

COUNTRY ANALYSIS BRIEFS

Chile

Last Updated: September 2005

Background

Chile has limited indigenous energy resources and relies on imports to meet its rapidly growing energy demand.

Chile has one of South America's most robust and open economies. The country is an associate member of the Common Market of the Southern Cone (MERCOSUR) and full member of the Asia-Pacific Economic Cooperation (APEC) organization. Chile is a member of a number of free trade agreements (FTAs) with various countries, such as Canada, Mexico, South Korea, the United States, and the European Union. The FTA with the United States entered into force in January 2004, and will lead to full trade liberalization within 12 years.



In 2004, Chile's real gross domestic product (GDP) grew by 5.8 percent, an increase from the 3.3 percent growth experienced in 2003. Booming prices for Chile's mineral exports, especially copper, were the principle drivers of the higher growth rate; the country's economy is highly dependent on international trade, with exports amounting to 29 percent of GDP in 2003. State-owned copper mining firm Codelco (Corporacion Nacional del Cobre de Chile) is the world's largest copper-producing company. While copper and other minerals remain the mainstays of Chile's exports, trade of other non-traditional products, such as forestry products, fresh fruit and seafood, have grown considerably over the past two decades.

Chile has limited indigenous energy resources, with the exception of hydropower. As a result, the country must import the bulk of its energy needs. Chile's growing reliance on energy imports, particularly on natural gas, has not been without consequences. In April 2004, Argentina began restricting natural gas exports to Chile, with cuts reaching nearly 50 percent of contracted volumes on some days. Chile, in turn, began to reconsider its energy policy, which, prior to the import restrictions, had assumed an increased use of natural gas and power imports from Argentina. Most importantly, Chile has begun to pursue other sources of natural gas, such as liquefied natural gas (LNG) or piped

gas from other countries.

Oil

Chile has limited oil reserves and production.

According to the *Oil and Gas Journal (OGJ)*, Chile had 150 million barrels of proven crude oil reserves in 2005. As a result, the country's oil production is limited, reaching 18,400 barrels per day (bbl/d) in 2004. In contrast, Chile consumed 225,000 bbl/d of oil in 2004. The country's main source of oil imports is Argentina, followed by Brazil, Angola, and Nigeria.

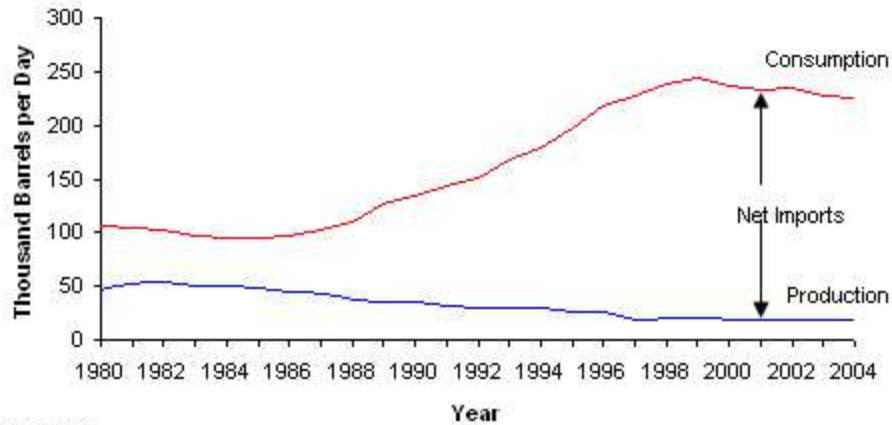
Sector Organization

State-owned Empresa Nacional del Petroleo (ENAP) controls Chile's oil sector. The company is the sole producer and refiner in the country. In 1990, ENAP formed an international subsidiary, Sipetrol, to seek foreign production that could offset declining domestic fields. Sipetrol has pursued investments in places such as Argentina, Colombia, Ecuador, and Egypt. The Comision Nacional de Energia (CNE) has principle regulatory oversight of the oil sector.

Exploration and Production

Chile's Magallanes basin is the sole oil-producing region in the country. ENAP has developed 23 fields in the basin, the largest being the Costa Auera. Overall, oil production in Chile is in decline, as existing wells have matured and exploration efforts elsewhere have proven unsuccessful.

**Chile's Oil Production and Consumption
1980-2004**



Source: EIA

Pipelines

Sonacol operates Chile's domestic oil transport network. The company operates 290 miles of crude oil and product pipelines, which link Chile's oil fields to its refineries and population centers. Sonacol also operates a fleet of oil tankers. Chile has two crude oil import pipelines. The 270-mile, 115,000-bbl/d Trasandino, linking Chile with Argentina, and the Arica-Sica, linking Chile with Bolivia.

Downstream

According to *OGJ*, Chile has 226,800 bbl/d of crude oil refining capacity. The country has three facilities, all operated by ENAP. The largest is the 113,400-bbl/d BioBio refinery, located north of Santiago.

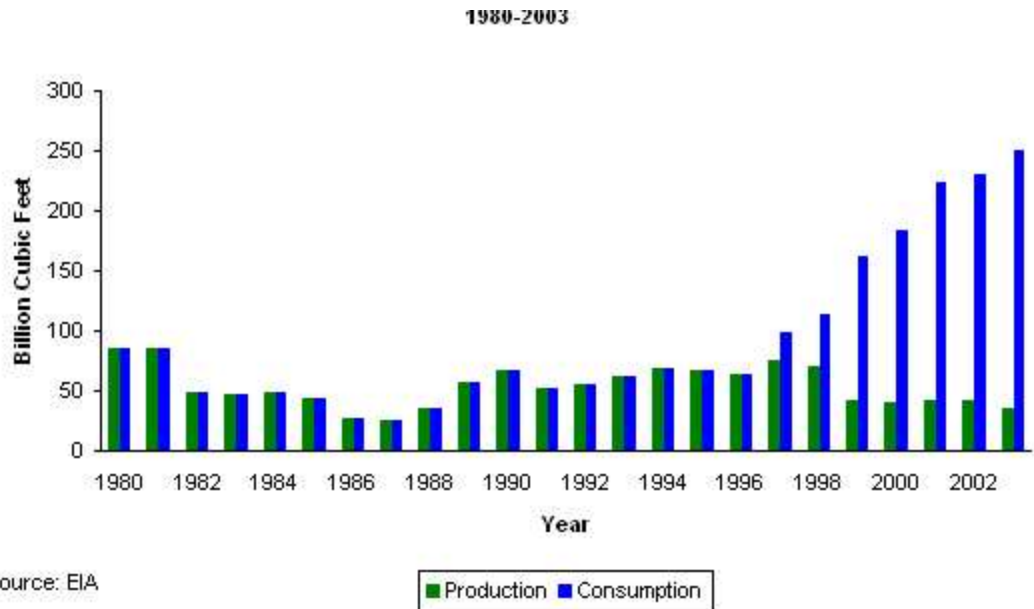
ENAP has recently invested in expanding the capacity of its refineries. In June 2004, it signed a deal with partners Tecnicas Reunidas (Spain) and Germany's Ferrostaal Group to build a \$110 million mild hydrocracker at its BioBio refinery to produce low-sulfur diesel fuel. In June 2005, ENAP announced that it would build a \$430 million delayed coker plant at its Aconcagua refinery, with planned start-up in 2008.

Natural Gas

Chile depends upon imports for almost all of its natural gas needs.

OGJ reported that Chile had 3.5 trillion cubic feet (Tcf) of proven natural gas reserves in 2005. The country has little domestic production, which was 35.3 billion cubic feet (Bcf) in 2003. ENAP controls all natural gas production in Chile, which occurs mostly in the Magallanes basin. Chile has vigorously explored the country for natural gas reserves, but has so far not met with any significant success.

Chile's Natural Gas Production and Consumption



Despite its lack of domestic reserves, Chile's natural gas consumption has ballooned in recent years. Historically, low domestic production constrained consumption, with natural gas only constituting 8 percent of total energy consumption (TEC) in 1996. A combination of increasing energy demand, environmental concerns, and the unreliability of hydropower prompted the Chilean government to re-consider its energy policy and encourage the use of natural gas. To that end, Chile began large-scale imports of natural gas for the first time in 1997; since then, the country's natural gas consumption has increased by an average of 21.7 percent a year, reaching 249.3 Bcf and 23.7 percent of TEC in 2003.

Pipelines

Domestic System

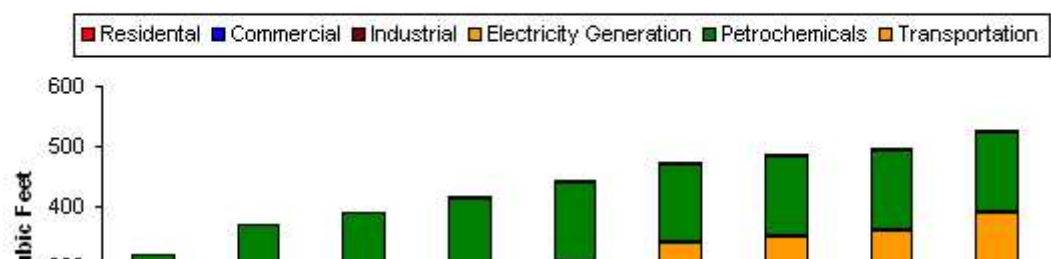
ENAP operates a network of natural gas pipelines that connect production fields in the Magallanes basin to major consumption center.

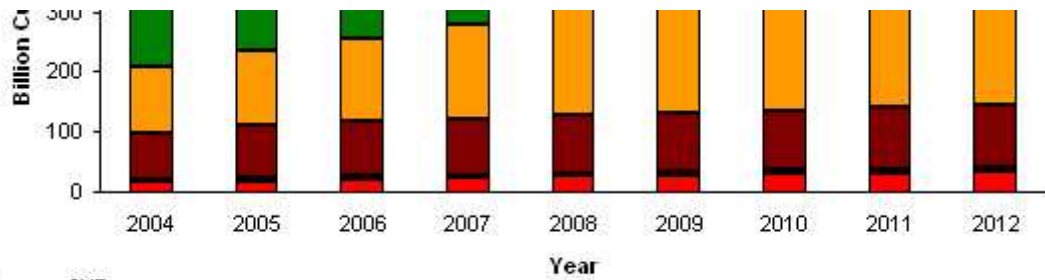
Import Pipelines

Seven pipelines, all built in the late 1990s, link Argentina with Chile. Three in the south; Tierra del Fuego, El Condor-Posesion, and Patagonia supply methanol plants operated by Methanex, the world's largest methanol producer. Methanex exports most of the methanol produced here to North America and Asia. Proximity to natural gas reserves in southern Chile and adjacent Argentina, high-quality port facilities, and a favorable investment climate have encouraged the creation of a methanol hub in the area. However, the Methanex plants were impacted by the natural gas supply disruption from Argentina, forcing some plants to shutdown or reduce runs.

In the north, the GasAtacama pipeline runs from Cornejo, Argentina to Mejillones, Chile. Owned by Endesa and U.S.-based CMS, the 578-mile GasAtacama supplies 300 million cubic feet per day (Mmcf/d) to the companies' Nopel power plant. Also in the north, the 250-Mmcf/d NorAndino, operated by Belgium's Tractebel, runs parallel to GasAtacama. In the central region, the 288-mile, 307-Mmcf/d GasAndes pipeline, majority owned by TotalFinaElf, connects the Neuquen basin in Argentina to Santiago, Chile. Also in the central region, the 330-mile, 343-Mmcf/d Gasoducto del Pacifico connects Neuquen to central Chile. Majority owned by TransCanada (30%), El Paso (21%), and Gasco (20%), Gasoducto del Pacifico supplies municipal distributors and gas-fired power plants.

**Chile's Projected Natural Gas Consumption, by Sector
2004-2012**





Source: CNE

Disruptions in Argentine Supplies

In recent years, repeated disruptions in the flow of natural gas from Argentina to Chile have strained relations between the two countries. In 2004, Argentina suffered an energy crisis, forcing it to cut natural gas exports to Chile. Since then, exports to Chile have fluctuated between 20-50 percent below contracted volumes, with natural gas flows ceasing completely on some occasions. The import cuts have caused shutdowns at power plants and methanol facilities, as well as forcing consumers to switch to costlier fuels. Continuing structural difficulties in [Argentina's natural gas sector](#) could lead to supply problems in the future.

Proposed Pipelines

In light of the disruption of supplies from Argentina, Chile has pursued alternative sources of natural gas imports. Along with liquefied natural gas (see below), additional natural gas import pipelines are possible. In June 2005, Suez Energy International, a subsidiary of Belgium's Tractebel, began a formal feasibility study for a pipeline linking Peru's Camisea natural gas project with northern Chile. The project would feature a 930-mile pipeline system between Pisco, Peru and Tocopilla, Chile, with installed capacity of 810 Mmcf/d. In addition, the pipeline would have connects to the GasAtacama and NorAndio, allowing potential exports to Argentina, if future conditions permitted.

This pipeline is part of the natural gas "ring" proposed by Peru, Chile, Argentina, Uruguay, and Brazil. The ring would utilize new and existing pipelines to link natural gas reserves in those countries, facilitating greater energy integration in the Southern Cone. The ring would also reduce the dependence of some countries, notably Brazil, upon Bolivian natural gas production, which has become unreliable in recent years due to political controversy in that country.

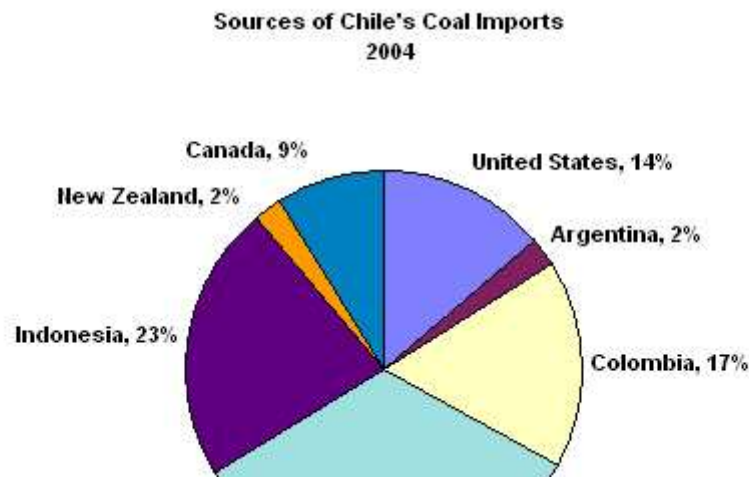
Liquefied Natural Gas (LNG)

As mentioned above, Chile has begun to pursue LNG as a means to diversify its natural gas supply away from Argentina. In July 2005, ENAP launched an international tender for the construction of an LNG receiving terminal near Quinteros, in central Chile. At the same time, ENAP signed agreements with Chile's four largest natural gas consumers, in which they pledged to purchase natural gas supplied by the LNG terminal. The Chilean government has held discussions with numerous potential suppliers for the LNG terminal, including Indonesia, Australia, and Peru.

Coal

Most of Chile's coal consumption is for electricity generation.

Chile has recoverable coal reserves of 1,300 million short tons (Mmst). In 2003, the country consumed 4.4 Mmst while producing 0.5 Mmst. Domestic coal production is located in the Lota/Coronel area and in the extreme south on Tierra del Fuego. The country has two mines, operated by Empresa Nacional del Carbón (Enacar) and La Compañía Carbonífera San Pedro de Catamutún (CCSPC), respectively.





Australia, 33%

Source: CNE

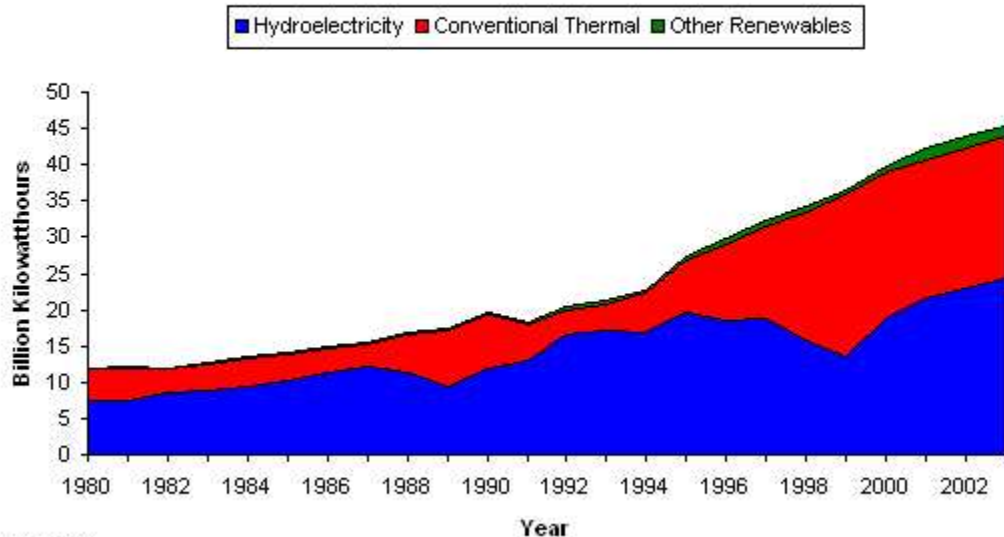
The level of coal consumption has tended to fluctuate, as the power sector, the country's largest coal consumer, uses the fuel largely as a back up to hydropower. In 2004, most imports came from Australia, followed by Indonesia and Colombia.

Electricity

The majority of Chile electricity supply comes from hydroelectricity, though the importance of conventional thermal sources is increasing.

In 2003, Chile had total installed electricity generating capacity of 10.5 gigawatts. The country produced 45.3 billion kilowatthours (Bkwh) of electricity in 2003, while consuming 44.1 Bkwh. Hydroelectricity supplies the largest share of Chile's electricity supply, contributing 53 percent in 2003, followed by 43 percent from conventional thermal sources. However, the contribution of conventional thermal sources has grown rapidly since the start of natural gas imports from Argentina in the late 1990s.

**Chile's Electricity Generation, by Source
1980-2003**



Source: EIA

Sector Organization

Chile privatized its electricity sector in the 1980s, and all generation, transmission, and distribution activities are now in private hands. CNE is mostly responsible for government regulation of Chile's electricity sector, along with the Ministry of Economy and Energy (MEE).

Chile has four separate electric systems: the Sistema Interconectado Central (SIC), which serves the central part of the country; the Sistema Interconectado del Norte Grande (SING), which serves the desert mining regions in the north; and the Aysen and Magallanes systems, which serve small areas of the extreme southern part of the country. The systems are mostly autonomous, as long distances between the four make integration difficult.

Transelec, majority-owned by Canada's Hydro Quebec, controls almost the entire national transmission grid that serves the four systems.

Of the four electricity systems, the largest is the SIC, which covers the major population centers surrounding Santiago and serves over 90 percent of all electricity customers. In the SIC, the most important player is Enersis, majority owned by Spain's Endesa. Enersis holds controlling stakes of both the largest generating company, Endesa, and the largest distribution company, Chilectra, in the SIC.

Unlike the large number of household consumers in the SIC, the SING serves mostly large industrial customers, principally mining interests, in Chile's northern regions. Also unlike the SIC, the large majority of the electricity supply of the SING comes from thermal sources, chiefly imported natural gas from Argentina. The largest generating company in the SING is Electroandina, owned by Tractebel and Codelco.

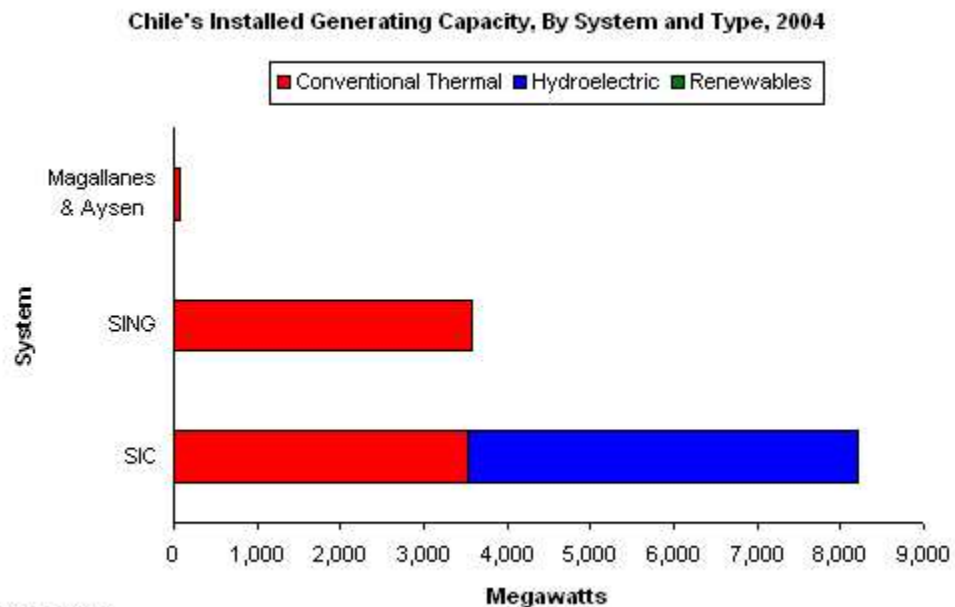
Hydroelectricity

Hydropower has historically been Chile's single largest power source. Droughts, however, have periodically curtailed hydropower production, causing supply shortfalls and blackouts. In response, the Chilean government began in the 1990s to diversify its energy mix to become less reliant on hydropower, mainly by building natural gas-fired power plants.

After being delayed for several years by opposition from local residents and environmental activists, Endesa's Ralco hydropower plant on the Biobio River began operations in September 2004. Ralco is the largest power plant in Chile, with generating capacity of 570 megawatts (MW). In December 2004, Chile's environmental agency approved plans by Endesa to expand Ralco's capacity to 690-MW.

The Argentine gas crisis has revitalized other Chilean hydropower projects. Chilean power generator

Colbun announced in November 2004 that it would proceed with construction of the 70-MW Quilleco hydroelectric plant on the Rio Laja; Colbun originally received regulatory approval for the \$80 million project in 1999. Endesa announced in June 2005 that it would proceed with its planned 32-MW Palmucho plant, which will work in conjunction with the company's Ralco facility. Australia's Pacific Hydro and Norway's SN Power Invest are developing the 155-MW La Higuera hydroelectric plant on the Tinguiririca River. Originally scheduled for completion in 2008, the project has stalled because Pacific Hydro has been acquired by another firm that plans to re-evaluate Pacific Hydro's international commitments. However, the project has signed an agreement with Brazil's Queiroz Galvao to build the facility and two long-term contracts with Chilean power distributors to purchase the project's output.



Conventional Thermal

Conventional thermal sources, especially natural gas-fired, have become increasingly important to Chile's electricity supply as a way to reduce susceptibility to hydroelectricity's seasonal fluctuations. In the SIC, conventional thermal sources constitute 43 percent of total electricity supply, while in the SING they constitute over 99 percent of the supply.

There are numerous large-scale power projects in the development pipeline for Chile. Colbun is currently building the 250-MW Candelaria combined-cycle, gas-fired turbine (CCGFT). Endesa plans to complete a 370-MW CCGFT at its existing San Isidro plant, near Santiago. In August 2005, Endesa placed an order with Mitsubishi Heavy Industries to provide the CCGFT for the project. Some planned projects, though, have been delayed. AES Gener, a subsidiary of US-based AES Corp, sought regulatory approval in early 2005 for its 740-MW Totihue CCGFT south of Santiago; however, a combination of local opposition to the plant and uncertainty about future natural gas supplies have caused the company to delay the project for the foreseeable future. Innergy Holdings, a Chilean gas distributor, planned to develop the 390-MW Campanario plant in southern Chile; while the project received regulatory approval in 2003, the company has not yet committed to completing the project due to a lack of interest from outside investors.

Due to the Argentine natural gas crisis, Chile has been reevaluating proposed natural gas projects. In the near term, it appears that a lack of a secure natural gas supply will affect many of these projects, such as the Totihue and Campanario plants. In response, many new power plant projects in Chile are designed to use a variety of alternative fuels, such as fuel oil or diesel. Another alternative would be natural gas sourced from Chile's planned LNG import terminal; indeed, Endesa agreed in 2005 to supply its San Isidro expansion from the LNG terminal.

Other Renewables

Other renewables contribute a small portion of Chile's total electricity supply. There has been heightened interest recently in Chile's geothermal potential. Geotermica del Norte, a consortium of ENAP and Codelco, began surveying the country in 2001. In 2005, ENAP signed an agreement with Italy's ENEL to develop a 300-MW geothermal facility in southern Chile.

Environment

Both the energy and carbon dioxide intensities of the Chilean economy are near the regional average.

Chile consumed 1.1 quadrillion British thermal units (Btu) of total energy in 2003. The country's growing economy has caused total energy consumption to rise by an average annual rate of 6.6 percent since 1980, but the country's total energy intensity of 7,200 Btu per dollar of GDP is still near the average for the region. Chile's dependence upon hydroelectricity and natural gas as energy sources has tended to keep carbon dioxide emissions low, with the carbon dioxide intensity of the country's economy near the regional average.

The primary environmental threats to Chile are air pollution from vehicle and industrial emissions, water pollution from untreated industrial sewage, deforestation and soil erosion. Air pollution in Santiago is the most obvious and severe environmental problem in Chile. Mitigating threats to the environment, however, is the increasing use of alternative fuels in Chile's industrial and energy sectors. Reliance on natural gas and hydroelectric generation to power the country has kept total carbon dioxide emissions in check over the past decade.

Click [here](#) to view the full environmental report.

Profile

Country Overview

Location	Southern South America, bordering the South Pacific Ocean, between Argentina and Peru
Population (2005E)	15,980,912
Languages	Spanish
Religion	Roman Catholic 89%, Protestant 11%
Currency	Chilean peso (CLP)
Inflation Rate (2004E)	2.4%
Gross Domestic Product (GDP, 2004E)	purchasing power parity - \$169.1 billion
Real GDP Growth Rate (2004E)	5.8%
Exports (2004E)	\$29.2 billion f.o.b.
Imports (2004E)	\$22.5 billion f.o.b.

Energy Overview

Proven Oil Reserves (January 1, 2005E)	150 million barrels
Oil Production (2004E)	18,400 barrels per day, of which 30% was crude oil.
Oil Consumption (2004E)	225,000 barrels per day
Proven Natural Gas Reserves (January 1, 2005E)	3.5 trillion cubic feet
Natural Gas Production (2003E)	35.3 billion cubic feet
Natural Gas Consumption (2003E)	249.3 billion cubic feet
Recoverable Coal Reserves (2003E)	1,301.8 million short tons
Coal Production (2003E)	0.5 million short tons
Coal Consumption (2003E)	4.4 million short tons
Electricity Installed Capacity (2003E)	10.5 gigawatts
Electricity Production (2003E)	45.3 billion kilowatt hours
Electricity Consumption (2003E)	44.1 billion kilowatt hours
Total Energy Consumption (2003E)	1.1 quadrillion Btus*, of which Oil (42%), Natural Gas (23%), Hydroelectricity (22%), Coal (10%), Other Renewables (1%), Nuclear (0%)
Total Per Capita Energy Consumption (2003E)	69.8 million Btus
Energy Intensity (2003E)	7,208.2 Btu per \$1995-PPP**

Environmental Overview

Energy-Related Carbon Dioxide Emissions (2003E)	53.8 million metric tons, of which Oil (55%), Natural Gas (26%), Coal (19%)
Per-Capita, Energy-Related Carbon Dioxide Emissions (2003E)	3.4 metric tons
Carbon Dioxide Intensity (2003E)	0.4 Metric tons per thousand \$1995-PPP**

Oil and Gas Industry

Organization	Empresa Nacional de Petroleo (ENAP), state-owned oil and gas company; Comision Energia Nacional (CNE) principal energy regulation and planning
Major Ports	Santiago, Puerto Montt, Concepcion, Valparaiso
Major Oil and Gas Fields	Costa Auera, Posesion, Daniel Este-Dungeness, Skau, Spiteful,

Major Refineries (crude oil capacity, bbl/d) BioBio (113,400), Aconcagua (97,650), Gregorio (15,750)

* The total energy consumption statistic includes petroleum, dry natural gas, coal, net hydro, nuclear, geothermal, solar, wind, wood and waste electric power. The renewable energy consumption statistic is based on International Energy Agency (IEA) data and includes hydropower, solar, wind, tide, geothermal, solid biomass and animal products, biomass gas and liquids, industrial and municipal wastes. Sectoral shares of energy consumption and carbon emissions are also based on IEA data.

**GDP figures from OECD estimates based on purchasing power parity (PPP) exchange rates.

Links

EIA Links

[EIA - Energy Data on Chile](#)

U.S. Government

[CIA World Factbook - Chile](#)

[U.S. State Department's Consular Information Sheet - Chile](#)

[Library of Congress Country Study on Chile](#)

Foreign Government Agencies

[Comisión Chilena de Energía Nuclear](#)

[Comisión Nacional de Energía](#)

[Ministerio de Economía y Energía](#)

[Instituto Nacional de Estadísticas](#)

[Superintendencia de Electricidad y Combustibles](#)

Oil and Natural Gas

[ENAP](#)

[Energas](#)

Electricity

[AESGener](#)

[Arauco Generación](#)

[CELTA \(sub. of Endesa\)](#)

[Cenelca](#)

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[Luz Linares](#)

[Luz Parral](#)

[Norgener](#)

[Pacific Hydro](#)

[Pehuenche](#)

[PSEG](#)

[San Isidro](#)

[SES](#)

[Sociedad Austral de Electricidad S.A. \(SAESA\)](#)

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