



## TRADE MARKET INTELLIGENCE

### **SPECIAL REPORT:** Ocean Research Ecosystems in Brazil, Chile, and Peru

October 2019

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Nova Scotia Business Inc.



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## Report Overview

This report is a brief introduction into the ocean research ecosystems of three prominent South American countries: Brazil, Chile, and Peru.

Brazil, the largest economy of the three, has significant resources dedicated to research and development, well above the average in the region. The country is emerging as a strong global player in ocean science research, driven largely by the oil and gas sector. With oil production increasing and exploration resuming in 2017, investments in research and development are expected to continue rising, providing opportunities for companies that supply the oil and gas sector in particular.

Chile is a growing economy characterized by high levels of foreign trade. Fishing and aquaculture are extremely important to the Chilean economy and are a key area of opportunity for ocean technology companies. Chile's newly created Ministry of Science, Technology, and Innovation is expected to help strengthen and promote science and research in Chile going forward.

Peru, the smallest of the three countries, has a burgeoning aquaculture industry and increasing oil and gas exploration activity. Renewable energy is also an area of potential in Peru, as interest in marine energy sources is increasing.

Each country also has a variety of academic organizations, government bodies, and private companies that are involved in ocean research. Many of these organizations are listed in the report and may present partnership opportunities for Nova Scotian companies.



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# Brazil

Located in South America, Brazil is the eighth largest economy in the world. The country's economy is bolstered by its natural resources and its exports. Exports totaled US\$184.5 billion in 2016 and US\$217.2 billion in 2017.<sup>1</sup>

Brazil is currently recovering from a recession. In recent years, the economy was negatively affected by several high-level government and private sector corruption scandals.<sup>2</sup> These scandals, coupled with falling commodity prices, further contributed to the declining annual GDP growth rate that began in 2010.<sup>3</sup> The economy dipped from a 3.01% growth rate in 2013, to -3.55% rate in 2015 and -3.31% in 2016. Brazil's economy saw marginal recovery to a 1.11% growth rate in 2018 and is projected to increase to a rate of 2.27% in 2020.<sup>4</sup> To repair the damage to the economy, the country's administration pushed for foreign investment, fiscal reforms, and further development of its oil and gas industry.<sup>5</sup> The oil and gas industry is one of the largest contributors to Brazil's economy. The sector was responsible for 13% of the country's GDP as of 2014.<sup>6</sup>

Additionally, Mercosur, a trading bloc that includes Brazil, Argentina, Paraguay and Uruguay, launched negotiations for a free trade agreement with Canada in March of 2018 with negotiations still ongoing.<sup>7</sup> The trading bloc has led to a US\$87.6 billion trade surplus for Brazil in the last ten years and accounts for 82% of South America's GDP as a whole.<sup>8</sup>

## Ocean Economy

Brazil is working towards improving the governance and protection of the “Blue Amazon”; the area of ocean governed by Brazil. This prioritization reflects Brazil’s view of the ocean’s role in the health of the economy and its residents. The expansive coastline (9,000 km) provides the country with many marine opportunities.<sup>9</sup> The Central Intelligence Agency reports that there are 791 merchant marine ships in Brazil as of 2018, consisting of 13 bulk carriers, 15 container ships, 47 general cargo, 38 oil tankers and 678 “other” ships. There are major seaports in Belem, Paranagua, Rio Grande, and Rio de Janeiro.<sup>10</sup>

Canada and Brazil signed a Framework Agreement for Cooperation on Science, Technology and Innovation in 2010 and mandated the Joint Science Technology and Innovation Committee to oversee the Agreement’s implementation. This agreement was aimed at propelling joint opportunities in ocean science and technology, clean technologies, and green energy, among other fields. In ocean science and technology, critical areas for research and development cooperation included: next generation sensor technology and ocean platforms; and ocean and coastal observing systems, including data management. Under green energy and clean technology, the potential for joint project development around hydroelectric and hydrogen resource development was highlighted.<sup>11</sup> Other areas of opportunity for Atlantic Canadian firms in Brazil include technologies and services directly supporting mining, oil and gas or naval shipbuilding operations; and modern environmental imaging, tracking and measurement systems.<sup>12</sup>

## Oil and Gas Sector

More than 94% of Brazil’s oil reserves are located offshore, with 80% of all reserves located offshore of the state of Rio de Janeiro. Pre-salt oil, located deep below the ocean and requiring extensive investment to extract, is of increasing interest to the sector. Pre-salt reserves in the Santos Basin were first discovered in 2005 by Petróleo Brasileiro S.A. (Petrobras), a semi-public Brazilian multinational corporation. Further exploration in the following years showed that pre-salt deposits extended through the Santos, Campos, and Espírito Santo Basins. In July 2017, output from pre-salt offshore wells surpassed combined volumes from all other fields for the first time. All pre-salt areas currently under development, with the exception of Libra field, were non-competitively granted to Petrobras.<sup>13</sup>

Petrobras was critical to the development of the oil and gas industry in Brazil which allowed it to become a major global entity. It has held a state of monopoly in the industry over the past few decades.<sup>14</sup> As of 2015, Petrobras produced 92% of the industry’s petroleum, and 94% of its natural gas.<sup>15</sup> Its involvement in the state scandal, Lava Jato (Car Wash), cost them US\$17 billion among other consequences and caused their investments in the industry to come to a halt in 2015. Because of its size and importance, this dramatically impacted the economy and contributed to the recession.<sup>16</sup>

In 2010, the Brazilian government passed legislation instituting a new regulatory framework for pre-salt reserves. One major change was the implementation of a production-sharing agreement (PSA) system for pre-salt reserves. Unlike non-pre-salt oil projects where companies are relatively uninhibited in exploring and producing, Petrobras was made the sole operator of each PSA and was set to hold a minimum 30% stake in all pre-salt projects. In 2016, further legislation made it so that Petrobras was no longer the mandatory operator but the preferred operator, allowing Petrobras to choose which biddings for blocks in the pre-salt areas it wanted to participate in.<sup>17</sup> With Petrobras no longer the sole operator in future pre-salt auctions, the sector has been opened to international oil companies.<sup>18</sup>

Since 1999, companies taking part in exploration have faced local goods and services requirements, aimed at expanding the capacity of the domestic supply chain. Contracts signed between the Brazilian National Agency of Petroleum, Natural Gas and Biofuels (ANP) and oil firms also required that firms give preference to Brazilian suppliers in cases where prices, quality, and delivery were equivalent to those of international suppliers.<sup>19</sup> In 2017, local content requirements were reduced significantly. Additionally, the renewal of REPETRO legislation saw reforms that waived taxes on the import of oil and gas equipment.<sup>20</sup>

## Marine Seismic Monitoring

According to the ThinkHazard! System developed by the Global Facility for Disaster Reduction and Recovery, Brazil is at medium risk for tsunamis, meaning that there is more than a 10% chance of a potentially damaging tsunami occurring in the next 50 years. This risk is highest in the southern states of Rio de Janeiro, Sao Paulo, Parana, Santa Catarina, and Rio Grande Do Sul.<sup>21</sup>

The Brazilian Seismographic Network (RSBR) began operation in 2011, funded by Petrobras, as a joint effort between four institutions: University of São Paulo (USP), University of Brasília (UnB), National Observatory (ON) and Rio Grande do Norte Federal University (UFRN). The members share data and exchange their experiences and technologies. Each member is responsible for installing, operating, and maintaining their stations. The RSBR is now sponsored by Brazilian Geological Survey, which coordinates general maintenance and the completion of seismic bulletins.<sup>22</sup> The RSBR's 84 stations were installed between 2010 and 2016. The stations along the southern and eastern coast were installed to better monitor earthquakes in the oil-rich continental shelf.<sup>23</sup> The majority of stations installed along the southern coast belong to ON, with a few owned by USP. Most on the east coast are owned by UFRN.<sup>24</sup>

Going forward, RSBR faces challenges in sustaining the present network and replacing the current equipment with next generation instruments.<sup>25</sup> Additionally, climate change is increasing the risk of tsunamis in low-lying coastal areas.<sup>26</sup> Increased risk may make subsea monitoring more of a priority in the future.

# Research and Development Funding

In 2016, Brazil spent an estimated 79 billion Real (CAD\$25 billion) on research and development (R&D) across all industries.<sup>27</sup> Overall, Brazil's R&D expenditures are well above the average among Latin American and Caribbean countries. In 2016, the most recent year for which the World Bank Group collected data, Brazil spent 1.266% of GDP on R&D, compared to the 0.76% of GDP average.<sup>28</sup>

Brazil's overall R&D spending has been trending positively over the past decade.<sup>29</sup> There was a slight decrease between 2015 and 2016, likely due to the recession and the resulting limits to government public spending.<sup>30</sup>

Brazil is emerging as a strong player in ocean science research, showing strong growth in research output over the past two decades.<sup>31</sup> Between 2010 and 2014, Brazil was the South American country with the most published papers in ocean science, totalling 13,211 papers over the period.<sup>32</sup> Between 2009 and 2013, Brazil was ranked among the top 20 countries with the highest government financial support for ocean science.<sup>33</sup>

The oil and gas sector in Brazil is a major contributor to R&D expenditures. A 2011 report, released right after Brazil's pre-salt exploration boom, estimated that the sector spent US\$3.1 billion (CAD\$4.1 billion) on ocean research.<sup>34</sup> The Canadian Trade Commissioner to Brazil for oil and gas stated that an R&D clause determines that oil companies must invest 1% of their gross earnings from high profitability fields into R&D projects conducted in the country. With pre-salt oil production increasing and the resumption of exploration in 2017, R&D investments are increasing again. In 2018, the sector's estimated R&D spending for pre-salt product was approximately R\$1.3 billion (CAD\$413.7 million). According to ANP, annual R&D spending by the sector overall was approximately R\$3 billion (CAD\$954.8 million). ANP also estimates that, by 2030, a total of R\$90billion (CAD\$28.6 billion) will have been invested in R&D in Brazil.<sup>35</sup>



# Ocean Research Organizations

## Academic

[Centro de Biologia Marinha \(CEBIMar\)](#) is an extension of the Universidad de São Paulo, supporting research and training in multidisciplinary fields not only for the university itself, but also other private, state or federal units and institutes. The seafront laboratory is the birthplace of a broad range of projects, with access to four vessels.

[Instituto Oceanográfico da Universidade de São Paulo \(IOUSP\)](#) consists of the Biological Oceanography department and the Physical, Chemical and Geological Oceanography department of the Universidad de São Paulo, and is dedicated to providing answers to problems in the ecosystem. Both marine observation courses involve classes aboard offshore vessels acquired through the Foundation for Research Support of the State of São Paulo (FAPESP). As another public extension of the Universidad de São Paulo, IOUSP is dedicated to the study and the transfer of knowledge on marine sciences.

[Centro de Estudos do Mar \(CEM\)](#) is located in southern Brazil and is a separate entity under the Universidade Federal do Paraná. It offers graduate programs on ocean and coastal systems, and undergraduate programs in oceanography, aquaculture engineering, and natural sciences, among others. They sometimes host other researchers who perform Antarctic research and offer access to a research vessel.

[Instituto Internacional del Océano \(IOI-SWAO\)](#) in Brazil acts as a training and support centre on ocean governance and works with the IOI centre in Costa Rica. It is located in southern Brazil, working with the support of CEM. It is an extension to the Universidad Nacional de Costa Rica (UNA), and a part of the Republic of Malta-based International Ocean Institute. It focuses on ocean governance, ocean sciences and geo-ethics, and the peaceful use of the ocean.

## Government

[Marinha do Brasil](#) is Brazil's Navy which, according to the Canadian Trade Commissioner service, is one of the most active entities involved in marine research.<sup>36</sup> Under the Brazilian Navy are the Centro de Hidrografia da Marinha (CHM) and Comissão Interministerial para os Recursos do Mar (CIRM). These centres are involved in the Brazilian Antarctic Program (the scientific exploration of the southern region of the white continent), the National Coastal Management plan and the Brazilian Ocean Observation System (for the forecast and observation of coasts and oceans). Programs under CIRM include scientific research on the island of Tindade, the exploration of mineral resources in the south Atlantic and Equatorial area.

[Ministério da Ciência, Tecnologia, Inovações e Comunicações](#) concerns itself with policymaking and the advancement of science, technology, innovation and communication. Under it are sixteen research units that carry out the generation of knowledge and development of their respective research areas.

[Embrapa](#) works in support of the Brazilian Ministry of Agriculture, Livestock, and Food Supply in partnership with the National Agricultural Research System. Embrapa works with the fisheries and aquaculture industry, operating as a research centre to stimulate competitiveness in the industry.

[Instituto Chico Mendes de Conservação da Biodiversidade \(ICMBio\)](#) is as an extension of the Ministry of the Environment. The goal of the Institute is to integrate the government model of the National Environmental System (Sisnama) and promote research programs related to the environment. It manages three hundred and thirty-four federal conservation units across Brazil which are responsible for the execution of research.

[Petrobras](#) is a Brazilian state-controlled energy company involved in offshore production and exploration of oil and natural gas. Other areas of involvement are petrochemicals, electric energy generation, and transportation (of oil products, biofuels and natural gas for export or refining) and trade. Petrobras operates a R&D centre in Rio de Janeiro called CENPES (Centro de Pesquisas Leopoldo Américo Miguez de Mello). CENPES is dedicated to technology developments for the company.

## **Private**

[Axess Group](#) is a Norway-based group that primarily offers engineering service and products. This organization operates in multiple industry sectors including oil and energy, offshore drilling and renewables. Their compliance services in Rio de Janeiro ensures client regulatory standards are on par with those of Brazil when performing activities within the region. The company has expressed intentions for future growth in Brazil.

[EGS Brasil](#) is a part of an international group of marine survey companies called EGS Survey with headquarters in Hong Kong. EGS operates in various industries including oil and gas, telecommunications, energy and scientific investigation in the field of marine geosciences and oceanography.

[Fugro](#) is a global geological engineering company for marine and land data acquisition with 2,073 employees located in the Americas. Their services include consultations, analytics and the construction and operation of a variety of vessels (geophysical survey, geotechnical vessels, and jack-up barges). More than half of company's market is within the oil and gas industry.

[Shell Brasil Petróleo Ltda](#) is a subsidiary of Royal Dutch Shell PLC, more commonly known as Shell. Its primary activities are the exploration and extracting of crude petroleum and natural gas in the three large basins in Brazil. In the past year, Shell has expanded its pre-salt coverage to 2.7 million acres.<sup>37</sup>



# Chile

Chile's economy is characterized by a high level of foreign trade, with exports accounting for around one third of the country's annual GDP. Exports totaled US\$60.6 billion in 2016 and US\$69.23 billion in 2017. Commodities make up 60% of total exports, with the export of copper providing 20% of government revenue.<sup>38</sup>

The Chilean economy has experienced sustained growth since 2003. The period between 2003-2013 saw positive growth, with real growth averaging almost 5% per year, though there was a slight contraction in 2009 from the global financial crisis. In 2017, growth slowed to 1.4%. Declines in the price of copper have had significant effects on the Chilean economy.<sup>39</sup> The GDP growth rate fell to an annual growth rate of 1.47% in 2017, but recovered to 4.04% in 2018. It is projected to decrease slightly over the next two years, hitting 3.30% in 2020.<sup>40</sup>

Chile holds 26 global trade agreements.<sup>41</sup> The modernized Canada-Chile Free Trade Agreement (CCFTA) has been in effect since 1997 and was modernized in 2019. In 2017, bilateral merchandise trade grew to CAD \$2.9 billion and the stock of Canadian investment in Chile was \$17.1 billion, making Chile the top direct investment destination in South and Central America.<sup>42</sup> The Comprehensive and Progressive Trans-Pacific Partnership (CPTPP) was signed at a ceremony in Chile in March 2018.<sup>43</sup> Chile has not yet ratified the agreement, but once ratified, CPTPP is expected to compliment the CCFTA and provide preferential access and clear trading rules for Canadian exporters.<sup>44</sup>

## Ocean Economy

Chile has a lengthy maritime waterfront and coastal borders of 6,435 km with major seaports in Coronel, Huasco, Lirquen, Puerto Ventanas, San Antonio, San Vicente, and Valparaiso. The entire country has a reported total of 222 merchant marine ships. In 2018, this consisted of 9 bulk carriers, 5 container ships, 58 general cargo, 15 oil tankers and 135 “other” ships.<sup>45</sup>

Aquaculture is an extremely important part of Chile’s ocean economy. Chile’s commercial aquaculture industry began in the 1980’s in an effort to protect native, wild fish stocks. To combat the over-exploitation of the local fishery, aquaculture was introduced with an emphasis on cultivating high commercial value species for foreign trade.<sup>46</sup> Now, the Chilean aquaculture market has rapidly expanded to become the third largest producer in the world making up 12% of global production.<sup>47</sup> Chile is the world’s second largest producer of farmed salmon with an annual production of over 700 thousand tons.<sup>48</sup>

The Chilean aquaculture industry is monitored and regulated by the National Fisheries and Aquaculture Services (Sernapesca). Sernapesca is consistently monitoring and making efforts to improve the aquaculture industry in Chile.<sup>49</sup> As of early 2019, Chile’s aquaculture research institution AquaPacífico launched a new innovation centre that aims to diversify the Chilean aquaculture industry. The centre will lead the development of production methodologies for over 17 species for potential aquaculture production.<sup>50</sup>

The Comité Oceanográfico Nacional (CONA), developed a list of areas of interest and business opportunities for Chile’s ocean economy under its National Oceanographic Plan. Areas of interest which align with Nova Scotian capabilities include aquaculture (particularly as it relates to pathology and associated diseases), marine currents, wave modulation, marine surveys and mapping, costal defence and security/monitoring, remote monitoring, and environmental monitoring.<sup>51 52</sup>

## Oil and Gas Sector

Chile has significant hydroelectric resources, but variable output and recent droughts keeps the use of hydroelectric constrained. Petroleum and natural gas still play a significant role in the country’s energy supply.<sup>53</sup> Chile imports considerably more fossil fuels than it exports.<sup>54</sup> Chile only produces small amounts of oil and gas, with all in-country exploration performed in the southernmost part of the Magallanes region. Empresa Nacional del Petróleo (ENAP) is the largest producer of petroleum in the country, owns all three of Chile’s refineries, and is also active in natural gas transmission.<sup>55</sup>

## Marine Seismic Monitoring

According to the ThinkHazard! System Chile is at high risk for tsunamis, meaning that there is more than a 20% chance of a potentially damaging tsunami occurring in the next 50 years. This risk is high across all regions of Chile.<sup>56</sup>

The official agency that manages the threat of Tsunamis for Chile is the Servicio Hidrográfico y Oceanográfico de la Armada de Chile (SHOA), the Hydrographic and Oceanographic Service of the Chilean Navy.<sup>57</sup> SHOA represents Chile in the International Tsunami Warning System of the Pacific and is the organization that operates the National Tsunami Warning System. The monitoring carried out by the SHOA is done through a network of buoys distributed in the Pacific Ocean. The network's buoys are composed of a buoy and a bottom pressure recorder that constantly measures the sea level. When the sensor is activated, the buoy on the surface retransmits the data through the satellite system and these are collected by both SHOA and the National Data Center of Buoys (NDBC). The network of stations is composed of 38 digital satellite platforms along the coast of Chile and island territories.<sup>58</sup>

## Research and Development Funding

In 2016, Chile spent an estimated 613.5 billion Pesos (CAD\$1.1 billion) on research and development (R&D) across all industries. A breakdown of R&D spending by organization type shows that in Chile the majority of expenditures come from higher education institutions and business enterprises. Government and private non-profit spending is much lower.<sup>59</sup> As a percentage of GDP, Chile's R&D accounted for 0.362%. This was much lower than the 0.760% average in Latin America & the Caribbean.<sup>60</sup>

The 2017, UNESCO Global Ocean Science Report found that Chile's average annual national expenditure on natural sciences between 2009 and 2013 was US\$314 million (CAD\$416 million). Of this, an estimated 0.7% was spent on ocean science, which amounts to an annual R&D expenditure of \$2.16 million (CAD\$2.86 million).<sup>61</sup>

Most of Chile's science funding is managed by the Comisión Nacional de Investigación Científica y Tecnológica (CONICYT), the National Commission of Scientific and Technological Investigation. CONICYT is an agency set up by the Ministry of Education.<sup>62</sup> In 2018, Chile's Congress decided to create a new science ministry and selected their first Minister of Science, Technology and Innovation. The Ministry of Science, Technology, Knowledge and Innovation is meant to advise and collaborate with the President of the Republic in promoting and strengthening science, technology and innovation derived from scientific-technological research. It will also be responsible for promotion of both basic and applied research in a variety of fields.<sup>63</sup> While CONICYT is still active as of September 2019, it was expected that the new Ministry would replace many of CONICYT's functions potentially including research funding allocation.<sup>64</sup>

# Ocean Research Organizations

## Academic

[Centro Interdisciplinario para la Investigación Acuícola \(INCAR\)](#) works towards the development of knowledge and actions in sustainable aquaculture. Five lines of research within the sector are animal health, aquaculture genome technology, marine genomics, and native resources. INCAR is a collaboration between the Universidad de Concepción, Universidad Andrés Bello, and Universidad Austral de Chile.

[Centro de Investigación en Exosistemas de la Patagonia \(CIEP\)](#) is an organization for regional research and sustainable development in Aysen, a southern region in Chile. As a non-profit it offers research relevant to the community and productive sectors, in the lines of aquatic ecosystems (climate change, acidification of the ocean, emergence of microalgae, drainage basin management and ecosystem services), small scale fisheries, aquaculture, terrestrial ecosystems, sustainable tourism, eco-climate, heritage and archaeology.

[Centro de Estudios del Cuaternario Fuego \(CEQUA\)](#) in southern Chile, works in collaboration with regional governments and CONICYT for the generation and sharing of knowledge of its ecosystems and natural resources, sharing this knowledge with the regional community and education system. Lines of research include the aquatic ecosystem, territorial studies, and climate change.

[Centro de Investigación Dinámica de Ecosistemas Marinos de Altas Latitudes \(IDEAL\)](#) is a partnership of the Universidad Austral de Chile (UACH), Universidad de Concepción (UdeC), and the Centro de Estudios del Cuaternario Fuego, Patagonia y Antártica (CEQUA). UACH itself is a research-focused center, with over 50% of its focus on Life and Physical sciences. Other researchers come from the Centro de Investigación en Ecosistemas de la Patagonia (CIEP) and Universidad de Magallanes (UMAG). IDEAL has two areas of focus: the Subantarctica and Antarctica as well as the research of the marine life and systems of those areas. The organization receives its funding through CONICYT and INACH.

[Comité Oceanográfico Nacional \(CONA\)](#) is currently composed of 30 separate Chilean institutions including the Universidad de Chile (UCh), the Servicio Nacional de Pesca y Acuicultura (SERNAPESCA), and the Comisión Nacional de Investigación Científica y Tecnológica (CONICYT). Known in English as the National Oceanographic Committee, this public body works to advise and coordinate institutions involved in the investigations of oceanography. CONA also identified the need for more research in remote areas as harmful algae and species became more prominent, and thus founded the Cruceros de Investigación Científica Marina en Áreas Remotas (CIMAR), or the Cruise Program of Marine Scientific Research in Remote Areas. This program entered its third execution (2016-2020) with multidisciplinary research goals.

[Instituto Antártico Chileno \(INACH\)](#), with headquarters located in Punta Arenas, works to encourage scientific, technological and innovation research and National Antarctic Policy compliance under the Chilean Ministry of Foreign Affairs. INACH focuses on the ecosystem, climate change, and thresholds of the Antarctic including earth sciences and biotechnology, as they hold sovereign rights to a section of the continent.

[Instituto de Fomento Pesquero \(IFOP\)](#) is an institution which acts as a technical reference and provides information for institutions operating in the fisheries and aquaculture sectors to assist them in decision-making. They aim to deliver public value and to foster competitiveness in the sector.

[Instituto Milenio de Oceanografía \(IMO\)](#) is a center of excellence for interdisciplinary research and education, which exists to stimulate the knowledge and understanding of the southeastern Pacific Ocean. IMO was created to attract international collaboration and Chilean scientific competitiveness. IMO's offshore studies and expeditions concern the various physical, biogeochemical and ecological processes of the ocean. It is financed by CONICYT.

[Universidad Arutro Prat del Estado de Chile \(UNAP\)](#) has several institutes including the Institute of Science and Technology of Puerto Montt, the Institute of Science and Technology of Concepción and the Institute of Exact Sciences. Sectors covered by these institutes include aquaculture, forestry, agriculture, and the scientific, technological and biotechnological research of these area in specialized laboratories.

## **Government**

[Comisión Nacional de Investigación Científica y Tecnológica \(CONICYT\)](#) is its own legal entity for the policy formation and funding of national research (FONDECYT) companies and universities. It is an advisory body of technological and scientific development for the President of the Republic

[Dirección General del Territorio Marítimo y de Marina Mercante \(DIRECTEMAR\)](#), is a division of the Chilean army whose mission involves the protection of human life and aquatic environment and to safeguard compliance laws. Under DIRECTMAR, are CONA and the Servicio Hidrográfico y Oceanográfico de la Armada (SHOA).

[Servicio Hidrografico y Oceanografico de la Armada \(SHOA\)](#), is part of the Chilean Navy and is concerned with the observation, mapping and monitoring of the ocean and its patterns (e.g. tsunami warnings, surface temperature, etc.). It services the state in hydrography and oceanography to provide information and technical assistance for the nation.

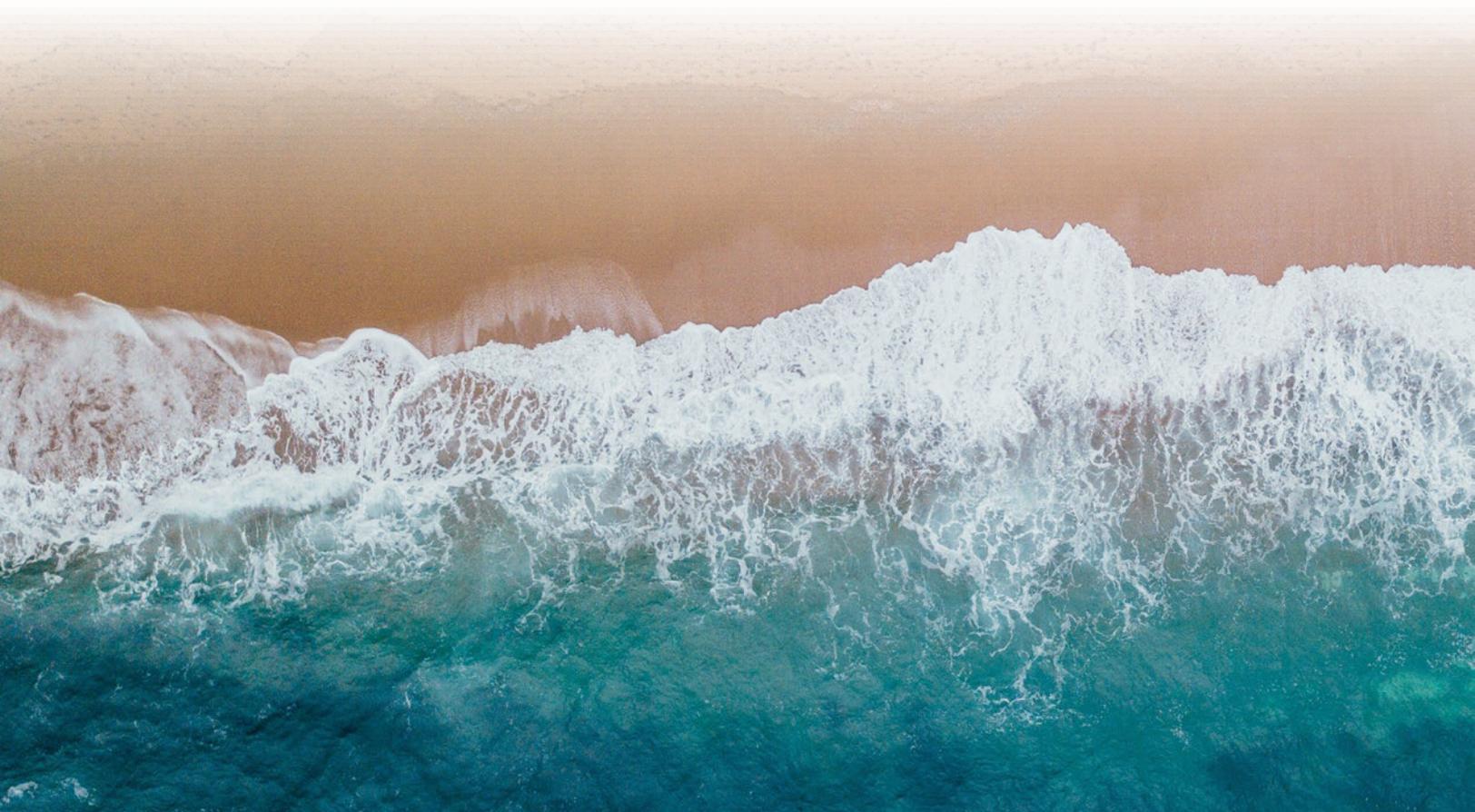
[Servicio Nacional de Pesca y Acuicultura \(SERNAPESCA\)](#) is an entity under the Ministry of Economy, Development and Tourism that supports the fisheries and aquaculture industry in Chile. SERNAPESCA is present in all 16 regions of the country with provincial offices, including two island offices.

## Private

[ASMAR Astilleros](#) is a shipbuilding company owned by Chile responsible for building the Cabo de Hornos for the MEDUSA project in marine research. Alongside shipbuilding, they specialize in repairs to domestic and foreign merchant, fishing and Chilean navy vessels. They hold plants in Punta Arenas, Valparaiso (Headquarters) and Talcahuano. Specific ship types built for the Chilean Navy include offshore and coastal patrol vessels, oceanographic research vessels, and cargo and passenger ships. Specifically, the oceanographic research vessel supports research in oceanography, fishing and geology of physical, chemical or operational intent among others.

[Empresa Nacional del Petróleo \(ENAP\)](#) has practices in the production and exploration of hydrocarbons in the Chilean, Argentinian, Ecuadorian and Egyptian petroleum market. The public petroleum company, owned by Chile, explores the refining, transportation, storage and commercialization of related materials through their refinery subsidiary. Thus, their activity and research lines can be classified as exploration and production, refining and marketing, and gas and energy.

[AquaPacífico](#) is a center of aquaculture innovation for the northern region of Chile. It is an alliance of two institutions: the Universidad Católica del Norte and Fundación Chile. AquaPacífico promotes small-scale aquaculture and strengthens the existing scientific-technological capacity for more than 17 species of commercial interest.





## Peru

Peru's average annual GDP growth rate between 2002 and 2013 was 6.1%, making it one of the fastest growing countries in Latin America. Structural reforms, a favourable external environment, and careful macroeconomic policies led to low inflation and high growth.<sup>65</sup> Peru's economy is supported by vast mineral resources making them the second largest producer of silver and copper in the world.<sup>66</sup> Metals and minerals account for 55% of Peru's total exports, which makes their economy vulnerable to fluctuations in world prices.<sup>67</sup> Declining global commodity prices between 2014 and 2017 have slowed Peru's GDP growth. In 2018, recovering domestic demand and commodity prices helped to raise GDP growth to around 4%, and growth is expected to remain around that level in the medium term.<sup>68</sup>

Since 2004, Peru has reduced its national poverty rate by over 35% through rapid expansion and various government programs. Distribution of income however remains one-sided and inequality continues to persist. Peru's policy focus is on strengthening their mining industry as a means to encourage economic growth and improve infrastructure to lessen inequality in the country.<sup>69</sup>

The Canada-Peru Free Trade Agreement (CPFTA) was entered into force in August 2009. The CPFTA was formed to increase bilateral trade and to re-engage relationships throughout the Americas.<sup>70</sup>

Peru is also a signatory of the CPTPP. However, they have not fully entered the agreement into force. Once implemented, Canada will benefit from preferential access to the Peruvian market. The CPTPP will also serve to compliment the CPFTA.<sup>71</sup>

## Ocean Economy

Peruvian seas have high biodiversity, which provides significant social and economic value to the country.<sup>72</sup> With major seaports in Callao, Matarani, and Paita, Peru had a recorded total of 95 merchant marine vessels, which includes 2 container ships, 13 oil tankers, and 80 “other” ships in 2018.<sup>73</sup> Peru also has 984 fishing fleet vessels, the majority of which are steel hull boats with an average storage capacity of 500 cubic meters.<sup>74</sup> Peru’s marine environment faces pressures from illegal fishing, over-exploitation, pollution, invasive species, the effects of a growing coastal population, and the impacts of climate change and El Niño.<sup>75</sup>

Peru is the world’s largest fishmeal producer, accounting for 18% of global production. Fishmeal is Peru’s fourth largest export, valued at US\$1.5 billion in 2018.<sup>76</sup> Peru’s fishmeal is predominantly made from anchoveta, which is heavily fished for fishmeal export rather than domestic fishmeal or human consumption. Overfishing has damaged Peru’s stock of anchoveta and efforts to better protect the stock through regulatory changes have not fully succeeded.<sup>77</sup> Peru’s anchoveta stock varies widely from year to year and requires constant monitoring.<sup>78</sup>

Peru has a burgeoning aquaculture industry, though the industry is currently fragmented. The Peruvian government is making efforts to facilitate industry growth. In early 2019, the government allocated PEN 221.5 million (CAD \$87.8 million) towards that goal. The funds are to be administered by Peru’s National Program for Innovation in Fisheries and Aquaculture (SNIPA). SNIPA has been successful in attracting entrepreneurial talent to aid Peruvian aquaculture. As of March 2019, there are 88 trout startups and 29 tilapia startups, as well as a few shrimp and scallop startups.<sup>79</sup>

Efforts to improve the Peruvian aquaculture industry are being made with special consideration for rainbow trout. As of September 2018, Peru established a partnership with the College of Agriculture and Life Sciences (CALs) to facilitate the development of three new projects that will aid the fisheries and aquaculture industry in Peru. Two projects will focus on marine fish native to Peru and the third will focus on rainbow trout cultivated at Lake Titicaca.<sup>80</sup> The Inter-American Development Bank Group’s (IDB) innovation laboratory is also funding a US\$2 million project to improve the aquaculture productivity at Lake Titicaca. Aquaculture tech start-up Umitron, with its Peruvian partner Abaco, will be overseeing the project. The partnership and funding will aim to combine the expertise of each organization in Internet-of-Things, AI, and satellite remote sensing with trout farming to reduce overfeeding and threat of harmful algae bloom. The funds will be used to calibrate the technology, train local producers, and scale up Umitron’s solution in the Lake Titicaca region.<sup>81</sup>

Outside of the fishing and aquaculture sectors, there has also been interest in renewable energy projects. Peru's efforts towards renewables are dominated by hydroelectric, onshore wind, and solar energy. Peru's potential for ocean energy is unknown, but the environment lends itself well to the potential growth of a marine renewable industry. Offshore wind, wave, tide, thermal gradients, ocean currents, biomass and salinity gradients are all potential sources for Peruvian marine energy. In 2015, a wave energy demonstration project was conducted in southern Peru, though the cost of production makes wave energy currently economically unviable. Going forward, feasibility studies to examine potential opportunities will need to be conducted in Peru to help grow renewables energy capacity.<sup>82</sup>

## Oil and Gas Sector

Ernst & Young estimated that between 2018 and 2019 approximately US\$4 billion would be invested in Peru's hydrocarbons industry.<sup>83</sup> Peru has 18 sedimentary basins with hydrocarbon exploration potential, 10 of which are located in the continental zone (in the coast and jungles) and 8 located offshore. Only 3 basins have been exploited so far, meaning that there is significant exploration potential in Peru.<sup>84</sup>

Peru's national oil company, Petroperu, was allowed to resume its involvement in exploration and production activities in 2006. In 2014, Petroperu took the first step to following through on this by associating with a private company planning on exploring and producing hydrocarbons. In 2017, Petroperu began modernizing and reorganizing its internal structure.<sup>85</sup> In the coming years, Petroperu is planning to carry out oil bidding rounds on several onshore and offshore blocks.<sup>86</sup>

Tullow Oil, a multinational based in the UK, agreed to acquire a 100% stake in five Peruvian offshore blocks in 2018. However, the government revoked these contracts later that year when a new President stepped into power, claiming that the Energy & Mines industry felt that the public had not been adequately consulted.<sup>87</sup> In June 2019, Tullow was able to acquire one licence.<sup>88</sup> Tullow expects to drill an exploration well in 2020 in the Tumbes basin 30 km offshore northern Peru. The company is also looking to gain entry on four other Peruvian licences.<sup>89</sup>

## Seismic Monitoring

According to the ThinkHazard! System Peru is at high risk for tsunamis, meaning that there is more than a 20% chance of a potentially damaging tsunami occurring in the next 50 years. This risk is high across all coastal regions of Peru.<sup>90</sup>

The Peruvian Navy is involved in tsunami monitoring and alerts, primarily through the Directorate of Hydrography and Navigation. They operate the National Tsunami Warning Center (Centro Nacional De Alerta De Tsunamis, CNAT). CNAT's mission is to investigate, analyze and monitor seismic events at sea or near the coast and alert the Civil Defense Institute.<sup>91</sup>

# Research and Development Funding

In 2016, Peru spent an estimated PEN 777.7 million (CAD\$307.1 million) on research and development (R&D) across all industries.<sup>92</sup> As a percentage of GDP, Peru's R&D accounted for 0.120% in 2016. While this was much lower than the 0.760% average in Latin America & the Caribbean, it was up significantly from 2012 when it was only 0.055% of GDP.<sup>93</sup>

Peru has robust legislation around science, technology, and innovation issues. Under the 2004 Framework Law for Science, Technology and Technological Innovation, the National System of Science, Technology and Technological Innovation (Sistema Nacional de Ciencia, Tecnología e Innovación Tecnológica, SINACYT) was defined. The Framework also designated the National Council for Science, Technology and Technological Innovation (Consejo Nacional de Ciencia, Tecnología e Innovación Tecnológica, CONCYTEC) as the directing body of SINACYT. The Framework established the National Fund for Scientific, Technological, and Technological Innovation Development (Fondo Nacional de Desarrollo Científico Tecnológico y de Innovación Tecnológica, FONDECYT). In 2016, Peru's National Policy set six strategic objectives around improving science and technology innovation in Peru, including stimulating and increasing SINACYT activities. Innovation, and the funding required to support it, has become more of a priority for the Peruvian government in recent years. Notably, however, in a poll conducted between 2012 and 2014, only 4% of private firms in Peru received government funding support for innovation. The majority relied on their own financing or private commercial bank funding.<sup>94</sup>

## Ocean Research Organizations

### Academic

[Universidad Científica del Sur \(UCSUR\)](#) is a university located in Lima. They offer courses in marine biology and aquaculture engineering, and award grants for research in marine biology. They have a [marine ecosystem research unit](#), created in collaboration with SERNANP and the World Bank. UCSUR also has a laboratory of research and marine crops that aims to develop species of commercial interest such as mollusks, crustaceans, marine fish, and others.

[Universidad Nacional Federico Villareal \(UNFV\)](#) is a Peruvian public university with a research unit dedicated to the promotion, coordination, and development of research within the Faculty of Oceanography, Fisheries, Food Sciences and Aquaculture. Its mandate is to develop scientific and technological production as well as to provide support to researchers in the form of higher learning resources and advanced training.

## Government

[Dirección de Hidrografía y Navegación \(The Peruvian Navy Directorate of Hydrography and Navigation\)](#) is the part of the Peruvian Navy tasked with administering, operating and researching activities related to environmental sciences in the aquatic environment, in order to contribute to national development, provide support and safety in navigation to Naval Units and seafarers in general. The Directorate has several departments, which carry out tasks from collection of oceanographic data to operating a tsunami warning center.

[Ministerio de la Producción \(PRODUCE\)](#) has responsibility over all fisheries and aquaculture activities, as well as oversight over the formulation, approval, and supervision of all policies.

[Instituto del Mar del Perú \(IMARPE\)](#) is the government agency under PRODUCE which is responsible for scientific and technical research. IMARPE is responsible for monitoring the pelagic resources off the Peruvian coast and monitors school conditions and size through satellite imagery and research vessels expeditions.

[Instituto Tecnológico de la Producción \(ITP\)](#) is a government agency operating under PRODUCE with an interest in supporting the improvement of the productivity, quality, and profitability of companies through the provision of environmentally sustainable and accessible research, development, innovation, adaptation, transformation and technology transfer services.

[Fondo Desarrollo Pesquero](#) is a government agency operating under PRODUCE which is in charge of providing technical and financial support to the artisanal fishing sector.

[Petroperu](#) is a company owned by the Peruvian state under private law, dedicated to the transportation, refining, distribution and sale of fuel and other products derived from oil. It was recently authorized to resume exploration and production activities.

[Peru-Korea Joint Ocean Research Center \(KOPE-LAR\)](#) is a marine science and technology cooperation organization between Korea and Peru. Their main objectives are to promote and support marine science and technology cooperation activities between Korea and Latin America, and to support the discovery and conduct of joint marine science and technology research between Korea and Latin America.

[The South Pacific Regional Fisheries Management Organization \(SPRFMO\)](#) is an intergovernmental organization formed for the purpose of addressing the gap between member countries in conservation and international management of non-migratory fisheries and the protection of biodiversity in the marine environment in the high seas of the South Pacific Ocean. Currently, 15 countries have joined the SPRFMO Commission, one of which is Peru. The SPRFMO has carried out research pertaining to the topics stated above and regularly holds meetings to discuss the findings.

## Private

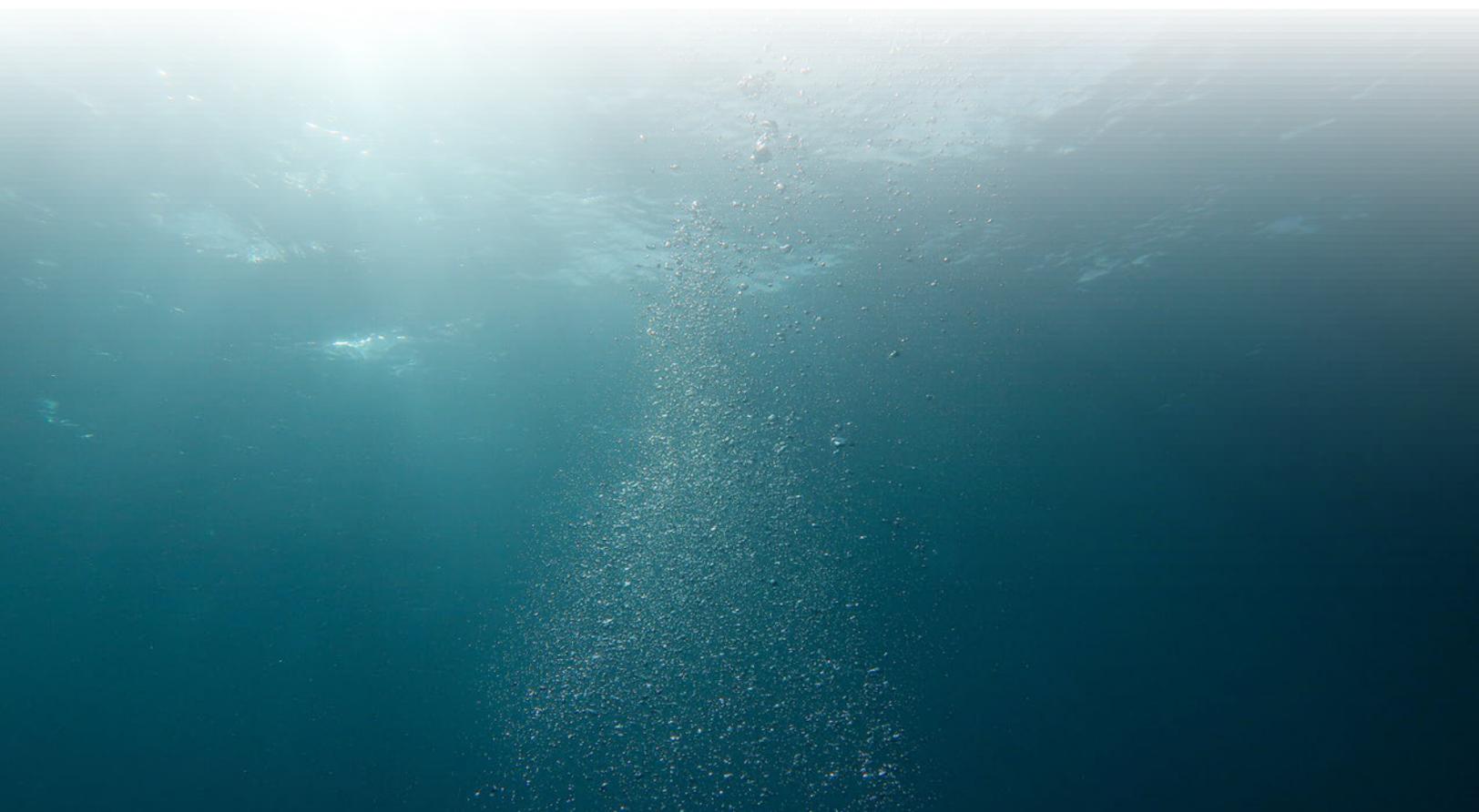
[Areas Costeras y Recursos Marinos \(ACOREMA\)](#) is a non-profit organization dedicated to coastal and marine conservation efforts, through research and conservation of marine biodiversity and by raising public awareness of issues such as species endangerment.

[Organization for Research and Conservation of Aquatic Animals \(ORCA\)](#) is a privately-owned non-profit organization based in Lima, dedicated to researching and preserving marine wildlife, namely sea-lions, dolphins, marine otters, whales, sea turtles, and penguins.

[ProDelphinus](#) is a non-profit organization based in Lima, dedicated to the conservation of threatened and endangered marine wildlife. It also conducts research projects on the conservation of these endangered species, specifically on the interactions between different marine fauna and Peruvian fisheries.

[TASA](#) is a Peruvian company in the fishing sector which produces marine food and ingredients, namely fishmeal and fish oil. TASA has a mandate to practice sustainable fishing and runs many innovation programs designed to improve their business processes.

[Tullow Oil](#) is a UK-based multinational company that holds an offshore oil exploration and development licence in Peru and has interest in acquiring four other offshore licences.





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# Sources

- 1 CIA, 2019. [The World Factbook - Brazil](#)
- 2 CIA, 2019. [The World Factbook - Brazil](#)
- 3 The World Bank, n.d. [GDP growth annual % - Brazil](#). Accessed 5/6/19
- 4 OECD, n.d. [Real GDP forecast](#). Accessed 9/23/19
- 5 CIA, 2019. [The World Factbook - Brazil](#)
- 6 Third World Quarterly, 2018. [Industrial policy and state-making: Brazil's attempt](#). Pg. 3
- 7 Standing Committee on International Trade, 2018. [Canada and the Mercosur Countries: a Potential Agreement to Advance Trade Relations](#)
- 8 Brazil.gov, 2018. [Brazil's trade surplus with Mercosur reaches US\\$ 87.6 bn in ten years](#)
- 9 Frontiers in Marine Science, 2018. [Healing Brazil's Blue Amazon: The Role of Knowledge Networks in Nurturing Cross-Scale Transformations at the Frontlines of Ocean Sustainability](#)
- 10 CIA, 2019. [The World Factbook - Brazil](#)
- 11 Canadian Trade Commissioner Service, 2011. [Canada-Brazil Joint Committee for Cooperation on Science, Technology and Innovation](#)
- 12 To be Canada Inc, 2011. [A Study to Identify Key Sectors of Opportunity for Atlantic Canadian Firms in Brazil](#). Pg. 70
- 13 EIA, 2019. [Background Reference: Brazil](#). Pg. 3-4
- 14 Third World Quarterly, 2018. [Industrial policy and state-making: Brazil's attempt](#). Pg. 3, 7
- 15 Third World Quarterly, 2018. [Industrial policy and state-making: Brazil's attempt](#). Pg. 8
- 16 Third World Quarterly, 2018. [Industrial policy and state-making: Brazil's attempt](#). Pg. 14
- 17 EIA, 2019. [Background Reference: Brazil](#). Pg. 4-5
- 18 Export.gov, 2017. [Recent Changes to Brazil's Oil & Gas Sector](#)
- 19 Third World Quarterly, 2018. [Industrial policy and state-making: Brazil's attempt](#). Pg. 8
- 20 Export.gov, 2017. [Recent Changes to Brazil's Oil & Gas Sector](#)
- 21 ThinkHazard!, n.d. [Brazil - Tsunami](#). Accessed 9/10/19
- 22 Seismological Research Letters, 2018. Volume 89, Number 2A. [The Brazilian Seismographic Network \(RSBR\): Improving Seismic Monitoring in Brazil](#). Pg. 1

- 23 Seismological Research Letters, 2018. Volume 89, Number 2A. [The Brazilian Seismographic Network \(RSBR\): Improving Seismic Monitoring in Brazil](#). Pg. 3-4
- 24 RSBR, n.d. [Homepage](#). Accessed 9/10/2019
- 25 Seismological Research Letters, 2018. Volume 89, Number 2A. [The Brazilian Seismographic Network \(RSBR\): Improving Seismic Monitoring in Brazil](#). Pg. 5
- 26 ThinkHazard!, n.d. [Brazil - Tsunami](#). Accessed 9/10/19
- 27 UNESCO, 2019. [Data - Science, Technology and Innovation: GERD by sector of performance](#). Accessed 9/24/19
- 28 The World Bank, n.d. [Research and development expenditure \(% of GDP\)](#). Accessed 5/17/19
- 29 The World Bank, n.d. [Research and development expenditure \(% of GDP\)](#). Accessed 5/17/19
- 30 The World Bank, 2019. [Overview - Brazil](#)
- 31 UNESCO, 2017. [Global Ocean Science Report](#). Pg. 20
- 32 UNESCO, 2017. [Global Ocean Science Report](#). Pg. 97
- 33 UNESCO, 2017. [Global Ocean Science Report](#). Pg. 80
- 34 To be Canada Inc, 2011. [A Study to Identify Key Sectors of Opportunity for Atlantic Canadian Firms in Brazil](#). Pg. 68
- 35 Correspondence with Trade Commissioner to Brazil, Nadine Lopes. Received 6/7/19
- 36 Correspondence with Trade Commissioner to Brazil, Nadine Lopes. Received 6/7/19
- 37 Shell, 2018. [Shell Adds Material Acreage to its Deep-Water Position in Brazil](#)
- 38 CIA, 2019. [The World Factbook - Chile](#)
- 39 CIA, 2019. [The World Factbook - Chile](#)
- 40 OECD, n.d. [Real GDP Forecast](#). Accessed 9/23/19
- 41 Export.gov, 2018. [Chile - Trade Agreements](#)
- 42 Government of Canada, 2019. [CCFTA](#)
- 43 CIA, 2019. [The World Factbook - Chile](#)
- 44 Government of Canada, 2019. [CPTPP](#)
- 45 CIA, 2019. [The World Factbook - Chile](#)
- 46 FAO, 2005. [National Aquaculture Sector Overview - Chile](#)
- 47 MIKE, 2019. [Ensuring Sustainable Aquaculture in Chile](#)
- 48 Reviews in Aquaculture, 2019. [Environmental Issues in Chilean Salmon Farming: A Review](#)

- 49 Seafood Source, 2018. [Sernapesca Director Steps Down Amid Regulatory Reforms in Chile](#)
- 50 Hatchery International, 2019. [Chile's Aquaculture Research Institution AquaPacífico has Launched a New Innovation Centre that will Oversee the Development of More Than 17 Commercial Species in a bid to Diversify the Country's Aquaculture Industry](#)
- 51 CONA, 2010. [Plan Oceanográfico Nacional](#). Pg. 7-9
- 52 SHOA, n.d. [Servicio Hidrográfico y Oceanográfico de la Armada](#). Accessed 6/13/19
- 53 OECD, n.d. [Chile: Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels](#). Pg. 1. Accessed 9/23/19
- 54 CIA, 2019. [The World Factbook - Chile](#)
- 55 OECD, n.d. [Chile: Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels](#). Pg. 1. Accessed 9/23/19
- 56 ThinkHazard!, n.d. [Chile - Tsunami](#). Accessed 9/23/19
- 57 EENA, 2018. [Public Warning in Chile - Resilient Culture](#). Pg. 5
- 58 EENA, 2018. [Public Warning in Chile - Resilient Culture](#). Pg. 16
- 59 UNESCO, 2019. [Data - Science, Technology and Innovation: GERD by sector of performance](#). Accessed 9/24/19
- 60 The World Bank, n.d. [Research and Development Expenditure \(% of GDP\)](#). Accessed 5/17/19
- 61 UNESCO, 2017. [Global Ocean Science Report](#). Pg. 82
- 62 Sciencemag, 2018. [Chile, keen to become a knowledge society, creates a ministry of science](#)
- 63 Santiago Times, 2018. [Meet Andrés Couve Correa - Chile's first Minister of Science, Technology and Innovation](#)
- 64 Sciencemag, 2018. [Chile, keen to become a knowledge society, creates a ministry of science](#)
- 65 The World Bank, 2019. [The World Bank in Peru](#). Accessed 9/25/19
- 66 Andina, 2019. [Peru remains second largest producer of copper, silver and zinc worldwide](#)
- 67 CIA, 2019. [The World Factbook - Peru](#)
- 68 The World Bank, 2019. [The World Bank in Peru](#). Accessed 9/25/19
- 69 CIA, 2019. [The World Factbook - Peru](#)
- 70 Government of Canada, 2016. [Canada-Peru Free Trade Agreement](#)
- 71 Government of Canada, 2016. [CPTPP Partner: Peru](#)

- 72 Environ Dev Sustain, 2019. [Charting the course for a blue economy in Peru: a research agenda](#). Pg. 7
- 73 CIA, 2019. [The World Factbook - Peru](#)
- 74 US Department of Agriculture, 2019. [GAIN Report: 2/26/2019 Peru - Oilseeds and Products Annual](#). Pg. 3
- 75 Environ Dev Sustain, 2019. [Charting the course for a blue economy in Peru: a research agenda](#). Pg. 6
- 76 US Department of Agriculture, 2019. [GAIN Report: 2/26/2019 Peru - Oilseeds and Products Annual](#). Pg. 4
- 77 US Department of Agriculture, 2019. [GAIN Report: 2/26/2019 Peru - Oilseeds and Products Annual](#). Pg. 3
- 78 The World Bank, 2017. [In Peru, Fishing Less Anchoveta Pays Off](#)
- 79 Undercurrent News, 2019. [Peru Seeks to Unleash Huge Aquaculture Potential with Government Plan](#).
- 80 NC State University, 2018. [Peru Partnership Focuses on Aquaculture, Fisheries](#).
- 81 Garage, 2018. [Aquaculture Tech Startup Umitron Snags US\\$2M Funding for Peru Project](#).
- 82 Environ Dev Sustain, 2019. [Charting the course for a blue economy in Peru: a research agenda](#). Pg. 13-14
- 83 EY, 2018. [Peru's Oil & Gas Investment Guide 2018/2019](#). Pg. 66
- 84 EY, 2018. [Peru's Oil & Gas Investment Guide 2018/2019](#). Pg. 74
- 85 EY, 2018. [Peru's Oil & Gas Investment Guide 2018/2019](#). Pg. 74-75
- 86 EY, 2018. [Peru's Oil & Gas Investment Guide 2018/2019](#). Pg. 120
- 87 World Oil, 2018. [Peru repeals Tullow Oil laws signed as Kuczynski quit presidency](#)
- 88 Tullow Oil, 2019. [Peru](#)
- 89 Offshore Mag, 2019. [Tullow lines up wells offshore Peru, Suriname](#)
- 90 ThinkHazard!, n.d. [Peru - Tsunami](#). Accessed 9/26/19
- 91 Peru Directorate of Hydrography and Navigation, n.d. [National Tsunami Warning Center](#). Accessed 9/26/19
- 92 UNESCO, 2019. [Data - Science, Technology and Innovation: GERD by sector of performance](#). Accessed 9/24/19
- 93 The World Bank, n.d. [Research and Development Expenditure \(% of GDP\)](#). Accessed 5/17/19
- 94 Oxford Business Group, 2017. [Government bodies promote innovation in Peru](#)



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