the Group's Subsidiaries and operational entities to measure and evaluate the level of implementation of their societal governance on the field. Actions involving dialogue, impact management and the contribution to socioeconomic and cultural development are recorded and analyzed.

3.5.5.2 Procedures for assessing Suppliers

The Supplier qualification process was harmonized at Group level in 2017 by Total Global Procurement. A new internal framework was published in 2018. In particular, it was used to set up a new IT qualification tool to be deployed progressively within the Group which also will serve as a consolidated database. The framework covers human rights, environment, health and safety.

Depending on the results of a risk analysis carried out by Suppliers, a detailed assessment is performed. It includes questionnaires addressing the aforementioned issues and, if needed, an action plan, a technical inspection of the site by employees or an audit of working conditions carried out by a specialist service provider with which a framework agreement was signed in 2016. Crude oil and petroleum product purchasing by Trading & Shipping, gas and electricity purchasing by the subsidiary Total Gas & Power Ltd, and the purchases made by the Subsidiaries Hutchinson, Saft Groupe and SunPower are subject to Supplier qualification processes specific to their organizations.

This qualification process may be completed if needed by specific organizations, such as the unit put in place in the Group as from September 2018 for the selection of palm oil suppliers. This unit aims to ensure that palm oil purchases are made on the basis of sustainability certifications such as the ISCC EU certification.

(1) With the exception of purchases made by the Subsidiaries Hutchinson, Saft Groupe and SunPower. Total Global Procurement made purchases from over 100,000 suppliers worldwide in 2018.

This type of certification incorporates criteria relating to carbon footprint, anti-deforestation, good use of land and respect for human rights. In addition to this mandatory certification, suppliers must have signed the Fundamental principles of purchasing and be members of the Roundtable on Sustainable Palm Oil (RSPO).

As regards the chartering of tankers and barges, any operation that involves tankers or barges calling at a terminal operated by a Group Subsidiary, carrying shipments that belong to the Group or chartered by TOTAL must be approved in advance by the Vetting department. Responses are given on the basis of technical data and independently of any commercial considerations. The audits conducted with ship owners also permit the assessment of the quality of the technical management systems implemented by the operators, crew selection and training, as well as the support provided to vessels.

Through the annual inspections performed by inspectors representing the Group, TOTAL is actively involved in sharing inspection reports with other international oil and gas companies through the SIRE (ship inspection report) Program set up by the OCIMF (Oil Companies International Marine Forum), thus contributing to the continuous improvement of petroleum shipping safety.

3.5.6 Awareness and training actions

3.5.6.1 Awareness and training of Group employees

The Group has put in place a variety of communication and information channels enabling all employees of TOTAL S.A. and its Subsidiaries to have access to the Action Principles defined by the Group in relation to human rights and fundamental freedoms, health, safety and the environment.

The Code of Conduct is distributed to all employees and can be consulted on the Group's website. All new employees must confirm that they are familiar with it.

Events such as the annual Business Ethics Day are used to raise awareness among employees of TOTAL S.A. and its Subsidiaries. Practical guides are available on the Group's intranet, such as the Human Rights Guide and the Guide to dealing with religious questions within the Group, to help Group employees apply the commitments provided for in the Code of Conduct in each individual cases.

The HSE Division organizes the Group's World Safety Day, which aims to bring teams on board and raise awareness of ways to put the HSE Action Principles into practice. The Group's employees implement its safety culture on a day-to-day basis through "Safety Moments" at the beginning of meetings or before hazardous operations, consisting of a short discussion to reiterate the key safety messages and align participants with mutual commitments.

Training courses, incorporating on-line educational programs as well as technical training tailored to the various business segments, are offered to all Group employees.

Dedicated human rights and fundamental freedoms training programs have been set up for senior executives, site directors and the employees most exposed to these issues. Awareness-raising sessions on these subjects are organised regularly for employees, as is the case at the time of ethical assessments of Subsidiaries. In the field of procurement, training modules explaining the Group's ethical commitments and the Fundamental Principles of Purchasing have also been developed for the Group's purchasers.

Similarly, training programs in the fields of health, safety and environment have been rolled out within the Group reflecting different perspectives: general, by type of activities or by subject areas. For example, the following general training actions exist depending on the level of responsibility and experience in the Group: HSE Leadership for Group senior executives, HSE training for managers, and Safety Pass training for new recruits.

3.5.6.2 Awareness and training of Suppliers

The Fundamental Principles of Purchasing are brought to the attention of Suppliers as of their registration in the Supplier database.

Training initiatives are also undertaken with the Group's Suppliers, such as the responsible security training given to safety service providers' personnel, and the Safety Contract Owners program, which brings together more than 650 suppliers at the Group level.

3.5.6.3 Information on product risks

All of the chemical and petroleum products marketed by the Group are covered by a safety data sheet prepared in accordance with applicable regulations. The packaged products are labelled accordingly.

Each safety data sheet provides comprehensive information on the substances or mixtures usable in the regulatory framework of managing chemicals in the workplace. It enables users to identify the risks linked to handling such products, particularly regarding safety and the environment, in order to implement any measures necessary to protect people and the environment.

Safety data sheets are available to carriers of dangerous goods, emergency services, poison control centers, as well as professional and industrial customers. Consumers are informed of the risks and precautions of use through product labelling.

3.5.7 Whistleblowing mechanisms

To support employees on a day-to-day basis, the Group encourages a climate of dialogue and trust that enables individuals to express their opinions and concerns. Employees can thus go to their line manager, an HR or other manager, their Compliance Officer or their Ethics Officer.

The Group's employees and Suppliers, as well as any other external stakeholder, can contact the Ethics Committee to ask questions or report any incident where there is a risk of non-compliance with the Code of Conduct using the generic email address (ethics@total.com). The system is supplemented by specific whistleblowing mechanisms implemented at certain subsidiaries (SunPower, Hutchinson).

The Group's Suppliers can also contact the internal supplier mediator using a generic email address (mediation.fournisseurs@total.com). The mediator is available to Suppliers and purchasers, and restores dialogue to find solutions when measures taken with the usual contact have been unsuccessful.

Grievance handling procedures are also in place within the Group in order to receive and facilitate the resolution of concerns and grievances of local communities that may be affected by its Activities.

As regards HSE, an on-call system has been set upto alert the directors of the business segments and of the Group as quickly as possible in the case of a major incident. Depending on the incident, a crisis management and monitoring process is put in place (refer to point 3.3.3.1).

3.5.8 Monitoring procedures

To ensure the continuous updating of the Vigilance Plan, TOTAL relies on existing monitoring procedures and tools relating to human rights, safety, health and environment made available to the Subsidiaries.

Thus, the system of internal reporting and of indicators for monitoring implementation of the actions undertaken in the Group in these areas is based:

— for social indicators (including, in particular, health), on a guide entitled “Corporate Social Reporting Protocol and Methodology”;

— for industrial safety indicators, on a Group rule concerning event and statistical reporting; a feedback analysis process identifies, in particular, events for which a structured analysis report is required in order to learn lessons in terms of design and operation; and

— for environmental indicators, on a Group reporting procedure, together with activity-specific instructions.

Consolidated objectives are defined for each key indicator and reviewed annually. The business segments apply these indicators as appropriate to their area of responsibility, analyze the results and set out a plan.

All of the procedures enable regular monitoring of actions and areas for improvement to be implemented in the area of human rights, safety, health and environment. The Group Performance Management Committee (refer to point 4.1.5.2 of chapter 4) is involved in this approach. In particular, it is responsible for examining, analyzing and steering the Group’s HSE, financial and operational results on a quarterly basis.

In addition, the committee responsible for monitoring the CSR Global Agreement signed by TOTAL in 2015, known as the “FAIR Committee”, meets every year in the presence of representatives who are members of trade unions affiliated to the IndustriALL Global Union (refer to points 5.3.3.3 and 5.10.3 of Chapter 5) and appointed by this federation to monitor and implement the agreement. It identifies good practice and areas for improvement in the fields of safety, health, human rights and fundamental freedoms.

Additionally, the Group publishes a Human Rights information document that describes the Group’s Activities’ major impacts on human rights and fundamental freedoms and the remedial measures taken. In 2016, TOTAL became the first company in the oil industry to have published this document in accordance with the UN Guiding Principles Reporting Framework. It is available on the Group’s website and was updated in 2018.

Since 2015, TOTAL also publishes a report to assess the progress made in the implementation of the Voluntary Principles on Security and Human Rights. The information set out in the report is based on annual reporting organized by the Security Division that brings together the results of the risk and compliance analyses for each subsidiary operating in a sensitive context.

Lastly, in September 2018 TOTAL published the third edition of its “Integrating climate in our strategy” brochure dedicated to the consideration of climate issues and detailing the Group’s lines of action in this area.

3.5.9 Report on implementation of the Vigilance Plan (1)

3.5.9.1 Human rights and fundamental freedoms

TOTAL’s human rights approach is based on written commitments. It is supported by a dedicated organization, and embedded through an awareness-raising and training program, as well as evaluation and follow-up mechanisms aiming at measuring the effectiveness of the Group’s actions.

A) Human rights in the workplace

The prohibition of forced and child labor, non-discrimination, just and favorable conditions of work, as well as safety all form part of the principles set out in TOTAL’s Code of Conduct and Human Rights Guide.

TOTAL’s commitment to human rights in the workplace is demonstrated, in particular, by the signature of various agreements, such as the one concluded with IndustriALL Global Union (2) in 2015. In particular, this agreement covers the promotion of human rights in the workplace, diversity, the participation of employees and their representatives in social dialogue and the recognition of health and safety at work as absolute priorities in the Group’s activities and global supply chain.

In its activities

TOTAL cares about the working conditions of its employees which are governed by the Group’s Human Resources policy (refer to point 5.3 of chapter 5).

Safety is one of the Group’s core values. Over the last few years, the Group has continued to develop occupational health and safety standards focusing on the right to enjoy fair and adequate living and working conditions (refer to point 3.5.9.2 of this chapter).

TOTAL is committed to promoting diversity and endeavors to combat all forms of discrimination (origin, gender, sexual orientation, handicap, age, membership in a union or a political or religious organization, etc.). The Diversity Council, which is chaired by a member of the Executive Committee, illustrates this commitment.

In 2017, TOTAL published a “Practical guide to dealing with religious questions within the Group” in order to provide practical solutions to the questions raised by the Group’s employees and managers worldwide. It draws on the experiences of the business segments in various countries and encourages dialog, respect and listening as a way to find solutions suited to the local context. Many internal and external experts helped draft this document, including representatives of various religious communities. This guide has been translated into nine languages.

(1) Refer to point 5.11 of chapter 5 concerning the reporting ‘s scope and medology concerning information provided in point 3.5.9 of this chapter. Since the identification of risks and the prevention of severe impacts on human rights, human health and safety and the environment overlap partially with certain risks covered in the non-financial performance statement (refer to chapter 5), TOTAL has chosen to report on the implementation of its Vigilance Plan by incorporating certain aspects of its non-financial performance statement although it includes risks of varying degrees.
(2) International union federation representing more than 50 million employees in the energy, mining, manufacturing and industrial sectors in 140 countries.

In addition to the Group's reporting and internal control system, the working conditions of TOTAL's employees are evaluated by GoodCorporation, an independent third party, as part of the ethical assessments of the Group's entities.

In the Group's value chain

The Fundamental Principles of Purchasing (FPP) set out the commitments expected from suppliers in various domains, including human rights in the workplace and safety. A Group directive reaffirms the obligation to annex the FPP or to transpose them in the selection process as well as in the contracts concluded with suppliers of goods or services.

The prevention of forced and child labor in the supply chain is a critical point of attention identified in the 2017-2018 human rights roadmap endorsed by the Executive Committee. TOTAL has therefore developed a new methodology for selecting its suppliers which takes account the risks of human rights violations, in particular forced and child labor. In September 2016, TOTAL also entered into a partnership with a third-party service provider in charge of evaluating suppliers' practices with regard to fundamental rights in the workplace (refer to point 3.5.9.5 of this chapter).

Finally, the working conditions of the employees of service stations' dealers are evaluated by GoodCorporation, an independent third party, as part of the ethical assessments conducted in the Group entities. Between 2016 and 2017, a baseline study of 22 affiliates in the Marketing & Services segment across different continents was also conducted. One of the main recommendations identified is to improve service station dealers' awareness of the Group's Code of Conduct principles and of the fundamental Conventions of the International Labor Organization. In response, Marketing & Services is developing educational tools, which should be promoted in 2019 to this business segment's entities.

B) Human rights and local communities

TOTAL's operational activities may have impacts on the rights of local communities, in particular when TOTAL obtains temporary or permanent access to their land for Group's projects that may involve the physical and/or economic displacement of these populations. Noise and dust emissions and other potential impacts may also have consequences on the livelihood of neighboring communities. Consequently, the access to land of local communities and their right to health and an adequate standard of living are two salient issues for TOTAL.

In accordance with internationally recognized human rights standards, TOTAL requires the Group entities to maintain a regular dialogue with their stakeholders and make sure that their activities have no negative consequences on local communities or, if these cannot be avoided, that they limit, mitigate and remedy them. The solutions proposed in response to the expectations of local communities are coordinated by the societal teams that work in close collaboration with the legal, safety and environmental teams. The Group's approach to this topic is described in the section on societal issues of the non-financial performance Statement in point 5.9 of chapter 5.

C) Respect for human rights in security-related activities

In certain situations, intervention by government security forces or private security providers might be necessary to protect TOTAL staff and assets. In order to prevent any misuse of force, TOTAL asks Group employees, private security providers and government security forces to implement the Voluntary Principles on Security and Human Rights (VPSHR) issued by States, NGOs and Extractive Companies.

TOTAL has been a member of this initiative since 2012. Within this framework, the Group publishes an annual report setting out the challenges, lessons learned and good practices in relation to security and human rights and, if applicable, reports any incidents associated with the Group's activities. This report is available at sustainable-performance.total.com.

Self-assessment and risk analysis tools have been developed and are deployed, in particular, in the entities located in high risk countries and conflict zones.

When government security forces are deployed to ensure the protection of the Group's staff and assets, the Group entities maintain an ongoing dialogue with the representatives of national or regional authorities in order to raise their awareness on the need to respect the VPSHR and encourage them to sign memorandums of understanding that comply with these principles.

TOTAL regularly organizes training sessions and awareness-raising activities on the risk of misuse of force, and more generally on the VPSHR, for its staff, private security providers and government security forces. In 2018, TOTAL partnered with other Extractive Companies and the Myanmar Center for Responsible Business to organize two VPSHR awareness workshops for government officials, private security providers and NGOs in Myanmar.

3.5.9.2 Personal health and safety

TOTAL places safety at the heart of its ambition to be a responsible company. The measures and indicators used to manage the Group's activities are based on this fundamental value, in accordance with the strictest standards, particularly relating to health.

A) Preventing occupational accidents

The Group's personal safety policy covers three main areas: preventing occupational accidents, preventing transport accidents, and preventing accidents linked to technological risks, such as fires and explosions. It relates to all employees of Group subsidiaries, employees of external contractors working on these entities' sites as well as employees of transport companies under long-term contracts. The safety results are monitored with the same vigilance for all.

Indicators defined according to an internal procedure measure the main results. In addition to its aim of zero fatalities in the exercise of its activities, the Group has set the target of continuously reducing the TRIR[1] and, for 2018, of keeping it below 0.9 for all personnel (Group and External Contractors).

(1) TRIR: Total Recordable Injury Rate.

Safety indicators	2018	2017	2016
TRIR[(a)]: number of recorded injuries per million hours worked – All Personnel	0.91	0.88	0.91
Group company employees	0.82	0.89	0.83
External contractors employees[(b)]	1.01	0.88	0.99
LTIR[(c)]: number of lost time injuries per million hours worked – All Personnel	0.59	0.58	0.51
SIR[(d)]: average number of days lost per lost time injury	26	28[(e)]	30[(e)]
Number of occupational fatalities	4	1	1

(a) TRIR: Total Recordable Injury Rate.
(b) As defined in point 5.11.4 of chapter 5.
(c) LTIR: Lost Time Injury Rate.
(d) SIR: Severity Injury Rate.
(e) Excluding Saft Groupe.

The Group's safety efforts over more than 10 years have resulted in a significant improvement in the TRIR and LTIR. Performance has stabilized since 2016, mainly due to acquisitions and disposals of assets or subsidiaries. The gradual implementation of the One MAESTRO framework aims to strengthen the Group's safety culture and create a new drive to improve safety results. Despite the measures put in place, in 2018 three accidents resulted in the death of four employees working for external contractors: one during road transport in Ethiopia, one during a handling operation in the Republic of the Congo, and two during an operation to recommission a fuel storage tank in Egypt.

Generally, an analysis is launched in response to any type of accident whatsoever. The method and scope of the analysis depend on the actual or potential severity of the event. Consequently, a near miss with a high severity potential is treated as a severe accident, and its analysis is considered an essential factor of progress. Depending on its relevance to the other Group entities, it triggers a safety alert and the distribution of a feedback form, depending on the circumstances.

Regarding **occupational safety**, since 2010, the basic rules to be scrupulously followed by all personnel, employees and contractors alike, in all of the Group's businesses worldwide, are described in the document "*Safety at Work: TOTAL's Twelve Golden Rules*", which has been widely circulated within the Group.

The aim of the Golden Rules is to set out simple, easy-to-remember rules that cover a large number of occupational accidents. In addition, further rules can be found in the One MAESTRO HSE framework, the business segment frameworks and the subsidiary frameworks.

According to the Group's internal statistics, in more than 44% of severe incidents or near misses with high severity potential in the workplace, at least one of the Golden Rules had not been followed. The proper application of these Golden Rules, and more generally of all occupational safety procedures, is verified through site visits and internal audits. The Stop Card system, which was set up in 2015, also enables any employee of the Group or an external contractor to intervene if any of the Golden Rules is not being followed. In addition, in 2016, the HSE department created a unit bringing together the reference persons on high-risk operations (work at height, lifting, high-pressure cleaning, excavations, etc.) in order to consolidate in-house knowledge and relations with contractors.

The reporting of anomalies and near misses (approximately 600,000 per year) is strongly encouraged on a daily basis and is permanently monitored. The ability of each employee to identify anomalies or dangerous situations is one of the measures of the employees' involvement and vigilance in accident prevention and reflects the safety culture within the Group. In 2016, the Group HSE Department also created a unit aimed at providing support for sites to improve their safety culture upon their request.

Regarding road **transport**, for many years the Group has been monitoring the number of severe road accidents involving its employees and those of external contractors. The actions taken have reduced the number of severe accidents between 2016 and 2018 by 33%. Work began in new areas in 2018, particularly relating to the use of new technologies in accident prevention (defining a new standard for the light vehicles used, driver fatigue detection) and the assessment of the driver support and assistance systems offered by manufacturers (automatic emergency braking, lane keeping assist, lane change assist, etc.).

Number of severe road accidents[(a)]	2018	2017	2016
Light vehicles and public transport[(b)]	7	11	9
Heavy goods vehicles[(b)]	23	26	36

(a) Overturned vehicle or other accident resulting in the injury of a crew member (declared incident).
(b) Vehicles on long-term contract with the Group (>6 months).

With regard to **technological risks** (also known as "major" industrial risks), the risk analysis and prevention actions are described in point 3.5.9.3.B of this chapter.

Whatever the nature of the accident, prevention actions rely on all employees abiding by the Group's safety policies. These are disseminated through training courses aimed at the various groups of employees (new arrivals, managers, senior executives, etc.).

As TOTAL's core value, Safety has been a component of the Group's employee compensation policy since 2011. A portion of the variable compensation received by employees, as well as by senior executives and the Chairman and Chief Executive Officer, depends on the achievement of HSE targets (refer to point 4.3.2 of chapter 4 and point 5.3.1 of chapter 5).

With regard to **security**, the Group has put in place means to analyze threats and assess risks in order to take preventive measures to limit its exposure to security risks in the countries where it operates.

B) Preventing occupational health risks through improved assessment

With regard to prevention of occupational health risks, the Group implements a policy that defines the risk assessment methodology to be applied by all Group entities and subsidiaries. The associated Group directive stipulates that the assessment includes chemical, physical, biological, ergonomic and psychosocial risks, and that it must result in the design and roll-out of an action plan. In addition, it requires that each Group entity sets out a formal medical monitoring procedure taking into account the requirements under local law (frequency, type of examination, etc.) and the level of exposure of its personnel to the various risks.

To complement this program, the Group has set up an employee health observatory. The aim is to monitor the health of a sample of employees in order to identify the emergence of certain illnesses and, if applicable, suggest appropriate preventive measures. The data is gathered anonymously during medical examinations and covers approximately 12% of Group employees worldwide.

The Group also has a Medical Advisory Committee that meets regularly to discuss key health issues relating to the Group's activities. It decides whether there is a need for additional health protection strategies to be implemented. It consists of external scientific experts and also brings together the Group's senior executives and stakeholders concerned by these issues.

In terms of prevention, the Group has decided to make psychosocial risk prevention a priority commitment. In 2018, the Group identified four areas of progress worldwide:

— a minimum level of awareness and training for all;

— a system for measuring stress and the quality of the social climate, facilitating the production of action plans;

— a system for listening to and supporting employees in difficult situations;

— coordination of actions and monitoring of indicators.

A Quality of Life at Work and Health working group was set up in September 2018 to coordinate and ensure the effectiveness of all of the actions taken. Led by the Group Human Resources division, all of TOTAL's business segments are represented, particularly the international medical department. Its first task is to create and roll out a Worldwide Psychosocial Risk (PSR) Prevention program that addresses the four areas for progress.

Regarding the priority commitment to training, a fully updated PSR pack aimed at entity managers, prevention contributors and managers was finalized in 2018. Approved by international experts, it has now been translated into 11 languages and is the core material for training on this subject. The pack consists of two guides: a methodological guide for entity managers and anyone with a role in PSR prevention, and a practical guide for managers to raise awareness of the importance of the quality of life at work as a key factor in preventing PSRs. It also aims to support them in the day-to-day management of their teams in the event of difficulties, risky situations and crisis situations.

On a broader level, TOTAL is helping to promote individual and collective health programs in the countries where it operates, including vaccination campaigns and screening programs for certain diseases (AIDS, cancer, malaria, etc.) for employees, their families and local communities. Action is also taken regularly to raise awareness of lifestyle risks (anti-smoking and anti-drinking campaigns, etc.).

The Group has put in place the following indicators to monitor the performance of its program:

Health indicators *(WHRS scope)*	**2018**	**2017**	**2016**
Percentage of employees with specific occupational risks benefiting from regular medical monitoring[(a)]	98%	98%	99%
Number of occupational illnesses recorded in the year (in accordance with local regulations)	154	143	108

(a) As an exception to the reporting principles described in section 5.11 of chapter 5, the 2018 rate does not include a company that did not report its data in time for the 2018 WHRS.

Reporting on occupational illnesses covers only the Group's personnel (WHRS scope) and illnesses reported according to the regulations applicable in the country of operation of each entity.

Musculoskeletal disorders, the main cause of occupational illnesses in the Group, represented 69% of all recorded illnesses in 2018, against 68% in 2017. Therefore, in addition to ergonomic risk assessments and the gradual training of personnel on its sites, the annual Group Industrial Hygiene Day in December 2017 was on the theme of Ergonomics and Musculoskeletal disorders.

The annual Group Industrial Hygiene day held in September 2018 was dedicated to asbestos and refractory ceramic fibers.

C) Minimizing the risks throughout the life cycle of products to prevent consumer health and safety risks

Unless certain precautions are taken, some of the products marketed by TOTAL pose potential risks to the health and safety of consumers. The Group therefore aims to meet its obligations with regard to information and prevention in order to minimize the risks throughout the life cycle of its products.

TOTAL's health and products directive sets out the minimum requirements to be observed by the Group's entities and subsidiaries for marketing the Group's products worldwide in order to reduce potential risks to consumer health and the environment. TOTAL identifies and assesses the risks inherent to its products and their use. The material safety data sheets (MSDS) that accompany the products marketed by the Group (in at least one of the languages used in the country) as well as product labels are two key sources of information. All new products comply with the regulatory requirements in the countries and markets for which they are intended.

3.5.9.3 Environment

TOTAL places the environment at the heart of its ambition of being a responsible company. In light of the specific nature of its activities, the Group's operations pose risks for which TOTAL develops structured management systems.

Environmental indicators have been monitored for many years in order to constantly adapt the Group's environmental protection measures, which are presented in this section.

A) General policy and environmental targets

TOTAL considers the respect for the environment to be a priority. All employees, at every level, must do their utmost to protect the environment as they go about their work. TOTAL strives to control its energy consumption, its emissions in natural environments (water, air, soil), its residual waste production, its use of natural resources and its impact on biodiversity. With regards to the environment, TOTAL takes a constructive approach that is based on transparency and dialogue when communicating with its stakeholders and third parties.

To this end, the HSE division and the HSE departments within the Group's entities seek to ensure both applicable local regulations and internal requirements resulting from the Safety Health Environment Quality Charter and the Group's additional commitments are respected. Group steering bodies, led by the HSE division, are tasked with:

— monitoring TOTAL's environmental performance, which is reviewed annually by the Executive Committee, for which multi-annual improvement targets are set;

— handling, in conjunction with the business segments, the various environment-related subjects of which they are in charge; and

— promoting the internal standards to be applied by the Group's operational entities.

The Group's environmental targets[a]:

- decrease SO_2 air emissions by 50% between 2010 and 2020;
- maintain hydrocarbon content of water discharges below 30 mg/l for offshore sites and below 15 mg/l for onshore and coastal sites;
- valorize more than 50% of the waste produced by the sites operated by the Group.

Moreover, the Group is committed to:

- systematically develop biodiversity action plans for production sites located in protected areas[1];
- not conducting oil and gas exploration or production operations in the area of natural sites listed on the UNESCO World Heritage List[2];
- not conducting exploration in oil fields under sea ice in the Arctic.

(a) For climate, refer to point 3.5.9.4.D of this chapter.

What has been accomplished:

- more than 50% reduction in SO_2 air emissions reached since 2017;
- 100% of the Group's oil sites have met the target for the quality of onshore discharges since 2016 and 96% of the Group's oil sites have met the target for the quality of offshore discharges in 2018;
- more than 50% of the waste produced by the sites operated by the Group was valorized in 2018;
- 5 biodiversity action plans deployed or in preparation in 2018;
- no oil and gas exploration or production activity in the area of natural sites listed on the UNESCO World Heritage List[2];
- no exploration activity in oil fields under sea ice in the Arctic.

The Group's internal requirements state that the environmental management systems of its operated sites that are important for the environment[3] must be ISO 14001 certified within two years of start-up of operations or acquisition: 100% of these 71 sites were in conformity in 2018. Beyond these internal requirements, at the end of 2018, a total of 264 sites operated by the Group were ISO 14001 certified. In 2018, the Moho Nord site (Republic of the Congo) has been ISO 14001 certified.

All investment, divestment or acquisition projects which are submitted to the Executive Committee for approval are assessed and reviewed with regards to their risks and impact, particularly environmental, before the final investment decision is made.

TOTAL seeks to ensure that all employees share its environmental protection requirements. Employees receive training in the required skills. TOTAL also raises employee awareness through internal communication campaigns (e.g., in-house magazines, intranet, posters).

B) Preventing incident risks

To prevent incident risks and, in particular, major industrial events, TOTAL carries out periodic risk assessments and implements adapted risk-management policies and measures.

The Group has management structures and systems that present similar requirements and expectations across all the entities. TOTAL strives to minimize the potential impacts of its operations on people, the environment and property through a major technological risk management policy. This management draws on a shared approach in all segments that includes, on the one hand, risk identification and analysis, and on the other hand, the management of these risks.

This structured approach applies to all of the Group's operated businesses exposed to these risks. In addition to its drilling and pipeline transport operations, the Group has at the end of 2018 195 sites and operating zones exposed to major technological risks, which could cause harm or damage to people, property and the environment, corresponding to:

- all the offshore and onshore operating activities in Exploration & Production; and
- the Seveso classified industrial sites (upper and lower threshold) and their equivalents outside the EU (excluding Exploration & Production).

This approach first sets out an analysis of the risks related to the Group's industrial operations, on each site, based on incident scenarios for which the probability of occurrence and the severity of the consequences are assessed.

Second, based on these parameters, a prioritization matrix is used to determine whether further measures are needed in addition to compliance with the Group's standards and local regulations. These mainly include preventive measures but can also include mitigation measures.

The management of major technological risks also hinges on:

- staff training and raising awareness;
- a coherent event reporting and indicators system;
- systematic, structured serious event analysis, particularly to learn lessons in terms of design and operation;
- regularly tested contingency plans and measures.

In terms of monitoring indicators, the Group reports the number of Tier 1 and Tier 2 events as defined by the API and the IOGP. The Group set itself a loss of primary containment target of under 100 (Tier 1 and Tier 2) in 2018.

The target is slightly exceeded due to the inclusion of new entities in the reporting scope. In addition to the 103 Tier 1 and Tier 2 operational events indicated in the table below, the Group recorded four Tier 1 events and one Tier 2 event due to sabotage or theft in 2018.

Loss of primary containment[a]	2018	2017[b]	2016[b]
Loss of primary containment (Tier 1)	30	28	38
Loss of primary containment (Tier 2)	73	75	101
Loss of primary containment (Tier 1 and Tier 2)	103	103	139

(a) Tier 1 and Tier 2: indicator of the number of loss of primary containment events, with more or less significant consequences, as defined by the API 754 (for downstream) and IOGP 456 (for upstream) standards. Excluding acts of sabotage and theft.
(b) Excluding TEP Barnett in 2016 and 2017.

In accordance with industry best practices, TOTAL also monitors accidental liquid hydrocarbon spills of more than one barrel. Spills that exceed a predetermined severity threshold (in terms of volume spilled, toxicity of the product in question or sensitivity of the natural environment affected) are reviewed on a monthly basis and annual statistics are sent to the Group Performance Management Committee. All large spills are followed by corrective actions aimed at returning the environment to an acceptable state as quickly as possible. Due to their unpredictable nature, there is no quantitative target for accidental hydrocarbon spills. Nevertheless, changes in the number of spills are observed and analyzed.

(1) Sites located in an IUCN I to IV or Ramsar convention protected area.
(2) Natural sites included on the UNESCO World Heritage List of December 31, 2017.
(3) Sites that emit more than 30 kt CO_2e per year.

Accidental hydrocarbon spills [(a)]	2018	2017 [(b)]	2016
Number of hydrocarbon spills	74	62	73
Total volume of hydrocarbon spills *(thousands of m³)*	0.3	0.5	0.9

(a) Accidental spills with an environmental impact and of more than one barrel.
(b) In 2017, the indicator perimeter was updated to exclude spills due to sabotage by a third party.

In order to manage a major accidental spill efficiently, the Group implemented a global crisis management system that is primarily based on a dedicated organization and a crisis management center at the head office to enable the management of two simultaneous crises. As part of this process, TOTAL regularly trains in crisis management on the basis of risk scenarios identified through analyses.

In particular, the Group has response plans and procedures in place in the event of a hydrocarbon leak or spill. For accidental spills that reach the water surface, oil spill contingency plans are regularly reviewed and tested during exercises. These plans are specific to each company or site and are adapted to their structure, activities and environment while complying with Group recommendations.

Oil spill preparedness	2018	2017	2016
Number of sites whose risk analysis identified at least one risk of major accidental pollution to surface water [(a)]	126	126	143
Proportion of those sites with an operational oil spill contingency plan	99%	91%	99%
Proportion of those sites that have performed at least one oil spill response exercise during the year	86% [(b)]	95%	89%

(a) The variation of the number of sites between 2016 and 2018 is due to perimeter variation.
(b) Decrease in 2018 compared to 2017 corresponds mainly to two subsidiaries where equipment was being refurbished in 2018.

In the event of accidental pollution, the Group companies can call on in-house human and material resources (Fast Oil Spill Team, FOST) and benefit from assistance agreements with the main third-party organizations specialized in the management of hydrocarbon spills.

Since 2014, subsea capping and subsea containment equipment that can be transported by air has been strategically positioned at different points of the world (South Africa, Brazil, Norway and Singapore) in order to provide solutions that are readily available in the event of oil or gas eruptions in deep offshore drilling operations. From these locations, the equipment can benefit TOTAL's operations worldwide. This equipment was developed by a group of nine oil companies, including TOTAL, and is managed by Oil Spill Response Ltd (OSRL), a cooperative dedicated to the response to marine pollution by hydrocarbons. TOTAL has also designed and developed its own capping system ("Subsea Emergency Response System") to stop potential eruptions in drilling or production operations as quickly as possible. Since 2015, equipment has been installed in Angola, then the Republic of the Congo, potentially covering the entire Gulf of Guinea region.

For its sea and river shipment requirements, TOTAL only charters ships and barges that meet the highest international standards. The Group has an internal policy that lays down the process and criteria by which ships and barges are selected (known as vetting). These criteria are based, in particular, on the regulations, best practice and recommendations of the OCIMF [(1)] and, in Europe, on the European Barge Inspection Scheme (EBIS). Tankers and barges are vetted by a single centralized Group entity. The average age of the Group Shipping division's time-chartered fleet is approximately six years.

With regard to operated marine terminals, the Group got involved in an initiative that seeks to systematically record their physical characteristics and store this data in a global database that forms part of the Marine Terminal Information System (MTIS) of the OCIMF. At the end of 2018, 95% of coastal marine terminals and 50% of offshore terminals had submitted their characteristics, thereby making it easier to assess the compatibility of ships with the ports of call. Additionally, since 2018, large TOTAL terminals have used the Marine Terminal Management Self Assessment (MTMSA), the framework recommended by the industry for the self-assessment of terminals and the continuous improvement of the safety of product transfers. A training course on ship/shore interface management (*SSSCL – Ship Shore Safety Check List*) and cargo transfer operations, developed by the Group in 2016, had completed by operators of 80% of operated-terminals by the end of 2018.

C) Limiting the environmental footprint

Wherever TOTAL conducts its business, it makes sure that it complies with applicable laws and regulations, which the Group complements with specific requirements and commitments when necessary. TOTAL implements an active policy of avoiding, reducing, managing and monitoring the environmental footprint of its operations. As part of this policy, emissions are identified and quantified by environment (water, air and soil) so that appropriate measures can be taken to better control them.

Water, air

The Group's operations generate emissions into the atmosphere from combustion plants and the various conversion processes and discharges into wastewater. In addition to complying with applicable legislation, the Group's companies actively pursue a policy aimed at reducing emissions. After analyses have been conducted and when necessary, the sites introduce various reduction systems that include organizational measures (such as using predictive models to control peaks in sulfur dioxide (SO_2) emissions based on weather forecast data and the improvement of combustion processes management, etc.) and technical measures (wastewater treatment plants, using low NO_X burners and electrostatic scrubbers, etc.).

For new facilities developed by the Group, impact assessments are systematically carried out on these emissions and, if necessary, actions are taken to limit their impact.

In 2010, SO_2 emissions were 99 kt. The Group set itself the target of not exceeding 49.5kt by 2020; it has met this target since 2017.

Chronic emissions into the atmosphere [(a)]	2018	2017	2016
SO_2 emissions *(kt)*	48	47	52
NO_x emissions *(kt)*	66	69	76

(a) Refer to point 5.11 of chapter 5 for the scope of reporting.

SO_2 emissions that are likely to cause acid rain are regularly checked and reduced.

(1) OCIMF (Oil Companies International Marine Forum): An industry forum including the leading worldwide oil companies. This organization manages, in particular, the Ship Inspection Report (SIRE) Programme, which holds and provides access to tanker and river barge inspection reports (Barge inspection Questionnaire – BIQ).

NO_X emissions, which are mainly concentrated in the Exploration & Production, are primarily located offshore and far away from the coast. Their impact on air quality is therefore considered to be minor.

Discharged water quality

In 2018, with regards to discharges to aquatic environments, all of the operated sites met the onshore discharge quality target set to restrict the impact on receiving environments.

	2018	2017	2016
Hydrocarbon content of offshore water discharges *(in mg/l)*	14.1	17.7	17.2
% of sites that meet the target for the quality of offshore discharges *(30 mg/l)*	96% [(a)]	100% [(a)]	100% [(a)]
Hydrocarbon content of onshore water discharges *(in mg/l)*	1.8	2.4	3.1
% of sites that meet the target for the quality of onshore discharges *(15 mg/l)*	100%	100%	100%

(a) Alwynn site (United Kingdom) excluded, as its produced water discharges only occur during the maintenance periods of the water reinjection system and are subject to a specific regulatory authorization.

In 2018, the percentage of sites conforming to the targets for quality of offshore discharges decreased due to a site acquired as part of the Mærsk Oil acquisition that exceeds the targets of the Group. The water discharge from this site is minor in terms of volume and represents less than 3% of the Group's global offshore discharge.

The improvement in the quality of onshore water discharges in 2018 is linked to a better performance of the waste water treatment plants at Anvers, Donges and Normandie Refineries and to the expiry of the Mahakam license in Indonesia.

Soil

The risks of soil pollution related to TOTAL's operations come mainly from accidental spills (refer to point 3.5.9.3.B of this chapter) and waste storage (refer to point 3.5.9.3.E of this chapter).

The Group's approach to preventing and managing these types of pollution is based on four key principles:

— preventing leaks, by implementing, as far as possible, industry best practices in engineering, operations and transport;

— carrying out maintenance at appropriate frequency to minimize the risk of leaks;

— overall monitoring of the environment to identify any soil and groundwater pollution; and

— managing any pollution from previous activities by means of containment and reduction or elimination operations.

In addition, a Group directive defines the following minimum requirements:

— systematic identification of each site's environmental and health impacts related to possible soil and groundwater contamination;

— assessment of soil and groundwater contamination based on various factors (extent of pollution inside or outside the site's boundaries, nature and concentrations of pollutants, presence of a vector that could allow the pollution to migrate, use of the land and groundwater in and around the site); and

— management of health or environmental impacts identified based on the use of the site (current or future, if any) and the risk acceptability criteria recommended by the World Health Organization (WHO) and the Group.

Lastly, decommissioned Group facilities operated by Group entities or affiliates (i.e., chemical plants, service stations, mud pits or lagoons resulting from hydrocarbon extraction operations, wasteland on the site of decommissioned refinery units, etc.) impact the landscape and may, despite all the precautions taken, be sources of chronic or accidental pollution. TOTAL created a policy of evaluation, treatment of environmental risks related to soil and groundwater and remediation of its sites at the end of their activity. In agreement with the authorities, the aim is to allow new operations to be set up once the future use of the land has been determined. Remediation operations are conducted by specialized entities created by the Group. At the end of 2018, 123 industrial sites that were no longer in operation (excluding service stations) were in the process of remediation.

Sustainable use of resources

Fresh water

The Group's activities, mainly those of Refining & Chemicals, and to a lesser extent those of the Exploration & Production, Gas, Renewables & Power segments, may potentially have an impact on, as well as be dependent of, water resources. This is especially true when an activity is located in a water resources sensitive environment.

Fully aware of these challenges, TOTAL implements the following water risk management actions:

1. monitor water withdrawals to identify priority sensitive sites and then carry out a risk assessment;
2. improve the water resources management depending on identified needs, by adapting the priority sites' environmental management system.

In order to identify the priority facilities, TOTAL records the withdrawal and discharge of water on all of its sites and assesses these volumes on the basis of the current and future water stress indicators of the WRI[(1)] Aqueduct tool (currently 9.7%[(2)] of fresh water withdrawals take place in a global water stress area).

In addition, TOTAL assesses water resources risk levels of priority facilities which are those that withdraw more than 500,000 m³ per year and are located in areas potentially exposed to water resource risks, using the Local Water Tool (LWT) for Oil & Gas from the Global Environmental Management Initiative (GEMI). This tool also helps to guide the actions taken to mitigate any risks in order to make optimal use of water resources on these sites.

Globally, the sites operated by the Group are not particularly exposed to water risk. By the end of 2018, out of the 24 priority sites identified, the level of water risk was assessed on 16 priority Group sites (11 Refining & Chemicals, 3 Exploration & Production, 2 Gas, Renewables & Power). Following this assessment, two sites were identified as being at risk and were reported to the CDP. This analysis process is expected to be extended to other current priority sites, including eight additional sites that have been identified.

In 2018, the Group answered the CDP Water survey for the 2017 period and was graded A-. The main indicator used in this reporting is aggregated withdrawal.

Water-related indicator [(a)]	2018	2017	2016
Fresh water withdrawals excluding cooling water and rain water *(million m³)*	116	116	123

(a) Refer to point 5.11 of chapter 5 for the scope of reporting.

Soil

TOTAL uses the ground surface that it needs to safely conduct its industrial operations and, in 2018, did not make extensive use of ground surfaces that could substantially conflict with various natural ecosystems or agriculture.

(1) World Resources Institute.
(2) According to CDP Water 2018 definition.

In 2018, the Group introduced a specific selection process concerning palm oil suppliers to ensure all palm oil purchases for the La Mède facility will be certified sustainable in accordance with European Union criteria (ISCC EU certification) and are conducted with a limited number of suppliers.

D) Not to harm biodiversity and ecosystems during projects and operations

TOTAL's activities may potentially be located in sensitive natural environments.

The Group is fully aware of this challenge and takes biodiversity and ecosystems into account during its projects and operations. In July 2018, and within the framework of the Act4Nature initiative, the Group made 16 biodiversity commitments to make this policy more tangible. The 16 commitments are described in the biodiversity brochure available on the website sustainable-performance.total.com. There are 10 general commitments common to all of the signatory companies and an additional 6 commitments specific to TOTAL, some of which existed before the initiative. These differentiate the Group from its competitors.

3.5.9.4 Climate

TOTAL's ambition is to become the responsible energy major. The Group is committed to contributing to the United Nations Sustainable Development Goals, particularly with regards to those subjects that are connected to climate change and the development of more available and cleaner energy for as many people as possible.

In order to make an effective contribution to the climate change issue, TOTAL relies on an organization and structured governance framework to make sure climate-related challenges are fully integrated into the Group's strategy. Consequently, the Group has a robust strategy and implements a structured risk management system.

In line with the multiple situations encountered in the field, and while supporting the Group's governance bodies, the Strategy and Climate division shapes the Group's approach to climate change while working with the operational divisions of the Group's business segments. By monitoring indicators, progress can be measured and the Group's actions can be adjusted.

A) Governance

TOTAL has an organization and structured governance framework to make sure climate-related challenges are fully integrated into the Group's strategy. Since September 2016, its organization includes a Strategy-Innovation corporate division, which includes the Strategy & Climate division as well as the Gas, Renewables & Power business segment, whose President is a member of the Executive Committee.

Oversight by the Board of Directors

TOTAL's Board of Directors ensures that climate-related issues are incorporated into the Group's strategy and examines climate change risks and opportunities during the annual strategic outlook review of the Group's business segments.

To carry out its work, the Board of Directors relies on its Strategic & CSR Committee, whose rules of procedure were changed in September 2017 then in July 2018 in order to broaden its missions in the realm of CSR and in questions relating to the inclusion of climate-related issues in the Group's strategy.

Aware of the importance of climate-change challenges faced by the Group, the Board of Directors decided, in 2016, to introduce changes to the variable compensation of the Chairman and Chief Executive Officer to take better account of the achievements of Corporate Social Responsibility (CSR) and the Group's HSE targets. For fiscal year 2018, the importance given to these criteria rose further: CSR performance is assessed by considering the extent to which climate issues are included in the Group's strategy, the Group's reputation in the domain of Corporate Social Responsibility as well as the policy concerning all aspects of diversity.

The Board of Directors meeting of March 13, 2019 decided to change the criteria for the determination of the variable portion of the Chairman and Chief Executive Officer's compensation for the year 2019. Among others, a quantifiable criteria related to the evolution of GHG emissions (Scopes 1 & 2) on operated oil & gas facilities (refer to chapter 4, section 4.3.2 for details).

Role of management

TOTAL's Chairman and Chief Executive Officer, in compliance with the long-term strategic direction set by the Board of Directors, implements the strategy of the Group and its business segments while making sure climate change challenges are taken into account. He relies on the President, Group Strategy-Innovation, who is a member of the Executive Committee, to whom the Senior Vice President Strategy & Climate, and the Senior Vice President Climate report (refer to the Group organization chart in chapter 1). The Senior Vice President Climate chairs the Climate-Energy steering Committee, which mainly includes representatives of Strategy and HSE management from the various business segments. The mission of this Committee consists of structuring the Group's approach to the climate.

B) Strategy

Identification of climate-related risks and opportunities

The identification of climate-related risks forms an integral part of the analysis of investment projects. The impact of these risks is also examined for the Group asset portfolio as a whole. These risks are presented in detail in point 3.1.2 of this chapter.

In order to ensure the viability of its projects and long-term strategy in light of the challenges raised by climate change, the Group integrates, into the financial evaluation of investments presented to the Executive Committee, either a long-term CO_2 price of \$30 to \$40 per ton (depending on the price of crude), or the actual price of CO_2 in a given country if higher.

TOTAL has five major levers to integrate climate in its strategy.

1) Improving energy efficiency

Optimizing the energy consumption of its operated facilities is TOTAL's first lever to reduce emissions. The Group therefore aims to improve the energy efficiency of its operated facilities by an average of 1% per year over the 2010-2020 period, at a time when exploration is becoming increasingly complex. This indicator is described in point 3.5.9.4.D of this chapter.

TOTAL uses appropriate architectures and equipment and introduces technological innovations. For example, on offshore production barges, offshore platforms and onshore facilities, heat recovery systems at gas turbine exhausts have been implemented thereby avoiding the need for furnaces or boiler systems.

2) Growing in natural gas

To respond responsibly to the strong rise in demand for electricity, TOTAL remains committed to gas, whose CO_2 emissions are half those of coal when used to generate electricity [(1)].

The Group wishes to be present throughout the whole gas chain, from production to end customer. Significant operations have taken place in the upstream and the downstream to make this possible. Upstream, TOTAL has acquired a stake in the giant Yamal LNG project in the north of Russia. The Group has also acquired the LNG assets of Engie. These two complementary portfolios allow for the management of a volume of nearly 40 Mt of LNG as from 2020. Downstream, the Group has made strategic acquisitions, such as Direct Énergie and Lampiris, gas and electricity suppliers on the French and Belgian markets, and has developed Total Spring, which was launched in 2017 on the French market.

(1) Source: International Reference Centre for the Life Cycle of Products, Processes and Services; Life cycle assessment of greenhouse gas emissions associated with natural gas and coal in different geographical contexts, October 2016.

Finally, TOTAL has committed itself to gas fuel for transport by acquiring a 25% stake in Clean Energy Fuels Corp., one of the leading distributors of gas fuel for HGVs in the United States, and by signing a contract with CMA-CGM, the first shipping company to equip its transcontinental container ships with LNG-powered engines.

Strengthening the position of gas in the energy mix must however be accompanied by a greater focus on control of methane emissions. To preserve the advantage that gas offers in terms of GHG emissions compared to coal for electricity generation, it is necessary to strictly reduce the methane emissions associated with the production and transportation of gas. In 2018, TOTAL's methane emissions are kept below 0.25% of the commercial gas produced[1]. TOTAL's target is to sustainably reduce the intensity of its methane emissions of its operated facilities in the Exploration & Production segment to less than 0.20% of commercial gas produced by 2025.

The Group has been a member since 2014 of the partnership between governments and industrial companies for the improvement of tools to measure and control methane emissions set up by the Climate and Clean Air Coalition and promoted by UN Environment and the non-profit organization Environmental Defense Fund. The Group also took several actions as part of the Oil & Gas Climate Initiative and signed the guiding principles on the reduction of methane emissions on the gas value chain[2].

3) Developing a profitable low-carbon electricity business

TOTAL is developing along the whole of the low-carbon electricity value chain, from electricity generation, storage and sale to the end customer. As demand for electricity is expected to grow strongly in the coming decades, TOTAL intends to become a major player in this segment. To meet this target, TOTAL plans to invest $1.5 to $2 billion per year. In 2018, the Group completed the acquisition of Direct Énergie, a French electricity supplier, for nearly €2 billion. With regards to the generation of electricity, TOTAL aims at holding a production capacity of 10 GW of low-carbon electricity by 2023. In 2018, TOTAL acquired four combined-cycle natural gas power plants in France with a global capacity of 1.6 GW. Refer to chapter 2 for further information on recent acquisitions.

4) Developing sustainable biofuels

A pioneer in biofuels for more than 20 years, TOTAL is now one of Europe's major actors with 2.4 Mt[3] blended sustainable biofuels in 2018 for a worldwide distribution of 3.2 Mt.

Furthermore, TOTAL produced 0.1 Mt of sustainable biofuels in its refineries in 2018. Production at La Mède factory is scheduled to start in 2019. It has a capacity of 0.5 Mt per year of hydrotreated vegetable oil (HVO) based on sustainable certified charges, the Group intends to reach a market share of over 10% in Europe. Biofuels that are currently available are mainly made with vegetable oil and sugar.

For more than 10 years, TOTAL's R&D teams have developed technologies that have broadened the range of usable resources, while also meeting the need for sustainability. The consortium BioTFuel is working on, for example, the development of lignocellulose (plant waste).

5) Investing in carbon sink businesses

Carbon storage is key to achieving carbon neutrality in the second half of the 21st century. TOTAL is focusing, on the one hand, on developing CCUS and, on the other, on preserving and restoring the capacity of ecosystems to act as carbon sinks. CCUS is vital for several industries, especially those that emit massive amounts of CO_2 due to the nature of their business (cement, steel, etc.). TOTAL allocates significant resources to this area by dedicating up to 10% of the Group's R&D budget to it. Several projects have made substantial progress in recent months. Northern Lights (Norway) is a project in which the Group participates alongside Equinor and Shell. TOTAL is also a partner of the Clean Gas Project (UK), together with the OGCI's investment fund and a few companies of the sector[4].

TOTAL announced in February 2019 the creation of an entity dedicated to investments in natural carbon sinks, composed of experts in environment and agronomy, with an investment budget $100 million per year from 2020 onwards. Furthermore, actions of preservation and restoration of the forest are currently conducted (refer to point 5.9 of chapter 5 where presented the Total Foundation program carried mainly by the *Fondation d'entreprise Total*).

Sector initiatives and international framework

TOTAL is also in various sector initiatives on the main challenges raised by climate change. Indeed, tackling climate change requires cooperation between all actors, from both public and private sectors.

Thus, in 2014, TOTAL decided to join the call of the UN Global Compact, which encourages companies to consider a CO_2 price internally and publicly support the importance of such a price via regulation mechanisms suited to the local context. In particular, TOTAL advocates the emergence of a balanced, progressive international agreement that prevents the distortion of competition between industries or regions of the world. Drawing attention to future constraints on GHG emissions is crucial to changing the energy mix. TOTAL therefore encourages the setting of a worldwide price for each ton of carbon emitted, while ensuring fair treatment of "sectors exposed to carbon leakage" (as defined by the EU). In addition, TOTAL is working with the World Bank as part of the Carbon Pricing Leadership Coalition (CPLC). In June 2017, TOTAL became a founder member of the Climate Leadership Council, an initiative that calls for the introduction of a "carbon dividend", namely, a redistribution mechanism that would tax the biggest fossil fuel consumers (a population's wealthiest citizens) in order to pay a dividend to the entire population.

In 2014, TOTAL was actively involved in launching and developing the Oil & Gas Climate Initiative (OGCI), a global industry partnership. At year-end 2018, this initiative involved 13 major international energy players. Its purpose is to share experiences, advance technological solutions and catalyze meaningful action in order to assist the evolution of the energy mix in a manner that takes into account climate change issues. Launched in 2017, the OGCI Climate Investments fund, which has access to over $1 billion over 10 years, invests in technology that significantly cuts emissions. The fund's initial investments notably are: a large-scale industrial CO_2 capture and storage project (Clean Gas Project); a solution that reduces the carbon footprint of cement by using CO_2 instead of water to set concrete (Solidia Technologies); a high-efficiency opposed-piston engine that reduces GHG emissions (Achates Power) and a technology that incorporates CO_2 as a raw material in the production of polyols used in polyurethanes, which are plastics that have multiple uses (Econic Technologies).

(1) Refer to the OGCI methodology for methane intensity calculation: http://oilandgasclimateinitiative.com/blog/methodological-note-for-ogci-methane-intensity-target-and -ambition.
(2) "Guiding Principles on Reducing Methane Emissions across the Natural Gas Value Chain".
(3) Physical volume of biofuels in equivalent ethanol and esters according to the rules defined by the European RED Directive, excluding volumes sold to third parties via trading.
(4) BP, ENI, Equinor, Occidental Petroleum and Shell.

The Group also plays a role in various international initiatives that involve the private and the public sectors to bring about (non-exhaustive list):

- carbon pricing within Caring for Climate – United Nations Global Compact, and the Paying for Carbon call;
- the end of routine flaring of gas associated to oil production within the World Bank's Zero Routine Flaring by 2030 initiative;
- greater transparency, while taking into account the recommendations of the G20 Financial Stability Board on climate, and of the Task Force on Climate-related Financial Disclosures (TCFD);
- the development of new state-of-the-art energy companies, since 2017 within the Breakthrough Energy Coalition (BEC), a group of investors created by Bill Gates in 2015, and since 2016 within the Breakthrough Energy Ventures, a $1 billion fund created in 2016 by the BEC.

C) Targets and metrics to measure climate-related risks

TOTAL has set itself targets and introduced a number of indicators to coordinate its performance.

The Group's climate targets:

- an 80% reduction of routine flaring[1] on operated facilities between 2010 and 2020 in order to eliminate it by 2030;
- an average 1% improvement per year in the energy efficiency of operated facilities between 2010 and 2020;
- a sustainable reduction in the intensity of the methane emissions of the Exploration & Production segment's operated facilities to less than 0.20% of gas produced for sale, by 2025;
- a GHG emission reduction (Scopes 1 & 2) on operated oil & gas facilities of 46 Mt CO_2e in 2015 to less than 40 Mt CO_2e in 2025.

What has been accomplished:

- more than 80% reduction in routine flaring between 2010 and 2018;
- more than 10% improvement in energy efficiency between 2010 and 2018;
- an intensity of the methane emissions below 0.25% of the commercial gas produced in 2018;
- a GHG emission reduction (Scopes 1 & 2) on operated oil & gas facilities from 46 Mt CO_2e to 42 Mt CO_2e between 2015 and 2018.

Indicators related to climate change

		2018	2017	2016	2015
SCOPE 1 Direct greenhouse-gas emissions (operated scope)	**Mt CO_2e**	**40**	**38**	**41**	**42**
Breakdown by segment					
Exploration & Production	Mt CO_2e	18	17	19	19
Gas, Renewables & Power	Mt CO_2e	2	0	0	-
Refining & Chemicals	Mt CO_2e	21	21	22	22
Marketing & Services	Mt CO_2e	< 1	< 1	< 1	< 1
SCOPE 1 Direct greenhouse-gas emissions based on the Group's equity interest	Mt CO_2e	54	50	51	50
SCOPE 2 Indirect emissions attributable to energy consumption by sites	**Mt CO_2e**	**4**	**4**	**4**	**4**
GHG emissions (Scopes 1 & 2) on operated oil & gas facilities	**Mt CO_2e**	**42**	**41**	**45**	**46**
Net primary energy consumption (operated scope)	TWh	143 (a)	142	150	153
Group energy efficiency indicator	Base 100 in 2010	88.4	85.7	91.0	90.8
Daily volume of all flared gas (Exploration & Production operated scope) (including safety flaring, routine flaring and non-routine flaring)	Mm^3/d	6.5	5.4	7.1	7.2
Of which routine flaring	Mm^3/d	1.1	1.0	1.7 (b)	2.3 (c)

(a) Excluding primary energy consumption of Direct Énergie gas power plants.
(b) Estimated Volume at end 2016 based on new definition of Routine Flaring published in June 2016 by the Working Group Global Gas Flaring Reduction.
(c) Volumes estimated upon historical data.

All this data as well as the related risks are also reported to the CDP once a year, and TOTAL's response to the CDP Climate Change questionnaire is posted on the Group's website (sustainable-performance.total.com). For its 2018 reporting regarding 2017 activities, the Group received an A-.

Flaring

Reducing routine flaring has been a long-standing target of the Group, which designs its new projects without resorting to it. In addition, TOTAL is committed to putting an end to routine flaring of its operated facilities by 2030. An 80% reduction target was set for 2020 compared to 2010, in other words, an average of 1.5 Mm^3/d. This target has been met since 2017.

Furthermore, as part of the Global Gas Flaring Reduction program, TOTAL has worked alongside the World Bank for over 10 years to help producing countries and industrial players control flaring of gas associated to oil production.

The increase in flaring linked to oil production in 2018 is due to acquisition and startup of new sites.

(1) Routine flaring, as defined by the working group of the Global Gas Flaring Reduction program within the framework of the World Bank's Zero Routine Flaring initiative.

Energy efficiency

One of the Group's performance targets is to better control energy consumption. Since the beginning of 2013, a Group directive has defined the requirements to be met at operated sites using more than 50,000 tons of oil equivalent per year of primary energy (approximately 40 sites). At end 2018, all the concerned sites reported compliance or had taken steps to comply with this directive. The aim is to ensure that 100% sites using more than 50,000 tons of oil equivalent per year by the end of 2020 have an Energy Management System auditable, such as the ISO 50001 on energy management[1]. A certain number of sites that use less energy have, voluntarily, taken measures to become ISO 50001 certified.

Energy efficiency is a key factor for the improvement of economic, environmental and industrial performance. Since 2013, the Group has used a Group Energy Efficiency Index (GEEI) to assess its performance in this area. It consists of a combination of energy intensity ratios (ratio of net primary energy consumption to the level of activity) per business.

The Group's target for the 2010-2020 period is to improve the energy efficiency of its operated facilities by an average of 1% per year. By design, the base value of the GEEI was defined as 100 in 2010 and the target is to reach 90.4 in 2020. This target has been met since 2017.

Through the "Total Ecosolutions" program, the Group is developing innovative products and services that perform above market standards on the environmental front. At year-end 2018, 97 products and services bore the "Total Ecosolutions" label. The CO_2 eq emissions avoided throughout the life cycle by the use of "Total Ecosolutions" products and services, compared to the use of benchmark products on the market and for an equivalent level of service, are measured annually based on sales volumes. This represented 1.75 Mt CO_2e in 2018.

GHG emissions

The Group has reduced by 25% the GHG emissions produced by its operated activities since 2010. This reduction was reached thanks to notably reducing flaring and improving energy efficiency.

In February 2019, TOTAL announced a target to decrease the GHG emissions (Scopes 1 & 2) on its operated oil & gas facilities to less than 40 Mt CO_2e in 2025.

3.5.9.5 Contractors and suppliers

TOTAL's activities generate hundreds of thousands of direct and indirect jobs worldwide. Present in more than 130 countries, the Group currently works with a network of more than 100,000 suppliers of goods and services worldwide. In 2018, the Group's purchases of goods and services (excluding petroleum products and vessel chartering by Trading & Shipping) represented approximately $29 billion[2] worldwide. The allocation of expenditures on the Group level is approximately 32% for goods (products, materials, etc.) and approximately 68% for services (in particular consulting services, work with supply of materials, transport, etc.).

TOTAL's success as a responsible company is played out all along its value chain, and the Group is convinced of the importance of working with suppliers that respect human rights and take care of their employees. The Group expects its suppliers to adhere to principles equivalent to those in its own Code of Conduct, as set out in the Fundamental Principles of Purchasing directive. To this end, the Group wanted the management of its supplier relations to be coordinated by the dedicated cross-functional "Total Global Procurement" entity, which is tasked, in particular, with delivering Purchasing services and assisting the Group's entities and sites, mainly in Exploration & Production, Refining & Petrochemicals, Marketing & Services and Gas, Renewables & Power. This approach is complemented by employee training programs and actions to raise awareness amongst the Group's partners, customers and suppliers. Its success is also based on TOTAL's involvement in international initiatives or collaborative approaches specific to the energy sector that promote the emergence of good practices.

A) The Group's responsible procurement policy

The Group ensures that contractual conditions are negotiated in an equitable manner with its suppliers. The Code of Conduct restates this requirement and the three essential principles that guide TOTAL's relations with its suppliers: dialogue, professionalism and the fulfillment of commitments.

These principles are also set forth in the Fundamental Principles of Purchasing, launched in 2010, that specify the commitments that TOTAL expects its employees and suppliers to adhere to in the following areas: respect for human rights at work, the protection of health, safety and security, preservation of the environment, prevention of corruption, and conflicts of interest and the fight against fraud, respect for competition law, as well as the promotion of economic and social development. These principles were drawn up in keeping with the fundamental principles defined in particular in the United Nations Universal Declaration of Human Rights, the conventions of the International Labor Organization, the United Nations Global Compact and the OECD Guidelines for Multinational Enterprises.

Furthermore, a Sustainable Procurement road map defines TOTAL's guidelines in this area. A Sustainable Procurement Committee regularly brings together the Management Committee of Total Global Procurement and the Civil Society Engagement (including the Human Rights Department), HSE and Legal divisions as well as the Ethics Committee. It is tasked with monitoring the implementation of the Group's Sustainable Procurement road map.

Employee awareness-raising actions and training

TOTAL has set up a number of channels of communication to raise employee awareness of the risks and issues related to its supply chain. Training modules explaining the Group's ethical commitments and the Fundamental Principles of Purchasing have been developed for and made available to Group procurement representatives. In 2018, 196 procurement representatives were trained on respect of human rights and working conditions by suppliers, and 250 on anti-corruption rules.

The Group provides its procurement representatives with supporting materials, such as the "Sustainable Purchasing Awareness Cards" that recap human rights at work and identify the purchaser practices that must alert them. A set of communication tools intended to help procurement representatives to enter discussions on the Fundamental Principles of Purchasing was also distributed within Total Global Procurement. The materials used in the annual performance review have been revised to include a section on human rights.

In June 2018, the International Procurement Days brought together the 170 procurement representatives present in 41 countries. The Fundamental Principles of Purchasing were distributed during the event and the internal supplier qualification and audit processes were presented.

With respect to the development of good practices in business relations, TOTAL also launched an initiative to raise its employees' awareness of mediation as an alternative method for resolving disputes. Since 2013, a training day run by professional mediators to raise awareness of mediation has been organized in French and English. In 2017, an open day for employees of the Group, lawyers and suppliers, enabled participants to learn about the benefits of mediation. A brochure designed to increase awareness of the mediation process is available to all Group employees. In addition, an email address is available on the Group website (under "Suppliers"). The Group's suppliers can contact the internal supplier mediator using a generic email address (mediation.fournisseurs@total.com). The internal mediator is tasked with facilitating relations between the Group and its French and international suppliers. The general purchasing terms and conditions also mention the possibility of recourse to mediation.

(1) The ISO 50001 standard accompanies the implementation in companies of an energy management system that allows a better use of energy.
(2) $25 billion excluding Hutchinson, SunPower and Saft Group.

B) Extension of the Group's policy to the supply chain

TOTAL expects its suppliers to:

- adhere to the Fundamental Principles of Purchasing and ensure that they are adhered to in their activities;
- accept to be audited according to these principles;
- remain attentive to the everyday working conditions of their employees and their suppliers' employees;
- ensure that their own suppliers and subcontractors adhere to these Fundamental Principles of Purchasing;
- refer to the Group Ethics Committee when in doubt or in the event of any malfunction.

The rules set out in these Principles must be included or transposed into the agreements concluded with suppliers. To this end, these Principles are available for consultation by all suppliers in both French and English on TOTAL's website (under "Suppliers").

The supplier qualification process

The supplier qualification process was harmonized at Group level in 2017 by Total Global Procurement. A new internal framework was published in 2018. A new computerized qualification tool will gradually be rolled out starting in 2019, with a planned scope of 107 countries thus far.

It will be used to automate and document the supplier qualification process, which unfolds in four stages:

1. confirmation of interest;
2. a risk pre-analysis to decide whether an in-depth analysis of each criterion is necessary (HSE, anti-corruption, societal, financial, technical);
3. determination of the qualification status;
4. monitoring and renewal of qualification. Qualifications are valid for three years.

The supplier assessment process

Simultaneously, the Group has set up a supplier assessment process to identify and prevent risks of severe impacts on human rights and fundamental freedoms, human health and safety. Thus, since 2016, the Group started conducting campaigns to audit working conditions amongst its suppliers. These audits are conducted by a specialized service provider, with which TOTAL signed a framework contract in 2016.

Since 2017, the Group has been rolling-out specific training for Group purchasers to evaluate suppliers with respect to human rights.

Moreover, in September 2018, TOTAL, BP, Equinor and Shell announced their intention to develop a common collaborative approach to assess the respect of human rights by their suppliers. The partner companies are convinced of the importance of working with suppliers that respect human rights, on the one hand, and take good care of their employees, on the other. The goal of this common approach is to encourage the improvement of working conditions in the supply chain of the companies involved. This initiative addresses the United Nations SDG N° 8: "to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all".

Supplier awareness-raising actions

The deployment of the anti-corruption policy in purchasing continued in 2017 with awareness-raising sessions for strategic suppliers at the Suppliers Day. This event gathered more than 100 suppliers that are considered to be strategic in view of their contribution to Group operations. In addition to numerous initiatives taken in previous years, in 2018 approximately 229 suppliers underwent an anti-corruption analysis through the issuing of specific questionnaires, completed, in some cases, by external inspections.

Every year, one of the departments of the IPO (TOTAL IPO in Shanghai, China) organizes a compliance day and invites one of its approved suppliers. It can explain the actions it takes regarding anti-corruption compliance, the concrete problems encountered and how it deals with them. The discussions, based on case studies and topical issues, are enlightening for all. In 2018, this event was held in December (refer also to point 5.8.1 of chapter 5).

Finally, pursuant to Rule 13p-1 of the Securities Exchange Act of 1934, as amended, which implemented certain provisions of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, TOTAL has submitted since 2014 to the SEC an annual document relating to "conflict minerals"(1) sourced from the Democratic Republic of the Congo or an adjoining country. The document indicates whether, during the preceding calendar year, any such minerals were necessary to the functionality or production of a product manufactured (or contracted to be manufactured) by the TOTAL S.A. or one of its affiliates had. The main objective of the rule's obligation to publish this information is to prevent the direct or indirect funding of armed groups in central Africa. For more information, refer to TOTAL's most recent publication available at: sustainable-performance.total.com or www.sec.gov.

C) The Group's responsible procurement commitments

Since 2010, TOTAL is a signatory to the French Economy and Finances Ministry's Sustainable Supplier Relations Charter, which aims to allow more sustainable and balanced relations between customers and suppliers.

Worldwide, a CSR global agreement monitoring Committee (known as the "FAIR Committee") meets every year in the presence of representatives who are members of trade unions affiliated with the IndustriALL Global Union and appointed by this federation to monitor and implement the agreement. It identifies good practice and areas for improvement. In application of the areas for improvement defined by this Committee, the programs mentioned earlier have already been set up: Suppliers Day, International Procurement Day and trainings in human rights for purchasers.

Since 2018, TOTAL has been a member of the United Nations Global Compact platform on Decent Work in Global Supply Chains, and, in this capacity, takes part in various workshops that aim to help the member companies of the Global Compact to make progress in this area. In December 2018, the Group committed to pursuing its efforts in terms of decent work and respecting human rights in its supply chain by signing the "Six Commitments" of the United Nations Global Compact.

The Group's buyers also take part in international working groups on responsible procurement. TOTAL is an active member of IPIECA's Supply Chain Working Group. Building on the workshops held since 2015, TOTAL continued to participate in the Operationalization of the UN Guiding Principles work organized by the IPIECA, aimed at both oil and gas companies and engineering, procurement and construction (EPC) contractors.

Finally, the Group pays special attention to the disabled and protected employment sectors. In France, the Group's purchases from this sector enabled the achievement of an indirect employment rate of nearly 1% in 2018. TOTAL is a member of the Pas@Pas association and provides its buyers with an online directory that can be used to identify potential suppliers and service providers (disabled or protected employment sectors) by geographical area and by category (refer to point 5.3.5.3 in chapter 5).

(1) Rule 13p-1 defines "conflict minerals" as follows (irrespective of their geographical origin): columbite-tantalite (coltan), cassiterite, gold, wolframite as well as their derivatives, which are limited to tantalum, tin and tungsten.