Espírito Santo

oil & natural gas yearbook

2021

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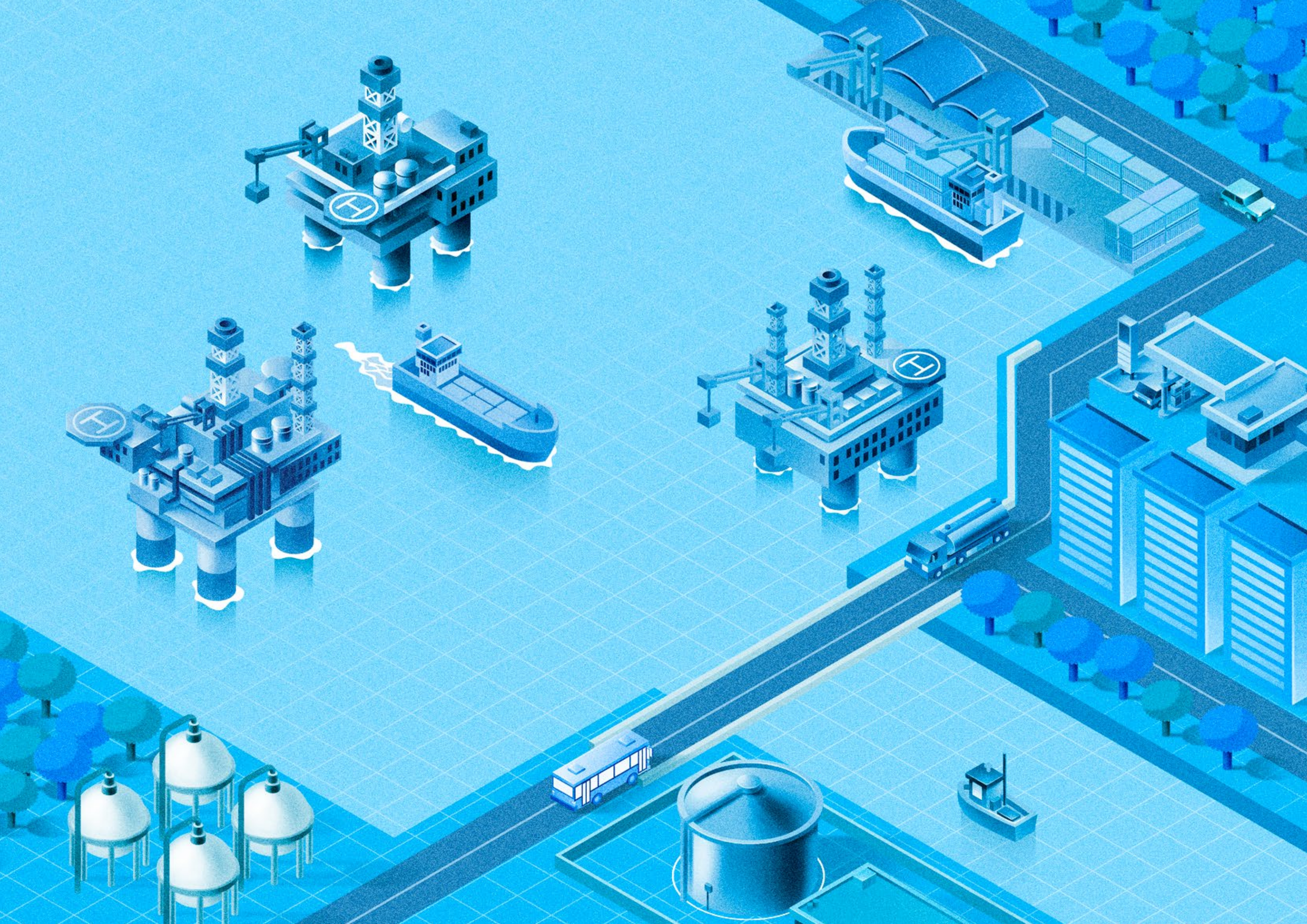

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PRESENTATION

We are currently experiencing an intense period of changes related to the future of the planet. The term energy transition invaded the discussions between the different social actors, promoting changes in consumption habits and, also, greater demand from society for the acceleration of actions that promote the reduction of the impacts caused by the increase in the world's temperature. These aspirations come up to reduce the need for fossil energy consumption.

There is no question about the benefits caused by the transition from an energy matrix intensive in fossil fuels to a matrix with low or zero carbon emissions. The doubts about this transition lie in the speed at which it will occur, given the need for energy security and the financial, technological, and regulatory stimuli to be promoted by global leaders.

Recently, the world's attention has been directed to the geopolitical tensions involving oil and natural gas-producing countries. The situation exposed the essential nature of energy security, highlighting the need for a decentralized, decarbonized, and digitalized energy matrix.

It is in this context that the oil and natural gas sector will continue to be a fundamental part of the coming decades, being responsible for providing global energy security. The big oil companies have committed to intensify the reduction of carbon emissions along with the input value chain, which represents a significant effort in the reduction of greenhouse gas emissions.

Ensuring that information is a precious asset, the 5th edition of the Espírito Santo Oil & Natural Gas Yearbook brings together the most important variables of analysis of the sector for Espírito Santo, combining technical rigor and structured, updated, and reliable information.

The first chapter of the Yearbook addresses the world oil and natural gas industry. Chapter 2 explains the oil and natural gas industry in Espírito Santo. The consequences of these activities, focus on government participation, are dealt with in Chapter 3. Chapter 4 discusses the Oil and Gas sector's incentive mechanism for Research, Development, and Innovation. Finally, chapter 5 points out the new opportunities in oil and natural gas exploration and production for Espírito Santo.

For this year, the novelties consist of the inclusion of analyses of natural gas and the presentation of an exercise for the projection of oil and natural gas production in Espírito Santo. Ideies reaffirms its commitment to the sector and Espírito Santo industry, keeping the Panel - Oil and Gas Industry - updated, which contains the most relevant data in the sector in a digital, intuitive, and dynamic format. In addition, we present the official map of the sector, in partnership with the National Agency of Petroleum, Natural Gas, and Biofuels (ANP).

Good Reading!

Marília Gabriela Elias da Silva
Executive Manager of Ideies

ACESSE AQUI O PAINEL – INDÚSTRIA DO PETRÓLEO E GÁS
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INTERNATIONAL SCENARIO

Society's restlessness with the future mostly consists of damages caused by the increase of the planet's temperature and the consequences of climate change. The main global leaders are negotiating new goals and international agreements focused on reducing the causes that cause global warming.

The energy sector is at the core of these discussions, provided it is responsible for a significant portion of carbon dioxide emissions into the atmosphere. The efforts toward reducing emissions have led to an energy transition from the current fossil fuel-intensive energy matrix to a low or zero-carbon emitting one, in the whole planet.

In this scenario, the sources of renewable energy became the backbone of the energy transition movement, for meeting the role of generating clean energy. Fossil fuels play a relevant part in providing energy security in the transition period. It is incumbent on large companies in the industry, in their turn, the commitment already assumed by them to intensify the reduction of carbon emissions throughout the value chain.

1.1 Global energy consumption

In 2020, the global consumption of primary energy was 557 exajoules, 4.3% lower than was recorded in the previous year. The drop was caused by the retraction of global economic activity caused mostly by the outburst of the new Coronavirus pandemic in March of that year.

Global energy consumption is concentrated within a group of ten countries (chart 1) which together account for 66.9% of the total energy consumed in the world. China and the United States alone represent 41.9% of the total energy consumed worldwide.

China's energy matrix is made up of the following sources: coal (56.6%), oil (19.6%), natural gas (8.2%), hydropower (8.1%), renewable energy (5.4 %), and nuclear energy (2.2%). The energy matrix of the United States is composed of the following sources: oil (37.1%), natural gas (34.1%), coal (10.5%), nuclear energy (8.4%), renewable energy (7.0%), and hydroelectric (2.9%).

In the last twenty years, the consumption of primary energy in the world had an average annual growth of 1.7%. The highlight for the period was the increase in the share of renewable energy sources in the energy matrix. In 2000, renewable sources accounted for 0.7% and in 2020 they rose to an 8.0% share of the total energy consumed in the world (chart 2). The growth in consumption of these sources was present in regions with greater participation in the total consumption of primary energy, especially China and the United States.

66.9%

of global energy consumption is concentrated in a group of ten countries

41.9%

of the energy consumed in the world is concentrated in China and the United States

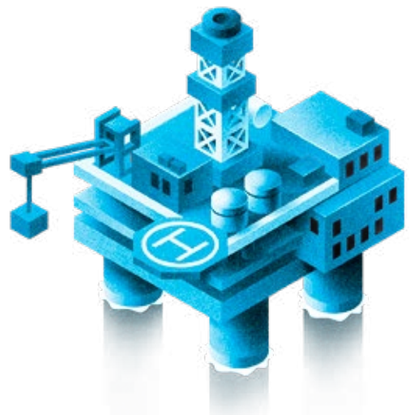
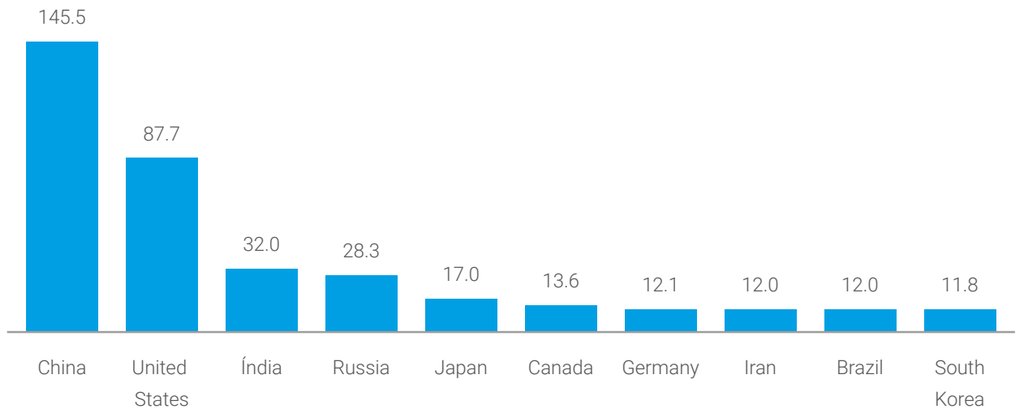


Chart 1 - Countries with the highest consumption of primary energy (in exajoules) – 2020



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To a lesser extent, fossil fuels grew more timidly. In 2000, coal represented 25.0% of the total primary energy consumed in the world, and it rose to 27,2% in 2020. China, India, and the United States concentrated 72.0% of the total coal consumed worldwide. China and the United States reduced the share of this input in the total energy consumption in each country, while India increased the share of coal in the total consumption of primary energy. It is known that coal is one of the most polluting energy sources however, there was no reduction in its consumption during the period.

Natural gas, which represented 21.9% of the total primary energy consumed in the world in 2000, rose to 24.7% in 2020. Natural gas consumption represents an alternative in the transition to less polluting sources.

As renewable sources are still not available on a large scale, the use of natural gas becomes strategic due to the production, flow, treatment, and regasification infrastructure already installed. Moreover, this source is less polluting than oil and coal, contributing to the decarbonization of the energy sector. The United States, Russia and China concentrated 41.9% of the total consumption of natural gas worldwide.

Finally, oil represented 39.1% of primary energy consumption in the world in 2000, decreasing to 31.2% in 2020. In 2020, the United States, China. and India concentrated 41.5% of the total oil consumed worldwide.

1.7%

was the average annual growth in primary energy consumption in the world over the last twenty years

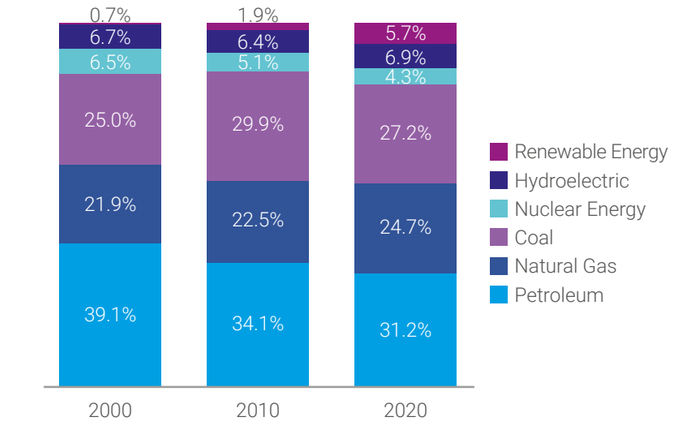
24.7%

of the total primary energy consumed in the world in 2020 came from natural gas

31.2%

of the total primary energy consumed in the world in 2020 came from oil

Chart 2 - Participation of fuels in the global energy matrix (in %)



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As renewable sources are still not available on a large scale, the use of natural gas becomes strategic due to the production, flow, treatment and regasification infrastructure already installed. Natural gas is less polluting than oil and coal, contributing to the decarbonization of the energy sector.

1.2. Global production and consumption of oil and natural gas

World oil production in 2020 was 88.4 million barrels a day, 6.9% lower than in 2019 (chart 3). There was a decrease of 6.6 million barrels a day in production, compared to the previous year, which caused the greatest negative variation in the supply of oil in the historical series that began in 1965. The drop was caused by the retraction of global economic activity caused, mainly, by the outbreak of the new Coronavirus pandemic.

In 2020, the division of oil production between regions in the world was: Middle East (31.3%), North America (26.6%), Commonwealth of Independent States (15.3%)[1], Asia (8.4%), Africa (7.8%), South America and Central (6.6%) and Europe (4.0%). The top-producing countries were the United States, Saudi Arabia and Russia, which together accounted for 43.2% of global production. Brazil was the 9th country with the largest production of the input in the world, with 3.0 million barrels a day.

2.3 million

barrels of oil per day were consumed in Brazil in 2020, which places the country in 8th position in the global ranking

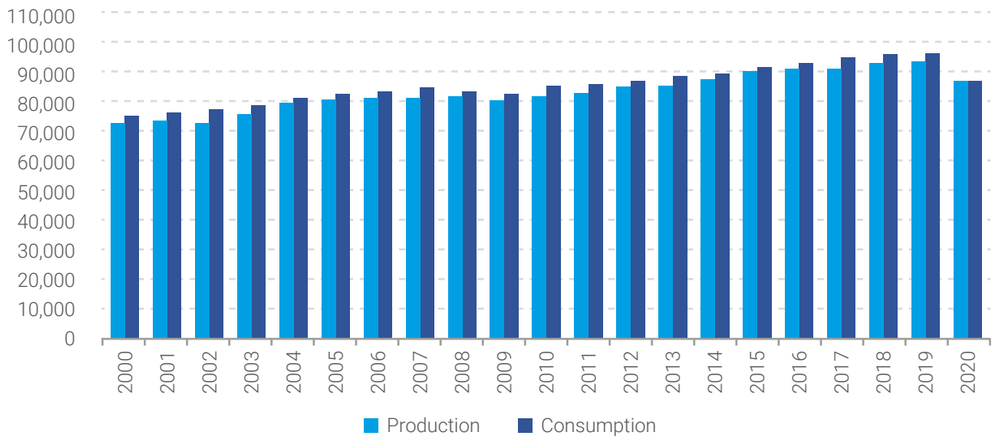
Division of oil consumption in the world

Asia	38.0%
North America	23.5%
Europe	14.5%

Middle East: 9.4%
South and Central America: 6.0%
Commonwealth of Independent States (CIS): 4.7%
Africa: 4.0%

1. Member States: Armenia, Azerbaijan, Belarus, Kazakhstan, Moldova, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan

Chart 3 - Production and consumption of oil in the world (thousands of barrels/day)



Source: BP Statistical Review of World Energy | Prepared by: Ideies/Findes

Division of natural gas consumption in the world

North America 27.0%

Asia 22.5%

Middle East 14.4%

Commonwealth of Independent States (CIS): 14.1%

Middle East: 9.4%

Africa: 4.0%

South and Central America: 3.8%

Oil consumption follows a distinct distribution of production. In 2020, 88.5 million barrels of oil per day were consumed worldwide, 9.3% lower than the volume consumed in the previous year (chart 3). Except for China, all countries registered a drop in oil consumption. This country's consumption increased by 1.6%, which made China's global share rose from 14.4% to 16.1% between 2019 and 2020.

The breakdown of oil consumption among regions in the world was: Asia (38.0%), North America (23.5%), Europe (14.5%), Middle East (9.4%), South and Central America (6.0%), Commonwealth of Independent States (4.7%) and Africa (4.0%). The countries with the highest consumption were the United States, China, and India, which in conjunction account for 40.8% of global consumption. Brazil is the 8th country with the highest oil consumption in the world, with 2.3 million barrels a day.

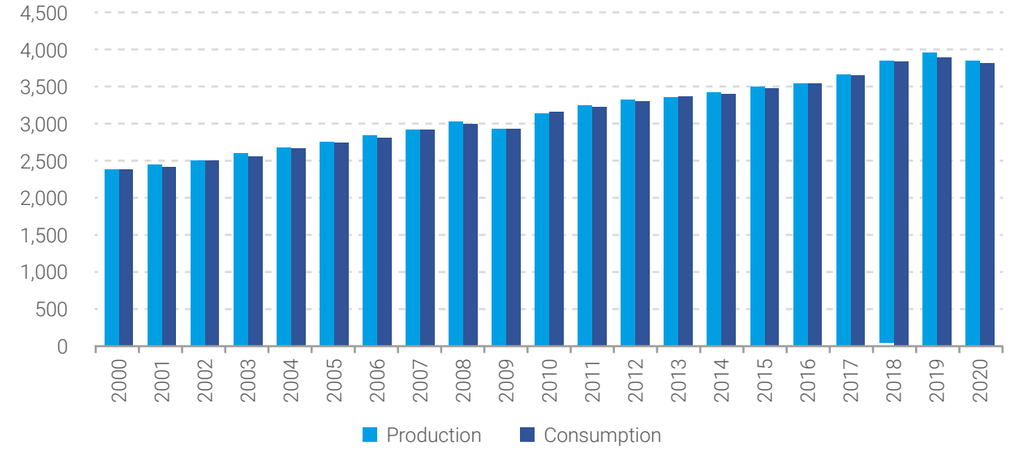
32 billion

m³ of natural gas per day were consumed in Brazil in 2020, which places the country in 29th place in the global ranking

Concerning natural gas, global production reached 3.9 trillion m³ in 2020 (chart 4). The production of this input had a reduction of 122 billion m³ from 2019 to 2020, recording the second drop in production in twelve years.

The division of natural gas production among regions in the world was: North America (28.8%), Commonwealth of Independent States (20.8%), Middle East (17.8%), Asia (16.9%), Africa (6.0%), Europe

Chart 4 Production and consumption of natural gas worldwide (billions of m³)



Source: BP Statistical Review of World Energy | Prepared by: Ideies/Findes

(5,7%), and South and Central America (4.0%). The top producing countries were the United States, Russia, and Iran, which together account for 46.8% of global production. Brazil was the 30th country with the largest production of this input in the world, with 24 billion m³ of natural gas.

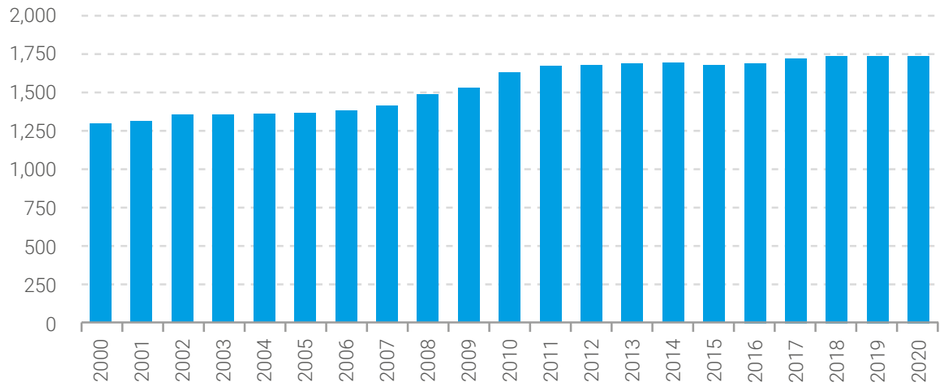
Natural gas consumption also follows a different distribution from production. In 2020, 3.8 trillion m³ of natural gas were consumed worldwide. This amount is 2.1% lower than what was recorded in the previous year.

The breakdown of natural gas consumption among regions in the world was: North America (27.0%), Asia (22.5%), Middle East (14.4%), Europe (14.2%), Commonwealth of Independent States (14.1%), Africa (4, 0%) and South and Central America (3.8%). The United States, Russia, and China concentrated 41.2% of global natural gas consumption. Brazil was the 29th country with the highest consumption of this input in the world, with 32 billion m³ of natural gas.

1.3. Global oil and natural gas reserves

The world's total oil reserves in 2020 were 1.73 trillion barrels of oil, practically stable compared to 2019, with a slight drop of 0.1% (chart 5). In absolute terms, the reduction amounted to 2.4 billion barrels. It is worth noting that the last significant change was in 2018 when there was a 37.9 billion barrel increase in global oil reserves.

Chart 5 Proven global oil reserves (billions of barrels)



Source: BP Statistical Review of World Energy | Prepared by: Ideies/Findes

Division of oil reserves in the world

Middle East 48.3%

South and Central America 18.7%

North America 14.0%

Commonwealth of Independent States (CIS): 8.4%
Africa: 7.2%
Asia: 2.6%
Europe: 0,8%

The share of oil reserves between regions in the world was: Middle East (48.3%), South and Central America (18.7%), North America (14.0%), Commonwealth of Independent States (8.4%), Africa (7.2%), Asia (2.6%) and Europe (0.8%). Venezuela, Saudi Arabia and Canada account for 44.4% of the world's total oil reserves. Brazil was the 16th country with the largest reserves of this input in the world, with 11.9 billion barrels of oil.

Regarding natural gas, in 2020, the reserves reached 188.1 trillion m³, 1.2% lower than in the previous year. In absolute terms, the drop was 2.2 trillion m³ of natural gas (chart 6). The distribution of natural gas reserves among regions in the world was: Middle East (40.3%), Commonwealth of Independent States (30.1%), Asia (8.8%), North America (8.1%), Africa (6.9%), South America and Central (4.2%), and Europe (1.7%). Russia, Iran and Qatar account for 50.1% of the world's total natural gas reserves. Brazil was the 33rd country with the largest reserves of this input in the world, with 348.5 billion m³ of natural gas.

Division of natural gas reserves in the world

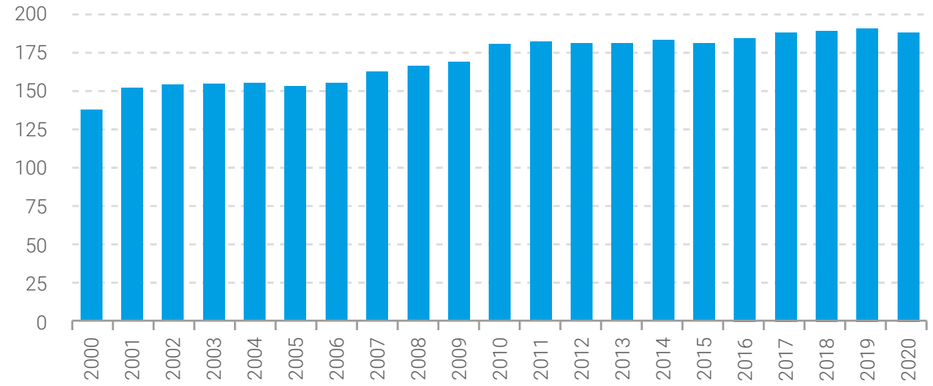
Middle East 40.3%

CIS 30.1%

Asia 8.8%

North America: 8.1%
Africa: 6.9%
South and Central America: 4.2%
Europe: 1.7%

Chart 6 - Global natural gas reserves (trillions of m³)



Source: BP Statistical Review of World Energy | Prepared by: Ideies/Findes

11.9 billion

barrels of oil is the reserve of this input in Brazil in 2020, which places the country in the 16th position in the global ranking

1.4. Global Oil Refining and Capacity

The world's refining capacity was 101.9 million barrels a day in 2020. There was an increase of 199 thousand barrels a day, 0.2% more than in the previous year. As for oil refinement, it was 75.5 million barrels per day in 2020, representing a 7.4 million barrel drop in refined oil per day in the world, 9.0% lower than the previous year (chart 7).

Refining capacity across regions in the world in 2020 was distributed as follows: Asia (35.8%), North America (21.4%), Europe (15.3%), Middle East (10.0%), Commonwealth of Independent States (8.2%), South America and Central (6.1%) and Africa (3.3%). The United States, China, and Russia concentrated 40.8% of the world's oil refining capacity.

348.5 billion

m³ of natural gas was the reserve of this input in Brazil in 2020, which places the country in the 33rd position in the global ranking

Oil refining capacity in the world

Asia	35.8%
North America	21.4%
Europe	15.3%

Middle East: 10.0%
Commonwealth of Independent States (CIS): 8.2%
South and Central America: 6.1%
Africa: 3.3%

Brazil was the 9th country with the largest refining capacity in the world, with 2.3 million barrels a day. The United States was the country that most reduced its oil refining capacity in 2020, with a drop in capacity of 831,000 barrels of oil per day (4.6% of its total capacity). China, on the other hand, was the country that most increased its oil refining capacity, with an increase of 492 thousand barrels of oil (2.9% of its total capacity).

The oil refining share among regions in the world was: Asia (38.0%), North America (21.7%), Europe (14.8%), Middle East (10.1 %), Commonwealth of Independent States (8.6%), South America and Central (4.4%), and Africa (2.4%). The United States, China, and Russia concentrated 44.5% of the world's oil refining. Brazil was the 9th country with the largest oil refining capacity in the world, with 1.8 million barrels a day.

Oil refining in the world

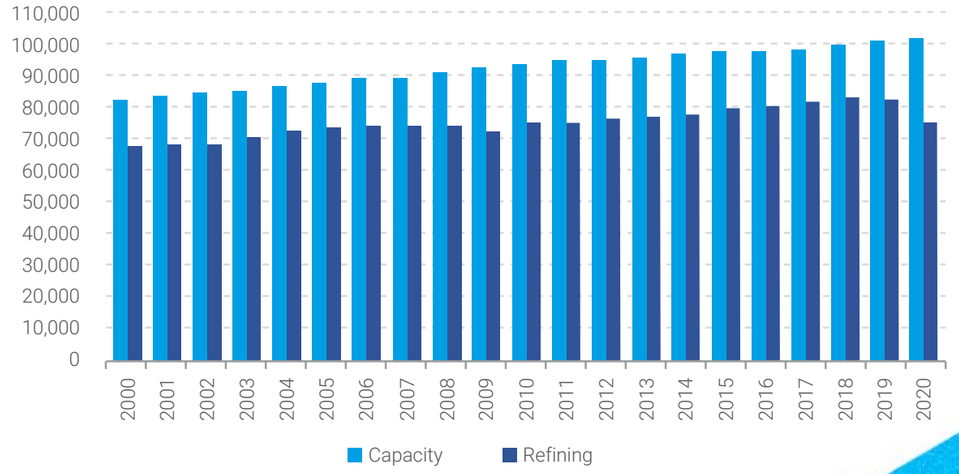
Asia	38.0%
North America	21.7%
Europe	14.8%

Middle East: 10.1%
Commonwealth of Independent States (CIS): 8.6%
South and Central America: 4.4%
Africa: 2.4%

1.8 million

barrels of oil per day were refined in Brazil in 2020, which places the country in the 9th position in the global ranking

Chart 7 - Global Oil Refining Capacity (thousands of barrels/day)



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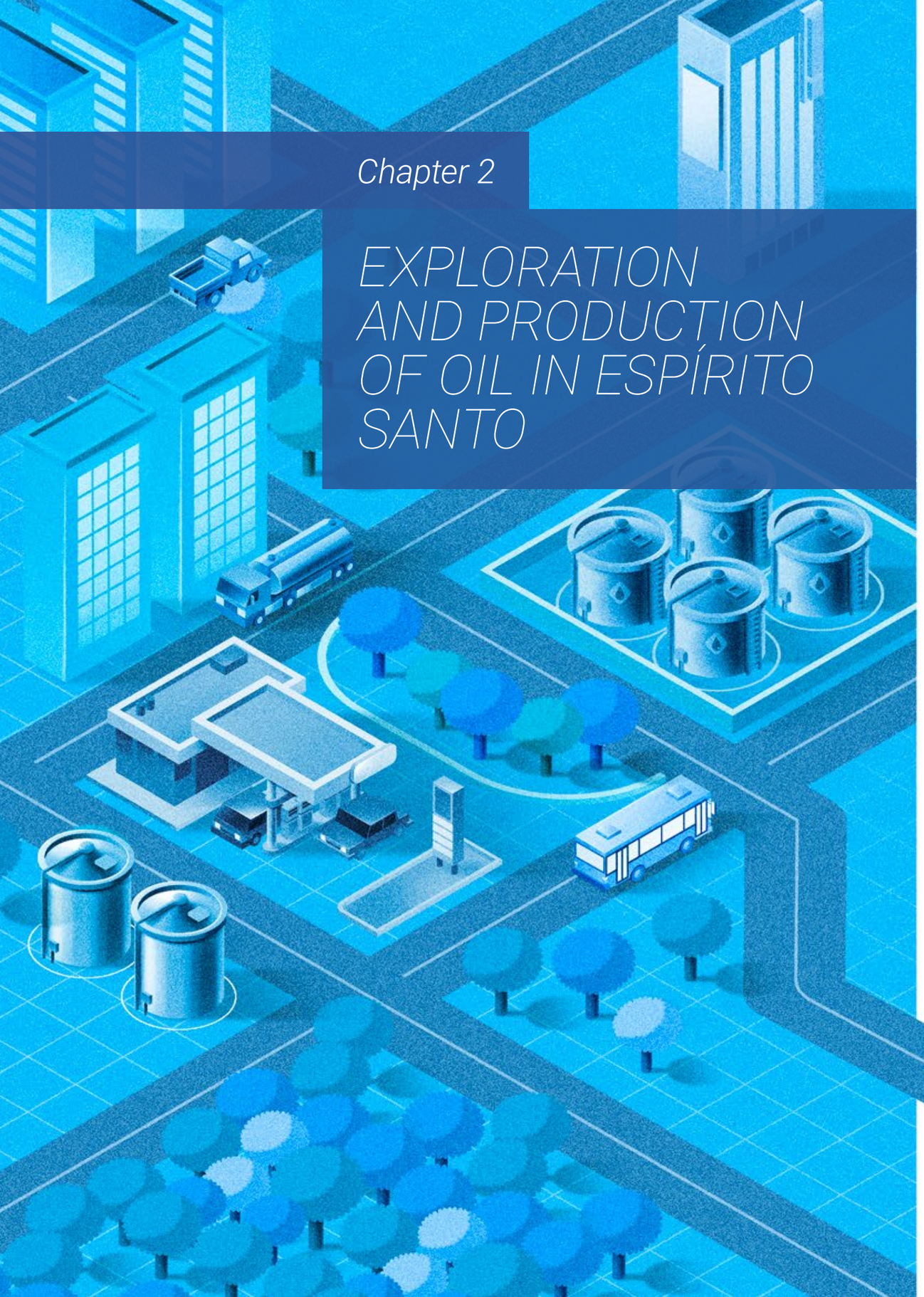


Chapter 2

EXPLORATION AND PRODUCTION OF OIL IN ESPÍRITO SANTO

The oil and gas exploration and production infrastructure of Espírito Santo State, both onshore and offshore, comprises 68 fields in operation and 5 fields in the development phase. In addition to these, the State has 30 exploratory blocks divided into two sedimentary basins: part of the Campos basin and the entirety of the Espírito Santo basin. On the border with the Campos basin, the State has 7 fields in production and 2 exploratory blocks. In the Espírito Santo basin, there are 61 fields in production, 7 in the offshore portion and 54 in the onshore. Still, in this last basin, there are 28 exploratory blocks, 10 in the offshore portion and 18 in the onshore portion.

Twelve (12) oil companies are operating in the State with fields in the production stages or the product development stages. Among them, 4 foreign companies (Central Resources, ONGC Campos, QPI Brasil, and Shell Brasil) and 8 national companies (BGM, Imetame, IPI, Petrobras, Petromais, Petrosynergy, Ubunto Engenharia, and Vipetro). Petrobras holds the concession for the fields with the highest productivity in the state, such as the fields that make up Parque das Baleias.

2.1. Drilling Activity in Espírito Santo

The offshore drilling activities in Espírito Santo began with the first well on the border with the municipality of São Mateus in 1968. Since then, 535 wells have been drilled more frequently between 2009 and 2015, when the annual average of drilling was 37 wells drilled per year. The main oil companies that conducted this process were Petrobras and Shell Brasil.

In the most recent period, between 2015 and 2020, offshore drilling was reduced to an annual average of 3 wells drilled, marking the worst performance of the activity since the beginning of offshore drilling in Espírito Santo (chart 8). In 2020, three wells were drilled offshore, two of them in the Campos basin (Campo de Jubarte and Campo Argonauta) and the other in the Espírito Santo basin (Golfinho). In 2021, until August, three wells were drilled offshore: two wells in Jubarte and one well in block ES-M-669.

562

offshore wells have been drilled in Espírito Santo since 1968

37

was the annual average of offshore well drilling between 2009 and 2014, the period with the highest frequency

6

offshore wells were drilled in 2021, 4 of which in Jubarte, 1 in block ES-M669 and 1 in Argonauta

Onshore drilling in Espírito Santo began with the drilling of two wells in the city of Conceição da Barra, in 1959. In total, 1,769 wells have been drilled more frequently in the 1980s, when the average drilling was 76 wells per year, and also in the 2000s when the average drilling was 44 wells per year.

Between 2016 and 2018, the annual average of onshore drilling was reduced to 3 wells, marking it the lowest activity level since the 1970s. However, 2019 and 2020 indicated a possible return of onshore drilling activity in Espírito Santo (chart 1). Between the two years, 61 wells were drilled by oil companies Petrobras, BGM, and Imetame. Petrobras resumed onshore drilling in the Fazenda Alegre and Cancã fields, while BGM focused its efforts on the Suindara field and Imetame on the Rio Ipiranga field[2].

1,768

onshore wells have been drilled in Espírito Santo since 1959

7

onshore wells were drilled in 2021, 4 in the Suindara field, 1 in the Rio Ipiranga field, 1 in the ES-T-496 block and 1 in the ES-T-441 block

76

was the average annual drilling of onshore wells during the 1980s, the period with the highest frequency

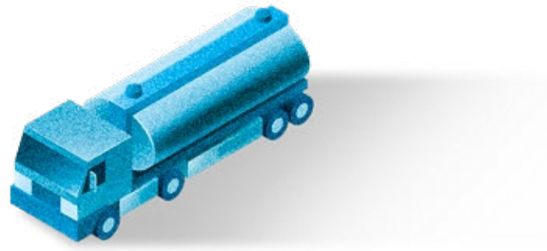
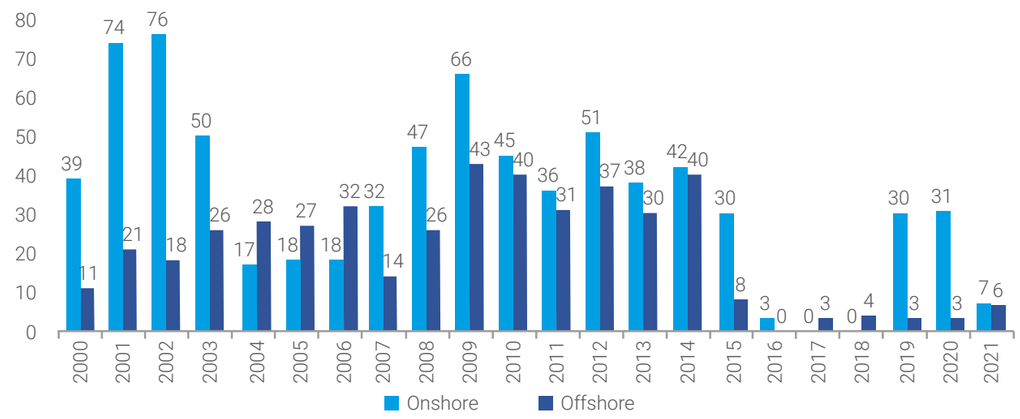


Chart 8 - Onshore and offshore wells drilled in Espírito Santo (in units)



Source: ANP | Prepared by: Ideies/Findes

2.2. Declarations of hydrocarbon traces

Since 1998, when the declaration of hydrocarbons traces became mandatory, 221 declarations from the offshore origin and 222 declarations relative to onshore drilling were issued in Espírito Santo. The first declaration relative to offshore drilling was issued in connection with the BES-100 block (which covers the Golfinho and Canapu fields) and from the Peroá field, both bordering the municipalities of Aracruz and Linhares.

Between 2018 and 2020, zero offshore hydrocarbon declarations of hydrocarbon traces were issued in Espírito Santo due to the reduction in exploration activity in the State (chart 2). During this period, Brazil issued 24 offshore declarations of hydrocarbon traces, all concentrated in the Campos, Santos, and Sergipe basins. In 2021, the most recent period, Petrobras announced the existence of natural gas in block ES-M-669. This block is part of Petrobras and Equinor's campaign to reach the pre-salt layer in the Espírito Santo basin[3].

Onshore, the first declarations of hydrocarbon traces were issued in the Mosquito and Fazenda Alegre fields, located in the municipalities of São Mateus and Jaguaré. The highest frequency of issuance occurred between 2005 and 2013 when the annual average issuance was 17 declarations per year. The main oil companies that conducted this process were Petrobras and Vipetro.

Between 2016 and 2018, no onshore declarations of hydrocarbon traces were issued in Espírito Santo due to the reduction of exploration activity in the state (chart 9). In this period, Brazil issued 41 onshore declarations of hydrocarbon traces, all concentrated in the basins of Potiguar[4], Recôncavo[5], and Parnaíba[6].

Between 2019 and 2020, 4 declarations of hydrocarbon traces were issued on the Espírito Santo for onshore drilling. Imetame announced the discovery of oil and natural gas in block ES-T-487 and BGM announced the discovery of oil in three wells in the Suindara field. In 2021, the most recent period, Imetame announced the existence of Oil in block ES-T-441, located in the municipality of Jaguaré. This block was acquired in the 14th round of the ANP auction held in 2017.

221 **offshore declarations of hydrocarbon traces**

223 **onshore declarations of hydrocarbon traces**

This was the number of declarations issued in Espírito Santo since 1998

2021

Petrobras announced the existence of natural gas in block ES-M-669

Imetame announced the existence of oil in block ES-T-441 (municipality of Jaguaré)

2022

BGM announced the existence of oil in block ES-T-496

2. Of the total 61 wells drilled onshore between 2019 and 2020, 30 are currently producing, which represents a 49.2% success rate

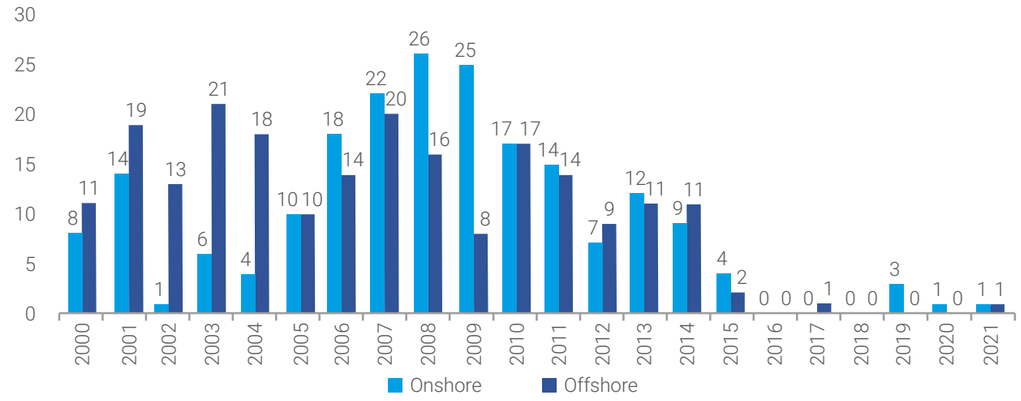
3. The project, entitled "Prospector de Monai" will be essential for them to be able to assess the exploration of other concessions acquired in the 11th round of the ANP auction, which, so far, has not presented areas of interest for exploration.

4. Located in the State of Rio Grande do Norte and Ceará.

5. Located in the State of Bahia.

6. Located in the States of Piauí, Maranhão, Pará, Tocantins, Bahia and Ceará.

Chart 9 - Quantity of declarations of hydrocarbon traces in Espírito Santo (in units)



Source: ANP | Prepared by: Ideies/Findes

20 **offshore declarations of commerciality**

37 **onshore declarations of commerciality**

This was the number of declarations issued in Espírito Santo since 1998

2020

3 onshore declarations were issued in the Suindara, Rio Mariricu and Garça Branca fields.

2021

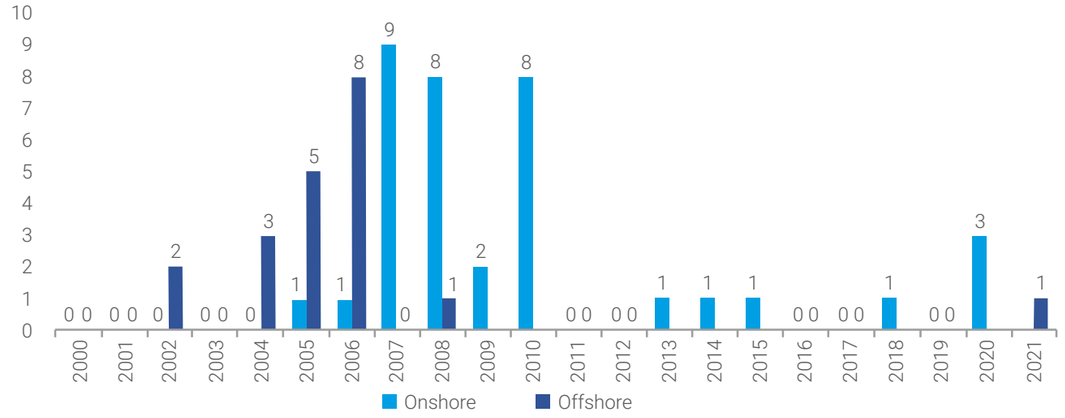
offshore declarations of commerciality were issued for the Wahoo field.

2.3. Declarations of Commerciality

Since 1999, 50 declarations of commerciality have been issued in Espírito Santo, 37 for onshore and 20 for offshore exploration. The first offshore declaration was issued in the Jubarte and Cachalote fields, in 2002. The highest frequency of issuance of declarations for offshore production occurred in the period between 2002 and 2006, with an annual average of 4 declarations (chart 10). The oil companies responsible were Petrobras and Shell Brasil. In December 2021, the ANP approved the declaration of commerciality for the Wahoo field, at the request of PetroRio. The Wahoo field is located in the pre-salt layer, in the Espírito Santo part of the Campos Basin. Since 2008, Espírito Santo has not registered a declaration of commerciality at sea. The last one was issued at the request of Petrobras for the Camarupim Norte field.

The first declaration on onshore wells was issued in 2002, in the Mosquito field, located in the municipality of São Mateus. The highest frequency of onshore declarations of commerciality issued occurred between 2007 and 2010, with an annual average of 7 declarations (chart 10). Petrobras was the main oil company responsible for issuing these declarations. In 2018, Petrobras issued a declaration of commerciality for the Cancã Leste field, and in the following year, no onshore declaration was issued in the State. In 2020, 3 declarations were issued for the fields of Suindara, Rio Mariricu, and Garça Branca. The oil companies responsible for issuing relative to these fields were, respectively, BGM, Petrobras, and Petromais.

Chart 10 - Quantity of commerciality declaration in Espírito Santo (in units)



Source: ANP | Prepared by: Ideies/Findes

In more recent times, the low number of issuance of declarations of commerciality in Espírito Santo signals a low number of new oil and natural gas exploration and production projects in the State.

2.4. Oil and natural gas reserves

In 2020, Brazilian oil reserves reached 20.2 billion barrels, 7.2% lower than in 2019. Espírito Santo reached, in 2020, an oil reserve of 1.3 billion barrels of oil, 5.6% lower than what was recorded in the previous year. With this drop, the State becomes the third largest holder of oil reserves in the country, after São Paulo (2.1 billion barrels) and Rio de Janeiro (16.0 billion barrels).

As for natural gas, in 2020 Brazilian reserves reached 450.9 billion m³, 17.9% lower than in 2019. In Espírito Santo, the total reserves reached 30.7 billion m³, 36.2% lower than in the previous year. With this decrease, the State became the third largest holder of natural gas reserves, after São Paulo (37.7 billion m³) and Rio de Janeiro (281.4 billion m³).

1.3 billion

barrels of oil is the reserve of this input in Espírito Santo in 2020, which places the state in the 3rd position in the national ranking

30.7 billion

m³ of natural gas is the reserve of this input in Espírito Santo, which places the state in the 3rd position in the national ranking

2.4.1. Offshore reserves in Espírito Santo

8.1%

was the drop in offshore oil reserves in Espírito Santo in 2020

36.7%

was the drop in offshore natural gas reserves in Espírito Santo in 2020

In 2020, Espírito Santo's offshore oil reserves fell by 8.1% compared to the previous year, reaching 1.2 billion barrels of oil (chart 11). Upon the decrease, the State recorded the lowest level of offshore oil reserves in 17 years, thus losing its position as the second State with the highest volume of offshore oil reserves. The state of São Paulo, by recording a 123.4% increase in the same comparison, takes over the second position, only behind the State of Rio de Janeiro.

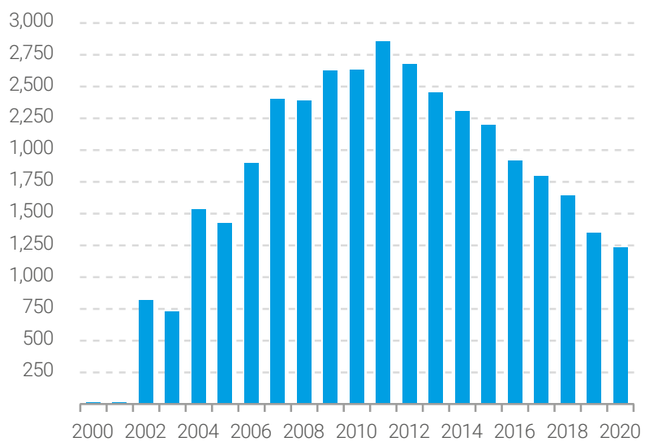
Regarding offshore Natural Gas, in 2020, Espírito Santo reached 30.2 billion m³ of reserves, a 36.7% decrease compared to the previous year (chart 12). Due to that decrease, the State lost its position as the second State with the highest volume of offshore natural gas reserves. The state of São Paulo, by recording a 19.2% increase in the same comparison, takes over the second position, only behind the State of Rio de Janeiro.

The indicator that assesses the useful life of reserves that will sustain production over time[7] showed that, currently, Espírito Santo has offshore oil reserves with a useful life estimated at 14 years, below the average Brazilian indicator that recorded 19 years. Concerning natural gas, the indicator showed that Espírito Santo reserves have a useful life of 13 years, higher than the national indicator, which recorded 9 years.

The useful life of offshore oil reserves in Espírito Santo is 14 years, below the national average set at 19 years.

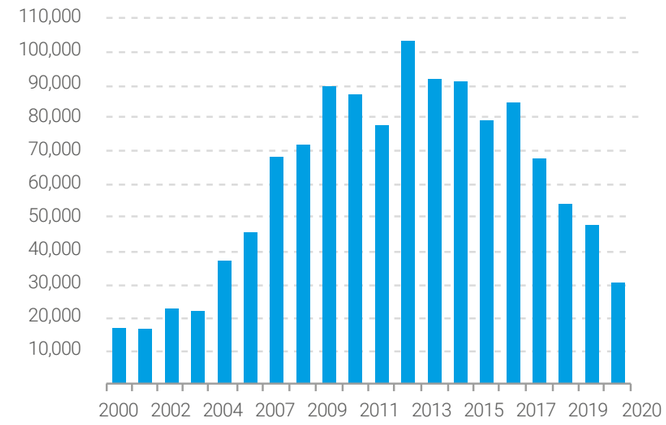
The useful life of offshore natural gas reserves in Espírito Santo is 13 years, above the national average set at 9 years.

Chart 11 - Offshore oil reserves (in millions of barrels)



Source: ANP | Prepared by: Ideies/Findes

Chart 12 - Offshore Natural Gas Reserves (millions of m³)



Source: ANP | Prepared by: Ideies/Findes

2.4.2. Onshore reserves in Espírito Santo

Regarding the onshore scenario, in 2020, oil reserves in Espírito Santo increased by 61.7% compared to the previous year, reaching 79.7 million barrels of oil (chart 13). With this increase, the state reaches the highest level of onshore oil reserves in 10 years and maintains its position as the fourth state with the largest onshore reserves among all Brazilian states, behind Sergipe (172.8 million barrels), Rio Grande do Norte (176.8 million barrels) and Bahia (204.0 million barrels).

Onshore natural gas reserves increased by 70.1% in 2020 compared to the previous year and reached a reserve of 386.0 million m³ (Chart 14), raking Espírito Santo in sixth place among the states with the largest reserves of the resource. The states of Amazonas (47.7 million m³), Maranhão (29.1 million m³), Bahia (8.9 million m³), Alagoas (2.6 million m³) and Rio Grande do Norte (1,9 million m³), respectively, are among the largest onshore natural gas reserves.

The indicator that calculates the useful life of reserves that will sustain production over time[8] showed that, currently, Espírito Santo has a useful life of onshore oil reserves of 24 years, above the Brazilian average indicator that recorded 20 years. Furthermore, the indicator for natural gas showed that Espírito Santo reserves have a useful life of 14 years, higher than the average national indicator, which recorded 12 years.

61.7%

was the increase in onshore oil reserves in Espírito Santo in 2020

70.1%

was the increase in onshore natural gas reserves in Espírito Santo in 2020

The useful life of onshore oil reserves in Espírito Santo is 24 years, above the national average of 20 years

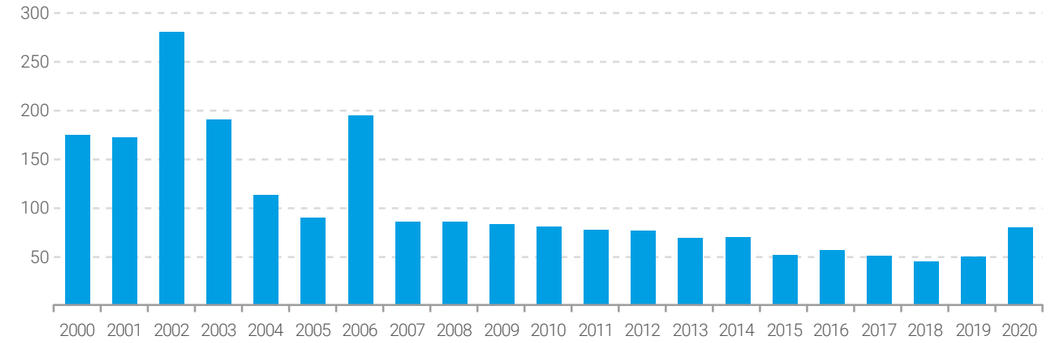
The useful life of onshore natural gas reserves in Espírito Santo is 14 years, above the national average of 12 years

7. The indicator is calculated through the ratio between the reserve and the production of oil and natural gas. The higher the indicator, the longer the time available for producing these input.

8. The indicator is calculated through the ratio between the reserve and the production of oil and natural gas. The higher the indicator, the longer the time available

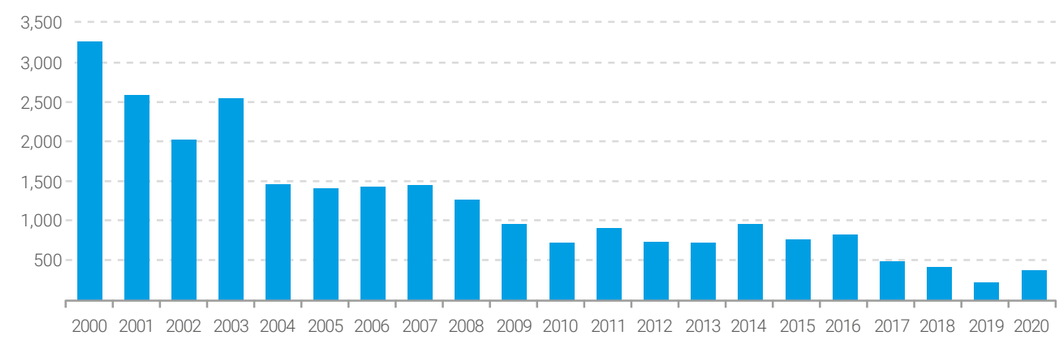
The increase in oil and natural gas reserves onshore in Espírito Santo signals the recovery of this activity in Espírito Santo. This movement is mainly explained by the regulatory incentives promoted by the ANP, which stimulated the opening of the sector by promoting competition and attracting small and medium-sized companies to onshore production.

Chart 13 - Onshore oil reserves (in millions of barrels)



Source: ANP | Prepared by: Ideies/Findes

Chart 14 Total Onshore Natural Gas Reserves (millions of m³)



Source: ANP | Prepared by: Ideies/Findes

90.4 million

barrels of oil were produced in Espírito Santo in 2020, which places the state in the 3rd position in the national ranking

2.5. Total oil and natural gas production

Brazilian oil production reached 1.1 billion barrels in 2020, 5.7% higher than in 2019. Espírito Santo produced, in 2020, a total of 90.4 million barrels of oil, 13.9% lower than what had been recorded in the previous year (Chart 15). The State remained in the third position with the highest oil production among all States, only behind São Paulo (98.2 million barrels) and Rio de Janeiro (853.8 million barrels).

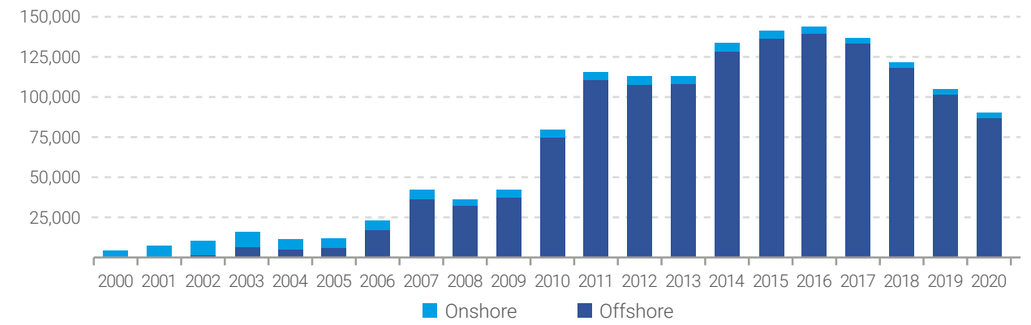
2.3 million m³ of natural gas were produced in Espírito Santo in 2020, which places the state in the 4th position in the national ranking

Between 2011 and 2018, the state remained the second largest producer of the input, losing in 2019 to the state of São Paulo.

Concerning natural gas, in 2020 Brazilian production was 46.6 million m³, 4.3% lower than what had been recorded in 2019. In Espírito Santo, 2.3 million m³ were produced, 13.8% lower than in the previous year (chart 16). The state remained the fourth largest producer of natural gas among all States, behind Amazonas (5.0 million m³), São Paulo (6.2 million m³), and Rio de Janeiro (29.6 million m³). m³).

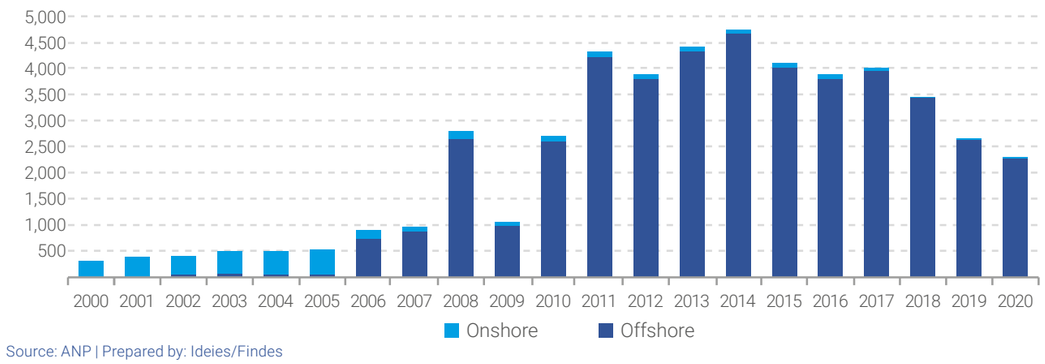
> The increase in oil and natural gas reserves onshore Espírito Santo signals the recovery of this activity in Espírito Santo. This movement is mainly explained by the regulatory incentives promoted by the ANP, which stimulated the opening of the sector by promoting competition and attracting small and medium-sized companies to onshore production.

Chart 15 - Total oil production (thousands of barrels)



Source: ANP | Prepared by: Ideies/Findes

Chart 16 - Total Natural Gas Production (millions of m³)



Source: ANP | Prepared by: Ideies/Findes

2.5.1. Offshore Production in Espírito Santo

The offshore oil production in Espírito Santo in 2020 was 87.1 million barrels, 14.2% lower than the volume recorded in the previous year (Chart 17). With this drop, the state is approaching the levels produced in 2010, the year when production from the pre-salt layer of Espírito Santo waters began. The drop can be explained mainly by the performance of the production of pre-salt layer wells, which, in 2020, dropped by 19.7%, reaching a production equal to 234 million barrels of oil. Production in the pre-salt layer is responsible for 51.7% of the total oil produced offshore in Espírito Santo.

Regarding the division by location, Espírito Santo's offshore production can be divided into three parts. The first two are located in the Campos Basin, in the producing fields of Parque das Baleias and of Parque das Conchas , and the third one is located in the producing fields of the Espírito Santo Basin .

Offshore oil production is concentrated in Parque das Baleias and Parque das Conchas, operated by Petrobras and Shell Brasil, respectively. The production of natural gas associated with oil is concentrated in Parque das Baleias and the production of natural gas not associated with oil is concentrated in the producing fields of the Espírito Santo Basin, mostly operated by Petrobras and in the process of being sold by the company.

87.1 million

barrels of offshore oil were produced in Espírito Santo in 2020

With a drop of 14.2% in 2020, oil production in Espírito Santo approaches the level produced in 2010.

2.3 billion

m³ of offshore natural gas were produced in Espírito Santo in 2020

In 2020, oil production at Parque das Baleias fell by 18.9% compared to the same period in the previous year, producing 68.7 million barrels of oil that year, but still accounting for 78.9% of the total oil produced in the state. In 2020, Parque das Conchas produced a total of 14.6 million barrels of oil, a 10.8% drop compared to the previous year, concentrating 16.8% of total local oil production.

The only oil-producing field in the offshore producing fields of the Espírito Santo Basin is the Golfinho field which, in 2020, produced a total of 3.7 million barrels of oil, 7.3% higher than the level produced in 2019, responsible for 4.3% of oil production in Espírito Santo in 2020.

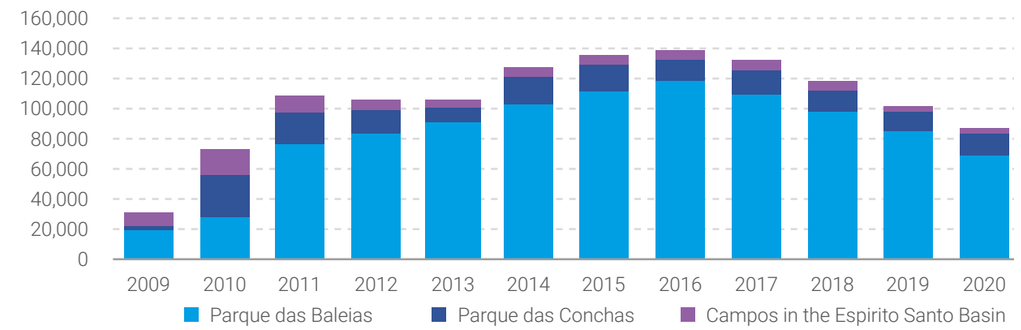
It must be noted that offshore oil-producing regions, part of the Campos Basin and the Espírito Santo Basin are in the natural phase of declining production and, consequently, they have shown a decline in production.

Regarding offshore natural gas in Espírito Santo, Parque das Baleias produced, in 2020, 1.8 billion m³ of the input, 17.4% lower than the previous year. Parque das Conchas produced, in the same period of comparison, a total of 157.5 million m³ of natural gas, a 24.6% increase relative to production in the previous year. The fields in the Espírito Santo basin produced a total of 275.5 million m³ of natural gas, 1.6% less than the previous year.

Natural gas production in Parque das Baleias and the offshore fields in the Espírito Santo Basin represented 80.0% and 12.0% of Espírito Santo's total natural gas production, respectively. The production of natural gas in Parque das Conchas represented, in the same period used for comparison, 6.8% of the total production of natural gas in Espírito Santo.

Both offshore oil-producing regions, part of the Campos Basin and the Espírito Santo Basin are in the natural phase of declining production and, consequently, they have shown a decline in production in recent years.

Chart 17 - Offshore Oil production by location (thousands of oil barrels)



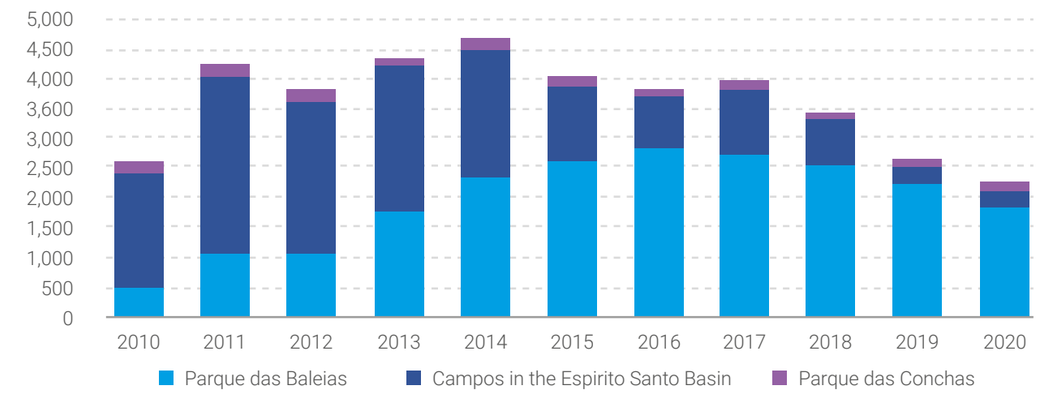
Source: ANP | Prepared by: Ideies/Findes

9. In 2019, ANP and Petrobras signed an agreement concerning the Parque das Baleias reservoir for the purpose of paying royalties and special participations. The agreement considered only one reservoir called Novo Campo de Jubarte, which included the areas between Jubarte, Baleia Azul, Baleia Franca, parts of Cachalote, Mangangá, and Pirambu. The agreement made it possible to approve a new Development Plan for Novo Campo de Jubarte, with an extension for another 27 years for the production phase.

10. Comprised by the Abalone, Argonauta, and Ostra fields.

11. Comprised by Cação, Camarupim, Camarupim Norte, Canapu, Cangoá, Golfinho, and Peroá fields.

Chart 18 Natural Gas Production by location (thousands of m³)



Source: ANP | Prepared by: Ideies/Findes

3.3 million

barrels of onshore oil were produced in Espírito Santo in 2020

27.0 million

m³ of onshore natural gas were produced in Espírito Santo in 2020

2.5.2. Onshore Oil and Gas Production

Offshore oil production in Espírito Santo in 2020 was 3.3 million barrels, 6.2% lower than the volume recorded in the previous year (Chart 19). The State has reached the lowest level of onshore oil production since the beginning of the century. The Production historic peak was between 2002 and 2003 when 9.0 and 9.2 million barrels, respectively. After this period, production reduced, attaining in 2020 the same production levels of the 1990s, when the exploratory activities of the 2000s had not yet been intensified.

Onshore natural gas production in Espírito Santo, in 2020, was 27.0 million m³, 15.7% lower than in the previous year (chart 20). The State has reached the lowest level of onshore natural gas production since the beginning of the century. Production reached its historic peak between 2004 and 2005 when 473.7 and 474.0 million m³ of natural gas, respectively.

The explanation for this trend is related to Petrobras' little desire for onshore production, and the little stimulus provided by ANP through regulatory measures during the early 2000s. Despite these results, it is expected that Espírito Santo's onshore production may show signs of recovery due to the recent measures implemented by ANP to encourage onshore production, especially and more intensively after 2017. Moreover, the sale of onshore assets by Petrobras could attract new players in the sector and, thereby boost future production.

Regarding the division by location,

95.0% of onshore oil production in Espírito Santo is concentrated in ten fields:

Fazenda Alegre 48.6%
Cancã 15.8%
Inhambu 8.0%

Fazenda São Rafael: 7.7%
Fazenda Santa Luzia: 6.8%
Fazenda São Jorge: 3.2%
Rio Preto Oeste: 1.5%
São Mateus: 1.2%
Fazenda Queimadas: 1.1%
Lagoa Parda: 1.1%

95.0% of onshore oil production in Espírito Santo is concentrated in ten producing fields: Fazenda Alegre (48.6%), Cancã (15.8%), Inhambu (8.0%), Fazenda São Rafael (7.7%), Fazenda Santa Luzia (6.8%), Fazenda São Jorge (3.2%), Rio Preto Oeste (1.5%), São Mateus (1.2%), Fazenda Queimadas (1.1%), and Lagoa Parda (1.1%). Except for the Lagoa Parda field under concession to the Imetame group, all other fields were granted under concession to Petrobras.

Onshore natural gas production in Espírito Santo is concentrated in ten producing fields, which, in conjunction account for 96.2% of total production. These fields are: Fazenda Alegre (39.9%), Fazenda Santa Luzia (18.3%), Fazenda São Rafael (17.3%), Cancã (6.4%), Rio São Mateus (6.0%), Lagoa Parda (2.0%), Fazenda São Jorge (2.0%), Inhambu (1.7%), Cacimbas (1.4%) and Lagoa Suruaca (1.1%).

96.2% of onshore natural gas production in Espírito Santo is concentrated in ten fields:

Fazenda Alegre 39.9%
Fazenda Santa Luzia 18.3%
Fazenda São Rafael 17.3%

Cancã: 6.4%
Rio São Mateus: 6.0%
Lagoa Parda: 2.0%
Fazenda São Jorge: 2.0%
Inhambu: 1.7%
Cacimbas: 1.4%
Lagoa Suruaca: 1.1%

Chart 19 Onshore oil production (thousands of oil barrels)

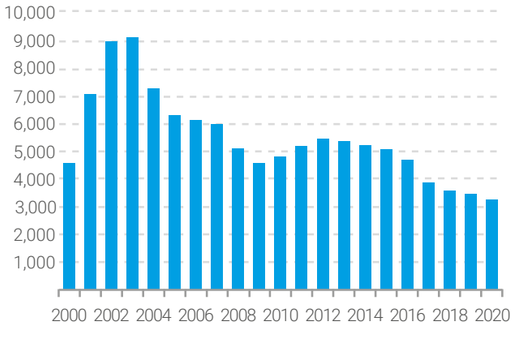
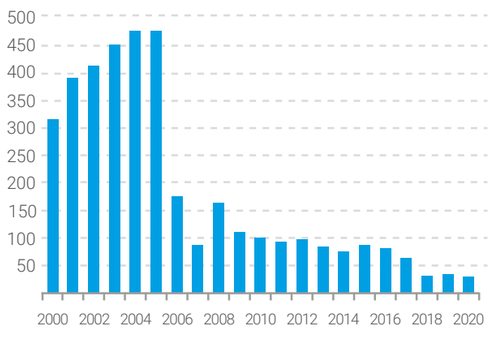


Chart 20 - Onshore Natural Gas Production (millions of m³)



Source: ANP | Prepared by: Ideies/Findes
Note 1: the evolution of production by producing field can be found in the appendix of this document

2.6. Production projection

For the projection of oil and natural gas production in Espírito Santo, the use of accounting rules was adopted as a methodology to capture the production trend focused on the regional supply of the input. The values were projected until 2025 considering a detailed analysis of the hydrocarbon supply profile and in connection to the exploration and production phases of each field, operator, and platform. More information about the methodology can be obtained at portaldaindustria-es.com.br/categorias/notas-tecnicas/arquivos.

2.6.1. Projection of Offshore Production in Espírito Santo

Offshore production represents the majority portion of the total oil and natural gas volumes produced in Espírito Santo. The evolution of offshore extraction determines the total volume produced in the state and, for the next years, it is expected that this configuration will remain the same. It is expected that by 2025 offshore oil production will have an average annual decline of 2.7%, reaching a production of 64.4 million barrels. For natural gas, an average annual increase of 1.02% is projected until 2025, reaching a production of 2.1 billion m³.

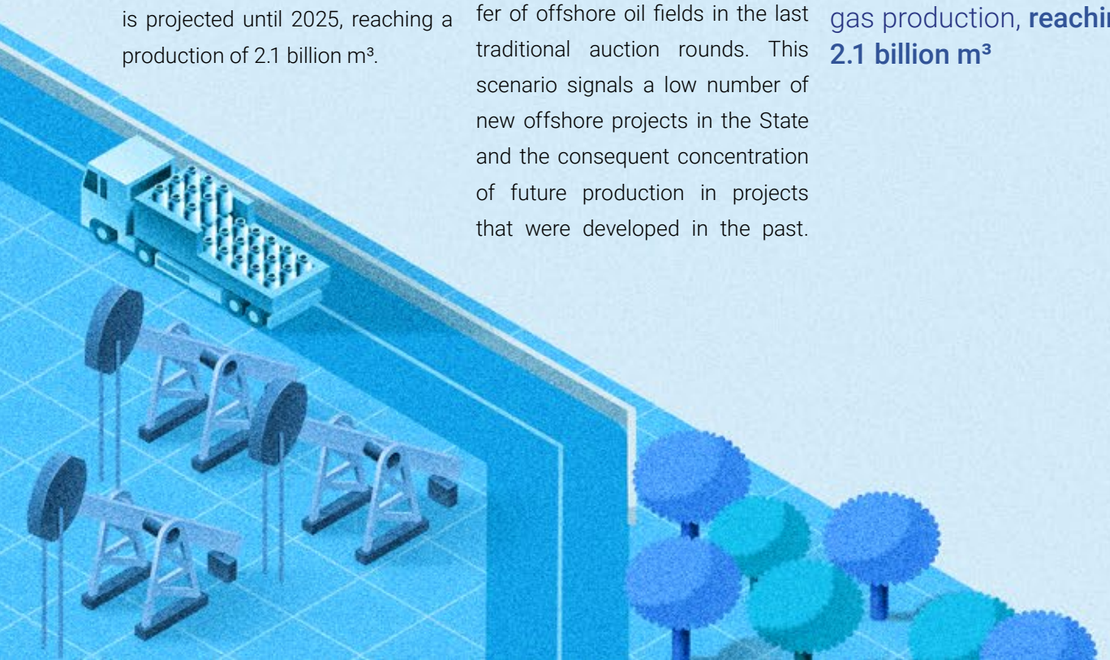
Charts 21 and 22 present the recent evolution and the projection of offshore production until 2025. The downward trend in input production can be explained by the natural decline of offshore producing fields (Appendix I), especially in Parque das Baleias and Parque das Conchas, which concentrate the State's offshore oil and gas production. Furthermore, there is the fact that the last communication of offshore commerciality took place in 2008 and that there was no offer of offshore oil fields in the last traditional auction rounds. This scenario signals a low number of new offshore projects in the State and the consequent concentration of future production in projects that were developed in the past.

2.7%

is the expected average annual drop through 2025 in offshore oil production, **reaching 64.4 million barrels**

1.0%

is the average annual increase expected until 2025 in offshore natural gas production, **reaching 2.1 billion m³**



The downward trend in oil production can be explained by the natural decline of offshore producing fields, especially in Parque das Baleias and Parque das Conchas

For the years between 2021 and 2023, less accentuated drops are projected due to better use of the production in Parque das Conchas and the temporary non-interruption of the State's offshore fields due to low prices, an episode witnessed in 2020 due to the Covid-19 health crisis. Moreover, it is expected that the new operator of Polo de Peroá will invest in the revitalization of the area and thus increase the reserve recovery factor, which is likely to increase natural gas production.

A significant change was considered between 2024 and 2025 when Petrobras intends to startup a new platform at Parque das Baleias. The project provides for the unification of the Novo Campo de Jubarte, formed by the Jubarte, Baleia Azul, Baleia Franca areas, parts of Cachalote and Pirambu. Upon implementation of the project, a 52.2% increase in oil production and 65.6% in natural gas production is projected for 2025 compared to 2024.

With the new platform at Parque das Baleias, an increase is projected for 2025, of:

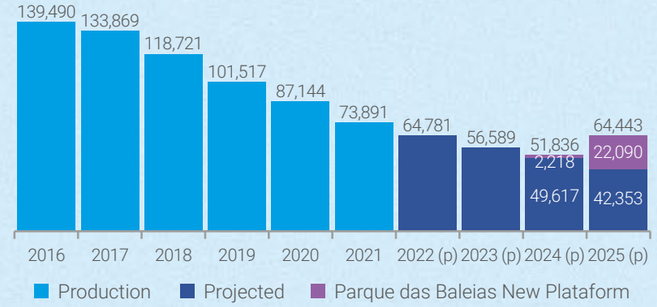
52.2%

in oil production

65.6%

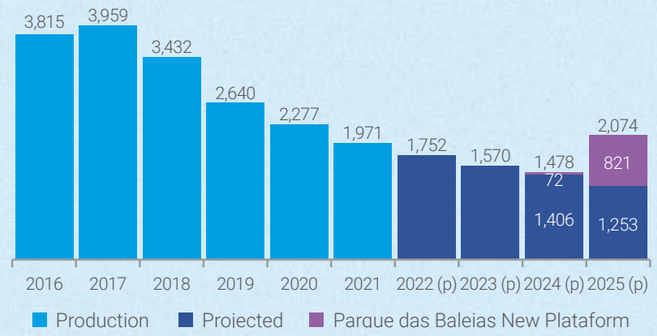
in natural gas production

Chart 21 - Projection of Offshore Oil Production in Espírito Santo (in thousands of barrels)



Prepared by: Ideies and LCA

Chart 22 - Projection of Offshore Natural Gas Production in Espírito Santo (in millions of m³)



Prepared by: Ideies and LCA

2.6.2. Projection of Onshore Production in Espírito Santo

Onshore production is responsible for the minority portion of the produced oil and natural gas volume. The evolution of onshore production does not significantly affect the total produced by the State. However, this activity is important in the regional socioeconomic development of the producing municipalities, particularly in the creation of jobs and income. By 2025, onshore oil production is expected to experience an average annual decline of 3.58%, reaching in 2025 a production of 2.5 million barrels. For natural gas, an average annual drop of 3.62% is projected by 2025, reaching a production volume of 21.7 million m³.

Charts 23 and 24 present the recent evolution and projection of onshore production for 2025. The downward trend in input production is because all the main fields are mature and in a downward production trend (Appendix II). Moreover, Petrobras has no interest in developing onshore assets, which reduces the capacity to absorb new projects in the region.

Onshore natural gas production does not necessarily follow oil production. Consequently, the concentration in oil production areas differs from the concentration of natural gas. In terms of oil production, the Fazenda Alegre, Cancã, Inhambu and Fazenda São Rafael fields account for 78.9% of total onshore production. In terms of natural gas production, the Fazenda Alegre, Fazenda São Rafael, Fazenda Santa Luzia and Rio São Mateus fields account for 80.2% of the total onshore production. The natural downward trend in production in these fields explains the recent and future evolution of onshore production in the state.

After 2022, the drops in production are likely to be less intensive due to the temporary non-interruption of production caused by low prices, an episode witnessed in 2020 related to the Covid-19 health crisis. Furthermore, the sale of Petrobras assets to other operators could start a process of revitalization and extension of the useful life of onshore reserves, which should improve future production. It is also worth noting that there are new onshore projects in Espírito Santo which have still not been disclosed by the new companies operating in the region, as a result of the diversification of operators promoted by the ANP and due to the sale of Petrobras assets.

As onshore production values are lower, any new projects or unconsidered interruptions can cause large deviations from projected volumes.

3.58%

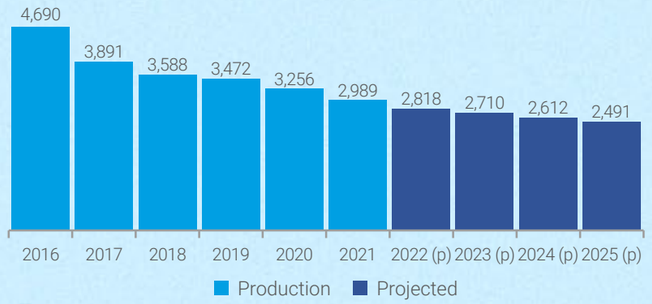
is the expected average annual decline through 2025 in annual onshore oil production, reaching 2.5 million barrels

3.62%

is the average annual drop expected by 2025 in annual onshore natural gas production, reaching 21.7 million m³

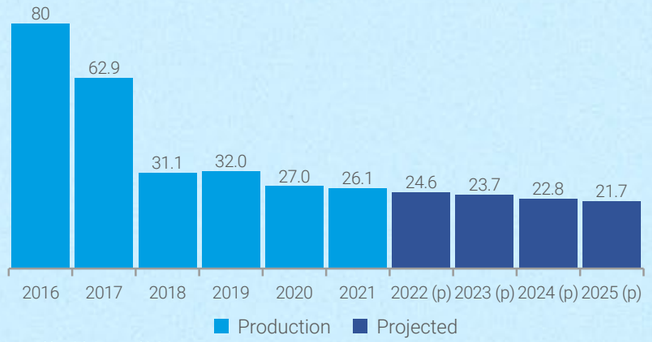
The downward trend in input production is due to the fact that all the main fields are mature and with a tendency to present a decline in production.

Chart 23 - Projection of Onshore Oil Production in Espírito Santo (in thousands of barrels)



Prepared by: Ideies and LCA

Chart 24 - Projection of Onshore Natural Gas Production in Espírito Santo (in millions of m³)



Prepared by: Ideies and LCA

Chapter 3

GOVERNMENT SHARE AND ECONOMIC IMPACTS

The exploration and production of oil and natural gas generate demands for goods and services that create a specialized market around them. The consequences are an expansion in the number of companies, qualified jobs, investments and payment of financial compensation, and taxes relative to the exploration of this natural resource.

R$ 47.0 billion

were paid for oil and natural gas production in Brazil in connection with the government share in 2020

The composition of payments made to the Federal Government, States, and Municipalities was as follows

Special shares	50.8%
Royalties	48.5%
Occupancy rate	0.6%
Signing Bonus	0.03%

3.1. Government Share

The oil companies bidding in oil and natural gas fields[12] pay financial compensation for exploring a finite natural resource owned by the country[13] referred to as government share.

In 2020, the production of oil and natural gas in Brazil paid R$ 47.0 billion to the Government Share, an amount allocated to the Federal Government States and municipalities.

The breakdown of these payments in the country was: 50.8% in special shares (SS); 48.5% in royalties; 0.6% in area occupation or retention fee; and 0.03% in signing bonuses[14]. We point out that only the first two are also redirected to State governments and municipalities.

In 2020, the amount paid in the government share in Brazil was reduced by 64.4%, compared by the same period in the previous year. This drop was mainly caused by the lower generation of signing bonuses (-99.9%), the amount disbursed by the companies that won the bidding, due to the postponement of ANP auctions caused by the Covid-19 pandemic. Furthermore, there were also reductions in revenues rom government share (-29.7%) and royalties (-6.8%) in the country

Overall, Espírito Santo received R$ 2.3 billion in Government Shares in 2020, which corresponded to 5.0% of the total amount in the country. It was the third largest share collection among the states, only behind Rio de Janeiro (R$ 18.7 billion) and São Paulo (R$ 2.5 billion). Of that total, 53.8% was allocated to the Government of Espírito Santo and 46.2% to the municipalities.

12. Companies that win the bidding rounds held by ANP (Law 9.478/1997).

13. Art. 20 of the Federal Constitution.

14. The signing bonus is a government share only destined for the Federal Government.

• Ranking of amounts received in Government Shares

1st: Rio de Janeiro

R$18.7 billion

was received by Rio de Janeiro in Government Shares

2nd: São Paulo

R$2.5 billion

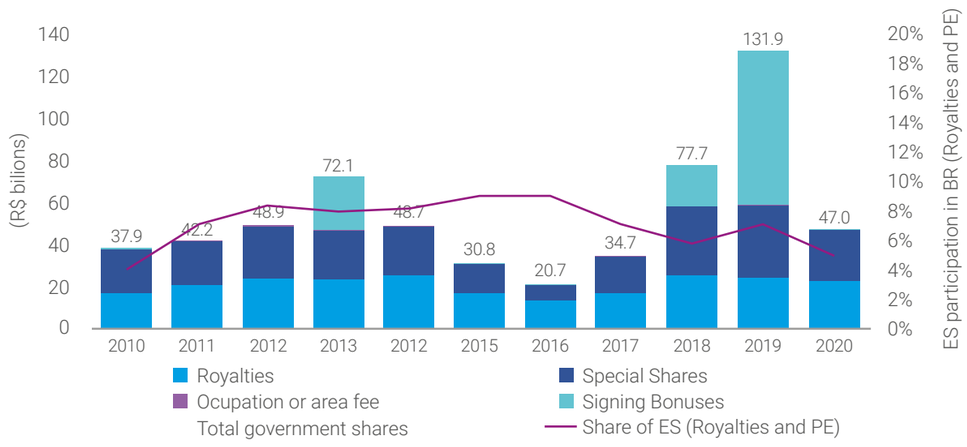
was received by São Paulo in Government Shares

3rd: Espírito Santo

R$2.3 billion

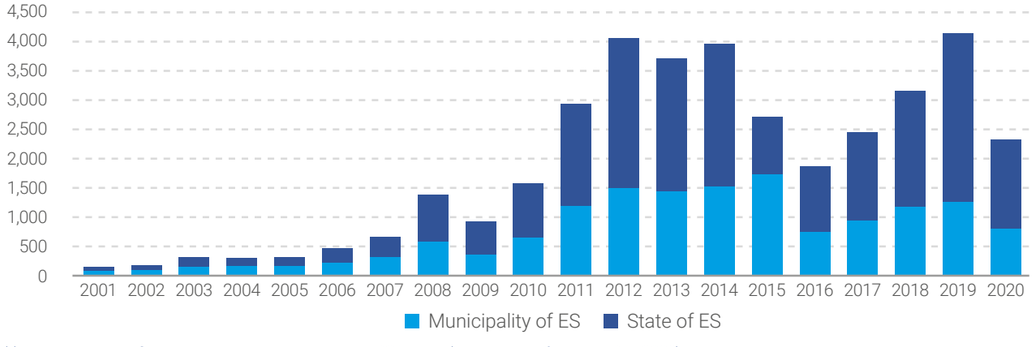
was received by Espírito Santo in Government Shares

Chart 25 Evolution of the composition of the government share in Brazil, by modality (R$ billions)



(*) Amounts with deflation calculated according to the IPCA index (accumulated from Jan-Dec 2020).
Source: ANP | Prepared by: Ideies/Findes
Share transferred to ES in BR (Royalties and PE)

Chart 26 Revenue from the government share (royalties and SS) in Espírito Santo in constant amounts* (R$ million)



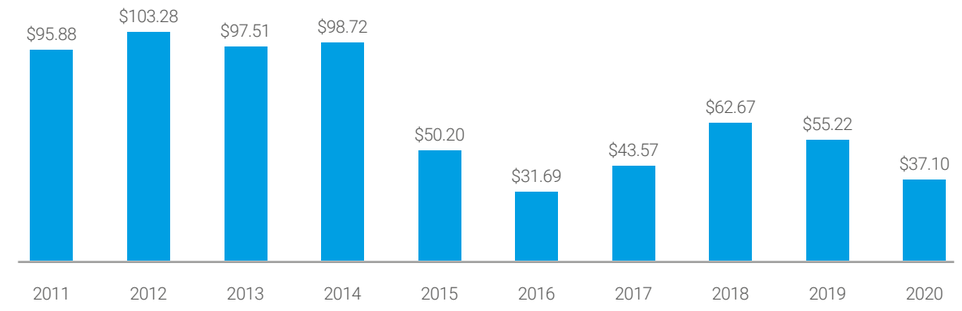
(*) Amounts with deflation calculated according to the IPCA index (accumulated from Jan-Dec 2020).
Source: ANP | Prepared by: Ideies/Findes

Compared to 2019, the amount received from Government Share by Espírito Santo decreased by 43,9% in 2020. And the drop in revenue in the state government (-47.1%) was greater than that of the municipalities of Espírito Santo (-36.5%).

The main contributing factor to the loss of revenue from the government share in Espírito Santo is caused by the drop in special shares received (-53.1%). It is worth noting that 2019 recorded an atypical flow of Special Shares received due to the signing of the agreement to unify Parque das Baleias, which caused the basis for comparison to be higher. Not only that but royalties (-27.2%) also declined in the State at the turn of the year.

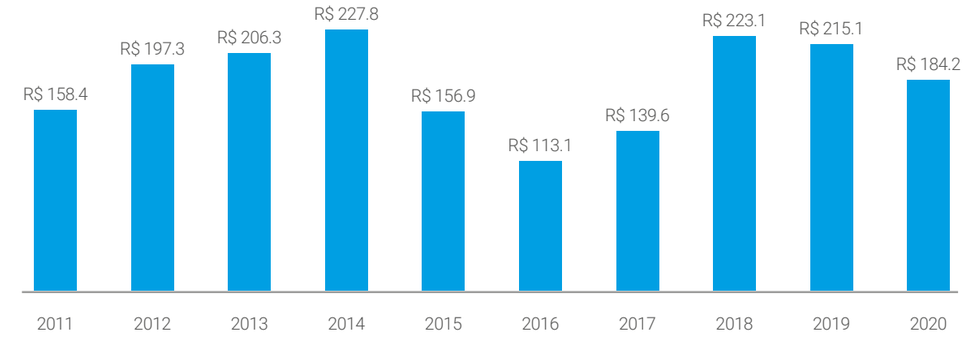
Furthermore, in 2020, the drop in oil and natural gas production and the devaluation of the price of the barrel - provided that the latter is explained by the reduction in world demand due to the Covid-19 pandemic - also contributed to the reduction in the revenue from the Government Share both in the state and country. On the other hand, the devaluation of the Brazilian currency (Real) exchange rate against the dollar was a counterpoint to this result, which can be seen by the difference in the magnitude of the reduction in the average reference price of Espírito Santo in Reais and US Dollars (chart 27).

Chart 27 Evolution of the average reference price of oil in Espírito Santo (in US$)



Source: ANP | Prepared by: Ideies/Findes

Chart 28 Evolution of the average reference price of oil in Espírito Santo (in R$)



Source: ANP | Prepared by: Ideies/Findes

3.1.1. Royalties

- Ranking of amounts received in Government Shares

1st: Rio de Janeiro	2nd: São Paulo	**3rd: Espírito Santo**
R$9.9 billion	R$1.7 billion	**R$1.1 billion**
were received by Rio de Janeiro in royalties in 2020	was received by São Paulo in royalties in 2020	was received by Espírito Santo in royalties in 2020

Royalties are financial compensations calculated[15] by applying one of the rates outlined in a contract, ranging between 5% and 15% of the income from the producing well (quantity of oil and natural gas extracted multiplied by the reference price[16]).

In 2020, the neighboring producing fields in the territory of Espírito Santo paid R$ 3.0 billion in royalties, 98.2% of which resulted from the offshore activity and 1.8% from the onshore activity. The largest amounts were generated by the Jubarte (R$ 1.4 billion) and Roncador[17] (R$ 1.0 billion) offshore fields, Fazenda Alegre (R$24.1 million), and Cancã (R$9.9) onshore. However, that total volume is not transferred only to Espírito Santo, provided that the royalties are distributed among the States, the municipalities and the Federal Government, taking into account criteria such as the location of the producing field (onshore or offshore) and the presence of installations that handle oil and natural gas.

Still, in 2020, Espírito Santo received a total of R$ 1.1 billion in royalties. Approximately R$ 523.0 million were redirected to the State Government and R$ 547.0 million to the municipalities of Espírito Santo, amounts, respectively, 30.1% and 24.3% lower than those recorded in 2019.

With these results, Espírito Santo recorded the third largest collection of royalties among all Brazilian states, third only to Rio de Janeiro (R$9.9 billion) and São Paulo (R$1.7 billion), and accounted for 4.7 % of the total received by the Federal Government.

The municipalities in Espírito Santo that received the most royalties in 2020 were: Presidente Kennedy (14.1%), Marataízes (14.2%), Linhares (12.8%) and Itapemirim (12.2%). Together they concentrated 53.8% of the total of these municipal revenues (chart 29). This high value of shares is explained by the fact that they are municipalities with areas bordering fields with high production of oil and natural gas and having facilities for serving offshore activity. Among them, Linhares is the only municipality with both onshore and offshore activities.

The municipalities with the highest share of the royalties in their total revenues collected were: Presidente Kennedy (32.5%); Marataízes (26.7%) and Itapemirim (19.6%). Except for Linhares, these municipalities have the highest dependence on resources from the royalties in the composition of their revenues (chart 31).

The composition of Royalties payments made in Espírito Santo was the following:

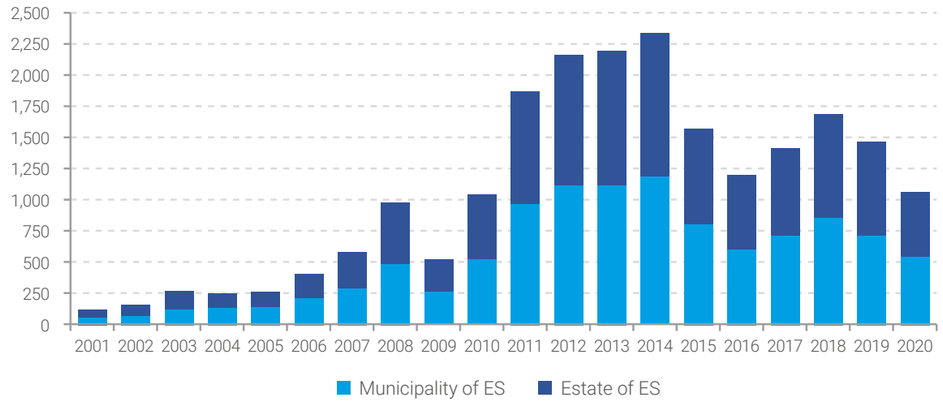
R$ 523 million
were redirected to the State Government

R$ 547 million
were redirected to the Municipalities of Espírito Santo

- The highest amounts in royalties originated from the following fields

OFFSHORE		ONSHORE	
Jubarte	R$1.4 bi	**Fazenda Alegre**	R$24.1 mi
Roncador	R$1.0 bi	**Cancã**	R$9.9 mi

Chart 29 Revenues from royalties in Espírito Santo in constant amounts (R$ millions)*



(*) Amounts with deflation according to the IPCA index (accumulated from Jan-Dec).
Source: ANP | Prepared by: Ideies/Findes

15. For more details on how the amount payable in royalties is calculated, see the box in chapter 3 of the 2019 Yearbook of the Oil Industry of Espírito Santo: https://portaldaindustria-es.com.br/system/repositories/files/000/000/577/original/Anuario_Petroleo-ES_2019_port.pdf?1588180009

16. The reference price of oil is calculated on a monthly basis by ANP, according to the monthly average of Brent-type oil, in US Dollars per barrel. The reference price for natural gas is calculated monthly by the sum of the products of the volumetric fractions of NG.

17. The Roncador field also borders the State of Rio de Janeiro. Therefore, its royalties are also destined to the State Government of Rio de Janeiro, and municipalities of Rio de Janeiro.

Chart 30 Municipalities of the State of Espírito Santo that received more royalties - % on the total royalties received by all municipalities of the State of Espírito 2020

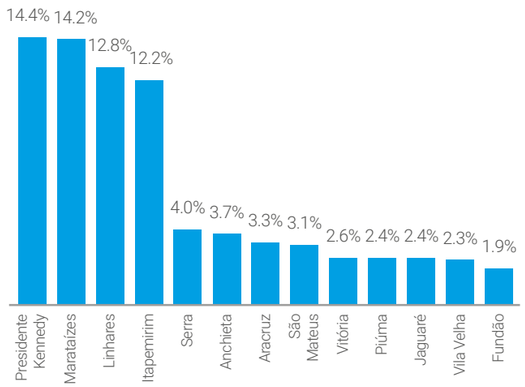
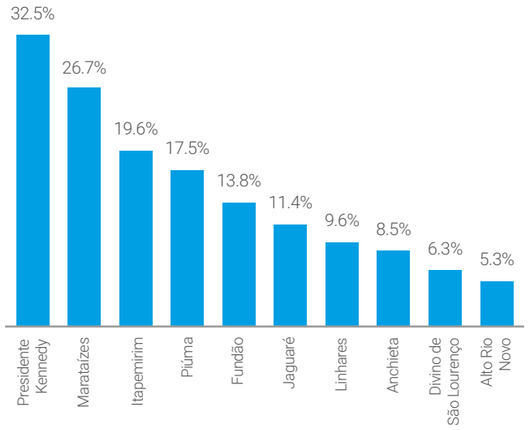


Chart 31 Municipalities of Espírito Santo with the highest share in revenues from royalties in their total income (%) - 2020



Source: ANP | Prepared by: Ideies/Findes

Table 1 Royalties paid by oil and gas producing fields, onshore and offshore, in Espírito Santo – 2020

	Field	Royalties	Participação (%)
Onshore	(R$ millions)	24.11	45.1%
	Cancã	9.90	18.5%
	Inhambu	4.70	8.8%
	Fazenda São Rafael	4.63	8.7%
	Fazenda Santa Luzia	3.21	6.0%
	Fazenda São Jorge	1.44	2.7%
	Rio Preto Oeste	0.77	1.4%
	Fazenda Queimadas	0.67	1.3%
	São Mateus	0.59	1.1%
	Lagoa Parda	0.52	1.0%
	Lagoa Suruaca	0.35	0.7%
	Rio Preto	0.33	0.6%
	Rio Preto Sul	0.27	0.5%
	Córrego Dourado	0.26	0.5%
	Córrego Cedro Norte	0.23	0.4%
	Jacutinga	0.23	0.4%
	PA-1BGM1ES_EST-T-476	0.21	0.4%
	Lagoa Piabanha	0.19	0.4%
	Seriema	0.14	0.3%
	Campo Grande	0.11	0.2%
	Rio São Mateus	0.09	0.2%
	Fazenda Cedro Norte	0.08	0.1%
	Córrego das Pedras	0.07	0.1%
	Tucano	0.07	0.1%
	Biguá	0.05	0.1%
	Mariricu	0.04	0.1%
	Fazenda Cedro	0.04	0.1%
	Gaivota	0.03	0.1%
	Mariricu Norte	0.03	0.1%
	Tabuiaiá	0.03	0.0%
	Guriri	0.02	0.0%
	Rio Mariricu	0.02	0.0%
	Rio Itaúnas	0.02	0.0%
	Cacimbas	0.01	0.0%
	Lagoa Bonita	0.01	0.0%
	Cancã Leste	0.01	0.0%
	Córrego Cedro Norte Sul	0.01	0.0%
	São Mateus Leste	0.0019	0.0%
	Bem-te-vi	0.0005	0.0%
	Lagoa Parda Norte	0.0001	0.0%
	Total onshore	53.50	100.0%
Offshore	Jubarte	1,460.2	49.1%
	Roncador	1,033.8	34.8%
	Argonauta	198.5	6.7%
	Frade	123.1	4.1%
	Golfinho	80.7	2.7%
	Ostra	41.6	1.4%
	Baleia Anã	19.8	0.7%
	Peroá	7.6	0.3%
	Abalone	2.7	0.1%
	Abalone	2.7	0.1%
	Cangoá	1.4	0.0%
	Total offshore	2,972.2	100.0%

Note: Royalties paid by producing fields in Espírito Santo were distributed among the municipalities, the State and the Federal Government.
Source: ANP | Prepared by: Ideies/Findes

3.1.2. Special Shares (SS)

The special share is a financial compensation paid by oil companies that have fields with a high production volume[18]. I.e., this is an extraordinary payment related to the productivity level of an area. The calculation of the amount to be paid in SS is made by applying progressive rates[19] on net revenues[20] from the quarterly production of each field.

After the unification of Parque das Baleias[21], Espírito Santo passed to border two fields that generated special share resources in 2020: Jubarte (R$ 751.0 million) and Roncador (R$ 0.21 million). Compared to 2019, the amounts paid in SS by these fields were respectively reduced by -44.5% and -99.9%, and these results are explained by the lower production of oil and natural gas in both areas (Table 2). In the case of Rocandor, it was only in Q1 2020 that a positive net income was recorded for calculating the SS.

Table 2 Special participations paid by fields bordering Espírito Santo – 2020* (R$ million)

Field	2019	2020	Variation
Jubarte	3,170.50	1,759.94	-44.5%
Roncador**	751.04	0.21	-99.97%

(*) Amounts with deflation calculated according to the IPCA index (accumulated from Jan-Dec 2020).
(**) The field also borders the State of Rio de Janeiro. Therefore, part of that amount is also distributed to the State Government and the municipalities in Campos dos Goytacazes and São Joao da Barra.
Source: ANP | Prepared by: Ideies/Findes

In 2020, Espírito Santo received a total of R$ 1.2 billion in special shares. Of that amount, R$ 997.1 million were allocated to the State government and R$ 249.3 million to the municipalities of Marataízes, Presidente Kennedy, Piúma, and Itapemirim, which border the fields that entail the SS.

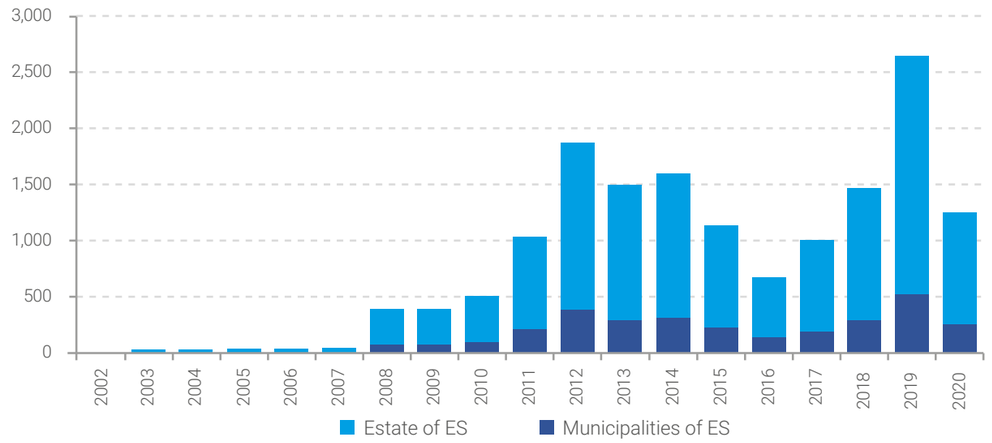
In 2020, compared to the same period of the previous year, revenues from special shares fell by 53.1% for the State government and the aforementioned municipalities in Espírito Santo. It is worth reminding that Espírito Santo beat the record in collection the of SS due to the signing of the contract to unify the Parque das Baleias in 2019, and therefore the comparison base was also atypically high (Chart 32).

In 2020, Espírito Santo was the second State that received the most revenues from special shares, second only to Rio de Janeiro (R$ 8.7 billion), which accounted for 5.2% the total special shares received by the country. The other States that received these resources were: São Paulo (R$1.1 billion), Amazonas (R$41.0 million), and Bahia (R$1.5 million).

We point out that the unification of Parque das Baleias, through the "Settlement for Ending the Dispute Involving the Areas of the Contract and Concession BC-60", has also created a retroactive balance of the special share to be paid in 42 installments by Petrobras to the Federal Government (50%), to the Government of the State of Espírito Santo (40%) and the municipalities (10%)[22] of Itapemirim, Marataízes, Piúma, and Presidente Kennedy.

In 2020 alone, Petrobras paid a total of R$ 620.8 million in SS referring to the execution of that agreement. Of that amount, R$ 248.3 million were destined for the Government of the State of Espírito Santo and R$ 62.8 million for the municipalities of the State[23].

Chart 32 Revenues from Special Shares in Espírito Santo in constant amounts (R$ million)



Source: ANP | Prepared by: Ideies/Findes

Ranking of amounts received in Special Shares

1st: Rio de Janeiro

R$ 8.7 billion

Reais were received by Rio de Janeiro in Special Shares

2nd: Espírito Santo

R$ 1.2 billion

billion was received by Espírito Santo in Special Shares

3rd: São Paulo

R$ 1.1 billion

billion reais were received by São Paulo in Special Shares

18. Its regulation happens through Law 9.478/97 (Petroleum Act) and Decree 2.705/1998.

19. They vary according to the location of the well, the number of production years, and the quarterly production volume calculated.

20. ANP monitors the cost of oil companies so it may calculate that net income. Moreover, are also considered the projected deductions (royalties, investments in the exploration, overhead, depreciation, and taxes).

21. In April 2019 was signed the unification field in connection with the fields part of Parque das Baleias, composed by the areas of Jubarte, Baleia Azul, Baleia Franca, parts of Cachalote, and Pirambu, in the Campos Basin. With that, one single large producing field was formed, which is now called "Novo Campo de Jubarte" or simply "Jubarte". That unification created a substantial volume of SS payments to Espírito Santo. For more details, access the previous edition of this Yearbook: https://portaldaindustria-es.com.br/system/repositories/files/000/000/952/original/Anuario_Petroleo-ES_2020_port.pdf?1618494352

22. Pursuant to art. 50 of Law 9.478/97, the distribution of the special share is made in the following manner: i) 40% to the Ministry of Mines and Energy (MME) and 10% to the Ministry of the Environment (MMA), totaling 50% to the Federal Government; iii) 40% to the States; and iv) 10% to municipalities. In the case of Jubarte, the amount paid to the municipalities is distributed among Itapemirim (32.3045%), Marataízes (37.7702%), Piúma (0.3230%), and Presidente Kennedy (29.6023%).

23. Learn more about the ANP reports regarding the "Novo Campo Jubarte Agreement" at: https://www.gov.br/anp/pt-br/assuntos/royalties-e-outras-participacoes/participacao-especial

3.1.3. Payment to landowners

64

owners regularized to receive payment for the use of land for the oil exploration and production activity in Espírito Santo in 2020

496.1 thousand

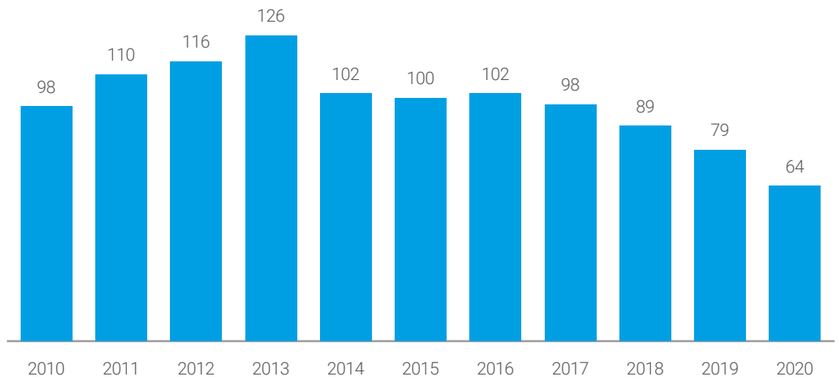
reais were paid by concession holders to land owners in Espírito Santo in 2020

The Petroleum Act[24] determines that concession holders also pay a rate, set between 0.5% and 1%[25], on the gross income from the production of oil and natural gas to the owners of the land where active wells are located.

Espírito Santo onshore production happens only in the Espírito Santo Basin, located in the northern portion of the State. There were there 64 owners regularized for receiving the rate on the gross income of the wells located on their land in 2020, an amount 19.0% lower than what was recorded in 2019.

In 2020, concession holders paid, without deducting income tax, R$ 491.6 thousand to landowners in Espírito Santo, which represented 0.6% of the amount disbursed countrywide. In the comparison with 2019, this payment had an 89.0% retraction in the State. That reduction was caused by the natural process of decline in the production of oil and natural gas onshore; due to the drop in the oil reference price and due to the movement in restructuring the onshore E&P activity in the State of Espírito Santo due to Petrobras' divestment.

Chart 33 Number of land owners with a share in the production of oil and natural gas of Espírito Santo



Source: ANP | Prepared by: Ideies/Findes

Table 3 Amounts received in government shares by the State and Municipalities of Espírito Santo (R$ millions)*

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total in Government Share	Municipalities of ES	574.7	349.3	631.8	1178.0	1497.0	1424.5	1514.3	1714.0	743.7	927.8	1157.2	1253.5	796.2
	State of ES	797.5	572.7	928.1	1735.1	2553.7	2271.2	2430.8	1000.4	1130.4	1514.0	2006.7	2872.1	1520.1
	Total in Brazil	43,539.8	30,260.4	37,586.7	41,889.0	48,615.2	46,360.9	48,518.7	30,372.1	20,669.4	34,465.4	55,138.3	58,477.3	46,707.2
	% of Brazil	3.2%	3.0%	4.2%	7.0%	8.3%	8.0%	8.1%	8.9%	9.1%	7.1%	5.7%	7.1%	5.0%
Royalties	Municipalities of ES	497.2	271.6	529.2	970.0	1121.1	1123.6	1193.4	805.8	609.2	724.1	862.1	722.4	547.0
	State of ES	487.5	261.8	517.6	903.1	1049.8	1067.7	1147.4	773.3	592.4	699.2	826.2	747.8	523.0
	Total in Brazil	21,026.9	14,682.1	17,279.4	21,221.3	24,138.5	23,771.9	25,384.2	17,152.5	13,786.5	17,308.8	22,837.7	24,487.8	22,819.3
	% of Brazil	4.7%	3.6%	6.1%	8.8%	9.0%	9.2%	9.2%	9.2%	8.7%	8.2%	7.4%	6.0%	4.7%
Special Share	Municipalities of ES	77.5	77.7	102.6	208.0	376.0	300.9	320.9	227.1	134.5	203.7	295.1	531.1	249.3
	State of ES	310.0	310.9	410.6	832.1	1503.9	1203.5	1283.4	908.2	538.0	814.8	1180.4	2124.3	997.1
	Total in Brazil	22,512.8	15,578.3	20,307.3	20,667.7	24,476.7	22,589.0	23,134.5	13,219.6	6,882.9	17,156.6	32,300.6	33,989.5	23,887.9
	% of Brazil	1.7%	2.5%	2.5%	5.0%	7.7%	6.7%	6.9%	8.6%	9.8%	5.9%	4.6%	7.8%	5.2%

Source: ANP | Prepared by: Ideies/Findes

24. Law 9.478 of 1997.

25. Landowners receive, every month, a share ranging between 0.5% in marginal fields and 1% in the other cases (ANP Ordinance 143, of 09.25.1998).

3.2. Labor market

The oil and gas industry promotes the growth and improvement of the job market. In this yearbook, the oil sector chain in the State of Espírito Santo was segmented into five links[26]: (i) exploration and production (E&P), also known as upstream, which consists of the actual extraction and production activities of O&G; (ii) derivatives, which are activities related to the processing of oil and natural gas; (iii) supply, which consists of processing and trading of[27] O&G products; (iv) petrochemicals, which is a branch of the chemical industry that uses oil and natural gas as input; and (v) supply chain[28], which includes the industrial activities that provide specific products and services for E&P activities (see Appendix II).

In 2020, the oil and gas production chain employed 11,462 formal employees in Espírito Santo, representing 2.9% of the national chain and 1.3% of all employment in the State (Table 4). These numbers in the Espírito Santo industry were distributed in: 63.5% in the supply chain link; 28.0% in E&P; 7.1% in supply; 1.3% in petrochemicals; and 0.1% in petroleum byproducts.

In comparison with 2019, there was a 2.8% increase in the number of employees in the oil and natural gas industry in the state, a result driven by the expansions of: 6.5% in E&P, 1.7% in the supply chain; and 11.3% in petrochemicals.

Still, -in the transition from 2019 to 2020, the total number of formal jobs in Espírito Santo decreased by 0.7%, due to the new Coronavirus pandemic. However, in the production chain of the oil and gas sector, this drop was not seen, possibly due to the following reasons: i) due to the intensity of capital employed, the technological complexity, and the high degree of knowledge necessary to perform certain activities, the workforce is usually specialized and requires an advanced level of training. The layoff in an uncertain scenario is not strategic for companies; ii) as an essential activity, E&P was not interrupted by government decree, and iii) federal and state programs to encourage job maintenance during the pandemic helped the industry maintain formal employment.

Due to the multidisciplinarity required to carry out activities in the

11,462

formal employees were employed in Espírito Santo in the oil and natural gas production chain

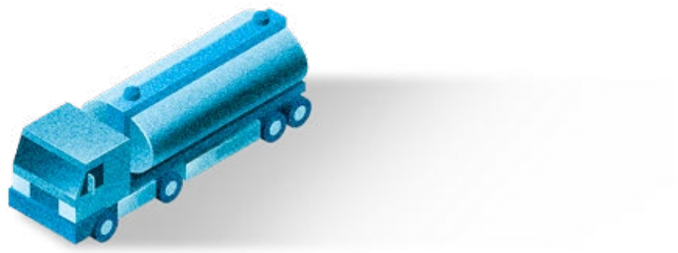
Distribution of employees in the oil and natural gas sector by links in the chain in 2020

Chain of Supply	63.5%
E&P	28.0%
Supply	7.1%
Petrochemical	1.3%
Oil byproducts	0.1%

Table 4 - Formal jobs in the chain of the O&G production sector in Espírito Santo

Links in the Chain	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
E&P	2,278	2,636	2,818	2,914	3,192	3,251	3,087	3,207	3,071	2,883	2,518	2,439	3,011	3,207
Oil byproducts	97	86	91	197	102	91	95	33	31	15	17	16	19	15
Petrochemicals	20	7	6	2	35	51	53	51	0	123	123	125	133	148
Supply	501	563	669	642	674	730	804	820	835	807	787	739	827	817
Chain of Supply	4,942	7,703	7,633	6,060	6,868	8,223	7,186	7,630	7,143	5,981	6,232	7,107	7,155	7,275
Total	7,838	10,995	11,217	9,815	10,871	12,346	11,225	11,741	11,080	9,809	9,677	10,426	11,145	11,462
% of the total jobs in ES	1.0%	1.4%	1.4%	1.1%	1.2%	1.3%	1.2%	1.2%	1.2%	1.1%	1.1%	1.2%	1.2%	1.3%
% of the ES chain in the total of the same chain in Brazil	2.1%	2.6%	2.6%	2.1%	2.1%	2.3%	2.1%	2.3%	2.3%	2.3%	2.5%	2.7%	2.8%	2.9%

Source: Rais/ME | Prepared by: Ideies/Findes

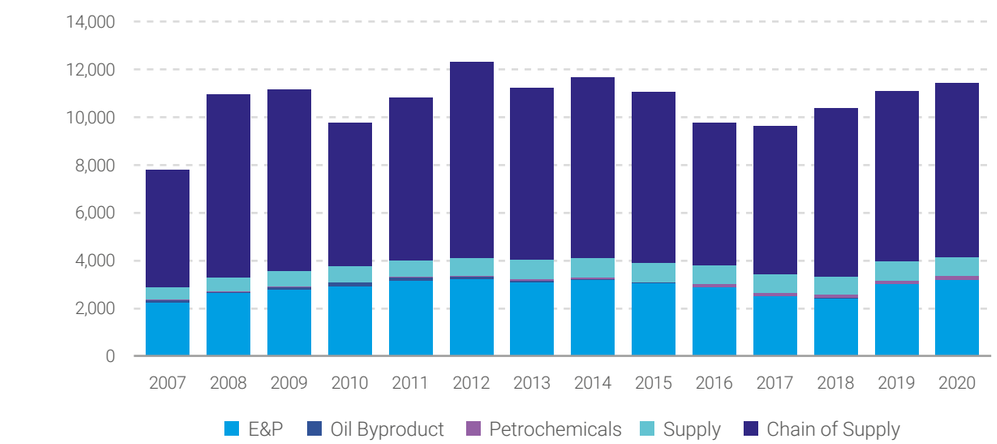


26. In this edition of the yearbook, the oil and natural gas sector chain was expanded from 3 to 5 links, now including oil derivatives/byproducts and petrochemicals. We must highlight that for the composition of the sector chain and the possibility of extracting information from official sources, it is necessary to use the National Classification of Economic Activities 2.0 (CNAES), and in this edition, previously used CNAES were reclassified and new ones were added to that list (see Appendix II). Moreover, it is a known fact that the structuring of a production chain, whether in the oil and gas sector, or in any other sector of economic activity, through CNAES is limited, since many companies can operate in different activities, which are not covered by the CNAE in which it is classified.

27. In this chain, the retail fuel trade was not considered because this activity exists in practically all regions of the country, regardless of whether or not the region has O&G exploration and production activities.

28. In this yearbook, the chain covers the CNAES which IBGE describes as an activity that supplies raw materials or provides a service to the oil and natural gas industry.

Chart 34 - Distribution of formal employees in the chain of production of the O&G industry – Espírito Santo



Source: Rais/ME | Prepared by: Ideies/Findes

13.9%

of workers in the oil and natural gas industry worked in the area of assembly of pipes, metallic structures and composites

7.2%

of workers in the oil and natural gas industry worked as engineers, architects and in similar professions

oil and natural gas industry, the profile of workers that make up the industry's chain is heterogeneous, covering various occupations, different age groups and levels of qualification, and different average salaries (Table 5). In 2020, 13.9% of workers worked in the area of assembly of pipes, metallic, and composite structures; and 7.2% were engineers, architects, and similar professionals.

The occupation that employed the most that year was welder (518), followed by oil exploration operator (465) and administrative assistants (404). Moreover, the O&G chain employed 55.0% of machine operators and 35.1% of steel structure preparers in Espírito Santo.

Regarding the age group (Table 5), 38.6% of the workers in the O&G Espírito Santo chain were between 30 and 49 years old (4,421) and 37.6% of the employees were over 50 years old, in 2020.

Regarding workers' education, at least 23.9% had a college degree and 56.6% had a High School diploma. The oil and gas industry in Espírito Santo absorbs 2.6% of employees with a master's degree in the state.

As a result of the qualification of its employees, the average monthly compensation in the O&G sector in Espírito Santo was R$ 6,622.79 and countrywide, it was R$ 6,031.60 in 2020. These amounts were higher than the total average monthly compensation of the state (R$ 2,547.42) and the country (R$ 2,924.32).

The average wage of the O&G industry's production chain has differences between the links that compose it. In the E&P link, the average compensation reaches R$ 16,502.43, while in the supply chain the average is R$ 2,532.71.

38.6%

of workers in the oil and natural gas industry were between 30 and 49 years old in 2020

37.6%

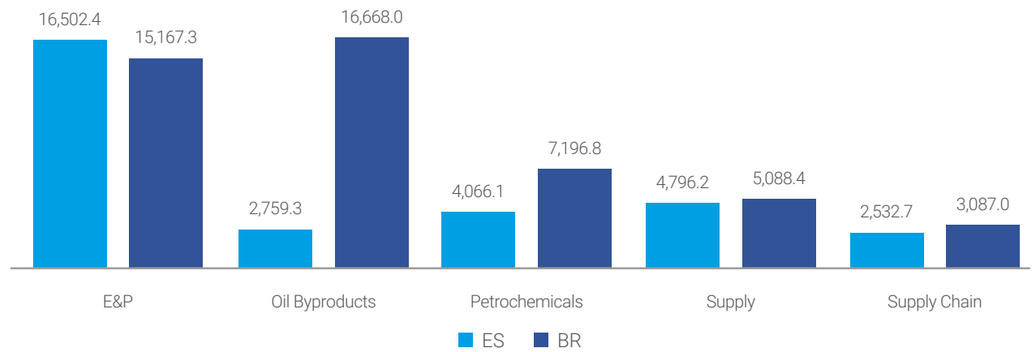
of employees in the oil and natural gas industry were over 50 years old in 2020

Distribution of education levels of employees in the oil and natural gas industry in 2020:

High School	56.6 %
College Education	23.9 %
Master's Degree	2.6 %

Another point that draws attention is the salary difference paid in the oil derivatives link in Espírito Santo and Brazil (chart 35).

Chart 35 - Average monthly wage of the links of the chain of production in the O&G industry, 2020 – Espírito Santo and Brazil (R$ thousands)



Source: Rais/ME | Prepared by: Ideies/Findes

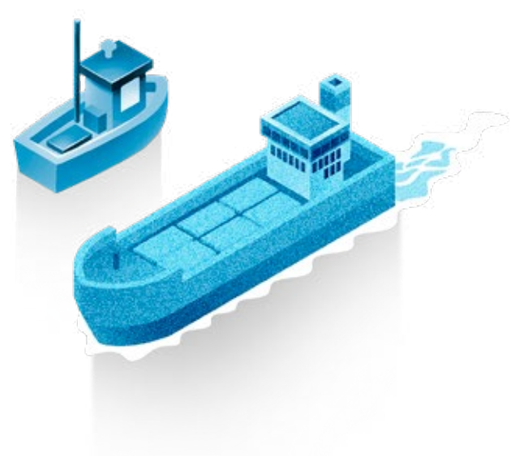


Table 5 Characteristics of the jobs market of the O&G chain in Espírito Santo – 2020

	ES	BR	% ES in the Brazilian chain	% in the total of the State of ES
Main Occupations				
Welder	518	13,922	3.7%	11.3%
Oil exploration operator	465	8,471	5.5%	100.0%
Administrative assistant	404	15,035	2.7%	1.2%
Metal structure preparer	283	2,720	10.4%	35.1%
General machine maintenance mechanic	249	6,203	4.0%	4.1%
Truck driver (regional and international routes)	245	13,366	1.8%	1.1%
Machine tool operator	242	1,478	16.4%	55.0%
Mechanical technician	240	4,713	5.1%	12.0%
General office assistant	222	11,444	1.9%	0.6%
Stockroom Clerk	219	5,642	3.9%	3.0%
Metal structure assembler	219	6,575	3.3%	10.7%
Job subgroup				
Workers in assembly of pipes, metal and composite structures	1,593	37,544	4.2%	13.2%
Engineers, Architects and similar professionals	829	17,910	4.6%	21.2%
Clerks in general, agents, assistants and administrative assistants	649	26,995	2.4%	0.9%
Vehicle drivers and operators of lifting and handling equipment	615	23,459	2.6%	1.3%
Operators of facilities in chemical, petrochemical and related industries	505	15,195	3.3%	27.3%
Electronics and photonics technicians	504	10,072	5.0%	8.6%
Metalwork technicians	494	8,978	5.5%	14.8%
Age Range				
10 to 14	2	14	14.3%	1.3%
15 to 17	49	1,290	3.8%	0.7%
18 to 24	1,147	35,620	3.2%	1.0%
25 to 29	1,536	49,313	3.1%	1.3%
30 to 39	4,421	140,151	3.2%	1.6%
40 to 49	2,852	98,987	2.9%	1.3%
50 to 64	1,399	63,168	2.2%	0.9%
65 OR MORE	56	5,319	1.1%	0.4%
Education Level				
Illiterate	13	592	2.2%	0.5%
Up to 5th grade - Incomplete	80	4,694	1.7%	0.4%
5th Grade Elementary School - Complete	73	4,718	1.5%	0.4%
6th to 9th Grade of Elementary School	345	13,342	2.6%	0.8%
Elementary Education - Complete	610	26,831	2.3%	0.9%
High School - Incomplete	762	19,151	4.0%	1.3%
Complete High School	6,490	206,145	3.1%	1.5%
Incomplete College Education	353	19,312	1.8%	1.1%
Complete College Education	2,511	94,127	2.7%	1.3%
Master's Degree	203	4,251	4.8%	2.6%
Doctorate Degree	22	699	3.1%	0.3%
Total average compensation amount (R$)	R$ 6,622.79	R$ 6,031.60		

Source: Rais/ME | Prepared by: Ideies/Findes

3.3. External Sector

The production of the oil and natural gas industry can be consumed internally in the country, after being processed, or sold abroad. These exports range from crude oil, petroleum coke, oil byproducts, and petrochemical products.

The total value exported by the Espírito Santo oil industry totaled R$ 599 million in 2020, which represented 2.2% of the sector's foreign sales in the country and 12.1% of the total exported by Espírito Santo. Among all Espírito Santo sectors, these were the sixth largest foreign sales figures.

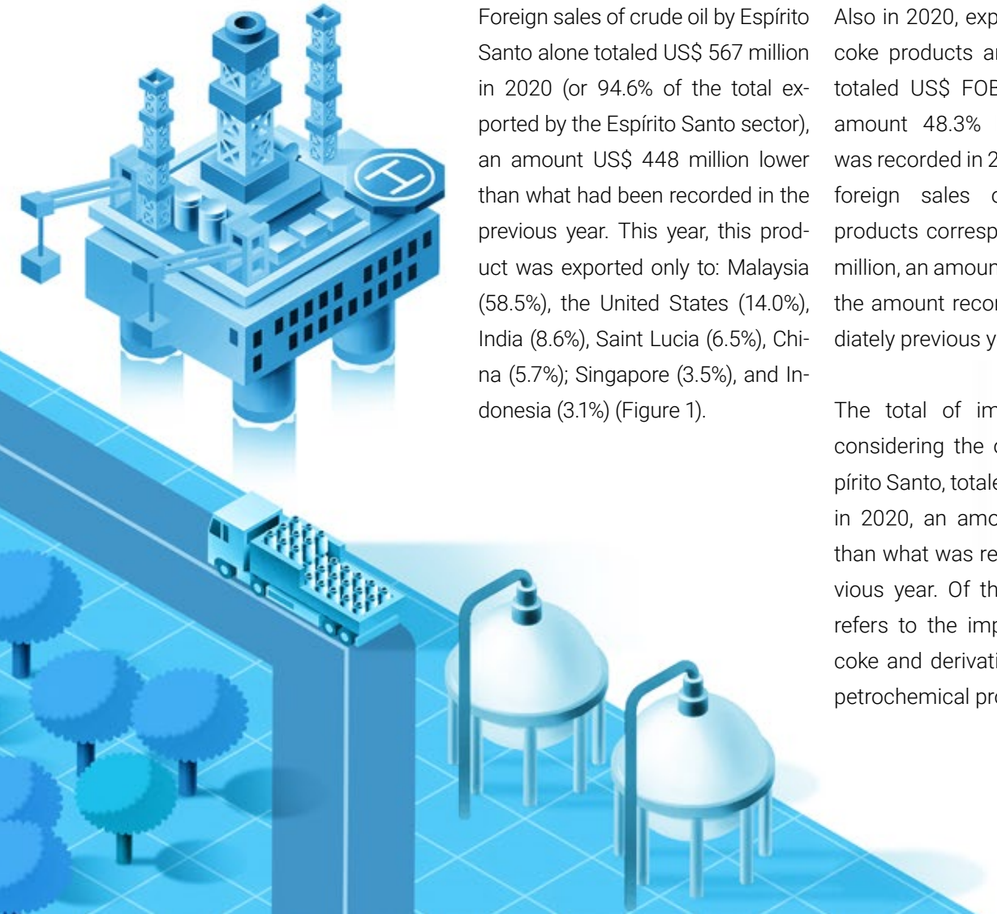
In comparison with 2019, the volume of exports of the oil and natural gas industry retracted by 44.3%. This lower performance in the foreign market was mainly caused by the Covid-19 pandemic, decreed in March 2020 by the World Health Organization (WHO), which led several countries to adopt measures of social distancing and isolation, which proved to reduce economic activities and mobility of people. As a result, there was a reduction in international demand for oil and natural gas.

599 million

were exported by the whole oil industry in Espírito Santo

Chart 36 - Exports of oil and share in exports of oil in the total exports of Espírito Santo

Source: MDIC/Secex | Prepared by: Ideies/Findes
Portion in the total exports by ES.



Foreign sales of crude oil by Espírito Santo alone totaled US$ 567 million in 2020 (or 94.6% of the total exported by the Espírito Santo sector), an amount US$ 448 million lower than what had been recorded in the previous year. This year, this product was exported only to: Malaysia (58.5%), the United States (14.0%), India (8.6%), Saint Lucia (6.5%), China (5.7%); Singapore (3.5%), and Indonesia (3.1%) (Figure 1).

Also in 2020, exports of petroleum coke products and oil byproducts totaled US$ FOB 30.4 million, an amount 48.3% lower than what was recorded in 2019. Furthermore, foreign sales of petrochemical products corresponded to US$ 1.7 million, an amount 5.4% higher than the amount recorded in the immediately previous year.

The total of imported products, considering the oil industry in Espírito Santo, totaled US$ 140 million in 2020, an amount 30.4% higher than what was recorded in the previous year. Of this amount, 61.0% refers to the import of petroleum coke and derivatives and 39.0% to petrochemical products (Table 7).

Table 6 - Exports of the oil industry in Espírito Santo (US$ FOB millions)

Period	Total exports		Crude Oil		Coking and oil byproducts		Petrochemical Products	
	Total ES	% ES/BR	Total ES	% ES/BR	Total ES	% ES/BR	Total ES	% ES/BR
2010	899	3.9%	899	5.6%	0.0	0.0%	0.0	0.0%
2011	1,512	4.9%	1,511	7.0%	0.0	0.0%	1.5	0.0%
2012	1,323	4.4%	1,322	6.6%	0.0	0.0%	0.3	0.0%
2013	934	4.3%	932	7.2%	0.0	0.0%	1.9	0.0%
2014	2,006	8.1%	2,001	12.2%	0.001	0.00003%	5.6	0.1%
2015	1,130	6.6%	1,128	9.6%	0.07	0.004%	1.9	0.1%
2016	467	3.2%	465	4.6%	0.0	0.0%	1.6	0.0%
2017	924	4.2%	920	5.7%	0.0	0.0%	4.3	0.1%
2018	1,004	3.1%	960	3.8%	38.5	0.9%	5.6	0.2%
2019	1,075	3.2%	1,014	4.2%	58.8	1.0%	1.6	0.1%
2020	599	2.2%	567	2.9%	30.4	0.6%	1.7	0.1%

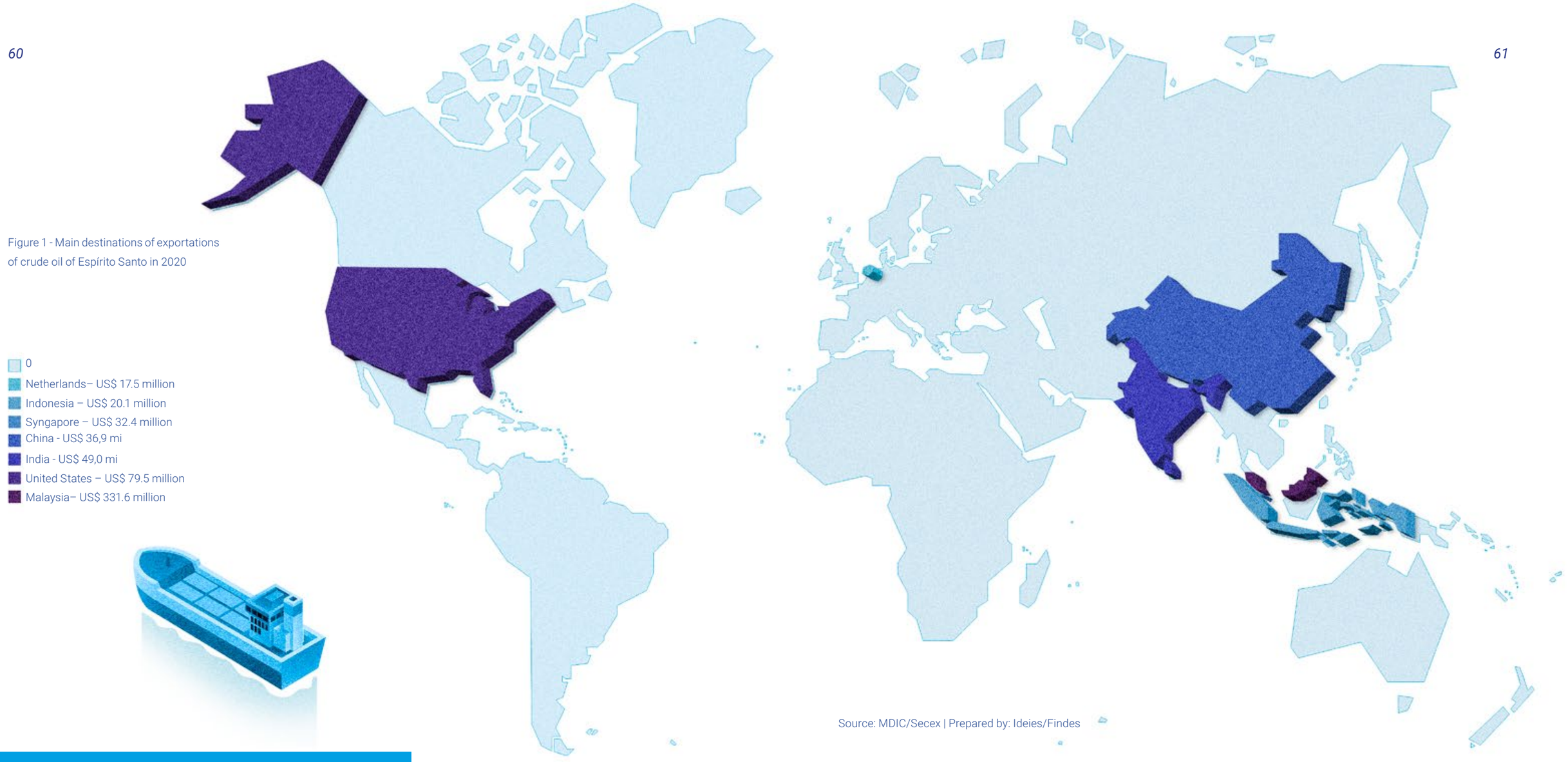
Source: MDIC/Secex | Prepared by: Ideies/Findes

Table 7 - Espírito Santo imports of products from the oil industry (US$ FOB millions)

Period	Total exports		Crude Oil		Coking and oil byproducts		Petrochemical Products	
	Total ES	% ES/BR	Total ES	% ES/BR	Total ES	% ES/BR	Total ES	% ES/BR
2010	313	0.9%	0	0.0%	46.3	0.4%	266.3	4.0%
2011	283	0.6%	0	0.0%	17.1	0.1%	266.3	3.2%
2012	264	0.6%	0	0.0%	34.6	0.2%	229.5	2.9%
2013	203	0.5%	0	0.0%	37.8	0.2%	164.8	1.9%
2014	183	0.4%	0	0.0%	35.530	0.2%	147.4	1.8%
2015	218	0.8%	0	0.0%	67.03	0.7%	151.0	2.4%
2016	122	0.5%	0	0.0%	33.8	0.4%	87.7	1.7%
2017	129	0.4%	0	0.0%	81.1	0.6%	48.2	0.8%
2018	118	0.3%	0	0.0%	46.3	0.3%	71.2	1.0%
2019	108	0.2%	0	0.0%	51.6	0.4%	56.0	0.9%
2020	140	0.4%	0	0.0%	85.6	1.0%	54.7	0.9%

Source: MDIC/Secex | Prepared by: Ideies/Findes

Figure 1 - Main destinations of exportations of crude oil of Espírito Santo in 2020



Source: MDIC/Secex | Prepared by: Ideies/Findes

BOX 1 – **“REPETRO”-ELIGIBLE PRODUCTS**

Until the 4th edition of the Espírito Santo Petroleum Industry Yearbook, products “Repetro-Eligible of originating from Repetro” in foreign trade analyses.

Repetro is a special customs regime that allows an agent authorized by the Federal Revenue Service of Brazil to export and import a list of goods intended for research and exploration activities in oil and natural gas deposits, through temporary admission[29], fictitious export[30], and drawback[31]. As of the date of this publication, this permitted list consisted of 124 NCMs[32] that could benefit from this special customs regime. It is worth noting that these listed items are not fixed, and are changed upon approval of the inclusion or suppression of certain products in the Regulatory Directive that governs Repetro.

Since it is not possible to disaggregate official foreign trade data into products that have or have not benefited from Repetro, exports and imports of NCMs covered by this special regime could overestimate the flow of foreign transactions intended for serving the oil and gas industry in Espírito Santo. The reason for that is that said list contains products that do not exclusively serve the O&G industry. Consequently, starting with this 5th edition of the Espírito Santo Oil Industry Yearbook, we chose to remove Repetro-Eligible products from our foreign trade analysis.

29. Import, with a total suspension of payment of federal taxes, in the case of goods used in the exploration and production of oil and gas with the commitment to be re-exported.

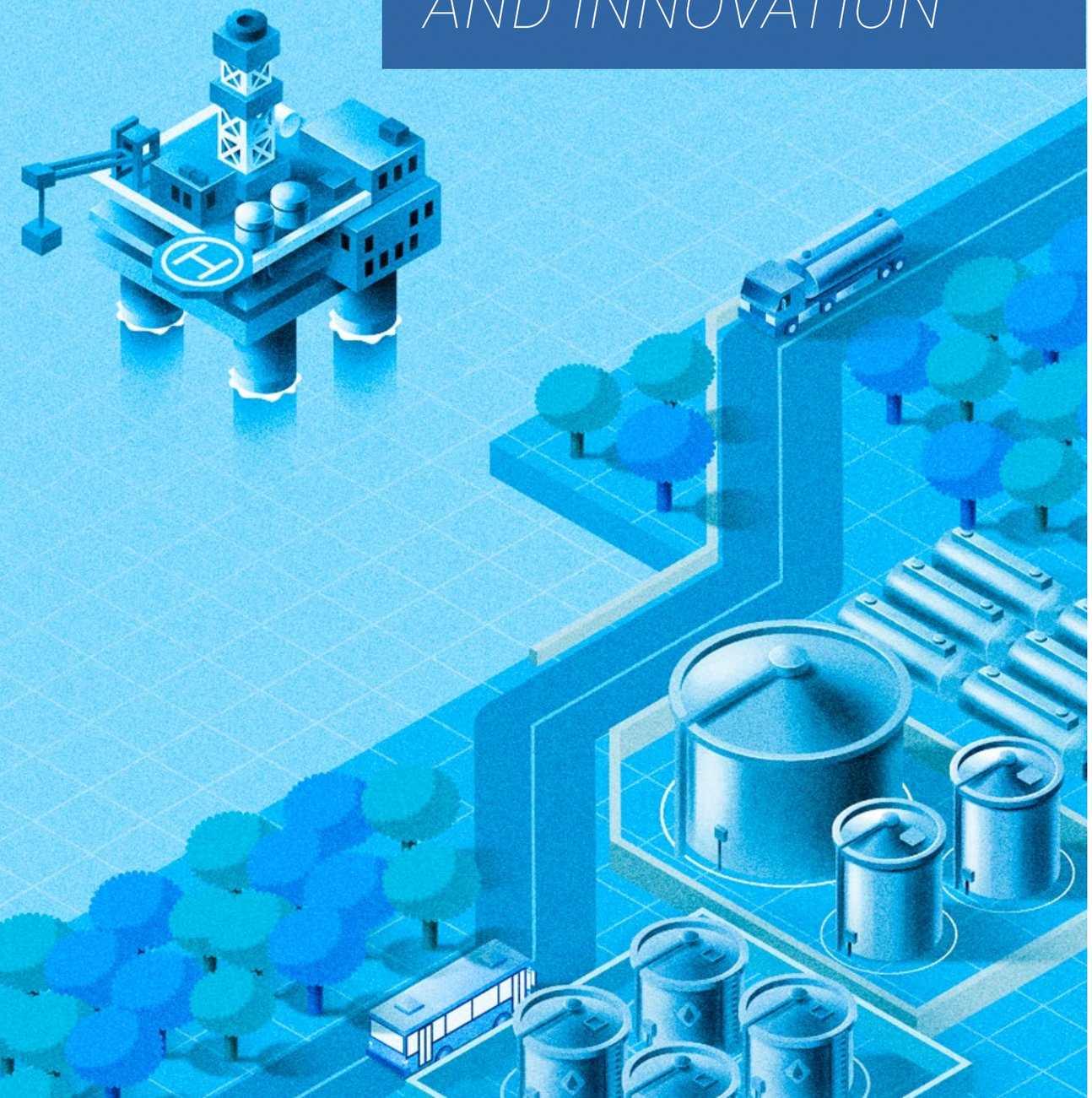
30. Export, without leaving the customs area, based on the transfer of ownership of the goods to a corporate entity domiciled abroad.

31. Import of inputs for the production of goods that will be re-exported. Drawback suspends some taxes and fees, such as PI, PIS import, COFINS import, AFRMM and ICMS.

32. Common Mercosur Nomenclature (NCM) is a type of classification for imported and exported products, mainly based on the Harmonized System (HS Code).

Chapter 4

RESEARCH, DEVELOPMENT AND INNOVATION



Innovation is a key point for the development of technological solutions in the Oil and Gas (O&G) industry. Having said that, encouraging research, development, and innovation (RD&I) in the O&G industry is essential for maintaining the industry's production capacity and competitiveness.

The development of these solutions covers topics such as production, processing, well engineering, safety, and the environment, among others. These innovations become fundamental for the development of new technologies for the industry and for the safety of workers. In this context, the Research, Development, and Innovation (RD&I) Clause remains an important incentive mechanism for the production of knowledge and new technologies for the industry.

4.1. The RD&I Clause

Signed in the oil and natural gas exploration and production contracts, this provision establishes the investment of a percentage of the gross revenue from production in research, development, and innovation projects and programs by oil companies. The amounts generated are invested in RD&I projects that can be developed by the Oil Company itself, by Brazilian Companies, or by Accredited Institutions throughout the country.

The financing of these projects, according to the clause, began in 1998, the year after the enacting of the Petroleum Act (Law 9.478/97), but was only regulated in 2005 by ANP Resolution 05/2005).

In 2015, this regulation was replaced by the current one, coming into force in the following year. As of this last resolution, companies supplying O&G goods and services and technology-based companies were able to use the resources under the aforementioned clause. Moreover, standards, definitions and procedures were established for the three models of oil and natural gas exploration and production contracts practiced in the country[33].

In 2019, the ANP approved the revision of the regulation and the changes expanded the possibilities of operations by research institutions and encourage the execution of projects in partnership between universities and companies[34]. This change opened up the possibility of creating a more dynamic and productive innovation environment with a diversity of players.

2019

ANP approved the revision of ANP Technical Regulation 3/2015.

The changes have expanded the possibilities for research institutions to operate, they encourage the execution of projects in partnership between universities and companies and allow for the execution of new models of projects and programs

33. In concession contracts, the RD&I provides that concession holders shall incur qualified expenses such as research and development in amounts corresponding to 1% (one percent) of the gross revenue from production of the fields paying the Special Share. In production sharing and transfer of rights contracts, the value of the obligation corresponds to, respectively, 1% (one percent) and 0.5% (half percent) of the annual gross revenue of the fields belonging to the blocks detailed and outlined in the respective contracts.

34. The changes are contained in resolution 799, of September 2, 2019, which are available at: http://www.anp.gov.br/images/Pesquisa_Desenvolvimento/Investimentos_PDI/Regulamentacao_tecnica/resolucao-799-2019.pdf

Figure 2 - Regulatory Time Line of RD&I Projects

The RD&I Clause

1998 — Research, Development, and Innovation Projects (RD&I) started receiving the resources provided in the oil, and natural gas exploration and production contracts in 1998

2005 — The application of the resources provided in the RD&I clauses was originally regulated by Resolution 33/20005 and the respective Technical Regulation 5/2005

2015 — The regulation was replaced by ANP Resolution 50/2015 and ANP Technical Regulation 3/2015 and it sets forth the definitions, guidelines and standards for the investment of resources as well as the rules for proving the activities have been performed.

2019 — ANP Technical Regulation 3/2015 (standards for application of resources) was improved by ANP Resolution 799/2019 And ANP Technical Regulation 7/2012 (accreditation of institutions) was improved by ANP Resolution 775/2019

The revisions of the regulations expanded the possibilities of operations by research institutions, encouraging the execution of projects in partnership between universities and companies.

2021 — By 2020, no company in Espirito Santo had developed a research, development and innovation project with the resources under the RD&I Clause

In 2021 Mogai Tecnologia Started a project with resources from the clause as the executing company.

2022 — Approval of ANP Resolution 866 of February 11, 2022, amending ANP Technical Regulation 3 of 2015, which addresses the rules for investment of the resources.

Source: ANP | Prepared by: Ideies/Findes

2022

In February 2022, the ANP approved the resolution that improves the rules for the application of RD&I resources

The new version of the resolution proposes greater clarity on the eligibility of RD&I projects relative to renewable energies and the energy transition, including de-carbonization, CO2 capture and characterization and environmental protection studies.

4.2. Obligations created by the RD&I clause in Brazil

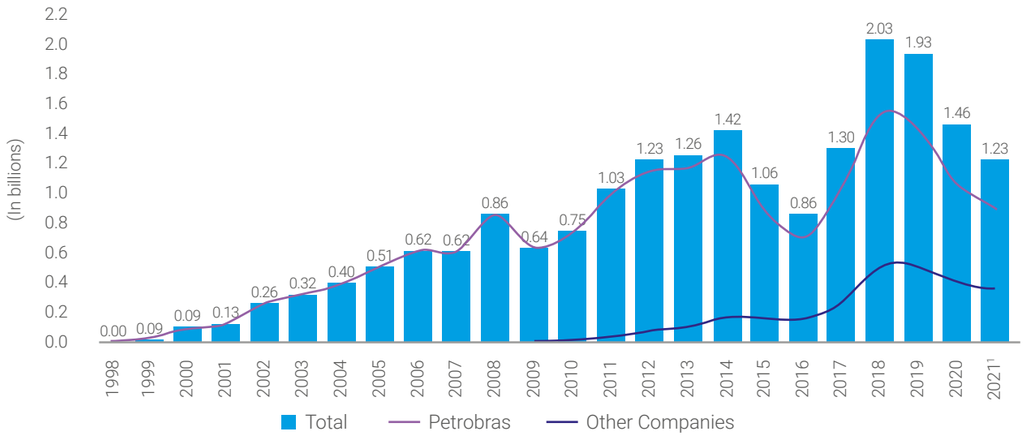
Between 1998 and June 2021, the RD&I clause generated in Brazil approximately R$ 20.0 billion in volume of obligations, where Petrobras was responsible for R$ 17.3 billion (86.1%). In 2020 (the last year with information available for the 12 months), the amount generated in obligations under the clause was R$ 1.46 billion, a 24.4% decrease compared to 2019.

Petrobras' relative share compared to other oil companies in 2020 was 72.6%. Despite this result representing a concentration, there is an increase in the participation of other companies, which was 16.6% in 2015 and rose to 27.4% in 2020.

R$ 1.47 billion

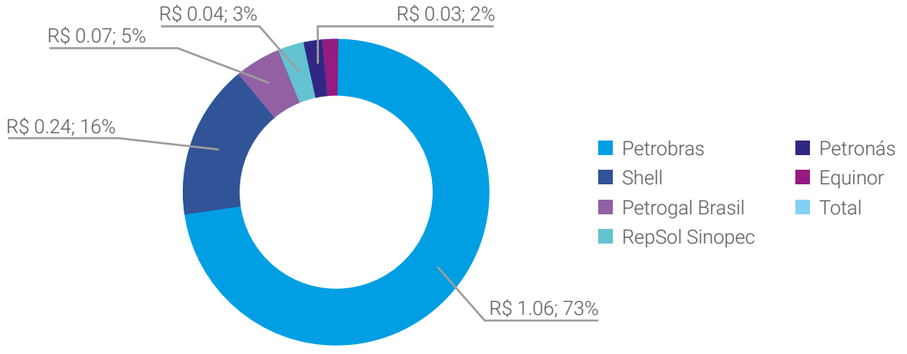
Reais have been generated in obligations in connection with the RD&I Clause in 2020, a 24.4% drop relative to 2019

Chart 37 - RD&I Investment Obligations, per annum



Source: ANP | Prepared by: Ideies/Findes
¹ until June 2021
Information extracted on: 10/25/2021

Chart 38 - RD&I Investment Obligations by Oil Company, in billions (2020)



Source: ANP | Prepared by: Ideies/Findes
Data collected on 10/25/2021

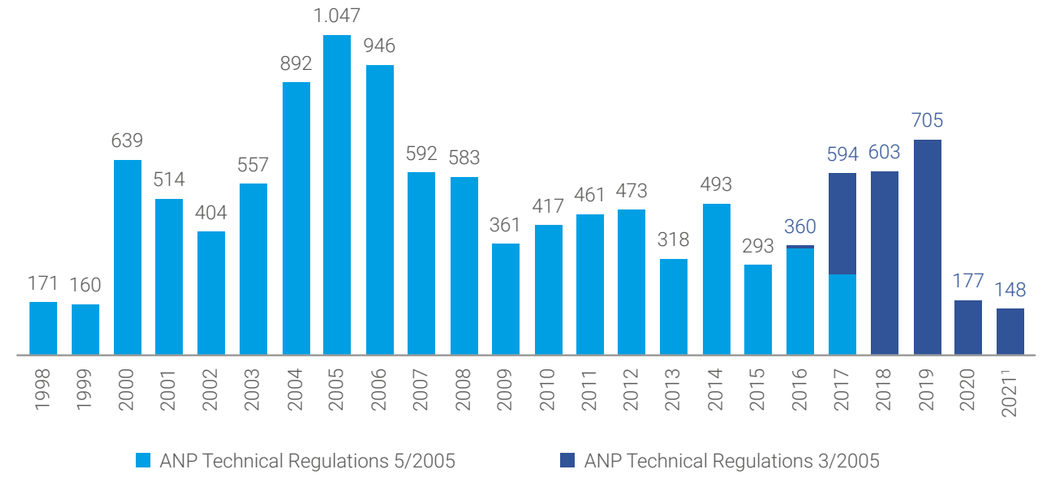
4.3. Projects and programs developed using the RD&I clause

Between 1998 and June 2021, 11,908 projects were developed in Brazil financed with resources from the obligations generated by the Clause. When comparing 2020 (177) with 2019 (705), the number of projects dropped by 74.9% and was the lowest volume of projects since 1999 (160). The peak in the number of projects developed with the resources under the clause occurred in 2005 (1,047).

74.9%

was the drop in the number of projects generated in connection with the RD&I Clause between 2019 (705) and 2020 (177)

Chart 39 - Number of projects started that received resources under the RD&I clause in Brazil



Source: ANP | Prepared by: Ideies/Findes
Data until 09/29/2021
Data collected on 10/25/2021

It is important to note that the reduction in the number of projects between 2019 and 2020 is mainly related to the impacts of the Covid-19 pandemic on the global and Brazilian economies. Several projects developed by research institutions, for example, require face-to-face activities, which were suspended for several months in 2020.

In Espírito Santo, between 2000 and June 2021, 90 projects were financed with resources from the obligations generated by the Clause. Of these projects, 87 were executed, or are being executed, by UFES, 1 by IFES, 1 by UCL, and 1 by the company Mogai Tecnologia.

The largest number of projects started in 2019 (16), significantly higher when compared to 2018 (5), and the largest volume since 2000, the first year that a project took place in the State (according to data provided by the ANP). In the years 2001, 2009, and 2017 no project was executed. In 2020, the three projects developed in the state represented 0.5% of the total in Brazil. In 2019, they represented 2.5%.

The projects developed in Espírito Santo covered the areas of research on supply, exploration and production, natural gas and transversal themes, subdivided into 8 themes, and 12 sub-themes (as detailed below).

90

projects financed with resources from the obligations generated by the RD&I clause were developed in Espírito Santo between 2000 and 2021

UFES 87 projects
IFES 1 project
UCL 1 project
Mogai Tecnologia 1 project

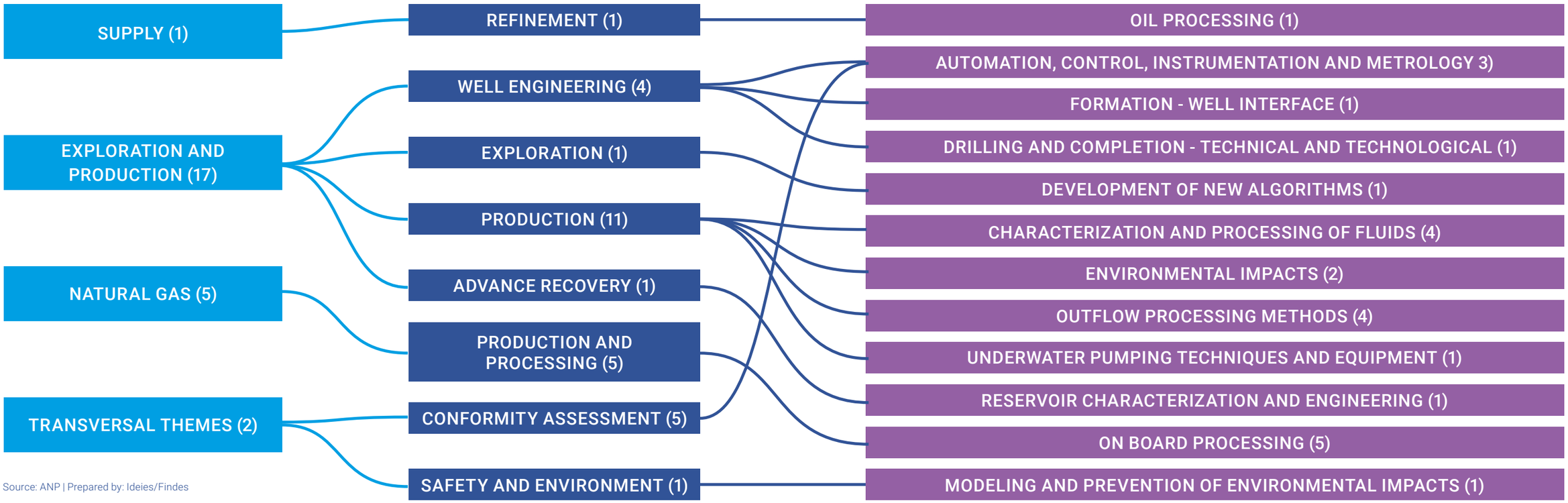
R$ 49.2 million was the amount obtained in connection with the RD&I clause in 25 projects developed in Espírito Santo between 2016 and June 2021

Considering only the projects in connection with ANP Technical Regulation 03/2015, which is made available by the ANP with more detailed information about the projects and their values, between 2016 and June 2021, 1,968 projects were executed in Brazil with the resources under the Clause, with a value of R$ 8.30 billion.

In Espírito Santo, evaluating the projects under current regulation, 25 projects were executed with the resources under the Clause in the same period, amounting to a total of R$ 49.15 million. Of these projects, 24 were executed by UFES and 1 by Mogai Tecnologia.

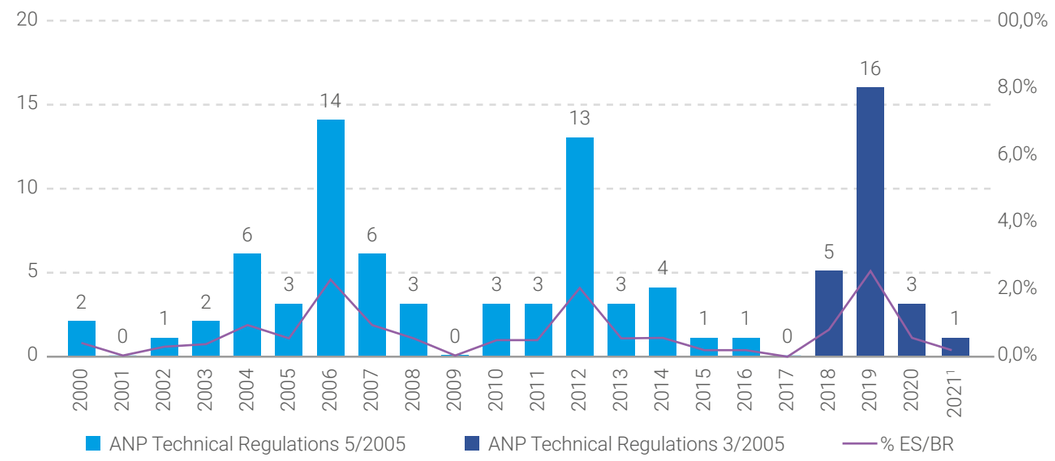
The projects developed in Espírito Santo investigated supply, exploration and production, natural gas and transversal themes, subdivided into 8 themes and 12 sub-themes

Figure 3 - Area, theme and sub-theme of the Projects – Espírito Santo



Source: ANP | Prepared by: Ideies/Findes

Chart 40 - Projects started that received resources under the RD&I clause in Espírito Santo (number of projects)



Source: ANP | Prepared by: Ideies/Findes
Data until 09/29/2021
Data collected on 10/25/2021

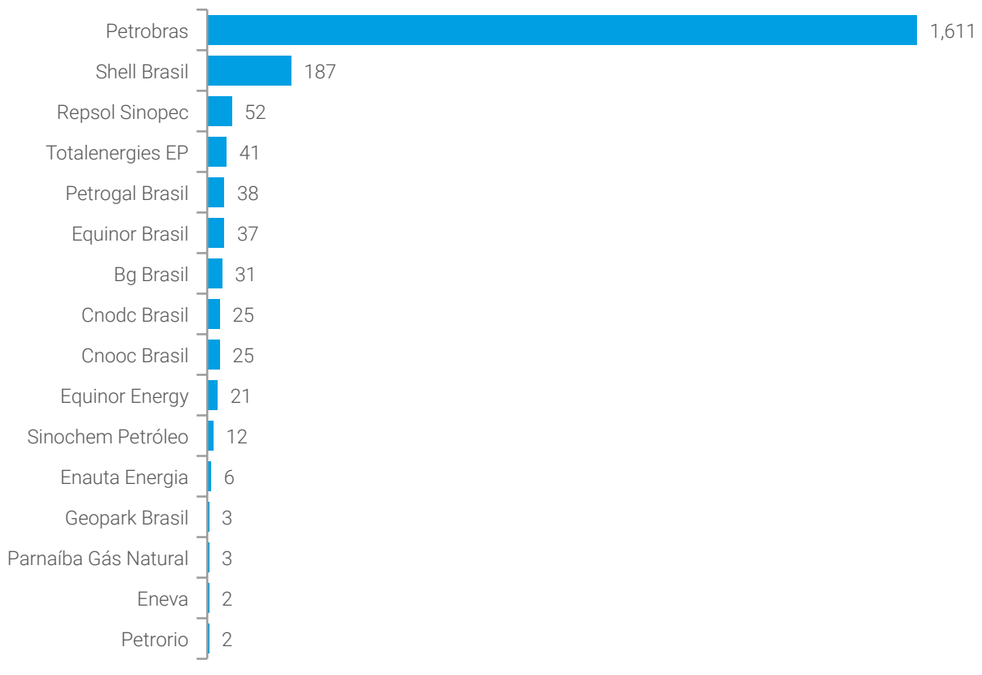
4.4. Funders and executors of projects financed under the RD&I Clause

Research and development projects executed with resources from the Clause can be executed by the oil company, research institutions, and Brazilian companies. In the case of the last two, the studies developed aim at meeting the specific demands of oil extraction and production companies. An RD&I project can be carried out by one or more accredited companies or institutions and financed by one or more oil companies.

4.4.1. Main financing and executing companies

Petrobras stands out in terms of the number of projects financed (1,611), as expected, the company also generates a greater volume of funds from RD&I obligations. Shell Brasil, with 187 projects financed, takes the second position as the largest company that finances RD&I projects. In Espírito Santo, the company that financed all projects was Petrobras.

Chart 41 Quantity of projects started by funder, in Brazil



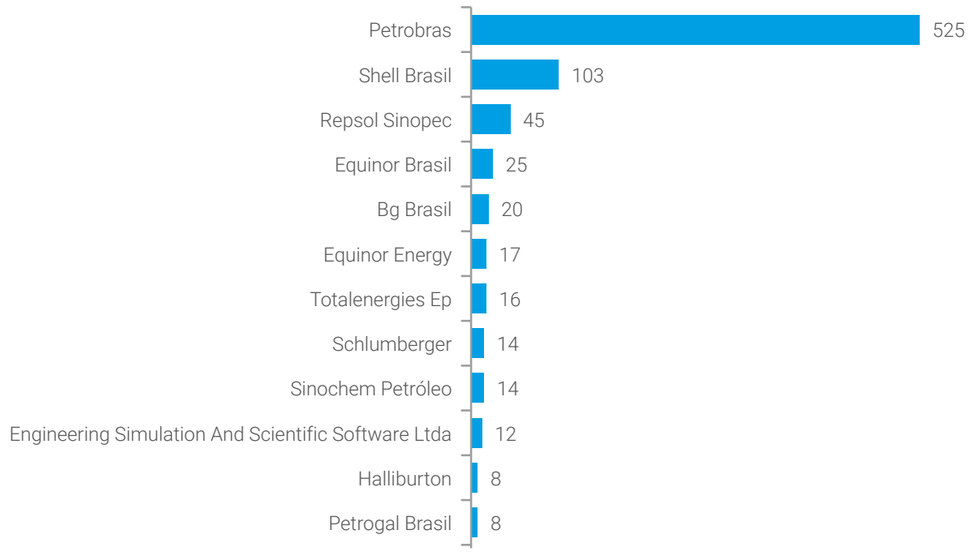
Source: ANP | Prepared by: Ideies/Findes
Note: The total number of projects exceeds 1,968 as a project can have more than one financing company.
Data until 09/29/2021
Data collected on 10/25/2021

Regarding the companies executing these projects, Petrobras also stands out, having participated in 525 projects, followed by Shell (103 projects) and Repsol Sinopec (45 projects). Until 2020, no company in Espírito Santo had developed research, development and innovation projects with these resources. However, the state already showed potential to do so, standing out in public notices in the oil and gas sector, such as in the Repsol-Sinopec Digitization Challenge[35], in Layer 2019 of FindesLab with the Shell Brasil Challenge[36], in The Connections Regulations for Innovation of Petrobras and Sebrae[37], and in the 2020 Digital Oil and Gas Mission, of ApexBrasil[38].

In 2021, the company Mogai from Espírito Santo, which operates in the field of cutting-edge technol-

Mogai was the first company in Espírito Santo that developed a project with resources from ANP'S RD&I Clause.

Chart 42 - Number of projects started by the main executing companies in Brazil



Source: ANP | Prepared by: Ideies/Findes
Note: A project can have more than one executing company.
Data until 09/29/2021
Data collected on 10/25/2021

35. Of the five companies approved in the public notice, two were from Espírito Santo: Mogai and Factum. The challenge was to develop new technological solutions for the industry through artificial intelligence techniques, robotic equipment, computer modeling, or digitalization.

36. Shell's challenge was led by companies from Espírito Santo, with 14 projects submitted, and 1 was selected from Espírito Santo startup, Dersalis.

37. In this public notice, 2 Espírito Santo companies were selected in the 1st phase: Mogai and Wize Company.

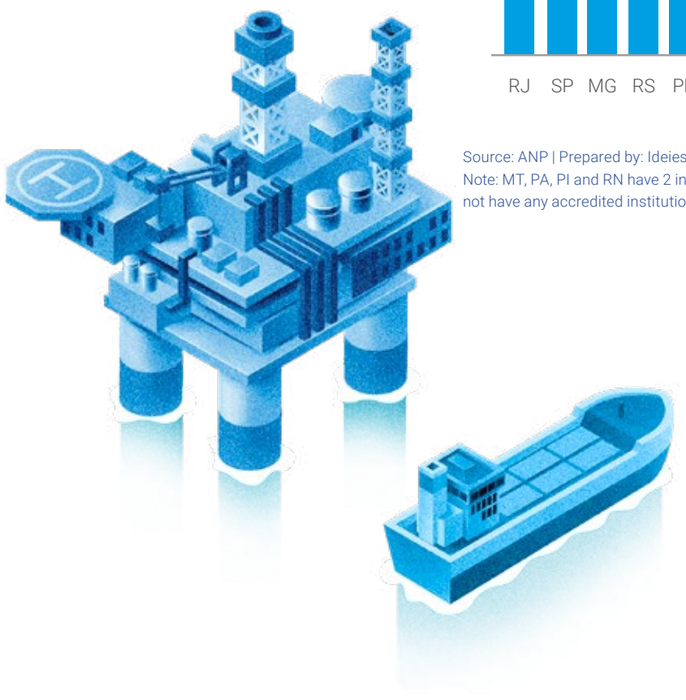
38. For this program, 150 enrollments were recorded countrywide, 75 of which were validated. Of the 30 companies selected in phase 1 (innovation), 6 are from Espírito Santo: Endserv, 2Solve, Inside, Marca Ambiental, R1 Engenharia and Vixteam, which were referred by Shell, Petrobras, Equinor and Eneva, the operators participating in the mission. The mission also had 4 companies from Espírito Santo (2solve, Orion, R1 Engenharia and VPS Group) among the 25 companies selected for phase 2, which addresses internationalization, with training, customized agendas for international business development and access to industry content.

In Espírito Santo, there are 3 institutions accredited by the ANP to carry out projects with resources from the RD&I Clause:

1. Universidade Federal do Espírito Santo (UFES)
17 research units

2. Instituto Federal do Espírito Santo (IFES)
4 research units

3. Universidade de Vila Velha (UVV)
1 research unit



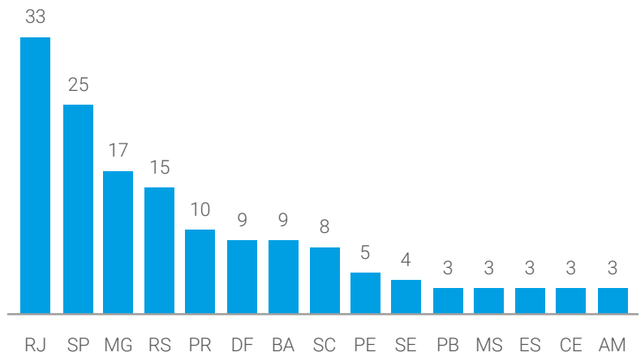
ogy, was the first company in Espírito Santo to develop a project with the resources under the ANP's RD&I Clause. The objective of the project is to reduce the cost of the corrosion of the platforms[39].

4.4.2. Main executing institutions

In Brazil, until September 20, 2021, there were 165 research institutions registered with the ANP to carry out projects with resources under the RD&I Clause. These institutions are divided into 1,013 research units. The state with the most registered institutions was Rio de Janeiro (33), followed by São Paulo (25).

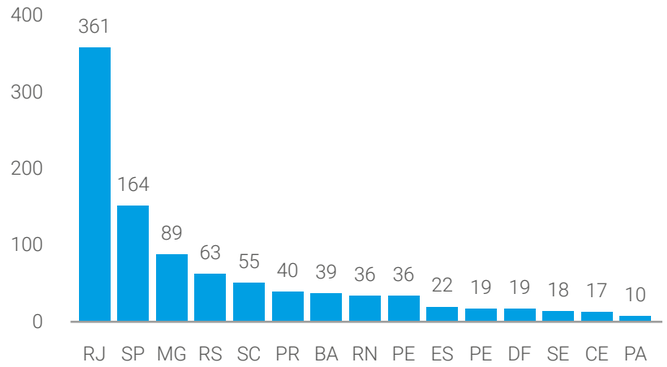
In Espírito Santo there are 3 accredited institutions: Universidade Federal do Espírito Santo (UFES), Instituto Federal do Espírito Santo (IFES) and Universidade de Vila Velha (UVV). These 3 institutions together have 22 registered research units, 17 of which are located at UFES, 4 at IFES and 1 at UVV.

Chart 43 - Accredited institutions in Brazil, by State (above 3 institutions)



Source: ANP | Prepared by: Ideies/Findes
Note: MT, PA, PI and RN have 2 institutions; AC, AL, AP, GO, MA, RR and TO have 1 institution; RO does not have any accredited institutions.

Chart 44 Accredited research units in Brazil, by State (10 or more research units



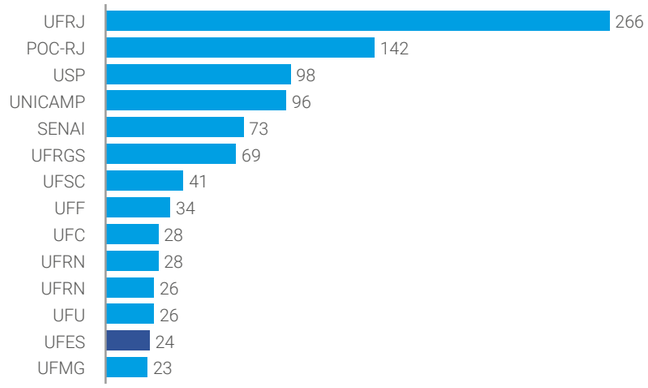
Source: ANP | Prepared by: Ideies/Findes
Note: MT, PA, PI and RN have 2 institutions; AC, AL, AP, GO, MA, RR and TO have 1 institution; RO does not have any accredited institutions.

24

is the number of projects using resources in connection with the RD&I Clause executed by Universidade Federal do Espírito Santo (UFES)

Analyzing the main institutions executing projects initiated in Brazil with the resources under the RD&I Clause, UFRJ participated in 266 projects, PUC-RJ in 142, USP in 98 and Unicamp in 96. Universidade Federal do Espírito Santo (UFES) executed 24 projects using the resources under the clause.

Chart 45 - Number of projects started according to the main executing institutions, in Brazil



Source: ANP | Prepared by: Ideies/Findes
Note: A project can have more than one executing company.
Data until 09/29/2021
Data collected on 10/25/2021

39. This reduction will come from the adaptation of Mogai's 3D camera used in mining, for integrated use with other industrial asset management tools for industrial painting and corrosion monitoring. The proposed solution will assist in the diagnosis of corrosion or paint degradation from easy-to-use 3D cameras adapted to the oil rig environment.

The small number of research units in Espírito Santo explains, to some extent, why only 90 projects/programs were developed within the state, namely three possible reasons in particular:

(i) The reduced number of professors, scholarship holders and laboratories present in these research units;

(ii) The complexity and duration of projects and programs;

(iii) Faculty duties in other academic activities.

These points, taken as a whole, reveal why the research units have limited time to receive the investments under the RD&I Clause. One option to increase the number of projects using this Clause is, consequently, increasing the number of registered research units, as well as to continue expanding the involvement of companies in pursuit of the resources under the Clause.

BOX 2 – **THE ROLE OF SENAI IN THE DEVELOPMENT OF INNOVATIVE PROJECTS**

SENAI
PELO FUTURO DO TRABALHO

26
innovation institutes

62
innovation institutes

The evolution of projects financed by ANP'S RD&I Clause is important for the development of the O&G industry, standing as a fundamental promotion strategy for the expansion of the market and development of new technologies. The National Industrial Learning Service (SENAI), under the organization and management of the National Confederation of Industries (CNI) and Federations of Industries, is one of the five largest professional education complexes in the world and the largest in Latin America and can contribute to the advancement of projects and the technological process of the industry.

In addition to offering professional education (from initiation into technological graduation and graduate courses), SENAI has 26 Innovation Institutes[40] and 62 Technology Institutes[41], which develop highly complex products and processes and offer technological services to the industry.

Innovation Institutes are present in the states of Rio de Janeiro (4), Bahia (4), São Paulo (3), Minas Gerais (3), Santa Catarina (3), Rio Grande do Sul (2), Paraná (2), Pernambuco (1), Rio Grande do Norte (1), Mato Grosso do Sul (1), Amazonas (1) and Pará (1). The focus of these Institutes is applied research, development of new products and customized solutions, working from the pre-competitive phase of the innovative process to the final stages of development, when the new product is about to be manufactured by the industry.

The Technology Institutes work strongly in providing specialized technical services in metrology and consulting and developing solutions based on existing technologies to create new processes and products, through the 62 units present in 17 Brazilian states.

Espírito Santo has a Senai Institute of Technology in Operational Efficiency, which supports companies from Espírito Santo in the search for a process for improvement and technology transfer with customized solutions for optimizing resources and reducing waste in the industry. The Institute has a portfolio of services focused on the fields of metrology, consulting, research and development and specialized technical services.

> Espírito Santo has a Senai Institute of Technology in Operational Efficiency

Table 8 - Fields of Operation of the Senai Institute of Technology in Operational Efficiency of Espírito Santo

Areas of Operation	Description	Services offered
Metrology	Verification of performance and quality of products and processes. In addition to carrying out assessments, the institute acts as a liaison between companies with the national network of laboratories for testing and calibration.	• Mechanical tests • Nondestructive testing
Consulting	Work in diagnosis, technical assistance and solution of industrial problems is the main line of action of the institute. Consulting in the production process, customized according to the demand of companies stands out.	• Lean manufacturing consulting • Energy efficiency and alternative energy sources • Implementation of cleaner production programs • Life cycle assessment • Consultancy in planning and control of production processes • Adjustment of machines for complying with standards • Environmental licensing, auditing and program development • Environmental Impact Study (EIA-Rima) • Implementation of ABNT Standards - ISO 14001, 17025 and 50001 • Process automation consulting • Consulting in Sensing and Digitization • Consulting in Process Simulation and Optimization
Intelligent Systems	Technological development plays a fundamental role in gaining productivity and operational efficiency and is consolidated as a challenge for industries.	• Gamification and Distance Learning Platforms • Instructional Design • Virtual and Augmented Reality • Project of Prototypes, Devices, and Products • Software w Platforms, IoT (Internet of Things) • Machine Learning / Artificial Intelligence • Data mining
Specialized Technical Services	Standardized operational services based on systematized standards and procedures. These services focus on increasing the efficiency of production processes and products.	• Modeling development • Environmental diagnosis and inventories • Cut map • Management plans for solid waste, liquid effluents and atmospheric emissions • Reverse logistics plans • Effluent treatment project and water reuse plan • Prototyping • Computer simulation

Source: Senai. Prepared by: Ideies / Findes

40. Learn more at: http://institutos.Senai.br/ 41. Learn more at: http://institutostecnologia.Senai.br/

Senai is authorized to execute projects with the resources under the RD&I Clause as an executing institution.

10

State Senai institutions developed projects with the resources of the RD&I Clause between 2016 and September 2021

73

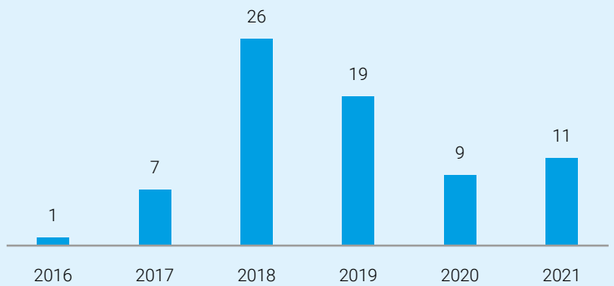
projects were started with the resources of the RD&I clause through 17 Senai research units (which are the Innovation or Technology Institutes)

Senai is authorized to execute projects with the resources under the RD&I Clause as an executing institution. To do so, Senai in each state needs to register Innovation Institutes or Technology Institutes as research units in the ANP. Currently, Senai has 38 research units registered and suitable for projects development, using the resources provided by the RD&I Clause. These units are allocated among Brazilian states.

Between 2016 and 2021, the Clause's resources were used for implementing 73 projects in 17 Senai research units (which are the Institutes of Innovation or Technology). Twenty-two of these projects were developed in partnership withexecuting companies and 51 were carried out individually by Senai institutes. These projects covered the areas of supply, biofuels, oil exploration and production, natural gas, regulation of the oil sector, and cross-cutting issues (such as safety and the environment).

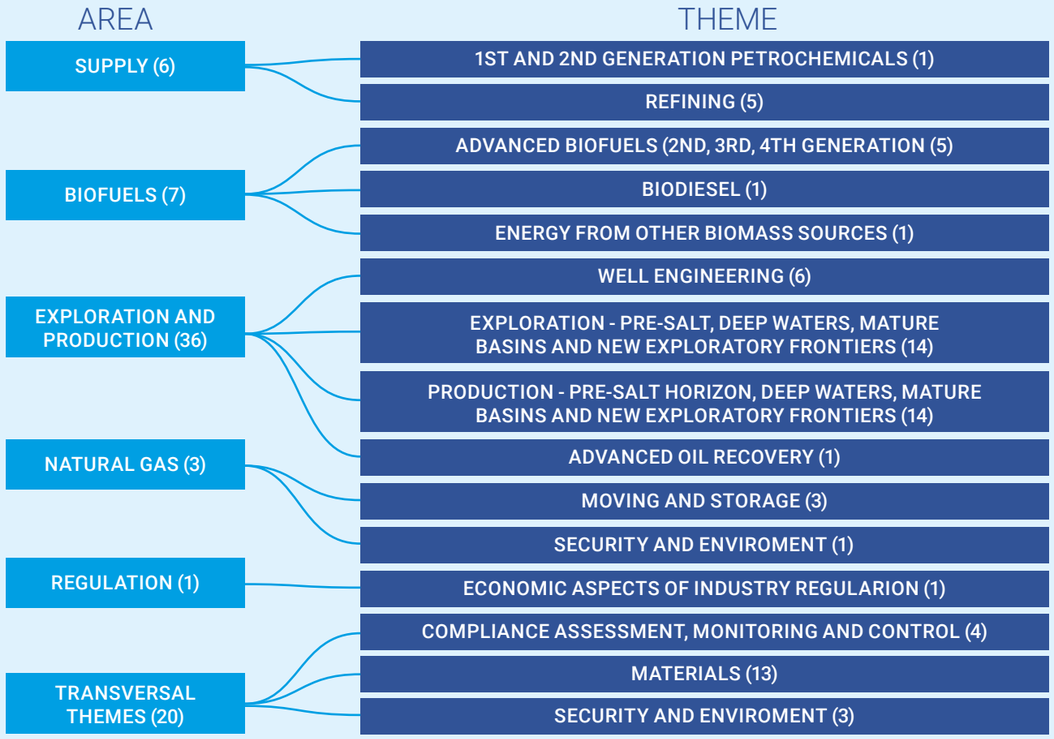
In March 2022, a project developed in the 1st Industrial Entrepreneurship Program by the Espírito Santo startup Dersalis in conjunction with Shell won the international Gartner Power of the Profession Supply Chain Award. The Dersalis-Shell partnership, brokered by Findeslab, took first place in the People Breakthrough of the year category, with the project "Use of the Smartwatch for the safety and care of employees".

Chart 46 - Number of projects initiated/executed with the resources of the RD&I Clause by SENAI, per year



Source: ANP | Prepared by: Ideies/Findes

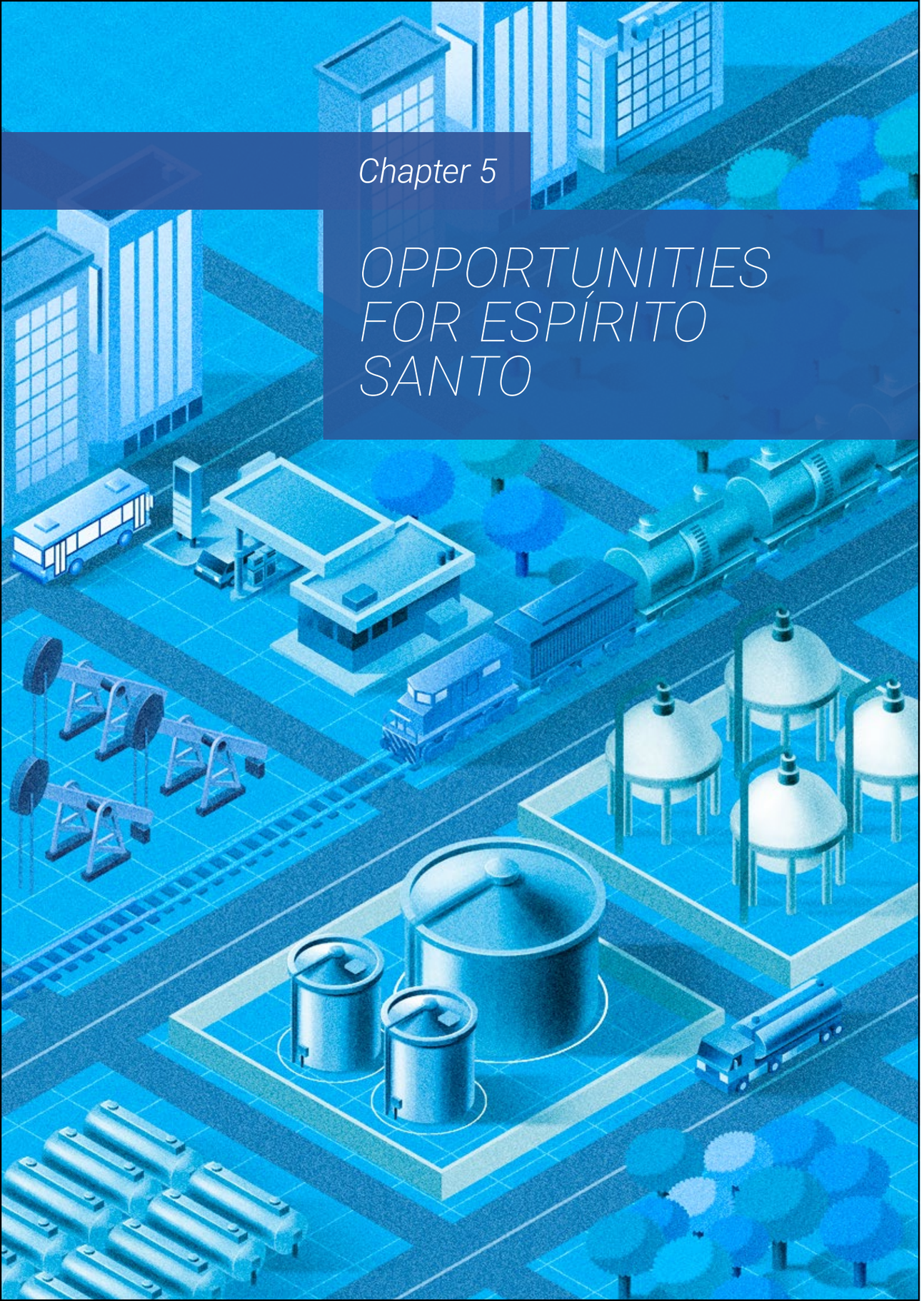
Figure 4 - Area and theme of the Projects – Senai



Source: ANP | Prepared by: Ideies/Findes

In addition to Findeslab, the project also counted on the participation of Senai in the development of the device prototype. Three Senai Institutes were involved: the Senai Institute of Technology in Operational Efficiency (IST-EO), located in Espírito Santo; the Senai Institute of Technology in Electronics and Automation; and the Senai Institute for Innovation in Advanced Manufacturing and Microfabrication, both located in São Paulo.

These results show Senai's potential to contribute to the innovation ecosystem in Brazil and to the development of new technologies for the Oil and Gas sector, contributing to it in the national and international markets. In addition to being the biggest trainer of professionals for the Brazilian industry, Senai has enormous potential, as it is an important link between the university and the industry.



Chapter 5

OPPORTUNITIES FOR ESPÍRITO SANTO

The scenario for the next few years for the oil and gas sector will be marked by the drop in global investments and the maintenance of production in priority areas by the large oil companies. Notwithstanding, this new background requires greater adaptability and predictability of the concerned players. Espírito Santo will be impacted by the priority projects of the large oil companies and also by the new market of small and medium-sized companies operating in new areas of the industry. The opportunities can be summarized into four groups: i) Announced Investments ii) Permanent Offer iii) Petrobras Divestment Plan and iv) Decommissioning of facilities.

5.1. Announced investments

26.5%

was the average annual drop in global investment flow according to the FDI Markets platform, reaching $536 billion

4.1%

is the expected growth of the global economy for 2022 according to the World Bank projections

According to the FDI Markets platform, between 2018 and 2020, the global investment flow recorded an average annual drop of 26.5%, reaching US$ 536 billion in 2020. The level recorded was the lowest in the historical series, which began in 2003. The unsatisfactory performance is largely explained by the outbreak of the new Coronavirus global pandemic in 2020, which postponed investment decisions on a global basis. An unfavorable macroeconomic scenario of the main economies in the world also contributes to a drop in investments in traditional sectors such as oil and gas, coal, real estate, and the chemical sector.

In the coming years, the trend is for the flow of global investments to return to more substantial amounts. The basis for this statement lies in the projection of 4.3% growth of the global economy for 2022, signaled by the World Bank. According to the institution, the world will grow at a faster pace after the recession caused by the Covid-19 health crisis. Upon the advance of vaccination against the disease, there will be a greater need for investments to return the level of global activity to the levels existing before the recession.

The main sectors responsible for global investments in the period between 2018 and 2020 were the renewable energy sector (10.1%) and the oil and natural gas sector (9.3%). The oil and gas sector recorded an average annual drop of 31.2% in the three years of analysis and, even with the expressive drop, it remained with a significant amount of investments in the global scenario. In contrast, the renewable energy sector recorded an average annual increase of 4.7% in the same period (chart 47).

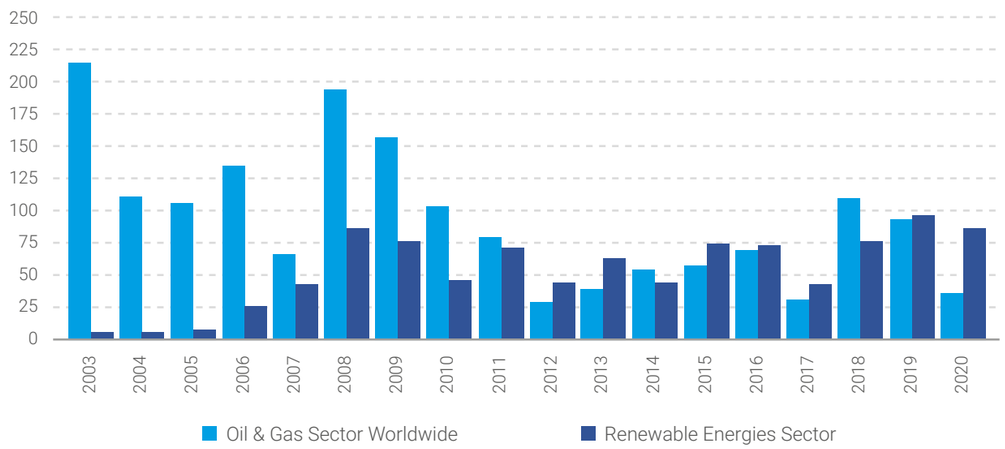
The main oil companies in the oil

The greater volume of investments in renewable energies is related to the growing concern of global leaders with the energy transition, aiming at reducing CO2 emissions and, consequently, mitigating the effects of global warming.

and gas industry have undergone significant changes in the composition of their investments since the outbreak of the Covid-19 pandemic. Companies started prioritizing investment projects with higher return rates, focusing on the planning of already consolidated oil and natural gas exploration and production projects, which required a lower volume of invested capital.

In this scenario, part of the industry's global investment capacity was absorbed by the renewable energy sector. The greater volume of investments in renewable energies is related to the growing concern of global leaders with the energy transition, aiming at reducing CO2 emissions and, consequently, mitigating the effects of global warming.

Chart 47 - Investment in the oil industry worldwide (in billions of US$)



Source: FDI Markets | Prepared by: Ideies/Findes

754

is the number of investment signals worldwide for the oil and natural gas industry

According to the FDI Markets platform, there are currently 754 investment signals worldwide for the oil and natural gas sector. Brazil is mentioned in 26 projects, 3.44% of the total. The projects that mention Brazil are mostly from new investment strategies or regarding expansions of already consolidated projects. The capital invested come mainly from Spain, the United Kingdom, and Norway. Brazil competes for receiving these investments with countries such as India, Mexico, South Africa, and South American countries such as Peru, Argentina, Bolivia and Colombia.

In Espírito Santo, according to the investment survey carried out by Ideies, it is estimated that the state will receive a total of US$ 8.1 billion in investments in the oil and gas sector by 2025. In total, 7 projects were identified in the State, mainly involving the companies Petrobras, Karavan Oil and Gas and Shell. The highlight is the Integrated Project of Parque das Baleia (IPB).

The Parque das Baleias Integrated Project (IPB) intends to increase the oil and gas recovery factor by optimizing the current drainage network, with the interconnection of a new FPSO[42]. In November 2021, a letter of intent was signed between Petrobras and the company Yinson for chartering and providing services for the new FPSO, which is expected to commence operations in 2024. Currently, the project is included in Petrobras' Strategic Plan 2022-2026 and has a total investment of R$ 5.0 billion. Table 9 presents the main projects identified by Ideies Investment Compass.

US$ 8.1 billion

in investments are expected in the oil and natural gas sector in Espírito Santo by 2025

Table 9 - Main investments announced in the Oil & Gas industry in Espírito Santo for the next 5 years

Investor	Project	Sector	Municipality	Amount (millions R$)	Project Status
Petrobras	- Integrated of Parque das Baleias (IPB).	Oil & Gas	Anchieta, Piúma, Itapemirim, Marataízes and Presidente kennedy	5,000	Ongoing bidding
Karavan Oil & Gas	Investment opportunity in areas of exploration and production of Petrobras' Divestment Plan	Oil & Gas	São Mateus, Conceição da Barra and Jaguaré	1,000	In execution
Shell Brasil	Development and Production of the fields in the Southern Shore of Espírito Santo.	Oil & Gas	Anchieta, Piúma, Itapemirim, Marataízes and Presidente Kennedy	1,000	In execution
PetroRio	The Wahoo project contemplates the drilling of wells and the connections between the wells and the Frade FPSO.	Oil & Gas	Presidente Kennedy	800	In execution
ESGÁS	Expanding the distribution networki in another 292 thousand meters and connecting over 96 thousand new consumers	Oil & Gas	Espírito Santo	260	Planning
Imetame	The company acquired from Petrobras the entirety of the interest in onshore fields of the Lagoa Parda Complex.	Oil & Gas	Linhares	40	In execution
ESGÁS	Interconnection of the Linhares distribution network to the Cacimbas-Catu transportation pipeline for expanding the supply capacity to the municipality of Linhares.	Oil & Gas	Linhares	40	In execution
Total				8,140	-

Source: IJSN, Petrobras, ESGÁS and Bandes | Prepared by: Bússola do Investimento - Ideies/Findes

42. The area of the park is formed by the Jubarte, Baleia Azul, Baleia Franca, parts, portions of Cachalote and Pirambu.

5.2. Permanent offer

The Permanent Offer consisted, until December 2021, of the continuous offer of exploratory blocks and areas with marginal accumulations located in any onshore or offshore basins, with the exception of blocks located in the pre-salt polygon, in strategic areas, or on the Continental Shelf beyond the 200 nautical miles and the areas authorized for making up the 17th and 18th Bidding Rounds.

In December 2021, the National Energy Policy Council (CNPE) authorized the agency to define and bid a Permanent Offer, under the concession regime blocks in any onshore or offshore basins, as well as to bid for fields returned or in the process of being returned. For areas located in the pre-salt polygon or in strategic areas, the offer must be preceded by a specific determination by the CNPE.

In January 2022, the council authorized the bidding on 11 blocks in the Permanent Offer under the production sharing regime, approving the technical and economic parameters. Consequently, the Permanent Offer encompasses the concession and production sharing regimes.

Throughout the national territory, 1,068 exploratory blocks located in 17 sedimentary basins are being offered under the concession regime for the Permanent Offer. In addition to these, 350 exploratory blocks are being studied for being offered under the concession regime in 6 Brazilian sedimentary basins and 10 areas with marginal accumulations in 5 onshore basins. The areas under study will be available for the Permanent Offer soon after the environmental analysis is finalized and the public hearing, promoted by the ANP, is held.

In Espírito Santo, 44 exploratory blocks are available, 21 onshore and 23 offshore blocks. These areas have received a low volume of drilling in the past and, therefore, are associated with a greater exploratory risk due to the scarcity of information. According to the schedule released by the ANP, the public session for submitting bids is scheduled for April 2022. Figures 7 and 8 show the areas on offer, onshore and offshore, respectively.

AREAS IN OFFER IN ESPÍRITO SANTO

CONCESSION REGIME
44 exploratory blocks:

21 **blocks on the onshore portion**

23 **blocks in the offshore portion**

Bid Submission: April 2022

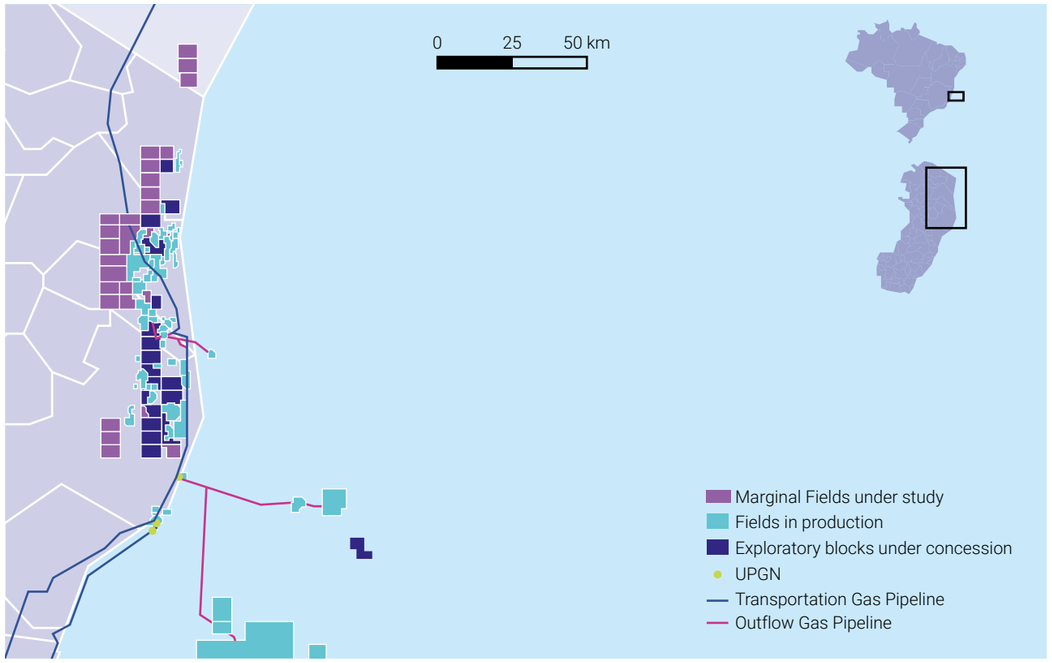
SHARE REGIME
Área de Turmalina
Public Hearing:
March 2022

AREAS UNDER STUDY IN ESPÍRITO SANTO

CONCESSION REGIME MARGINAL ACCUMULATIONS

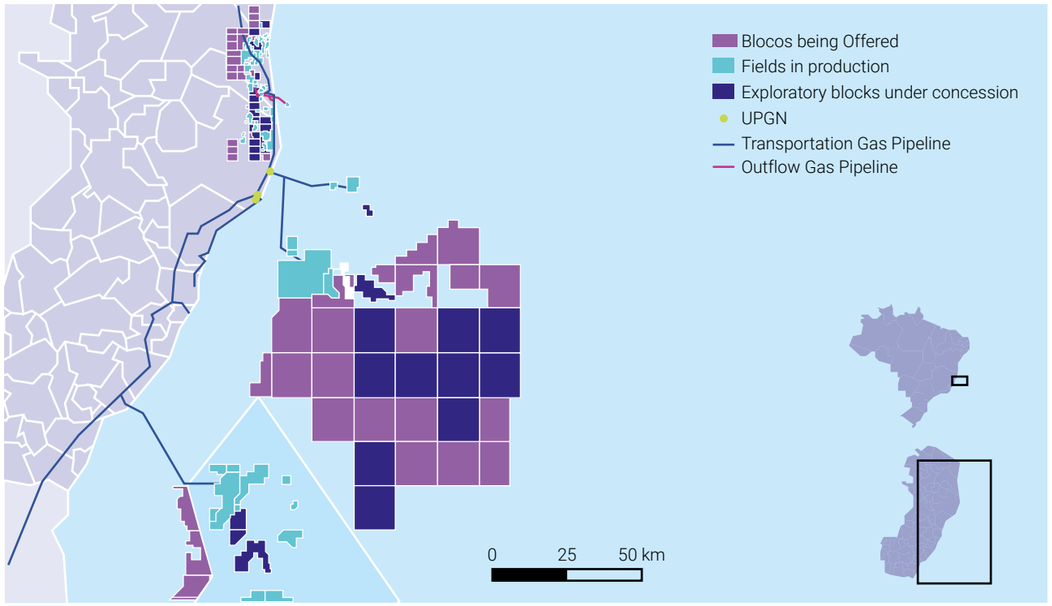
6 onshore areas:
Barra do Ipiranga
Rio São Mateus Oeste
Mariricu Oeste
Nativo Oeste
Jacupemba
Rio Itaúnas Leste

Figure 5 - Onshore exploratory blocks offered in the Permanent Offer



Source: ANP | Prepared by: Ideies/Findes

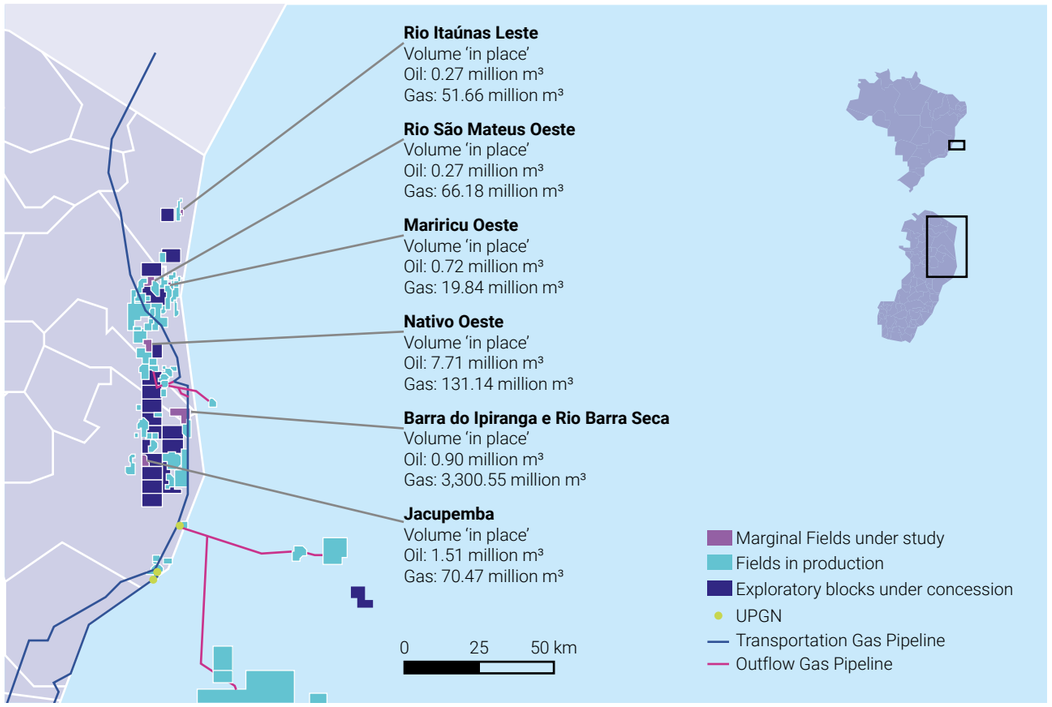
Figure 6 - Offshore exploratory blocks offered in the Permanent Offer



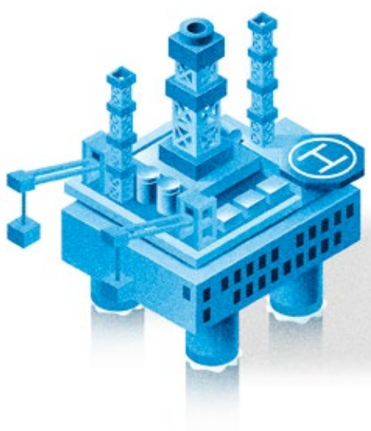
Source: ANP | Prepared by: Ideies/Findes

In addition to those, a total 6 areas with marginal accumulations are under study in Espírito Santo. Among those: Barra do Ipiranga[43], Rio São Mateus Oeste, Mariricu Oeste, Nativo Oeste, Jacupemba and Rio Itaúnas Leste, both located between the municipalities of Conceição da Barra, São Mateus, Jaguaré and Linhares. These areas were under concession of Petrobras and were returned to the ANP in 2019[44]. The areas and the potential of oil and natural gas reserves are detailed in figure 8.

Figure 7 - Areas with marginal accumulations under study for Permanent Offer



*Volume in place is the estimated total amount of hydrocarbon present in the field.
Source: ANP based on Petrobras reports | Prepared by: Ideies/Findes



Finally, 11 exploratory blocks located between the Campos and Santos basins are being offered under the sharing regime for the Permanent Offer. These are: Turmalina, Jade, AGATA, Tupinambá, Água-Marinha, Esmeralda, Bumerangue, Itaimbezinho, Norte de Brava, Sudoeste de Sagitário and Cruzeiro do Sul. The Turmalina area borders the State of Espírito Santo. To obtain additional substantiation on the pre-bidding Regulations and production contract drafts referring to the areas described above, ANP will hold a public hearing in March 2022, regarding the offer of these areas under the sharing regime for the Permanent Offer.

5.3. Petrobras' Divestment Plan

Since 2015, Petrobras began the process of selling a group of assets relative to the exploration and production of oil and natural gas. The company's Divestment Plan aims at reducing the company's debt and maximizing investments in assets with greater profitability, focused on operations, for example, in exploration and production of oil and natural gas in deep and ultra-deep waters.

50 areas were offered in Espírito Santo, with 68.0% having their sale completed

13 offshore areas were offered in Espírito Santo, with 15.4% having their sale completed

37 onshore areas were offered in Espírito Santo, with 86.5% having their sale completed

In total, 50 areas were offered in Espírito Santo with 68.0% of the assets sold. On offshore, 13 areas were offered with 15.4% of the assets sold and as for onshore, 37 areas were offered with 86.5% of the assets sold. Table 1 lists the assets and status of each project.

Petrobras has already sold 32 fields and 3 exploratory blocks in Espírito Santo. Karavan O&G acquired 27 fields at Polo Cricaré. Imetame Energia acquired Polo Lagoa Parda, which has 3 fields, all in the northern portion of the State. Cowan Petróleo e Gás acquired Petrobras' stakes in the ES-T-506 and ES-T-516 exploratory blocks. Finally, 3R Petroleum acquired the Peroá cluster, comprising two fields (Cangoá and Peroá) and the exploratory block B-M-21, which houses the Malombe natural gas discovery.

Petrobras is negotiating with the Seacrest Capital Group the sale of Fazenda Alegre, Cancã, Cancã Leste, Fazenda São Rafael and Fazenda Santa Luzia fields (all in production). In addition to these, the company is negotiating with BW Offshore the sale of its stakes in Polo Golfinho and in the ES-M-525 block (BM-ES-23).

As for the binding phase, there are seven areas. Among them, Polo Camarupim, formed by the Camarupim and Camarupim Norte fields. The offer contains the full transfer of operations, including all existing wells and facilities. The area has 10 wells drilled and 2 producing wells. The volume of the field corresponds to 9.1 billion cubic meters (Mm³) of natural gas and 9.5 million cubic meters (Mm³) of oil, according to 2015 estimates. The Camarupim Norte field has 7 wells drilled and 1 well in production.

Petrobras' participation in 5 exploratory blocks is also for sale. The ES-M-596, ES-M-598, ES-M-671, ES-M-673 and ES-M-743 blocks have between 40% and 50% interest held by Petrobras

43. The Rio Barra Seca field was incorporated into Barra do Ipiranga.

44. In 2019, the ANP Board of Directors determined, through Board Resolution 0254/2019, the termination of the concession process for 8 Petrobras fields, 7 of which are located in Espírito Santo Basin. The recovery of these areas by the agency took place because Petrobras did not resume production, which had been stopped for more than six months, nor transferred the rights of these fields within the period determined by the ANP notification (twelve months).

and the partners Equinor, Total and Enauta hold between 20% and 50%. In the opportunity disclosure Teaser, Petrobras states that these areas have the potential to prove significant volumes of oil and establish a position in a new exploratory frontier in both the pre-salt and post-salt layers.

Recently, the company also announced the binding phase of the Catuá field, located in the deep waters of the Campos Basin. The area, discovered by Petrobras in 2003, has four wells drilled, with the identification of an oil reservoir. According to Petrobras, there are two exploratory opportunities (Cobra D'Água and Catuá Norte), which represent possible new accumulations in the reservoir.

It is worth noting that Petrobras' divestment plan is important because it encourages the arrival of new oil and natural gas exploration and production companies in Espírito Santo. It is expected that this movement can boost future production, as well as the greater demand for specialized goods and services in the sector's supply chain.

Petrobras' divestment plan is important because:

1. It encourages the entry of new oil and natural gas exploration and production companies in Espírito Santo.

2. This trend can boost future production, as well as the greater demand for specialized goods and services in the industry's supply chain.

Table 10 - areas offered by Petrobras in Espírito Santo

Project	Location	Quantity of areas	Bordering Municipality	Project Status	Partner
Sale of interest in the fields of Peroá, Cangoá and of block ES-M-414 (BM-ES-21).	Offshore	2	Linhares	Concluded	3R Petroleum
Sale of Petrobras' interest in Polo Golfinho and block ES-M-525 (BM-ES-23)	Offshore	3	Linhares	Binding Proposal	BW Offshore
Sale of Petrobras interest in Polo Camarupim	Offshore	2	Linhares	Binding Proposal	Potential[1]
Sale of area ES-M-596 (exploratory area)	Offshore	1	Vitória	Binding Proposal	Potential[1]
Sale of area ES-M-598 (exploratory area)	Offshore	1	Vitória	Binding Proposal	Potential[1]
Sale of area ES-M-671 (exploratory area)	Offshore	1	Vitória	Binding Proposal	Potential[1]
Sale of area ES-M-673 (exploratory area)	Offshore	1	Vitória	Binding Proposal	Potential[1]
Sale of area ES-M-743 (exploratory area)	Offshore	1	Vitória	Binding Proposal	Potential[1]
Sale of Petrobras' interest in the Catuá field	Offshore	1	Anchieta	Binding Proposal	Potential[1]
Sale of 50% interest in block ES-T-506	Onshore	1	Linhares	Concluded	Cowan Petróleo e Gás
Sale of 50% interest in block EST-516	Onshore	1	Linhares	Concluded	Cowan Petróleo e Gás
Polo Cricaré	Onshore	27	São Mateus, Conceição da Barra and Jaguaré	Concluded	Karavan Oil
Polo Lagoa Parda	Onshore	3	Linhares	Concluded	Imetame
Campo Cancã	Onshore	1	Espírito Santo	Binding Proposal	Seacrest Capital Group
Campo Cancã Leste	Onshore	1	Espírito Santo	Binding Proposal	Seacrest Capital Group
Campo Fazenda Alegre	Onshore	1	Espírito Santo	Binding Proposal	Seacrest Capital Group
Campo Fazenda São Rafael	Onshore	1	Espírito Santo	Binding Proposal	Seacrest Capital Group
Campo Fazenda Santa Luzia	Onshore	1	Espírito Santo	Binding Proposal	Seacrest Capital Group

[1] in the process of sale and with partners still not announced
Source: Petrobras and Portal Petróleo Hoje | Prepared by: Ideies/Findes

5.4. Decommissioning of facilities

The decommissioning of facilities[45] is the safe destination for oil and natural gas exploration and production structures after the end of their production phase. In other words, it occurs at the end of a field's useful life and, consequently, it leads to: the removal of its facilities; the drawing up of wells; the proper destination of materials, waste and tailings; and the environmental recovery of the area. It is worth noting that the ANP only approves the definitive interruption of the operation of the facilities when all options for economically and environmentally viable development of the well in question have been considered.

As of March 2021, ANP had 102 proposals for the Facility Decommissioning Program (PDI) in Brazil, 71 of which were approved (44 onshore and 27 offshore). In addition to those, another 2 are under analysis, 6 are awaiting a response, 12 are in interrupted (or stopped) and 11 have been closed.

102

proposals for Facility Decommissioning Program (PDI)

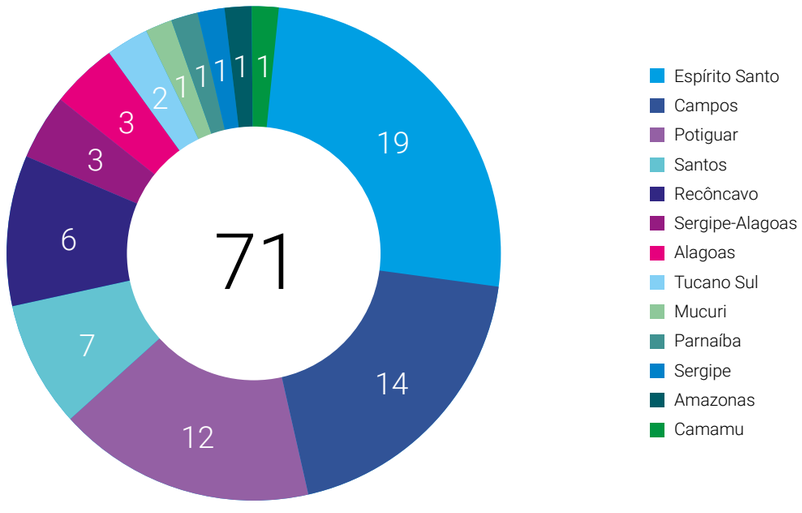
71 have been approved:

44 **in the onshore environment**

27 **in the offshore environment**

Another 2 are under analysis, 6 are awaiting a response, 12 are stayed (or interrupted) and 11 have been concluded

Chart 48 - Distribution of Facility Decommissioning Programs (PDI) approved by ANP, by Basin



Fonte: ANP | Elaboração: Ideies/Findes

45. Resolution 817 of April 24, 2020 was an important milestone for the national oil industry as it modernized the regulation that governs decommissioning of E&P facilities, the procedure for returning areas to the ANP and the disposal and reversal of assets. This precaution in the legislation aims to maximize the recovery of reservoirs and avoid premature decommissioning of production facilities.

13

basins had a total of 71 PDIs approved by ANP

19

projects were approved in the Espírito Santo Basin

Offshore 1 project

Onshore 18 projects

R$ 2.4 billion

is the total investment planned for the decommissioning of 680 wells in the years 2022 through 2026

In total, thirteen basins had a total of 71 PDI approved by ANP. Of that total, 19 plans were located in the Espírito Santo Basin, 14 in Campos Basin, 12 in Potiguar Basin and 26 in another ten basins (Chart 48). In the Espírito Santo basin, 18 projects were approved for onshore wells and only 1 project for offshore wells (Cação). Of the total, 17 projects are fields owned by Petrobras, 1 project owned by Petrosyenergy and 1 project owned by Vipetro.

Table 11 - List of Decommissioning Programs (PDI) of the Espírito Santo Basin, approved and under analysis

PDI	Basin	Field	Environment	Company
Albatroz	Espírito Santo	Albatroz	Onshore	Petrisyenergy
Barra do Ipiranga	Espírito Santo	Barra do Ipiranga	Onshore	Petrobras
Cação	Espírito Santo	Cação	Offshore	Petrobras
Corruíra	Espírito Santo	Corruíra	Onshore	Petrobras
Jacupemba	Espírito Santo	Jacupemba	Onshore	Petrobras
Lagoa do Doutor	Espírito Santo	Lagoa do Doutor	Onshore	Vipetro
Lagoa Parda Sul	Espírito Santo	Lagoa Parda Sul	Onshore	Petrobras
Mariricu Oeste	Espírito Santo	Mariricu Oeste	Onshore	Petrobras
Mosquito	Espírito Santo	Mosquito	Onshore	Petrobras
Mosquito Norte	Espírito Santo	Mosquito Norte	Onshore	Petrobras
Nativo Oeste	Espírito Santo	Nativo Oeste	Onshore	Petrobras
Rio Barra Seca	Espírito Santo	Rio Barra Seca	Onshore	Petrobras
Rio Doce	Espírito Santo	Rio Doce	Onshore	Petrobras
Rio Ibiribas Executivo	Espírito Santo	Rio Ibiribas	Onshore	Petrobras
Rio Itaunas Leste	Espírito Santo	Rio Itaunas Leste	Onshore	Petrobras
Rio Mariricu	Espírito Santo	Rio Mariricu	Onshore	Petrobras
Rio Mariricu Sul	Espírito Santo	Mariricu Sul	Onshore	Petrobras
Rio Preto	Espírito Santo	Rio Preto	Onshore	Petrobras
Rio São Mateus Oeste	Espírito Santo	Rio São Mateus Oeste	Onshore	Petrobras

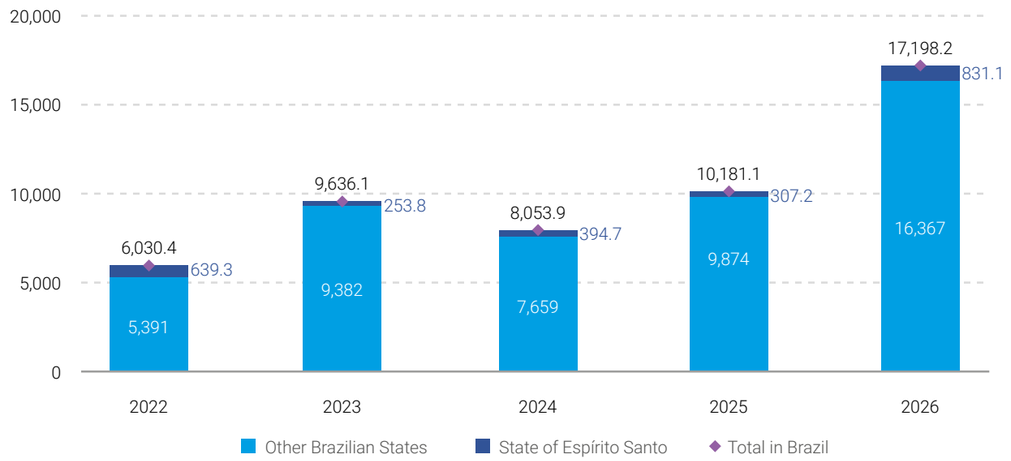
Source: ANP | Prepared by: Ideies/Findes

In the State of Espírito Santo, the decommissioning of 680 wells will generate R$ 2.43 billion in investment in the years 2022 to 2026, R$ 781.2 million of which in the Campos Basin and another 1.64 billion in the Espírito Santo Basin. This total amount will be invested in permanent abandonment activities (59.9%), removal of lines (23.3%), removal of facilities associated with Onshore Production Units (4.5%), environmental recovery (5.2%) and UEP demobilization (6.9%).

Of this total investment in the State of Espírito Santo in the period, 2022 to 2026, R$ 546.48 million will be generated by the decommissioning of 661 onshore wells. And another R$ 1.88 by 19 offshore wells.

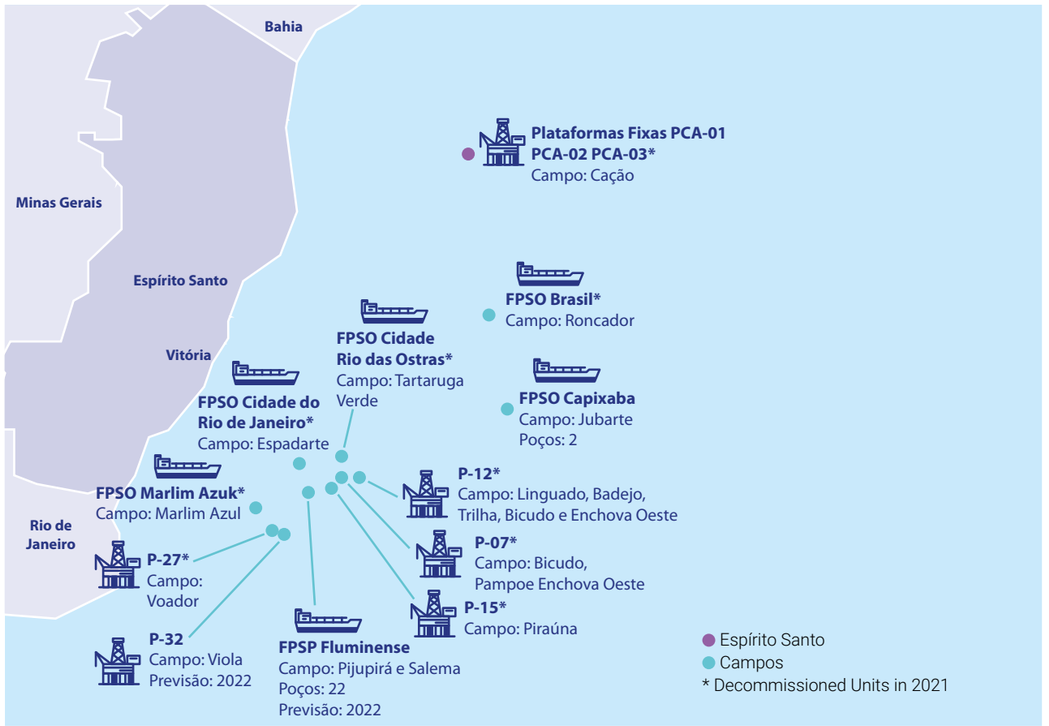
Consequently, there are opportunities in thirteen basins for supplier companies to operate in the decommissioning of facilities, which is the final stage of the oil and natural gas chain. It is worth noting that this process can still be a major challenge for the oil and natural gas production industry due to the need of complying with regulations, expanding technical training and developing the service chain.

Chart 49 Investments Projected for PDI Facilities Decommissioning Programs in Brazil (in millions R$) – 2021-2025

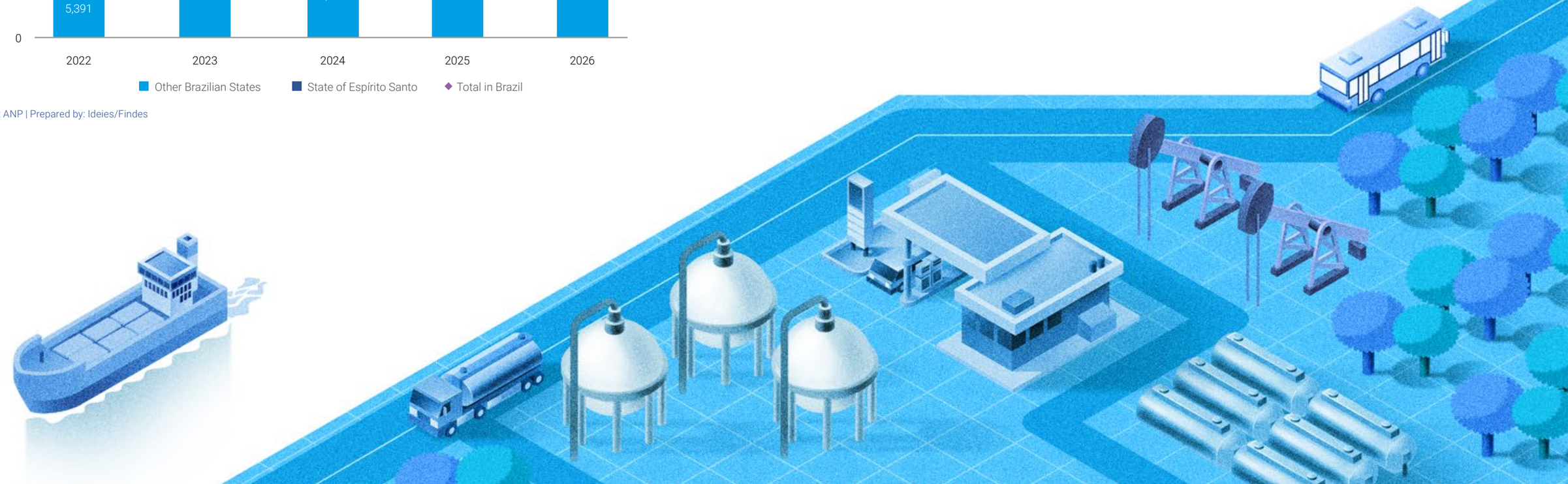


Source: ANP | Prepared by: Ideies/Findes

Figure 8 - Inventory of offshore facilities with approved PDI close to the State of Espírito Santo (2021-2026)



Note: The other two facilities of the Campos basin with approved PDI and which are not on the map were FPSO OSX-1 (Tubarão Azul Field) and FPSO Polvo (Polvo Field), both decommissioned in 2021.
Source: ANP | Prepared by: Ideies/Findes



GLOSSARY

A

Adjacent pioneer exploratory well: well used for testing the occurrence of oil or natural gas in an area adjacent to a discovery.

Area Return Notification: written communication issued by the Concession Holder to ANP relative to the return of areas, in the circumstances governed by the Contract, which contains the list of Reversible Assets existing in the portion to be returned and the outlining of the polygon of the areas to be retained.

B

Barrel of equivalent oil (boe): barrel of equivalent oil (1,000 m³ of gas ≈ 6.28981 bbl) - measure that sums the volumes of oil and gas production

Barrel of oil per day (bpd): unit used to reference the daily production of barrels of oil.

Bidding rounds: a process held by the ANP for the purpose of having an auction between companies and/or joint-ventures interested in acquiring exploratory areas on concession or sharing basis.

Brent: oil extracted in the North Sea and traded on the London Stock Exchange, its quotation is an international reference for the price of oil.

C

Closed well: a completed well that has already started production or injection operations, but which is closed, awaiting normalization of surface conditions, additional studies for decision making, or intervention with a probe for reassessment, re-completion, restoration, abandonment, among other purposes.

Concession Holder: a company incorporated under Brazilian law, with headquarters and management in Brazil, with which the ANP enters into a concession contract for the exploration and production of oil or natural gas in a sedimentary basin located in the national territory.

Concession: a modality of assignment of an economic activity by the government, usually through a bidding process, to an economic agent that proves the capacity to perform it, at its own risk and for a predetermined period. In Brazil, the administrative contract for the delegation is made by the ANP, which grants companies the right to carry out exploration and production activities of oil and natural gas in the Brazilian territory.

D

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

Declarations of hydrocarbon traces: the concession contracts set the terms and work programs for exploration and production activities. Under these contracts, the concession holder is required to notify the ANP of any discovery of hydrocarbons or other mineral resources within the concession area within 72 hours after the occurrence.

Decommissioning: a set of legal actions, techniques and engineering procedures applied in an integrated way to a Pipeline, for ensuring its decommissioning meets the conditions relative to safety, environmental preservation, reliability and traceability of information and documents.

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

Deeper prospection exploratory well: well used for testing the occurrence of accumulations or deeper favorable geological conditions in a given area.

Destroyed well: permanently abandoned well in which all equipment related to the wellhead assembly was removed and the surface and the casing at the bottom of the preboring was cut.

Development plan: the instrument for planning development and production, covering the entire life cycle of the oil field. It describes the activities and investments that will be made/carried out, whereby all other medium and short-term plans will have to be consistent with it.

E

Exploration phase: this phase has the goal of discovering and surveying oil and/or natural gas deposits. Exploratory activities involve the acquisition of seismic, gravimetric, magnetometric, geochemical data, drilling, and evaluation of wells, among others, and which must comply with the Minimum Exploration Program (PEM) agreed with the ANP.

Exploratory Block: geographically delimited areas referring to a sedimentary basin, where oil and natural gas exploration activities are carried out.

Exploratory extension well: a well used for limiting the accumulation of oil or natural gas and/or to investigate contact between fluids, communication between regions of a reservoir, and properties that allow characterizing it.

Exploratory injection well: well used for injecting fluids into the reservoir to improve the recovery of hydrocarbons.

Exploratory production well: well used for draining one or more deposits from a field.

Exploratory stratigraphic well: well used for learning the stratigraphic column and obtaining other surface´s geological information in a basin or region that is little explored;

F

Federal Petroleum, Natural Gas and Biofuels Agency (ANP): regulatory body for the oil, natural gas, and biofuels markets in Brazil, except for regulation of natural gas distribution, which is governed on a state level.

Financial Compensation: amount owed to States, Municipalities, and the Federal Government for the use of natural resources, since these entities are affected by the exploration and production activity.

G

Government Shares: payments to be made by the holders of concessions of oil and natural gas exploration and production activities, pursuant to Articles 45 to 51 of Law 9.478, of 1997, and of Decree 2.705, of 1998.

H

Hydrocarbon: A chemical compound composed solely by carbon and hydrogen atoms. Oil and natural gas are examples of hydrocarbons.

I

Injecting well for storage: well operates as a fluid injector for the storage of natural gas.

Injecting well: well operates as a fluid injector to improve the recovery of hydrocarbons from the reservoir.

M

Marginal fields: inactive areas in which there was no production of oil and/or natural gas or production was interrupted due to lack of economic interest.

Mature Basin: sedimentary oil basin whose production is already in decline.

Mature fields: oil fields whose production is already in decline.

Minimum Exploratory Program (PEM): exploratory activities to be necessarily carried out by the concession holder during the exploration phase, defined by the ANP, according to criteria for surveying the areas to be explored.

Mining: a set of coordinated operations for extracting oil or natural gas from a deposit and preparing for its handling/transportation.

O

Offshore: maritime environment and land-sea transition zone or area located in the sea.

Oil byproducts: products resulting from the transformation of petroleum.

Oil fields: area producing oil or natural gas, from a continuous reservoir or more than one reservoir, at variable depths, encompassing installations and equipment intended for production. (Source: Law 9.478, of 8/6/1997.

Oil production chain: a group of activities in the production chain, from the extraction of crude oil to the last phase of adding value in the sector, segmented into four branches: exploration, refining, petrochemical industry, and transformation industry.

Oil Production: a set of coordinated operations for extracting oil or natural gas from a deposit and preparing its handling, according to the definitions outlined in

GLOSSÁRIO

item XVI of art. 6 of Law 9.478 of 1997, or even the volume of oil or natural gas extracted during production, as one may see in the text, as applicable.

Oil refinement: activity carried out by an industrial unit that uses as raw material the oil originated from an extraction and production unit of a field and which, through processes including heating, fractioning, pressure, vacuum, and reheating in the presence of catalysts, creates oil byproducts from the lightest ones (refinery gas, LNG, Petroleum Nafta) to heavier ones (bunker, fuel oil), in addition to solid fractions, such as petroleum coke and asphalt residue.

Oil Well: drilling on the surface used for producing oil and/or natural gas.

Oil: any and all liquid hydrocarbons in their natural state, such as crude oil and condensate, whose exploration and production is governed by Law 9,478, of 8/6/1997.

Onerous assignment: a model of assignment of an exploratory area to Petrobras – bilateral negotiation, in consideration for payment of a certain amount, which was regulated by Law 12,276, of June 30, 2010, limiting exploration to up to 5 billion boe.

Onshore: terrestrial environment or area located onshore.

P

Payment for area occupation or retention: amount paid by concession holders to land owners where oil and natural gas exploration and production activities are carried out. This payment is made in two ways: (i) on an annual basis, through unitary amounts in Reais per square kilometer of the concession area outliner in the Bidding Regulations and the contract, successively applicable to the exploration, development, and production phases. The determination of this amount is made by the ANP and takes into account the geological characteristics and the location of the sedimentary basin; (ii) on a monthly basis, by multiplying the equivalent of 1% of the total volume of oil and natural gas production in the field, during the reference month by their respective reference prices.

Permanent offer: continuous offer of fields returned (or in the process of being returned) and exploratory blocks offered in previous bids and not auctioned or returned to the agency (Article 4 of CNPE Resolution 17, 06/08/2017).

Permanently abandoned well: well for which there is no interest in future resumption and operations were carried out to establish redundant sets of permanent barriers.

Petroleum Coke: fuel derived from coal agglomeration and consisting of mineral matter and carbon fused. It is a solid and cohesive residue left over from the destructive distillation of coal, oil, or other carbonaceous residues and contains mainly carbon.

Petroleum consumption: an activity that consists of the use of crude petroleum oil to manufacture petroleum products.

Pioneer exploratory well: well used for testing the occurrence of oil or natural gas in one or more objectives of a geological prospect not yet drilled.

Pre-salt layer: a subsoil region formed by a vertical prism of undetermined depth, with a polygonal surface defined by the geographic coordinates of its vertices detailed in the Appendix of Law 12.351/2010, as well as other regions that may be outlined by the Executive Branch, according to the evolution of geological knowledge.

Producing well: well operating as a hydrocarbon producer.

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

Production stage: The stage where the accumulations of oil and/or natural gas are discovered and which have had their commercial viability proven and originate in a producing field, developed, and put into production to supply the market.

Production Unit (Exploration and Production): a group of facilities intended to promote the separation, treatment, storage and flow of fluids produced and moved in an oil, and natural gas field.

Proven reserves: A quantity of Oil or Natural Gas that the analysis of geoscience data and engineering indicates with reasonable certainty that it is an economically viable well, and for which investments are commercially recoverable.

R

Repetro-Eligible: goods under a special export and import customs regime, which are intended for research activities and mining of oil and natural gas deposits, with a suspension of customs duties.

Returned fields: area returned to the ANP through the Area Return Notice. The act of returning the field implies the interruption of all exploration activities on the returned portion, except for the activities concerning the decommissioning of facilities and environmental recovery.

Royalties: a financial compensation owed to the Federal Government, States, and Municipalities, by the holders of concessions for exploration and production of oil or natural gas to be paid on a monthly basis according to the volume of production in the month, in a given field, right from the start of production;

S

Sedimentary Basin: depression of the earth's crust where sedimentary rocks accumulate and which may store oil or gas, whether or not associated.

Shallow waters: oceanic waters located at any distance from the coast with a seabed depth of 0-300 meters.

Shallower prospection exploratory well: well used for testing the occurrence of accumulations or shallower favorable geological conditions in a given area

Signing bonus: resources offered by the winning bidder in the proposal to obtain the oil or natural gas exploration concession, which cannot be lower than the minimum value set in the Bidding Notice/Regulations. Part of these resources are destined for the Federal Government and another part for the ANP;

Special Share: this is an extraordinary financial compensation owed to the Federal Government, States, and Municipalities, following ANP Resolution 12/2014 by holders of concessions for exploration and production of oil or natural gas, in cases of large production volume or high profitability.

Special well: well used for specific objectives that do not fit the previously defined purposes.

Storage Well: well intended to allow natural gas storage operations, including injection, withdrawal, and monitoring.

T

Temporarily abandoned well with monitoring: well which there is interest in future resumption of operations and for which work has been carried out to establish redundant sets of barriers, which must be periodically monitored and/or verified.

U

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

Upstream: a segment of the petroleum industry that includes the activities of exploration, development, production, and transportation of oil to refineries.

W

Well operating for disposal: a well operating for disposal of fluids produced by other wells or disposal of various effluents generated in exploration and production activities, in areas that do not produce at that time.

Well producing and injecting: well operating simultaneously producing hydrocarbons and injecting fluids (at different intervals).

Well temporarily abandoned without monitoring: well which there is interest in the future resumption of operations and for which work has been carried out to establish joint sets of barriers not monitored and/or verified.

Well under observation: instrumented well used for monitoring pressures in a reservoir producing hydrocarbons or storing natural gas.

Well withdrawing stored natural gas: well operating to withdraw natural gas from a storage reservoir.

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

Complementation of the list of the National Classification of Economic Activities (CNAES) of the Oil and Natural Gas industry chain of production

The complementation of the list of the National Classification of Economic Activities (CNAES) of the productive chain of the Oil and Natural Gas industry used in this yearbook was prepared based on two methods. The first was the conversion of the Mercosur Common Nomenclature (NCM) of exported products used in the "External Sector" section of this Yearbook for CNAES[46]. The second was the mapping through a consultation of the "Manual on National Classification of Economic Activities version 2.0"[47] which, in most cases, describes which CNAE activities "x" supplies or provides services.

Table 12 - List of the National Classification of Economic Activities (CNAES) of the oil and natural gas industry chain of production

CNAE	CNAE Description	Link of the O&G chain of production
6000	Extraction of oil and natural gas	E&P
9106	Oil and natural gas extraction support activities	E&P
19217	Manufacturing of oil refinement products	Oil byproducts
19225	Manufacturing of oil byproducts, except for refinement products	Oil byproducts
20215	Manufacturing of basic petrochemical products	Petrochemicals
20223	Manufacturing of intermediaries for plasticizers, resins and fibers	Petrochemicals
20291	Manufacturing of chemicals and organic products not previously specified	Petrochemicals
20312	Manufacturing of thermoplastic resins	Petrochemicals
20321	Manufacturing of thermosetting resins	Petrochemicals
20339	Manufacturing of elastomers	Petrochemicals
35204	Production of gas	Supply
46818	Wholesale of solid, liquid and gas fuels, except for natural gas and LPG	Supply
46826	Wholesale of liquefied petroleum gas (LPG)	Supply
20941	Manufacturing of catalysts	Chain of Supply
25110	Manufacturing of metal structures	Chain of Supply
28291	Manufacturing of machines and equipment for general use not previously specified	Chain of Supply
28518	Manufacturing of machines and equipment for prospection and extraction of oil	Chain of Supply
28691	Manufacturing of machines and equipment for specific industrial use not previously specified	Chain of Supply
30113	Construction of vessels and floating structures	Chain of Supply
71197	Technical activities relative to architecture and engineering	Chain of Supply
77390	Rental of machines and equipment not previously specified	Chain of Supply

Source and preparation: Ideies/Findes

Fonte e elaboração: Ideies/Findes

46. IBGE publishes a table for converting NCM into CNAE at: https://concla.ibge.gov.br/classificacoes/correspondencias.html

47. You can access the document at: https://biblioteca.ibge.gov.br/visualizacao/livros/liv36932.pdf

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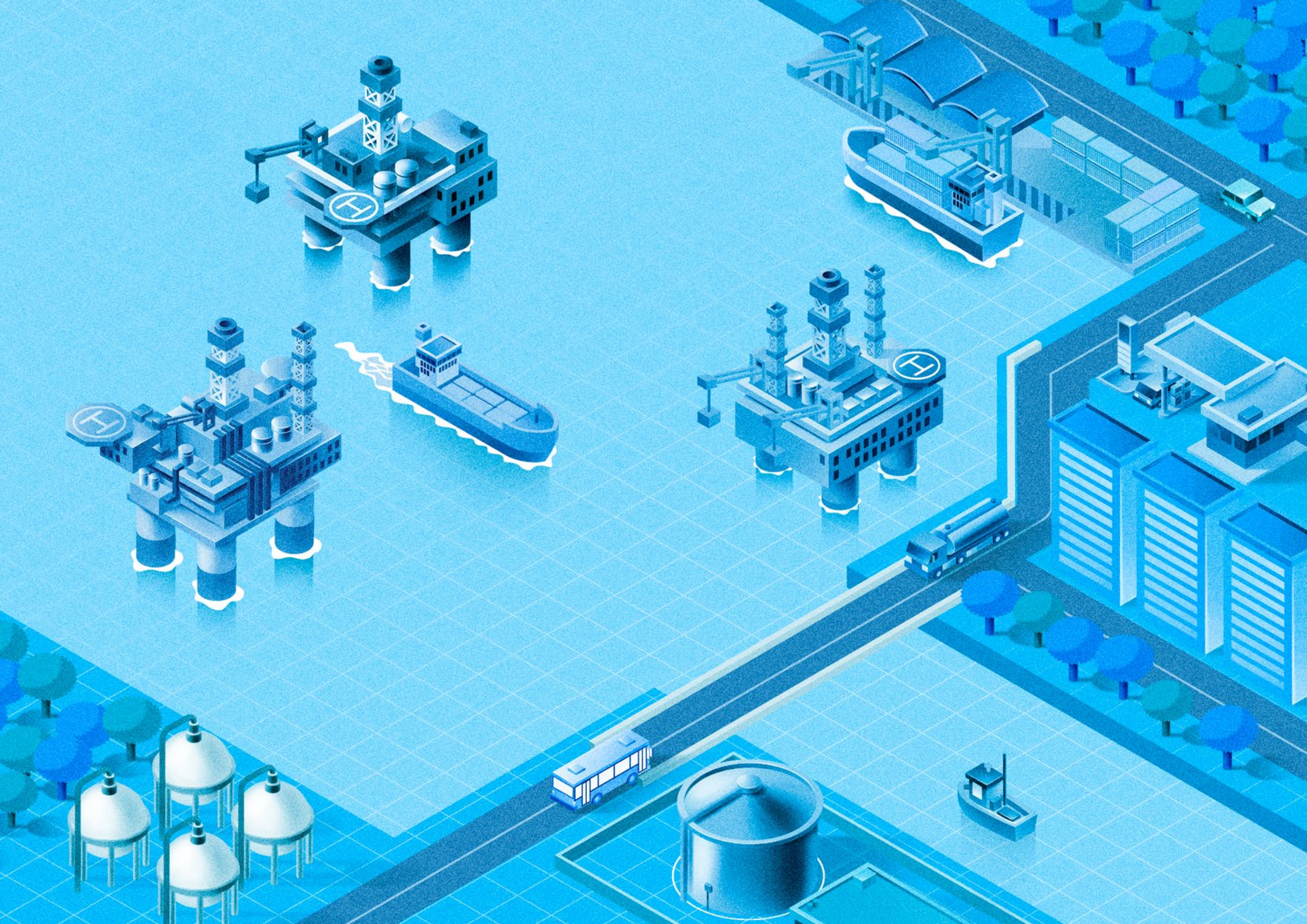

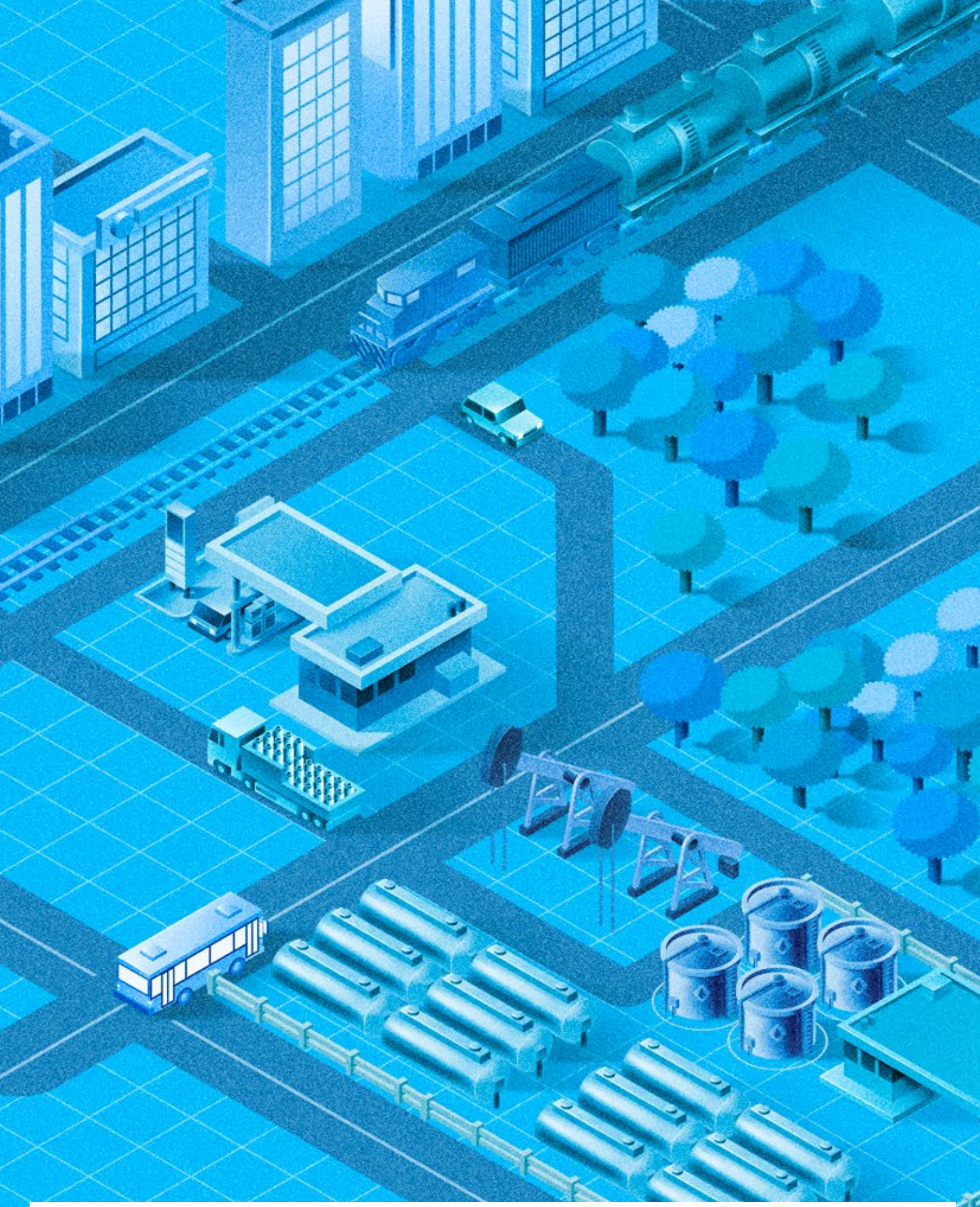

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