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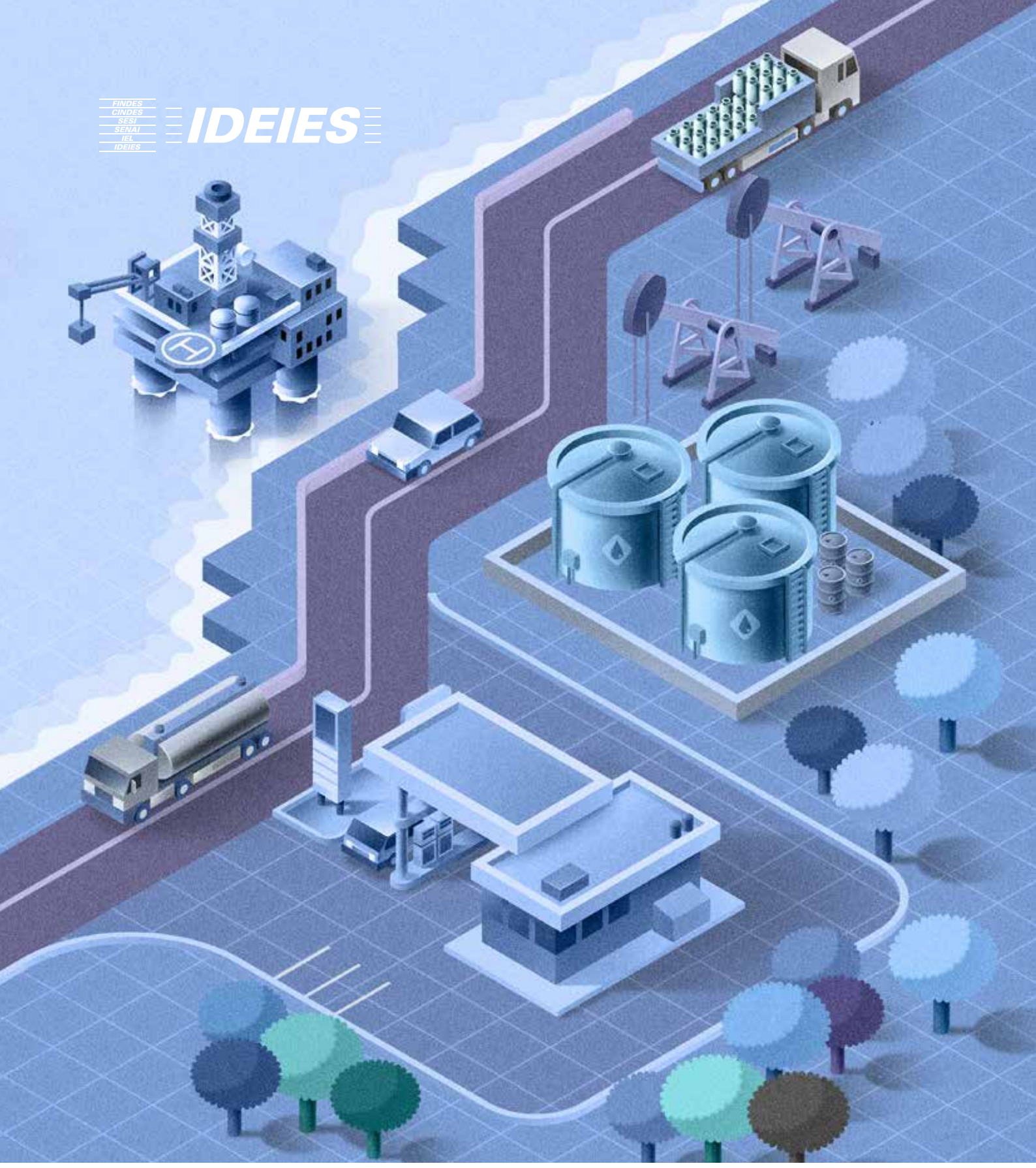

2018

ESPÍRITO SANTO OIL INDUSTRY YEARBOOK

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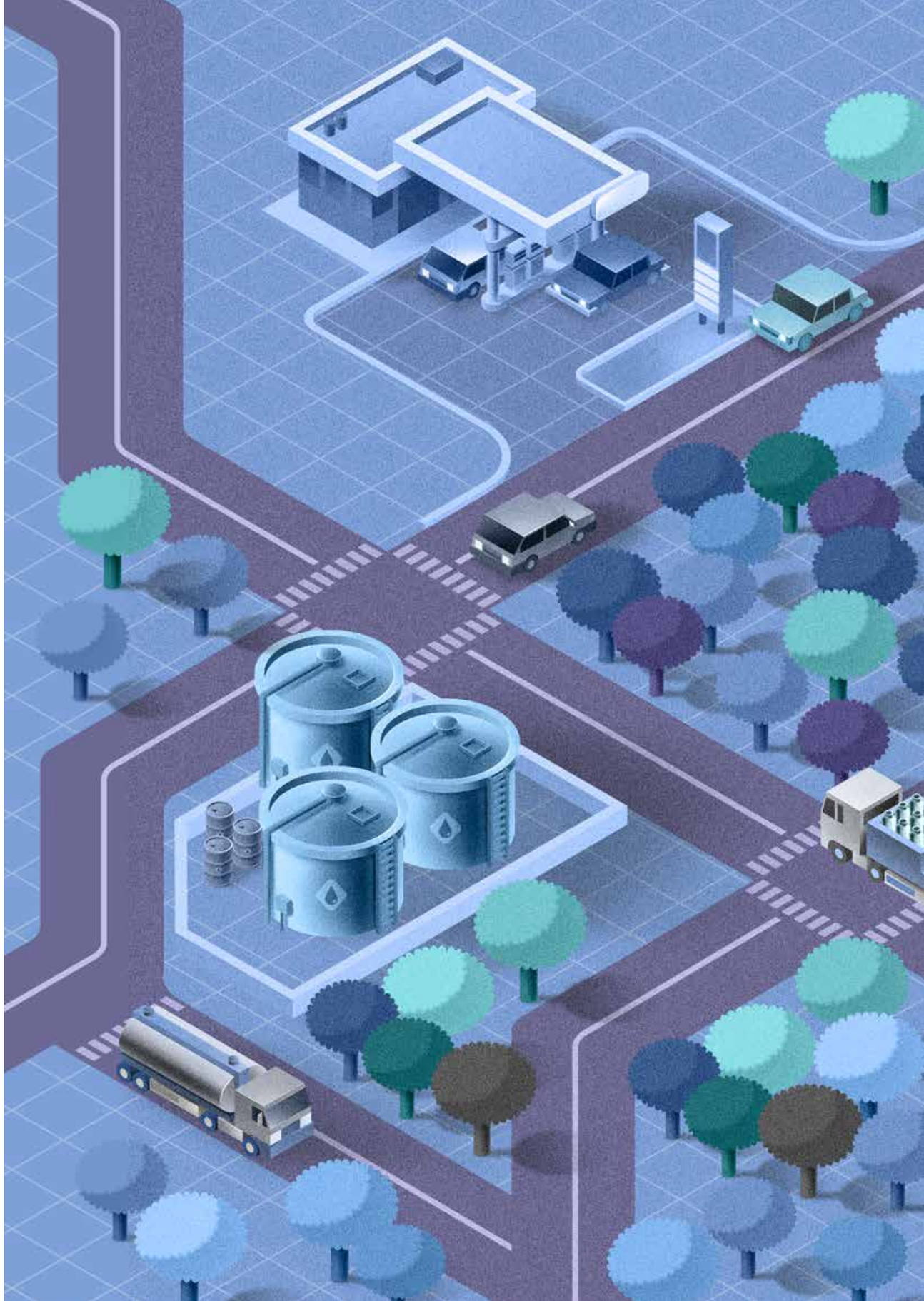

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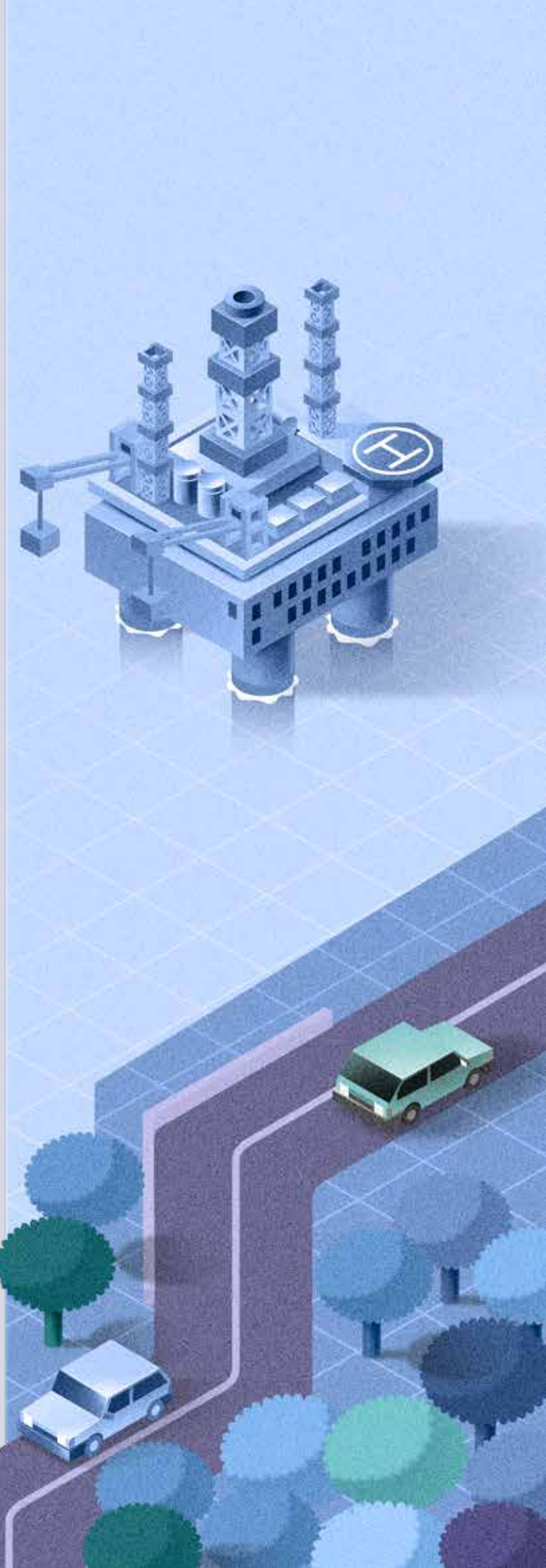


INTRODUCTION

The discovery of pre-salt is a milestone in the national industry. After findings of gigantic reservoirs in 2006 at the Santos Basin and, later on, at the Campos Basin, the oil industry development became a protagonist in the Brazilian industrial scenario. On one hand, this "protagonism" reflects optimization in well drilling activities. The certainty of the pre-salt's existence reduced the risks in drilling activities, reflecting production scale changes for extraction activities.

On the other hand, since this was a great national discovery, with the mastering of Brazilian technology, there are great investment opportunities for the whole chain in the country. Therefore, the existence of pre-salt demands the development of innovation centers that may foster and enable more competitiveness in the sector.

In Espírito Santo, the O&G extraction accounts for 30% of the industrial transformation value (VTI, in Portuguese), the largest industry in the state. In 2006 the state oil production represented 3.6% of the total national value. In 2017 this participation grew to 14.4%, with 137.8 million oil barrels. Regarding pre-salt, in 2010 the state oil production was 22.6 thousand barrels/day, and in 2017 this production grew to 195.4 thousand barrels/day, an impressive increase of 30%. Also in 2017, Espírito Santo received approximately, BRL 2.2 billion in royalties and special participations, from which BRL 1.4 billion were allocated to the state government and the rest to the municipal governments.

All things considered and, with the relevance of the oil chain for the industry, important state actors created the Espírito Santo Oil and Gas Forum (FCP&G) in 2013 to provide support to the local supply chain of the O&G sector. The state government, the federation of industries, with the role of executive secretariat, and the oil companies Petrobras, Shell, Prysmian group and Equinor are all members of this forum. Recently, FCP&G launched a catalog of suppliers (base industries, service providers and trade representatives) to provide them with opportunities to take part in competitive tenders of oil companies. It is a simple but necessary initiative for the strengthening of the supply chain in the Espírito Santo's oil and gas sector.

In this context, the Espírito Santo Oil Industry Yearbook – 2018 aims at disclosing the main data from the sector and analyzing the evolution of this important industry for the state of Espírito Santo, revealing opportunities and challenges until 2017.

To contextualize the national oil industry and the role of Brazil in international affairs, the first chapter analyzes the global scenario of the oil industry under the following standpoints: reserves, production, refinement capacity, consumption of the countries and a forecast for the consumption of oil and other sources of energy in the next few years.

The second chapter brings information on the development of the oil industry in Espírito Santo, comparing it to Brazil and to other states. In this session, it is possible to analyze the evolution of the reserves, the drilling activity and the production on the onshore and offshore fields in the state, as well as the performance of variables which may affect the trajectory of the oil and gas sector in the state.

Then, the third chapter displays the economic impacts of the development in the oil and gas sector for the job market, describing the singularities of this sector in Espírito Santo, and the analysis of oil exports from the state. The chapter also shows the evolution of special participation and royalty incomes, both for the state and the municipalities.

Focusing on the RD&I clause, the fourth chapter highlights the research, development and innovation (RD&I) information, exploring the relationship among the agents that work in the oil and gas sector, as well as the access barriers to the resources provided by the clause in the state. The role of the National Agency of Petroleum, Natural Gas and Biofuels (ANP) and the research funding agencies are also explored in this chapter.

Lastly, the fifth chapter shows the importance of promoting rounds for the maintenance of oil production and the consequent economic development. There is also an analysis of the bidding rounds of oil blocks in which Espírito Santo took part, besides revealing opportunities for the state in the next rounds organized by ANP.

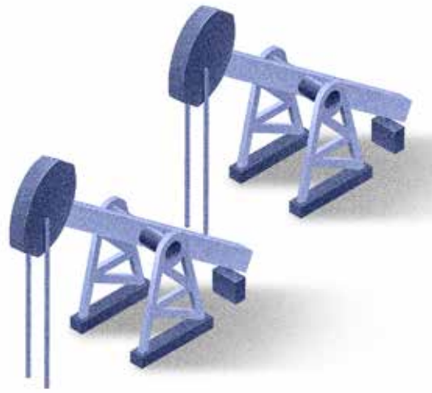
In summary, the Espírito Santo Oil Industry Yearbook – 2018 shows the importance of the oil industry for the economic development of the state and identifies the future perspectives for the sector, allowing companies to support their investment decisions, and redirect their business plans.

The data and information contained and analyzed here are public and made available by the National Agency of Petroleum, Natural Gas and Biofuels (ANP), the Annual List of Social Information (Rais) and the Ministry of the Industry, Foreign Trade and Services (MDIC). The complete version of this document can also be accessed at Ideies website: www.ideies.org.br.

Marcelo Saintive
Executive director

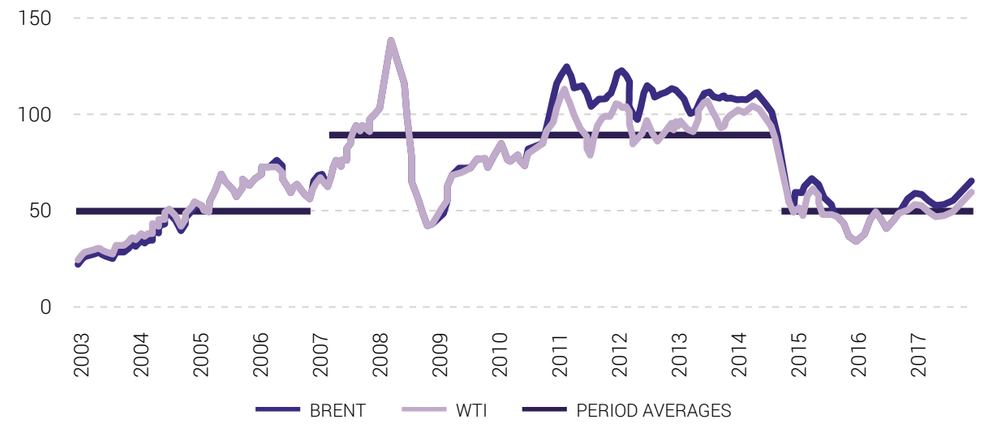
Chapter 1

INTERNATIONAL OVERVIEW



A key piece in several industrial segments, oil is one of the most important inputs in the global economy, playing a strategic role in commercial relationships among countries. The oil price, as most commodities, varies according to the oscillations between supply and demand, also depending on the economic and geopolitical movements of the countries in production. Thus, when we talk about oil, regardless of the geographic snapshot, it undeniably requires a discussion on how the reserves are distributed around the world; what is the production capacity of these countries; and what is the consumption level and what is the refinement capacity of these countries as well. The reserves, the production, the consumption and the refinement of oil associated with the global economy and geopolitics influence the oil price.

Chart 1 – Oil price (USD per barrel)



Source: Investing.com. Elaboration: Ideies/Findes System.

Between 2003 and 2007, the growth in global economy resulted in an increase in the oil price. In June 2008, the barrel of WTI (West Texas Intermediate) reached USD 140 and, seven months later, it was only USD 42 (January 2009). This sudden decrease was a reflection of the 2008 crisis (subprime), which negatively impacted the expectations towards the global economy. Between 2009 and 2014, the appreciation of the oil price reflected the successive deals of OPEC[1] – which decreased the offer of oil in the world – and the improvement in global economy, especially the good results in China and the United States.

The post-2014 period was marked by a reduction in the level of oil barrel prices in consequence of the larger volume of oil production in the world, especially in OPEC countries[2].

1.1 Oil Reserves in the World

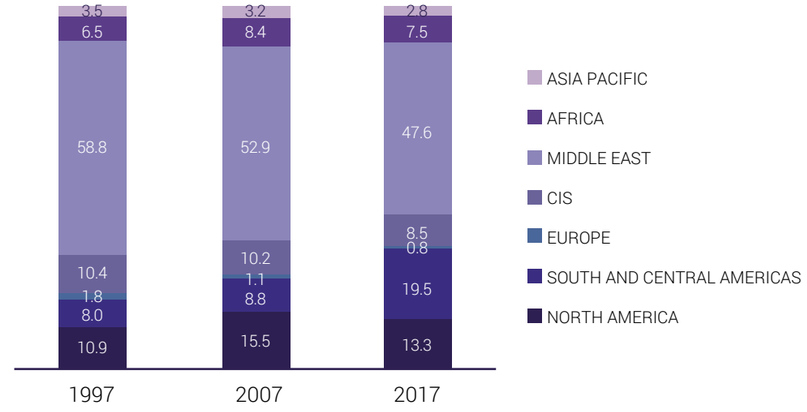
The proved reserves in the world are mostly concentrated in the Middle East (47.6%), Central and South America (19.5%) and North America (13.3%), as seen in chart 2. Individually, the countries with the largest volumes of proved reserves are Venezuela (303.18 billion barrels), Saudi Arabia (266.21 billion barrels), Canada (168.92 billion barrels), Iran (157.20 billion barrels) and Iraq (148.77 billion barrels), as displayed on chart 3.

At the turn of 2016 to 2017, the oil reserves in the world suffered a 0.03% decrease, reaching a total of 1.7 billion oil barrels. However, in the 20 previous years (1997-2017), the average annual increase of these reserves was 1.9%, explained by the growth in the reserves of the Americas (4.7%/year), Africa (2.6%/year) and the Middle East (0.8%/year), highlighting the performance of reserves in Venezuela (6.9%/year), Canada (6.1%/year), Ecuador (4.1%/year), Brazil (3.0%/year), Sudan (9.1%/year) and Angola (4.6%/year).

[1] International organization created in 1960 at the Conference of Bagdad, which aims at coordinating in a more centralized way the oil policy from the member countries, which are: Argelia, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates and Venezuela.

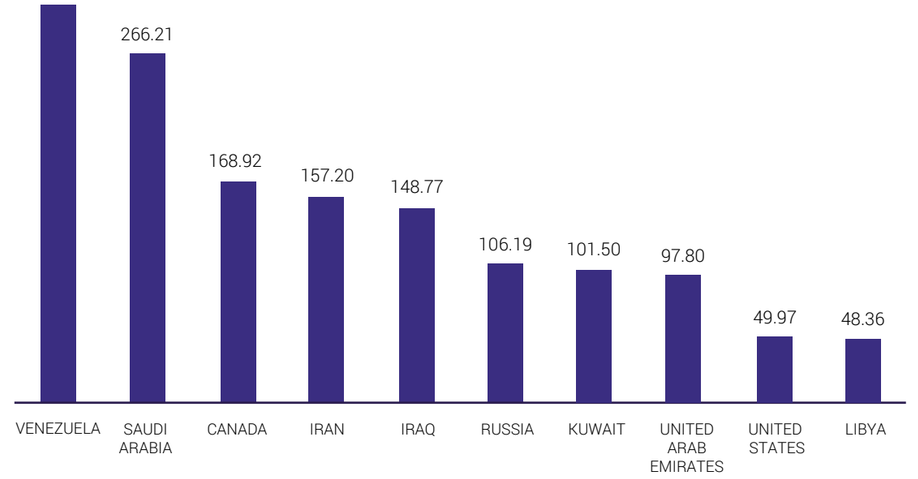
[2] Between 2008 and 2014, the average price of WTI (West Texas Intermediate) oil barrel was USD 88.9 and the Brent price was USD 96.0. In the period between 2015 and 2017, WTI had an average price of USD 48.5 and Brent, USD 52.0.

Chart 2 – Participation in the total quantity of proved oil reserves per region (%)



Source: BP Statistical Review of World. Elaboration: Ideies/Findes System.

Chart 3 – Major owners of proved reserves (billions of barrels) – 2017



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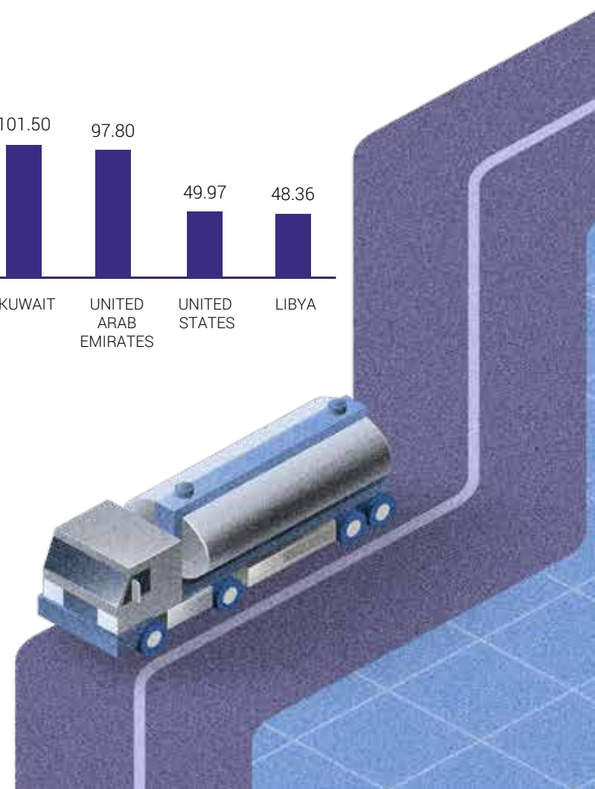
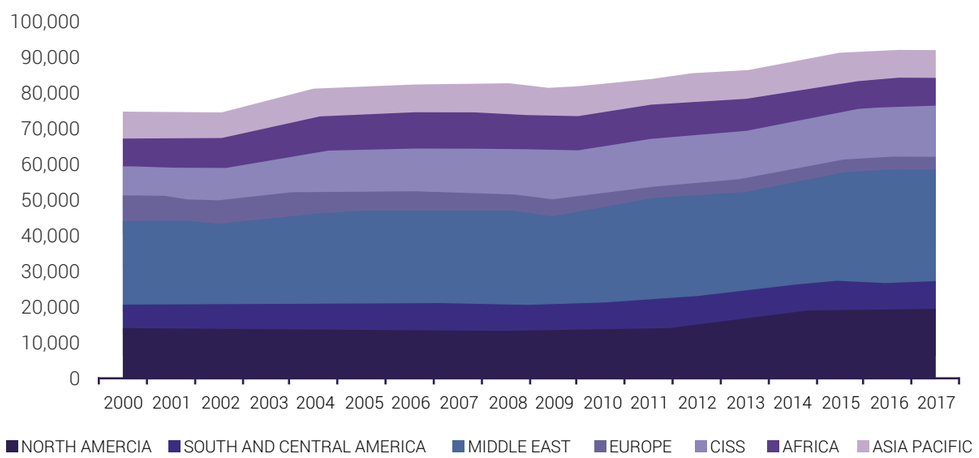


1.2 Oil Production in the World

The global oil production increased 0.7% in 2017, reaching 92.6 billion barrels/day, only 0.6 billion barrels/day above the values observed in 2016. The African continent displayed the biggest variation (+5.0%), from 7.7 billion barrels/day in 2016 to 8.1 billion in 2017. With a behavior contrary to the one displayed by the Brazilian production (+4.8%) in this period, Central America and South America recorded a 3.2% decrease, especially due to the reduction in Venezuelan production (-11.6%).

After an expressive increase of 6.1% in 2016, the oil production in the Middle East dropped 0.8% in 2017, with a production decrease in six countries: Kuwait (-3.8%), Oman (-3.4%), Qatar (-2.7%), Saudi Arabia (-3.6%), Syria (-1.6%) and the United Arab Emirates (-2.1%). The explanation for this decrease is connected to the successive conflicts in the region and the OPEC policies that directly impact the level of oil supply.

Chart 4 – Oil production per region (thousands of barrels/day)



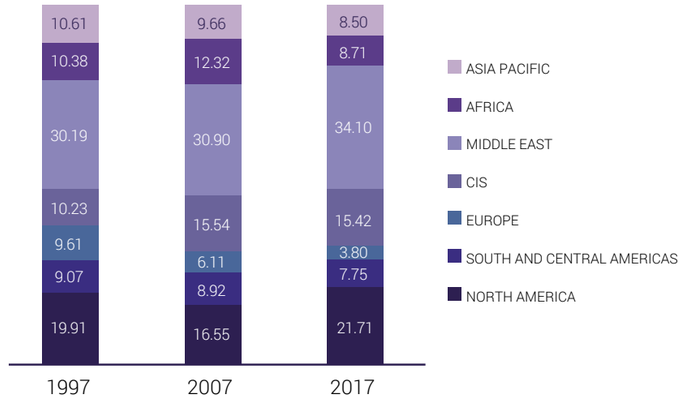
Source: BP Statistical Review of World. Elaboration: Ideies/Findes System.

With a slightly different distribution of proved reserves (section 1.1), the most relevant participations in the global oil production are concentrated in the Middle East (34.1%), in North America (21.7%) and the Community of Independent States - CIS[3] (15.4%). The South and Central America, even though they have 19.5% of the proved reserves in the world, are in charge of only 7.8% of the global oil production. .

The ten biggest oil producing countries in the world represent 69.2% of the crude oil available, highlighting the United States (14.1%), Saudi Arabia (12.9%) and Russia (12.1%).

Even though Venezuela has 17.9% of the proved oil reserves in the world, it is only responsible for 2.3% of the world production. The United States, in turn, have only 2.9% of the global oil reserves, but are responsible for 14.1% of the world production.

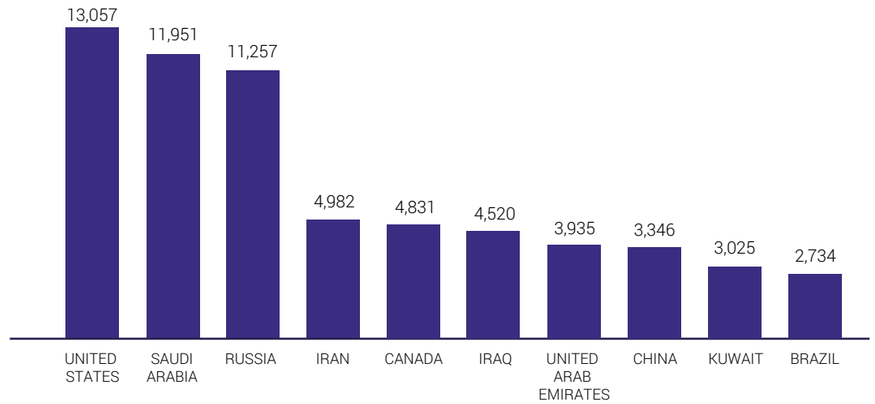
Chart 5 – Participation in the total oil production per region (%)



Source: BP Statistical Review of World. Elaboration: Ideies/Findes System.

Between 2008 and 2017, the average annual growth in the American oil production was 6.8%, higher than Saudi Arabia (1.1%/year), the second biggest oil producer in the world. A possible explanation for this movement is the incentive given by the North American government for the exploration of shale gas and shale oil using a technique known as fracking, which consists of hydraulic fracturing a rock. The use of this technique allowed an expressive increase in oil and natural gas production in the United States.

Chart 6 – Major oil producing countries (thousands of barrels/day) – 2017



Source: BP Statistical Review of World. Elaboration: Ideies/Findes System.

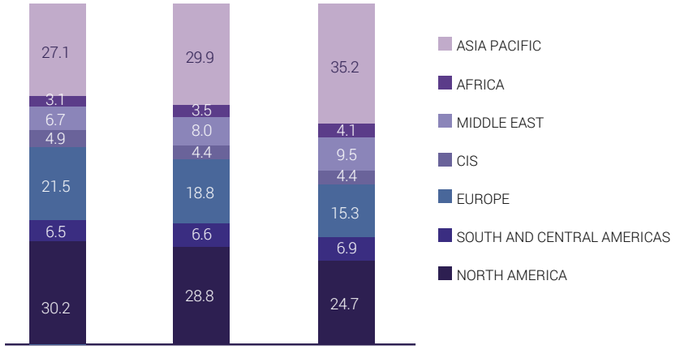
[3] The Community of Independent States (CIS) is an organization that involves 11 republics that used to belong to the old Soviet Union. They are the following: Armenia, Azerbaijan, Byelorussia, Kazakhstan, Kirgizstan, Moldavia, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

1.3 Oil Consumption in the World

The region that consumed most oil in the world in 2017, was the Asia Pacific, due to the annual average growth of oil consumption in China (5.7%)[4] between 2000 and 2017. This region represented, in 2017, 35.2% of the global consumption (chart 7). The noticeable increase in the Chinese consumption was, in turn, a result of the successive growths in the country's industrial production, which made China responsible for 13.0% of the oil consumed in the world in 2017. Japan, in this same period, reduced the consumption of oil to an annual average rate of 1.8%. Therefore, their oil consumption represents only 4.1% of the total oil consumed in the world, a lower participation than the one observed in the year 2000 (5.6%).

The second region that consumed the largest amount of oil in the world in 2017 was North America, responsible for the consumption of 24.7% of the global oil production, reflecting the high consumption in the United States (20.2%). Even though Europe is the third largest consumer in the world (15.3%), it is reducing the use of this energy source.

Chart 7 – Participation in the total oil consumption per region (%)



Source: BP Statistical Review of World. Elaboration: Ideies/Findes System.

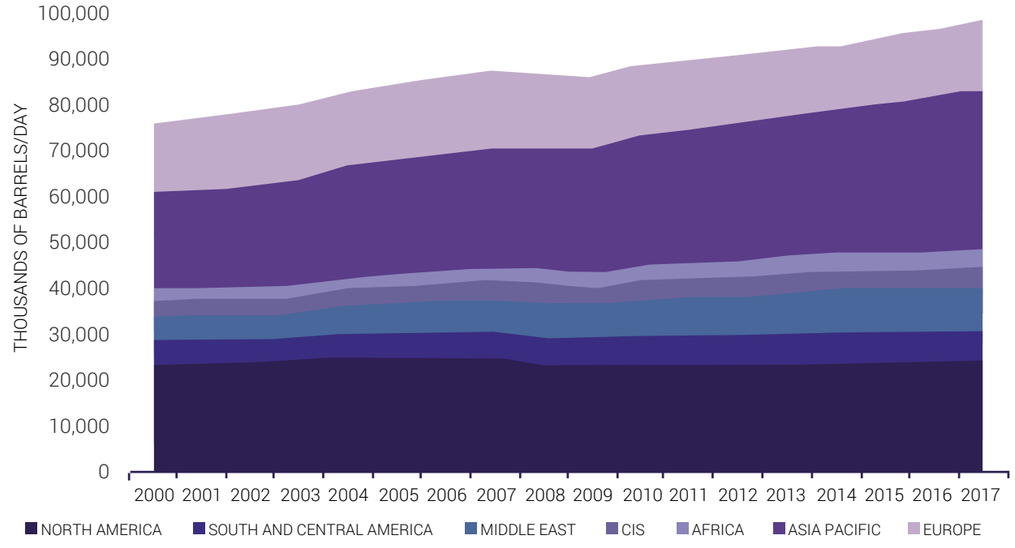
> **Between 2000 and 2017, the European region displayed a 0.3% annual average rate of oil consumption. This behavior is partially explained by the successive agreements related to climate change.**

The Middle East, in turn, was responsible for 9.5% of the consumption of this resource in 2017, due to the growth in oil consumption in Saudi Arabia, whose average annual increase was 5.0% between 2000 and 2017.

In 2017, the world consumed 98.2 million oil barrels per day. This volume was 1.8% higher than the one recorded in the previous year (96.5 million barrels/day). The following countries were among the top consumers of oil in 2017: United States (19.9 million barrels/day) and China (12.8 million barrels/day). Brazil was ranked 7th, with a consumption of 3.0 million barrels/day.

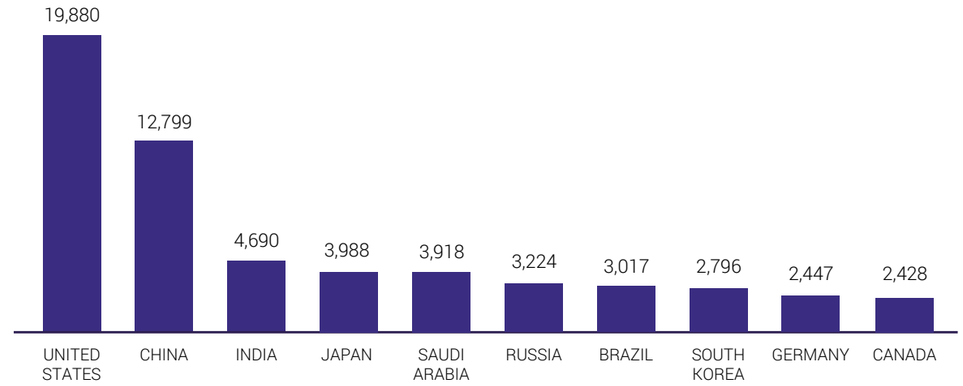
[4] Oil consumption data extracted from BP's Statistical Review of World.

Chart 8 – Oil consumption per region (thousands of barrels/day)



Source: BP Statistical Review of World. Elaboration: Ideies/Findes System.

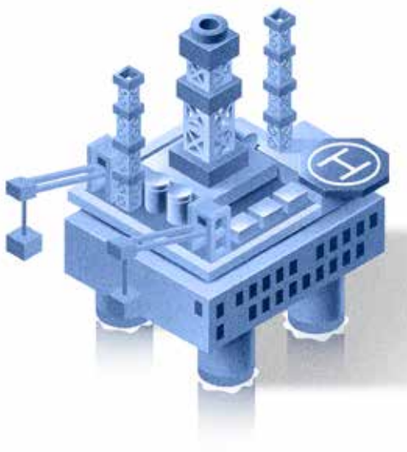
Chart 9 – Major oil consuming countries (thousands of barrels/day) - 2017



Source: BP Statistical Review of World. Elaboration: Ideies/Findes System.

According to the data in BP's Statistical Review of World Energy, the countries which are part of the Organization for Economic Co-operation and Development (OECD[5]) had a 0.15%/year reduction in their oil consumption between 2000 and 2017, differently than the countries which are not part of the OECD, whose consumption increase 3.30%/year within this period. This trend, as mentioned by the Energy Information Administration, is explained by the successive commitments with climate agreements, where the economically advanced countries agreed to some changes in their energy matrix.

[5] Most OCDE members represent economies with high per capita GDP and HDI, and they are also considered developed countries.

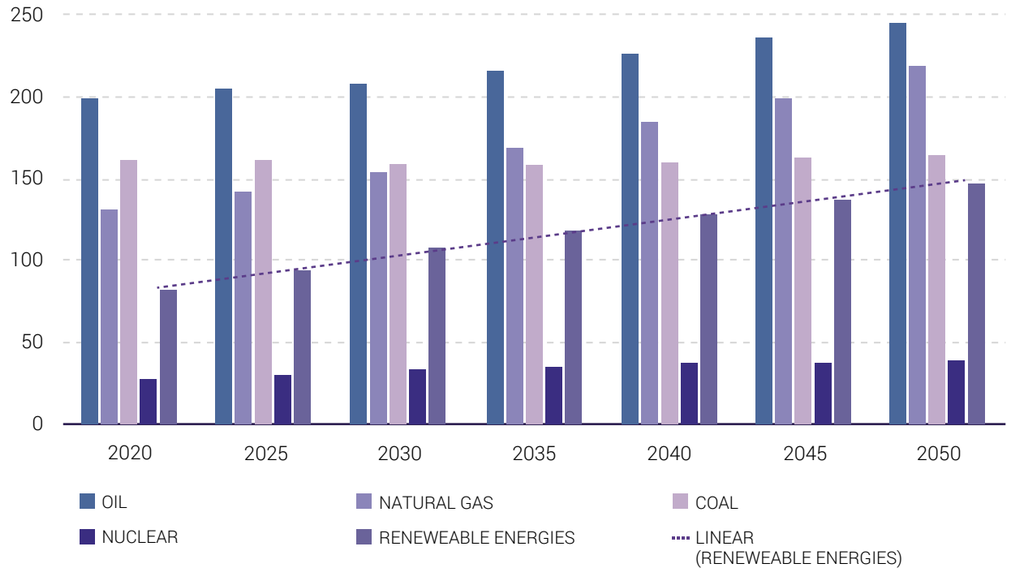


The Annual Energy Outlook 2017 report from the Energy Information Administration reveals that the oil will remain as an important component in the energy matrix of the world.

It is expected that, in 2050, the countries which are part of the OECD group will have an average oil participation of 32.7% in their energy matrices. While the countries which are not part of the OECD will have an oil participation of 28.8%.

According to the agency, in 2050, the demand for renewable energies will be 95.7% higher than the current one, with more intensity in the electrical sector, representing a 114,2% increase in total consumption. However, even with the growth in renewable sources, the agency forecasts that, between 2020 and 2050, the consumption of oil and natural gas will grow at a rate of 1.1%/year. This rate will demand a better preparation from the producing countries to supply the global demand for this input.

Chart 10 – Energy consumption expectations per source (quadrillions of BTU)



Source: Energy Information Administration. Elaboration: Ideies/Findes System.

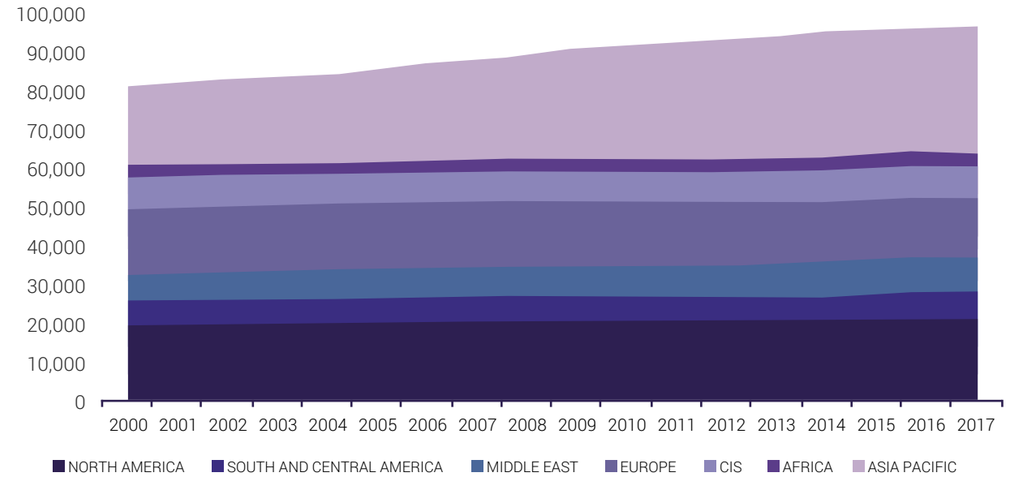
1.4 Oil Refinement in the World

In 2017, the oil refinement capacity in the world was 98.1 million barrels/day, 0.6% higher than the figures of 2016. Among the countries that increased their refinement capacity, we would like to highlight India (+7.6%), and China (+2.4%). These two countries together represent 19.9% of the total refinement capacity in the world. In the overall rank, the United States occupy the first position in oil refinement capacity, with 18.9% of the global capacity. Brazil was ranked 8th, with a capacity of 2.3 million barrels/day and 2.3% of the total global refinement.

Refinement activity is not restricted to the countries which own the oil reserves.

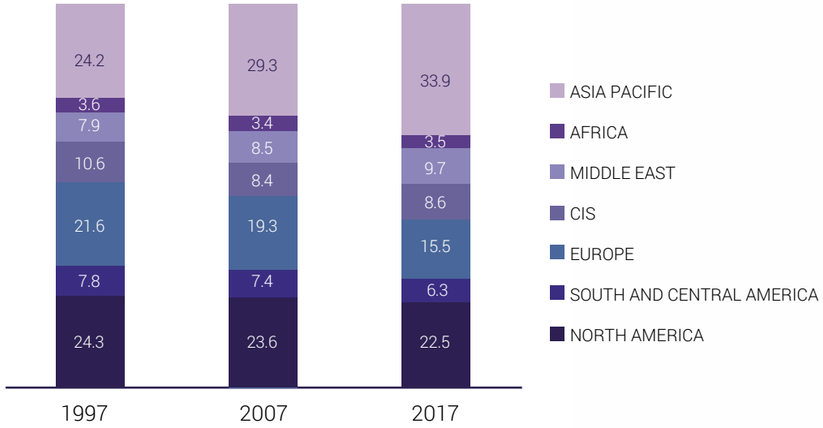
The countries with more refinement capacity are the United States (18.9%), China (14.8%) and Russia (6.7%), which occupy, respectively, the 9th, 13th and 6th positions in terms of proved reserves.

Chart 11 – Refinement capacity per region (thousands of barrels/day)



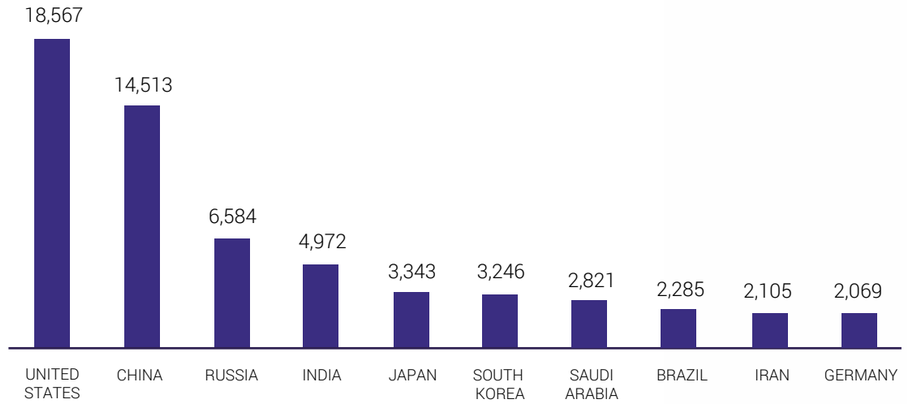
Source: BP's Statistical Review of World. Elaboration: Ideies/Findes System.

Chart 12 – Participation in the total refinement capacity per region (%)

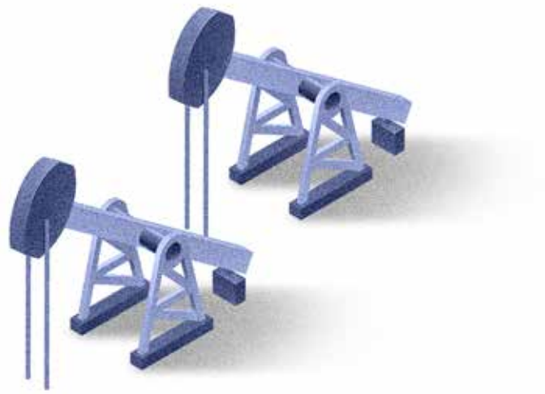


Source: BP's Statistical Review of World. Elaboration: Ideies/Findes System.

Chart 13 – Major countries with refinement capacity (thousands of barrels/day) – 2017



Source: BP's Statistical Review of World. Elaboration: Ideies/Findes System.



Chapter 2

OIL EXPLORATION AND PRODUCTION IN ESPÍRITO SANTO

Espírito Santo has a reserve of 1.8 billion barrels of oil, 69 fields and 367 wells divided in onshore and offshore activities. The oil exploration and production, in turn, happens in two sedimentary basins: the Campos basin, in the South of the state, and the Espírito Santo basin, in the North. In the state of Espírito Santo, there are 9 oil companies under production, 4 of them are foreign companies (Shell Brasil, ONGC, QPI Brasil and Central Resources) and 5 are national (Petrosynergy, OPEnergia, Vipetro, IPI and Petrobras). Petrobras is the largest operator in the state, with 100% shareholding participation in high productivity fields.

2.1 Oil Reserves in Espírito Santo

In 2017, the oil reserves in Espírito Santo reached 1.8 billion oil barrels, 6.5% lower than the records for 2016[6] (chart 14).

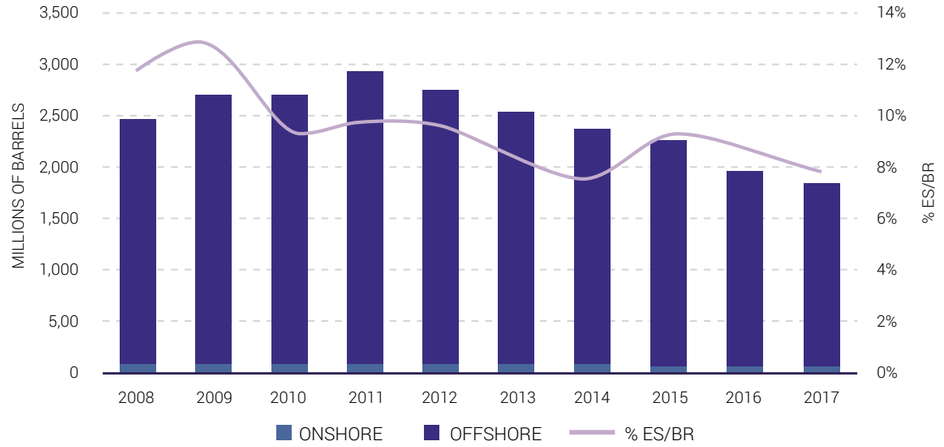
Between 2008 and 2017, there was the reduction in the reserves of the state (2.9%/year), partially explained by the decrease in wells drilling activities between 2000 and 2015 (charts 16 and 17) and the lack of Espírito Santo's participation in ANP rounds between 2008 and 2013[7].

Espírito Santo is the second federation unit with the highest level of oil reserves in Brazil with 7.8% of the total national reserves. Rio de Janeiro, in turn, is first in the rank, with 83.7%. The state of São Paulo that, in 2010, had a reserve of 118 million of oil barrels (0.4% of the total reserves in Brazil), in 2017 was responsible for 3.9% of the oil reserves in the country (chart 15), occupying the third position in the national rank.

[6] In 2016, the volume of the reserves in Espírito Santo was 2 billion oil barrels.

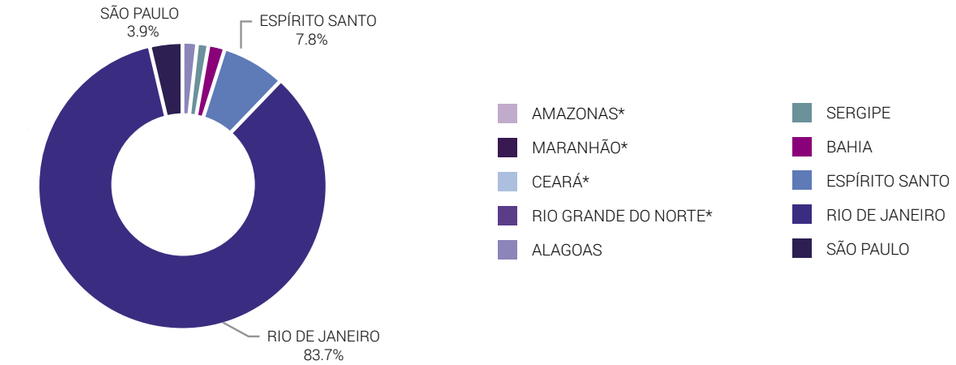
[7] This topic will be addressed in chapter 5.

Chart 14 - Total oil reserves (millions of barrels) and participation (%) of Espírito Santo



Source: ANP. Elaboration: Ideies/Findes System.

Chart 15 – Participation in the Brazilian oil reserves per federation unit – 2017



Source: ANP. Elaboration: Ideies/Findes System. * States with participation of less than 1%.

In Espírito Santo, the offshore reserves represent 97.3% of the total in the state. This is explained by the great potential of reserves in deep and ultradeep waters, especially, close to the limits of the pre-salt layer. In the last 10 years, the offshore reserves display a 2.8% decrease in the annual average, reaching 1.79 billion oil barrels in 2017.

Table 1 – Total oil reserves in Espírito Santo (millions of barrels)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Onshore	85	84	80	77	76	69	70	52	56	50
Offshore	2,381	2,617	2,627	2,852	2,676	2,447	2,301	2,197	1,910	1,789
Total	2,466	2,701	2,707	2,929	2,753	2,516	2,371	2,249	1,966	1,839

Source: ANP. Elaboration: Ideies/Findes System.

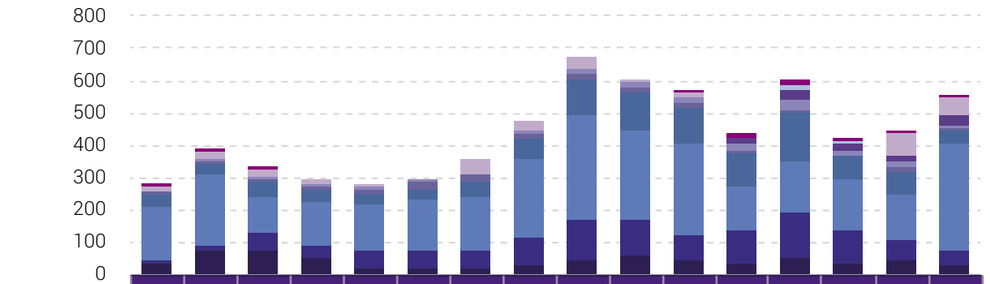
The onshore reserves, in turn, represent 2.7% of the total reserves in the state. Between 2008 and 2017, the volume of these reserves decreased 5.2%/year reaching 50 million oil barrels in 2017. This reduction probably happened because of the biggest stimuli provided to offshore activities, due to the highest probability of the great oil companies obtaining commercial viability in maritime fields. The onshore reserves in Brazil are concentrated in the Northeast region, especially in Bahia (32.7%), Rio Grande do Norte (24.0%) and Sergipe (23.5%).

The existence of oil reserves is intimately connected to the drilling activity, since this is the method used to find such reserves.

Between 2000 and 2015, the drilling of wells in Espírito Santo on onshore fields suffered an average annual reduction of 1.6%. However, the states of Rio Grande do Norte (+4.2%/year), Sergipe (+21.8%/year), and Maranhão[8] (+57.9%/year) displayed a growth, as well as Brazil (+4.5%/year).

Between 2000 and 2015[9], the drilling of wells in the offshore fields of Espírito Santo suffered an average annual reduction of 2.8%, following the reduction of 2.5%/year of drilling activities at a national level. São Paulo, in turn, displayed, in this period, a growth of 16.2%/year in drilling activities of offshore wells due to high productivity expectations at the Santos basin.

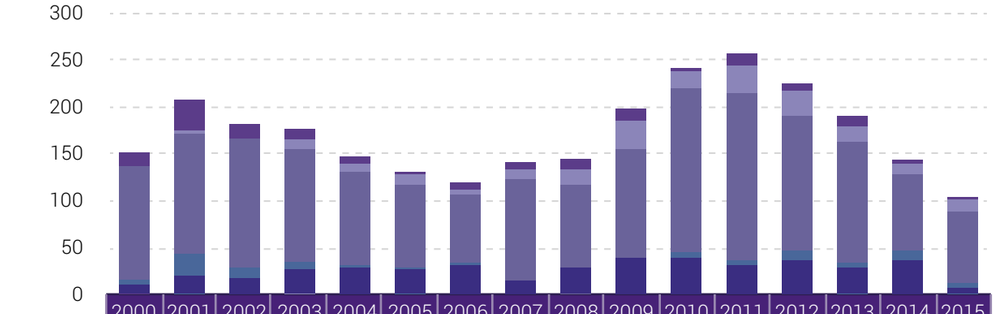
Chart 16 – Onshore wells drilled per federation unit (in units)



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
OTHERS	1	4	1	0	0	0	0	0	0	0	3	10	18	11	1	2
CE	12	19	30	19	6	0	45	34	44	9	14	0	0	0	74	61
MG	0	0	0	0	0	0	0	0	0	0	2	6	18	10	0	0
MA	0	0	0	0	0	0	0	0	0	0	2	12	28	17	16	31
AM	3	6	4	3	4	4	0	3	8	17	15	26	30	18	14	6
AL	10	10	10	9	15	27	23	15	17	12	17	9	7	4	14	5
BA	34	32	42	44	35	30	46	69	114	122	107	96	155	67	69	37
RN	172	218	110	127	142	158	168	243	321	272	283	138	156	161	147	331
SE	2	20	55	45	57	58	55	81	123	109	79	101	141	98	63	47
ES	39	74	76	50	17	17	18	31	47	63	45	36	51	38	42	30

Source: ANP. Elaboration: Ideies/Findes System.

Chart 17 – Offshore wells drilled per federation unit (in units)



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
OTHERS	16	35	15	11	10	3	8	7	11	12	3	14	8	10	7	2
SP	1	3	1	11	6	12	5	10	16	30	18	28	25	15	10	11
RJ	121	127	138	120	100	89	74	108	88	116	175	177	144	129	80	77
SE	4	22	10	9	4	1	1	2	2	0	5	7	10	6	10	5
ES	11	21	18	26	28	27	32	14	28	40	40	31	37	29	38	7

Source: ANP. Elaboration: Ideies/Findes System.

2.2 Offshore Production in Espírito Santo

Between 2016 and 2017, the offshore oil production in Espírito Santo recorded a 4.0% decrease, even with the Brent and WTI oil prices varying between 21.1% and 16.6%, respectively, in this period. On the other hand, the states of Rio de Janeiro and São Paulo recorded an increase of 5.9% and 17.0%, in this order. In Brazil, the national growth was 5.4%, reaching 910.5 million oil barrels.

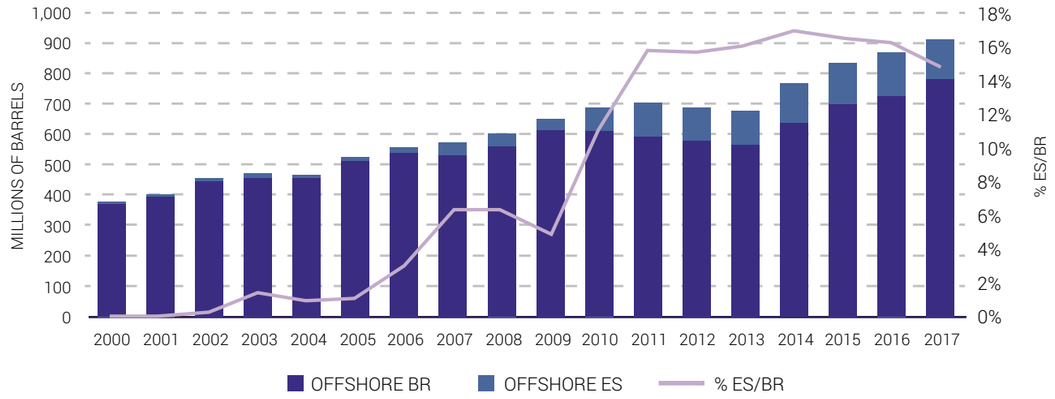
An individual analysis of the basins in Espírito Santo reveals that the oil production at the Campos basin suffered a 14.1% reduction in 2017, while in the Espírito Santo Basin, the production had a 20.3% increase, due to the activities at the Golfinho field[10]. In 2017, Petrobras returned to ANP part of the Golfinho field, which, according to the oil company, was not productive.

[8] Between 2010 (the year that drilling activities were resumed in Maranhão) and 2015, the number of onshore drilling activities in the state of Maranhão grew 57.9%/year. Since 1998, this activity was inexistent in the state, and it was resumed in 2010 with the drilling of two wells in the Gavião Real field. In 2015, Maranhão reached the mark of 31 wells drilled, from which 13 were classified as 'production status', derived from the fields of Gavião Branco, Gavião Vermelho, Gavião Real and Gavião Caboclo.

[9] The reduction or increase in drilling activities impacts the levels of reserves and production for the next few years, therefore, despite the information gap (2015), there is no harm to the analysis.

[10] The Golfinho field is a mature area.

Chart 18 - Offshore production and participation of Brazil and Espírito Santo (%)



Source: ANP. Elaboration: Ideies/Findes System.

Table 2 – Offshore production in Brazil and Espírito Santo (barrels of oil)

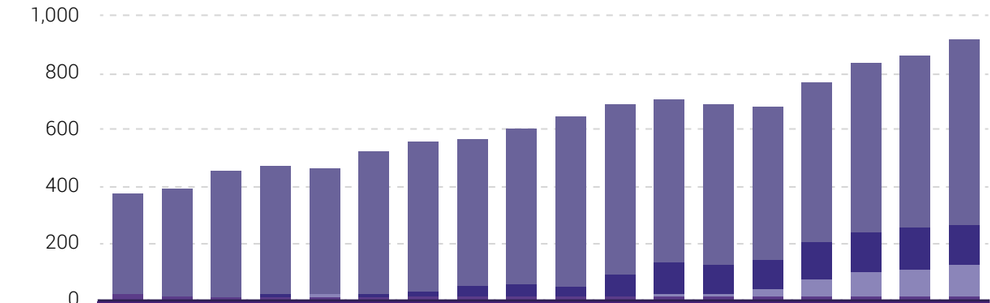
Year	Espírito Santo	Brazil	% ES/BR
2000	99,448	374,309,114	0.0
2001	62,338	394,691,441	0.0
2002	1,137,801	451,901,457	0.3
2003	6,616,635	466,341,179	1.4
2004	4,406,962	462,084,021	1.0
2005	5,945,298	521,291,410	1.1
2006	16,759,080	557,955,410	3.0
2007	36,196,724	568,124,383	6.4
2008	37,132,465	596,937,198	6.2
2009	31,371,134	646,417,019	4.9
2010	75,231,864	683,979,718	11.0
2011	110,688,316	702,027,945	15.8
2012	107,666,050	688,361,204	15.6
2013	108,033,682	674,820,282	16.0
2014	128,738,998	761,350,933	16.9
2015	136,581,480	831,297,960	16.4
2016	139,489,504	864,043,412	16.1
2017	133,868,705	910,546,697	14.7

Source: ANP. Elaboration: Ideies/Findes System.

In 2017, Espírito Santo remained the second state in terms of participation in the offshore oil production of the country with 14.7% of the total production, behind Rio de Janeiro (71.5%) and above the state of São Paulo (13.2%).

Due to the pre-salt exploration at the Santos basin, the state of São Paulo, which was, in 2010, in charge of only 0.8% of the oil produced in the country, became responsible, in 2017, for 13.2% of the Brazilian production.

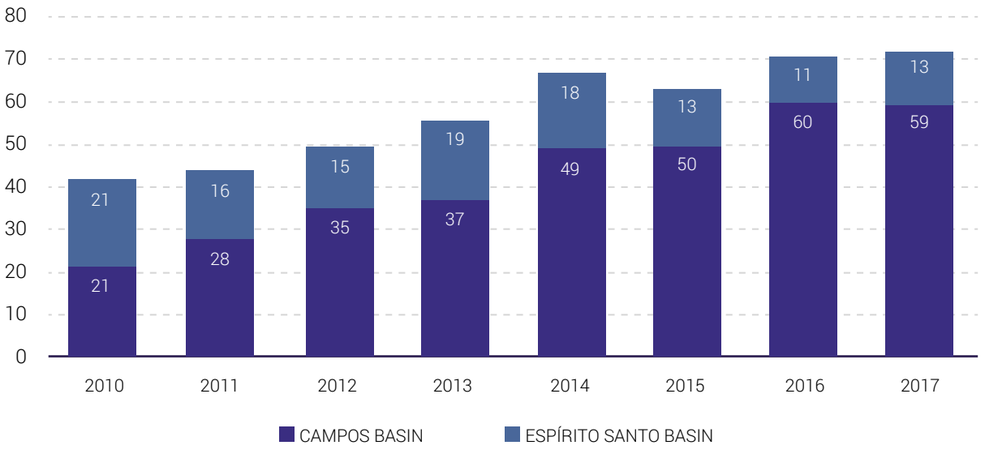
Chart 19 - Offshore oil production in the Brazilian states (millions of barrels)



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
RJ	358.8	380.5	438.3	446.2	433.2	501.8	529.6	520.9	547.3	605.2	594.8	568.5	561.5	532.0	563.2	596.9	614.7	650.9
ES	0.1	0.1	1.1	6.6	4.4	5.9	16.8	36.2	37.1	31.4	75.2	110.7	107.7	108.0	128.7	136.6	139.5	133.9
SP	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.4	0.3	0.3	5.3	14.0	10.9	25.3	59.2	90.0	102.6	120.0
OTHERS	14.9	13.6	11.9	13	14.0	13.1	11.1	10.6	12.2	9.5	8.7	8.8	8.3	9.5	10.1	7.8	7.2	5.8

Source: ANP. Elaboration: Ideies/Findes System.

Chart 20 – Offshore oil wells in production in Espírito Santo (in units)



Source: ANP. Elaboration: Ideies/Findes System.

Table 3 – Wells in production (in units)

	Localization	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Brazil	Onshore	7,760	7,761	8,131	8,275	8,227	8,229	8,263	8,106	7,772	7,196
	Offshore	779	799	824	769	791	765	841	786	755	793
Espírito Santo	Onshore	282	254	285	295	318	315	337	347	295	295
	Offshore	19	17	38	43	50	57	67	63	71	72

Source: ANP. Elaboration: Ideies/Findes System.

Table 4 - Offshore fields in production and under concession in Espírito Santo

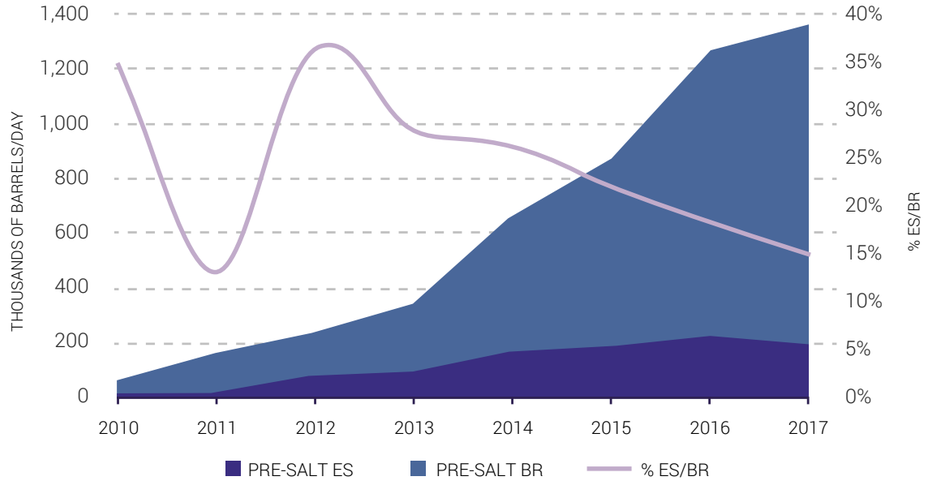
Basin	Field	Operator	%	Partner 1	%	Partner 2	%
Campos	Abalone	Shell Brasil	50	ONGC Campos	27%	QPI Brasil Petróleo	23%
Campos	Argonauta	Shell Brasil	50	ONGC Campos	27%	QPI Brasil Petróleo	23%
Campos	Baleia Anã (under development)	Petrobras	100				
Campos	Baleia Azul (5 pre-salt well)	Petrobras	100				
Campos	Baleia Franca (2 pre-salt wells)	Petrobras	100				
Campos	Cachalote	Petrobras	100				
Campos	Jubarte (9 pre-salt wells)	Petrobras	100				
Campos	Ostra	Shell Brasil	50	ONGC Campos	27%	QPI Brasil Petróleo	23%
Campos	Pirambu	Petrobras	100				
Espírito Santo	Cação	Petrobras	100				
Espírito Santo	Camarupim	Petrobras	100				
Espírito Santo	Camarupim Norte	Petrobras	65	OP Energia	35%		
Espírito Santo	Canapu	Petrobras	100				
Espírito Santo	Cangoá	Petrobras	100				
Espírito Santo	Golfinho	Petrobras	100				
Espírito Santo	Peroá	Petrobras	100				

Source: ANP. Elaboration: Ideies/Findes System.

In 2017, Espírito Santo recorded the first reduction in pre-salt production (-14.6%) since 2011[11], producing 195.4 thousand barrels/day.

In the rest of the country, this type of production increased 7.4%, in 2017, reaching 1.4 million barrels/day. It is worth highlighting that, despite the reduction in production of this layer, the decrease in Espírito Santo's participation in the national production is due to the growth in reserves and production at the polygon in other states.

Chart 21 – Pre-salt production and participation of Brazil and Espírito Santo



Source: ANP. Elaboration: Ideies/Findes System.

Table 5 – Production per pre-salt well in the Espírito Santo's portion of the Campos Basin (barrels of oil per day)

ES Wells	Field	2010	2011	2012	2013	2014	2015	2016	2017
6BRSA1222AESS	Jubarte	0	0	0	0	0	0	17,573	22,021
6BRSA631DBESS	Baleia Azul	0	0	5,139	17,925	17,711	12.842	9,016	6,180
6BRSA639ESS	Jubarte	22,642	21,537	20,652	20,101	18,663	13,231	16,647	11,639
7BAZ3ESS	Baleia Azul	0	0	3,757	0	0	4,973	7,337	5,707
7BAZ4ESS	Baleia Azul	0	0	27,732	17,068	15,808	11,471	12,718	9,562
7BAZ6ESS	Baleia Azul	0	0	17,667	15,440	16,236	12,452	7,322	7,341
7BAZ8ESS	Baleia Azul	0	0	0	0	16,120	17,978	15,308	12,195
7BFR12PAESS	Baleia Franca	0	0	0	0	18,096	12,515	11,842	17,200
7BFR7ESS	Baleia Franca	0	0	0	0	14,831	16,713	16,948	18,334
7JUB34HESS	Jubarte	0	0	13,039	25,539	34,052	33,897	33,147	19,651
7JUB44ESS	Jubarte	0	0	0	0	0	0	17,187	10,876
7JUB45ESS	Jubarte	0	0	0	0	8,530	6,526	4,618	1,875
7JUB55ESS	Jubarte	0	0	0	0	5,984	3,064	10,099	6,891
7JUB57DPAESS	Jubarte	0	0	0	0	0	18,693	18,762	16,358
7JUB58DPAESS	Jubarte	0	0	0	0	0	19,356	19,780	20,014
8JUB39ESS	Jubarte	0	0	0	0	6,870	6,650	10,612	9,594
7PRB1ESS	Pirambu	0	0	0	0	0	0	0	82
Total pre-salt ES	-	**22,642**	**21,537**	**87,987**	**96,072**	**172,901**	**190,359**	**228,917**	**195,438**
Total pre-salt BR	-	**65,199**	**167,500**	**242,700**	**346,100**	**667,027**	**874,973**	**1,262,436**	**1,356,205**
% ES/BR	-	**34.7%**	**12.9%**	**36.3%**	**27.8%**	**25.9%**	**21.8%**	**18.1%**	**14.4%**

Source: ANP. Elaboration: Ideies/Findes System.

[11] Year when only 1 well of the pre-salt polygon in the state was operational, at the Jubarte field.

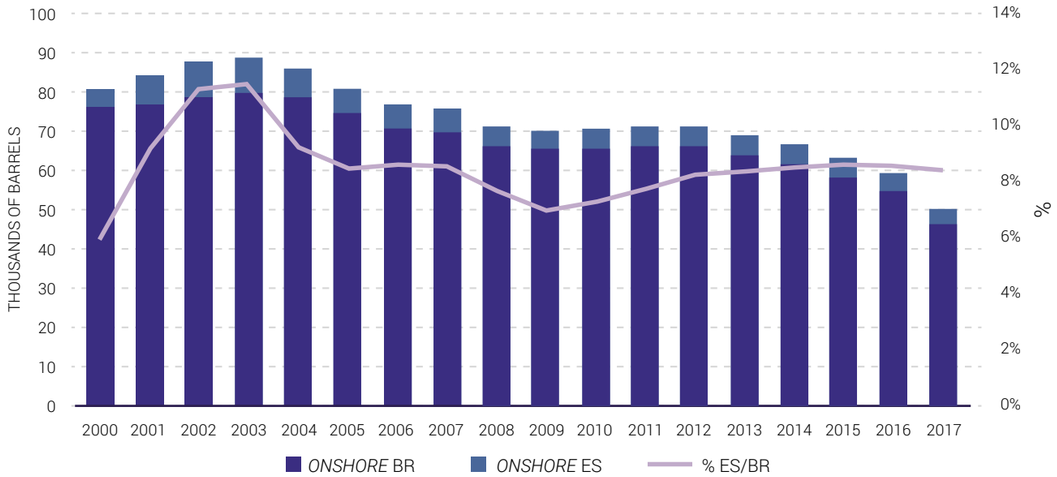
2.3 Onshore Production in Espírito Santo

In Espírito Santo, the onshore production dropped 0.9%/year in the period between 2000 and 2017, with a 17.0% reduction on the turn from 2016 to 2017.

> **Espírito Santo's onshore production participation in the total Brazilian production dropped 3.0 percentage points, going from 11.4%, in 2002, to 8.4%, in 2017.**

In Brazil, in the same year the onshore production reached 46.4 million barrels of oil, 15.2% lower than the figures for 2016. Most of the Brazilian onshore production is concentrated in the Northeastern region, which represents 83.9% of the national production, especially in the states of Rio Grande do Norte (32.8%) and Bahia (25.1%) (chart 23).

Chart 22 - Onshore production and participation of Brazil and Espírito Santo (%)



Source: ANP. Elaboration: Ideies/Findes System.

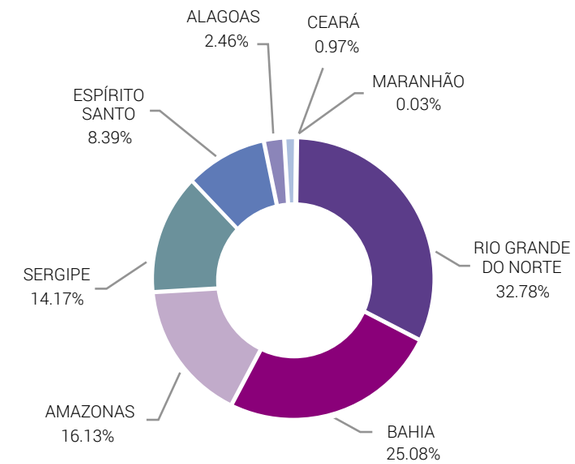
With 53 fields under production and concession, equivalent to 14.3% of the total Brazilian onshore fields, the onshore production in Espírito Santo is located in the Northern part of the state. The winning companies of the auctions to operate in onshore fields do not form a consortium, which means that they have 100% shareholding participation in field production. Petrobras has 86.8% of the concession in production fields, and it is in charge of 99.7% of the onshore production in Espírito Santo. Four other companies (Petrosynergy, Central Resources, Vipetro and IPI) have the concession of seven fields under the production process.

Table 6 – Onshore production in Brazil and in Espírito Santo (barrels of oil)

Year	Espírito Santo	Brazil	% ES/BR
2000	4,568,188	76,316,111	6.0
2001	7,086,899	77,169,864	9.2
2002	8,983,566	78,952,005	11.4
2003	9,183,123	79,738,221	11.5
2004	7,278,109	78,631,947	9.3
2005	6,337,921	74,962,035	8.5
2006	6,102,545	70,840,754	8.6
2007	5,962,488	69,892,738	8.5
2008	5,107,602	66,336,916	7.7
2009	4,586,623	65,464,458	7.0
2010	4,800,700	65,972,643	7.3
2011	5,178,594	66,441,348	7.8
2012	5,435,102	66,045,953	8.2
2013	5,350,019	63,892,828	8.4
2014	5,234,916	61,577,039	8.5
2015	5,066,186	58,367,662	8.7
2016	4,690,264	54,687,605	8.6
2017	3,890,987	46,380,974	8.4

Source: ANP. Elaboration: Ideies/Findes System.

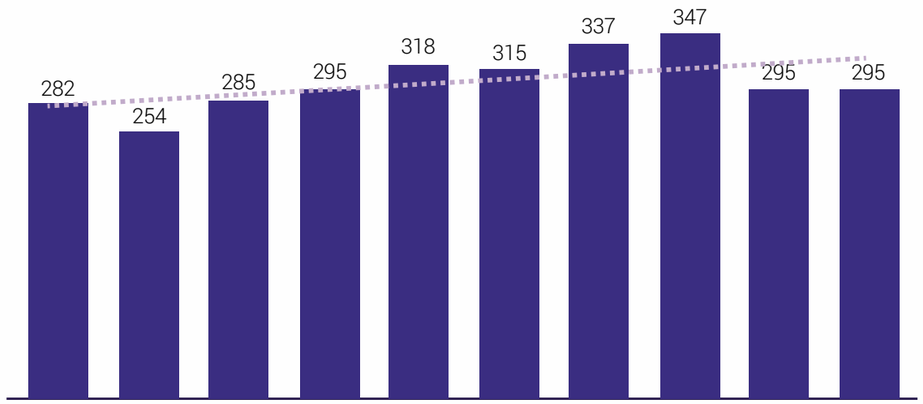
Chart 23 – Distribution of the onshore production in Brazil per federation unit (%) – 2017



Source: ANP. Elaboration: Ideies/Findes System.

The state of Espírito Santo has 295 oil drilled wells with onshore activities (chart 24). From this total, the wells with the biggest onshore production are located in the field of Fazenda Alegre, in the Northern part of the state. This field, with a dropping production, has a production delivery system through an oil pipe until the Norte Capixaba Terminal (TNC), and, from there, it moves on to refinement. Besides Fazenda Alegre, we also highlight the field of Cancã. However, this field has displayed an increase in production activities since 2008, and it is located in the city of Linhares. However, the latter has a growing production and activity since 2008.

Chart 24 - Onshore oil wells in production in Espírito Santo



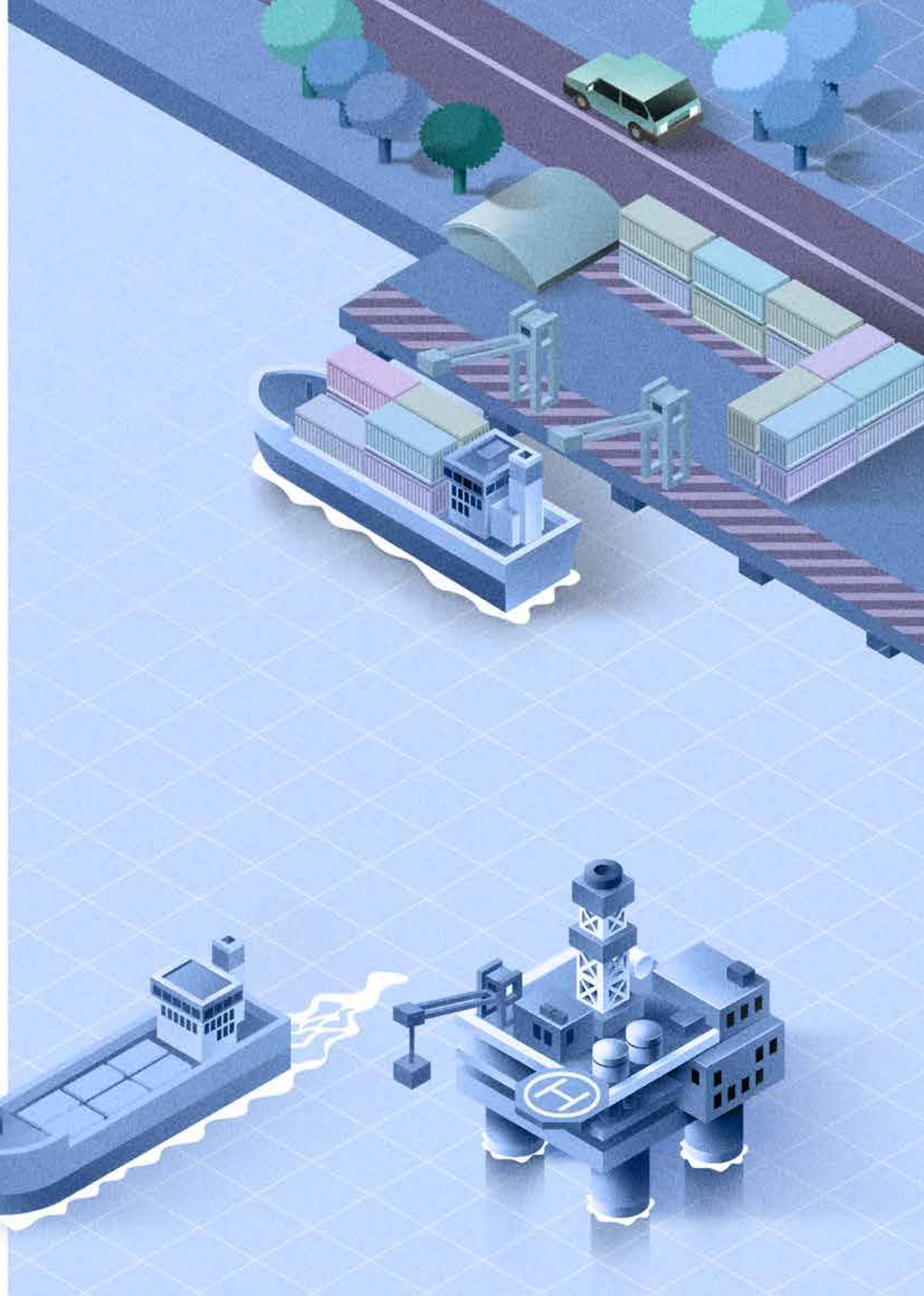
Source: ANP. Elaboration: Ideies/Findes System.

Table 7 - Onshore fields in Espírito Santo in production and development stages - 2017

Petrobras (48)	Barra do Ipiranga, Biguá, Cacimbas, Campo Grande, Cancã, Córrego Cedro Norte, Córrego Cedro Norte Sul, Córrego das Pedras, Córrego Dourado, Fazenda Alegre, Fazenda Cedro, Fazenda Cedro Norte, Fazenda Queimadas, Fazenda Santa Luzia, Fazenda São Jorge, Fazenda São Rafael, Guriri, Inhambu, Jacupemba, Jacutinga, Lagoa Bonita, Lagoa Parda, Lagoa Parda Norte, Lagoa Parda Sul, Lagoa Piabanha, Lagoa Suruaca, Mariricu, Mariricu Norte, Mariricu Oeste, Mosquito, Mosquito Norte, Nativo Oeste, Rio Barra Seca, Rio Doce, Rio Ibiribas, Rio Itaúnas, Rio Itaúnas Leste, Rio Preto, Rio Preto Oeste, Rio Preto Sul, Rio São Mateus, Rio São Mateus Oeste, Saira, São Mateus, São Mateus Leste, Seriema, Tabuiaiá and **Curruira**
Petrosynergy (1)	Albatroz
Central Resources (2)	Crejoá and Garça Branca
Vipetro (4)	Gaivota, Tucano, **Bem-Te-Vi** and **Lagoa do Doutor**
IPI (1)	Rio Ipiranga
Ubuntu Engenharia (1)	**Rio Mariricu**

*All the fields in bold are in the development stage

Source: ANP. Elaboration: Ideies/Findes System.



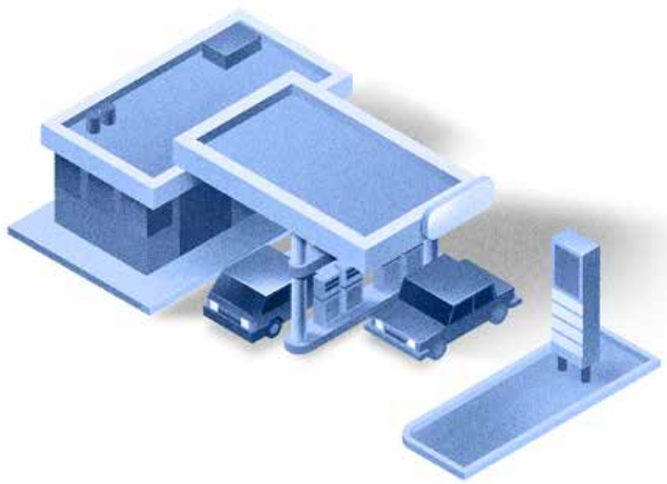
Chapter 3

GOVERNMENTAL PARTICIPATIONS AND ECONOMIC IMPACTS

The region's economic development, which includes the production and exploration of oil and natural gas (O&G), is affected both by the labor market and the international trade. Also, these regions receive financial compensations (governmental participations) which may be used in favor of the wellbeing of the society in the surroundings.

3.1 Governmental Participations

The governmental participations consist of payments made by the concessionaires of O&G exploration areas described in their respective concession contracts and displayed in the following modalities (Law no. 9,478/97 and Decree no. 2,705/98): signature bonus[12]; royalties; special participation and payment for the occupation or retention of areas[13].



The regulation of charging/payment of governmental participations, as well as the use and supervision of these resources, dates back to the origin and evolution of the oil and gas sector in Brazil. Legislation related to the governmental participation is constantly updated, which may be positive, since these alterations aim at modernizing the institutional relationships in the O&G sector, but it causes uncertainty for the investor.

3.1.1 Royalties

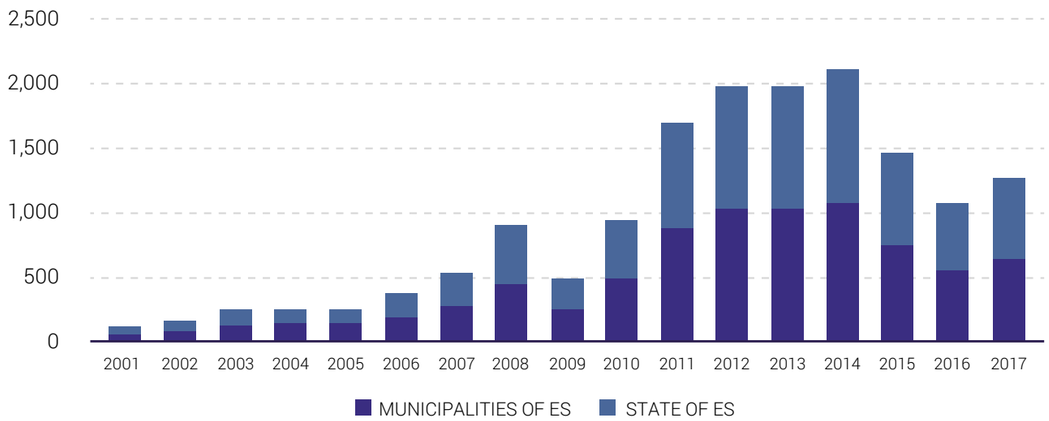
The payment of royalties is the most important governmental participation. It is generated in all exploration fields (both onshore and offshore), and its aliquot may vary between 5% and 10%. This resource is allocated, according to criteria defined by law[14], to the Federal Government, to the federation units and the municipalities.

From 2002 to 2017, the volume of royalties received both by Brazil and the state of Espírito Santo increased. In the country, the average annual growth in received royalties was 4.0%. For the state of Espírito Santo, this increase was 13.7%/year, slightly above the values observed in the municipalities of the state (14.5%/year).

> **The period between 2010-2013, the peak of pre-salt exploration, represents the time with most royalties received by the state and its municipalities, with an annual average growth of 19.8% and 20.7%, respectively. In this same period, the national volume of these resources grew 8.3%/year.**

Due to the drop in oil price levels in the international market (chart 1), between 2014 and 2017, there was a reduction in the Brazilian royalty income, as well as the income of Brazilian states and municipalities. Throughout these years, the volume of resources of this kind allocated to the state of Espírito Santo suffered an average annual reduction of 11.9%; the municipalities had a 12.0% reduction and Brazil, 9.4%.

Chart 25 – Royalty income of Espírito Santo in constant values – average 2017 IPCA – (BRL millions)



Source: ANP. Elaboration: Ideies/Findes System.

[12] The analysis of the amount of signature bonus obtained in the concession of the fields in the territory of Espírito Santo will be described in chapter 5.

[13] This modality of governmental participation will not be addressed in this yearbook, because this resource is dedicated to private groups. Information obtained via Decree no. 2,705/1998.

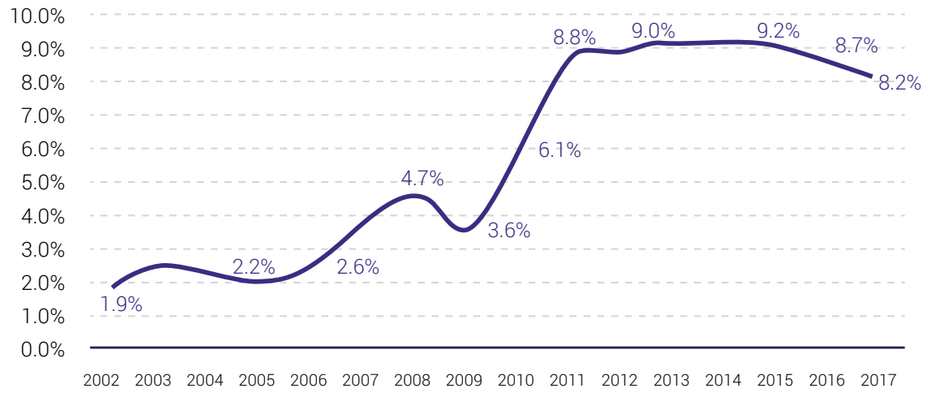
[14] See annex: Table 1 – Evolution of the Brazilian Royalties and Special Participations Act.

In 2017, the royalties received by the state of Espírito Santo were BRL 626.9 million, very close to the ones received by the municipalities of the state, BRL 649.2 million, which resulted in a total revenue of BRL 1.3 billion.

In this same period, the Federal Government received the amount of BRL 15.5 billion, granting Espírito Santo with a participation of 8.2% in the total royalties from Brazil.

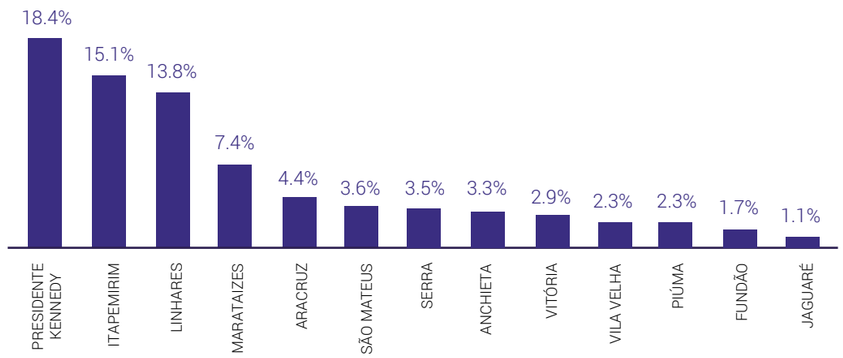
Espírito Santo received, in 2017, 17.4% more in royalty income than the previous year. The municipalities in Espírito Santo, received 18.3% more. This movement is mostly explained by the increase in oil barrel prices, which stimulated more production, and due to the economic-financial and institutional recovery of Petrobras. The participation of this royalty income from Espírito Santo in the Brazilian royalty income increased 7.1 percentage points (p.p.), from 1.9%, in 2002, to 9.0%, in 2012.

Chart 26 – Participation of the royalty income of Espírito Santo in the Brazilian royalty income (%)



Source: ANP. Elaboration: Ideies/Findes System.

Chart 27 – Municipalities of Espírito Santo that received most royalties - % of total royalties received by all municipalities in ES - 2017[15]



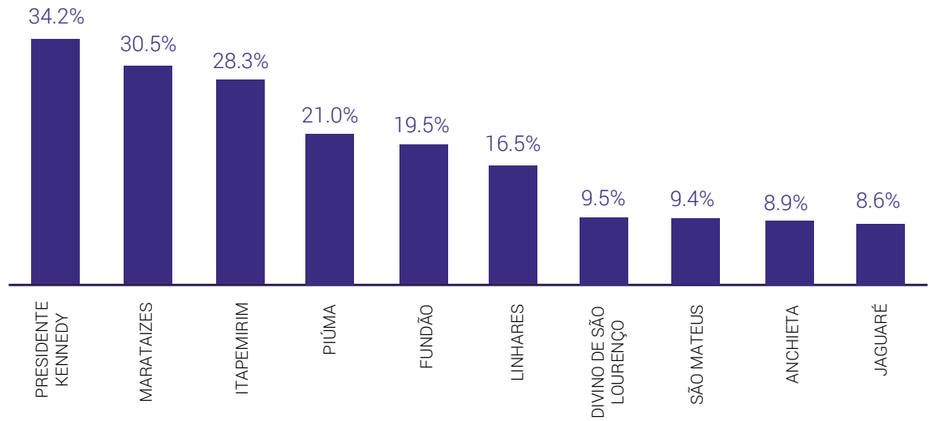
Source: ANP. Elaboration: Ideies/Findes System.

In 2017, as observed in 2016, the municipalities of Espírito Santo that received most royalties were the following: Presidente Kennedy (BRL 120.2 million), Itapemirim (BRL 98.9 million) and Linhares (BRL 90.0 million), which accounted for 47.3% of the total royalties received by the municipalities in Espirito Santo. This concentration is explained by the fact that these municipalities are located in bordering areas of high productivity fields (Table 9).

While analyzing the participation of royalty incomes in the total revenue of the municipalities, we can see that, with the exception of Linhares, the municipalities that received most royalties were also the ones with the biggest participation of this resource in their total revenue.

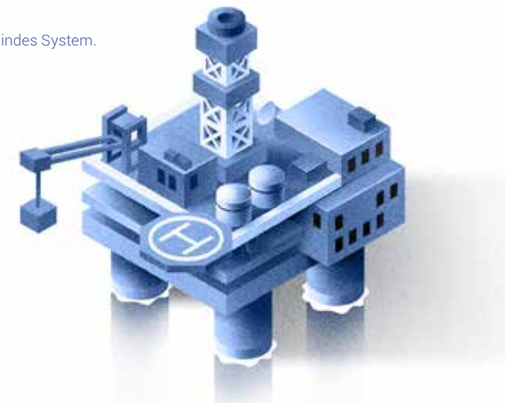
In Presidente Kennedy, 34.2% of the revenue comes from royalties, followed by Marataízes (30.5%) and Itapemirim (28.3%). Even though Linhares is the 3rd municipality in number of royalties received, it is only the 6th in terms of royalty participation in its total revenue.

Chart 28 – Municipalities of Espírito Santo with the largest participation of royalty income in their total revenues (%) - 2017



Source: ANP and Finances of the Municipalities in Espírito Santo – AEQUUS. Elaboration: Ideies/Findes System.

In 2006, the state government of Espírito Santo, through Law no. 8,308/2006, created the Fund for the Reduction of Regional Inequalities – FRDR in Portuguese, allocating 30% of the financial compensation collection from royalties to the municipalities of the state. From 2016 to 2017, the resources dedicated to FRDR increased 18.0%[16], in real terms, reaching the amount of BRL 105 million.



[15] The other 65 municipalities, altogether, correspond to 20.2% of the total royalty incomes received by the municipalities in Espirito Santo.

[16] Deflated values by the average IPCA of 2017.

The resources in the fund[17] must be used exclusively for: (I) the harmonization of basic sanitation services; (II) the final destination of solid waste; (III) the harmonization of elementary education and assistance to childhood education; (IV) assistance to health; (V) the building of houses for the low income population; (VI) the draining and pavement of urban streets; (VII) the construction of integrated social assistance centers; (VIII) professional training; (IX) transportation; (X) security; (XI) digital inclusion; and (XII) the generation of jobs and income.

In the last few years, the state government has lighten the FRDR Act, allowing the use of this resource for operational expenses. In 2017, the state allowed the municipal governments to use 60% of the resources from the fund in current expenses.

3.1.2 Special Participations (PE)

The special participations may be understood as a sort of extraordinary governmental participation owed by the oil and gas exploration and production concessionaires to the field with high production levels. They were regulated through Law no. 9,478/97 (The Oil Act) and Decree no. 2,705/1998.

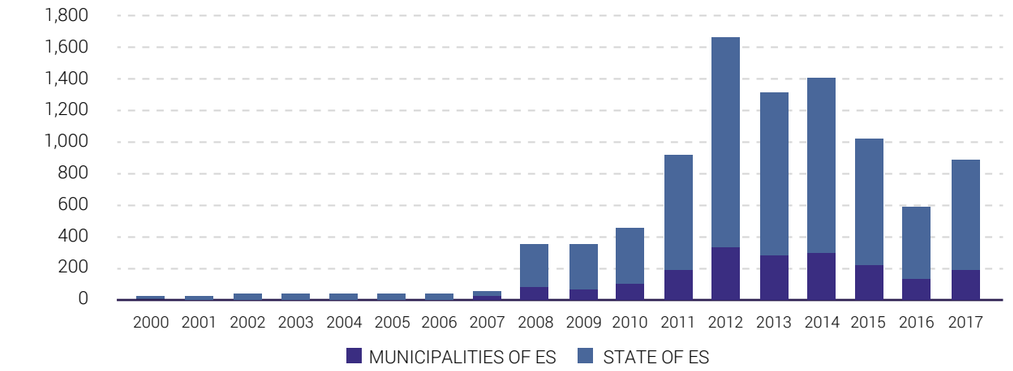
The verification of special participations in the oil and natural gas production happens through the application of progressive aliquots – which vary according to the location, the number of years in production and volumes of the quarterly production – over the net revenue of the quarterly production in each field, considering the predicted discounts (royalties, investments in exploration, operational costs, depreciation and taxes).

In the state of Espírito Santo, only 4 offshore fields[18] generate special participation income, notedly, Baleia Azul, Baleia Franca, Jubarte and Roncador. The municipalities in Espírito Santo that border these fields and, therefore, receive PE revenues are Itapemirim, Marataízes and Presidente Kennedy.

As the case of royalties, the trajectory of special participation income in the state of Espírito Santo grew for a certain period. Between 2002 and 2017, this financial compensation increased 35.9%/year, both for the state and the municipalities in Espírito Santo. The years in the 2006-2009 period were the most significant ones in terms of average annual growth in special participations (74.4%). In Espírito Santo, this was the most productive period for the fields of Baleia Azul, Baleia Franca, Jubarte and Roncador. Between 2014 and 2017, the PE income dropped 11.0%/year, due to the reduction in the international price of the oil barrels and the institutional crisis at Petrobras.

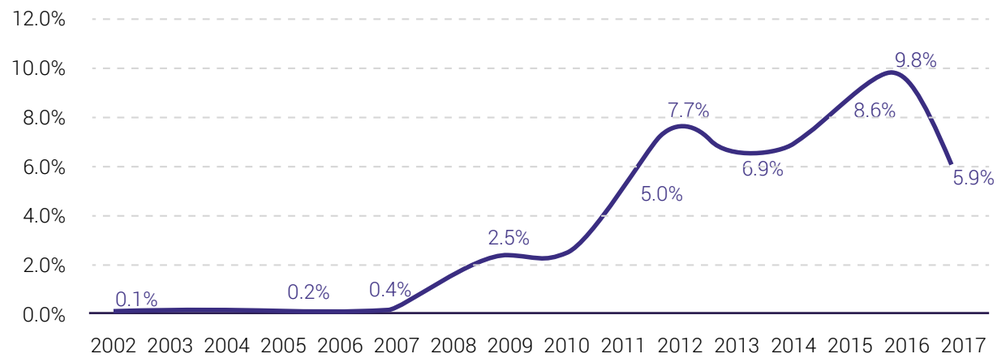
In 2017, the state of Espírito Santo earned BRL 730.5 million in special participation income, 50.7% higher than the revenues received in 2016 (BRL 484.7 million). For Brazil, this increase was even more expressive, 148%, reaching BRL 15.4 billion in 2017.

Chart 29 – Special Participation Taxes in Espírito Santo in constant values – average 2017 IPCA – (BRL millions)



Source: ANP. Elaboration: Ideies/Findes System.

Chart 30 – The role of Espírito Santo's special participation income in the overall Brazilian special participation (%)



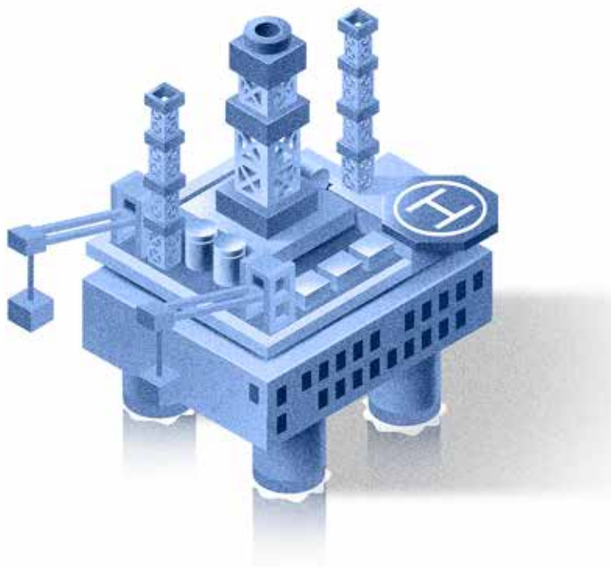
Source: ANP. Elaboration: Ideies/Findes System.

The participation of PE incomes from Espírito Santo in the total incomes of the country dropped 3.8 p.p. in 2017 , possibly as a result of the relative decrease in productivity of the fields that generated this compensation for the state.

The municipalities that border the fields that generate special participation income obtained, in 2017, BRL 182.6 million in SP income. Presidente Kennedy, Itapemirim and Marataízes received, respectively, BRL 95.9 million (52.5%), BRL 72.5 million (39.7%) and BRL 14.2 million (7.8%).

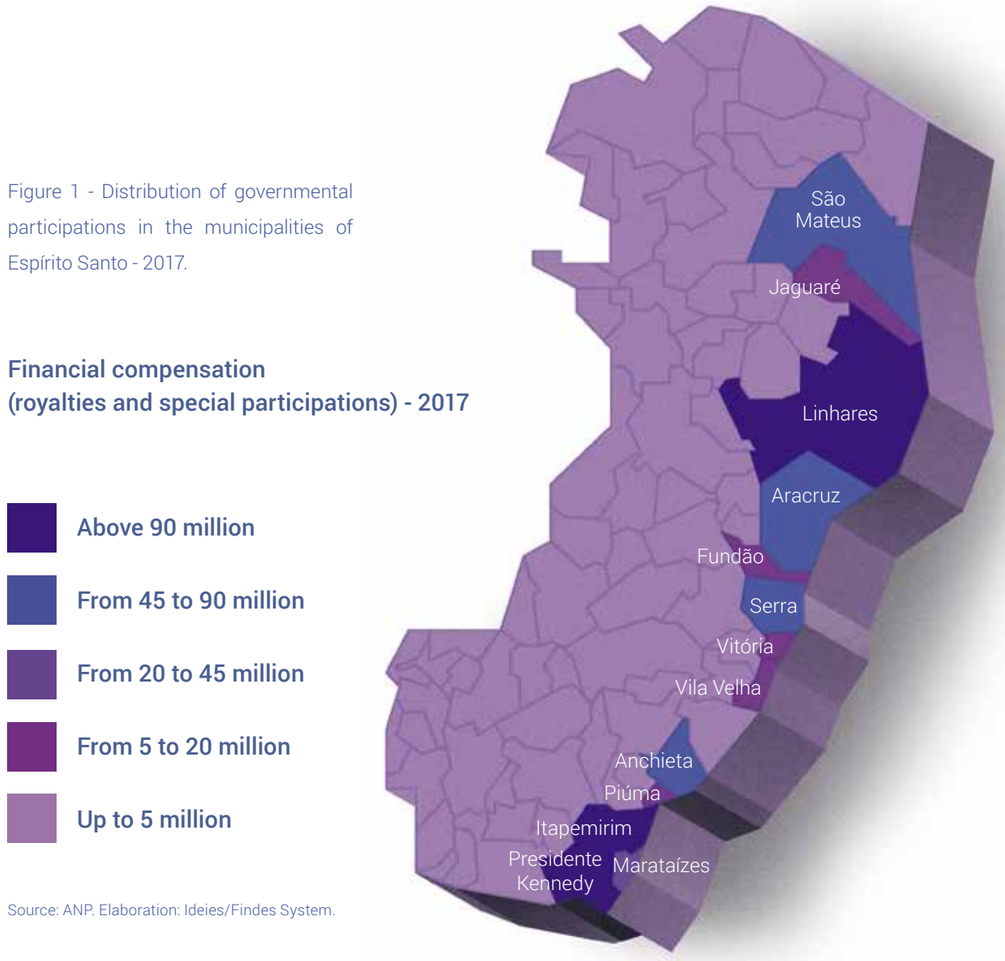
[17] Art. 3rd of the Law no. 8,308/2006.

[18] The onshore fields in the territory of Espírito Santo do not generate financial compensation of special participations.



In Espírito Santo, the state and municipalities received BRL 913.1 million in special participations in 2017. The sum of the royalties and special participations, that is, the total of governmental participations allocated to Espírito Santo, in 2017, was BRL 2.2 billion, accounting for 7.1% of the governmental participations in the country, and increasing 6.0 percentage points in relation to 2001 (1.1%). From these BRL 2.2 billion received, BRL 1.4 billion were allocated to the state government and BRL 831.8 million, to the municipalities (Table 8). Over half (57%) of these governmental participations (royalties and special participations) went to the municipalities of Presidente Kennedy, Itapemirim and Linhares (Figure 1).

Figure 1 - Distribution of governmental participations in the municipalities of Espírito Santo - 2017.



Source: ANP. Elaboration: Ideies/Findes System.

Table 8 – Collection of royalties and special participation taxes in the state and the municipalities of Espírito Santo in constant values – average 2017 IPCA - (BRL millions)

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Governmental Participations	Municipalities in ES	55.4	75.2	122.5	135.8	141.4	199.3	279.0	520.0	314.3	573.3	1,067.5	1,362.2	1,292.6	1,375.2	952.4	670.1	831.8
	State of ES	68.8	86.2	153.0	133.4	141.2	214.3	303.1	721.7	515.4	842.1	1,572.4	2,323.7	2,060.8	2,207.6	1,550.7	1,018.5	1,357.4
	Total Brazil	11,327.3	14,784.3	21,244.6	21,885.4	26,144.2	31,514.1	26,962.2	39,401.1	27,228.5	34,103.3	37,960.7	44,237.9	42,067.4	44,062.2	28,008.5	18,623.6	30,899.7
	% of Brazil	1.1%	1.1%	1.3%	1.2%	1.1%	1.3%	2.2%	3.2%	3.0%	4.2%	7.0%	8.3%	8.0%	8.1%	8.9%	9.1%	7.1%
Royalties	Municipalities in ES	55.3	73.9	117.8	129.9	134.5	191.7	269.3	449.9	244.4	480.1	879.0	1,020.1	1,019.6	1,083.8	743.0	548.9	649.2
	State of ES	68.5	80.8	134.1	109.5	113.7	184.0	264.4	441.2	235.6	469.6	818.4	955.3	968.8	1,042.0	713.1	533.8	626.9
	Total Brazil	6,481.5	8,266.9	9,942.7	10,699.6	12,318.8	14,674;6	13,768.9	19,028.2	13,211.0	15,678.0	19,231.2	21,965.1	21,570.4	23,052.6	15,817.7	12,422.0	15,518.0
	% of Brazil	1.9%	1,9%	2.5%	2.2%	2.0%	2.6%	3.9%	4.7%	3.6%	6.1%	8.8%	9.0%	9.2%	9.2%	9.2%	8.7%	8.2%
Special Participation	Municipalities in ES	0.1	1.3	4.7	6.0	6.9	7.6	9.7	70.1	69.9	93.1	188.5	342.1	273.0	291.4	209.4	121.2	182.6
	State of ES	0.3	5.4	19.0	23.9	27.5	30.3	38.7	280.5	279.8	372.5	754.0	1,368.5	1,092.1	1,165.6	837.6	484.7	730.5
	Total Brazil	4,845.8	6,517.4	11,302.0	11,185.8	13,825.4	16,839.5	13,193.4	20,372.9	14,017.4	18,425.3	18,729.5	22,272.8	20,497.0	21,009.6	12,190.8	6,201.7	15,381.6
	% of Brazil	0.0%	0.1%	0.2%	0.3%	0.2%	0.2%	0.4%	1.7%	2.5%	2.5%	5.0%	7.7%	6.7%	6.9%	8.6%	9.8%	5.9%

Source: ANP. Elaboration: Ideies/Findes System.

Table 9 – Governmental participations (royalties and special participations) paid per offshore field and comparison among municipalities - 2017

Field	Royalties (BRL million)	Special Participation (BRL million)	Total of Governmental Participations (BRL million)	Municipality	% average comparison
Abalone	-	-	-	Itapemirim-ES	100.0
Argonauta	178.74	-	178.74	Anchieta-ES	16.5
				Itapemirim-ES	15.9
				Marataízes-ES	24.1
				Piúma-ES	17.6
				Presidente Kennedy-ES	25.9
Baleia Anã	23.70	-	23.70	Anchieta-ES	0.2
				Itapemirim-ES	7.8
				Marataízes-ES	50.0
				Piúma-ES	42.0
Baleia Azul	286.75	78.14	364.89	Itapemirim-ES	24.3
				Marataízes-ES	55.7
				Presidente Kennedy-ES	20.0
Baleia Franca	217.34	41.57	258.91	Itapemirim-ES	50.0
				Presidente Kennedy-ES	50.0
Cação	-	-	-	Linhares-ES	57.0
				São Mateus-ES	43.0
Cachalote	103.43	-	103.43	Itapemirim-ES	45.2
				Marataízes-ES	41.1
				Piúma-ES	4.8
				Presidente Kennedy-ES	8.9
Camarupim	-	-	-	Aracruz-ES	100.0
Camarupim Norte	-	-	-	Aracruz-ES	100.0
Canapu	14.50	-	-	Aracruz-ES	52.9
				Fundão-ES	8.0
				Serra-ES	39.1
Cangoa	2.25	-	2.25	Linhares-ES	100.0
Frade	108.60	-	108.60	Presidente Kennedy-ES	100.0
				Campos dos Goytacazes-RJ	20.0
				São Joao da Barra-RJ	80.0
Golfinho	163.69	-	163.69	Aracruz-ES	61.6
				Fundão-ES	10.2
				Serra-ES	26.0
				Vitória-ES	2.2
Jubarte	1,144.92	1,537.34	2,682.26	Itapemirim-ES	44.6
				Marataízes-ES	6.4
				Presidente Kennedy-ES	49.1
Ostra	51.74	-	51.74	Anchieta-ES	47.3
				Marataízes-ES	0.7
				Piúma-ES	2.7
				Presidente Kennedy-ES	49.3
Peroa	13.05	-	13.05	Linhares-ES	100.0
Pirambu	0.15	-	0.15	Marataízes-ES	100.0
				Presidente Kennedy-ES	0.0
Roncador	1,403.27	1,293.10	2,696.37	Presidente Kennedy-ES	100.0
				Campos dos Goytacazes-RJ	68.2
				São João da Barra-RJ	31.8

Source: ANP. Elaboration: Ideies/Findes System.

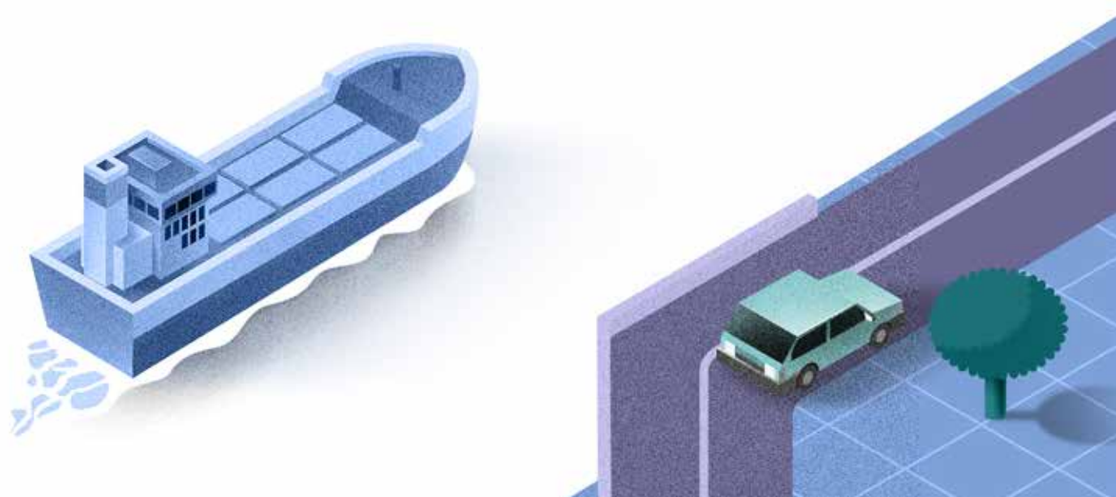


Table 10 – Governmental participation (royalties)[19] paid per onshore field - 2017

Field	Royalties (BRL Million)	Distribution (%)
Fazenda Alegre	12.08	2.8
Cancã	9.48	18.7
Inhambu	9.35	18.4
Fazenda São Rafael	7.69	15.1
Fazenda Santa Luzia	3.13	6.2
Fazenda São Jorge	1.41	2.8
Lagoa Parda	1.37	2.7
Lagoa Suruaca	0.85	1.7
São Mateus	0.67	1.3
Rio Preto Oeste	0.58	1.1
Fazenda Queimadas	0.56	1.1
Rio Preto	0.49	1.0
Jacutinga	0.46	0.9
Córrego Cedro Norte	0.33	0.7
Rio Preto Sul	0.26	0.5
Biguá	0.26	0.5
Córrego Dourado	0.26	0.5
Rio São Mateus	0.18	0.4
Cacimbas	0.17	0.3
Lagoa Piabanha	0.17	0.3
Lagoa Bonita	0.17	0.3
Gaivota	0.16	0.3
Córrego das Pedras	0.10	0.2
Rio Itaúnas	0.10	0.2
Seriema	0.10	0.2
Lagoa Parda Norte	0.08	0.2
Fazenda Cedro Norte	0.08	0.2
Rio Ipiranga	0.08	0.2
Tabuiaiá	0.05	0.1
Campo Grande	0.04	0.1
Fazenda Cedro	0.03	0.1
Mariricu	0.03	0.1
São Mateus Leste	0.02	0.0
Mariricu Norte	0.02	0.0
Córrego Cedro Norte Sul	0.01	0.0
Crejoá	0.01	0.0
Rio São Mateus Oeste	0.00	0.0
Tucano	0.00	0.0
Mariricu Oeste	0.00	0.0
Albatroz	0.00	0.0
Barra do Ipiranga	0.00	0.0
Garça Branca	0.00	0.0
Guriri	0.00	0.0
Jacupemba	0.00	0.0
Lagoa Parda Sul	0.00	0.0
Mosquito	0.00	0.0
Mosquito Norte	0.00	0.0
Nativo Oeste	0.00	0.0
Rio Barra Seca	0.00	0.0
Rio Doce	0.00	0.0
Rio Ibiribas	0.00	0.0
Rio Itaúnas Leste	0.00	0.0
Saira	0.00	0.0
Total	50.80	100

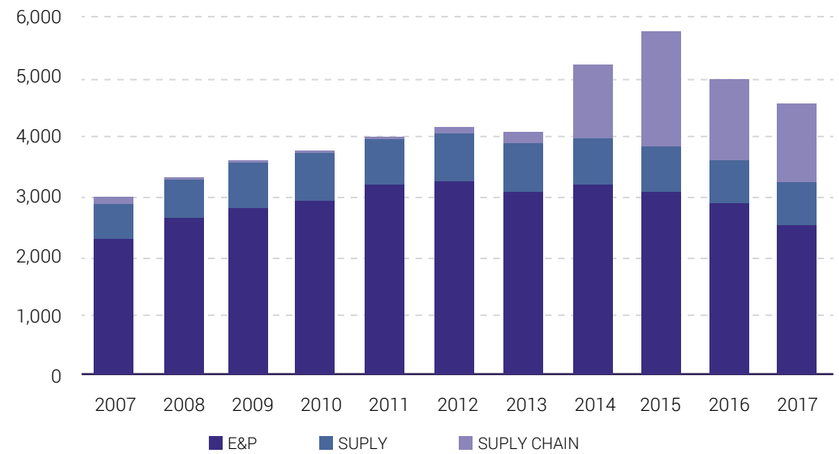
Source: ANP. Elaboration: Ideies/Findes System.

3.2 Job Market

The activity of oil and natural gas exploration and production contributes, in general, to the social-economic development of the region in general and, in particular, the growth and improvement of the job market. In this document, the oil and natural gas chain in the state of Espírito Santo was divided into three axes: (i) exploration and production (E&P), also known as upstream, which consists of the activities of O&G extraction and production; (ii) supply, which consists of the transformation and commercialization of O&G products and (iii) supply chain , with the industrial activities that provide specific products and services for the E&P activities.

In 2017, the O&G production chain employed 4,540 regular employees, 55.5% in E&P, 15.5% in supply and 29.0% in supply chain.

Chart 31 – Distribution of employees throughout the three links of the production chain in the O&G Sector

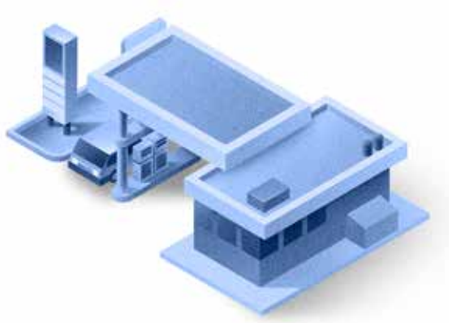


Source: RAIS/M.T.E. Elaboration: Ideies/Findes System.

[19] The onshore fields in the state territory do not generate financial compensation in the form of special participations, therefore, we only displayed the values of generated royalties.

[20] In this chain, we did not consider the retail of fuels, since we understand that this activity exists in practically in all regions of Brazil, regardless of O&G exploration and production activities.

[21] For the state of Espírito Santo we considered the construction of vessels and floating structures as the supplier of E&P activities, because we understand that the existence of this activity in the state is derived from the existence of E&P in the O&G sector.



Between 2016 and 2017, the number of jobs in the O&G sector had a setback of 8.4%. The biggest drop was observed in E&P (-12.7%), followed by supply chain (-3.2%) and supply (-1.4%).

The job market in the O&G sector of Espírito Santo grew, in average, 3.9%/year, between 2007 and 2017. In the same period, E&P grew 0.9%/year, supply grew 1.5%/year and supply chain expanded 25.3%/year. This expressive growth in supply chain happened, especially, due to the deployment of a big industry from the construction of vessels and floating structures in the municipality of Aracruz in 2014.

Table 11 - Jobs in the oil & gas production chain of Espírito Santo

Chain segment	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
E&P	2,278	2,636	2,818	2,914	3,192	3,251	3,087	3,207	3,071	2,883	2,518
Supply	596	641	739	817	747	785	788	749	759	714	704
Supply chain	112	44	27	41	72	122	197	1,232	1,928	1,362	1,318
Total	2,986	3,321	3,584	3,772	4,011	4,158	4,072	5,188	5,758	4,959	4,540
% of the total job in the industry of ES	1.9%	2.0%	2.1%	2.0%	2.1%	2.1%	2.1%	2.7%	3.2%	3.1%	2.9%
% ES in Brazil - Total	2.0%	2.0%	2.0%	2.0%	2.0%	1.9%	1.8%	2.3%	2.8%	2.7%	2.8%

Source: RAIS/M.T.E. Elaboration: Ideies/Findes System.

While analyzing the profile of workers in the oil and gas production chain of Espírito Santo, we observed that, in 2017, there was a concentration of workers in the production of industrial goods and services (1,554). The activity that generated most jobs this year was filtering and separation (405), which corresponds to 81.7% of the total value of this occupation in the general industry of Espírito Santo. Besides, the O&G chain employed 83.8% of the chemical engineers in the industry of ES and 41.0% of the mechanical engineers (Table 12).

Most of the workers in the O&G chain of Espírito Santo belong to the age range of 30 and 49 years (1,911) and almost half of the employees (1,964) on this chain have a college degree, followed by the employees who completed high school (1,811).

> **The O&G chain in Espírito Santo absorbs 15.1% of the employees with a college degree in the state industry, 63.8% of the employees have a Master's degree and 55.0% have a Doctors degree.**

In 2017, the average remuneration of the O&G production chain in Espírito Santo was BRL 11,124.42; while in Brazil, it was BRL 10,211.20. These values were way above the average remuneration of the Espírito Santo industry (BRL 2,502.37) and the rest of the Brazilian industry (BRL 2,644.06)[22].

[22] The national/state industry, here, encompasses the industry of extraction, transformation and civil construction.

Table 12 – Characteristics of the labor market of Espírito Santo's oil & gas chain - 2017

	ES	BR	% ES IN BRAZIL	% INDUSTRY OF ES
Main Occupations				
Filtering and Separation Operators	405	9,742	4.2	81.7
Clerical Staff, Agents, Administrative Assistants	257	10,636	2.4	2.8
Workers in Planning and Assembly of Metallic Structures	121	2,464	4.9	10.0
Mechanical Technicians on the Manufacturing and Assembly of Machines, Systems and Instruments	184	4,406	4.2	16.7
Chemical Engineers	166	3,939	4.2	83.8
Mechanical Engineers	143	3,597	4.0	41.0
Technicians in Electricity and Electricians	106	2,278	4.7	10.9
Technicians in Calibration and Instrumentation	117	1,975	5.9	31.6
Workers in Extraction of Liquid and Gaseous Minerals	90	4,220	2.1	66.7
Workers in Welding and Cutting of Materials and Compounds	140	3,812	3.7	5.0
Others	2,811	117,847	2.4	-
Professions				
Workers in Production of Industrial Goods and Services	1,554	66,590	2.3	1.6
Medium-Level Technicians	1,041	29,394	3.5	8.3
Professionals of Sciences and Arts	986	30,310	3.3	20.6
Workers in Administrative Services	477	17,955	2.7	2.9
Workers in Services, Retail Vendors	187	8,325	2.2	1.5
Workers in Reparation and Maintenance Services	220	4,905	4.5	2.5
Higher Members of Public Administration, Directors of public interest organizations	75	7,010	1.1	1.9
Age Groups				
10 to 17	53	345	15.4	3.2
18 to 24	292	9,416	3.1	1.4
25 to 29	591	20,456	2.9	2.4
30 to 39	1,911	63,908	3.0	3.7
40 to 49	996	37,967	2.6	3.1
50 to 64	663	31,271	2.1	3.1
65 and over	34	1,553	2.2	2.1
School Level				
Illiterate	1	92	1.1	0.2
Until 5th Grade (Incomplete)	31	1,476	2.1	0.6
Elementary School (Until 5th grade)	26	1,715	1.5	0.5
Elementary School (6th to 9th grades)	52	5,236	1.0	0.4
Completed Elementary School	115	8,639	1.3	0.6
Incomplete High School	214	5,832	3.7	1.4
Completed High School	1,811	68,654	2.6	2.3
Incomplete Higher Education	140	6,881	2.0	3.6
Complete Higher Education	1,964	62,407	3.1	15.1
Master's Degree	164	3,357	4.9	63.8
Doctors Degree	22	627	3.5	55.0
Value of average remuneration (BRL) of the O&G chain	11,124.42	10,211.20	-	-
Value of average remuneration (BRL) of the industrial sector	2,502.37	2,644.06	-	-

Source: RAIS/M.T.E. Elaboration: Ideies/Findes System.

Even though the O&G sector represents only 2.9% of the job market in the industry of Espírito Santo, since it is intensive in the capital, it employs over half of the professionals with a high degree of qualification (Masters and Doctors), remunerating them well above the levels observed in the general industry. While a Master in the general industry earned, in 2017, an average of BRL 18,814.31/month; in the O&G chain, this remuneration was BRL 24,014.24, very close to the average remuneration of a Doctor, BRL 24,270.76, and BRL 4,486.56 higher than the remuneration observed in the general industry for a Doctor.

Espírito Santo Oil and Gas Forum (FCP&G)

Due to the importance of the oil and gas chain for the industry of Espirito Santo, especially in E&P, large and medium-sized industrial companies, especially in the shipbuilding and energy sectors, were attracted to the state. Besides, some companies specialized as chain suppliers. This significant movement leveraged and justified the creation, in 2013, of the Espírito Santo Oil and Gas Forum (FCP&G) with the intention of institutionally strengthening these companies.

The Forum supports the activities of over 300 companies, including (direct and indirect) suppliers and potential suppliers in the O&G sector. Currently, among these companies, twelve of them are developing research and innovation projects.

These projects are key for the execution of innovations and to increase the complexity and competitiveness in the Capixaba oil and gas production chain.

Altogether, these twelve companies employed, in 2017, 301 people, with an average remuneration of BRL 2,542.56/month, BRL 40.19 higher than the general remuneration in the industrial sector of Espirito Santo.

From all the employees of these companies, 22.6% are workers in planning and assembly of metallic structures, 60.1 have completed high school and 34.9% are within the age group of 30-39 years old.

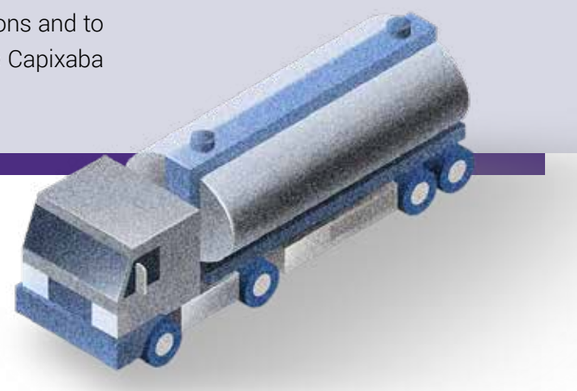


Table 13 – Characteristics of the labor market in FCP&G companies with research and innovation projects - 2017

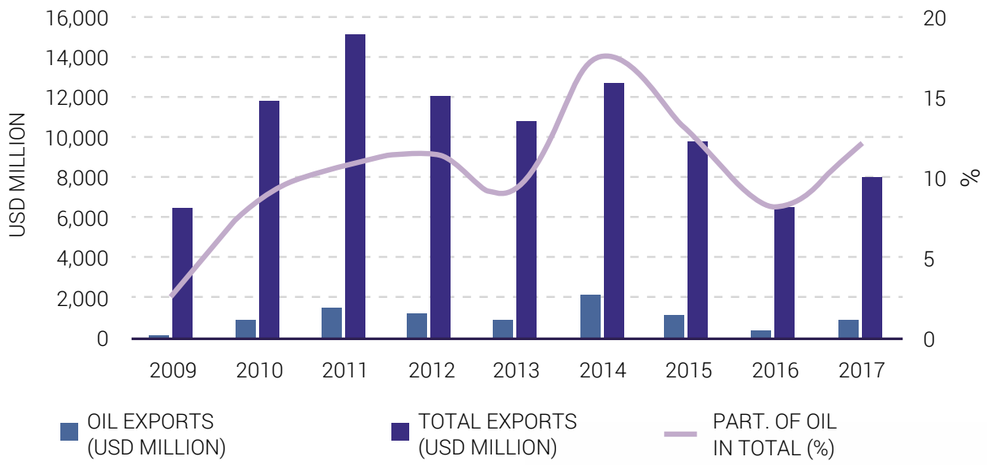
	Number of employees	Distribution (%)
Main Occupations		
Workers in planning and assembly of metallic structures	68	22.6
Workers in welding and cutting of metallic alloys	37	12.3
Machine preparers and operators– conventional tool	24	8.0
Operators of steam operated machines and utilities	24	8.0
General clerical staff, agents, administrative assistants	19	6.3
Computational systems analyst;	17	5.6
Technicians in calibration and instruments;	8	2.7
Technicians in planning and production control;	8	2.7
Technicians in systems and applications development	7	2.3
Supervisors of repairing services and machine maintenance	5	1.7
Others	84	27.9
Age Group		
15-17	5	1.7
18-24	44	14.6
25-29	65	21.6
30-39	105	34.9
40-49	43	14.3
50-64	37	12.3
65-80	2	0.7
School Level		
Until 5th Grade (Incomplete)	3	1.0
Elementary School (Until 5th grade)	3	1.0
Elementary School (6th to 9th grades)	19	6.3
Completed Elementary School	21	7.0
Incomplete High School	20	6.6
Completed High School	181	60.1
Incomplete Higher Education	14	4.7
Complete Higher Education	40	13.3
Total	301	
Average Remuneration Value (BRL)	2,542.56	

Source: RAIS/M.T.E. Elaboration: Ideies/Findes System

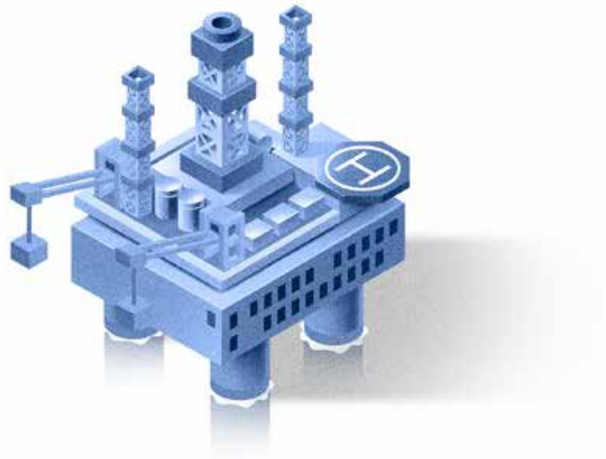
3.3 External Sector

The oil exports include crude oil, coke and oil products, petrochemical products and the Repetro[23] eligible products. From the beginning of the exploration in the oil fields located in the Espírito Santo's portion of the pre-salt polygon in 2010, the exports of these hydrocarbons in the state reached 11.5% of the total value on the 2012 agenda. In 2014, the value of oil exports from the state reached 2.2 billion dollars, representing a 17.5% participation in the total exports from Espírito Santo. The decrease in international oil barrel prices, from 2014, resulted in a contraction in the exports of this product and its participation in the exports agenda of the state, which was 8.2% in 2016. In 2017, the oil exports resumed their growth, reaching a value of 968 million dollars and a participation of 12% in the exports from Espírito Santo.

Chart 32 – Total and oil exports from Espírito Santo and the participation of oil exports in total exports



Source: MDIC/Secex. Elaboration: Ideies/Findes System.



Between 2010 and 2017, crude oil represented, in average, 90.9% of the exports of assets in the oil category in Espírito Santo's agenda. Throughout this period, the average participation of oil exports from the state, when compared to the ones in Brazil, was 4.9%.

Santo reached the highest values of participation in Brazilian exports of oil, 8.2%, and crude oil, 12.2%. The decrease in state exports, in 2015 and 2016, also represented significant participation losses of oil exports in the total oil exports from the country. But a comparison between 2016 and 2017 can identify a growth of the exported values of crude oil and petrochemical products of, respectively, 97.8% and 61.9 %.

From the total oil exports in 2017, 95.1% were related to the crude oil exports, 4.5% were the exports of Repetro eligible products and 0.4% were the exports of petrochemical products

Table 14 – Oil exports from Espírito Santo (USD Millions)

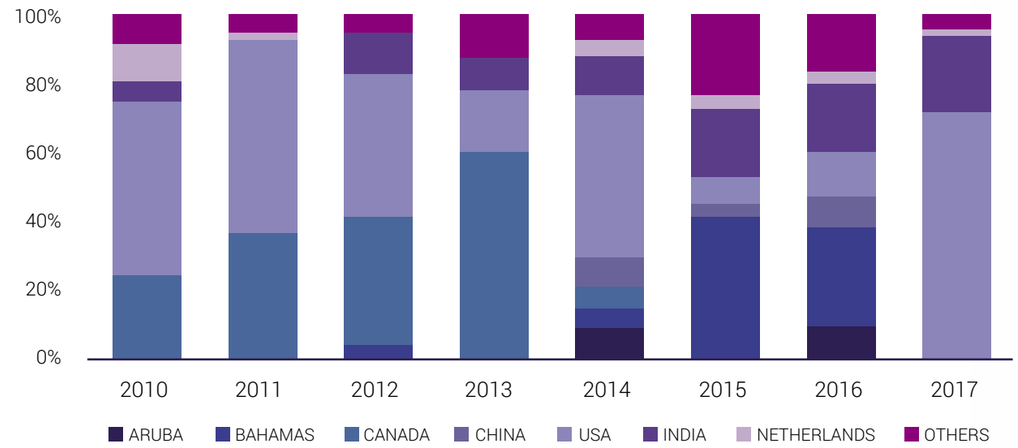
Period	Total oil exports		Crude oil		Coke and oil products		Petrochemical products		Repetro eligible products	
	Total ES	%ES/BR	Total ES	% ES/BR	Total ES	% ES/BR	Total ES	% ES/BR	Total ES	% ES/BR
2010	1,020	4.4	899	5.5	0	0.0	1	0.1	119	8.2
2011	1,635	5.2	1.511	7.0	0	0.0	2	0.1	123	4.5
2012	1,397	4.4	1.322	6.5	0	0.0	0	0.0	74	2.1
2013	1,011	3.4	932	7.2	0	0.0	2	0.1	78	0.8
2014	2,223	8.2	2.001	12.2	0	0.0	6	0.2	217	5.2
2015	1,278	6.4	1.128	9.6	0	0.0	2	0.1	147	3.8
2016	535	2.8	465	4.6	0	0.0	3	0.1	68	1.3
2017	968	4.1	920	5.5	0	0.0	4	0.2	43	1.7

Source: MDIC/Secex. Elaboration: Ideies/Findes System.

[23] Repetro is the special customs regime applicable to exports and imports of assets dedicated to research activities, the exploration of the oil and natural gas deposits, provided in Law no. 9,478, of August 6th 1997. This regime allows, according to each case, the application of the following customs approaches: Decree-Law no. 37, from 1966, art. 93, with the wording of Decree-Law nº. 2,472, of 1988, art. 3º.

In the period between 2010-2017, the crude oil exports in Espírito Santo very much concentrated in seven countries: United States, Canada, India, the Netherlands, Aruba, Bahamas and China. In this period, these countries represented, in average, 90% of the destination of crude oil exports from the state. Throughout this period, their participation varied a lot (Chart 33), but the United States were the main commercial partner in 2010, 2011, 2012, 2014 and 2017. The main destination of crude oil exports from Espírito Santo was also Canada in 2013 and the Bahamas, in 2015 and 2016.

Chart 33 – Main destinations of crude oil exports from Espírito Santo



Source: MDIC/Secex. Elaboration: Ideies/Findes System.

The concentration of destinations for the crude oil exports is also a common characteristic of Brazil: in 2017, the main importers were China (44%), the United States (16%), Chile (9%) and India (9%).

The oil imports from Espírito Santo between 2010 and 2017 consisted, predominantly, of petrochemical products. The state did not import crude oil in this period. The higher volume of petrochemical product imports occurred in 2012 and represented 3.3% of the total imports of this same product in Brazil. In 2014, the imports of Repetro eligible products were above the figures for petrochemical products and coke and oil products. In 2016 and 2017, there was a decrease in total oil imports, but Espírito Santo kept its participation in the total amount of Brazil (0.8%).

From the total oil imports in 2017, 51.6% are coke and oil products, 26.7% are petrochemical products and 21.7%, Repetro eligible products.

Table 15 – Oil imports from Espírito Santo (USD Millions)

Period	Total imports		Crude Oil		Coke and Oil Products		Petrochemical Products		Repetro Eligible Products	
	Total Oil	%ES/BR	Total ES	%ES/BR	Total ES	%ES/BR	Total ES	%ES/BR	Total ES	%ES/BR
2010	231	0.8	-	-	46	0.4	119	2.9	66	2.8
2011	244	0.6	-	-	17	0.1	157	3.0	70	2.6
2012	290	0.8	-	-	35	0.2	163	3.3	92	3.2
2013	264	0.6	-	-	38	0.2	119	2.1	107	3.1
2014	315	0.7	-	-	35	0.2	107	1.9	173	4.8
2015	228	0.9	-	-	67	0.7	111	2.5	50	1.3
2016	132	0.8	-	-	33	0.4	69	1.9	29	1.1
2017	156	0.8	-	-	81	0.7	42	1.1	34	2.0

Source: MDIC/Secex. Elaboration: Ideies/Findes System

The oil exports and imports agenda of Espírito Santo is a reflection of the oil and natural gas production chain of the state, where the exploration and crude oil production are strong, while the refinement activity is inexistent.

This reality explains why the exports from the state are concentrated in crude oil, with less added value, and the imports are concentrated in oil products and petrochemical products, which require more complexity in their transformation, thus they are considered products with more value added.

Chapter 4

RESEARCH, DEVELOPMENT AND INNOVATION[24]

The development of new technologies is key for the maintenance of production capacity and competitiveness in the oil and gas sector. Brazil has an incentive and support instrument for strategies related to research, development and innovation (RD&I) in the oil and natural gas sector: the mandatory clause of investments in projects and programs of research, development and innovation (RD&I).

4.1 Regulation

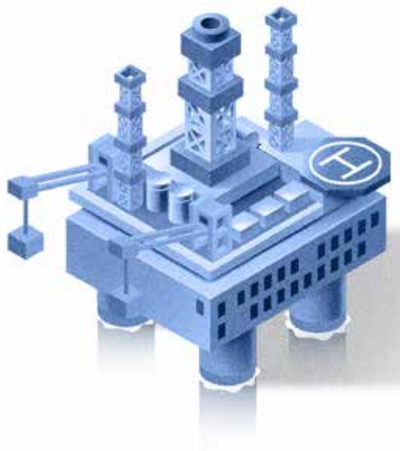
The clause establishes the application of a percentage of the gross production revenue from the production fields in RD&I projects and programs, which varies according to the modality of contract signed with ANP: 1% in the case of concession and production sharing and 0.5% in the case of onerous transfer[25].

The funding of these RD&I projects and programs, through the clause, started in 1998, the year that followed the creation of the Oil Act – Law nº 9,478/97 – approved in 2005 by Resolution no. 33/2005 and the respective Technical Regulation nº 05/2005. In 2015, this regulation was replaced by the ANP Resolution no. 50/2015 and the respective ANP Technical Regulation no. 03/2015, which was enacted only in the following year[26].

[24] We would like to thank Luiz Alberto Carvalho (Tecvix), Eustáquio Vinicius de Castro (Labpetro/ UFES) and Aline D'Avila for their contribution in this chapter.

[25] According to the Law no. 9,478/97 (The Oil Act), the National Agency of Petroleum, Natural Gas and Biofuels (ANP) is in charge of stimulating the use of new technologies in the Oil and Gas sector in Brazil.

[26] The data about the provisions of the ANP's RD&I clause have undergone a review regarding the information and change in the type of availability by ANP in its website (www.anp.gov.br). From 2018, the agency started disclosing only the total amount of projects/programs regulated by RT no. 05/2005, without the amount spent. The information available regarding values is about the projects addressed by RT no. 05/2005 which would require authorization by ANP. For the other projects (a larger amount), there is no information on this. The data about projects regulated by RT no. 03/2015 have more disaggregation, displaying the values spent in each project. But not all projects and programs in 2017 were addressed by this last resolution. Because of that, this ediction of the Oil Yearbook has little information on the available amounts.



With the regulation, few modalities of expenses needed ANP's authorization to be performed. Thus, most of the projects or programs continued not requiring an authorization for their execution, it was enough for the executing authorities to account for the expenses of the resource used[27].

The projects of research, development and innovation may only be executed by the oil company, accredited institutions or by a Brazilian company individually or in a partnership. The application of resources from the clause in programs or projects must respect the specific distribution percentages of each one of these types of executing authorities and take into consideration the type of contract or round.

Box 1- Legal and normative references for distribution per type of executing entity for resources of the RD&I clause

Concession contract until 10th round	Concession contract after 10th round and production sharing	Onerous transfer contracts
Investment of at least 50% of the resources in projects and programs executed by Accredited Institutions (IC). From this amount, up to 30% may be invested directly in (micro, small and medium-sized) Technically-Based Companies (EBT) in projects or programs executed in partnership with Accredited Institutions (IC).	The investment of at least 50% of the resources in IC. From this amount, up to 30% may be applied in EBT of medium/large sizes.	Investment of 100% of the predicted resources in IC. Up to 30% of these resources may directly applied in EBT of up to medium and large sizes, in projects executed in partnership with the Accredited Institutions.
From the rest of the resource, up to 50% may be allocated to any of the allowed executing authorities: Oil Company, Brazilian Company or Accredited Institution.	At least 10% of the resources must be applied in EBTs that supply assets or provide services.	
	The remaining amount, up to 40%, may be allocated to any of the executing authorities allowed.	

Source: ANP. Elaboration: Ideies/Findes System.

[27] These projects in RT no. 03/2015 are: (a) technological programs for technical development and training of suppliers; (b) specific improvement projects for laboratory infrastructure; (c) projects for study of sedimentary basins with new borders that involves data acquisition activities; (d) specific projects of basic industrial technology; (e) specific training program on human resources; (f) specific projects of non-routine basic engineering; (i) specific support projects for laboratory and RD&I facilities.

4.2 Projects and programs developed with resources from the RD&I clause

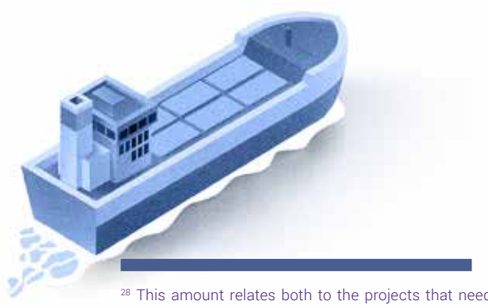
Between 1998 and 2017, the RD&I clause generated approximately BRL 13.3 billion in mandatory volumes in Brazil, and Petrobras was responsible for 92.6% of this value.

In 2017, the value generated by the clause was BRL 1.29 billion, a growth of 49.0% in comparison to the previous year.

Chart 34- Obligations generated by the RD&I clause in Brazil (BRL billions)

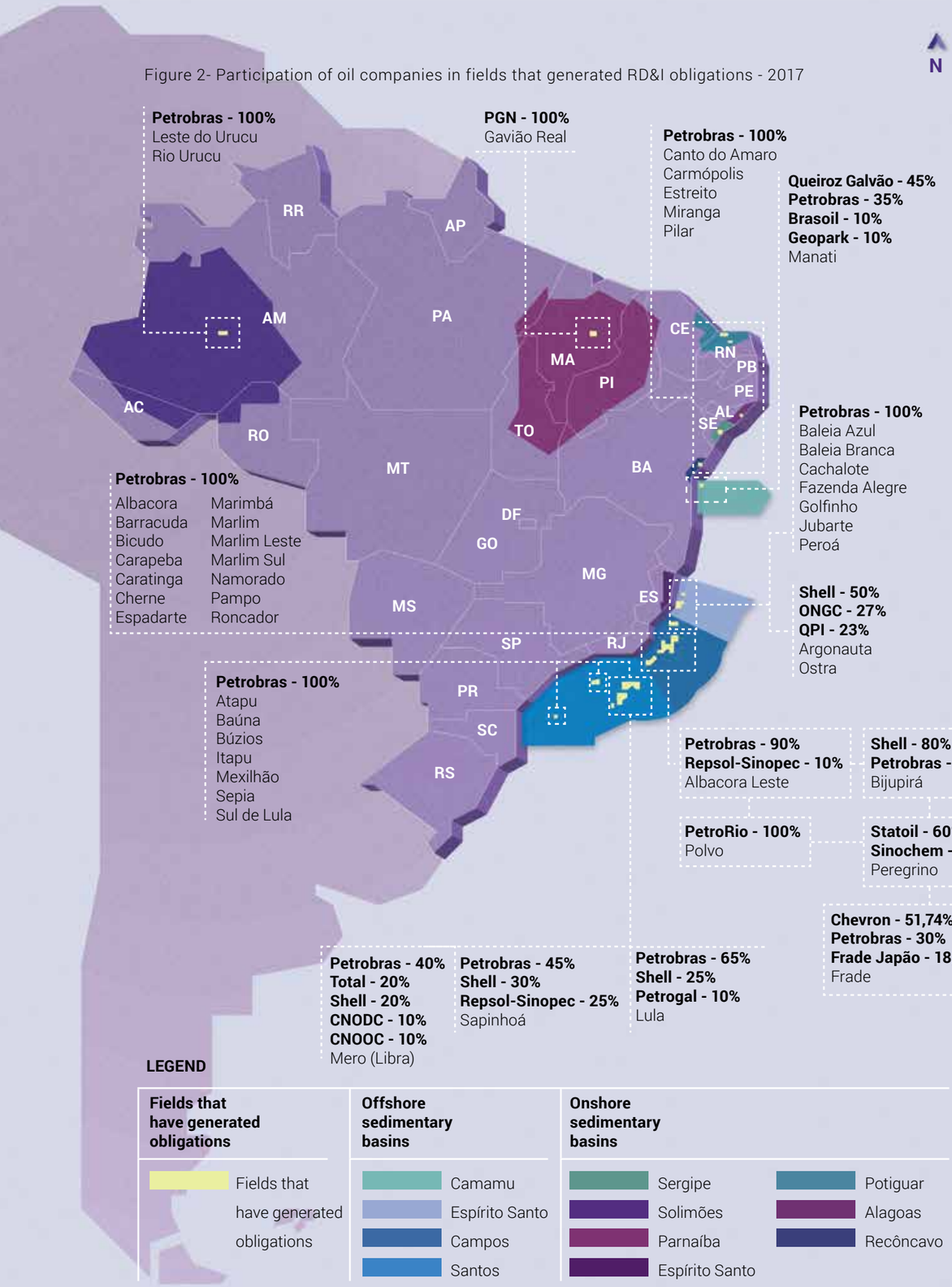
Source: ANP. Elaboration: Ideies/Findes System.

According to data made available by ANP, from 1998 to 2017, over 10 thousand projects[28] were developed in Brazil with funds from resources of the obligations generated by the clause, 96.3% of these projects were under Petrobras' responsibility. The peak in the number of projects happened in 2005 (1,042), the year before (2006) ANP's RT no. 05/2005 was enacted. When comparing 2017 with 2016, the quantity of projects grew 56.9% (Chart 35).



[28] This amount relates both to the projects that needed authorization by ANP and the ones that did not.

Figure 2- Participation of oil companies in fields that generated RD&I obligations - 2017

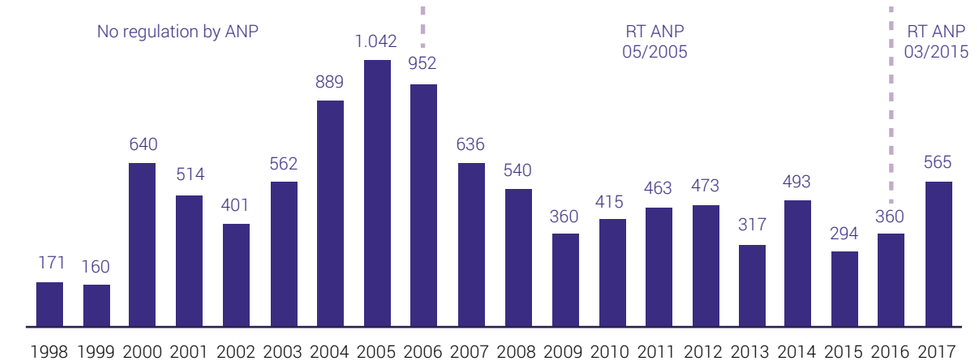


From 2000 to 2017, a total of 65 projects were started in the state of Espírito Santo.

From the four oil companies[29] that generated RD&I obligations, because they have production fields in the state border, only Petrobras (64) and Queiroz Galvão (1) had projects developed with this resource. Even though it does not have these obligations in Espírito Santo, Queiroz Galvão also developed a project. The number of projects peaked in 2006 (14), and in three years of the series (2001, 2009 and 2017), no project was started in the state (Chart 36).

From the amount of 10 thousand executed projects aforementioned, 1,502 projects were authorized by ANP between 2005 and 2017 (table 16). Among the authorized projects, 302 were not executed and, therefore, were not considered in the general estimation of 10 thousand projects.

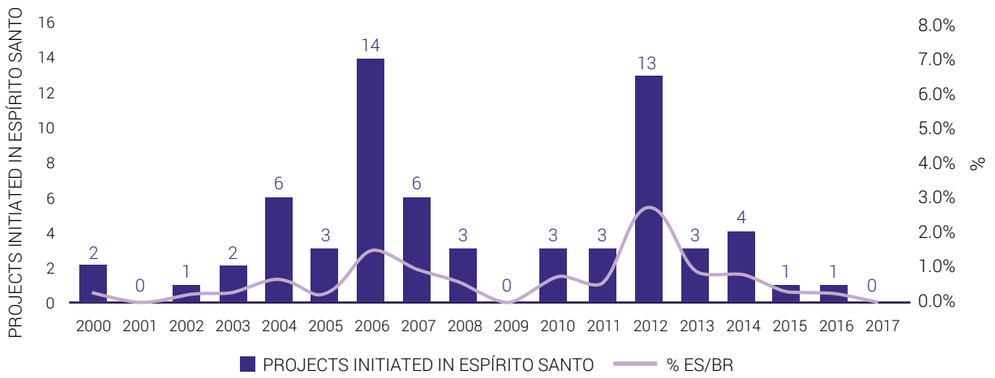
Chart 35 – Projects initiated that received resources from the RD&I clause in Brazil (no. of projects)



(*) Year declared by ANP as the beginning of the project. It is worth highlighting that many projects are executed for many years.

Source: ANP. Elaboration: Ideies/Findes System.

Chart 36 – Projects initiated in Espírito Santo that received resources from the RD&I clause



Source: ANP. Elaboration: Ideies/Findes System.

[29] Petrobras; Shell; ONGC and QPI.

These 1,502 projects authorized by ANP[30], accumulated until 2017, resulted in a total approved expense of BRL 4.8 billion[31]. The oil companies with the largest authorized volumes were Petrobras, Shell and Queiroz Galvão, with respectively, 88.5%, 3.9% and 2.1% of the total amount.

Table 16 - RD&I investments authorized by ANP in Brazil through the main concessionaires – accumulated between 2005-2017

Oil Company	No. of authorized Projects	%	Authorized values (BRL million)	%
Petrobras	1,329	88.48	4,446.2	91.44
Shell	58	3.86	289.1	5.95
Queiroz Galvão	32	2.13	9.6	0.20
Statoil	18	1.20	36.7	0.76
Petrogal	15	1.00	29.0	0.60
Repsol	13	0.87	13.6	0.28
Sinochem	12	0.80	18.9	0.39
Chevron	9	0.60	6.4	0.13
Geopark	3	0.20	0.7	0.01
Parnaíba gás natural	2	0.13	5.6	0.11
BP	2	0.13	2.3	0.05
ONGC	2	0.13	0.5	0.01
Brasoil	2	0.13	0.2	0.01
QPI	2	0.13	0.2	0.00
Frade Japão	1	0.07	3.2	0.07
Rio das contas	1	0.07	0.1	0.00
Total	1	0.07	0.1	0.00
Total	1,502	100.00	4,862.3	100.00

Source: ANP. Elaboration: Ideies/Findes System.

[30] Quantity related to the total RD&I projects and programs released by ANP to receive resources from the RD&I clause. The fact that these projects/programs are approved does not guarantee their execution.

[31] In the projects' work plans, there were expenses greater than BRL 6.4 bilhões, but only BRL 4.8 needed authorization.

In Espírito Santo, as well as in the rest of Brazil, only a part of the projects funded with the resource from the clause required authorization. More specifically, only 14 of the 65 projects developed in the state were authorized by ANP[32], reaching an amount of BRL 58.42 million in resources released by the agency. A big part of these resources was allocated to the creation and adaptation of infrastructure in laboratories and the acquisition of necessary research equipment.

4.3 Executing authorities of the projects and programs funded by the RD&I clause

As addressed in box 1, the research and development projects performed with the resources from the clause may be executed by the oil company, research institutions and Brazilian companies. For the two last ones, the developed studies aim at answering specific demands from the oil extraction and production companies. Usually, the connection between the claimant and the candidates for project execution is established through institutional articulation, and the oil company chooses the institution/company they deem more capable for the work.

4.3.1 Registered Institutions

In Espírito Santo, until 2017, the Federal University of Espírito Santo (UFES), the Federal Institute of Espírito Santo (IFES) and the Centro Leste University (UCL) executed projects with resources from the RD&I clause, and UFES was in charge of 96.9% of the total quantity of projects performed in the state.

Most of the projects performed by UFES were results of the articulation between the Center of Competences on Heavy Oil (Copes), with members of the institution and Petrobras. This group, which is currently extinct, verified the compatibility between competences in the research units registered at ANP and the demands of Petrobras, enabling the execution of some projects.

[32] In the state of Espírito Santo, 22 projects (BRL 67.5 million in authorized budgets) were approved by ANP, however, 8 of them were not developed. That is, 14 projects authorized by the agency were effectively executed in the state.

Table 17 - Institutions of Espírito Santo that received resources from the RD&I clause – accumulated between 1998-201

	Ufes	Ifes*	UCL	Total ES
Nº. of researched units registered at ANP in 2017	14	0	1	15
Nº. of projects that received RD&I resources without authorization by ANP - until 2017	50	0	1	51
Nº. of projects that required authorization by ANP**	13	1	0	14

(*) Until the date of this publication, IFES was not accredited at ANP.

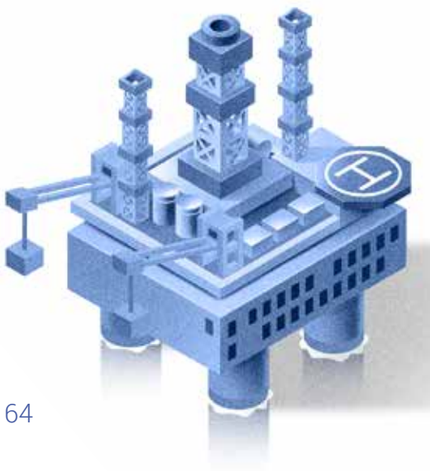
(**) ANP disclosed only the values (BRL) for the projects that required authorization.

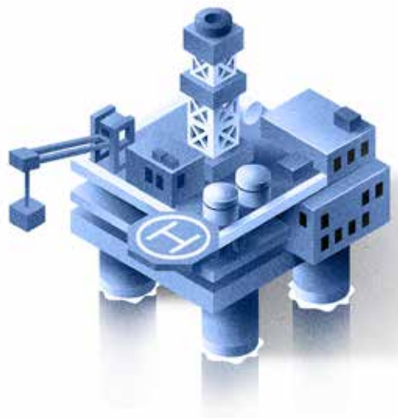
Source: ANP. Elaboration: Ideies/Findes System.

In the country, in 2017, there were 137 registered entities with 733 research units (UP, in Portuguese). The states with more registered research units were Rio de Janeiro (30) and São Paulo (21). In Espírito Santo, there are only two research institutions registered at ANP: UFES, with 14 registrations and UCL, with 1.

This small amount of research units explains, to some extent, the 65 projects/programs developed within the state, with three possible reasons: (I) the small number of professors, scholars and laboratories in these UPs; (II) the complexity and deadline of the projects; (III) professors' obligations with other academic activities. These points, altogether, reveal why the UPs have limited capabilities of receiving the investments from the clause.

One option to increase the quantity of projects developed with resources from the RD&I clause is by increasing the number of registered research units. According to the data in the CNPQ Census, in 2016, Espírito Santo had other 37 lines of research directly related to the activities of extraction and production of oil, natural gas and biofuels, which were not yet registered at ANP[33]. Since they comply with the other requirements of ANP's Resolution no. 47/2012 and the respective ANP's Technical Regulation no. 7/2012, these lines of research may be transformed into registered research units.





[33] These lines are recorded by the CNPQ Census (2016) as researchers of the Cnae's of exploration, production and gains from oil and its products (09, 19 and 20).

4.3.2 – Brazilian Companies

The Brazilian companies developed 81 RD&I projects in the country with resources from the clause during the period from 1998 to 2017, and only six of them required authorization by ANP. These companies may be the only executing authorities of the project (60.5% from the total of companies' projects), may contract a research institution (21.0% of the same total) or they may also be contracted by the oil company (18.5% of the amount of these projects).

Table 18 – Projects developed with RD&I resources by technology-based Brazilian companies – accumulated until 2017

	Quantity	Participation
Total projects	81	100.0%
Only the company	49	60.5%
As a contractor of the oil company	15	18.5%
With contracted institutions	17	21.0%

Source: ANP. Elaboration: Ideies/Findes System.

The companies in Espírito Santo have not yet developed RD&I projects with these resources, but the state has potential.

In the Espírito Santo Oil and Gas Forum (FCP&G), with executive coordination of the Federation of the Industries of Espírito Santo (Findes), there are 12 companies in charge of developing 24 different projects that comply with the necessary requirements to receive resources from the clause.

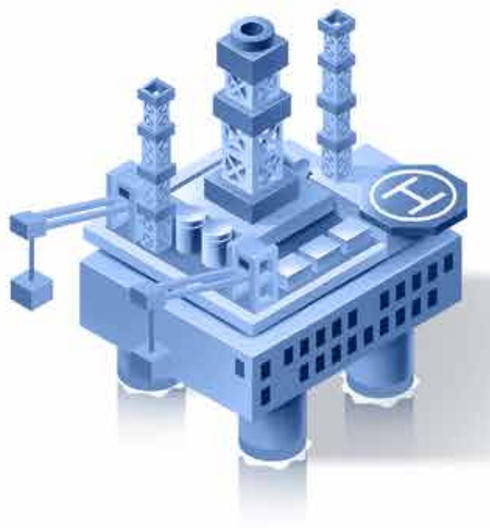
Chapter 5

ANP ROUNDS AND OPPORTUNITIES FOR ESPÍRITO SANTO

Oil consumption will continue growing until 2050[34], which may be deemed a good opportunity for the countries that have reserves. In the specific case of Brazil, maintaining the bidding round agenda is paramount for the investments in the oil and gas sector, improving its potential and ensuring more predictability for the representative agents in this sector, the society, and the municipal, state and federal governments.

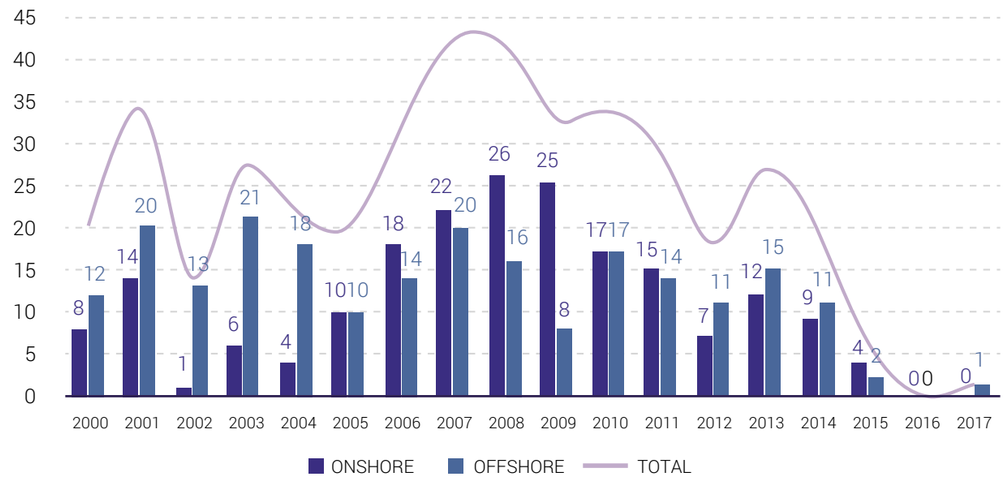
5.1. Declarations of hydrocarbon traces and commerciality

In order to perform the extraction and production, the oil and natural gas activities must undergo a few phases. The first oil production phase consists of bidding rounds, through auctions that offer areas with probable existence of hydrocarbons. After winning the auction, the contracts are signed with the companies or the winning consortium, allowing the start of the exploration development stage. During this stage, there is the confirmation of the presence or absence of oil and gas in the offered area. If there are traces of such hydrocarbons, the company must inform it to ANP by issuing a declaration of "hydrocarbon traces", pointing out their existence for exploration.



[34] Energy Information Administration.

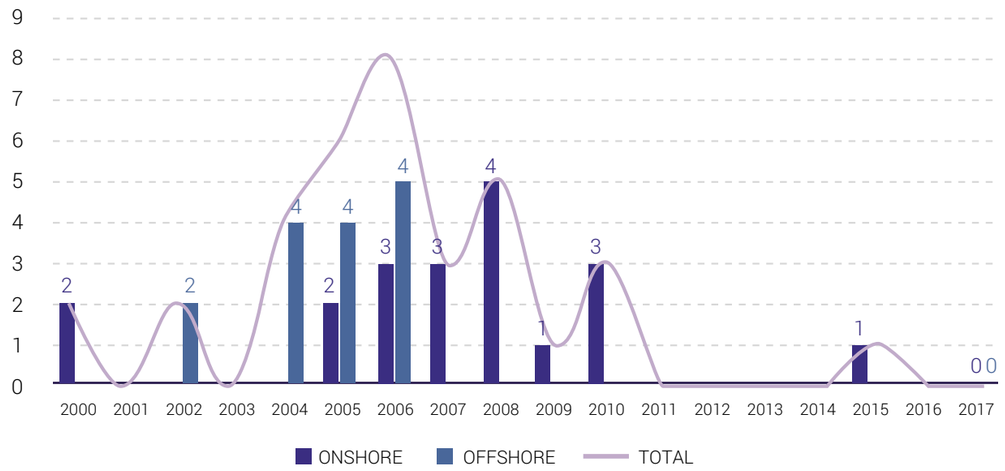
Chart 37 – Declarations of hydrocarbon traces in Espírito Santo (units)



Source: ANP | Elaboration: Ideies/Findes System.

In case the company decides to produce oil in the area where hydrocarbons were identified, it must elaborate a commerciality declaration informing that the production in that field is commercially viable and compatible with the development plan for the field (chart 38).

Chart 38 – Commerciality declarations in Espírito Santo (units)



Source: ANP | Elaboration: Ideies/Findes System.

The declarations of hydrocarbon traces and commerciality precede the oil and gas production stage. Charts 37 and 38 reveal a slowdown in the oil exploration activities, with a drop in the future production of the hydrocarbon in the state of Espírito Santo, which will consequentially reduce the governmental revenues derived from this activity.

The declarations of hydrocarbon traces slowed down with time. Between 2006 and 2009, the average issuing was 37 declarations per year, and it dropped to 27 declarations per year between 2010-2013. It has decreased even further to only 7 declarations per year in the period between 2014 and 2017. The commerciality declarations were also reduced in the analysis intervals: from 2006 to 2009, 4 declarations per year were issued in average; in the next period (2010-2013), this average dropped to 1; and it was practically null in the period between 2014 and 2017[35].

> **These results reflect the non-execution of ANP rounds between 2008 and 2013, which practically impaired the exploration of oil in the state in the subsequent years.**

5.2 History of Rounds

Supported by Law no. 9,478/1997 (The Oil Act), ANP promotes auctions through which the Federal Government grants the right to explore and produce oil and natural gas in Brazil. These auctions are divided into: concession regime and sharing regime. Since 1997, the agency has offered areas in 15 rounds under the concession regime, 4 under the sharing regime and other 4 also under the concession regime, for the areas in onshore and mature fields.

Since the beginning of the auctions, Espírito Santo took part in ten bidding rounds: with the offer of 18 sectors containing 92 blocks that were bought and are now under concession, from which 31 are located in the Campos Basin and 61 in the Espírito Santo Basin (both onshore and offshore). Regarding the attractiveness of the blocks, round 1 was extremely successful, especially for the Campos Basin, because 100% of the blocks were purchased by the following companies: Agip, YPF, Texaco and Petrobras. In the same round, the Espírito Santo Basin (ES) had only onshore offers and 50.0% of the blocks were purchased by the following companies: Esso, Unocal, Texaco and YPF.

[35] Within this period, there was only 1 declaration issued in 2017 for Golfinho field, with petroleum fluid.

Table 19 – Number and percentage of blocks offered and purchased in Espírito Santo

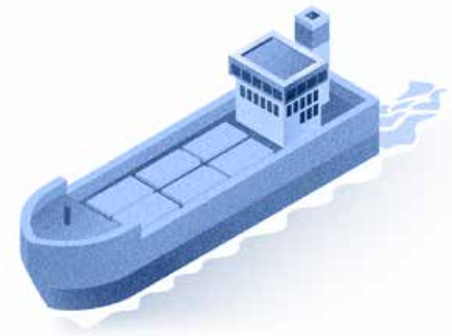
	Blocks offered per basin				Blocks bought					
	Year	Campos	ES	Total	Campos	Part. Campos (%)	ES	Part. ES (%)	Total	Part. Total (%)
Round 1	1999	3	4	7	3	100	2	50	5	71
Round 3	2001	2	9	11	1	50	7	78	8	73
Round 4	2002	2	7	9	2	100	3	43	5	56
Round 5	2003	12	57	69	6	50	4	7	10	14
Round 6	2004	6	69	75	4	67	19	28	23	31
Round 7	2005	8	60	68	-	-	23	38	23	34
Round 9	2007	-	16	16	-	-	14	88	14	88
Round 11	2013	-	12	12	-	-	12	100	12	100
Round 13	2015	-	7	7	-	-	-	-	-	-
Round 14	2017	5	26	31	3	60	10	38	13	42
Total		50	275	325	31	62	102	37	133	41

*This data does not contemplate the purchased blocks and returned blocks

Source: ANP. Elaboration: Ideies/Findes System.

For the Campos Basin, the best rounds were the first and the fourth, with 100% performance. In all six rounds where the Campos Basin offered blocks, the performance was at least 50%, with the exception of the 7th round, where 8 blocks were offered and none of them were purchased. Rounds 9 and 11 were the best rounds for the Espírito Santo basin, with 88% and 100% performance, respectively. However, in rounds 5, 6, 7 and 14, in which the Espírito Santo basin took part, the percentage of purchased blocks was below 50%. However, in rounds 5,6,7 and 14, that offered blocks at the Espírito Santos basin, the percentage of purchased blocks was below 50%. In general, the Espírito Santo basin offered five times more blocks than the Espírito Santo's portion of the Campos basin. However, the average attractiveness of the Campos Basin is much higher (62.0%) than the Espírito Santo basin (37.0%).

Regarding the participation of the companies that purchased blocks in Espírito Santo, we see an increase in the participation of international companies, 42 of them started working in oil and gas exploration and production activities throughout the rounds. The auction with the most important participation of these companies happened in round 6, with 7 companies that purchased blocks in the state.



Box 2 – Winning companies per bidding round in Espírito Santo

Round	National	International
1	Petrobras	YPF, Agip and Texaco
3	Petrobras	Esso, Unocal, Enterprise, Phillips, ElPaso, Wintershall and Kerr-McGee
4	Petrobras	BHP Billiton Limited, Shell Brasil Ltda, Partex Oil in Gas Corporation and NewField Exploration Company
5	Petrobras	-
6	Petrobras	Shell, EnCana, Kerr-McGee Corp, Synergy, Devon, SK Corporation and Repsol Sinopec
7	Petrobras, Silver Marlin and **Vitória Ambiental**	Hess, Repsol YPF, Petrogal, Shell, Central Resources e Synergy and StatoilHydro
9	OGX, Petrobras, **Vitória Ambiental** and Petro Rio	Perenco, Ongc, Canacol and SHB
11	Petrobras, Queiroz Galvão and Cowan Petróleo e Gás	Statoil Brasil O&G, Total E&P do Brasil
14	Petrobras, **BertekLtda, Imetame and Vipetro**	ExxonMobilBrasil, CNOOCPetroleum and RepsolExploración

*the companies in bold are from Espírito Santo

Source: ANP. Elaboration: Ideies/Findes System.

5.2.1 Attractiveness of the rounds

The attractiveness of the rounds may be assessed in two different ways: (i) signature bonus and (ii) minimum exploratory program (PEM). The signature bonus consists of a value offered by the oil companies or by the consortium to the area to be granted by ANP. Along with the bonus, the company also offers an amount to the Minimum Exploratory Program (PEM), whose estimate is carried out according to the activities that the offeror intends to perform, such as: seismic research, drilling of exploratory wells, among others.

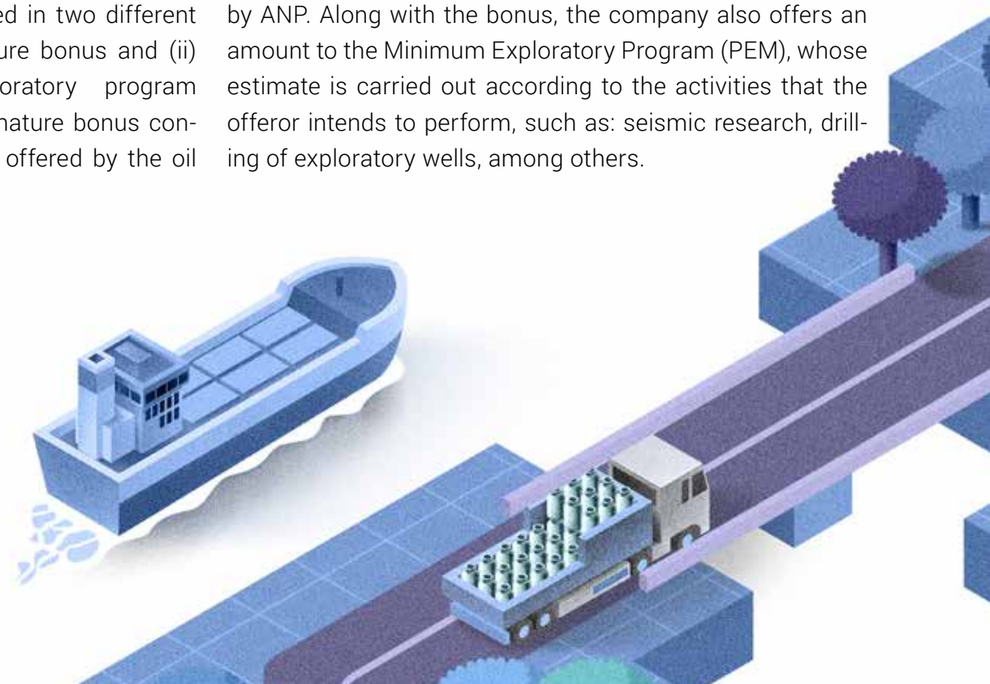
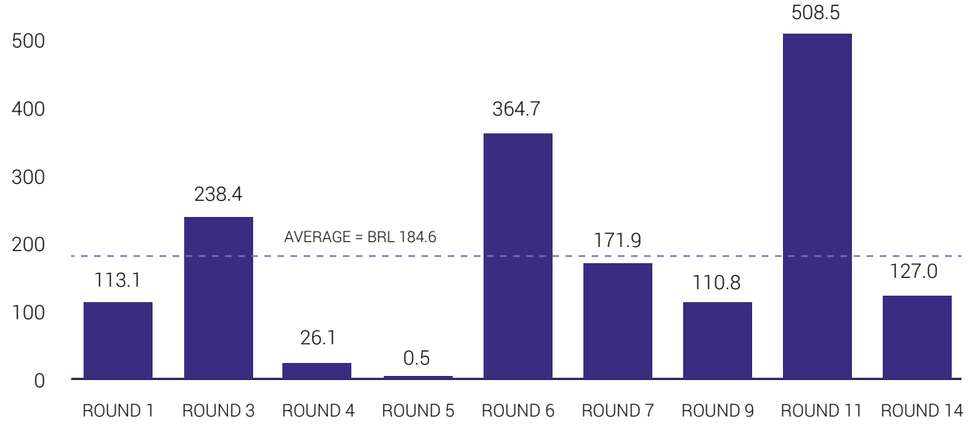


Chart 39 – Signature bonuses from blocks negotiated in Espírito Santo (BRL millions)

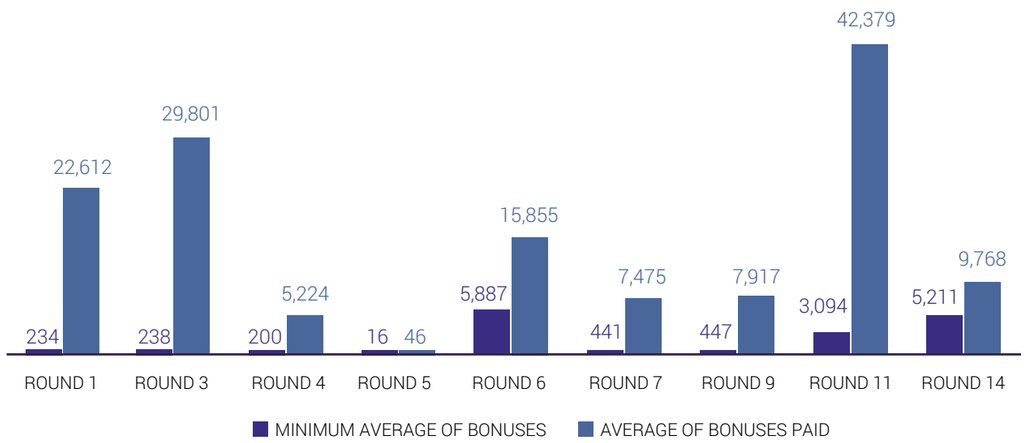


Source: ANP. Elaboration: Ideies/Findes System.

Between rounds 1 and 14, the Federal Government received a total of BRL 1.7 billion in signature bonuses related to the exploratory activities in Espírito Santo. From this total, 97.9% were related to offshore activities and 2.1% to onshore activities. The average signature bonus between rounds is BRL 184.6 million (chart 39).

From the difference between the minimum bonus required by the Federal Government and the effective payment (Chart 40), we notice that the areas purchased in Espírito Santo had attractiveness. The highest paid bonus was BRL 130 million, recorded in round 11 for the block ES-M-669, in the Espírito Santo basin.

Chart 40 – Minimum average of bonuses and average of bonuses paid per round in Espírito Santo (BRL millions)



Source: ANP. Elaboration: Ideies/Findes System.

Since PEM was only implemented in the state in round 5, it is still not possible to make a historical analysis of the collected values[36]. For this regime, the state had blocks offered and bought only in rounds 7, 9 ,11 and 14 (table 21). The highest PEM was recorded in round 11, block ES-M-596, for BRL 353.1 million. The lowest PEM was recorded in the 9th round, in block ES-T-362, for BRL 13.3 million. Regarding the average PEM per offered and purchased block, round 11 displayed the highest average (BRL 111.7 million) and round 14 displayed the lowest average (BRL 11.4 million).

Table 20 - Minimum Exploration Program (PEM) of Espírito Santo

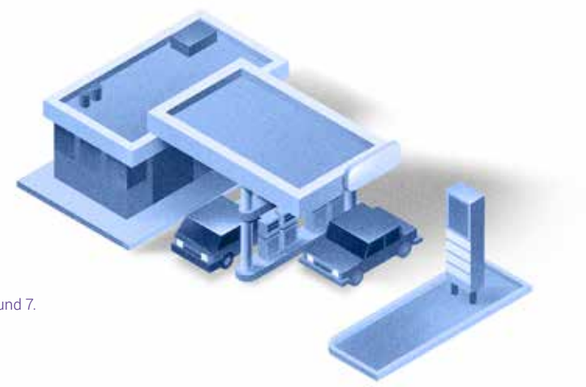
Rounds	PEM (in millions of BRL)				
	Maximum	Block – maximum PEM	Minimum	Block – minumum PEM	Average
Round 7	82.4	ES-M-737	0.06	ES-T-442	14.6
Round 9	47.1	ES-M-416	0.03	ES-T-362	13.3
Round 11	353.1	ES-M-596	7.60	ES-T-496	111.7
Round 14	34.7	ES-M-667	0.77	ES-T-476	11.4

Source: ANP. Elaboration: Ideies/Findes System.

5.3. Next ANP rounds

In 2017, the National Council of Energy Policies (CNPE) along with ANP committed to a schedule of rounds for the next few years (Figure 3). Furthermore, CNPE created important incentives for the participation of small and medium-sized companies, as well as the creation of the program for the Revitalization of Onshore Oil and Natural Gas Exploration and Production Activities – REATE, an important incentive for the onshore chain of oil and natural gas.

With a defined schedule for areas to be purchased, CNPE and ANP show the market and the agents that Brazil is committed to the offer of new exploratory blocks, allowing a better planning and providing agents with predictability, which is indispensable for the maintenance of a favorable environment for investments.



[36] The data is only available in BRL (Brazilian Reais) from round 7.

Figure 3 – Schedule of rounds announced by ANP for Espírito Santo

Besides following a schedule of rounds with all onshore and offshore areas, CNPE and ANP must also pay attention to the marginal areas, where the oil production is also decreasing.

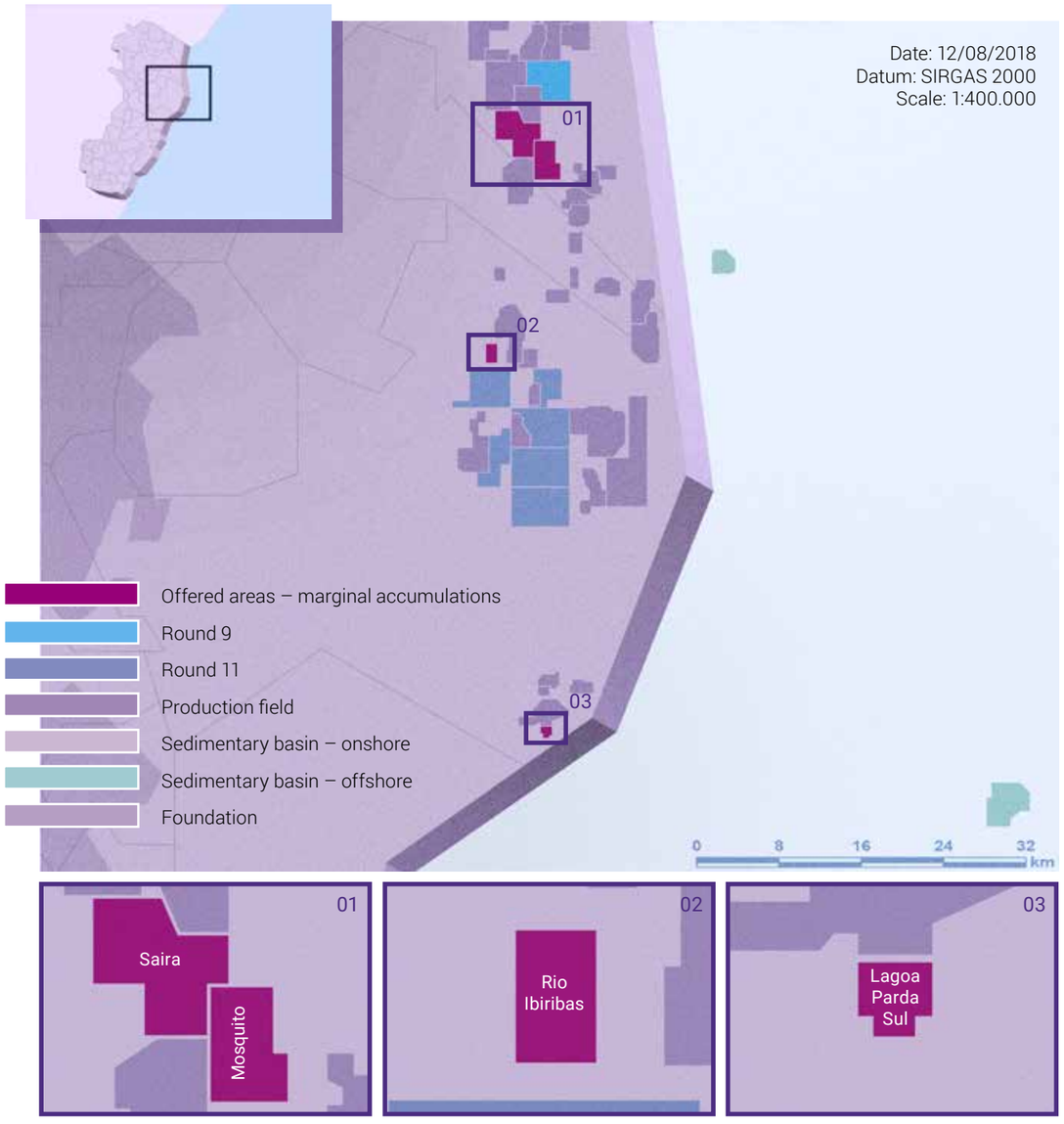
> **Such marginal areas display unsatisfactory economic results for the major oil companies, making the company return the concession of the area. A marginal field located in a mature basin is a great opportunity for small and medium-sized companies, since the technology in these areas is more disseminated than the areas with deep waters or new borders.**

In 2017, CNPE authorized ANP[37] to promote the bidding rounds of marginal areas in fields that were returned or under return process, as well as exploratory blocks with discoveries that were returned, or to offer areas that had been authorized by CNPE before. The bidding of these blocks happens through permanent offer.

The first bidding notice of permanent offers was published in April 2018 by ANP and forecasts 14 onshore areas with marginal accumulations in the basins of Espírito Santo, Potiguar, Recôncavo and Sergipe-Alagoas. In the Espírito Santo basin, the following four areas will be offered: Saíra, Mosquito, Rio Ibiritas and Lagoa Parda Sul, all of them were discovered in the 1980s, with the exception of Saíra, which was discovered in 2003 (Figure 4). Besides the marginal accumulation areas, the bidding notice also predicts the concession of 3 exploratory blocks considered mature in the onshore part of Espírito Santo.

According to the schedule of bidding rounds for blocks (Figure 3), the 17th round is predicted for 2020 and will have blocks in the Espírito Santo's portion of the Campos basin, and the 18th round is predicted for 2021 and will include blocks at the Espírito Santo basin (sector SES-AUP2, AUP3 and VT). Figure 5 displays the areas ANP is studying to offer in the next few years.

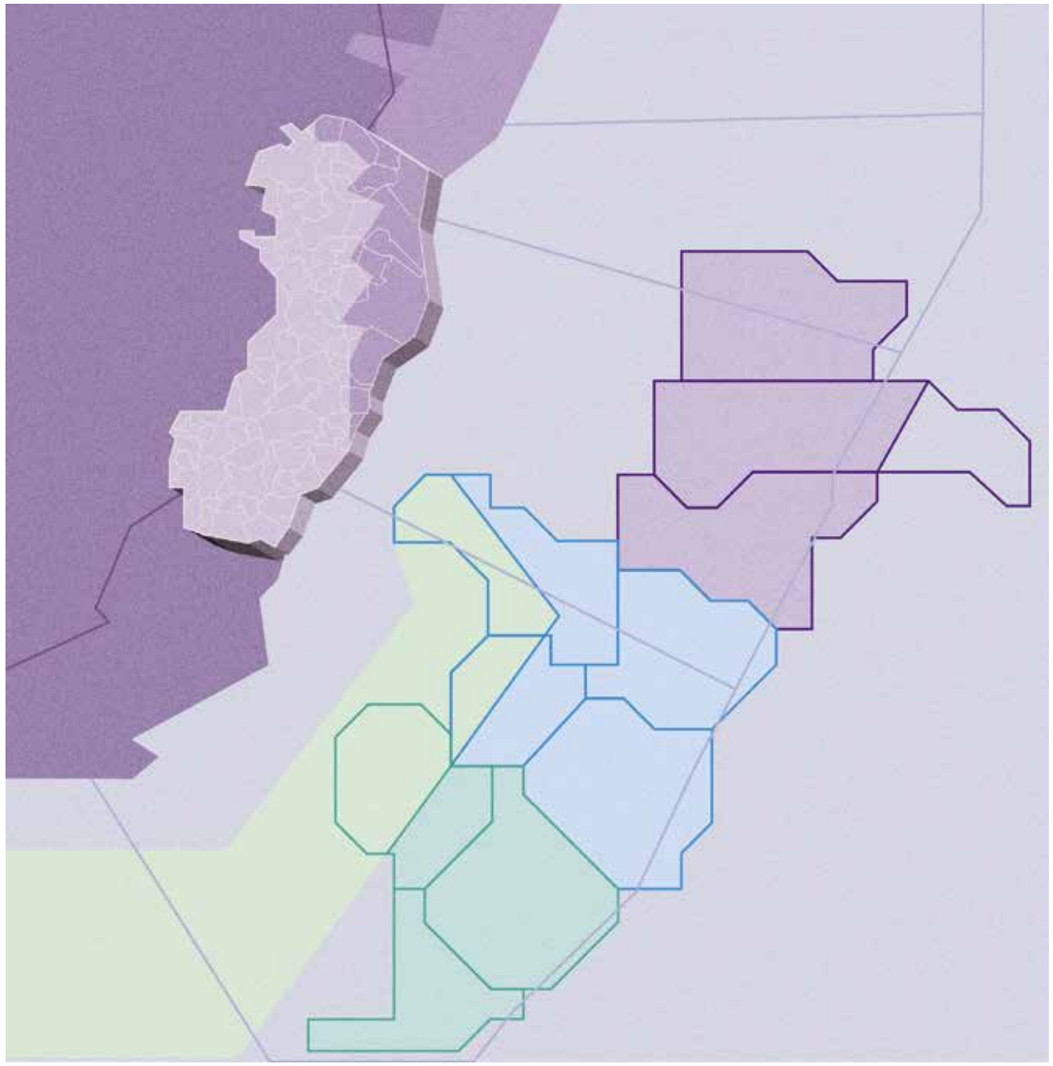
Figure 4 – Permanent offer of areas with marginal accumulations



Source: ANP | Elaboration: Ideies/Findes System

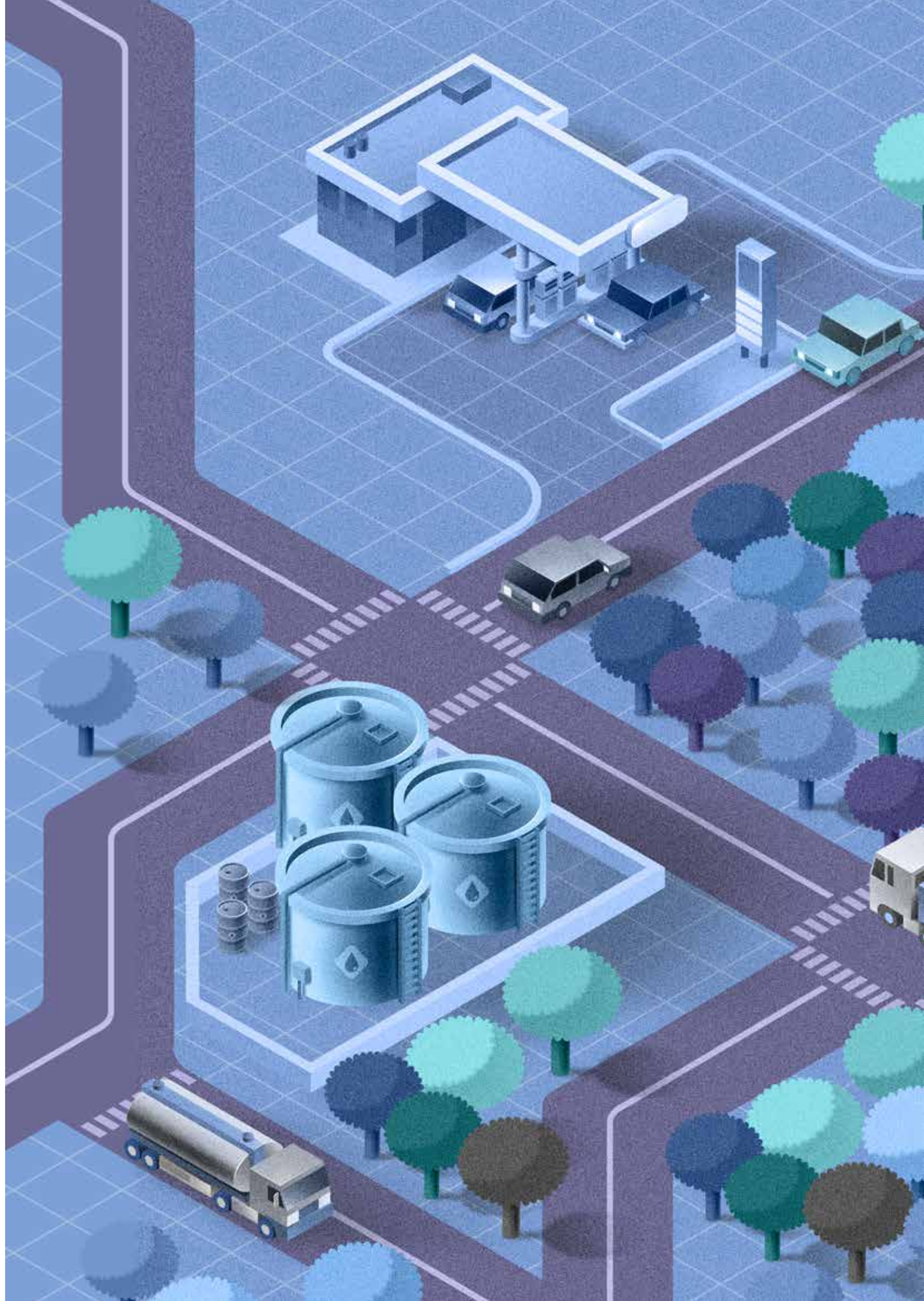
[37] CNPE Resolution no. 17/2017 published on the Federal Official Gazette on June 8th 2017

Figure 5 - Areas under study by the National Petroleum Agency (ANP)



Round 16 Sector
Study area Round 16
Round 17 Sector
Study area Round 17
Round 18 Sector
Study area Round 18
Pre-Salt Polygon
Sea sedimentary basin

Source: ANP | Elaboration: Ideies/Findes System



GLOSSARY

B

Barrel of oil equivalent (boe): barrel of oil equivalent (1,000 m3 of gas ≈ 6.28981 bbl) - unit that adds up the production volumes of oil and gas.

Barrels per day (bpd): a unit used to measure the daily production of oil barrels.

Bid rounds: ANP organized actions that aims to auction exploratory areas in concessions or sharing regimes to companies and/or consortiums.

Brent crude: oil extracted in the North Sea and traded on the London Stock Exchange. Its international reference price is the oil price.

BTU: short for British Thermal Unit, equivalent to 1.055056 x 10^3 J. Symbol = Btu. A Btu is defined as the amount of energy required to raise the temperature of one pound of water by one degree Fahrenheit, from 39° F to 40° F.

C

Coke: fuel formed by the agglomeration of coal, consisting of mineral matter and carbon, fused together. It is a solid and cohesive material derived from the destructive distillation of coal, oil or other carbonaceous residues that mainly contains carbon.

Commodities: designates a specific and standardized good in its raw state that is commercially important to the World, e.g.: coffee, cotton, petroleum, metallic and non-metallic minerals, among others. These goods have their price negotiated in the international market.

Concession: delegation of an economic activity by the public power, usually through a competitive process, to an economic agent that proves capacity for its performance, at its own risk and for a determined period. In Brazil, the concession agreement is drawn out by ANP, granting the companies the exploration and production (E&P) activities of oil and natural gas in Brazilian territory.

Concessionaire: a company incorporated under the Brazilian law, with headquarters and administration in Brazil, that is granted by ANP the exploration and production of oil or natural gas in a sedimentary basin located in the national territory, after concluding a concession agreement.

D

Declaration of commerciality: written notification from the concessionaire to ANP declaring a deposit as a commercial discovery in the concession area.

Deep waters: ocean waters located at any distance from the coast with seabed depth from 300-1,500 meters.

Development plan: the development and production planning instrument that covers the entire life cycle of the oil field. It describes the future activities and investments. All other medium and short-term plans have to comply to it.

E

Exploration phase: aims at discovering and evaluating oil and/or natural gas deposits. Exploratory activities involve the acquisition of seismic, gravimetric, magnetomechanical, geochemical, well drilling and evaluation data, among others, and must comply with the Minimum Exploration Program (PEM) agreed with ANP.

Exploratory Block: areas geographically delimited by a sedimentary basin, where oil and natural gas exploration activities are developed.

F

Financial Compensation: value due to states, municipalities and the Federal Government for the use of natural resources, since these entities are affected by the exploration and production activity.

Fracking: also known as hydraulic fracturing, it is a procedure that consists of the injection of a mixture of water, proppant (sand or other equivalent material) and several chemical products, in order to increase in a controlled way the fractures and cracks in the rocky substratum that encloses oil and natural gas. Those fractures and cracks are usually smaller than 1mm, allowing the oil to emerge on the surface.

G

Government Participation: payments due by the oil and gas E&P concessionaires, according to the articles 45 to 51 of Act 9,478 of 1997, and Decree 2,705 of 1998.

H

Hydrocarbon: chemical compound consisting of carbon and hydrogen atoms only. Oil and natural gas are examples of hydrocarbons.

M

Main production area: a set comprised of municipalities bordering the producing wells and municipalities where three or more facilities of this kind are located: (a) Industrial facilities for the processing, treatment, storage and offloading of oil and natural gas, excluding pipelines. These industrial facilities must exclusively serve the marine oil production. b) Facilities related to support activities for the exploration, production and disposal of oil and natural gas, such as: ports, airports, maintenance and manufacturing workshops, storages, warehouses and offices.

Marginal fields: inactive areas with no oil or natural gas production or with interrupted production due to lack of economic interest.

Mature basin: oil sedimentary basin with declining production.

Mature fields: oil fields with declining production.

Minimum Exploration Program (PEM, in Portuguese): exploratory activities to be fulfilled by the concessionaire during the exploration phase, defined by ANP, according to the evaluation criteria of the areas to be explored.

N

National Agency of Petroleum, Natural Gas and Biofuels (ANP): regulatory body of the oil, natural gas and biofuel market in Brazil. Regulates all the market, except for the distribution of natural gas, that is regulated by each state.

Notification of hydrocarbon signs: the concession agreements establish the deadlines and work programs for the exploration and production activities. According to these agreements, the concessionaire must notify ANP of any hydrocarbon or other mineral resource discovery at the concession area within 72 hours after the occurrence.

O

Offshore: marine environment and land-sea transition zone, or area situated at sea.

Oil by-products discovery: products derived from the oil as it is processed.

Oil consumption: an activity consisting of the use of crude oil for the manufacture of oil by-products.

Oil fields: an area producing oil or natural gas. It can be comprised of one continuous reservoir or more than one reservoir, at various depths, and include production facilities and equipment (source: Law 9,478 of August 6, 1997).

Oil production chain: set of activities of the production chain from the extraction of crude oil to the last phase, that is, the sector's added value. It is segmented into four branches: exploration, refining, petrochemical industry and manufacturing industry.

Oil well: drilling on the land surface used to produce oil and/or natural gas.

Onerous transfer: type of agreement for transferring an exploratory area to Petrobras. It is a bilateral negotiation that provides for the payment of a certain amount, determined under the Law 12,276 of June 30, 2010, that limits exploration to a maximum of 5 billion boe.

Onshore: land environment or land area.

P

Payment for occupation or area retention: amount paid by the concessionaires to the landowners of the area where oil and natural gas exploration and production activities are carried out. This payment is made in two ways: (i) annually, by means of unit values in reais per square kilometer of the concession area established in the notice and in the contract, being applicable, in succession, to the exploration, development and production phases. To determine this value, ANP considers the geological characteristics and the location of the sedimentary basin; (ii) monthly, by multiplying the equivalent of 1% of the total oil and natural gas production volume in the field (during the calculation month) by their respective reference prices.

Permanent offer: continuous supply at returned fields (or in the return process) and at exploratory blocks offered in previous tenders and not purchased or blocks returned to the agency (Article 4 of CNPE Resolution 17, dated 06/08/2017).

Petroleum: any liquid hydrocarbon in its natural state, such as crude and condensed oil, which has its exploration and production governed by Law 9,478 of August 6, 1997.

Petroleum Production: set of coordinated operations for the extraction of oil or natural gas from a deposit and the preparation for its development, in the terms defined in article 6, subsection XVI of Law 9,478 of 1997. Or, yet, the volume of oil or natural gas extracted during the production phase, as may be inferred from the text, in each case.

Petroleum refining: activity developed by an industrial unit that uses petroleum from an E&P field as raw material. Petroleum by-products are then generated, through processes of heating, fractioning, pressure, vacuum and reheating in the presence of catalysts. The by-products range from lighter ones (refinery gas, LPG, naphtha) to heavier ones (bunker, fuel oil), including solid fractions such as coke and asphalt residue.

Pre-salt: underground region formed by a vertical prism of indefinite depth, with a polygonal surface defined by the geographical coordinates of its vertices established in the Annex to Law 12,351/2010. May also comprise other regions delimited in a future act of the Executive Branch, according to the evolution of geological knowledge.

Production phase: when the accumulations of discovered oil and/or natural gas with proven commercial viability give rise to a producing field that is developed and put into production to supply the market.

Production phase in development stage: when all the infrastructure necessary for the effective production of the field is implemented.

Production phase in production stage: when all installed infrastructure and the field starts to produce oil and/or gas to supply the market.

Production Sharing: regime of oil and natural gas E&P, which provides not only the payment of royalties, but also the physical division of hydrocarbon production, discounting the costs incurred in exploration and production activities. It is currently governed by Law 12,351 of December 22, 2010.

Prospection: set of coordinated operations for the extraction of oil or natural gas from a deposit and for the preparation for this activity.

Proven reserves: amount of oil or natural gas that, after the analysis of geosciences and engineering data, are considered with reasonable certainty as an economically viable well, with commercially recoverable investments.

R

Repetro-elegibles: goods under a special export and import customs regime, that are destined to the research and prospection activities of oil and natural gas deposits, with suspension of customs taxes.

Returned fields: area returned to ANP by means of the Area Return Notification. The return of the field implies in the interruption of all exploration activities in the returned part, except for the activities of facility deactivation and environmental recovery.

Return of area notification: written communication on the return of areas, from the Concessionaire to ANP, stipulated in the Contract, containing the list of Reversible Goods in the parcel to be returned and the polygon delimitation of the areas to be retained.

Royalties: financial compensation due to the Federal Government, states and municipalities, by the oil and natural gas E&P concessionaires. It should be paid monthly, according to the production volume of the month in a given field, from the beginning of production.

S

Sedimentary basin: depression of the earth crust which accumulate sedimentary rocks that may contain oil and/or gas.

Shale: crystalline metamorphic rock with laminar structure, rich in micaceous material.

Shallow waters: ocean waters located at any distance from the coast with seabed depth up to 300 meters.

Signature bonus: an asset offered by the winning bidder in the proposal for obtaining the oil or natural gas exploration concession, that may not be lower than the minimum value set in the bidding document. Part of this resource is destined to the Federal Government and part to ANP.

Special Participation: according to ANP Resolution 12/2014, it is an extraordinary financial compensation due to the Federal Government, states and municipalities by the oil and natural gas E&P concessionaires, in cases of large production volume or high profitability.

Subprime: term coined in the financial crisis started on July 24, 2007, when subprime loans from US banks were granted to people unable to pay them back. This cycle of loans generated a "real estate bubble" that burst and struck stock exchanges, bankrupting several banks.

U

Ultra-deep waters: ocean waters located at any distance from the coast with seabed depth greater than 1,500 meters.

Upstream: segment of the oil industry that comprises exploration, development, production and transportation of oil to refineries.

W

WTI (West Texas Intermediate): oil extracted from the Permian Basin in western Texas and eastern New Mexico, traded on the New York Stock Exchange. Its price quote serves as an international reference for the oil price.

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ANNEXES

Box A3 - Evolution of the Royalties and Special Participations Act in Brazil

Standard	General Arrangement	Targeting
Law. 2,004 / 53	Defines the attributions of the National Petroleum Council, establishes the Corporation (Petrobras S.A.). Determines that Petrobras and its subsidiaries must pay quarterly to the states and territories where they prospect oil and bituminous shale and extract gas, a compensation that corresponds to 5% of the extracted oil or shale or gas value. The states and territories must distribute 20% of what they receive, proportionally to the municipalities, according to the oil production of each one of them.	Apply resources, preferably, in the production of electric energy and in the paving of highways.
Law 7,453 / 85	The municipalities receive the royalties directly from Petrobras and its subsidiaries; It introduces royalty payments when the extraction is carried out on a continental platform, with a new criterion for distribution: • 1.5% to the states and territories; • 1.5% to the producing municipalities and their respective geo-economic areas, • 1% to the Navy Command, to meet the inspection and protection costs of the economic activities of the mentioned areas, • 1% to constitute a Special Fund to be distributed among all states, territories and municipalities	Apply resources, preferably, in energy, road paving, water supply and treatment, irrigation, protection of the environment and basic sanitation.
Law 7,525 / 86	It introduces the concept of geo-economic region, dividing it into three zones: main zone of production; secondary zone of production and zone bordering the main zone of production. Defines the distribution of 1.5% of the royalty payments allocated to the bordering municipalities and its geo-economic areas: • 60% to the bordering municipality, along with the municipalities that make up the main production area, prorated proportionally to the population of each municipality, providing 1/3 (one-third) of this item to the municipality that concentrates the industrial facilities for the processing, treatment, storage and offloading of petroleum and natural gas; • 10% to the municipalities of secondary production, prorated proportionally to the population of the districts cut by pipelines; • 30% to the municipalities bordering the main production area, prorated proportionally to their population, not including the municipalities of the zone of secondary production; • Defines criteria for the apportionment of the State, Territories and Municipalities Participation Fund resources: • 20% for the states and territories; • 80% to the municipalities. It entrusts the Court of Auditors with the power to supervise the application of royalties. It attributes to IBGE the competence to define the geo-economic area municipalities and their respective zones of classification.	Except for the resources allocated to the Navy Command, the remaining resources will be applied exclusively by states, territories and municipalities in energy, road paving, water supply and treatment, irrigation, protection of the environment and basic sanitation.
Law 7,990/89	Amends Law 2,004/1953 as regards the distribution of government shares between states and municipalities: When prospection takes place on land: • 3.5% to the states (before it was 4.00%) • 1.0% to the producing municipalities (maintained) • 0.5% to municipalities that have facilities for loading or offloading crude oil or natural gas (added) When extracted from continental platform: • 1.5% to the states and Federal District (maintained); • 1.5% to the bordering municipalities and their respective geo-economic areas (maintained); • 0.5% to municipalities that have facilities for loading or off-loading crude oil or natural gas (added) • 1.0% to the Navy Command to cover the supervision and safety costs of the areas with economic activities (maintained) • 0.5% to constitute a Special Fund to be shared among all states, territories and municipalities (before it was 1.0%) Monthly payments of financial compensation (royalties). Requires the states to transfer 25% of their financial compensation to the municipalities, according to the same criteria of article 158 of the Constitution.	Prohibits the use of royalty income for payments of debts or permanent personnel.
Decree 1/91	Creates a strong restriction on oil royalty income despite the fact that Law 7,990/89 only prohibited it to be used in debt payments and permanent personnel.	The states and municipalities must apply financial compensation resources exclusively in energy, road paving, water supply and treatment, irrigation, protection of the environment and basic sanitation.

Standard	General Arrangement	Targeting
Act 9,478/97 (Petroleum Law)	It provides for national energy policy, activities related to the oil monopoly, establishes the National Energy Policy Council and the National Petroleum Agency and provides other measures[38]. Increased from 5.0% to 10.0% the oil royalty basic rate. In a bidding notice, ANP may consider a royalty reduction to a minimum of 5.0% of production, considering geological risks, production expectations and other relevant factors; Maintains the same criteria defined at Act 7,990/89 for a minimum portion of 5.0% of the royalties; Defines the distribution criteria for the portion above 5.0%. When prospection takes place on land or in lakes, rivers, inland and lacustrine islands: • 52.5% to States where production takes place; • 15.0% to Municipalities where production takes place; • 7.5% to Municipalities affected by loading and off-loading operations of oil and natural gas, according to the criteria established by ANP; • 25.0% to the Ministry of Science and Technology to finance programs to support scientific research and technological development applied to the oil industry. When prospection takes place on the continental platform: • 22.5% to the bordering producing states; • 22.5% to producing municipalities; • 15.0% to the Navy Command, to meet the inspection and protection costs of the production areas; • 7.5% to municipalities affected by loading and off-loading operations of oil and natural gas, according to the criteria established by ANP; • 7.5% for the constitution of a Special Fund, to be distributed among all states, territories and municipalities; • 25.0% to the Ministry of Science and Technology to finance programs to support scientific research and technological development applied to the oil industry. Included the payment of special participation, later regulated by Decree 2,705/98, in cases of large production volume or high profitability, with the following distribution: • 40.0% to the Ministry of Mines and Energy, for the financing of geology and geophysics studies and services applied to the exploration of oil and natural gas, to be promoted by ANP; • 10.0% to the Ministry of the Environment, Water Resources and Legal Amazon, for the development of studies and projects related to environment preservation and recovery of environmental damage caused by the activities of the oil industry; • 40.0% to the state where on-land production takes place, or to the state bordering the continental platform where production takes place; • 10.0% to the municipality where on-land production takes place, or to the municipality bordering the continental platform where production takes place.	Nothing is mentioned concerning specific mandatory use of resources received as financial compensations by the Federal Government, states and municipalities.

Standard	General Arrangement	Targeting
Decree 2,705/1998	Defines criteria for the calculation and collection of government participations referred to in Law 9,478/97, applicable for the exploration, development and production of oil and natural gas, and other measures. Highlighted points: Sets out the criteria for obtaining monthly reference prices (that is, oil and natural gas prices used to calculate royalties) to oil produced during that month; Defines the criteria for determining the extraordinary financial compensation, special participation, calculated on quarterly production. These criteria are defined according to the time of production (1 year, 2 years, 3 years, 4 years or more) and according to the location of the prospection (land, lakes, river islands or lake/continental platform in depth up to four hundred meters /continental platform in depth over four hundred meters).	
Law 10,195/2001	Institutes additional measures to stimulate and support the structuring and fiscal adjustment of states. Amends Law 7,990/89, which prohibits the application of resources in debt payment and in permanent personnel, inserting two new paragraphs: § 1 The prohibition in the leading sentence is not applicable for the payment of debts to the Federal Government and its entities. § 2 The funds originating from the financial compensation referred to in this Article may also be used for the capitalization of pension funds.	Authorizes the use of the governmental participations by the states and municipalities to pay debts contracted with the Federal Government.
Law 12,734/2012 (Royalties Law) - SUSPENDED	Establishes new rules for the distribution, among the entities of the Federation, of royalties and special participation due to the exploration of oil, natural gas and other fluid hydrocarbons, and improves the regulatory framework on the exploration of these resources in the production sharing regime. This Law is suspended, at least until October/2018, by an injunction granted by Justice Carmen Lucia in a monocratic decision of the Federal Supreme Court. The ADI (Unconstitutionality Action) judgement is still pending.	The law provided that resources should be allocated to the areas of education, social and economic infrastructure, health, safety, poverty eradication programs, culture, sport, research, science and technology, civil defense, environment, programs for mitigation and adaptation to climate change, and for the treatment and social reintegration of chemical dependents.
Law 12,858/2013	Allocates an amount of the oil and natural gas E&P profit sharing or financial compensation to the areas of education and health.	In addition, the states, the Federal District and the municipalities would forward their planning on the use of financial compensation resources in annex to the respective multi-annual plans, budget guideline laws and annual budget laws.

[38] The Oil Act is quite broad and permeates several aspects of the whole sector. This table only includes regulations concerning government participation.

Standard	General Arrangement	Targeting
Decree 9,042/2017	Amends Decree 2,705/1998 with regards to the minimum and reference price determination for the calculation and collection of government participations on the exploration, development and production of oil and natural gas. Until December 31, 2017, the reference price to be applied each month to the oil produced in each field during that month, in reais per cubic meter, in the standard measurement condition, must be equal to the weighted average of the selling prices practiced by the concessionaire, under normal market conditions, or at the minimum price established by the National Petroleum Agency (ANP), whichever is greater. As of January 1, 2018, the reference price to be applied monthly to the oil produced in each field during the respective month, in reais per cubic meter, in the standard measurement condition, must be established by ANP.	

Box A4 - Projects financed with the RD&I clause resources in Espírito Santo * - 2000-2017

Executing accredited institution	Project title	Oil company	Start date	End date	ANP authorization
UFES	Technical, environmental and economic feasibility of applying oily sand to by-roads and concrete artifacts.	Petrobras	11/23/2000	05/22/2002	-
UFES	Plasma for oil refining and natural gas processing - ctpetro 2000	Petrobras	11/23/2000	12/25/2002	-
UFES	Oceanographic description of the Espírito Santo basin based on past data	Petrobras	01/18/2002	08/15/2002	-
UFES	Plasmas for oil refining and natural gas refining	Petrobras	09/30/2003	09/28/2005	-
UFES	Scientific studies on measurement of natural gas flow using ultrasonic sensors	Petrobras	01/05/2004	12/29/2005	-
UFES	Studies on water resources and continuity of hydrogeological studies on aquifers of barrier formations and Doce River	Petrobras	12/29/2003	12/22/2005	-
UFES	Biodegradation of drilling fluids from marine wells to avoid environmental impact	Petrobras	06/25/2004	12/31/2005	-
UFES	Implementation of methodology for petroleum characterization	Petrobras	11/03/2004	01/31/2005	-
UFES	Development of a characterization study of oily residues	Petrobras	11/29/2004	11/28/2005	-
UFES	Plasma for the processing of heavy and extra heavy oils	Petrobras	12/10/2004	12/10/2007	-
UFES	Implementation of methodologies for the characterization of heavy and extra heavy oils at the UFES Department of Chemistry	Petrobras	12/14/2004	06/14/2007	-
UFES	Effect of acid oils on polyamide 11 in flexible ducts DQUI-CCE-UFES	Petrobras	03/10/2005	03/09/2007	-
UFES	Implementation of the competence center for heavy oils exploration and production	Petrobras	05/01/2005	08/31/2008	-
UFES	Distillation system for obtaining PEV curve - ASTM D2892 of oils in LABPETRO UFES and suitability for heavy and ultra heavy oils	Petrobras	12/15/2005	12/15/2008	-
UFES	Hydrogeological survey of Espírito Santo	Petrobras	02/26/2006	02/25/2008	-
UFES	Studies on water resources and water monitoring in northern Espírito Santo	Petrobras	04/17/2006	04/16/2010	-
UFES	Implementation and development of methodologies for the determination of metals and sulfur compounds in extra heavy, heavy and derived oils	Petrobras	11/29/2006	11/27/2008	-
UFES	ADD-RPD: Intelligent system for defect pattern recognition in motor pumps	Petrobras	12/06/2006	05/18/2011	-
UFES	Adjustment of methodology for obtaining PEV curves for heavy and extra-heavy oils	Petrobras	12/18/2006	12/18/2010	-
UFES	Implementation of a nuclear magnetic resonance laboratory at LABPETRO - UFES	Petrobras	12/20/2006	06/20/2011	-
UFES	Plasma for pyrolysis and natural gas processing	Petrobras	12/20/2006	06/20/2010	-
UFES	Effects of acid oils on polyamide 11 in flexible ducts - Phase II	Petrobras	07/16/2007	07/09/2011	-
UFES	Numerical simulation for heavy oils	Petrobras	10/11/2007	04/02/2011	-
UFES	Development of scientific studies on measurement of natural gas flow using ultrasonic sensors	Petrobras	11/05/2007	04/30/2010	-
UFES	Development of analytical laboratory methods to support research and development projects in the area of characterization, evaluation and primary processing of heavy and extra-heavy oils	Petrobras	12/21/2007	12/18/2013	-
UFES	Development of the quasi-dual formulation of the boundary element method in wave propagation problems: analysis of the completeness conditions in the sequence of radial functions and implementation of an iterative solution scheme	Petrobras	11/18/2018	05/16/2011	-

(*) The projects that needed ANP authorization have information in the "Authorization by the ANP" column. It is noteworthy that only 14 of the projects included in this table actually needed authorization from the agency. These projects comply to the prerequisites of the legislation that requires this authorization (RT 05/2005).

Source: ANP. Elaboration: Ideies/Findes System.

Executing accredited institution	Project title	Oil company	Start date	End date	ANP authorization
UCL	Studies on Fluid and Particulate Flow Control during Well Drilling in Deep Waters	Petrobras	02/22/2010	08/19/2014	-
UFES	Elaboration of the executive project for the scope additive of the Nucleus of Studies in Flow and Measurement of Oil and Gas infrastructure construction - NEMOG	Petrobras	06/16/2010	07/09/2013	-
UFES	Hydrogeological survey of the Espírito Santo state	Petrobras	12/29/2010	12/27/2015	-
UFES	Application of numerical solution techniques in geophysical models: wave propagation simulation using the finite volume method, application of the recursive procedure of the contour elements method in dynamics and optimization of the representation of surfaces, potential and discrete data set through functions of radial base	Petrobras	04/27/2011	11/21/2014	-
UFES	Recognition of defect patterns in submerged centrifugal pump systems	Petrobras	12/13/2011	04/05/2015	-
UFES	Modeling and simulation of the electromagnetic effect in carbonaceous incrustation mitigation	Petrobras	01/02/2012	09/27/2015	-
UFES	Development and application of new technologies in the field of petroleum chemistry related to the exploration and production segment - E&P	Petrobras	01/05/2012	12/28/2016	-
UFES	Development of a methodology to study the hydrolysis of chlorides and the degradation of naphthenic acids in oils during the atmospheric and vacuum distillation process	Petrobras	05/02/2012	04/21/2015	-
UFES	Socioeconomic diagnosis of the fishing communities of the Espírito Santo basin and northern portion of the Campos basin	Petrobras	08/31/2012	08/19/2017	-
UFES	Phytoremediation of heavy metals	Petrobras	09/03/2012	08/07/2017	-
UFES	Application of alternative analytical techniques and chemometrics in the development of new method for oil evaluation	Petrobras	10/31/2012	10/29/2017	-
UFES	Fiber Optic Sensor for Simultaneous Temperature and Oil Level Measurement in Terrestrial Production Tanks	Petrobras	10/31/2012	08/25/2017	-
UFES	Characterization of asphaltenes and paraffins by mass spectrometry of very high resolution and accuracy (FT-ICR MS)	Petrobras	10/31/2012	10/29/2017	-
UFES	Application of Broadband Powerline Communication technology for automation, supervision and SISP in oil wells on land	Petrobras	10/31/2012	06/16/2017	-

Executing accredited institution	Project title	Oil company	Start date	End date	ANP authorization
UFES	Studies on the behavior of multiphase and wet gas gauges: numerical simulations, laboratory and field analyses	Petrobras	10/31/2012	11/18/2016	-
UFES	Consolidation of the NCQP Nuclear Magnetic Resonance Laboratory - UFES	Petrobras	10/31/2012	10/29/2017	-
UFES	Studies of the velocity profile behavior in the flare gas measurement section and its influence on measurement quality: Numerical Simulation, Experimental Studies and Field Analysis	Petrobras	11/13/2012	08/03/2016	-
UFES	Environmental characterization of the Espírito Santo basin and northern portion of the Campos basin (Pelagic and Physical-Chemical System of Water and Sediments) - AMBES Project	Petrobras	11/14/2012	11/12/2016	-
UFES	Assembly of Manual Distillation Unit for Determining the Chloride Evolution in Brazilian Petroleum	Petrobras	08/21/2013	08/20/2015	-
UFES	Analytical methods of petroleum evaluation for environmental use	Petrobras	11/04/2013	12/27/2017	-
UFES	Development of analytical techniques for the characterization and quantification of paraffins in oils, focusing on logistics and supply activities	Petrobras	02/03/2014	02/02/2016	-
UFES	Expansion of learning mechanisms in the methodology of defect patterns recognition in submerged centrifugal pump systems	Petrobras	09/25/2014	09/23/2017	-
UFES	Evaluation of the corrosion rate of Pre-Salt oils and mixtures	Petrobras	12/17/2014	12/15/2017	-
UFES	Diagnosis of the oscillation and disturbance root cause in PEUs	Petrobras	1/7/2015	01/05/2018	-
UFES	Building of the Nucleus of Studies in Flow and Measurement of Oil and Gas infrastructure - NEMOG.	Petrobras	08/30/2006	02/13/2015.	229/2006
UFES	Implementation of the Nucleus of Competence in Heavy and Extra Heavy Oils Chemistry at the Federal University of Espírito Santo	Petrobras	08/30/2006	02/17/2013	229/2006 153/2009
UFES	Adapting the infrastructure of the Materials Laboratory at the Technological Center of UFES	Petrobras	08/30/2006	02/03/2014	229/2006
UFES	Modernization and expansion of the infrastructure at the welding laboratory in the Technological Center of UFES	Petrobras	08/30/2006	01/29/2014	229/2006

Executing accredited institution	Project title	Oil company	Start date	End date	ANP authorization
UFES	Assembly of a flow simulation loop at the Nucleus of Studies in Flow and Measurement of Oil and Gas – NEMOG	Petrobras	11/01/2006	05/22/2015	236/2006
UFES	Implementation of the Nucleus of Competence in Heavy and Extra Heavy Oils Chemistry at the Federal University of Espírito Santo	Petrobras	11/01/2006	01/07/2013	236/2006
UFES	Structuring and implementation of five biological and chemical oceanography laboratories focusing on deep-water environmental monitoring	Petrobras	11/24/2006	05/05/2014	262/2006 189/2013
UFES	Acquisition of equipment for the implementation of the Laboratory of Environmental Geochemistry (Lab GAM) at the oceanographic base in the Federal University of Espírito Santo	Petrobras	07/23/2007	07/10/2013	066/2007
UFES	Physical adequacy of the Laboratory of Computational Transport Phenomena (LFTC)	Petrobras	10/11/2007	12/03/2008	074/2007
UFES	Acquisition of equipment for the assembly of analytical laboratories and support for research and development at the Nucleus of Competences in Chemistry of Heavy and Extra-Heavy Oils in UFES	Petrobras	06/06/2008	05/30/2015	064/2008
UFES	Implementation of specific laboratories at the nucleus of studies in flow and measurement of oil and gas – NEMOG	Petrobras	11/24/2008	05/21/2015	080/2008
UFES	PRH 29 - Fostering human resource capacity building in oil and gas, using the PRH 29 support	Petrobras	12/07/2011	05/06/2016	424/2011
IFES	Fostering human resource capacity building through scholarship grants for students at technical courses in the oil, gas, energy and biofuels sectors	Petrobras	04/16/2013	03/30/2016	396/2013
UFES	Marine environmental characterization and monitoring in the Espírito Santo basin (Biological and Chemical Oceanography).	Petrobras	12/09/2014	12/07/2017	341/2014
UFES	Oil and gas institutional program at the Federal University of Espírito Santo	Queiroz Galvão	09/27/2016	08/31/2017	-

Source: ANP. Elaboration: Ideies/Findes System.

Box A5 – ANP Regulation

ANP document	Year	Principle	Change/action	Note
-	2017	Predictability	Calendar of rounds	For the first time, the National Energy Policy Council (CNPE) established a multiyear calendar of bidding rounds for exploration and production of oil and natural gas
Resolution 726 2017 – ANP	2017	Contract Improvement	Local Content	The local content commitments were defined in the specific clauses of the contract. Its adoption was not a bidding offer appraisal criterion.
Public notice of the rounds	2017	Market solution	Contract Improvement	Operation of investment funds
Public notice of the rounds	2017	Consistency	Contract Improvement	Adoption of the single exploration phase
Public notice of the rounds	2017	Adaptability	Contract Improvement	Withdrawal of local content as bidding criterion
Public notice of the rounds	2017	Consistency	Contract Improvement	Differentiated royalties for new frontier areas and mature basins
Public notice of the rounds	2017	Market solution	Contract Improvement	Minimum net equity reduction for non-operators
Public notice of the rounds	2017	Market solution	Contract Improvement	Encouraging increased participation of small and medium-sized enterprises
CNPE Resolution 17 2017	2017	Market solution and consistency	Permanent offer of areas	Permanent offer of returned areas
Resolution 703 2017 – ANP	2017	Transparency and adaptability	Review of the oil reference price	Establishes the criteria for determining the monthly oil reference price in each field.
Resolution 698 2017 ANP	2017	Simplicity	Production individualization	Changes in the regulation of production individualization procedures in situations where oil and natural gas deposits extend to non-contracted areas
Resolution 708 2017 ANP	2017	Simplicity	Exploration phase extension	Regulates the exploration phase extension, for a period of two years, for concession contracts of the 11th and 12th Bidding Rounds. This extension will allow investments in the ongoing implementation of the Minimum Exploration Program (PEM).
	2016	Market solution	Increase the recovery factor	Reserve Based Lending (RBL) application
	2017	Simplicity and consistency	Increase the recovery factor	Fosters sales of rights if operators are not applying necessary resources to maximize discovered volumes
Subject to ANP approval	2017	Consistency, adaptability and predictability	Increase the recovery factor	Extension of the contract production phase.

Source: ANP | Elaboration: Ideies/Findes System.

Box A6 - Projects being developed by companies from Espírito Santo that are not financed by the RD&I clause resources but fit in Technical Regulation 03/2015 by ANP

Company	Project list
2 Solve	"IHM Móvel" application in onshore wells
BJ e Seisa	Wellheads
BJ e Seisa	Auxiliary device for confined space access
Borges Tecnologia	Eletronic module/device to check stem alignment and offset for mechanical pumping
Borges Tecnologia	Compressed unit for well intervention
Borges Tecnologia	Roving Bat
Endserv	Pipeline repairing using over thickness depositions with MIG/MAG process of controlled short-circuit (STT and CMT) and TIG
HKM	Manufacture of insulated coatings for oil wells
Metacon	System for collection and transfer of oily residue during cargo tank cleaning
Metacon	Auxiliary device for confined space access
Metacon	Proximity devices
Qualimec	Mechanical Pumping Hydraulic Spacer
SPG	"IHM Móvel" application in onshore wells
Tecmark	Polished and conventional rods for pumping units
Tecvix	Casing stabilizer
Tecvix	Reciprocating onshore pumps for oil wells (BM)
Tecvix	Recovery of superduplex (and other) steel pipelines by the GMAW process with C.A. and secondary feed
Tecvix	Insulated collars
Tecvix	Mobile system for pipe inspection in wells
Tecvix	Wellheads
Tecvix	Compressed unit for well intervention
Tecvix	Extended Niple
Vix Fly	Drone adaptation for onshore well inspection and pipeline monitoring
VixSystem	Optimized Inspection and Cleaning Techniques in Ship Tanks, Vessels and Hulls.

Source: Espírito Santo Oil and Gas Forum (FCP&G). Elaboration: Ideies/Findes System.

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