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CHILE'S SECOND BIENNIAL UPDATE REPORT ON CLIMATE CHANGE

2016

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CHILE'S SECOND BIENNIAL UPDATE REPORT ON CLIMATE CHANGE

Chile´s Second Biennial Update Report

To the United Framework Convention on Climate Change

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Prologue

Chile presents its Second Biennial Update Report after the recently signed Paris Agreement. This climate agreement, the most important one in history, included a call for countries to send quality information about the conditions in which their institutions are functioning and how they are implementing climate action locally. Responding to this call, this report provides extensive, accurate, and up-to-date information on the progress of Chile in its recent climate activity, with a view to strengthening the implementation of the Paris Agreement itself, both within our borders, and internationally.

The information contained in this report covers actions taken in the country in the period running between the second half of 2014 to the first half of 2016, providing continuity to the results displayed in our First Biennial Update Report, presented to United Nations at the COP20 in December 2014. Just as Chile was the 4th country in the world to present its First Biennial Update Report, Chile will also present its Second Biennial Update Report in 2016, this time in the framework of the COP22 and following the two-year cycles agreed upon by the countries themselves. I also want to emphasize that Chile was one of the first countries to voluntarily submit its Biennial Report to the process of "International Consultation and Analysis" (ICA) receiving a congratulatory response in December 2015, being part of the first round of countries worldwide to participate in this process.

This time, Chile presents in detail one of the most important aspects of implementation in the international arena, that is, climate finance. In particular, this document includes the results of a systematic survey of public needs and support received in the climate area. The report of capacity building, technical assistance, and climate technology transfer has also been improved in the public and private sectors of our country.

The greenhouse gas emissions inventory deserves a special mention. In an unprecedented way, we have expanded both its sectorial coverage and timespan, by covering a reporting period between the years 1990 and 2013. But what makes us most proud is that the preparation of the inventory has consolidated joint work among various ministries, which have permanently made experts available within their own services to this country effort. We believe we have achieved greater cross-cutting collaboration in the construction and results of the inventory as a whole, as well as the sectorial inventories that compose it, facilitating the use of its results as an instrument to support sectorial policies of the ministries themselves.

As in previous versions, our Ministry's Department of Climate Change was responsible for coordinating the preparation of this report to the United Nations. This time, they had to double their efforts because, together with this Biennial Report, during 2016, Chile will also submit its Third National Communication to the United Nations Convention, an activity that was also headed by this department. I thank them and each one of the ministries, services, and focal points that contributed to the information needed to complete both reports. In any case, we believe that this effort is a major contribution that Chile makes towards the increasingly necessary and evident transparency and proactivity that we hope will progressively materialize internationally. Our challenge is for Chile to have public sectorial climate change policies, which permanently integrate the climate agenda with ongoing ministerial actions.

It is also time to thank the financial and technical support provided to Chile to prepare this report, especially to international cooperation projects, including the Global Environment Fund, the Low Emission Capacity Building Program, and the German Government's Information Matters project.

Chilean President, Michelle Bachelet, has especially highlighted the work of our country in the national and international climate arena. Her permanent presence in UN forums in which this issue was addressed, as well as her attendance, in an unprecedented manner for a President of our country, to the high-level segments in the COP20 and COP21, personally delivering Chile's First Biennial Report to the highest authorities of the Convention, demonstrates the commitment of our President with climate change issues. The President emphasized this when addressing the 70th Session of the United Nations General Assembly, and announced the main contents of Chile's Intended Nationally Determined Contribution: "The 2030 Climate Agenda is a shared horizon, now we must act."

Pablo Badenier Martínez
Chilean Minister of the Environment
Santiago de Chile, November 2016.

Executive Summary

Santiago, Cuadìo Padilla.

1. National Circumstances and Institutional Arrangements

1.1. Geography

Chile is a tri-continental country, situated in south western South America, stretching from 17°30'S latitude in the north to 56°30' latitude in the south. The territory encompasses Easter Island in Oceania and Antarctica in the far south in an area between the meridians 53° and 90° west longitude to the South Pole. Its territory extends north to the maritime border with Peru, and south to the shores of the Antarctic continent. Although it has many different climates, mainly determined by the latitude and altitude, temperate climate characteristics prevail.

El Morado, Archivo MMA.

The Chilean population grew rapidly in the 20th century, a trend that has begun contracting during the first decade of the 21st century. The progressive development of the country has raised the quality of life of Chile's inhabitants. The positive evolution of the country's Human Development Index (HDI)[1] in recent years is undisputable proof of these transformations (UNDP, 2015).

1.2. Economy

Chile has an open and stable economic model, which promotes trade and investment. To a large extent, the economic growth of the country is based on exports of raw materials. In recent years, Chile's economic policy has focused on instruments that promote economic growth and maintain a controlled and stable inflation rate. In particular, it can be noted that fiscal policy, in the framework of the structural balance policy, has continued to play a stabilizing role in the Chilean economic cycle.

To summarize, Table ES1 presents some key indicators for Chile, obtained from the information presented at the Third National Communication of Chile to the 2016 United Nations Framework Convention on Climate Change (3CN).

[1] *The Human Development Index assesses the progress of countries considering health (life expectancy), education (average and expected number of years of schooling), and income (GNI per capita).*

Table ES1. Chile- Key indicators

Information		Source
Geography and population		
Surface area:		
Total surface area (km²)	2,006,096	Instituto Geográfico Militar (IGM)
South American surface area (km²)	755,915	
Oceania surface area (Eastern Island) (km²)	181	
Land uses:		
Agricultural areas (%)	4.4	Corporación Nacional Forestal (CONAF), 2016[2]
Native Forests (%)	18.9	
Forest Plantations and mixed forests (%)	4.2	
Grasslands and Scrublands (%)	27.1	
Urban and Industrial Areas (%)	0.5	
Areas without vegetation (%)	32.5	
Protected marine areas (thousand ha)	45,111.4	Ministry of Environment (MMA), 2016
National System of Protected Wild Areas (SNASPE) (thousand ha)	14,630.5	
Population:		
Population in the year 2010	17,066,142	National Institute of Statistics (INE)
Population in 2016 estimated	18,191,884	
Males in the year 2016 estimated (%)	49.5	
Females in the year 2016 estimated (%)	50.5	
Population in the year 2020 estimated	18,896,684	
Population in the year 2050 estimated	20,204,779	
Rural population in 2015 estimated (%)	12.7	
Indigenous population in 2013	1,565,915	Ministry of Social Development, 2016
Migrant population in 2013	354,581	
Social development		
Life expectancy in 2015 (years)	79.1	National Institute of Statistics (INE), 2015
Infant mortality rate in 2013 (for every 1,000 live births)	7.0	
Literacy rate in 2012 (%)	98.9	UNICEF
Urban population connected to sewage system in 2014 (%)	96.7	Superintendence of Sanitary Services (SISS), 2014
Urban population with drinking water supply in 2014 (%)	99.9	
Waste water treated in treatment plants in 2014 (%)	99.9	
Human development Index in 2014	0.832	United Nations Development Program (UNDP), 2015
Population in extreme poverty in 2015 (%)	3.5	Ministry of Social Development, 2016
Population in poverty in 2015 (%)	11.7	
Ratio between the richest 10% and poorest 10% in 2015	27.2	
Gini coefficient in 2015	0.495	
Economic activity		
GDP in 2015 (million USD)	240,215.7	World Bank, 2016
GDP per capita, in 2015 (USD)	22,316	
Estimated GDP growth at 2016 (% annual)	1.9	
Estimated GDP growth at 2018 (% annual)	2.3	
Exportation of raw materials in 2015 (% of total exports)	43.7	
Export of goods and services in 2015 (% GDP)	30.1	
Trade balance in 2014 (million USD)	3,515	General Directorate of International Economic Relations (DIRECON), 2015
Mining exports in 2014 (% of total exports)	54.2	
agricultural and forestry exports in 2014 (% of total exports)	7.6	
Industrial Exports in 2014 (% of total exports)	38.2	

Source: Own elaboration

[2] *With respect to the South American and Oceania Surface area*

1.3. Institutional arrangements for climate change

1.3.1. Environmental institutional framework

National policies aimed at sustainable development are part of Chile's overall development strategy. The Constitution guarantees, as a fundamental right, living in a pollution-free environment. Granting the State the duty to protect and preserve the country's natural resources and environment (Government of Chile, 2002). The consolidation process of Chilean environmental institutions has been marked by the creation of the Ministry of Environment (MMA), the Environmental Assessment Service (SEA), and the Superintendence of Environment (SMA) in 2010, together with the Ministers Council for Sustainability.

1.3.2. Institutional framework and climate change policies in Chile

Since Chile ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 and also became a signatory to its Kyoto Protocol in 2002, it has actively participated in discussions and international efforts, in addition to faithfully meeting its commitments as a developing country. Moreover, the Paris Agreement, adopted in December 2015, was signed by Chile in September 2016.

Department of Climate Change, Ministry of Environment

A major milestone in the public management of climate change in Chile occurred in 2010 with the official creation of the Climate Change Office (OCC), directly under the Ministry of the Environment. In 2014, the OCC went on to form the "Department of Climate Change" (DCC), integrated with the MMA's Air Quality and Climate Change Division. As successor to the OCC, the DCC has actively participated in international negotiation processes associated with the implementation of the UNFCCC. It is also the designated national authority for the Clean Development Mechanism (CDM) and for the Adaptation Fund and serves as a focal point for the Intergovernmental Panel on Climate Change (IPCC) and the Nationally Appropriate Mitigation Actions (NAMA) Registry. In addition, the DCC participates in various networks for information exchange, such as the Latin American Network of Climate Change Offices (RIOCC), the Regional Cooperation Program between the European Union and Latin America (EUROCLIMA), the Scientific Committee on Climate Change of the Pacific Alliance, and the Inter-American Institute for Global Change (IAI).

Palacio de La Moneda,Camila González.

In her speech on May 21st, 2016[3], in the presence of the full Congress, President Bachelet announced the upcoming establishment of the Chilean Agency on Climate Change and Sustainable Development, in order to have an implementing agency for the Country's agreements in this area.

Sectorial institutional framework

National public institutional structure includes a number of institutions, agencies, or entities that do not belong to the MMA, but are linked to the issue of climate change. Most of the ministries that make up the Council of Ministers for Sustainability have defined some basic structure or person in charge of the climate change issue within their organization. A challenge is pending in this regard to increase interaction between the central government and the subnational levels of government although there are signs of greater participation in regional and municipal structures, especially in the area of adaptation to climate change.

[3] *A date on which Chilean presidents give the annual state of the nation speech.*

2. Chile's National Greenhouse Gas Inventory, 1990-2013

Key points

- In 2013, Chile's total GHG emissions (excluding *FOLU*) amounted to 109,908.8 Gg CO_2 eq, an increase of 113.4% since 1990 and of 19.3% since 2010. The main GHG emitted by Chile was CO_2 (78.4%), followed by CH_4 (10.7%), N_2O (10.0%), and fluorinated gases (0.9%).
- The *Energy* sector is the largest GHG emitter in Chile (77.4%), mainly due to the consumption of coal and diesel for electricity generation and consumption of diesel in road transport.
- The *Agriculture, Forestry, and other land uses (AFOLU)* sector is the only sector that consistently removes CO_2 in the country, and remains as a sink for the entire time series. Net removals from the sector amounted to -26,119.2 Gg CO_2 eq mainly due to the increase in biomass in forest plantations and second-growth natural forest.
- In 2013, Chile's balance of GHG emissions and removals (including *FOLU*) amounted to 70,054.4 Gg CO_2 eq.

2.1. Introduction

This is the Fourth National Greenhouse Gas Inventory (NGHGI) submitted by Chile to UNFCCC in fulfillment of Article 4, paragraph 1(a) and Article 12, paragraph 1(a) of the UNFCCC and decision 1/CP.16 of the 16th Conference of the Parties (Cancun, 2010).

Chile's NGHGI is compiled according *to 2006 IPCC Guidelines for national greenhouse gas inventories*, covering the entire national territory and including emissions and removals of carbon dioxide (CO_2) and emission of methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) in a series of time from 1990 to 2013.

2.2. Institutional arrangements and preparation of Chile's NGHGI

Since 2012, the area of GHG Inventories of the Ministry of the Environment's Department of Climate Change (DCC) designed, implemented, and has maintained the National Greenhouse Gas Inventory System of Chile (SNICHILE), which contains the institutional, legal, and procedural steps for the biennial update of Chile's NGHGI, thus ensuring the sustainability of the preparation of GHG inventories in the country, the consistency of GHG flows reported, and the quality of the results. SNICHILE's ongoing work is divided into five lines of action:

- Operation of SNICHILE
- Updating of Chile's NGHGI
- Quality assurance and quality control system
- Capacity building
- Archiving and dissemination.

SNICHILE's work plan is organized in a two-year cycle of activities. During the first year the Sectorial Technical Teams update the Sectorial Greenhouse Gas Inventories (SGHGI), while in the second year the Coordinating Technical Team compiles the SGHGIs and develops the cross-cutting issues of Chile's NGHGI.

The preparation of the Fourth Chile's NGHGI began during the first half of 2015 and concluded in mid-2016. The Ener-

Bosque de Araucarias, Charij Tala.

gy's SGHGI was updated by the Ministry of Energy's Foresight and Energy Policy Division; the IPPU's SGHGI was updated by the MMA's DCC; the AFOLU's SGHGI was updated by the Ministry of Agriculture through the Office of Agrarian Studies and Policies (ODEPA), the National Forestry Corporation (CONAF), the Forest Institute (INFOR), and the Agricultural Research Institute (INIA); the Waste's SGHGI was jointly updated by the Ministry of Environment's Waste and Environmental Risk Office and its DCC. Once the updating process was completed, the SGHGIs were compiled by the MMA's DCC for the preparation of Chile's NGHGI and the respective National Greenhouse Gas Inventory Report (NIR), which goes through a review process at the national and international levels.

In conclusion, Chile's NGHGI is the result of the collective and continuous efforts of the Ministries of Agriculture, Energy, and Environment, which have worked in coordination under the framework of SNICHILE. This work has strengthened the preparation of Chile's NGHGI by adding expert knowledge from the various sectorial ministries involved.

2.3. Trends in Chile's greenhouse gas emissions

In 2013, the balance of GHG[4] emissions and removals in Chile amounted to 70,054.4 Gg CO_2 eq, while total GHG emissions[5] in the country amounted to 109,908.8 Gg CO_2 eq, an increase of 113.4% since 1990 and of 19.3% since 2010 (Table ES2). The key drivers of this trend in the GHG balance were the *Energy* and the *AFOLU* sectors. The values observed that fall outside of the trend (Figure ES1) are primarily the consequence of forest fires accounted for in the *AFOLU* sector.

[4] *In this report, the terms "balance of GHG emissions and removals" or "GHG balance" refer to the sum of emissions and removals of greenhouse gases, expressed in carbon equivalent (CO2 eq). This term includes the entire AFOLU sector.*

[5] *In this report, the term "total GHG emissions" refers to the sum of national GHG emissions only, expressed in carbon dioxide equivalent (CO2 eq). This term excludes sources of emissions and sinks from forestry and other land uses (FOLU) of the AFOLU sector, but includes greenhouse gas emissions from Agriculture.*

Table ES2. Chile's NGHGI: GHG emissions and removals (Gg CO_2 eq) by sector, 1990-2013

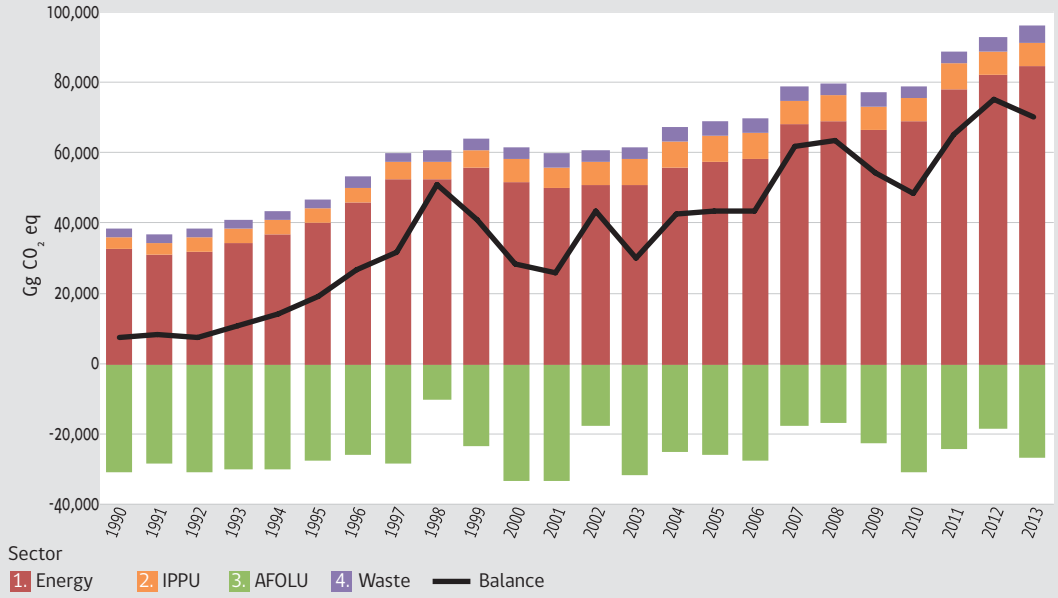
Sector	1990	2000	2010	2011	2012	2013
1. Energy	33,219.5	52,122.9	69,423.7	78,527.0	82,076.6	85,075.4
2. IPPU	3,127.5	6,449.6	6,008.1	6,868.3	7,214.9	6,619.4
3. AFOLU	-30,866.3	-32,819.2	-30,514.4	-24,339.9	-18,410.7	-26,119.2
Agriculture	12,633.5	13,580.7	12,879.8	12,741.7	13,285.0	13,735.2
FOLU	-43,499.8	-46,399.9	-43,394.2	-37,081.6	-31,695.8	-39,854.4
4. Waste	2,526.1	3,348.3	3,802.6	3,939.8	4,019.2	4,478.8
Balance (with FOLU)	8,006.8	29,101.5	48,719.9	64,995.1	74,899.9	70,054.4
Total (without FOLU)	51,506.6	75,501.4	92,114.2	102,076.7	106,595.6	109,908.8

Source: MMA's Coordinating Technical Team.

IPPU= Industrial processes and product use; AFOLU= Agriculture, forestry and other land use; FOLU= Forestry and other land use

In 2013, the total GHG emissions were dominated by CO_2, accounting for 78.4%, followed by CH_4 (10.7%) and N_2O (10.0%). Fluorinated gases collectively accounted for 0.9% of total GHG emissions in the country.

Figure ES1. Chile's NGHGI: GHG emissions and removals (Gg CO_2 eq) by sector, 1990-2013



IPPU= Industrial processes and product use; AFOLU= Agriculture, forestry and other land use; FOLU= Forestry and other land use

Source: MMA's Coordinating Technical Team.

The *Energy* sector is the leading GHG emitter in Chile, accounting for 77.4% of total GHG emissions in 2013. That year, GHG emissions from the sector amounted to 85,075.4 Gg CO_2 eq, an increase of 156.1% since 1990 and of 22.5% since 2010. In general, this is mainly due to the increase in energy consumption in the country, including the consumption of coal and natural gas for electricity generation and consumption of liquid fuels, mostly diesel and gasoline, for road transportation. With regard to subcategories, the *Energy Industries* (mainly *Main activity electricity and heat production*) is the leading source of GHG emissions within the sector, with 45.3% share in 2013, followed by 28.9% from *Transport* (mainly road transportation), 16.8% from *Manufacturing industries and construction*, and 8.0% derives from *Other sectors* (mainly *Residential*). The *Oil and natural gas* subcategory accounted for 0.9%, while *Solid fuel* accounted for 0.1%.

Central termoeléctrica, Archivo MMA.

The *IPPU* sector accounted for 6.0% of total GHG emissions in 2013. In the same year, GHG emissions from the sector amounted to 6,619.4 Gg CO_2 eq, an increase of 111.7% since 1990 and of 10.2% since 2010. Overall, this is mainly due to the sharp increase in production of iron and steel, lime, nitric acid, and cement. With regard to categories, 37.7% of GHG emissions from the sector correspond to the *Mineral industry*, followed by 23.9% from the *Metal industry*, 21.2% from the *Chemical industry*, 10.4% from *Product use as substitutes for ozone depleting substances*, 4.7% from *Other product manufacture and use*, and, finally, 2.1% from *Non-energy products from fuels and solvent use*.

The *AFOLU* sector is the only sector that consistently removes CO_2 in the country, making it the most relevant due to its mitigation potential. In 2013, the GHG balance from the sector amounted to -26,119.2 Gg CO_2 eq, reducing its sink condition by 15.4% since 1990 and by 14.4% since 2010. Overall, this is because the *Land* category decreased their removals, while GHG emissions from categories associated with agricultural activities (*Livestock* and *Aggregate sources and non-CO_2 emissions sources on land*) have remained stable during the 1990-2013 series. Regarding emissions and removals of greenhouse gases in absolute terms by category, 73.8% correspond to *Land,* followed by 15.5% from *Aggregate sources and non-CO_2 emissions sources on land* and, finally, 10.6% correspond to *Livestock*.

The *Waste* sector accounted for 4.1% of total GHG emissions in 2013. In the same year, GHG emissions from the sector amounted to 4,478.8 Gg CO_2 eq, an increase of 77.3% since 1990 and of 17.8% since 2010. In general, the key driver is the sustained increase in solid waste generation and its final disposal in landfills. With regard to categories, 72.0% of GHG emissions from the sector correspond to *Solid waste disposal*, followed by 26.7% from *Wastewater treatment and discharge*, 1.3% from *Biological treatment of solid waste* and, finally, 0.01% from *Incineration and open burning of waste*.

In accordance with the requirements of the UNFCCC and the 2006 IPCC Guidelines, GHG emissions generated by the consumption of fossil fuel in international air and maritime transport and CO_2 emissions from biomass burned for energy purposes were quantified and reported as *memo items*, but were excluded from the balance of GHG emissions and removals in the country.

3. GHG Mitigation Policies and Actions

Nationally, the actions that contribute to the reduction of GHG emissions have been developed in a sectorial context. The Ministry of Environment, in its role as coordinator of climate change issues in Chile, has gathered information on national policies and initiatives with benefits in GHG mitigation, enhancing this variable as an indicator of the country's efforts to comply with the objectives of the UNFCCC.

At COP 15 (2009, Copenhagen) the Minister, President of the National Environment Commission (CONAMA) expressed Chile's voluntary pledge, which affirms that "Chile will take nationally appropriate mitigation actions to achieve a 20% deviation below the "Business as Usual" emissions growth trajectory by 2020, as projected from the year 2007". The statement also specified that "To accomplish this objective, Chile will need a relevant level of international support." This voluntary commitment has led to the development of various mitigation activities in the country focused on reducing GHG emissions.

For the first time the Paris Agreement, adopted in December 2015, involves all parties in a common cause to make ambitious efforts to fight climate change and adapt to its effects and called on countries to make their best efforts in their Intended Nationally Determined Contributions. As part of the preparation of this agreement, Chile developed its Intended Nationally Determined Contributions (INDC).

Atardecer Stgo., Jenny Mager.

3.1. Chile's Intended Nationally Determined Contribution (INDC)

Chile has submitted its INDC to the secretary of the UNFCCC in September 2015. The country's commitments are divided into 5 pillars: i) Mitigation, ii) Adaptation, iii) Capacity building, iv) Technology Development and Transfer and v) Financing.

In the case of the mitigation pillar, Chile has chosen to present its contribution using the format of emissions intensity (tons of CO_2 equivalent per unit of gross domestic product (GDP) in millions of CLP$ at 2011). Methodologically, it was decided to separate the Land Use, Land-use change, and Forestry (LULUCF) sector from the national commitment to mitigation, due to the high annual variability of sinks and emissions from the sector, and for being less dependent on the trajectory of economic growth.

Chile's Intended Nationally Determined Contribution (INDC) in Mitigation Issues

Carbon Intensity Target:

a) Chile is committed to reduce its CO_2 emissions per GDP unit by 30% below their 2007 levels by 2030, considering a future economic growth which allows to implement adequate measures to reach this commitment*.

b) In addition, and subject to the grant of international monetary funds**, the country is committed to reduce its CO_2 emissions per GDP unit by 2030 until it reaches a 35% to 45% reduction with respect to the 2007 levels, considering, in turn, a future economic growth which allows to implement adequate measures to achieve this commitment.

Specific contribution from the forestry sector:

a) Chile has committed to the sustainable development and recovery of 100,000 hectares of forest land, mainly native, which will account for greenhouse gas sequestrations and reductions of an annual equivalent of around 600,000 tons of CO_2 as of 2030. This commitment is subject to the approval of the Native Forest Recovery and Forestry Promotion Law.

b) Chile has agreed to reforest 100,000 hectares, mostly with native species, which shall represent sequestrations of about 900,000 and 1,200,000 annual equivalent tons of CO_2 as of 2030. This commitment is conditioned to the extension of Decree Law 701 and the approval of a new Forestry Promotion Law.

** This commitment assumes a growth rate for the eco¬nomy similar to the growth path the country has expe¬rienced in the last decade, except for the most critical years of the international fi¬nancial crisis (2008-2009).*
*** This commitment assu¬mes a growth rate for the economy similar to the growth path the country has experienced in the last deca¬de, except for the most criti¬cal years of the international financial crisis (2008-2009). In addition, for the purposes of this commitment, an in¬ternational monetary grant shall be deemed any grants which allow to implement actions having direct effects on greenhouse gas emis¬sions within adequate time frames.*

Altos de Pemehue, Archivo CONAF.

3.2. Sectorial mitigation actions

Chile has implemented a series of cross-cutting and sectorial actions, which, although they have been designed with sectorial purposes, due to their characteristics, they have had an impact on GHG emissions in the country. During 2015 and 2016, the Chilean government prepared its National Action Plan on Climate Change (PANCC), which includes a strategic line of mitigation whose main objective is to *"create the enabling conditions for the implementation, compliance, and monitoring of the commitments to the UNFCCC to reduce Chile's GHG emissions and to contribute consistently to the country's sustainable development and to low growth in carbon emissions."*

This report covers the progress of actions and policies in diverse sectors. Regarding the Energy sector, which is regulated by the Ministry of Energy, the increasing share of renewable sources in the energy matrix of the country, the policies promoted by the sector that have contributed to reducing emissions thanks to the inclusion of clean energy, and the efficient use of energy , among others, can be highlighted. The development of the Energy Agenda and the Energy Policy of Chile - Energy 2050- with a long-term view, align the strategy and vision of this sector with the country's environmental objectives, specifically with regard to the commitments on mitigation of GHG emissions.

Regarding the Transportation sector, the Ministry of Transportation and Telecommunications, through its Undersecretary of Transportation, is responsible for generating policies, regulations,

and conditions for the development of transport systems. This sector has motivated and promoted technological improvements and alternative transport modes and has worked on management and planning. Initiatives such as the Green Zone in Santiago and the "National Strategy for Sustainable Transport" can be highlighted, which are in the local application process for the Green Climate Fund and intend to develop actions to ensure that public transport in Chile be at the forefront of technological development and innovation and be environmentally-friendly with low carbon emissions in order to improve the quality of life of Chileans.

With respect to the Agriculture and Land Use Change sector, the net contribution to GHG emissions is negative since its ability to capture CO_2 exceeds its emissions. Carbon sinks are mainly from second-growth natural forest; from regeneration of managed native forest, and from mostly exotic forest plantations. Due to the contribution to the mitigation capacity from the LULUCF sector, in its INDC, Chile shows a specific contribution for this sector, associated with sustainable forest management and recovery. As a key instrument to meet this forest goal, the National Forestry Corporation (CONAF) is formulating and implementing the National Strategy on Climate Change and Plant Resources (ENCCRV) in order to establish a legal, technical, operational, and financial platform to regulate and promote the conservation, recovery, and rational use of plant resources, from a perspective that contributes to mitigation and adaptation to climate change, and to the consequent desertification, drought, and land degradation processes, with emphasis on those territories with greater social, economic, and environmental vulnerability in the country.

In the Waste sector, most of Chile's GHG are generated by Municipal Solid Waste, which management is handled by municipalities through the Organic Constitutional Law of Municipalities and regulated by the Sanitary Code. The Ministry of Environment is responsible for the design and implementation of policies, plans, and programs on environmental issues, including waste management programs. Currently, the policy of comprehensive solid waste management is in the updating stage. A milestone in this context is Law No. 20,920, enacted in 2016, which sets the framework for waste management, increased responsibility of manufacturers and the promotion of recycling, and requires manufacturers and importers of six top products to recover a percentage of their products once they have completed their useful life.

In addition to these sectorial actions, in Chile there are other initiatives that contribute to GHG mitigation, including cross-cutting measures, such as the Clean Production Agreements; actions in the housing and urban development sector; local initiatives in the framework of the Chilean Network of Municipalities on Climate Change; and actions taken by the private sector. Among the latter, we can mainly highlight those carried out by the Mining, Cement, and Steel sectors, which have made significant investments for calculating emissions responding to the companies' own needs and to the report to international sectorial associations.

Vicuñas, Archivo CONAF.

3.3. Nationally Appropriate Mitigation Actions

Chile was the first country in the world to submit a NAMA to the UNFCCC, in October 2012. In the country six sectorial NAMAs were identified with different levels of maturity and information available. Five of the latter were registered in the NAMA Registry of the UNFCCC; some of the NAMAS have undergone major design changes since the publication of the first BUR. The NAMAS are complementary to sectorial mitigation actions described in the previous section.

Table ES 3: Chile's NAMAS

Name	Sector and Gases	Period	Reduction of estimated GHG	Situation
Self-supply renewable energies in Chile (SSREs)	Energy CO_2	2015-2021	1.5 $MtCO_2eq$	Underway
Green Zone for Transport in Santiago	Transport and infrastructure CO_2	2014-2022	1.43 $MtCO_2eq$	Underway and developing its MRV system
Design and Implementation of Strategy on Climate Change and Plant Resources	LULUCF CO_2	2013-2025	42 $MtCO_2eq$	Underway
Clean Production Agreements (APL) in Chile	Transversal	2012-2020	18.4 $MtCO_2eq$	Underway
Energy recovery from industrial waste program (former National Program for Industrial and Commercial Catalyzation and Organic Waste Management in Chile)	Energy, Waste CO_2; CH_4	To be defined	Reduction potential under estimation	In design stage
Carbon sequestration through sustainable land management	Agriculture, Forestry/AFOLU CO_2	To be defined	65 a 80 $MtCO_2eq$	Being designed, seeks support for its implementation

3.4. Transversal actions of support towards a low carbon economy

In addition to the actions described, the Chilean Government has developed a number of initiatives supported by international funding that have allowed creating a national vision of low-carbon growth. This is how the MAPS-Chile Project evaluated different possible mitigation scenarios for Chile with various sectorial measures. This information, in turn, was one of the main inputs for the construction of Chile's INDC, a commitment that will set the course in mitigation issues for the coming years. In addition, the Low Emission Capacity Building (LECB-Chile) project, that started in 2012 and supported capacity-building for mitigation in the country with four components, specifically supported the improvement of the National Inventory system and the design of the HuellaChile (carbon footprint) program, as a link between the public and private sectors.

As for economic instruments, in 2014 the Chilean Government enacted the Tax Reform Act. This included, for the first time in Chile, the introduction of three "green taxes". The first applies to light vehicles according to their urban performance and NOx emissions, and the second applies to fixed sources and taxes SO_2, NOx and PM emissions into the atmosphere. It is expected that these taxes have important, but indirect, co-benefits in reducing GHGs. The third is a direct tax on CO_2 emissions at US$5 per ton. The possible introduction of a system of emissions trading as a complement to the tax and the modifications that could be introduced into the latter, are being evaluated by the Partnership for Market Readiness (PMR) project, led by the Ministry of Energy in conjunction with the MMA.

3.5. Measurement, reporting, and verification of mitigation actions

In Chile, measurement, reporting, and verification (MRV) seeks to foster transparency in GHG mitigation actions implemented in the country through mechanisms that allow monitoring compliance with its objectives. Although Chile reports the implementation of their mitigation actions to the international community through the Biennial Update Reports (BUR) and through its national communications as requested by the UNFCCC, it is necessary to understand that having MRV systems for individual actions is key to assessing the effectiveness of those actions.

In this regard, since 2011, Chile has been working on independent MRV systems which have served as management tools for NAMAs as well as building capacities in this area through the international support of various projects, such as, support for the preparation of the "Guidelines for a Generic Framework of MRV for NAMAs" in 2014. This document explains how to measure, report, and verify impacts on GHG emissions and other co-impacts generated through the implementation of mitigation actions. Although this was developed for NAMAs, this framework can be used for any type of action that generates the mitigation of GHG emissions.

4. Needs and Support Received in the Area of Climate Change

Chile is extremely vulnerable to climate change; the various foreseen impacts translate into significant social and economic losses. That is why the country has been proactive in both mitigation and adaptation, which is reflected in its INDC submitted to the UNFCCC in 2015. However, there are still needs and gaps to be addressed through national efforts, but also, importantly, by means of international support.

PN Tolhuaca CONAF, Charif Tala.

4.1. Methodology and timeframe

As a methodological framework, the DCC has applied the Convention Guidelines for the submittal of the biennial update reports from Parties not included in Annex I of the Convention (Annex III, Decision 2/CP17[6]) to provide updated information on needs and support received on climate change. Both subjects were divided into the following areas: financial resources, capacity-building, technical assistance and technology transfer; identifying gaps and barriers for each area. In turn, these areas were subdivided into five different areas: reporting, mitigation, adaptation, national inventory of climate change and international negotiation; thus maintaining the same structure used for the first BUR.

For gathering information, a process was developed with five main stages: i. identification of initiatives and international support on climate change; ii. Validation of these initiatives with public institutions involved and incorporation of new information; iii. Workshop with said public institutions for participatory identification of needs, barriers, opportunities, etc.; iv. Cross-check on support received, from donors and implementers; and v. Bilateral meetings to validate previously gathered information.

The information presented covers the period immediately following the information gathering phase of the first BUR (from the second half of 2014 to the first half of 2016).

4.2. Needs

The development of Chile's institutional structure and capacity-building on climate change issues in Chile, have shown substantial progress in recent years. However, it is still possible to identify needs, gaps, and

[6] *http://unfccc.int/resource/docs/2011/cop17/spa/09a01s.pdf#page=*

barriers that hinder the development of more effective climate action in the country. The main needs that cut across all areas are related to the generation of appropriate institutions to facilitate the development of actions on climate change in the country and a funding strategy which is consistent with the requirements that are generated during the process.

With the approval of the National Plan for Adaptation to Climate Change in December 2014, an operating structure was proposed that has served as the basis for strengthening the institutional framework for climate change in recent years. This structure is made up of an Inter-Ministerial Technical Team on Climate Change (ETICC) and 15 Regional Committees on Climate Change (CORECCs). However, it is still necessary to develop and strengthen such institutions, by developing regulations that support their construction beyond sectorial intentions. Financial needs are also detected ranging from access to international funds to the capacity to receive financial resources, particularly in the public sector.

4.2.1. Reporting

The greatest challenge facing reporting activities continues to be the earmarking of the budget for the installation of permanent reporting systems. Capacity-building to systematize and provide timely and appropriate information for the different types of reports is an urgent necessity, as well as the development of technologies to improve and expand the coverage of the information generated and reported.

Primer bus eléctrico, Archivo MMA.

4.2.2. Mitigation

In the period reported, Chile has advanced with robust sectorial policies aimed at low carbon development. However, this effort is insufficient when considering the commitments acquired internationally, since, for their compliance, additional efforts at the country level are still required in terms of information systems and local capabilities, as well as the need for significant international support.

In regard to the strengthening of the measurement, reporting, and verification systems (MRV), through the development of institutional capacities, significant efforts have been made. However, it is a priority that this strengthening be applied to all institutions that develop actions that have the potential for reducing GHG emissions. With regard to local capacities, it is of particular importance to strengthen Regional Governments and Municipalities to implement and monitor mitigation measures.

From the point of view of technology transfer, the introduction of innovative equipment and processes is necessary to reduce energy use, with low emission technologies, and technologies to harness the energy potential of the country, in order to design and implement mitigation measures in the various sectors.

4.2.3. National Greenhouse Gas Inventory (NGHGI)

With respect to the NGHGI, the main need is to have the largest possible number of permanent and competent professionals, hired by the State, which constitute stable technical teams to ensure the sustainability of the system and the quality of GHG estimates. In addition, we expect to have the largest number of country-specific emission factors in order to reflect the

national situation more accurately in terms of GHG emissions and removals.

From the point of view of financial resources, it is necessary to have permanent national funding for hiring new professionals for the different technical teams as well as permanent funding for scientific research and development of country-specific emission factors.

As for technology transfer, adequate teams are required for scientific research and the development of country-specific emission factors, especially in the *AFOLU* sector.

4.2.4. Adaptation

The ongoing line of work that the DCC has done on issues of adaptation, allowed the preparation and approval of the National Climate Change Adaptation Plan PAN (MMA, 2014), a commitment assumed in the National Climate Change Action Plan 2008-2012. In addition to the specific sectorial plans of the Agriculture and Forestry sector (2013) and the Biodiversity sector (2014), the specific sectorial plan of the Fisheries and Aquaculture sector (2015) was approved and the Health sector plan is on verge of approval. Five other sectorial adaptation plans are in various stages of development and will focus on the Infrastructure (2017), Cities (2017), Water Resources (2018), Energy (2018), and Tourism (2018) sectors. However, for efficient adaptation it is extremely important to achieve proper coordination between national and sectorial policies, in regard to the development policies of regional governments; as well as financing requirements arising from the need to maintain permanent full-time staff in the different sectorial institutions, allowing to articulate and provide continuity to the various adaptation plans (implemented and under development).

In relation to the needs of technology transfer, requirements were identified in the introduction of diverse technologies to adapt to water scarcity, to increase energy efficiency, and to expand the coverage of the systems and information products to support climate risk management, among others.

4.2.5. International Negotiation

In regard to international negotiations, the main need is to expand the current negotiating team in the country and establish permanent teams in the relevant sectorial ministries, with adequate financial and technical capacity for the preparation and full strategic monitoring of the negotiations and appropriate coordination mechanisms.

4.2.6. Private Sector

In Chile, the private sector has played a key role in both the investment and the implementation of innovative measures to mitigate and adapt to climate change. However, there are situations that discourage the transversal actions of this sector, such as the lack of climate change regulations to clearly establish the objectives and requirements for this sector, the lack of capacities at the sectorial level, and the lack of incentives to catalyze the actions of the private sector.

4.2.7. Needs identified in the analysis process and the International Consultation of the First BUR

During 2015, Chile's first Biennal Update Report (BUR) was the subject of the International Consultation and Analysis (ICA) process whose main objective is to help the non-Annex I countries identify their capacity-building needs. The main needs declared by Chile primarily relate to: i) Ensuring a technical staff to increase the quality of national inventories; ii) Developing activities for capacity-building in the energy sector to address knowledge gaps resulting from a constant change in the professional teams; iii) Addressing technical and information gaps to enable the systematic collection of data and sectorial information; iv) Establishing specific procedures and arrangements to ensure the involvement of relevant institutions in the collection, compilation, and validation of the information reported; v) Capacity-building and exchanging of successful experiences in implementing MRV systems in the development of NAMAs of different sectors; and vi) Capacity-building to assess technological requirements relating to data collection for the BUR and the implementation of MRV systems. These requirements are in line with those identified internally in the country.

4.3. Support for Climate Action

Information on support received (international) and delivered (national) earmarked for climate change activities, is presented below.

HuellaChile MMA.

4.3.1. Support received for activities related to climate change

During the reporting period (June 1, 2014 to July 30, 2016), the donor countries and institutions have approved a total of US$ 22,150,625 for Chile to carry out national climate agenda activities. The projects carried out, and underway, to strengthen climate change action and policies, with international financial support, include: Mitigation Options for Addressing Climate Change (MAPS Chile), Low Emission Capacity Building - Chile (LECB-Chile), the Partnership for Market Readiness (PMR), and activities funded by the Carbon Partnership Fund.

Regarding financial resources channeled to private sector projects, the financial flows for the projects amount to US$ 217,700,000. This category includes financial flows (loans) from development bank institutions as well as institutions and funds focused on finance actions to mitigate climate change and the transition towards a low carbon emissions economy.

The support received in the area of capacity building and technical assistance has come from national and international sources through projects, workshops, studies, and specific programs, which have had a positive impact on increasing the technical capacity installed in the country. Chile has also received support for the development of national communications training activities, mainly directed to government officials in Chile.

Finally, with regard to technology transfer, the support has focused on renewable energy technologies and productive applications in the agriculture and forestry sector.

4.3.2. Domestic support for activities related to climate change

Even though Chile has received significant financial support and diverse types of support, in recent years it has earmarked domestic funds to co-finance actions to address climate change locally. The total amount of co-financing channeled through the International Cooperation Agency of Chile for the 2014-2016 period reached USD $20,370,000.

On the other hand, in the context of developing a strategy for climate financing (INDC commitment), the Chilean Government is implementing a methodology for defining and assessing public resources earmarked for climate change actions.

1 National Circumstances

Jeinimeni, Archivo CONAF.

1. Geographical Profile and Social Development

1.1. Territory and administrative division

Chile is a tri-continental country, its territory spreads across the western and southern edge of South America, between 17° 30' and 56° 30' south latitude, including Eastern Island in Oceania and stretching south until reaching Antarctica, covering in the latter an area extending between meridians 53° and 90° west longitude until the south pole. The country has a total area of 2,006,096 km², excluding its territorial sea, its economic exclusive zone and its continental shelf. The total area encompasses 755,915 km2 corresponding to South America, 1,250,000 km² to Antarctica and 181 km2 to Oceania, according the Military Geographical Institute (IGM) mapping records of year 2005. The national territory consists also of Juan Fernández archipelago and the islands Salas and Gómez, San Félix and San Ambrosio.

The Chilean maritime territory extends from the maritime border with Peru in the north until the Antarctic continental shores in the south, excepting the offshore area along the Drake Passage, between Cape Horn and the Antarctic Peninsula (Ministerio de Defensa Nacional, 2010).

Valle de la Luna, SERNATUR.

Chile is a unitary republic; its local political-administrative structure is based on three territorial government levels: administrative regions (15), provinces (54) and communes[1] (346). An administrative region is a territorial unit having its own specific geographic characteristics and sharing common social, economic and cultural attributes.

1.2. Geography and morphology

Chilean relief in the South American territory consists basically of three geomorphological parallel units: The Andes mountain range to the east; the Coastal Mountain range to

[1] *The Political Constitution of the Republic of Chile notes in Article 110 the following: "For Government and State internal administration, the territory of the Republic is divided into regions and these into provinces. For local administration purposes, the provinces are divided into communes. Creating, removing and designating regions, provinces and communes; changing its boundaries as well as establishing region and province capitals, shall be within the jurisdiction of the Constitutional Organic Act" and exclusive initiative of the President of the Republic.*

the west and the Intermediate Depression flanked by both mountain ranges. There are also other smaller scale geographical areas, such as the Coastline Plains, the Altiplano and the Magellanic Steppe. This geological variety shapes the Chilean landscape, where the flat land proportion does not exceed 20% of the continental territory.

1.3. Climate

The Chilean South American territory offers a wide variety of climates, giving the country unique climatic features because of multiple environmental factors influence. In general, the South American Chilean territory offers temperate climate characteristics, showing certain variations determined mainly by latitude and altitude that generate the desert, tropical, Mediterranean, temperate and polar climate systems (Santibáñez, Roa, & Santibáñez, 2016 por publicar).

1.4. Land use

The already mentioned geographical and bioclimatic conditions explain the large proportion of the population living in the intermediate depression area of the central zone, situation that is consistent with the country's observed patterns of land use. Most part of the territory belongs to cleared vegetation areas (32.5%), grasslands and natural scrublands (27.1%) and native forests (18.9%). Urban and industrial areas represent only a 0.5% of the total area, but showing a sustained upward trend (CONAF, 2016).

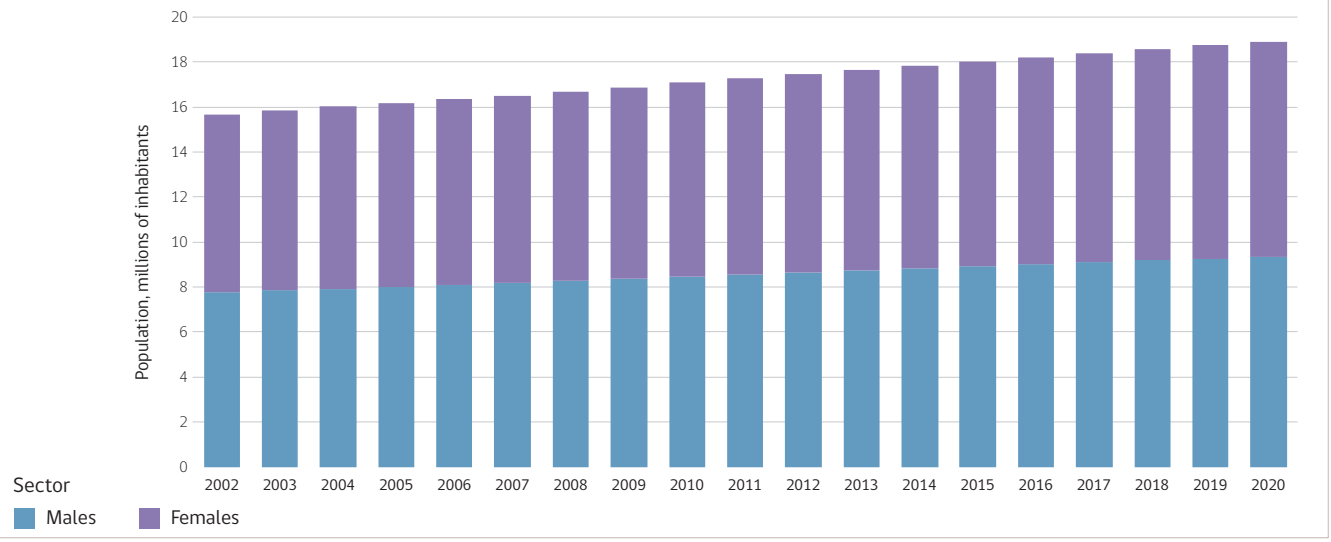
1.5. Population

Chilean population experienced a substantial growth during the 20th century, but the growth rate slowed during the first decade of the 21st century and is expected to drop even further by 2050. Chilean total estimated population by 2016 is 18,191,884 inhabitants, 49.5% of which would be male and 50.5% female (INE, 2015). By 2020, the country is expected to reach a population of 18,896,684 inhabitants, maintaining not only the proportionality between men and women population, but also a trend towards stabilization (Figure 1).

1.6. Social development

According to INE (2015), Chilean life expectancy reached 79.1 years, while the infant mortality rate was 7.0 per every thousand live births and the literacy rate rose to 98.9% (UNICEF, 2012). The Sanitary Services Superintendency (SISS) reported that by 2014, 96.7% of the urban population was provided access to sewerage services, 99.9% had access to drinking water and 99.9% of wastewater was treated in processing plants (SISS, 2014a).

Figure 1: Chilean population, disaggregated by gender, according INE estimations, based on the 2002 Population Census



Source: Drawn up from INE information (2012).

The positive trend of the Human Development Index (HDI)[2] is a clear evidence of the changes and the economic evolution of Chile between 1980 and 2014: during these years the HDI by 30% (from 0.64 to 0.83) (PNUD, 2015).

The new poverty measurement methodology, established by the Ministry of Social Development (MIDESO) as from the year 2015, survey two supplementary indexes, based on the Casen survey data: the poverty by income and the multidimensional poverty. The 2006-2015[3] period showed a significant poverty decline: while in 2006 a 29.1% of the country's population was living in poverty, by 2015 this value fell to 11.7%. Similarly, the population living in extreme poverty decreased from 12.6% in 2006 to 3.5% by 2015 (MIDESO, 2016), as can be seen in Figure 2.

1.7. Education

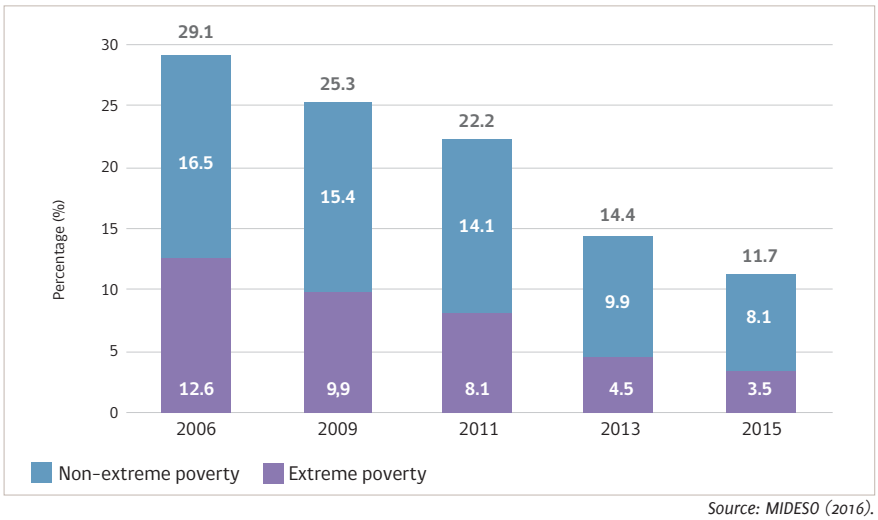
The Chilean educational system is structured in four levels: pre-primary education, primary and secondary education (these constitute together the formal school education) and higher education. Formal school education is implemented through state-own schools run by municipalities, private schools with governmental allowances, private schools and schools run by corporations; each of them having regulatory bodies that help the development of their functions accordingly. On the other hand, according the Ministry of Education (2015), higher education in Chile is represented by both state and private entities, at different levels: technical training centers or CFT (39), professional institutes or IP (33), state universities (25) and private universities (31).

FICH.

1.8. Science, technology and innovation

In the field of science, technology and innovation, there are three entities interacting concertedly: the government network, the universities and research centers and finally the private entities. Government establishes the system policies on science, technology and innovation. It also supports the national research activities through organizations under the authority of ministries and autonomous-decentralized entities. These entities in turn fund a large

Figure 2: Percentage of people living in poverty and in extreme poverty, by income, period from 2006 to 2015 ac cording the new measurement methodology.



Source: MIDESO (2016).

[2] *The Human Development Index assesses the countries progress in terms of health (life expectancy), education (average schooling years and envisaged) and income (per capita gross national income).*

[3] *Poverty by income data series (estimated through the new measurement methodology) covers the years 2006, 2009, 2011, 2013 and 2015.*

proportion of the activities performed by companies and universities in this field. The latter, together with the research centers carry out most of the fundamental research as well as a significant portion of the applied research and technology development. The corporate sector, consisting of private and public companies, funds a substantial percentage of domestic expenditure on research and development (R & D).

1.9. Economic profile

Chile has an open and stable economic model that promotes trade and investment. To a considerable extent, the country's economic growth is driven by the mining activity, exports of which represented in 2014 54.2% of total Chilean overseas shipments (DIRECON, 2015).

During the last twenty years, Chile has undergone a fast economic growth, led by commodities exports. Over the last years, the Chilean economic policy has been focusing on fiscal instruments that promote economic growth and simultaneously allow keeping inflation rates under control. Particularly, it should be noted that the fiscal policy within the structural balance concept has been playing a stabilizing role in the Chilean economic cycle.

A brief overview of four country economic sectors is presented below: Energy, agriculture and forestry, aquaculture and fishery and mining.

1.9.1. Energy

Chile's energy activities like generation, transmission and distribution of electricity are developed by private companies, but governed and audited by the State. In addition, the State is contributing with studies allowing the future electricity services demand to be assessed, therefore, estimating the need for investment in power generation and transmission.

Power generation in Chile comprises two main sources: hydraulic and thermal energies. The geographical conditions have determined an electric power transmission network consisting of four individual systems: Interconnected System of Norte Grande (SING) and Central (SIC) regions, and Aisén and Magallanes regions. On the other hand, Chilean power demand is determined by the energy end-use consumption of three main broad segments: i) transport, ii) industrial and mining, and iii) commercial, public and residential (CPR) (MINENERGIA, 2015).

1.9.2. Agriculture and Forestry

Over the last decades the agroforestry sector has undergone major changes. In the 1980s, these economic activities have been strengthening a successful internationalization process. This was possible within the framework of a development strategy based on a full opening of the economy to the outside world and thanks to the regulation of the productive activity based on its initial comparative advantages and the development of further competitive advantages (ODEPA, 2005). Because of these changes, the agri-food industry has become in one of the foundations of economic development; in multiple sectors, it has an international significance.

1.9.3. Aquaculture and Fishery

Chilean coastline grants the country a privileged status from the fishing industry perspective. Based on the origin of the product, this sector can be sub-divided into extractive fishing (industrial and artisan) and aquaculture. Highly productive ecosystems can be found at the exclusive economic zone (EEZ) and the territorial sea, granting almost unique advantages in the world for the extraction of worldwide highly valued and demanded fishing resources.

1.9.4. Mining

Chile owns vast mineral reserves, to the extent that it is the world's largest copper producer. In the metallic mining area, copper, iron, molybdenum, lead and zinc production show outstanding figures; from these, copper and molybdenum account for the largest equity share, the latter being a by-product of copper extraction. As a result of this abundance, the mining activity has been the main Chilean economic activity over decades. On the other hand, in the non metallic area the production rates of sodium chloride, calcium carbonate and sulfur compounds show also remarkable figures.

1.9.5. Summary of indicators

In summary, Table 1 presents some key indicators for the country, based on the information submitted at the Third National Communication of Chile to the United Nations Framework Convention on Climate Change in 2016 (3CN).

Table 1. Chilean key indicators

Information		Source
Geography and population		
Surface area:		
Total surface area (km^2)	2,006,096	Military Geographical Institute (IGM)
South American surface area (km^2)	755,915	
Oceania surface area (Eastern Island) (km^2)	181	
Land uses:		
Agricultural areas (%)	4.4	National Forest Corporation (CONAF), 2016[4]
Native Forests (%)	18.9	
Forest Plantations and mixed forests (%)	4.2	
Grasslands and Scrublands (%)	27.1	
Urban and Industrial Areas (%)	0.5	
Areas without vegetation (%)	32.5	
Protected marine areas (thousand ha)	45,111.4	Ministry of Environment (MMA), 2016
National System of Protected Wild Areas (SNASPE) (thousand ha)	14,630.5	
Population:		
Population in the year 2010 (inhabitants)	17,066,142	National Institute of Statistics (INE)
Population in 2016 estimated (inhabitants)	18,191,884	
Males in the year 2016 estimated (%)	49.5	
Females in the year 2016 estimated (%)	50.5	
Population in the year 2020 estimated (inhabitants)	18,896,684	
Population in the year 2050 estimated (inhabitants)	20,204,779	
Rural population in 2015 estimated (%)	12.7	
Indigenous population in 2013 (inhabitants)	1,565,915	Ministry of Social Development, 2016
Migrant population in 2013 (inhabitants)	354,581	
Social development:		
Life expectancy in 2015 (years)	79.1	National Institute of Statistics (INE), 2015
Infant mortality rate in 2013 (for every 1,000 live births)	7.0	
Literacy rate in 2012 (%)	98.9	UNICEF
Urban population connected to sewage system in 2014 (%)	96.7	Superintendence of Sanitary Services (SISS), 2014
Urban population with drinking water supply in 2014 (%)	99.9	
Waste water treated in treatment plants in 2014 (%)	99.9	
Human development Index in 2014	0.832	United Nations Development Program (UNDP), 2015
Population in extreme poverty in 2015 (%)	3.5	Ministry of Social Development, 2016
Population in poverty in 2015 (%)	11.7	
Ratio between the richest 10% and poorest 10% in 2015	27.2	
Gini coefficient in 2015	0.495	
Economic activity:		
GDP in 2015 (million USD)	240,215.7	World Bank, 2016
GDP per capita, in 2015 (USD)	22,316	
Estimated GDP growth at 2016 (% annual)	1.9	
Estimated GDP growth at 2018 (% annual)	2.3	
Exportation of raw materials in 2015 (% of total exports)	43.7	
Export of goods and services in 2015 (% GDP)	30.1	
Trade balance in 2014 (million USD)	3,515	General Directorate of International Economic Relations (DIRECON), 2015
Mining exports in 2014 (% of total exports)	54.2	
Agricultural and forestry exports in 2014 (% of total exports)	7.6	
Industrial Exports in 2014 (% of total exports)	38.2	

[4] *With respect to the South American and Oceania Surface area.*

Source: Prepared by authors.

2. *Institutional Arrangements for Climate Change*

Below is presented the existing institutional framework. This is intended to promote the coordination and strong collaboration between the multiple decision-making levels, including various partners, players and sectors in environment matters focused on climate change.

Moneda, Claudio Badilla.

2.1. Environment institutional framework

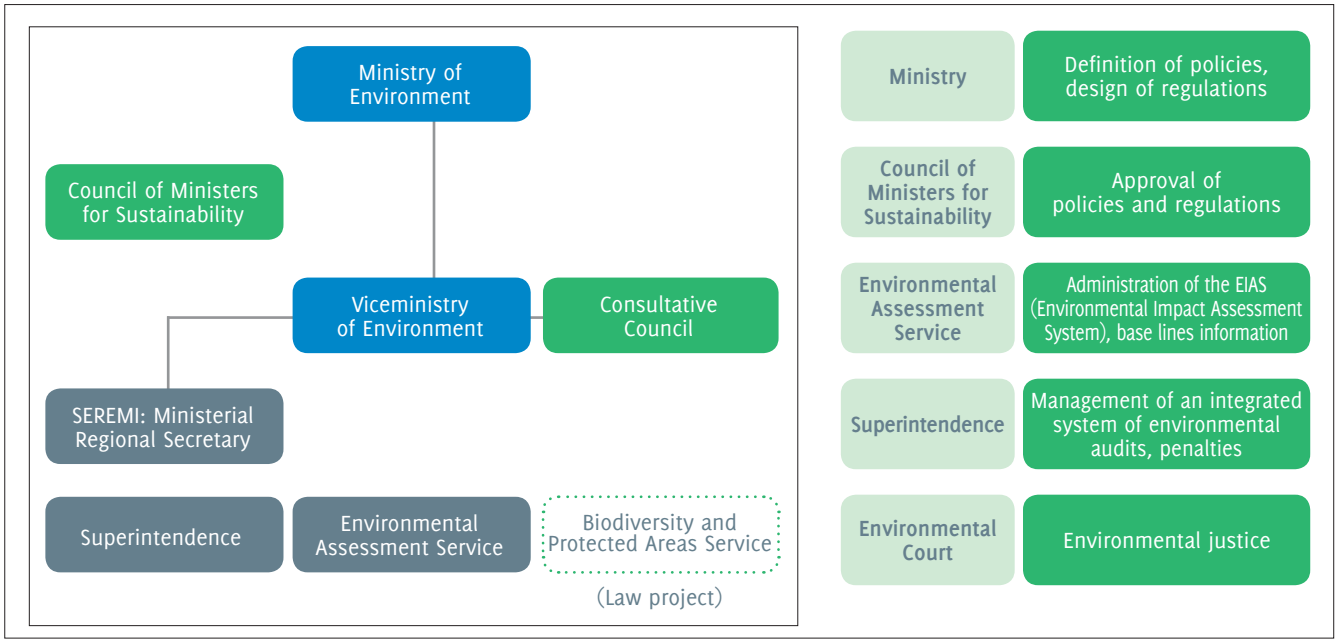
Domestic policies towards sustainable development are part of the comprehensive country's development strategy. The Constitution guarantees, as a fundamental right of the people, life in a pollution free environment, granting the State liabilities on protecting and preserving nature and the environmental heritage (Gobierno de Chile, 2002). On March 1994, law 19,300 on General Bases of the Environment was enacted, laying the groundwork for the environmental institutional framework and creating the Environmental National Commission (CONAMA), the first Chilean environmental agency and responsible supervising body. On January 2010, law 20,417 was enacted, creating the Ministry of Environment (MMA), the Environmental Assessment Service (SEA) and the Environment Superintendency (SMA). On the other hand, law 20,600 created the Environmental Courts. A brief overview of the national institutional framework concerning climate change issues is presented below[5].

2.1.1. Ministry of Environment

The MMA is defined as the State organization in charge of collaborating with the President of the Republic in devising and enforcing environmental policies, plans and programs, as well as regarding the protection and conservation of biological diversity and natural renewable and hydrological resources, promoting a sustainable development, the environmental policy integrity and the normative regulation. Law 20,417 stresses the MMA areas of responsibility in developing nationwide climate change topic, providing specifically, and for the first time in Chilean law, a special government level rule. This document requires the MMA to "propose policies and develop plans, programs and action plans on climate change issues. In performing this duty, it shall contribute to the different State Administration bodies nationwide and at regional and local levels aiming the impacts of climate change to be as-

[5] *More detailed information about the institutional framework relevant to climate change can be found in chapter 1 of the Third National Communication of Chile about climate change.*

Figure 3. Organization chart of Chilean environmental institutional framework and its main functions



Source: MMA, 2014.

sessed, as well as its adaptation and mitigation measures[6]". The multiple components of the environmental institutional framework and their main responsibilities are listed in Figure 3.

2.1.2. Council of Ministers for Sustainability (CMS)

Article 71 of law 20,417 created the Ministry of Environment, the Environmental Assessment Service and the Environment Superintendency. This law also created the Council of Ministers for Sustainability (CMS), chaired by the Minister of the Environment and composed of his peers of Agriculture; Finance; Health; Economy, Development and Tourism; Energy; Public Works; Housing and Urban Affairs; Transport and Telecommunications; Mining; and Social Development. Its main purpose is promoting policies and regulations focused on sustainability.

Given the strategic importance that climate change issues have acquired worldwide and particularly in Chile, efforts are being made establishing the CMS as the "Council of Ministers for Sustainability and Climate Change" (CMSCC), by granting the membership to the Minister of Foreign Affairs.

2.2. Institutional framework on climate change

Since Chile ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1994, and joined the Kyoto Protocol in 2002, it has been participating actively in the discussions and international efforts in this context; additionally Chile, as a developing country, has fulfilled rigorously commitments undertaken. A special mention deserves the country's adherence to the Paris Agreement on September 2016.

2.2.1. Department of Climate Change, Ministry of Environment

A major milestone in the Chilean climate change concerned public management was in 2010, when the Climate Change Office (OCC) was created, reporting directly to the Vice-secretary of Environment. OCC work was structured upon the following strategic pillars: (i) Inventory and measurement of GHG; (ii) Mitigation and low carbon development strategy; (iii) Vulnerabil-

[6] *Law 20,417, article 70 letter h.*

ity and adaptation; (iv) Education and awareness; (v) Negotiation and international involvement; (vi) Institutional arrangements.

In 2014, the OCC became the "Climate Change Department" (DCC), incorporated to the Air Quality and Climate Change Division of the MMA; after this process its previous powers, responsibilities and budget remain unchanged except for the addition of the Ozone Unit.

The DCC, as inheritor of the OCC, is the national designated authority of the Clean Development Mechanism (MDL) and the Adaptation Fund, as well as a focal point for the Intergovernmental Panel on Climate Change (IPCC) and the NAMA Registry. Furthermore, the DCC is also a stakeholder in several information exchange networks like the Ibero-American Network of Climate Change Offices (RIOCC), the Regional Cooperation Program between the European Union and Latin America (EUROCLIMA), the Scientific Committee on Climate Change of the Pacific Alliance and the Inter-American Institute for Global Change (IAI), as well as the Independent Association of Latin American and Caribbean (AILAC).

2.2.2. Agency on Climate Change and Sustainable Development

In May 21st 2016 speech[7], to the Congress Plenary, President Michelle Bachelet announced the early establishment of the Chilean Agency for Climate Change and Sustainable Development, towards having a state agency responsible for implementing Chilean commitments in these matters. Literally, she said "Our environmental commitment demands world-class standards. At the International Conference on Climate Change we committed to reduce our polluting emissions and this way become part of an essential global movement for the future of our planet. Implementing this requires the creation of an Agency on Climate Change and Sustainable Development, which will coordinate agreements between the State and companies in order to implement mitigation, adaptation and capacity strengthening measures according this new reality by means of a CORFO Committee".

Arrayanes, Macarena Mella.

2.3. Sectoral institutional framework

National public institutional structure possess a series of institutions, bodies or entities which, although not belonging to the MMA, are clearly linked to climate change matters. Current ministries with specific units, departments or bureaus specially appointed for dealing with these matters are listed below.

2.3.1. Ministry of Foreign Affairs (MINREL)

Focal Point of Chile at the UNFCCC, through the Environment and Ocean Affairs Directorate (DIMA). Climate change monitoring at both bilateral and multilateral levels is within the DIMA outreach, a unit responsible for arranging the Chilean role in the UNFCCC negotiations, aiming to position the country as a world-class player at climate change negotiations.

DIMA ensures compliance of Chilean international commitments; it also handles and coordinates management arrangements and multilateral instruments affecting the environment and maritime issues. It consists of four departments, all of them relevant to the climate change subject area, namely: Environment, Natural Resources, Climate Change and Sustainable Development, and Ocean Affairs.

It is also important to mention that the General Directorate of International Economic Relations (DIRECON) coordinates Bunkers Fuels round

[7] *Annual opportunity for the presidents of Chile to address the status of the nation in the presence of the National Congress.*

Viña, SERNATUR.

table discussions, air and maritime transport. The purpose of these round tables is to discuss and agree the Chilean stance on efforts towards reducing greenhouse gas emissions of international air and maritime transport. These issues are addressed within the outreach of the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO), respectively.

2.3.2. Ministry of Energy (MINENERGIA)

State institution which main purpose is to develop and coordinate the plans, policies and regulations towards proper functioning and development of this sector, ensure its enforcement and provide guidance to the Government on energy matters. Among the multiple Divisions belonging to the institution, the Sustainable Development Division stands out from the rest regarding climate change issues, its main purpose is to coordinate and align energy policies with the local development, the climate change and environmental stewardship. The Prospective and Energy Policy Division also deserves to be mentioned as within its multiple functions is responsible for developing the GHG inventory of the energy sector. One of the major developments of this Ministry regarding climate change matters refers to the agreed forward-looking energy policy, covering a period up to year 2050. One of the key challenges of this policy is to reach a 60% switch to renewable energies supply by year 2035 and at least 70% by year 2050. When it comes to energy efficiency, the main objective is aiming energy-intensive sectors to achieve energetic efficiency and that by 2050 all new buildings can meet OCDE concerned standards.

2.3.3. Ministry of Agriculture (MINAGRI)

State institution responsible for promoting, guiding and coordinating the agroforestry activities of the country. All Ministry institutions are linked to climate change matters, those achieving greater involvement so far are the Office of Agrarian Studies and Policies (ODEPA), the National Forestry Corporation (CONAF), the Foundation for Agricultural Innovation (FIA), the National Agricultural Research Institute (INIA), the Forest Institute (INFOR) and the Natural Resources Information Center (CIREN). One relevant milestone to highlight is its active engagement in developing the Adaptation Plan of the Agroforestry Sector, in force since late 2013 and the formal and public submission of the Forest Policy 2015-2035 in May 2016 whose development process was closely linked to the preparation of the National Strategy on Climate Change and Vegetation Resources (ENCCRV), led by CONAF through its Forest Promotion and Development Management (GEDEFF), specifically by its Climate Change and Environment Services Unit (UCCSA).

2.4. Institutional arrangements for reports development to the UNFCCC

All UNFCCC signatory countries shall report their actions towards the implementation of these convention principles, by means of national communications, and since 2014, Biennial Update Reports. In line with the "common but differentiated responsibilities" principle, the con-

tents and time to submit of national communications differ between developed and developing countries. Chile, as a signatory country of the convention and as a developing country (Non-Annex I) has submitted three national communications, the last one was developed by the MMA and submitted in 2016.

The Conference of Parties (COP) at its seventeenth session approved the guidelines specified in Decision 2/CP.17[8], Annex III, about report generation of Biennial Update Reports (BUR) for non-Annex I Parties. These guidelines outline both the objectives and the outreach of the information to be communicated. COP Decision 2/CP.17 also established that non-Annex I Parties, in accordance with their capabilities and the provided level of support for information purposes, shall submit their first BUR not later than December 2014.

The arrangements to which Chile has committed to for the purpose of this report liabilities are aligned with the institutional framework previously addressed. This means that the body appointed for the necessary coordination towards developing this report is the Climate Change Department, which has undertaken an information gathering process together with the public environmental competent institutions. Detailed information regarding specific arrangements for developing the Chilean domestic GHG inventory is explained in Chapter 2 of the present report.

2.5. Analysis process of the first BUR

Chilean first BUR was submitted to the UNFCCC on December 10 2014, within the period prescribed in the 17th COP session held in Durban. In 2015, Chile went through an Analysis and International Consultation process (ICA). This one-week technical analysis process, which took place between May 18 and 22 2015 in Bonn, Germany, was attended by consultants from the Experts Consultative Group and the Convention Secretariat, as well as experts from 5 countries considering Annex I and non-Annex I topics. The report of this process was completed in November 2015.

Parque Eólico, Constanza Montes.

This document focuses on the Chilean first BUR report from the perspective of its transparency features, but also from the guidelines implementation perspectives, contained in Appendix to 20/CP.19 Decision of the UNFCCC. The purpose of this process was to help the country to identify the need for capacity building in the different areas addressed in the Biennial Update Reports.

Within the process presented findings[9], there is an emphasis on the identified need for ensuring the continuance of the reports concerned experts; the technical and institutional capacities towards collecting relevant information permanently, whether to monitor (MRV) both the mitigation actions and the support received.

The process of reviewing the first Chilean BUR was completed with the first workshop on "Facilitative sharing of views" [10](FSV), carried out on May 20 2016 in Bonn, Germany, in the context of 44 session of the Subsidiary Body for Implementation of the UNFCCC (SBI). In this workshop, Chile introduced the BUR document besides sharing experiences and lessons learned during this document developing process and its technical analysis process.

Further information about the conclusions of the international analysis process, specifically regarding capacity building needs, can be found in chapter IV of this report.

[8] *http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf*
[9] *http://unfccc.int/resource/docs/2015/tasr/chl.pdf*
[10] *http://unfccc.int/files/national_reports/non-annex_i_parties/ica/facilitative_sharing_of_views/application/pdf/fsvr_chl_vf.pdf*

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II

Chile's National Greenhouse Gas Inventory, Series 1990-2013

1. Introduction

This chapter is a summary of the *National Greenhouse Gas Inventory Report in Chile, series* 1990-2013 containing the fourth National Greenhouse Gas Inventory of Chile (NGHGI) submitted by the country to the United Nations Framework Convention on Climate Change in fulfillment of article 4, paragraph 1(a) and article 12, paragraph 1(a) of the UNFCCC and decision 1 of the 16th Conference of the Parties of Cancun, in 2010.

Chile's NGHGI, elaborated in accordance to the 2006 *Intergovernmental Panel on Climate Change* (IPCC) *guidelines* for national greenhouse gas inventories, includes the entire national territory and all emissions and removals of greenhouse gases (GHGs) of anthropogenic origin not controlled by the Montreal Protocol from 1990 to 2013. The estimations of GHG emissions and removals refer to the last year of inventory (2013), unless otherwise specified.

This section presents the general background on Chile's NGHGI, institutional arrangements, updating process, methodology, key categories, uncertainty and completeness. Section 2 details trends in greenhouse gas emissions and removals in Chile. Sections 3 to 6 present detailed information on the four sectors: *Energy; Industrial processes and product use; Agriculture, Forestry and other land uses; and Waste*. Section 7 presents the memo items and section 8 summarizes recalculations.

1.1. General background

On 21 March 1994, the United Nations Framework Convention on Climate Change (hereinafter referred to as the UNFCCC or the Convention), ratified by Chile in the same year, came into force with the objective of achieving stabilization of GHG concentrations in the Atmosphere to a level that would prevent dangerous anthropogenic interference with the climate system. To achieve this goal, all member countries of the Convention must develop, update regularly, publish and facilitate national inventories of their GHG (NGHGI).

NGHGIs consist of a comprehensive numerical list of the counting of each of the anthropogenic GHGs released or absorbed from the atmosphere in an area and in a specific period, generally corresponding to a calendar year. NGHGI's objective is to determine the magnitude of national GHG emissions and removals that are directly attributable to human activ-

ity, as well as the country's specific contribution to the phenomenon of climate change.

In addition, according to the United Nations Development Program (UNDP, 2005), the preparation and presentation of NGHGI can provide a number of other benefits for a country, including:

- Identify the economic sectors that contribute most to climate change and their specific contributions;
- Provide useful information for economic development planning and evaluation;
- Provide useful information to address other environmental issues (for example, air quality, land uses or waste management);
- Identify gaps in national statistics;
- Evaluate GHG mitigation options, collaborating on the guidelines for a low emission development strategy and, consequently, to a more efficient use of natural and financial resources; and
- Provide the basis for emissions trading schemes.

Parque Nacional Salar de Huasco, CONAF Jorge Herreros

GHGs included in NGHGIs in developing countries, such as Chile, are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6).

In NGHGI, country economic sectors are grouped into four sectors defined by the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (hereinafter IPCC 2006 Guidelines), which share characteristics of Processes that generate GHG emissions or removals. These sectors are *Energy; Industrial processes and product use (IPPU); Agriculture, Forestry and other land uses (AFOLU); and Waste*.

The key reports to submit the NGHGI to the Convention are the national communications (CN) and, as of 2014, the biennial update reports (BUR), which must be submitted every two years and whose main content is the NGHGI. In addition, in 2014 Chile voluntarily submitted, in conjunction with its First BUR, its First Report on the National Inventory of Greenhouse Gas, series 1990-2010, document that is intended to be continually presented.

1.2. Institutional arrangements for the elaboration of Chile's NGHGI

In order to report on progress in implementing the objectives of the Convention, the 2010 COP16 defined that "developing countries must submit biennial update reports to the Convention, containing updates on *NGHGI*»[1]. In addition, COP17 in 2011 added that *"developing countries should submit their first BURs no later than December 2014 [...] covering at least one previous calendar year in no more than four years at the submission date"*[2].

[1] *Decision 1, paragraph 60(c) of the Report of the Conference of the Parties on its sixteenth session, held in Cancun from November 29th to December 10th 2010.*
[2] *Decision 1, paragraph 41(a) Report of the Conference of the Parties on its 17th session, held in Durban from November 28th to December 11th 2011.*

Because of these new commitments acquired by the country, the GHG Inventory Area of the Department of Climate Change of the Ministry of Environment has been designing, implementing and coordinating, since 2012, the National Greenhouse Gas Inventory System of Chile (SNICHILE), which includes institutional, legal and procedural measures for the biennial updating of Chile's NGHGI, thereby ensuring the sustainable preparation of GHG inventories in the country, the consistency of reported GHG flows, an the quality of results.

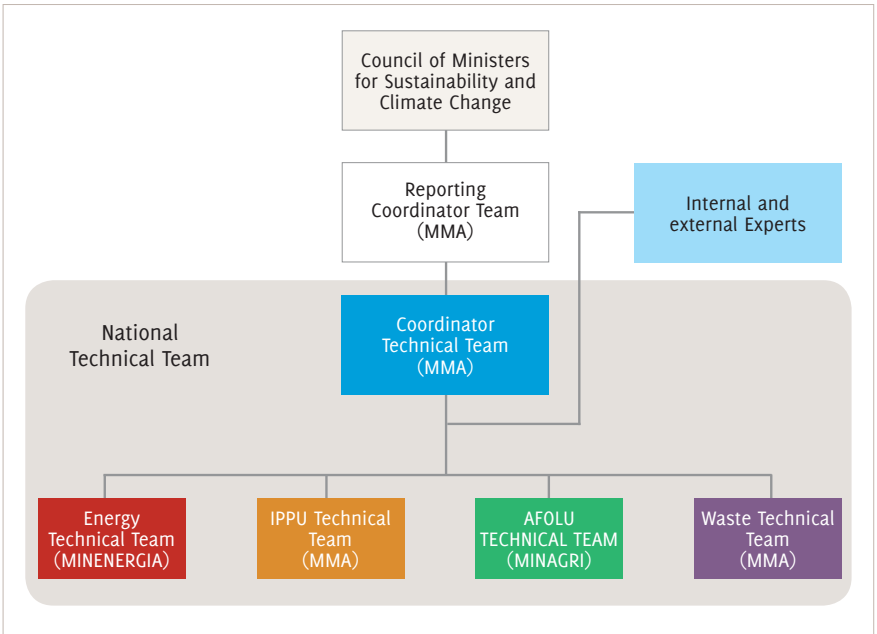
The permanent work of SNICHILE is divided into five lines of action covering the areas required for the continuous elaboration of Chile's NGHGI. They are described below.

1.2.1. Operation of SNICHILE

Line of action focused on the operation of the SNICHILE through the maintenance of an organic structure with defined roles and responsibilities. SNICHILE has a decentralized organizational structure, internalized in the State apparatus and independent of other pollutant inventories, so that Chile's NGHGI are the result of the collective and permanent effort of various public services (Figure 1).

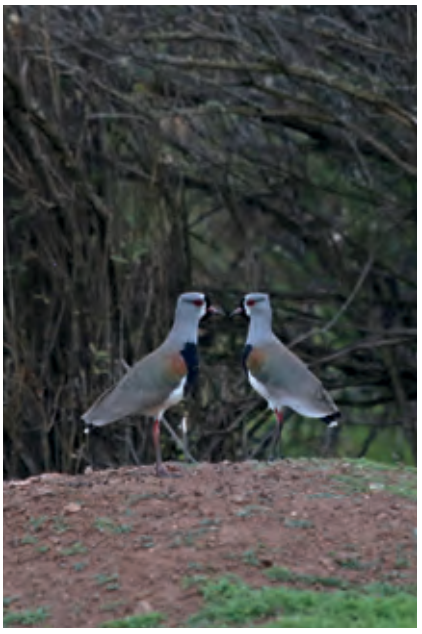
The National Technical Team (composed by the Coordinating Technical Team and the Sectoral Technical Teams) is in charge of the development and elaboration of Chile's NGHGI; the Reporting Coordination Team prepares reports for submission to the Convention; and the Council of Ministers for Sustainability, composed by the highest authority of eleven sectoral ministries, reviews and approves the reports of Chile that will be sent to the Secretariat of the Convention.

Figure 1. Organizational structure of SNICHILE



Source: MMA Technical Coordinating Team.

In addition, internal experts (ministerial focal points) and external experts (usually international experts hired by SNICHILE according to their own requirements) collaborate with their relevant experts to review and guarantee the quality of NGHGI Chile.



Quebrada de La Plata

The SNICHILE Coordinating Technical Team, a unique national entity, is established in the GHG Inventory Area of the Department of Climate Change of the Ministry of Environment. This national entity is responsible for coordinating the Sectoral Technical Teams through the work plan of SNICHILE, compiling GHG sector inventories (GHGSECI) to elaborate the Chile's NGHGI, developing the crosscutting themes of Chile's NGHGI and developing the National Greenhouse Gas Inventory Report of Chile (NIR). In addition, it is in charge of implementing the lines of action of SNICHILE.

The Sectoral Technical Teams develop and elaborate their respective

GHGSECI, including the development of sectoral crosscutting issues and the preparation of the GHG Sectoral Inventory Report. All of the above according to the SNICHILE work plan. Technical teams are established in the following institutions:

- Energy Technical Team, responsible for GHGSECI of Energy, is established in the Division of Prospective and Energy Policy of the Ministry of Energy.
- IPPU Technical Team, responsible for GHGSECI of IPPU, is established in the Department of Climate Change of the Ministry of Environment.
- AFOLU Technical Team, responsible for the AFOLU GHGSECI, is established in different offices of the Ministry of Agriculture, such as the Office for Agricultural Studies and Policies (ODEPA), the National Forestry Corporation (CONAF), the Forestry Institute (INFOR) and Institute of Agricultural Research (INIA).
- Waste Technical Team, responsible for Waste GHGSECI, is established in the Office of Waste and Environmental Risk, and in the Office of Climate Change, both belonging to the Ministry of Environment.

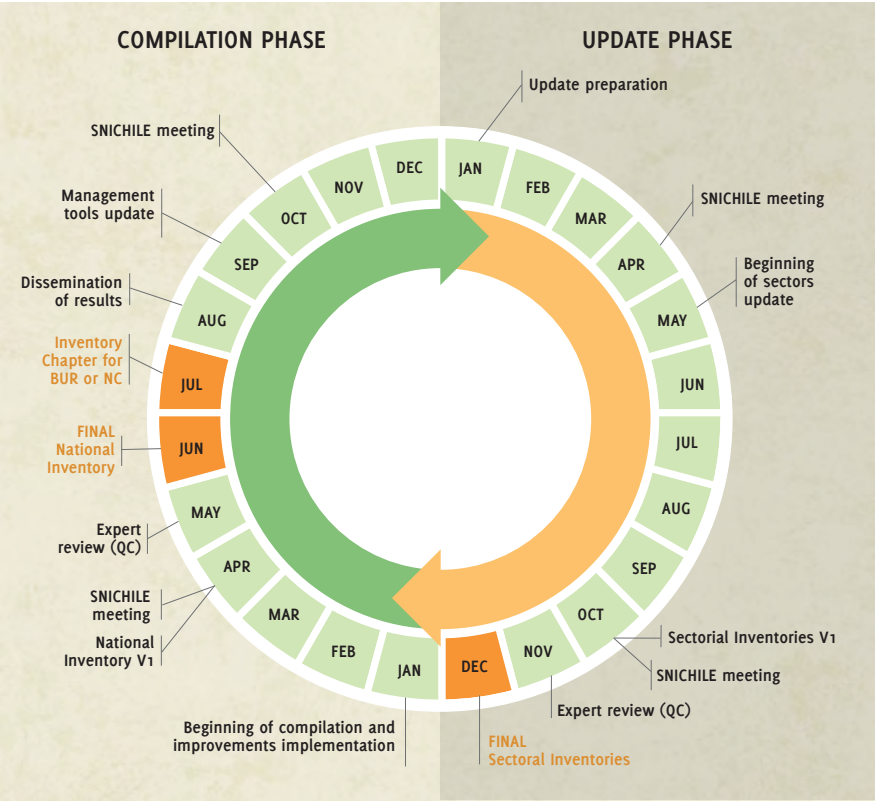
Finally, for the general coordination of SNICHILE, the Coordinating Technical Team has held biannual meetings with the National Technical Team since 2013. In addition, bilateral meetings are held periodically with the Sectoral Technical Teams to address issues specific to each sector.

1.2.2. Updating Chile's NGHGI

Line of action focused on updating Chile's NGHGI through the implementation and maintenance of a work plan consisting of a biennial cycle of activities, and in periods and budgets that guide the permanent work of the National Technical Team (Figure 2). In general, in the first year of the cycle (updating phase), the GHGSECIs of each sector are updated, while in the second year (compilation phase), the cross-cutting topics of Chile's NGHGI are compiled and developed.

The GHGSECI, according to the work plan, should be finalized in December of the first year of the cycle, including its external review, so that Chile's NGHGI is elaborated in the first six months of the second year of the cycle. In addition, the National Technical Team meets at least twice a year. It is important to mention that SNICHILE's work plan is flexible and adaptable to the circumstances and contingencies that may arise at all levels.

Figure 2. Biennial cycle of the SNICHILE work plan



Source: MMA Technical Coordinating Team.

1.2.3. Quality Assurance and Quality Control System

Line of action focused on quality improvement of Chile's NGHGI (transparency, completeness, consistency, comparability and accuracy) through the establishment and implementation of procedures for quality assurance, quality control and verification. In addition, to identify and prioritize the potential improvements of NGHGI in Chile, a continuous improvement plan (CIP) is developed.

Since 2015, SNICHILE has implemented a Quality Assurance and Control System (QA/QC) in line with IPCC good practices for the elaboration of NGHGI. The components of this system are as follows:

Tricahues, Pablo Carrido

- **Quality control:** a series of routine technical activities and procedures are documented and recorded to evaluate and maintain the quality of the inventory as the Sectoral Technical Teams prepare their GHGSECI and that the Technical Coordinating Team compiles and elaborates the Chile's NGHGI.

- **Quality assurance:** the comments, suggestions, recommendations and observations resulting from external independent professional reviews, which do not directly participate in the National Technical Team, are documented and recorded. These third-party reviews are of GHGSEC and NGHGI finished.

- **Verification:** A set of comparison activities between the GHG estimates of the National Technical Team and those elaborated by external agencies is documented and recorded. GHG estimates, statistical and parametric activity data, and emission factors are compared. Each Sectoral Technical Team applies its own sources of comparison using the criteria of the 2006 IPCC Guidelines. Some examples are the application of the Reference Method with the Sectoral Method in the Energy sector; comparison of the International Energy Agency's (IEA) GHG estimates with own estimates of the Energy Technical Team; and the comparison of the GHG estimates of the Food and Agriculture Organization of the United Nations (FAO) with the own estimates made by the AFOLU Technical Team.

- **Continuous improvement plan:** a set of activities and procedures are documented and recorded to identify possible areas of improvement, implementation and budget. These issues are addressed by the National Technical Team during the biannual SNICHILE, or bilaterally between the Sectoral Technical Teams and the Coordinating Technical Team.

All QA/QC activities and procedures are listed so that GHG inventory professionals can categorize them as "implemented" or "not implemented", and may also add comments for other professionals to follow up properly.

1.2.4. Building and maintaining capacities

Line of action focused on the creation, maintenance and increase of the technical capacities of the professionals of the SNICHILE National Technical Team for the generation of GHG inventories.

To identify training needs, the Coordinating Technical Team makes a diagnosis of needs by identifying gaps, barriers and obstacles, and then prioritizing needs. Overcoming gaps has usually been made through training workshops during SNICHILE meetings. To date, specific workshops have been held to address issues such as uncertainty assessment, shortening information gaps and general GHG inventories.

Tres Fases, Pablo Garrido

A relevant topic for SNICHILE is that, in July 2016, there are seven professionals qualified as expert reviewers of NGHGI for Parties Annex I to the Convention, who participate actively and permanently in the work of SNICHILE (Table 1). These professionals contribute with their specific knowledge in different stages of the process of Chile's NGHGI, thus collaborating with the assurance of its quality.

Table 1. : SNICHILE professionals qualified as expert reviewers of NGHGI of Parties Annex I to the Convention

Name	Institution	Qualification	Participation in SNICHILE
Aquiles Neuenschwander A.	Foundation for Agricultural Innovation of the Ministry of Agriculture	Leading reviewer and expert in the sector Land use, land-use change and forestry	AFOLU Technical Team Advisor
Sergio González M.	German Society for International Cooperation	Leading reviewer and expert in the Agriculture sector	AFOLU Technical Team Advisor and Coordinator
Fernando Farías E.	Department of Climate Change of the Ministry of Environment	Energy Sector Expert Reviewer	Coordinating Technical Team Advisor and Supervisor
Jenny Mager S.	Department of Climate Change of the Ministry of Environment	Expert reviewer of the industrial processes sector	IPPU Technical Team Leader
Paulo Cornejo G.	Department of Climate Change of the Ministry of Environment	Agriculture Sector Expert Reviewer	SNICHILE Coordinator
Marta Alfaro V.	Agricultural Research Institute of the Ministry of Agriculture	Agriculture Sector Expert Reviewer	AFOLU Technical Team Sub-Leader, responsible for livestock and related activities
Yasna Rojas P.	Forestry Institute of the Ministry of Agriculture	Expert reviewer in the sector of Land use, land-use change and forestry	AFOLU Technical Team Sub-leader, responsible for Forestry Lands and related activities

Source: MMA Technical Coordinating Team.

Another relevant initiative of SNICHILE is the creation and implementation, since 2013, of a Latin American Network of National Inventories of Greenhouse Gases, whose main objective is to maintain a South-South cooperation network on national GHG inventories among Latin American countries,[3] facilitate the development of technical and institutional capacities through the exchange of experiences and the adoption of best practices. Currently, the Secretariat pro tempore of the Network has been taken over by the SNICHILE coordinator.

1.2.5. Archiving and dissemination

Line of action focused on the documentation and archiving of information related to Chile's NGHGI and with the dissemination of this information, in order to ensure the management and transparency of Chile's NGHGI.

For the Chilean NGHGI archive, since 2015 the Coordinating Technical Team has implemented a filing and documentation system adapted to national circumstances, called the Tabular Record System (TRS), which consists of a set of folders and files (documents and calculation spreadsheets) to facilitate data management, GHG estimation and the treatment of cross-cutting issues related to the country's GHG inventories. The TRS is housed in a virtual cloud managed by the Coordinating Team and operated by the company Dropbox. The service allows users to store, share and synchronize folders and files online, between computers and other users. The TRS has its own manual that includes the necessary instructions for the implementation and management of the calculation spreadsheets.

For the dissemination of NGHGI in Chile, since 2015 the Coordinating Technical Team has maintained a virtual platform of SNICHILE to inform citizens about national GHG emissions and removals. The ultimate goal of the platform is to disseminate Chile's NGHGI, to be the central information repository for SNICHILE and to bring the population interactively to the topic of climate change. In addition, printed materials have been published as an executive summary and a brochure of Chile's NGHGI, along with complementary audiovisual material.

1.3. Updating process of Chile's NGHGI

The process for the elaboration of this Chile's NGHGI began the first semester of 2015 and concluded in the middle of 2016. As shown in Figure 3, each Sectorial Technical Team develops the GHG inventory of its own sector. The Coordinating Technical Team then compiles the GHGSECI and develops the crosscutting themes, with this material elaborated by Chile's NGHGI and its respective report. Subsequently, each Sectorial Technical Team approves the final report.

The next step is an international review process. This time we had the expert review of the German Federal Environment Agency, who are thank-

[3] As of July 2016, the member countries of the Network are: Argentina, Chile, Colombia, Ecuador, El Salvador, Honduras, Mexico, Panama, Paraguay, Peru and Uruguay.

ful for their contribution, as well as the Information Matter project of the German Society for International Cooperation (GIZ) for coordination And UNDP's Low Emission Capacity Building (LECB-Chile) project, which partially financed this process.

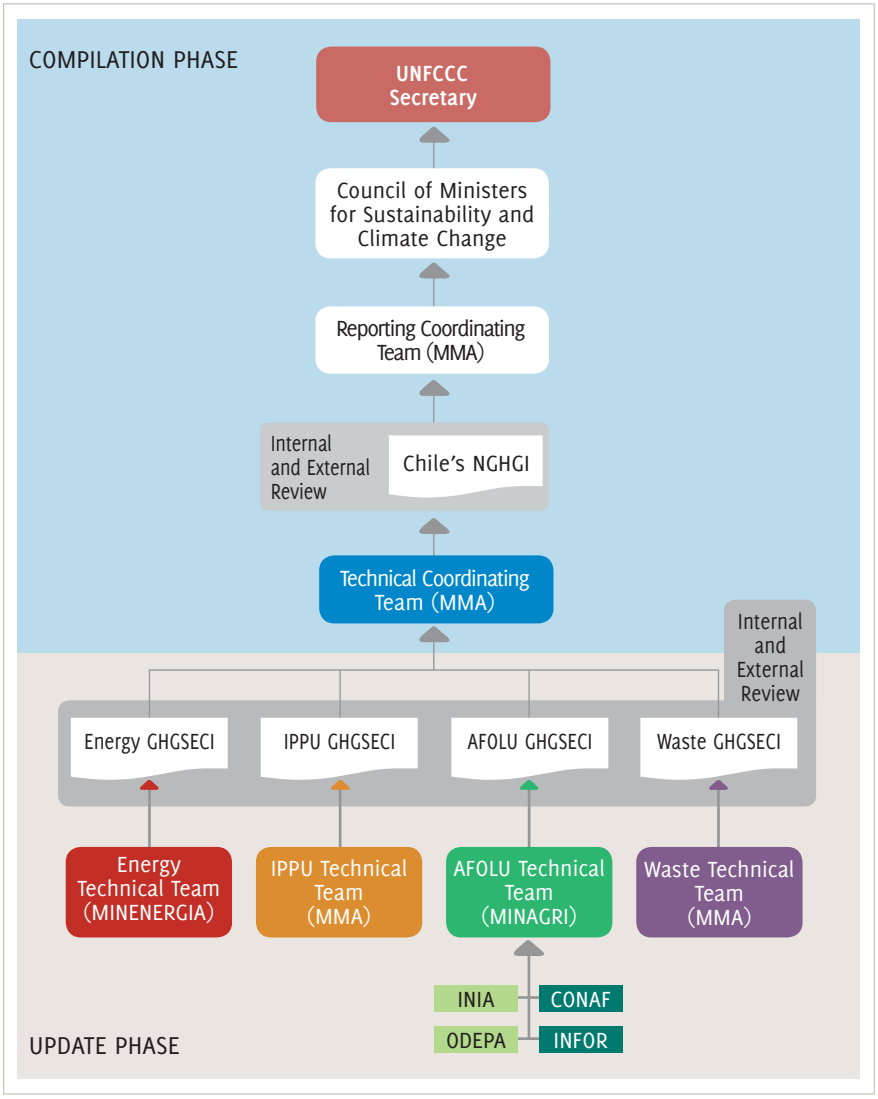
Finally, Chile's NGHGI is given to the Reporting Coordinating Team for inclusion in the Third National Communication of Chile and in the Second Biennial Update Report.

In conclusion, Chile's NGHGI is the result of the collective and permanent efforts of the Ministries of Agriculture, Energy and Environment, which have worked in coordination within the framework of SNICHILE, task that has strengthened the development of Chile's NGHGI by adding expert knowledge from different sectoral ministries involved.

1.4. Methodology and main sources of information

The following Chile's NGHGI, series 1990-2013, is the result of the compilation of GHGSECIs elaborated following 2006 IPPCC Guidelines for national greenhouse gas inventories[4] and applying IPCC software[5], with exception of AFOLU sector, including analysis of key categories and assessment of uncertainty. In addition, Chile's NGHGI has been elaborated in compliance with information requirements of biennial update reporting guidelines for Parties not included in Annex I to the Convention[6] and with

Figure 3. Updating process of Chile's NGHGI



Source: MMA Technical Coordinating Team.

Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention.[7]

To estimate GHG emissions and removals, the methodological approach is to combine the information on the extent to which a human activity takes place (called activity data or AD, which may be statistical and / or parametric) with the coefficients which quantify the emissions or absorptions by unit activity. They are called emission factors (EF). Therefore, the basic equation is:

[4] *Recovered from www.ipcc-nggip.iges.or.jp/public/2006gl/spanish/index.html*
[5] *Recovered from www.ipcc-nggip.iges.or.jp/software/index.html*
[6] *Decision Annex 17/COP8. Recovered from http://unfccc.int/resource/docs/spanish/cop8/cp807a02s.pdf#page=2*
[7] *Decision Annex III 2/COP8. Recovered from http://unfccc.int/resource/docs/2011/cop17/spa/09a01s.pdf#page=*

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GHG emissions = Activity data (AD) x Emission factors (EF)

Tier 1 is the "default method", the simplest methodological instance, applicable when there is no specific activity data or country-specific emission factors. While Tier 1 allows you to do the calculation, you run the risk that national circumstances will not be properly reflected. Tier 2 is based on the same methodological procedure as Tier 1, but with emission factors and / or parametric activity data specific to the country or region. In these circumstances, estimates of GHG removals and emissions are highly likely to be more accurate, so this option should be applied to the major categories. Tier 3 corresponds to country specific methods (models, censuses and others), whose application is recommended provided they have been duly validated and, in the case of the models, have been published in scientific journals with editorial committee.

Table 2 presents a summary of methods and tiers applied on Chile's NGHGI. Section 3 to Section 6 of this chapter provides information on the methodologies and methods applied in each sector. It emphasizes the application of Tier 2 methods and country-specific emission factors. For further information, the reader is encouraged to review the Chilean National Greenhouse Gas Inventory Report, 1990-2013 series.

Table 2. Methods applied in the CHILE'S NGHGI, series 1990-2013

Source and sink categories of greenhouse gases	CO_2		CH_4	
	Method used	Factor of emission	Method used	Factor of emission
1. ENERGY	T1, IE, NA, NE, NO	D, IE, NA, NE, NO	T1, T2, IE, NA, NE, NO	D, IE, NA, NE, NO
1.A. Fuel combustion activities (sector method)	T1, IE, NE	D, IE, NE	T1, T2, IE, NE	D, IE, NE
1.A.1. Energy Industries	T1, IE	D, IE	T1, IE	D, IE
1.A.2. Manufacturing industries and construction	T1, IE	D, IE	T1, IE	D, IE
1.A.3. Transport	T1, IE, NE	D, IE, NE	T1, T2, IE, NE	D, IE, NE
1.A.4. Other sectors	T1, IE	D, IE	T1, IE	D, IE
1.A.5. Non-specified	IE, NE	IE, NE	IE, NE	IE, NE
1.B. Fugitive emissions from fuels	T1, NA, NE, NO	D, NA, NE, NO	T1, NA, NE, NO	D, NA, NE, NO
1.B.1. Solid fuels	NA, NE	NA, NE	T1, NA, NE, NO	D, NA, NE, NO
1.B.2. Oil and natural gas	T1, NE, NO	D, NE, NO	T1, NE, NO	D, NE, NO
1.B.3. Other emissions from energy production	NE	NE	NE	NE
1.C. Transport and storage of CO_2	NO	NO	NO	NO
1.C.1. Transport of CO_2	NO	NO		
1.C.2. Injection and storage	NO	NO		
1.C.3. Other	NO	NO	NO	NO
2. INDUSTRIAL PROCESSES AND PRODUCT USE	T1, T2, NA, NE, NO	D, NA, NE, NO	T1, IE, NA, NO	D, IE, NA, NO
2.A. Mineral industry	T2, NE, NO	D, NE, NO	NA, NO	NA, NO
2.B. Chemical industry	T1 , NA, NO	D, NA, NO	T1, NA, NO	D, NA, NO
2.C. Metal industry	T1 , NO	D, NO	IE, NA, NO	D, IE, NA, NO
2.D. Non-energy products from fuels and solvent use	T1, NO	D, NO	NA, NO	NA, NO
2.E. Electronics industry	NA, NO	NA, NO	NO	NO
2.F. Product uses as subtitutes for ozone depleting substances	NA, NO	NA, NO	NO	NO
2.G. Other products manufacture and use	NO	NO	NO	NO
2.H. Other	NA	NA	NA	NA
3. AGRICULTURE, FORESTRY AND OTHER LAND USES	T1, T2, NA, NE, NO	CS, D, NA, NE, NO	T1, T2, NE, NO	CS, D, NE, NO
3.A. Livestock			T1, T2, NE, NO	CS, D, NE, NO
3.A.1. Enteric fermentation			T1, T2, NE, NO	CS, D, NE, NO
3.A.2. . Manure management			T1, T2, NE, NO	CS, D, NE, NO
3.B. Land	T1, T2, NA, NE	CS, D, NA, NE		
3.B.1. Forest land	T1, T2, NE	CS, D, NE		
3.B.2. Cropland	T1, T2, NE	CS, D, NE		
3.B.3. Grassland	T1, T2, NA, NE	CS, D, NA, NE		
3.B.4. Wetlands	T1, T2, NE	CS, D, NE		
3.B.5. Settlements	T1, T2, NE	CS, D, NE		
3.B.6. Other land	T1, T2, NE	D, NE		
3.C. Aggregate sources and non-CO_2 emissions sources on land	T1, NA, NO	D, NA, NO	T1, NE, NO	D, NE, NO
3.C.1. GHG emissions from biomass burning	NA	NA	T1, NE	D, NE
3.C.2. Liming	T1	D		
3.C.3. Urea application	T1	D		
3.C.4. Direct N_2O emissions from managed soils				
3.C.5. Indirect of N_2O emissions from managed soils				
3.C.6. Indirect N_2O emissions from manure management				
3.C.7. Rice cultivation			T1	D
3.C.8. Other (please specify)	NO	NO	NO	NO
3.D. Other	NE, NO	NE, NO	NO	NO
3.D.1. Harvested wood products	NE	NE		
3.D.2. Other (please specify)	NO	NO	NO	NO
4. WASTE	T1, NO	D, NO	T1, NO	D, NO
4.A. Solid waste disposal			T1	D
4.B. Biological treatment of solid waste			T1	D
4.C. Incineration and open burning of waste	T1, NO	D, NO	T1, NO	D, NO
4.D. Wastewater treatment and discharge			T1	D
4.E. Other	NO	NO	NO	NO
ANX. MEMORANDUM ITEMS				
Anx.1. International bunker	T1	D	T1	D
Anx.1.a. International aviation	T1	D	T1	D
Anx.1.b. International navigation	T1	D	T1	D
Anx.2. Multilateral operations	IE	IE	IE	IE
Anx.3. Biomass CO_2 emissions	T1	D		

T1 = Tier 1; T2 = Tier 2; T3 = Tier 3; C = Confidential Information; CS = Country-specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring

N_2O		HFC		PFC		SF_6	
Method used	Factor of emission	Method used	Factor of emission	Method used	Factor of emission	Method used	Factor of emission
T1, T2, IE, NA, NE	D, IE, NA, NE						
T1, T2, IE, NE	D, IE, NE						
T1, IE	D, IE						
T1, IE	D, IE						
T1, T2, IE, NE	D, IE, NE						
T1, IE	D, IE						
IE, NE	IE, NE						
NA, NE	NA, NE						
NA	NA						
NA, NE	NA, NE						
NE	NE						
NO	NO						
NO	NO						
T1, NA, NE, NO	D, NA, NE, NO	T1, NA, NE, NO	D, NA, NE, NO	T1, NA, NE, NO	D, NA, NE, NO	T1, NA, NO	D, NA, NO
NO	NO						
T1, NA, NO	D, NA, NO	NO	NO	NO	NO	NO	NO
NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NO	NO
NA, NO	NA, NO						
NA, NO	NA, NO	NO	NO	NO	NO	NO	NO
NO	NO	T1, NA, NE, NO	D, NA, NE, NO	T1 , NA, NE, NO	D, NA, NE, NO		
NA, NE, NO	NA, NE, NO	NO	NO	NA, NO	NA, NO	T1, NA, NO	D, NA, NO
NA	NA						
T1, NA, NE, NO	D, NA, NE, NO						
T1, NE, NO	D, NE, NO						
T1, NE, NO	D, NE, NO						
T1, NA, NE, NO	D, NA, NE, NO						
T1, NE	D, NE						
T1	D						
T1	D						
T1	D						
NA	NA						
NO	NO						
NO	NO						
NO	NO						
T1, NA, NO	D, NA, NO						
NA	NA						
T1	D						
T1, NO	D, NO						
T1, NA	D, NA						
NO	NO						
T1	D						
T1	D						
T1	D						
IE	IE						

Source: MMA Technical Coordinating Team.

After estimating the emissions and removals of each of the GHGs, and reporting of aggregate GHG values expressed in carbon dioxide equivalent (CO_2eq), developing countries should use global warming potentials (GWP) provided by the IPCC in its Second Assessment Report (SAR), which are based on the effects of GHG over a one-hundred-year horizon. The GWPs used for the main GHGs are presented in Table 3.

Table 3. Global warming potentials used at NGHGI in Chile

GHG	GWP
CO_2	1
CH_4	21
N_2O	310
HFC-32	650
HFC-125	2,800
HFC-134a	1,300
HFC-152a	140
HFC-143a	3,800
HFC-227ea	2,900
HFC-236fa	6,300
CF_4	6,500
SF_6	23,900

Source: own elaboration of the Technical Team Coordinator of MMA with base in IPCC, 1995.

Table 4 summarizes the sources of activity data used by each sector in Chile's NGHGI.

Table 4. Main sources of information of the Chile's NGHGI, series 1990-2013

Sector	Source
1. Energy	National Energy Balance (Ministry of Energy) Annual statistics of copper and other minerals (COCHILCO) International fuel consumption statistics (National Customs Service)
2. IPPU	Cement production (Bio Bio, Polpaico, Melon) Clinker imports and exports (National Customs Service) Lime production (Inacesa, Soprocal, CMPC and Arauco) Glass production (Cristalerías Toro, Verallia, Cristalerías Chile, Lirquén) Nitric acid production (POCH and Deuman) National Energy Balance (Ministry of Energy) Methanol production (Methanex) Iron production (COCHILCO, SERNAGEOMIN) Steel production (CAP, Gerdau Aza) Ferroalloy production (USGS) Production, importation and exportation of ODS (INE, National Customs Service) Production, importation and exportation of SF6 (SF6Chile) Production, importation and exportation of lubricants and paraffin wax (INE, National Customs Service)
3. AFOLU	Agriculture and Forestry Censuses (INE) Annual statistics (ODEPA) Animal population, crop and fertilizer statistics (INE, ODEPA) Ongoing Forestry Inventory (INFOR) Forestry statistics (INFOR) Vegetation Inventories (CONAF) Historic forest fire statistics (CONAF)
4. Waste	Population and Housing Census (INE) Adjusted Municipal Solid Waste Inventory (MMA) Statistics on domestic and industrial wastewater (SISS)

Source: MMA Technical Coordinating Team

Parque Natural Cantalao

It can be appreciated that the most relevant information of Chile's NGHGI is generated by the same institutions to which the Sectorial Technical Teams belong, and in many cases, the same teams are also in charge of its elaboration. This is an advantage because of the availability of data and the efficient use of financial resources.

1.5. Key categories

The concept of key category allows identifying the categories that have a significant impact on a country's NGHGI in terms of the absolute level[8], trends or uncertainty of GHG emissions and removals.

The SNICHILE Coordinating Technical Team has identified the key categories of Chile's NGHGI for 1990 and 2013 according to the tier and trend criteria. Method 1 was used, which is based solely on the amount of GHG emitted or absorbed, and Method 2, which includes the analysis of the uncertainty associated with the emission or absorption of GHG. In this case, the inclusion of Method 2 constitutes an improvement over the previous update, which only considered Method 1.

Table 5 summarizes emission sources and absorption sinks identified as major categories, marked with 'X' in gray cell, while columns indicate the identification criteria. Some categories meet the six criteria evaluated, for example CO_2 emissions from Road transportation in the Energy sector or the absorption of CO_2 by Second-growth forest from the AFOLU sector. This summary forms the basis for discussions with sectoral teams on the quality of estimates and possible improvements. The key categories of NGHGI in Chile are also subject to more detailed documentation and more exhaustive quality control.

Table 5. Summary of the key categories of Chile's NGHGI, series 1990-2013, ac cording to tier and trend assessments, using Methods 1 and 2

IPCC Code	IPCC Category	GHG	Identification Criteria					
			N1 1990	N1 2013	T1	N2 1990	N2 201 3	T2
1.A.1.	Energy industries - Gaseous fuels	CO_2	X	X				
1.A.1.	Energy industries - Liquid fuels	CO_2	X	X	X			
1.A.1.	Energy industries - Solid fuels	CO_2	X	X			X	
1.A.2.	Manufacturing industries and construction - Biomass	N_2O					X	
1.A.2.	Manufacturing industries and construction - Gaseous fuels	CO_2		X				
1.A.2.	Manufacturing industries and construction - Liquid fuels	CO_2	X	X	X		X	
1.A.2.	Manufacturing industries and construction - Solid fuels	CO_2	X	X	X	X		X
1.A.3.a.	Civil aviation	CO_2	X	X	X			
1.A.3.b.	Road transportation	CO_2	X	X	X	X	X	X
1.A.3.b.	Road transportation	N_2O					X	
1.A.3.d.	Water-borne navigation - Liquid fuels	CO_2	X	X	X			
1.A.4.	Other sectors - Biomass	CH_4	X	X	X	X	X	X
1.A.4.	Other sectors - Gaseous fuels	CO_2		X				
1.A.4.	Other sectors - Liquid fuels	CO_2	X	X	X			
1.B.1.	Solid fuels	CH_4	X		X	X		X
1.B.2.a.	Oil	CH_4	X		X	X		X
1.B.2.b.	Natural gas	CH_4	X		X	X	X	X
2.A.1.	Cement production	CO_2	X	X	X			
2.A.2.	Lime production	CO_2		X				
2.B.2.	Nitric acid production	N_2O		X				
2.B.8.a.	Methanol	CO_2	X		X			
2.C.1.	Iron and steel production	CO_2	X	X	X			
2.F.1.	Refrigeration and air conditioning	HFC			X		X	X
3.A.1.a.i.	Dairy cows	CH_4	X	X	X			
3.A.1.a.ii.	Other cattle	CH_4	X	X	X	X	X	X
3.A.1.c.	Sheep	CH_4	X		X			
3.A.2.h.	Swine	CH_4	X	X	X			
3.A.2.h.	Swine	N_2O					X	
3.B.1.a.i.1.	Second-growth forest	CO_2	X	X	X	X	X	X

[8] *In this report, the term "absolute" refers to the magnitude of the value. Its purpose is to compare the magnitudes between emissions and GHG removals.*

Table 5. Summary of the key categories of Chile's NGHGI, series 1990-2013, ac cording to tier and trend assessments, using Methods 1 and 2 (Continuation)

IPCC Code	IPCC Category	GHG	Identification Criteria					
			N1 1990	N1 2013	T1	N2 1990	N2 201 3	T2
3.B.1.a.i.2.	Native forest burned	CO_2	X	X	X	X	X	X
3.B.1.a.i.3.	Managed native forest	CO_2	X	X	X	X	X	X
3.B.1.a.i.4.a.	Pinus radiata	CO_2	X	X	X	X	X	X
3.B.1.a.i.4.b.	Eucalyptus globulus	CO_2	X	X	X	X	X	X
3.B.1.a.i.4.g.	Other species	CO_2	X	X	X			
3.B.1.a.ii.2.	Land in transition to forest land	CO_2		X	X		X	
3.B.1.a.iii.1.	P. radiata roundwood	CO_2	X	X	X	X	X	X
3.B.1.a.iii.2.	Eucalyptus spp. roundwood	CO_2	X	X	X	X	X	
3.B.1.a.iii.3.	Other exotic roundwood	CO_2		X				
3.B.1.a.iii.4.	Native species roundwood	CO_2	X		X	X		X
3.B.1.a.iv.	Firewood	CO_2	X	X	X	X	X	X
3.B.1.a.v.1.	Native forest burned	CO_2	X		X	X		X
3.B.1.a.v.2.	Forest plantations burned	CO_2	X		X			
3.B.1.a.v.3.	Substitution	CO_2	X	X	X	X		X
3.B.1.b.i.	Croplands	CO_2	X		X			
3.B.1.b.ii.	Grasslands	CO_2	X	X	X	X	X	X
3.B.1.c.	Land converted to fores land	CO_2	X	X	X	X	X	X
3.B.3.b.	Land converted to grasslands	CO_2	X	X	X	X	X	X
3.B.6.b.i.	Forest Lands	CO_2					X	
3.C.1.b.	Emissions from burning biomass in croplands	CH_4, N_2O				X		X
3.C.4.a.	Synthetic fertilizer	N_2O	X	X	X	X	X	X
3.C.4.b.	Animal manure, compost, sludge and other	N_2O				X	X	X
3.C.4.c.	Crop residues	N_2O			X	X	X	X
3.C.4.d.	Urine and dung deposited in pasture, range and paddock	N_2O	X	X	X	X	X	X
3.C.5.a.	Synthetic fertilizer	N_2O				X	X	X
3.C.5.b.	Animal manure, compost, sludge and other	N_2O				X	X	X
3.C.5.d.	Urine and dung deposited in pasture, range and paddock	N_2O	X	X	X	X	X	X
4.A.1.	Managed waste disposal sites	CH_4		X			X	
4.A.2.	Unmanaged waste disposal sites	CH_4	X		X	X		X
4.A.3.	Uncategorized waste disposal sites	CH_4	X	X	X	X	X	X
4.D.1.	Domestic wastewater treatment and discharge	CH_4		X		X	X	X
4.D.1.	Domestic wastewater treatment and discharge	N_2O				X	X	

N1 1990: 1990 analysis Method 1; N1 2013: analysis of 2013 Method 1; T1: trend analysis 1990-2013 Method 1; N2 1990: 1990 analysis Method 2; N2 2013: analysis of 2013 Method 2; T2: trend analysis 1990-2013 Method 2.

Source: MMA Technical Coordinating Team

Vista Relleno Santa Marta.

Another possible analysis, based on the key categories, is to list the categories according to their individual quantitative contribution. For example, Table 6 lists the categories listed from highest to lowest in absolute terms. It highlights the fact that only eleven categories represent 80% of the country's GHG emissions and removals in 2013. This is how the CO_2 emissions of Pinus radiata roundwood are the main category (12.2%), followed by Second-growth forest CO_2 removals (11.5%).

Table 6. Main categories of 2013 by level and Method 1 criterion

IPCC Code	IPCC Category	Greenhouse gas	Last year estimate. Ex. t ($Gg\ CO_2$ eq)	Last year absolute value estimate ($Gg\ CO_2$ eq)	Level evaluation. Lx. t	Cumulative total
3.B.1.a.iii.1.	P. radiata roundwood	CO_2	38,316.8	38,316.8	12.2%	12.2%
3.B.1.a.i.1.	Second-growth forest	CO_2	-36,195.7	36,195.7	11.5%	23.7%
3.B.1.b.vi.	Land converted to forest land	CO_2	-35,882.2	35,882.2	11.4%	35.2%
3.B.1.a.i.4.a.	Pinus radiata	CO_2	-31,610.6	31,610.6	10.1%	45.2%
1.A.1.	Energy industries - Solid fuels	CO_2	28,354.5	28,354.5	9.0%	54.3%
3.B.1.a.iii.2.	Eucalyptus spp. roundwood	CO_2	22,378.3	22,378.3	7.1%	61.4%
1.A.3.b.	Road transportation	CO_2	21,246.8	21,246.8	6.8%	68.2%
3.B.1.a.iv.	Firewood	CO_2	13,731.8	13,731.8	4.4%	72.5%
1.A.2.	Manufacturing industries and construction - Liquid fuels	CO_2	10,553.8	10,553.8	3.4%	75.9%
3.B.1.a.i.4.b.	Eucalyptus globulus	CO_2	-6,614.1	6,614.1	2.1%	78.0%
1.A.1.	Energy industries - Gaseous fuels	CO_2	6,239.0	6,239.0	2.0%	80.0%

Source: MMA Technical Coordinating Team

1.6. General assessment of uncertainty

According to the 2006 IPCC, uncertainty estimations are an essential part of a complete inventory of GHG emissions and removals. Uncertainty analyses should be conducted in order to prioritize national efforts to reduce uncertainty in future inventories and to guide the choice of methodology.

For the uncertainty analysis of Chile's NGHGI, the Coordinating Technical Team compiled uncertainties for each GHGSECI and analyzed these using Method 1: Error Propagation, which is used to estimate uncertainty across individual categories of the inventory (emission factors, activity data and other estimation parameters) and trends between a given year and the base year.

Chile's GHG emissions and removals balance has a combined uncertainty of -43.8% and +46.7%. In general terms, the sectors that contributed most to uncertainty ("contribution to variance") in 2013, considering also weighted emissions and removals, are AFOLU, followed by Energy, Waste, and lastly IPPU sector.

In the Energy sector, overall combined uncertainty was -3.0% and +4.5% in 2013. The sources of uncertainty that most contributed to vari-

ance are fugitive CH_4 emissions from natural gas and solid fuels extraction, followed by CO_2 emissions from liquid fuels used in automobiles and CO_2 emissions from solid fuels used to produce electricity. In general, the uncertainty of the sector is explained by the use of default emission factors rather than by the activity data collected in the National Energy Balance.

In the IPPU sector, overall combined uncertainty was ±16.3% in 2013. Uncertainty sources that most contribute to the variance are HFC emissions from refrigeration and air-conditioning applications, followed by N_2O emissions in nitric acid production, CO_2 emissions from lime production, and emissions of CO_2 in the production of methanol. Uncertainty of the sector is also mainly due to the use of default emission factors.

In the AFOLU sector, overall combined uncertainty was -116.6% and +123.8% in 2013. Uncertainty sources that most contribute to the variance are found in CO_2 emissions and removals on forest lands remaining as such, followed by CO_2 removals on lands in transition to forest land, roundwood of Pinus radiata and Eucalyptus spp., CO_2 emissions from the extraction of firewood and CO_2 removals associated with Pinus radiata. In general, sector uncertainty is due to the combinatorial of the numerous country-specific parametric data that are used to determine country-specific emission factors.

In the Waste, sector, overall combined uncertainty was -54.6% and 57.5% in 2013. Sources that most contribute to the variance are CH_4 emissions in the disposal of solid waste at different sites, followed by CH_4 y N_2O emissions in the treatment and disposal of domestic wastewater. In general, the sector uncertainty is due to the use of default emission factors, except for CH_4 emissions from the domestic wastewater treatment and disposal, in which case the uncertainty is mostly related to the activity data used.

1.7. General assessment of completeness

Chile's NGHGI covers the entire national territory (continental and insular territory and Antarctica) and includes a complete time series of GHG emissions and removals from 1990 to 2013.

The GHGs included on Chile's NGHGI are CO_2, CH_4, N_2O, HFC, PFC and recently incorporated SF_6. CO, NO_X, NMVOC and SO_2, precursors are partially included, which were only calculated for the Energy sector and the categories related to biomass burning in the AFOLU sector. In addition, Chile's NGHGI includes almost all sources of emissions and removals by sinks for almost all categories and subcategories that make up the sectors.

The categories that could not be estimated, due to lack of activity data or appropriate methodologies, have been reported using notation keys[9] (see Table 2 section 1.4 and Table 7 section 2). In accordance to the 2006 IPCC Good Practice Guidelines and for greater transparency, Annex 1 lists the categories identified as not estimated (NE) and those included elsewhere (IE), which should be prioritized depending on a cost/benefit analysis at futures NGHGI in order to advance in completeness.

Regarding the C pools of the AFOLU sector, the present Chile's NGHGI included living biomass (above and below ground) and part of the dead biomass (between the Regions of the Liberator Bernardo O'Higgins, and of Magallanes and the Chilean Antarctic), as in the previous update. The C pools, corresponding to litter and soil organic matter (SOC), were not included due to lack of activity data.

In accordance with the requirements of the Convention and the 2006 IPCC Guidelines, GHG emissions from fossil fuel consumption for international air and sea transport and CO_2 emissions from biomass burned for energy purposes have been quantified and reported as reporting Items (see section 7.), but were not included in the country's GHG emissions and removals balance.

[9] *Notation keys are: NE = Not estimated; IE = Included elsewhere; C = Confidential; NA = Not applicable; NO = Not occurring.*

2. Trends of Greenhouse Gas Emissions in Chile

Table 7 shows the results by source category and sinks of all GHGs in the country resulting from human activity in 2013. Gigagram (Gg) is used as the unit of mass, throughout the whole report. Positive numbers represent GHG emissions, while the negative ones correspond to GHG removals.

In 2013, emissions at the national level and by type of GHG were as follows:[10] net CO_2 emissions accounted for 46,268.6 Gg; emissions of CH4 accounted for 562.9 Gg and the emissions of N_2O accounted for 35.4 Gg. In case on fluorinated gases, HFC emissions accounted for 681.4 Gg CO_2eq; PFC emissions accounted for 5.4 Gg CO_2eq; and lastly, SF_6 emissions accounted for 308.7 Gg CO_2eq. The incorporation of this last GHG is highlighted, as it could not be included previously due to lack of information.

Regarding precursors gases, in 2013 emissions throughout the country were as follow: NO_X accounted for 165,619.4 Gg; CO accounted for 1,359.2 Gg; non-methane volatile organic compounds (NMVOC) accounted for 13,032.1 Gg; and SO_2 accounted for 449.1 Gg.

[10] *In this report, the term "net emissions" refers to the sum of GHG emissions and removals, also referred to as the "GHG balance".*

Table 7. Chile's NGHGI: anthropogenic emissions by sources and anthropogenic removals by sinks of all GHGs not controlled by the Montreal Protocol and precursors of GHGs. Year 2013

Source and sink categories of greenhouse gases	CO_2 net	CH_4	N_2O
		(Gg)	
All national emissions and removals	46,268.6	562.9	35.4
1. ENERGY	81,823.1	98.1	3.8
1.A. Fuel combustion activities (sector method)	81,821.6	56.2	3.8
1.A.1. Energy Industries	38,320.4	1.2	0.6
1.A.2. Manufacturing industries and construction	13,807.4	7.5	1.0
1.A.3. Transport	23,924.7	4.8	1.7
1.A.4. Other sectors	5,769.1	42.7	0.6
1.A.5. Non-specified	IE, NE	IE, NE	IE, NE
1.B. Fugitive emissions from fuels	1.5	42.0	NA, NE
1.B.1. Solid fuels	NA, NE	4.4	NA
1.B.2. Oil and natural gas	1.5	37.6	NA, NE
1.B.3. Other emissions from energy production	NE	NE	NE
1.C. Transport and storage of CO_2	NO	NO	NO
1.C.1. Transport of CO_2	NO		
1.C.2. Injection and storage	NO		
1.C.3. Other	NO	NO	NO
2. INDUSTRIAL PROCESSES AND PRODUCT USE	4,360.2	0.5	4.0
2.A. Mineral industry	2,496.7	NA, NO	NO
2.B. Chemical industry	137.3	0.5	4.0
2.C. Metal industry	1,584.3	IE, NA, NO	NA, NO
2.D. Non-energy products from fuels and solvent use	142.0	NA, NO	NA, NO
2.E. Electronics industry	NA, NO	NO	NA, NO
2.F. Product uses as subtitutes for ozone depleting substances	NA, NO	NO	NO
2.G. Other products manufacture and use	NO	NO	NA, NE, NO
2.H. Other	NA	NA	NA
3. AGRICULTURE, FORESTRY AND OTHER LAND USES	-39,915.0	268.2	26.3
3.A. Livestock		261.3	1.1
3.A.1. Enteric fermentation		204.0	
3.A.2. . Manure management		57.3	1.1
3.B. Land	-40,448.8		
3.B.1. Forest land	-42,548.9		
3.B.2. Cropland	188.2		
3.B.3. Grassland	1,066.7		
3.B.4. Wetlands	12.5		
3.B.5. Settlements	269.2		
3.B.6. Other land	563.6		
3.C. Aggregate sources and non-CO_2 emissions sources on land	533.8	6.9	25.3
3.C.1. GHG emissions from biomass burning	NA	2.7	0.1
3.C.2. Liming	128.8		
3.C.3. Urea application	404.9		
3.C.4. Direct N_2O emissions from managed soils			19.3
3.C.5. Indirect of N_2O emissions from managed soils			5.3
3.C.6. Indirect N_2O emissions from manure management			0.5
3.C.7. Rice cultivation		4.2	NA
3.C.8. Other (please specify)	NO	NO	NO
3.D. Other	NE, NO	NO	NO
3.D.1. Harvested wood products	NE		
3.D.2. Other (please specify)	NO	NO	NO
4. WASTE	0.3	196.1	1.2
4.A. Solid waste disposal		153.6	NA
4.B. Biological treatment of solid waste		1.3	0.1
4.C. Incineration and open burning of waste	0.3	0.0	0.0
4.D. Wastewater treatment and discharge		41.2	1.1
4.E. Other	NO	NO	NO
ANX. MEMORANDUM ITEMS			
Anx.1. International bunker	2,919.1	0.1	0.1
Anx.1.a. International aviation	1,697.0	0.0	0.0
Anx.1.b. International navigation	1,222.1	0.1	0.0
Anx.2. Multilateral operations	IE	IE	IE
Anx.3. Biomass CO_2 emissions	43,876.5		

C = Confidential Information; CS = Country-specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring

HFC	PFC	SF_6	NOx	CO	COVDM	SO_2
Equivalents of CO_2 (Gg)			(Gg)			
681.4	5.4	308.7	165,619.4	1,359.2	13,032.1	449.1
			165,617.3	1,285.0	13,032.1	449.1
			165,615.4	1,270.9	13,025.7	449.1
			146.4	92.4	1.8	333.4
			30.5	153.9	13.8	64.6
			165,410.9	274.5	12,871.9	6.9
			27.5	750.2	138.2	44.1
			NE	NE	NE	NE
			1.9	14.2	6.4	
					2.0	
			1.9	14.2	4.4	
			NE	NE	NE	
681.4	5.4	308.7	NE	NE	NE	NE
			NE	NE	NE	NE
NO	NO	NO	NE	NE	NE	NE
NA, NO	NA, NO	NO	NE	NE	NE	NE
			NE	NE	NE	NE
NO	NO	NO				
681.4	5.4					
NO	NA, NO	308.7				
			NE	NE	NE	NE
			2.1	74.1	NE	NE
			NE	NE	NE	NE
			NE	NE	NE	NE
			NE	NE	NE	NE
			NE	NE	NE	NE
			NE	NE	NE	NE
			2,1	74,1		
			2,1	74,1		
			NE	NE	NE	NE
			NE	NE	NE	
			NE	NE	NE	
			NE	NE	NE	
			NE	NE	NE	
			NE	NE	NE	
			15.2	1.6	0.6	17.1
			0.7	0.2	0.1	0.6
			14.5	1.4	0.5	16.5
			NE	NE	NE	NE

Source: MMA Technical Coordinating Tea

Along with the information presented in the above table, and in order to comply with the reporting requirements of the Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention, with GHG emissions and removals of the country for 1990, 1994, 2000, 2010 and 2013 in the format "Party not included in Annex I of the Convention".

2.1. Trends in aggregated GHG emissions

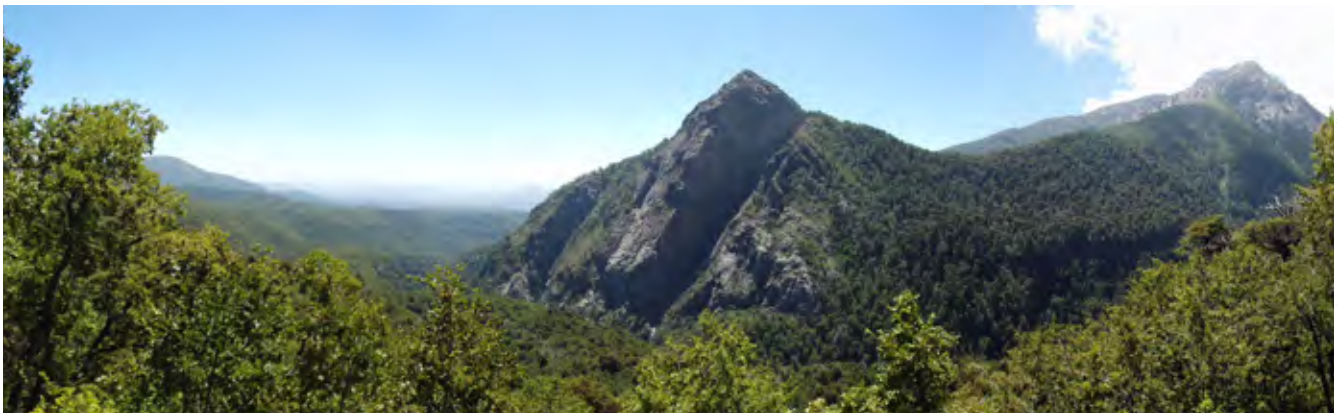
In 2013, the balance of CO_2 emissions and removals of Chile's GHG[11] accounted for 70,054.4 Gg CO_2eq, increasing by 774.9% since 1990 and by 43.8% since 2010 (Table 8). The main drivers of this trend in the GHG balance are the Energy and AFOLU sectors.

Archivo MMA

Table 8. Chile's NGHGI: emissions and removals of GHG (Gg CO_2eq) by sector, series 1990-201

Sector	1990	2000	2010	2011	2012	2013
1. Energy	33,219.5	52,122.9	69,423.7	78,527.0	82,076.6	85,075.4
2. IPPU	3,127.5	6,449.6	6,008.1	6,868.3	7,214.9	6,619.4
3. AFOLU	-30,866.3	-32,819.2	-30,514.4	-24,339.9	-18,410.7	-26,119.2
4. Waste	2,526.1	3,348.3	3,802.6	3,939.8	4,019.2	4,478.8
Balance	8,006.8	29,101.5	48,719.9	64,995.1	74,899.9	70,054.4

Source: MMA Technical Coordinating Team.



Reserva Nacional Altos de Lircay, Nuvia Briceño

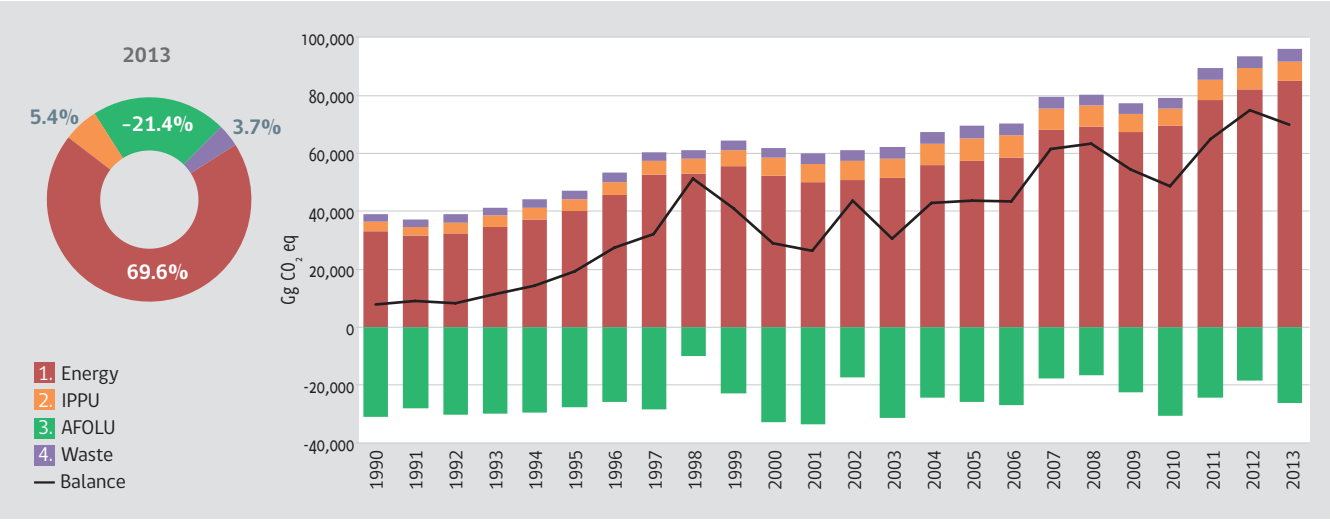
[11] *In this report, the term "GHG emissions and removals balance" or "GHG balance" refers to the sum of national GHG emissions and removals, expressed as carbon dioxide equivalent (CO_2eq). This term includes the AFOLU sector as a whole.*

Regarding GHG total emissions and removals in absolute terms[12] by sector (Figure 4), Energy sector represented 69.6%, followed by AFOLU sector (21.4%), IPPU sector (5.4%), and lastly Waste sector (3.7%). The values in the balance that fall outside of the global trend are primarily the consequence of wildfires (accounted for the AFOLU sector).

In 2013, the country's total GHG[13] emissions (excluding emissions sources and removal sinks from Forestry and other land uses [FOLU] of AFOLU sector, but including sources of GHG emissions from agriculture), accounted for 109,908.8 Gg CO_2eq in 2013, increasing by 113.4% since 1990 and by 19.3% since 2010 (Table 9).

Muelle Fluvial en Valdivia, archivo SERNATUR

Figure 4. Chile's NGHGI: emissions and removals of GHG (Gg CO_2eq) by sector, series 1990-2013



Source: MMA Technical Coordinating Team

[12] *In this report, the term "absolute" refers to the magnitude of the value. Its purpose is to compare the magnitudes between emissions and GHG removals.*
[13] *In this report, the term "total GHG emissions" refers only to the sum of national GHG emissions, expressed as carbon dioxide equivalent (CO2 eq). This term excludes sources of emissions and removal sinks from forestry and other land uses [FOLU] of AFOLU sector, but includes GHG emissions from Agriculture.*

Table 9. Chile's NGHGI: emissions of GHG (Gg CO_2eq) by sector (excluding FOLU), series 1990-2013

Sector	1990	2000	2010	2011	2012	2013
1. Energy	33,219.5	52,122.9	69,423.7	78,527.0	82,076.6	85,075.4
2. IPPU	3,127.5	6,449.6	6,008.1	6,868.3	7,214.9	6,619.4
3. Agriculture	12,633.5	13,580.7	12,879.8	12,741.7	13,285.0	13,735.2
4. Waste	2,526.1	3,348.3	3,802.6	3,939.8	4,019.2	4,478.8
Total	51,506.6	75,501.4	92,114.2	102,076.7	106,595.6	109,908.8

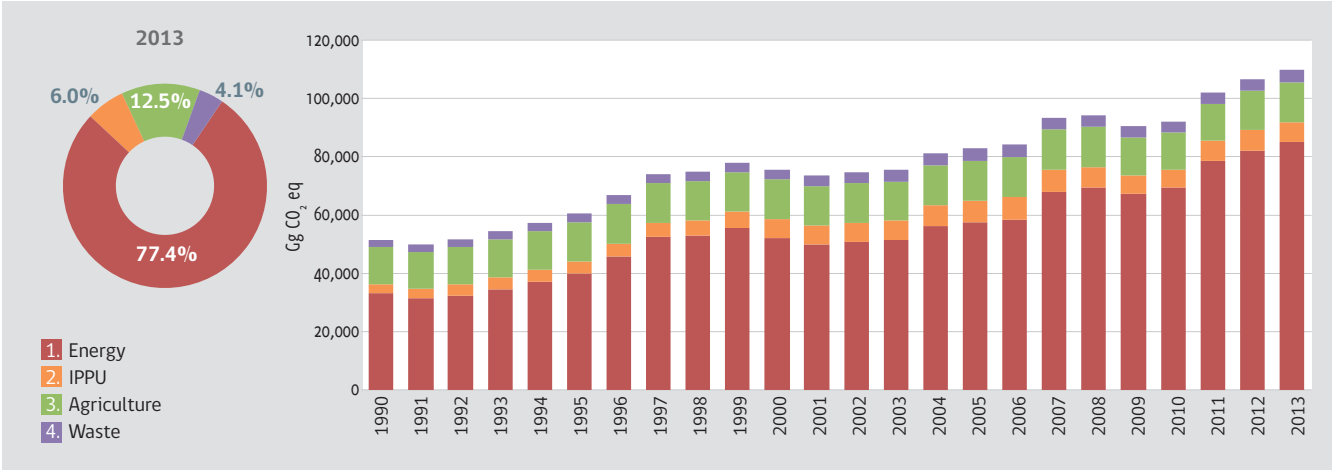
Source: MMA Technical Coordinating Team.

Regarding GHG total emissions by sector (Figure 5), *Energy* sector represented 77.4%, followed by Agriculture sector (12.5%, IPPU sector (6.0%), and lastly *Waste* sector (4.1%).

2.2. Trends in GHG emissions by type of GHG

Emissions and removals trends of the country by GHG changes depending whether sources of emissions and sinks from Forestry and other land uses [FOLU] since their inclusion generates a balance between GHG emissions and removals, especially CO_2 (Table 10).

Figure 5. Chile's NGHGI: emissions of GHG (Gg CO_2eq) by sector (excluding FOLU), series 1990-2013



Source: MMA Technical Coordinating Team.

Table 10. Chile's NGHGI: emissions and removals of GHG (Gg CO_2eq) by gas, series 1990-2013

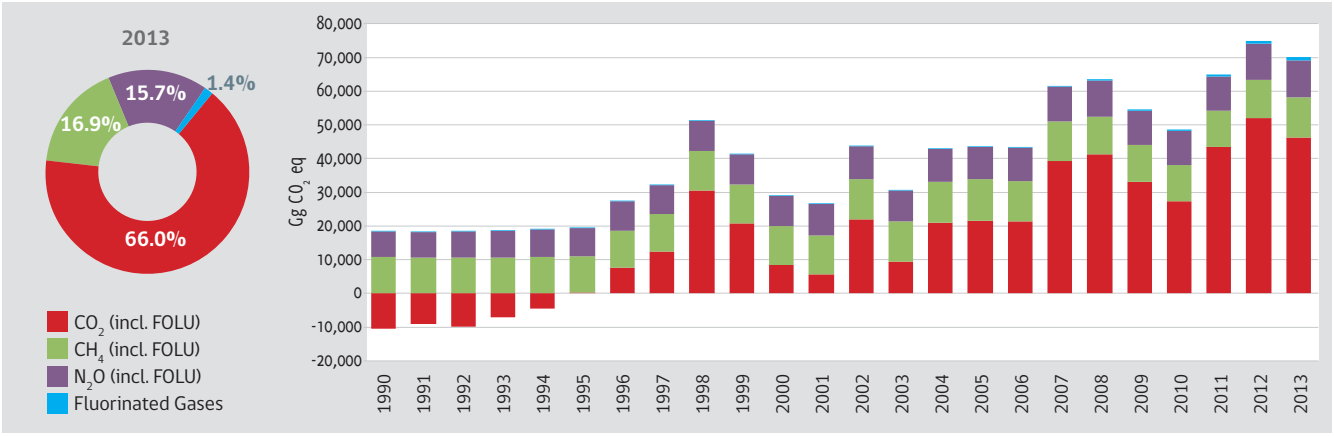
GHG	1990	2000	2010	2011	2012	2013
CO_2 (incl. FOLU)	-10,444.0	8,416.8	27,310.9	43,514.3	51,908.0	46,268.6
CO_2 (excl. FOLU)	33,286.2	54,902.1	70,949.2	80,745.7	84,064.6	86,183.6
CH_4 (incl. FOLU)	10,800.2	11,499.6	10,769.4	10,734.0	11,369.0	11,820.7
CH_4 (excl. FOLU)	10,673.8	11,453.0	10,636.1	10,652.5	11,116.4	11,787.7
N_2O (incl. FOLU)	7,586.4	9,086.5	10,094.9	10,117.5	10,744.7	10,969.5
N_2O (excl. FOLU)	7,482.3	9,047.8	9,984.1	10,049.3	10,536.4	10,941.8
Fluorinated Gases	64.3	98.6	544.7	629.3	878.2	995.6
HFC	NO	NO	284.2	366.7	628.2	681.4
PFC	NO	NO	6.1	5.9	5.7	5.4
SF_6	64.3	98.6	254.4	256.7	244.3	308.7
Balance (incl. FOLU)	8,006.8	29,101.5	48,719.9	64,995.1	74,899.9	70,054.4
Total (excl. FOLU)	51,506.6	75,501.4	92,114.2	102,076.7	106,595.6	109,908.8

NO = Not occurring
Source: MMA Technical Coordinating Team.

In 2013, the GHG balance (including FOLU) was dominated by CO_2, representing 66.0%, followed by CH_4 with 16.9% and N_2O with 15.7%. Fluorinated gases collectively accounted for 1.4% (Figure 6). It is noteworthy that from 1990 to 1994 the CO_2 balance was favorable to the net removal of this gas and that it has since been permanently favorable to the emission.

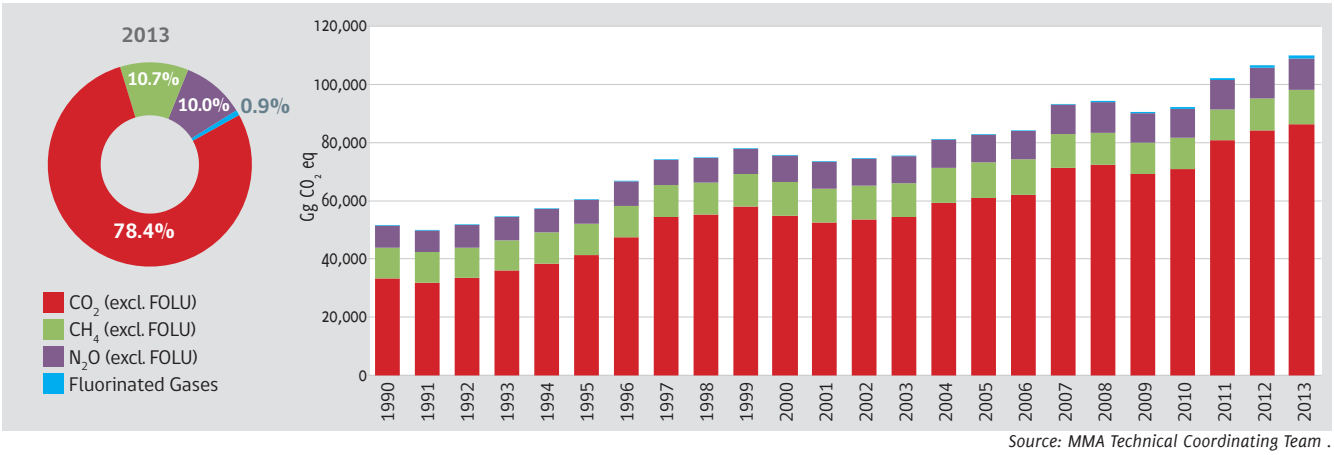
In 2013, total GHG emissions (*excluding FOLU*) were dominated by CO_2, representing 78.4%, followed by CH_4 with 10.7% and N_2O with 10.0%. Fluorinated Gases collectively account for 0.9% of the country's total GHG emissions (Figure 7).

Figure 6. Chile's NGHGI: emissions and removals of GHG (Gg CO_2eq) by gas (including FOLU), series 1990-2013



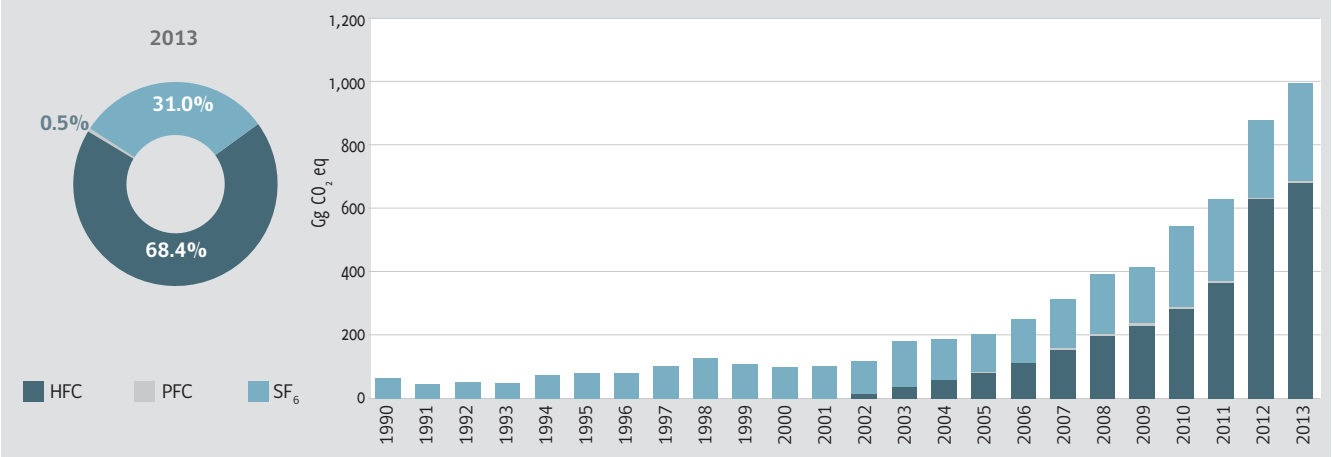
Source: MMA Technical Coordinating Team.

Figure 7. Chile's NGHGI: emissions of GHG (Gg CO_2eq) by gas (excluding FOLU), series 1990-2013



Source: MMA Technical Coordinating Team .

Figure 8. Chile's NGHGI: emissions of fluorinated gases (Gg CO_2eq) by gas group, series 1990-2013



Source: MMA Technical Coordinating Team.

Although fluorinated gases are less relevant in terms of total emissions, there is an increase of 1,448.7% since 1990 and 82.8% since 2010 (Figure 8), reflecting the growing importance of this type of GHG. In 2013, the main fluorinated gases were HFCs (68.4%), followed by SF_6 (31.0%) and PFCs which provided only 0.5%.

2.2.1. Carbon dioxide (CO_2)

In 2013, the balance of CO_2 emissions and removals accounted for 46,268.6 Gg CO_2eq, increasing by 543.0% since 1990 and by 69.4% since 2010 (Table 11).

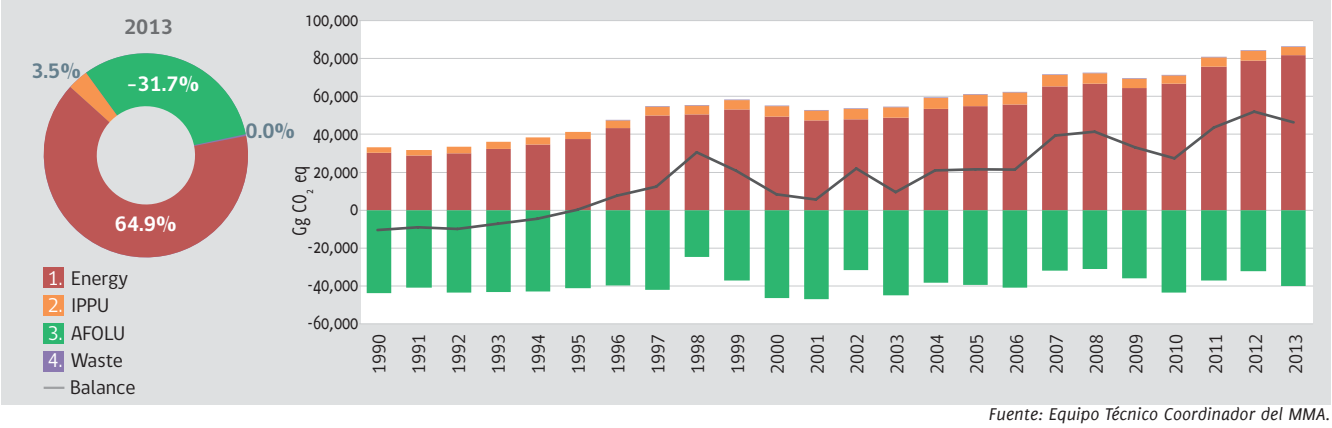
Regarding CO_2 emissions and removals in absolute terms by sector (Figure 9), the most relevant sector is Energy with 64.9%, mainly due to the combustion of fossil fuels; followed by the AFOLU sector with 31.7%, which acts as a CO_2 sink by increasing biomass in native and exotic forests; the IPPU sector with 3.5%, due

Table 11. Chile's NGHGI: emissions and removals of CO_2 (Gg CO_2eq) by sector (including FOLU), series 1990-2013

Sector	1990	2000	2010	2011	2012	2013
1. Energy	30,405.6	49,367.0	66,655.7	75,701.1	78,953.6	81,823.1
2. IPPU	2,880.6	5,535.0	4,293.2	5,044.4	5,110.7	4,360.2
3. AFOLU	-43,730.2	-46,485.3	-43,638.3	-37,231.5	-32,156.6	-39,915.0
4. Waste	NO	0.1	0.3	0.3	0.3	0.3
Balance	-10,444.0	8,416.8	27,310.9	43,514.3	51,908.0	46,268.6

NO = Not occurring
Source: MMA Technical Coordinating Team.

Figure 9. Chile's NGHGI: emissions and removals of CO_2 (Gg CO_2eq) by sector (including FOLU), series 1990-2013



Fuente: Equipo Técnico Coordinador del MMA.

to the production of iron and steel; and the Waste sector, with less than 0.01% associated with the burning of hospital waste.

2.2.2. Methane (CH_4)

In 2013, CH_4 emissions accounted for 11,820.7 Gg CO_2eq, increasing 9.4% since 1990 and 9.8% since 2010 (Table 12).

Regarding sectors and including FOLU (Figure 10), the sector with the greatest relevance in relation to CH_4 emissions is AFOLU with 47.6%, mainly due to livestock activities associated with the enteric fermentation process of ruminant animals; followed by the Waste sector with 34.8%, due to the disposal of solid waste in disposal sites; the Energy sector accounted for 17.4%, associated with the use of firewood in the residential sector; and the IPPU sector with 0.1%, generated by the production of methanol.

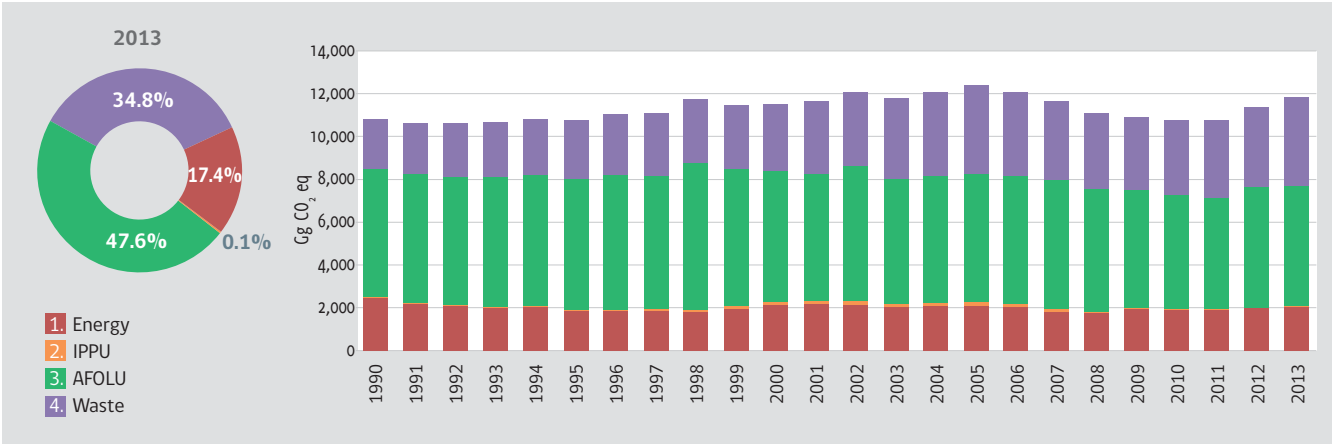
Vivero Putre, archivo CONAF

Table 12. Chile's NGHGI: emissions of CH_4 (Gg CO2eq) by sector (including FOLU), series 1990-2013

Sector	1990	2000	2010	2011	2012	2013
1. Energy	2,479.8	2,149.2	1,942.5	1,929.7	2,026.9	2,060.8
2. IPPU	41.4	140.8	45.3	26.9	15.2	9.9
3. AFOLU	5,949.5	6,107.0	5,331.2	5,188.3	5,657.9	5,632.4
4. Waste	2,329.4	3,102.6	3,450.5	3,589.2	3,668.9	4,117.6
Total	10,800.2	11,499.6	10,769.4	10,734.0	11,369.0	11,820.7

Source: MMA Technical Coordinating Team.

Figure 10. Chile's NGHGI: emissions of CH_4 (Gg CO_2eq) by sector (including FOLU), series 1990-2013



Source: MMA Technical Coordinating Team.

2.2.3. Nitrous oxide (N_2O)

In 2013, CH_2 emissions of N_2O accounted for 10.969,5 Gg CO_2eq, increasing 44.6% since 1990 and 8.7% since 2010 (Table 13).

Regarding sectors and including FOLU (Figure 11), the sector with the greatest relevance in relation to N_2O emissions is AFOLU with 74.4%, mainly due to livestock activities associated with urine and dung applied directly to soil; followed by IPPU sector with 11.4%, due to the production of nitric acid; Energy sector accounted for 10.9%, associated with the use of cars; and the Waste sector with 3.3%, generated by the domestic wastewater treatment.

Villarrica, archivo CONAF

Table 13. Chile's NGHGI: emissions of N_2O (Gg CO_2eq) by sector (including FOLU), series 1990-2013

Sector	1990	2000	2010	2011	2012	2013
1. Energy	334.2	606.7	825.5	896.2	1,096.1	1,191.5
2. IPPU	141.2	675.2	1,124.9	1,167.8	1,210.7	1,253.7
3. AFOLU	6,914.4	7,559.0	7,792.7	7,703.2	8,087.9	8,163.4
4. Waste	196.7	245.6	351.9	350.3	350.0	360.9
Total	7,586.4	9,086.5	10,094.9	10,117.5	10,744.7	10,969.5

Source: MMA Technical Coordinating Team.

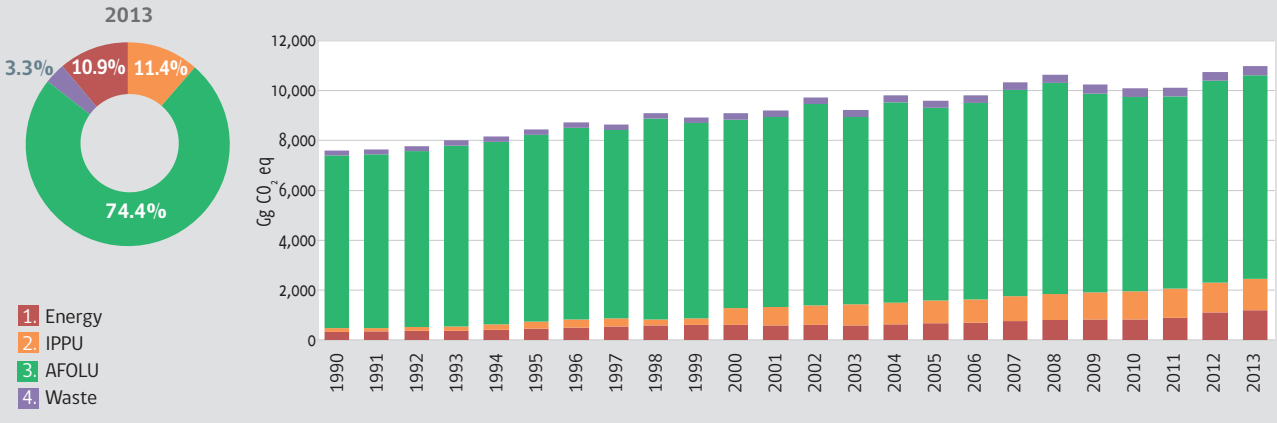
2.3. GHG Intensity Indicators

For the National Technical Team of SNICHILE it is important to manage the information of Chile's NGHGI in order to understand the evolution of GHG emissions of the country in a broad context. For this, two economic indicators of intensity have been defined: Gross Domestic Product (GDP) and per capita. This section provides information on this.

2.3.1. Chile's GHG emissions by Gross Domestic Product

Chile has expressed its nationally determined contribution (NDC) on mitigation in terms of total GHG emissions by unit of Gross Domestic Product (GDP) expressed in tons of CO_2 equivalent per million Chilean pesos in 2011 (t CO_2eq/MMCLP). For GHG emissions of the country, the GHG balance and total GHG emissions are evaluated.

Figure 11. Chile's NGHGI: emissions of N_2O (Gg CO_2eq) by sector (including FOLU), series 1990-2013



Source: MMA Technical Coordinating Team.

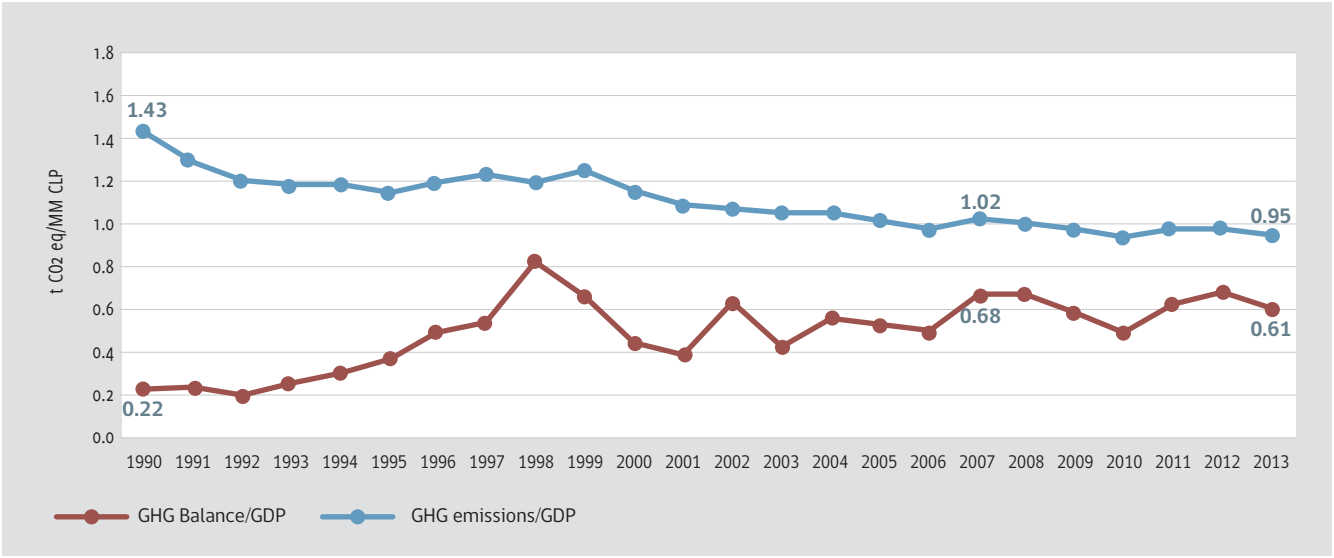
In 2013, the GHG/GDP balance indicator was 0.61 t CO_2eq/MMCLP, increasing by 172.3% since 1990, but decreasing by 10.4% since 2007, Chile's base year in its NDC. The observed interannual variation, with maximums in 1998 and 2002, is mainly due to the influence of forest fires on the country's GHG balance. On the other hand, the total GHG/GDP emissions indicator was 0.95 t CO_2eq/MMCLP, CO_2eq/MMCLP, decreasing by 33.6% since 1990 and by 7.1% since 2007; the trend is influenced by emissions from the energy sector that dominates the country's total GHG emissions (Table 14 and Figure 12).

Table 14. Chile's NGHGI: GHG balance by GDP and total GHG emissions by GDP (t CO_2eq / MMCLP), series 1990-2013

Indicator	1990	2000	2007	2010	2011	2012	2013
GHG/GDP Balance	0.22	0.44	0.68	0.50	0.62	0.68	0.61
Total GHG emissions/GDP	1.43	1.15	1.02	0.94	0.98	0.97	0.95

Source: own elaboration of the Technical Coordinating Team of MMA based in information of the Banco Central of Chile.

Figure 12. Chile's NGHGI: GHG balance by GDP and total GHG emissions by GDP (t CO_2eq / MMCLP), series 1990-2013



Source: own elaboration of the Technical Coordinating Team of MMA based in information of the Banco Central of Chile.

2.3.2. Chile's GHG emissions per capita

This indicator relates GHG emissions of the country with its inhabitants (per capita), and expressed that relation in tons of CO_2 equivalent per capita (t CO_2eq per capita). For GHG emissions of the country. The GHG balance and total GHG emissions are evaluated.

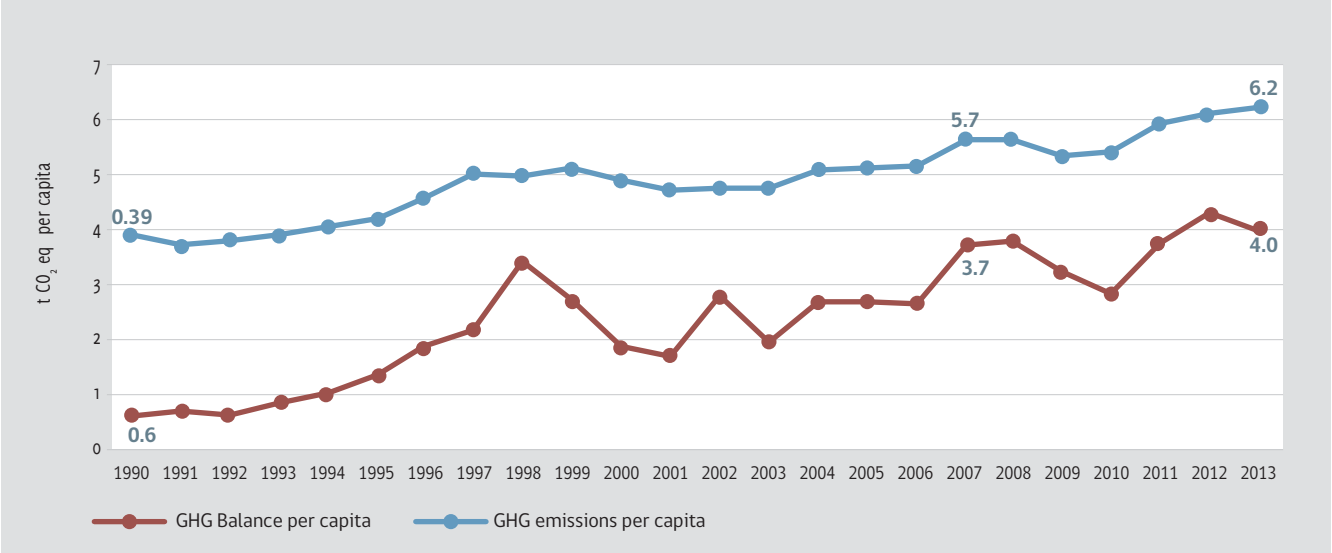
In 2013, the GHG balance indicator per capita was 4.0 t CO_2eq/MMCLP, increasing by 554.0% since 1990, but decreasing by 6.4% since 2007. The observed interannual variation, with maximums in 1998 and 2002, is mainly due to the influence of forest fires on the country's GHG balance. On the other hand, the total GHG emissions indicator per capita was 6.2 t CO_2eq per capita, increasing by 59.5% since 1990 and by 10.3% since 2007. The trend is influenced by emissions from the Energy sector that dominates the country's total GHG emissions (Table 15 and Figure 13).

Table 15. Chile's NGHGI: GHG balance per capita and total GHG emissions per capita (t CO_2eq per capita), series 1990-2013

Indicator	1990	2000	2007	2010	2011	2012	2013
GHG Balance per capita	0.6	1.9	3.7	2.9	3.8	4.3	4.0
Total GHG emissions per capita	3.9	4.9	5.7	5.4	5.9	6.1	6.2

Source: own elaboration of the Technical Team Coordinator of MMA with base in the National Statistics Institute (INE), 1995.

Figure 13. Chile's NGHGI: GHG balance per capita and total GHG emissions per capita (t CO_2eq per capita), series 1990-2013



Source: own elaboration of the Technical Team Coordinator of MMA with base in the National Statistics Institute (INE), 1995.

Cristian Eduardo Veloso Obreque.

3. Energy Sector (1)

Chile's NGHGI Energy sector includes the GHG emissions generated by the combustion of fossil fuels in the country and its associated fugitive emissions. The combustion of fossil fuels generates energy, in most countries. During combustion, carbon and hydrogen from fossil fuels are converted to carbon dioxide (CO_2) and water (H_2O), which release the chemical energy of the fuel in the form of heat. In general, heat is used directly (or with some loss per conversion) to produce mechanical energy.

The Energy sector is the main GHG emitting sector in the country, accounting for 77.4% of total GHG emissions (excluding FOLU) in 2013. The same year, GHG emissions of the sector accounted for 85,075.4 Gg CO_2eq, increasing 156.1% since 1990 and 22.5% since 2010 (Table 16). In general, the main cause is the increase in the country's energy consumption, including the consumption of coal and natural gas for electricity generation, as well as the consumption of liquid fuels for road transportation, mainly diesel and gasoline.

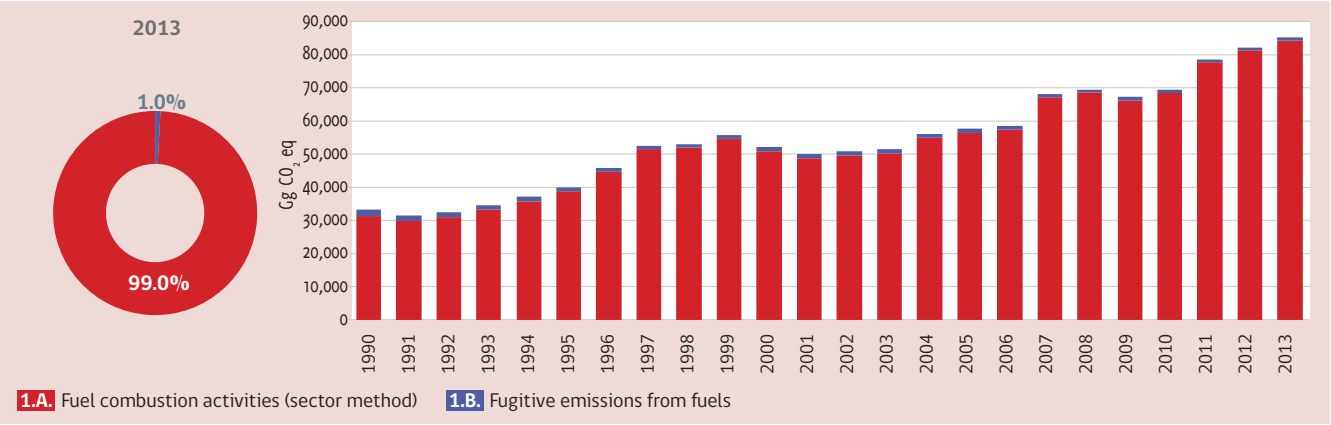
In terms of categories (Figure 14), 99.0% of GHG emissions of the sector corresponds to the Fuel combustion activities category and the remaining 1.0% to the category Fugitive emissions from fuels. Between 1990 and 1999 there is almost constant growth, however, from that last year until 2006, there was a decrease and then a sharp increase in 2007. This is due to the entry and subsequent fall in the supply of natural gas from Argentina, which was replaced mainly by coal and diesel. Then in 2008, and with greater strength in 2009, there is a decrease in GHG emissions from the sector, a decrease that is attributed in a significant way to the international economic crisis that began in 2008. On February 27, 2010, an earthquake occurred that reached a magnitude of 8.8 MW and was followed by a tsunami. This natural disaster delayed the activation of the country's economy until 2011. The increase in emissions between 2011 and 2013 is due in part to the increase in electricity generation driven by an increase in the country's economic activity. In addition, increased the use of coal for electricity generation and lowered the hydroelectric production because those years were little rainy.

Table 16. Chile's NGHGI: GHG emissions (Gg CO_2eq) by category, series 1990-2013

Category	1990	2000	2010	2011	2012	2013
1.A. Fuel combustion activities	31,325.4	50,827.7	68,405.8	77,577.2	81,189.5	84,192.7
1.B. Fugitive emissions from fuels	1,894.1	1,295.2	1,017.9	949.7	887.1	882.6
Total	33,219.5	52,122.9	69,423.7	78,527.0	82,076.6	85,075.4

Source: Energy Technical Team of MINENERGIA.

Figure 14. Chile's NGHGI: GHG emissions (Gg CO_2eq) by category, series 1990-2013



Source: Energy Technical Team of MINENERGIA.

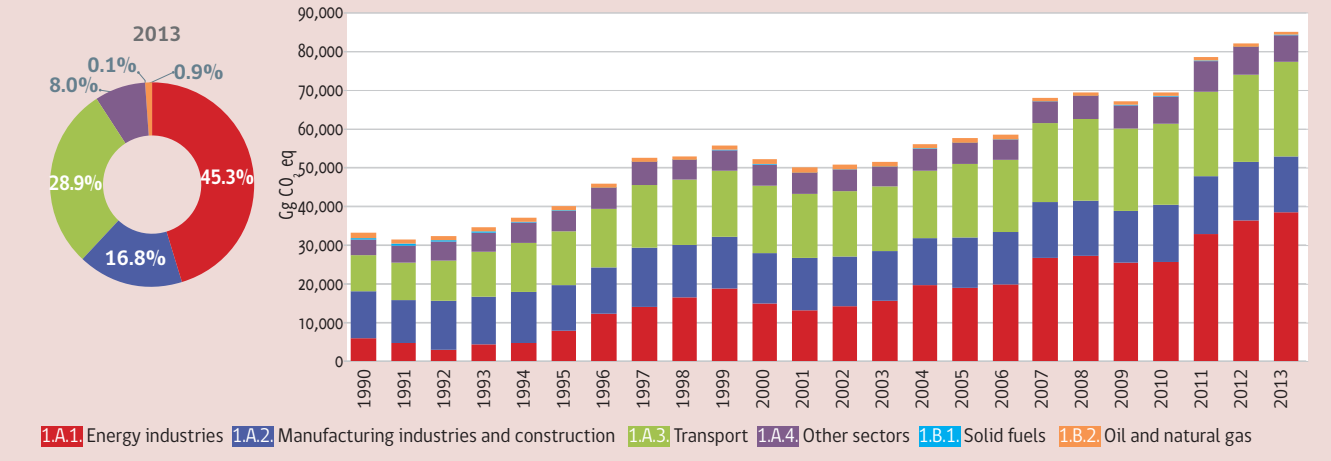
Regarding subcategories (Table 17 and Figure 15), Energy industries (mainly Electricity generation as the main activity) is the most important in the sector with a 45.3% participation in 2013, followed by a 28.9% Transport (mainly Road transportation), 16.8% Manufacturing industries and construction and 8.0% Other sectors (mainly Residential). The subcategory Oil and natural gas accounted for 0.9%, while solid fuels accounted for 0.1%.

Table 17. Energy Sector: GHG emissions (Gg CO_2eq) by sub category, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
1.A.1. Energy industries	5,843.8	14,909.2	25,623.4	32,800.0	36,388.6	38,518.4
1.A.2. Manufacturing industries and construction	12,257.5	13,007.4	14,801.8	14,901.0	15,122.8	14,282.3
1.A.3. Transport	9,249.3	17,348.9	20,952.5	21,861.6	22,555.3	24,545.7
1.A.4. Other sectors	3,974.8	5,562.1	7,028.2	8,014.6	7,122.8	6,846.4
1.B.1. Solid fuels	481.5	74.2	40.0	47.5	51.1	92.1
1.B.2. Oil and natural gas	1,412.7	1,221.0	977.9	902.3	835.9	790.6
Total	33,219.5	52,122.9	69,423.7	78,527.0	82,076.6	85,075.4

Source: Energy Technical Team of MINENERGIA.

Figure 15. Energy Sector: GHG emissions (Gg CO_2eq) by sub category, series 1990-2013



Source: Energy Technical Team of MINENERGIA.

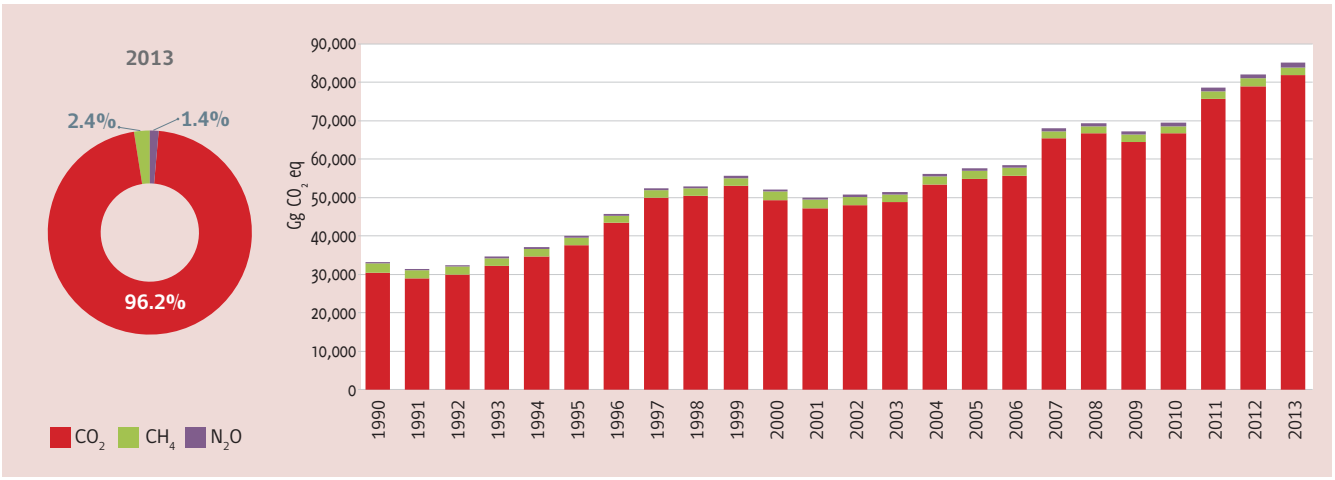
In 2013, the main GHG emitted by the sector was CO_2, representing 96.2% of the sector's total GHG emissions. It is followed by CH_4 with 2.4% and N_2O with 1.4% (Table 18 and Figure 16).

Table 18. Energy Sector: emissions by type of GHG (Gg CO_2eq), series 1990-2013

GHG	1990	2000	2010	2011	2012	2013
CO_2	30,405.6	49,367.0	66,655.7	75,701.1	78,953.6	81,823.1
CH_4	2,479.8	2,149.2	1,942.5	1,929.7	2,026.9	2,060.8
N_2O	334.2	606.7	825.5	896.2	1,096.1	1,191.5
Total	33,219.5	52,122.9	69,423.7	78,527.0	82,076.6	85,075.4

Source: Energy Technical Team of MINENERGIA.

Figure 16. Energy Sector: emissions by type of GHG (Gg CO_2eq), series 1990-2013



Source: Energy Technical Team of MINENERGIA.

3.1. General methodological aspects of the sector

For the estimation of GHG emissions in the Energy sector, a Tier 1 method was applied for practically all categories and GHGs, except for non-CO_2 gases from the Road transportation component, for which a Tier 2 method was applied with activity data specific technology used and default emission factors. In addition, for Fuel combustion activities the Reference Method was applied as an independent control of the Sectoral Method. For further information, the reader is encouraged to review the Chilean National Greenhouse Gas Inventory Report 1990-2013.

3.2. Comparison between the Reference Method and the Sectoral Method

The comparison of the results of the CO_2 emissions obtained with the Reference Method and the Sectoral Method allows verifying the validity of the calculations. The Reference Method uses the total values of the national energy statistics, while the Sectoral Method uses values bounded to each category that together add up the national total of the Energy sector.

The estimation of CO_2 by the Reference Method consists of a top-down method, in which the hypothesis is that carbon is conserved, so that, for example, the carbon of the crude oil

is equal to the total carbon content of all derived products.

In general, the trend of CO_2 emissions does not show significant differences between the two methods; the differences may be due to various considerations in the final use and transformation of fuels such as coal, natural gas, liquefied petroleum gas (LPG) and biogas (Table 19).

Figure 17 shows the percentage difference between the Reference Method and the Sectoral Method for the Historical Series 1990-2013. The absolute average of these variations is 1.3% with an absolute maximum of -3.0% in 2000, followed by 2007 with -2.8%. On the other hand, the years that present the smallest difference are 2004 and 2006, with differences smaller than 0.01%. All these values are below 5% indicated by the 2006 IPCC Guidelines as an acceptable difference between the two methods.

Table 19. Fuel combustion activities: CO_2 emissions (Gg CO_2eq) of the sectoral method and reference method, including their difference, series 1990-2013

Method	1990	2000	2010	2011	2012	2013
Reference method	30,051.9	50,829.5	65,991.6	75,470.3	79,992.4	83,954.7
Sector Method	30,403.0	49,365.3	66,654.4	75,699.7	78,952.1	81,821.6
Difference	351.1	-1,464.2	662.8	229.4	-1,040.2	-2,133.1
Difference%	1.2%	-3.0%	1.0%	0.3%	-1.3%	-2.6%

Source: Energy Technical Team of MINENERGIA.

3.3. Energy industries (1.A.1.)

This subcategory includes GHG emissions from fuel combustion due to energy production industries and fuel extraction activities.

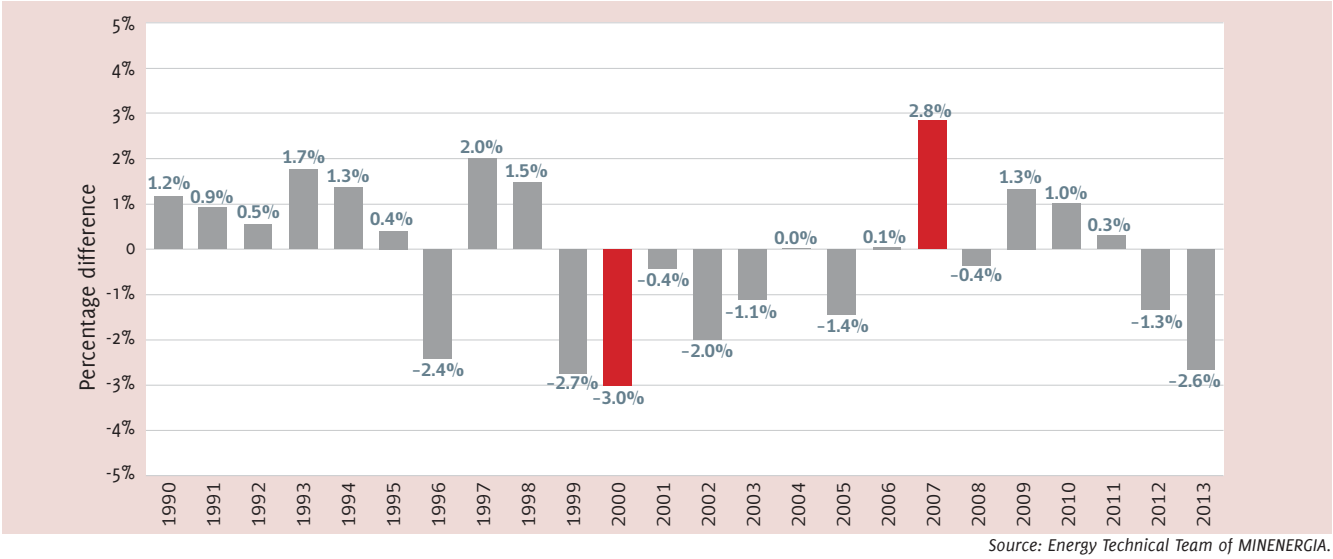
The subcategory Energy industries is the main subcategory of GHG in the Energy sector (45.3%) and the main source of emissions at the national level (35.0% excluding FOLU). In 2013, GHG emissions accounted for 38,518.4 Gg CO_2eq, increasing 559.1% since 1990 and 50.3% since 2010 (Table 20).

Table 20. 1.A.1. Energy industries: GHG emissions (Gg CO_2eq) by component, series 1990-2013

Component	1990	2000	2010	2011	2012	2013
1.A.1.a. Main activity electricity and heat production	3,872.4	13,036.4	24,030.4	29,761.8	32,179.0	34,418.9
1.A.1.b. Petroleum refining	1,691.8	1,470.7	903.7	1,981.7	2,784.8	3,120.3
1.A.1.c. Manufacture of solid fuels and other energy industries	279.6	402.1	689.3	1,056.6	1,424.8	979.2
Total	5,843.8	14,909.2	25,623.4	32,800.0	36,388.6	38,518.4

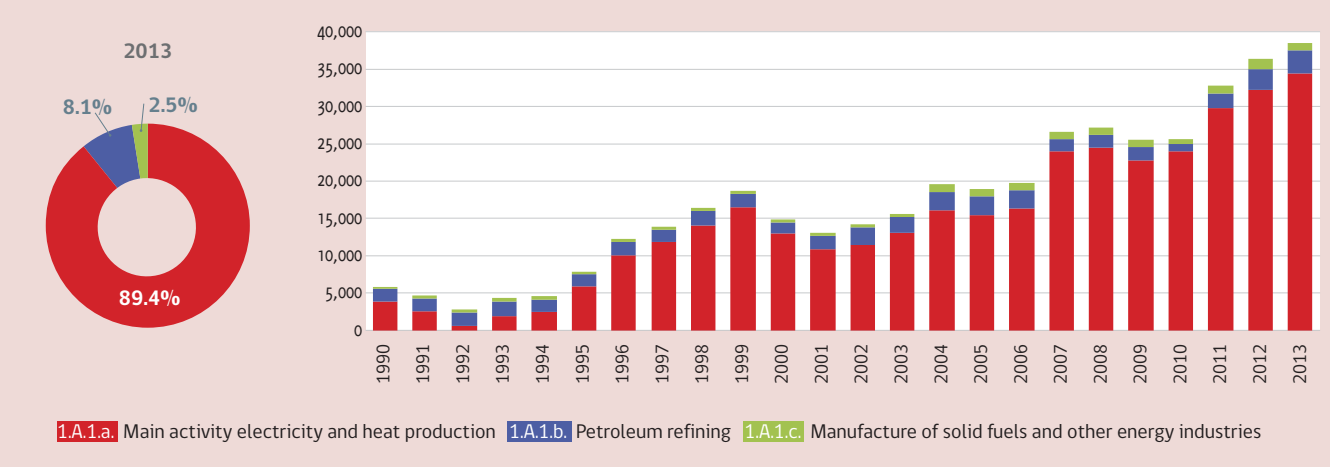
Source: Energy Technical Team of MINENERGIA.

Figure 17. Fuel combustion activities: percentage difference between CO_2 emissions of the Sectoral Method and the Reference Method, series 1990-2013



Source: Energy Technical Team of MINENERGIA.

Figure 18. 1.A.1. Energy industries: GHG emissions (Gg CO_2 eq) by component, series 1990-2013

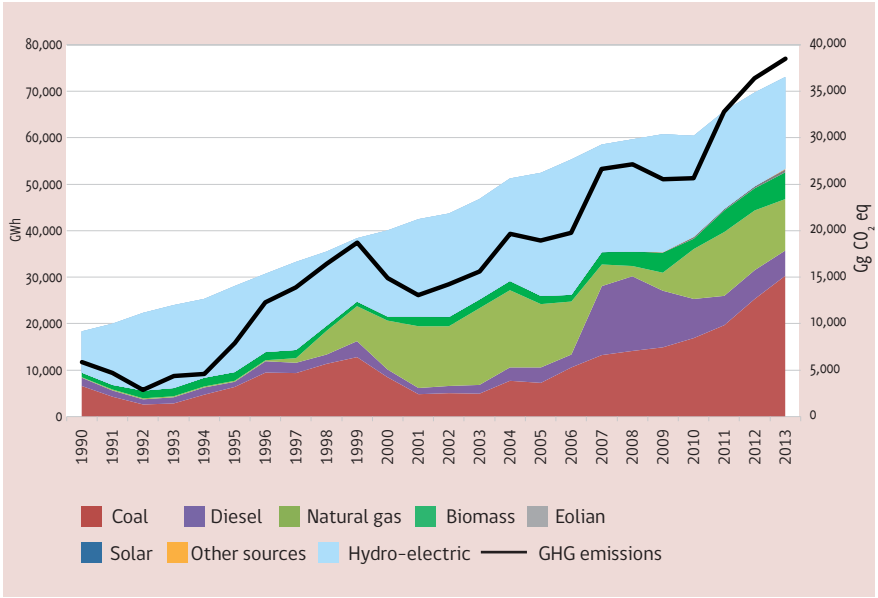


Source: Energy Technical Team of MINENERGIA.

Regarding components (Figure 18), main activity electricity and heat production is the most relevant with 89.4%, followed by 8.1% in Petroleum refining and 2.5% in Manufacture of solid fuels and other energy industries. The interannual variations are explained by the economic context of the time, for example the international crisis of 2008, and the changes in the energy matrix.

When analyzing the GHG emissions compared to the electricity generation curves (GWh) from different sources (Figure 19), it can be seen that the maximal emission occur when the generation by hydraulic source decreases and consumption of diesel and especially coal increases, as observed in 1999, 2008 and 2012-2013. The opposite situation occurs in the periods 1990-1992 and 2005-2006, which shows the increase of the hydraulic source and a decrease in the trend to increase the emissions of the subcategory. The influence of the use of natural gas on GHG emissions is noteworthy. During the 1990-2005 period, GHG emissions were reduced due to the increase in natural gas consumption because of the entry of a large supply of this fuel from Argentina, which displaces consumption of coal and diesel. In addition, since 2007, the cut in natural gas supply, coupled with a lower supply of water due to droughts, has led to an increase in the consumption of diesel and coal, which in turn increases GHG emissions, returning to the upward trend observed between 1990 and 1998.

Figure 19. Main activity electricity and heat production: electricity production by type of GHG source and emissions (Gg CO_2eq), series 1990-2013



Source: Energy Technical Team of MINENERGIA
** Emission data do not consider self-production, only public service. These data are preliminary.*
*** The generation data does consider self-production.*

3.4. Manufacturing industries and construction (1.A.2.)

This subcategory includes the GHG emissions generated by the burning of fossil fuels in the industry, including burning for electricity and heat generation for the own use of these industries. Excludes the industries of the energy category considered in the subcategory Industries of the energy.

In 2013, GHG emissions of this category accounted for 14,282.3 Gg CO_2eq (16.8%), increasing 16.5% since 1990, however has decreased 3.5% since 2010 (Table 21). The slight increase that they have presented is because, in general, of the activity of the manufacturing industry in Chile has not increased significantly in the last twenty years. The economic growth of the country is more related to activities of commerce and services. The main causes of the interannual variations are copper mining, the disappearance of some industries due to international competition and production costs (sugar and steel), and the unspecified industry, which, by definition, has high variability.

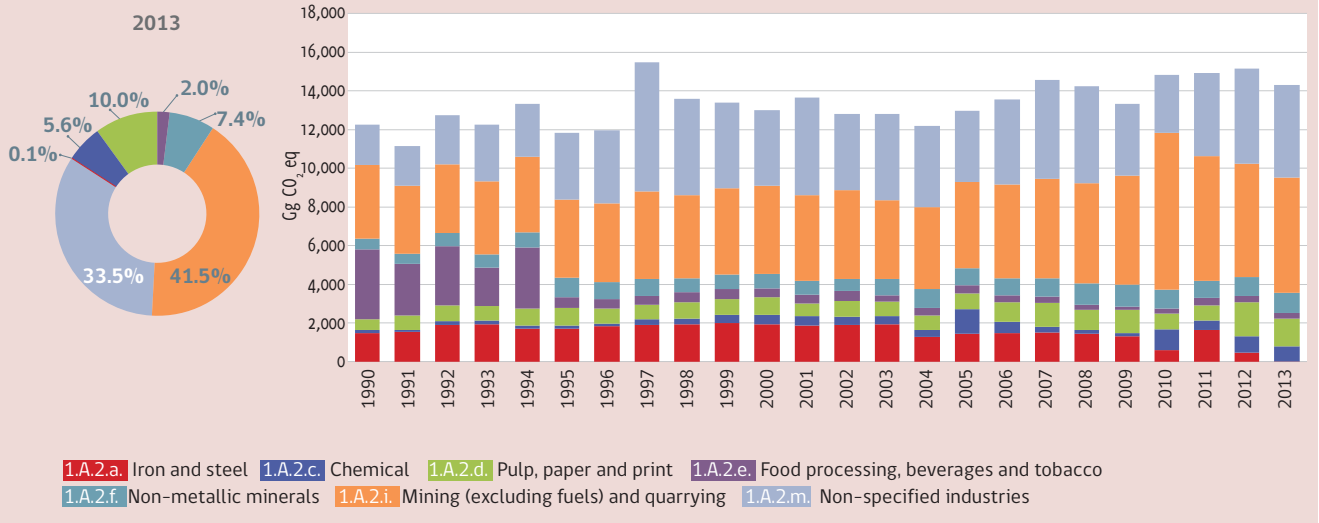
Regarding the components (Figure 20), Mining (excluding fuels) and quarrying is the most relevant with 41.5%, followed by 33.5% of Non-specified industry, 10.0% Pulp, paper and print, 7.4% non-metallic minerals, 5.6% chemical, 2.0% food, beverage and tobacco processing, and iron and steel 0.1%.

Table 21. 1.A.2. Manufacturing and construction Industries: GHG emissions (Gg CO_2eq) by component, series 1990-2013

Component	1990	2000	2010	2011	2012	2013
1.A.2.a. Iron and steel	1,494.9	1,948.4	587.0	1,635.1	457.2	9.2
1.A.2.c. Chemical	141.1	472.1	1,097.0	490.8	863.1	798.1
1.A.2.d. Pulp, paper and print	555.7	906.6	804.2	771.1	1,762.3	1,427.9
1.A.2.e. Food processing, beverages and tobacco	3,599.4	471.2	250.9	393.3	318.7	285.9
1.A.2.f. Non-metallic minerals	572.5	745.8	985.7	902.2	957.3	1,054.3
1.A.2.i. Mining (excluding fuels) and quarrying	3,799.6	4,539.8	8,092.0	6,437.7	5,854.3	5,923.5
1.A.2.m. Non-specified industries	2,094.3	3,923.4	2,984.9	4,270.9	4,910.0	4,783.4
Total	12,257.5	13,007.4	14,801.8	14,901.0	15,122.8	14,282.3

Source: Energy Technical Team of MINENERGIA.

Figure 20. 1.A.2. Manufacturing and construction Industries: GHG emissions (Gg CO_2eq) by component, series 1990-2013

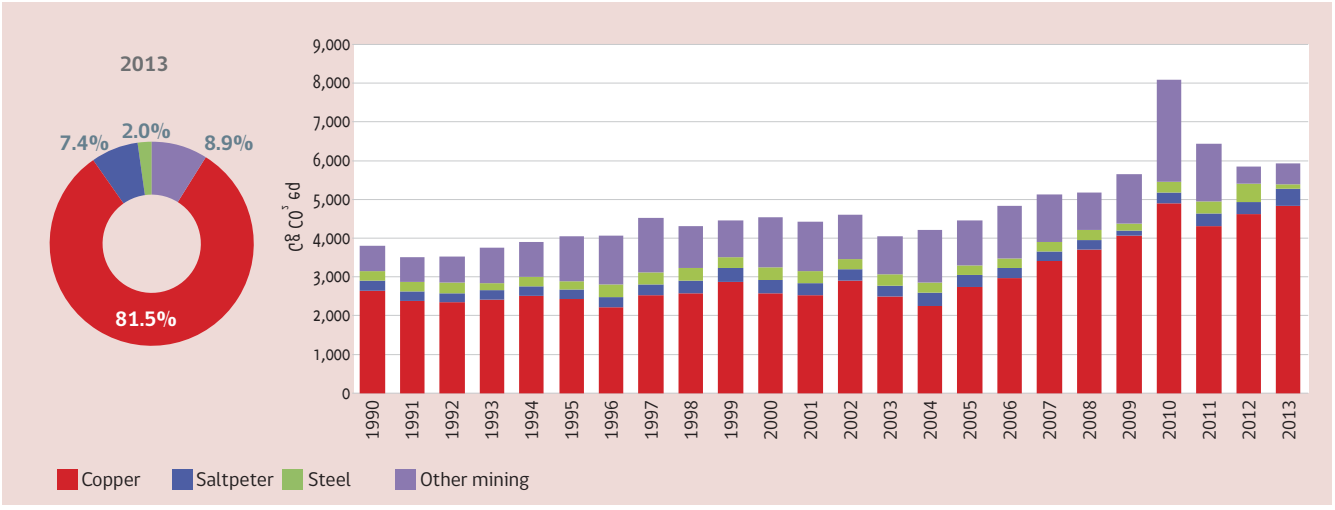


Source: Energy Technical Team of MINENERGIA.

Mining is the main industry in Chile, so it is important to know its emissions in detail. Copper is the most energy consuming mining with 81.5% of emissions in 2013, followed by 8.9% of other mining, 7.4% of saltpeter and 2.1% of steel. Figure 21 shows there was an increase outside the trend in 2010, which according to the BNE data is due to an increase in the consumption of natural gas in the copper mining and in other mining. However, it is likely that this increase is rather due to a difference in the NBF methodology for that year.

Tránsito en Santiago

Figure 21. **1.A.2.i. Mining (excluding fuels) and quarrying: GHG emissions (Gg CO_2eq) by subcomponent, series 1990-2013**



Source: Energy Technical Team of MINENERGIA.

3.5. Transport (1.A.3.)

This subcategory includes GHG emissions generated by the combustion of fossil fuels in all national transport activities (air, land, rail, navigation, etc.), excluding military transport and international transport (maritime and air transport). Reported separately (see section 7).

In 2013, GHG emissions of this subcategory accounted for 24,545.7 Gg CO_2eq (28.9%), increasing 165.4% since 1990, and 17.1% since 2010 (Table 22). The main cause is the growth of the national automobile industry induced by the expansion of the population, the greater purchasing power and the improvement of the road infrastructure in the country.

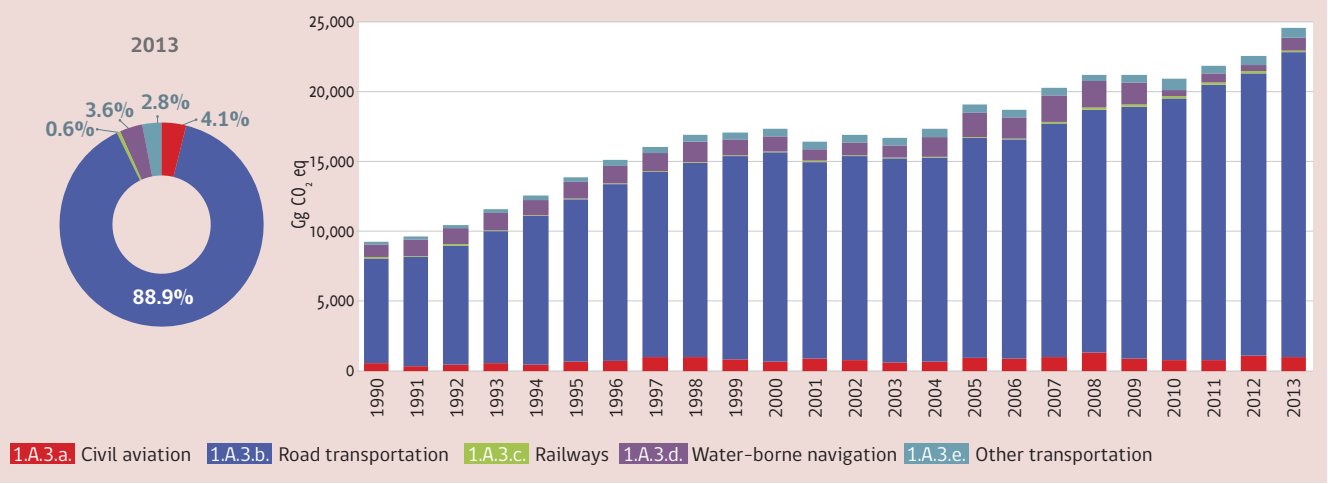
Regarding the components (Figure 22), Road transportation is the most relevant with 88.9% of GHG emissions, followed by 4.1% in Civil aviation, 3.6% in Water-borne navigation, 2.8% in Other transportation and 0.6% in Railways.

Table 22. 1.A.3. Transport: GHG emissions (Gg CO_2eq) by component, series 1990-2013

Component	1990	2000	2010	2011	2012	2013
1.A.3.a. Civil aviation	568.0	683.0	789.8	806.0	1,132.1	998.6
1.A.3.b. Road transportation	7,522.5	14,993.3	18,752.7	19,709.5	20,164.9	21,812.1
1.A.3.c. Railways	64.5	64.1	153.2	158.8	160.4	155.4
1.A.3.d. Water-borne navigation	880.4	1,079.0	434.4	621.8	467.7	889.2
1.A.3.e. Other transportation	213.9	529.6	822.3	565.5	630.3	690.4
Total	9,249.3	17,348.9	20,952.5	21,861.6	22,555.3	24,545.7

Source: Energy Technical Team of MINENERGIA.

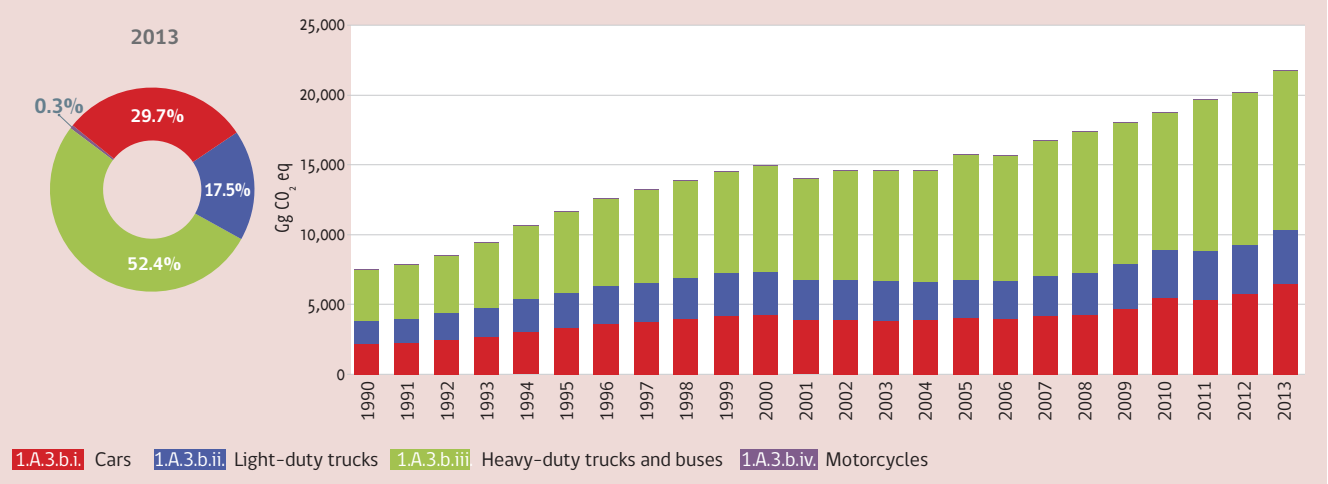
Figure 22. 1.A.3. Transport: GHG emissions (Gg CO_2eq) by component, series 1990-2013



Source: Energy Technical Team of MINENERGIA.

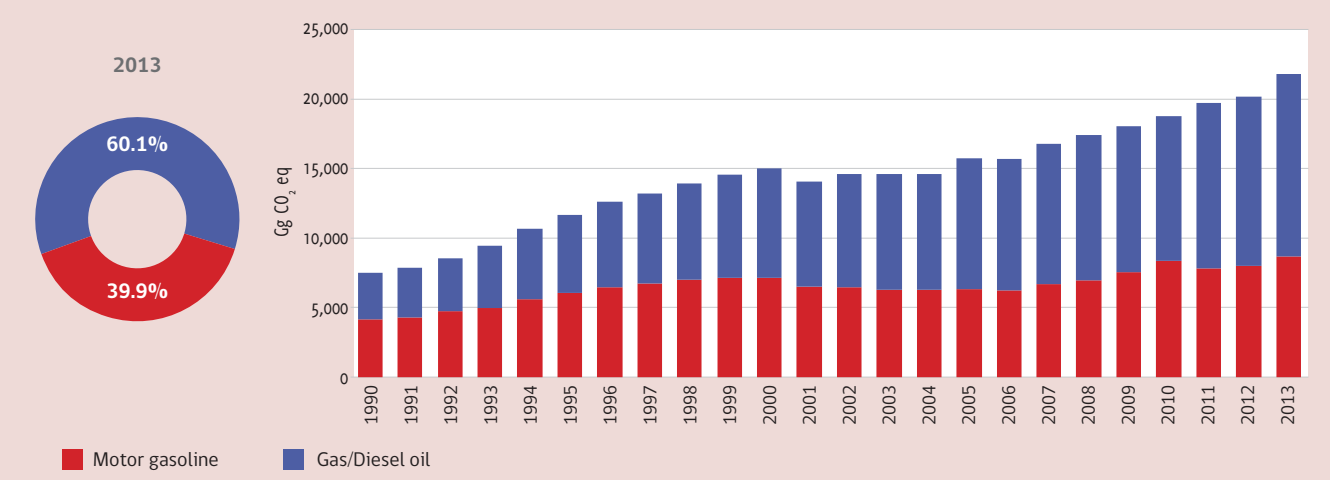
As Road transportation is the main component of the subcategory it was divided into subcomponents (Figure 23). In 2013, the highest percentage of emissions were Heavy-duty trucks and buses with 52.4%, followed by Cars with 29.7% followed by Light-duty trucks with 17.5%, and lastly Motorcycles with a 0.3%.

Figure 23. 1.A.3.b. Road transportation: GHG emissions (Gg CO_2eq) by subcomponent, series 1990-2013



Source: Energy Technical Team of MINENERGIA.

Figure 24. 1.A.3.b. Road transportation: CO_2 emissions (Gg CO_2eq) by fuel, series 1990-2013



Source: Energy Technical Team of MINENERGIA.

At the level of Road transportation by type of fuel (Figure 24), Gas/Diesel oil is the most important with 60.1% in 2013, while Motor Gasoline accounted for 39.9%.

3.6. Other sectors (1.A.4.)

This subcategory includes GHG emissions from fossil fuel combustion in commercial and institutional buildings, households and activities related to agriculture, forestry, fisheries and the fishing industry.

Rancagua

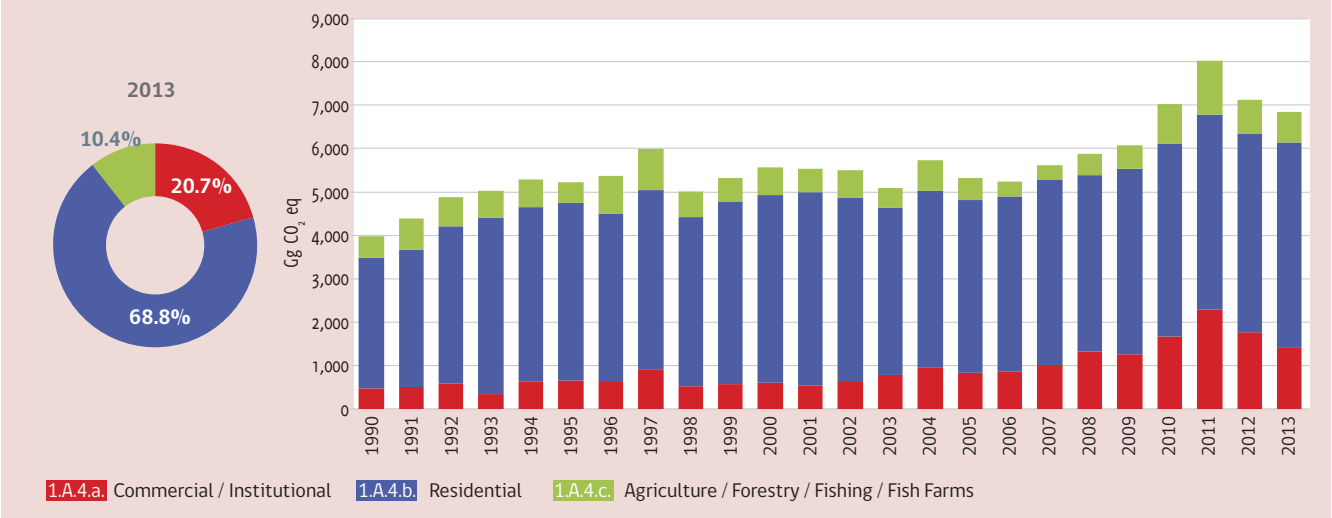
In 2013, GHG emissions of this subcategory accounted for 6,846.4 Gg CO_2eq (8.0%), increasing 72.2% since 1990, and decreasing 2.6% since 2010 (Table 23). In 2011, an increase outside the trend is attributed to an increase in diesel consumption in the Commercial / Institutional and Agriculture / Forestry / Fishing / Fish Farms Then in 2012 and 2013 there is a slowdown in these, probably due to a methodological change in the construction of the BNE during these years.

Table 23. 1.A.4. Other sectors: GHG emissions (Gg CO_2eq) by component, series 1990-2013

Component	1990	2000	2010	2011	2012	2013
1.A.4.a. Commercial / Institutional	486.7	612.4	1,680.6	2,291.6	1,776.6	1,419.3
1.A.4.b. Residential	3,004.1	4,322.8	4,417.6	4,488.0	4,550.9	4,712.4
1.A.4.c. Agriculture / Forestry / Fishing / Fish Farms	484.0	627.0	930.0	1,235.1	795.3	714.6
Total	3,974.8	5,562.1	7,028.2	8,014.6	7,122.8	6,846.4

Source: Energy Technical Team of MINENERGIA.

Figure 25. 1.A.4. Other sectors: GHG emissions (Gg CO_2eq) by component, series 1990-2013



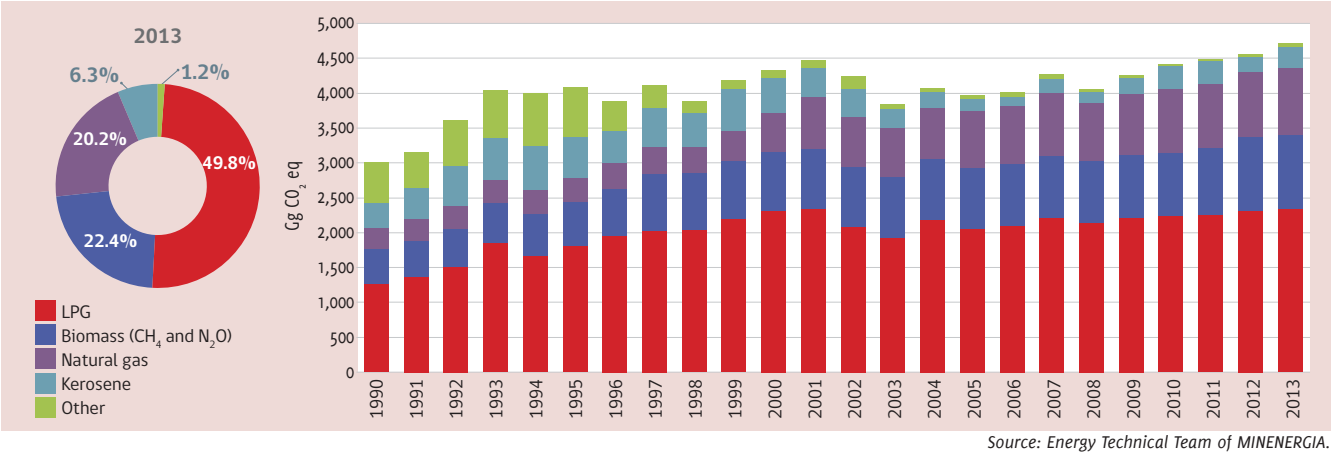
Source: Energy Technical Team of MINENERGIA.

Regarding the components (Figure 25), Residential is the most relevant with 68.8% of GHG emissions, followed by 20.7% in Commercial / Institutional and 10.4% in Agriculture / Forestry / Fishing / Fish farms.

Regarding the Residential component by type of fuel (Figure 26), liquefied petroleum gas is the most important with 49.8%, followed by 22.4% of Biomass (includes only CH_4 and N_2O emissions), 20.2% of natural gas, 6.3% of kerosene and 1.2% of other fuels.

Trasvasije de Avena

Figure 26. 1.A.4.b. . Residential: GHG emissions (Gg CO_2eq) by component, series 1990-2013



Source: Energy Technical Team of MINENERGIA.

3.7. Fugitive emissions from fuels: Solid fuels (1.B.1.) and Oil and natural gas (1.B.2.)

Fugitive emissions are considered intentional or unintentional emissions of GHGs released during the extraction, processing, storage and distribution of fossil fuels.

In 2013, GHG emissions of both subcategories accounted for 882.6 Gg CO_2eq (1.0%), decreasing 53.4% since 1990, and 13.3% since 2010 (Table 24). The main causes of the decline are the reduction of coal production from underground and surface mining, and the drop in the supply of natural gas from Argentina.

Regarding the subcategories (Figure 27), Oil and natural gas is the most relevant with 89.6%, followed by Solid fuels with a remaining 10.4%. Observed interannual variations are mainly due to changes in natural gas supply.

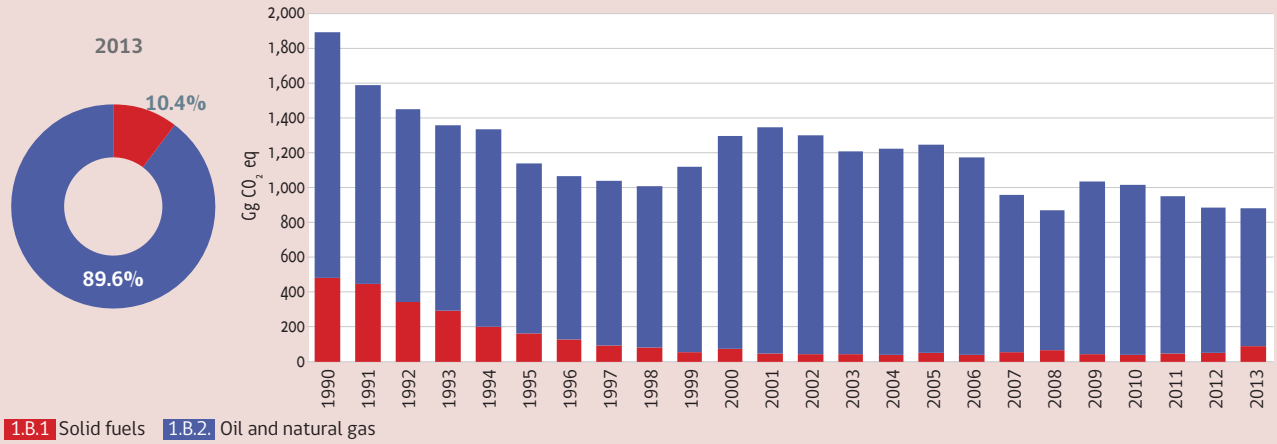
Combustibles ENAP, Karina Bahamonde

Table 24. 1.B. Fugitive emissions: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
1.B.1.Solid fuels	481.5	74.2	40.0	47.5	51.1	92.1
1.B.2.Oil and natural gas	1,412.7	1,221.0	977.9	902.3	835.9	790.6
Total	1,894.1	1,295.2	1,017.9	949.7	887.1	882.6

Source: Energy Technical Team of MINENERGIA.

Figure 27. 1.B. . Fugitive emissions: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013



Source: Energy Technical Team of MINENERGIA.

4. Industrial Processes and Product use Sector (2)

Chile's NGHGI Industrial processes and product use (IPPU) sector includes GHG emissions from a wide variety of industrial activities that transform raw materials by chemical or physical means. In addition, it considers the use of GHG in the products and non-energy uses of the carbon contained in the fuels.

IPPU sector accounted for 6.0% of total GHG emissions (excluding FOLU) in 2013. The same year, GHG emissions of the sector accounted for 6,619.4 Gg CO_2eq, increasing 111.7% since 1990 and 10.2% since 2010 (Table 25). In general, the main causes are the sustained increase of iron and steel, lime, nitric acid and cement productions.

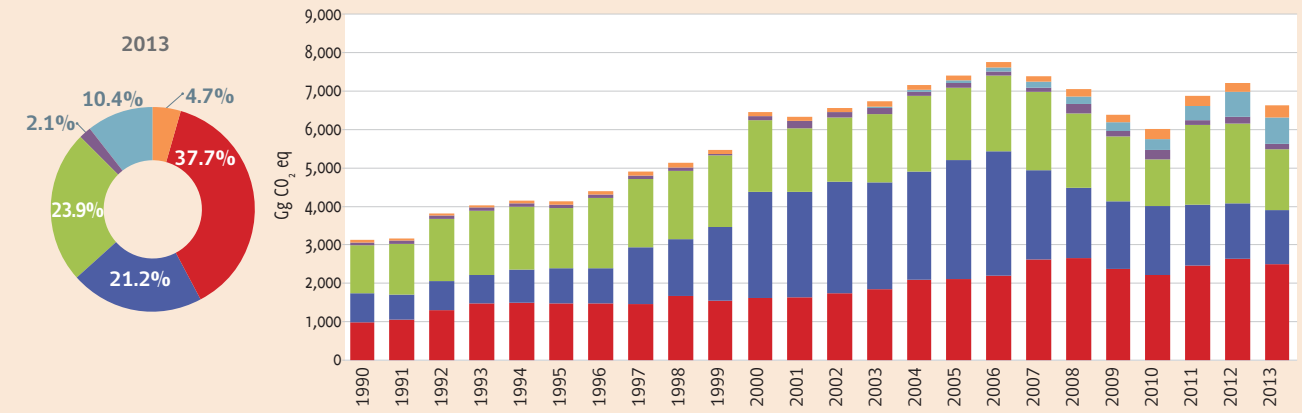
Regarding categories (Figure 28), 37.7% of the sector's GHG emissions correspond to the Mineral industry category, followed by a 23.9% of Metal industry, 21.2% of Chemical industry, 10.4% of Product uses as subtitutes for ozone depleting substances, 4.7% of Other product manufacture and use and, finally, 2.1% of Non-energy products of fuels and

Table 25. IPPU Sector: GHG emissions (Gg CO_2eq) by category, series 1990-2013

Category	1990	2000	2010	2011	2012	2013
2.A. Mineral industry	982.8	1,619.1	2,215.1	2,470.5	2,645.5	2,496.7
2.B. Chemical industry	755.4	2,768.0	1,797.6	1,566.7	1,437.0	1,400.9
2.C. Metal industry	1,249.8	1,849.0	1,209.7	2,073.0	2,066.3	1,584.3
2.D. Non-energy products from fuels and solvent use	75.1	114.8	241.0	128.9	188.0	142.0
2.F. Product uses as subtitutes for ozone depleting substances	NO	NO	290.3	372.6	633.8	686.9
2.G. Other product manufacture and use	64.3	98.6	254.4	256.7	244.3	308.7
Total	3,127.5	6,449.6	6,008.1	6,868.3	7,214.9	6,619.4

NO = Not occurring
Source: IPPU Technical Team of MMA

Figure 28. IPPU Sector: GHG emissions (Gg CO_2eq) by category, series 1990-2013



Source: IPPU Technical Team of MMA.

use of solvents. The main drivers of the increase between 1990 and 2006 are the sustained growth of methanol production, the cement industry and the lime industry. Since 2006, there has been a sharp fall in emissions due to the decrease in the supply of natural gas from Argentina, which is the raw material for the production of methanol. In addition, since 2008 the industrial activity of the country has fallen sharply due to the international economic crisis, which affected the production of cement and lime and, especially, the iron and steel industry. This crisis lasted until 2010, when an economic recovery that decreases again in 2013. On the other hand, the consumption of HFC for refrigeration and air conditioning increases strongly in 2012.

In 2013, the main GHG emitted by the sector was CO_2, representing 65.9% of the sector's total GHG emissions. It is followed by N_2O with 18.9% and HFC with 10.3%. SF_6 reaches 4.7% of emissions, CH_4 0.2% and, lastly, PFCs totaled 0.1% (Table 26 and Figure 29).

Table 26. IPPU Sector: emissions by type of GHG (Gg CO_2eq), series 1990-2013

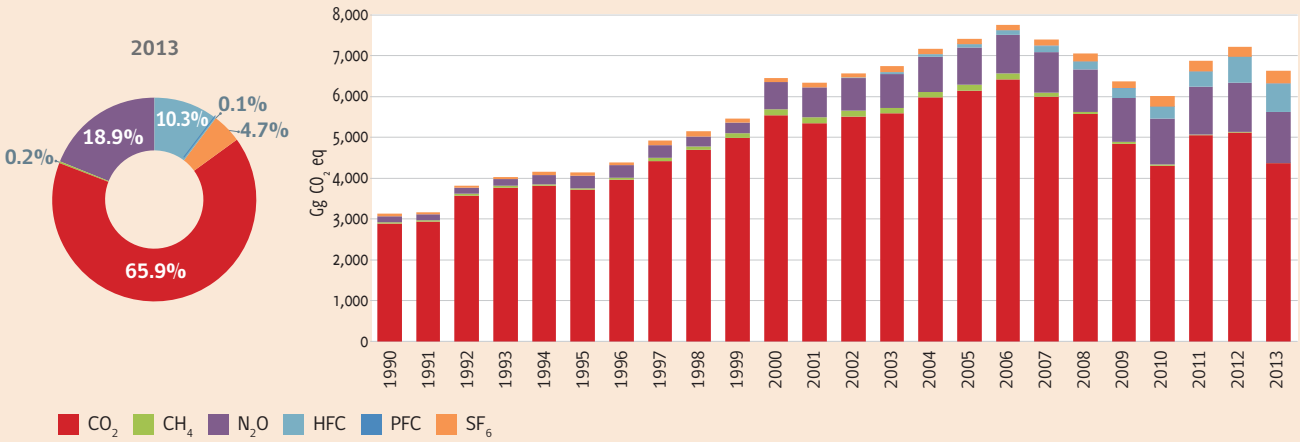
GHG	1990	2000	2010	2011	2012	2013
CO_2	2,880.6	5,535.0	4,293.2	5,044.4	5,110.7	4,360.2
CH_4	41.4	140.8	45.3	26.9	15.2	9.9
N_2O	141.2	675.2	1,124.9	1,167.8	1,210.7	1,253.7
HFC	NO	NO	284.2	366.7	628.2	681.4
PFC	NO	NO	6.1	5.9	5.7	5.4
SF_6	64.3	98.6	254.4	256.7	244.3	308.7
Total	3,127.5	6,449.6	6,008.1	6,868.3	7,214.9	6,619.4

NO = Not occurring
Source: IPPU Technical Team of MMA

4.1. General methodological aspects of the sector

For the estimation of GHG emissions in the IPPU sector, Tier 1 and Tier 2 methods were applied. The inclusion of the latter is an important advance in comparison to the previous Chile's NGHGI. Tier 2 method was applied for CO_2 emissions from the Mineral Industry category. It is important to note that the use of HFC and PFC gas applications for the category Product uses as substitutes of ozone depleting substances, SF_6 emissions from electrical equipment were estimated for the first time in the Other product manufacture and use category. For further information, the reader is encouraged to review the Chilean National Greenhouse Gas Inventory Report 1990-2013.

Figure 29. IPPU Sector: emissions by type of GHG (Gg CO_2eq), series 1990-2013



Source: IPPU Technical Team of MMA.

4.2. Mineral industry (2.A.)

This category includes CO_2 emissions related to processes resulting from the use of carbonated raw materials in the production and use of a variety of industrial mineral products.

Table 27. . 2.A. Mineral industry: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013

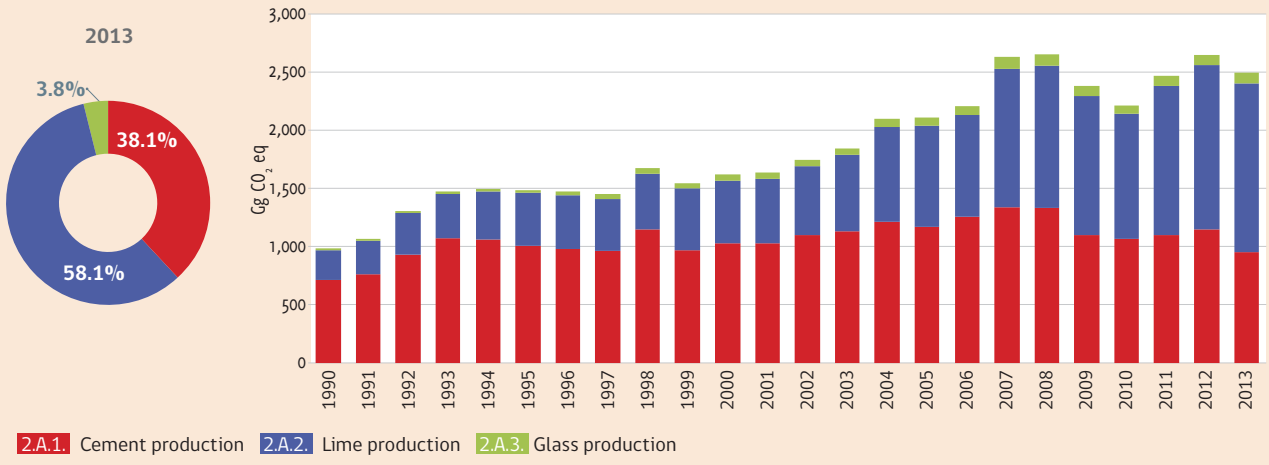
Subcategory	1990	2000	2010	2011	2012	2013
2.A.1. Cement production	714.5	1,028.6	1,065.3	1,099.5	1,147.7	950.7
2.A.2. Lime production	256.3	537.9	1,076.4	1,283.7	1,413.1	1,451.3
2.A.3. Glass production	12.0	52.6	73.4	87.3	84.7	94.6
Total	982.8	1,619.1	2,215.1	2,470.5	2,645.5	2,496.7

Source: IPPU Technical Team of MMA

The Mineral industry category is the main GHG emitting category of the IPPU sector (37.7%). In 2013, GHG emissions accounted for 2,496.7 Gg CO_2eq, increasing 154.0% since 1990 and 12.7% since 2010 (Table 27).

Regarding the subcategories (Figure 30), Lime production is the most relevant with 58.1%, followed by 38.1% of

Figure 30. 2.A. Mineral industry: GHG emissions trend (Gg CO_2eq) by subcategory, series 1990-2013



Source: IPPU Technical Team of MMA.

Cement production and 3.8% of Glass production. The main cause of the trend and interannual variations is the large increase in the lime industry, which has grown strongly since 2007. The decrease in cement production has also been affected since 2009, due to the decline in construction activity, because of the economic crisis, which recovers from 2010 and then drops again in 2013.

4.3. Chemical industry (2.B.)

This category includes GHG emissions resulting from the production of various inorganic and organic products for which the experience of several countries has confirmed that they contribute significantly to the global or national emission levels of GHG.

In 2013, GHG emissions of this category accounted for 1,400.9 Gg CO_2eq (21.2%), increasing 85.4% since 1990 due to sustained growth of Nitric acid production. However, GHG emissions have declined since 2006 due to the sharp fall in methanol production, coupled with a decline in the supply of natural gas, the main input of the industry, which reduced its emissions by 22.1% since 2010 (Table 28).

Regarding the subcategories (Figure 31), Nitric acid production is the most relevant with 89.5%, followed by 10.5% on Petrochemical and black carbon production

Table 28. 2.B. Chemical industry: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
2.B.2. Nitric acid production	141.2	675.2	1,124.9	1,167.8	1,210.7	1,253.7
2.B.8. Petrochemical and carbon black production	614.3	2,092.8	672.7	398.9	226.2	147.2
Total	755.4	2,768.0	1,797.6	1,566.7	1,437.0	1,400.9

Source: IPPU Technical Team of MMA.

4.4. Metal industry (2.C.)

This category includes GHG emissions resulting from the production of metals such as iron and steel, ferroalloys, lead, zinc, aluminum, etc.

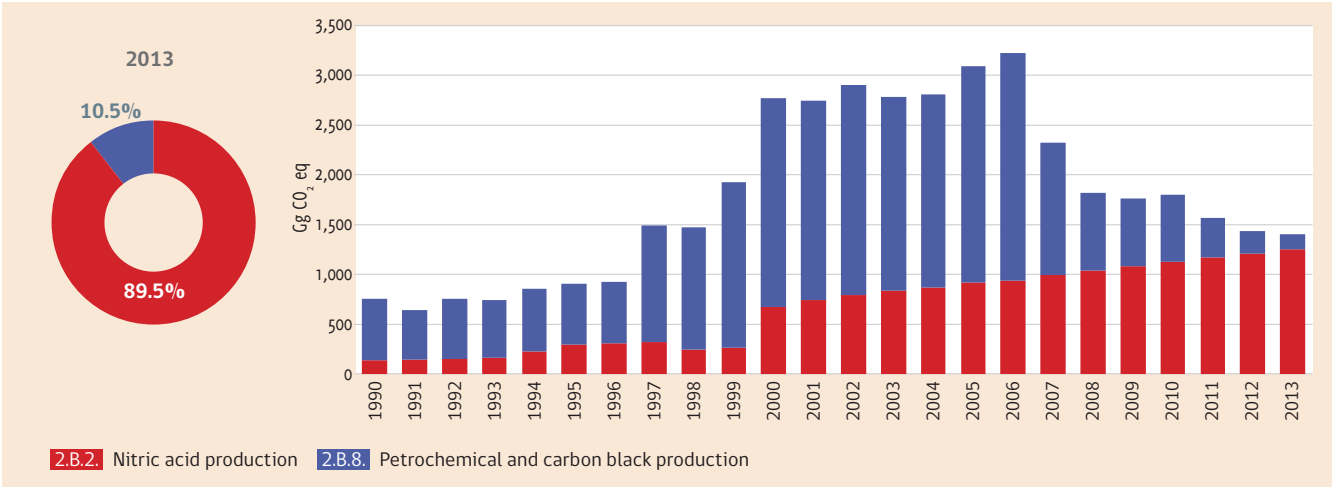
In 2013, GHG emissions of this category accounted for 1,584.3 Gg CO_2eq (23.9%), increasing 26.8% since 1990, and 31.0% since 2010 (Table 29).

Table 29. 2.C. Metal industry: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
2.C.1. Iron and steel production	1,218.1	1,840.5	1,209.4	2,072.9	2,066.2	1,584.2
2.C.2. Ferroalloy production	31.7	8.5	0.2	0.0	0.1	0.1
Total	1,249.8	1,849.0	1,209.7	2,073.0	2,066.3	1,584.3

Source: IPPU Technical Team of MMA.

Figure 31. 2.B. Chemical industry: GHG emissions trend (Gg CO_2eq) by subcategory, series 1990-2013



Source: IPPU Technical Team of MMA.

Regarding subcategories (Figure 32), iron and steel production is the most relevant with practically 100.0% of GHG emissions, while Ferroalloy production tends to 0.0%. Interannual variations are explained by the growth of the iron and steel industry, since the participation and influence of the ferroalloy industry is non-existing. From 2008, it can be seen iron and steel activity declined sharply due to the economic crisis that became more acute in 2010. In 2011 there was an increase in this activity, which is again downward in 2013, which shows the high fluctuation of these markets.

4.5. Non-energy products from fuels and solvents use (2.D.)

This category includes GHG emissions resulting from the earliest uses of fossil fuels as primary commodities, except: (i) combustion for energy purposes, and (ii) use as a feed process or as a reducing agent.

In 2013, GHG emissions of this category accounted for 142.0 Gg CO_2eq (2.1%), increasing 89.0% since 1990, and decreasing 41.1% since 2010 (Table 30).

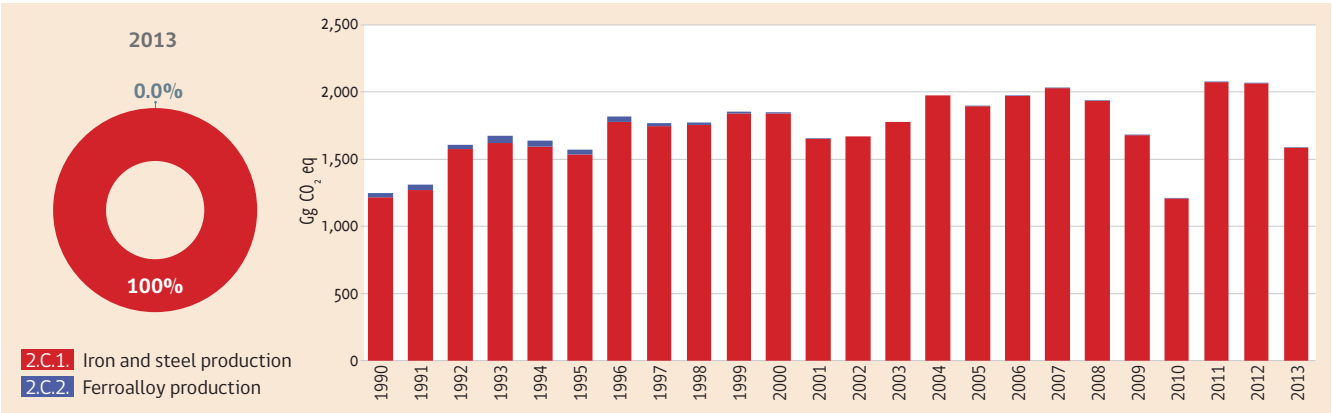
Regarding subcategories (Figure 33), Lubricant use is the most relevant with 91.7%, while Paraffin wax use contributes 8.3%. The main cause of the trend

Table 30. 2.D. Non-energy products from fuels and solvents use: GHG emissions (Gg CO_2eq) by subcomponent, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
2.D.1. Lubricant use	68.1	105.7	231.8	119.9	179.3	130.3
2.D.2. Paraffin wax use	7.1	9.1	9.3	9.0	8.7	11.7
Total	75.1	114.8	241.0	128.9	188.0	142.0

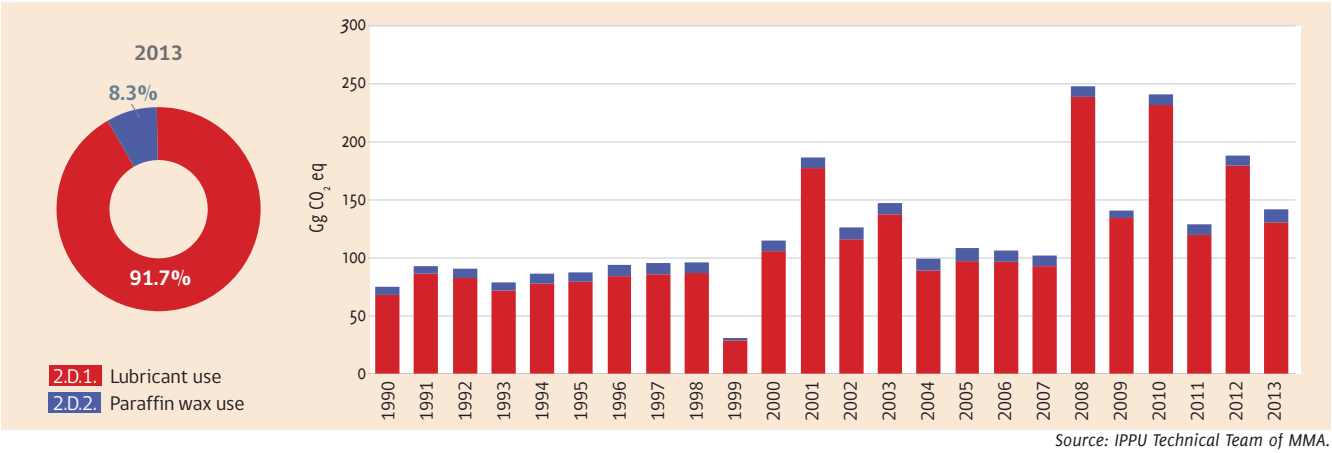
Source: IPPU Technical Team of MMA.

Figure 32. 2.C. Metal industry: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013



Source: IPPU Technical Team of MMA.

Figure 33. 2.D. Non-energy products from fuels and solvents use: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013



Source: IPPU Technical Team of MMA.

and interannual variations is the demand for lubricants and, consequently, the import and production of it.

4.6. Product uses as subtitutes for ozone depleting substances (2.F.)

This category includes gases from the families of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) which have a high greenhouse effect. HFCs and, to a very limited extent, PFCs serve as alternatives to ozone-depleting substances (ODS) and are being withdrawn from circulation by the Montreal Protocol.

In 2013, GHG emissions in this category accounted for 686.9 Gg CO_2eq (10.4%). Since 2002, the year in which the existence of these substances has begun to be registered in the country, GHG emissions have increased by an important 4,438.9% and by 137.0% since 2010. This is mainly due to the increase in consumption of HFCs for refrigeration and air conditioning. There is a strong increase in 2012 (Table 31).

Pauta Combustibles, Karina Bahamonde

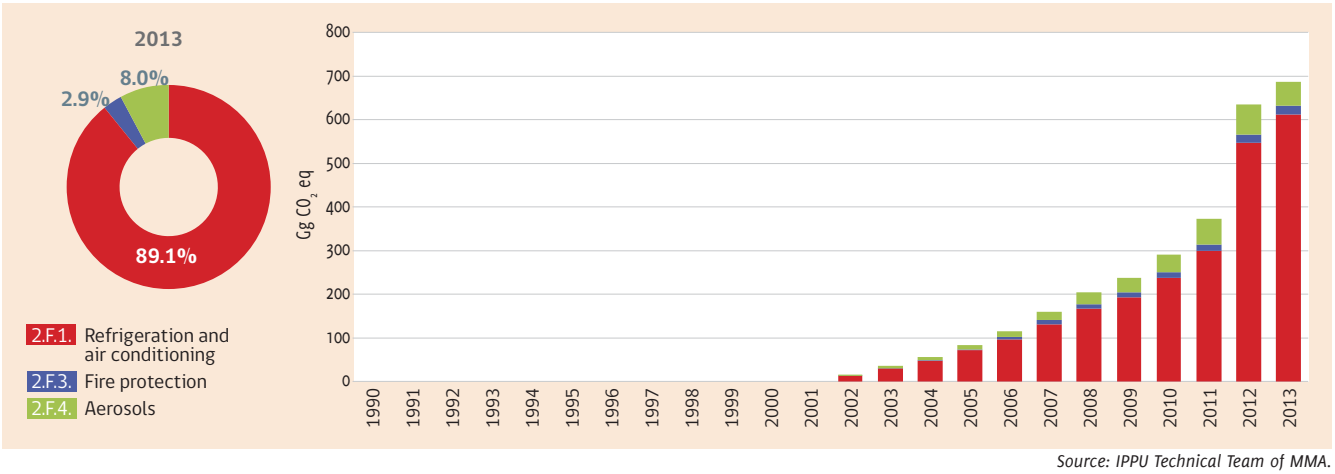
Regarding subcategories (Figure 34), Refrigeration and air conditioning is the most relevant with 89.1% of overall emissions, followed by 8.0% in Aerosols and 2.9% in Fire protection.

Table 31. 2.F. Product uses as subtitutes for ozone depleting substances: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
2.F.1. Refrigeration and air conditioning	NO	NO	236.9	298.7	547.3	611.8
2.F.3. Fire protection	NO	NO	12.8	15.3	18.6	19.8
2.F.4. Aerosols	NO	NO	40.6	58.6	68.0	55.2
Total	NO	NO	290.3	372.6	633.8	686.9

NO = Not occurring
Source: IPPU Technical Team of MMA.

Figure 34. 2.F. Product uses as subtitutes for ozone depleting substances: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013



Source: IPPU Technical Team of MMA.

4.7. Other product manufacture and use (2.G.)

This category includes GHG emissions from the use of SF_6, PFC and N_2O in different applications based on the different physical properties of these substances, such as the high dielectric constant of SF_6, the stability of PFCs and the anesthetic effects of N_2O.

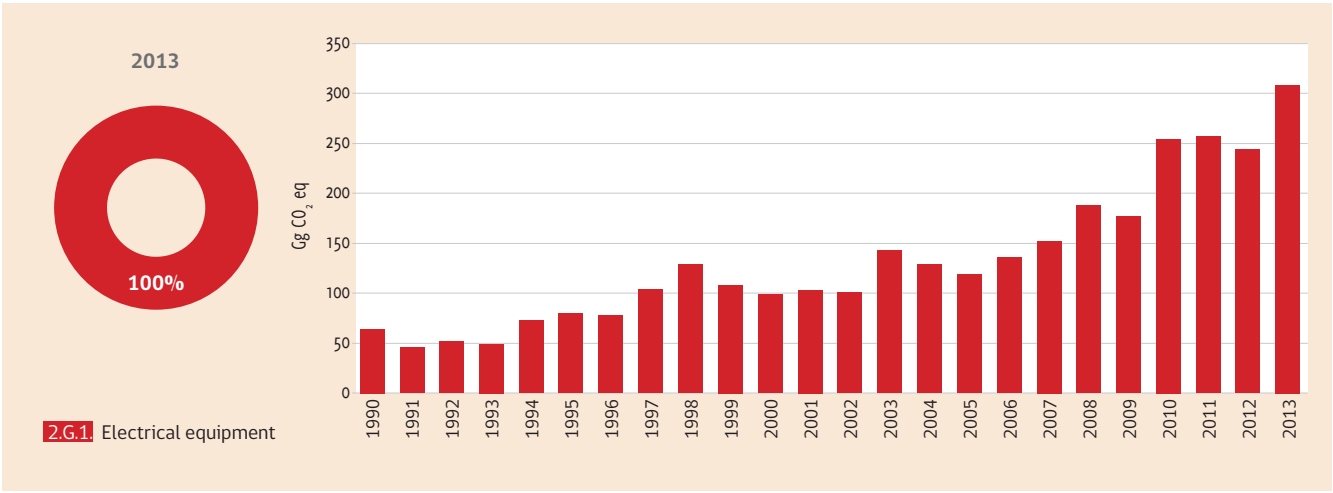
In 2013, GHG emissions of this category accounted for 308.7 Gg CO_2eq (4.7%), increasing 380.3% since 1990, and 21.4% since 2010 (Table 32). The emissions of this category correspond in their entirety to the emissions of the subcategory Electrical equipment (Figure 35).

Table 32. 2.G. Other product manufacture and use: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
2.G.1. Electrical equipment	64.3	98.6	254.4	256.7	244.3	308.7
Total	64.3	98.6	254.4	256.7	244.3	308.7

Source: IPPU Technical Team of MMA.

Figure 35. 2.G. Other product manufacture and use: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013



Source: IPPU Technical Team of MMA.

Archivo MMA.

5. Agriculture, Forestry and other Land use (3)

Chile's NGHGI Agriculture, forestry and other land use (AFOLU) sector includes GHG emissions associated with agricultural activities and CO_2 emissions and removals associated with forestry and land management, including the gain or loss of biomass resulting from the change in land uses.

The AFOLU sector is the only sector that consistently absorbs CO_2 in the country, making it the most relevant because of its mitigation potential. In 2013, GHG emissions of the sector accounted for -26,119.2 Gg CO_2eq, decreasing 15.4% since 1990 and 14.4% since 2010 (Table 33). In general terms, this is because the Land category decreased its removals, while the GHG emissions of the categories associated with the agricultural activity (Livestock and Aggregate sources and of non-CO_2 emissions sources on land) have remained stable during series 1990-2013.

Regarding GHG emissions and removals in absolute terms by category (Figure 36), 73.8% corresponds to Land, followed by 15.5% of aggregate sources and sources of non-CO_2 emissions from the land and, lastly, 10.6% corresponding to Livestock. Due to its weight on the balance, any increase or decrease in the emissions or removals of Land affects significantly the whole sector, and even the general balance of Chile's NGHGI. A good example is the significant reduction in the GHG balance (detriment of removals) in 1998 and 2002, which was a direct consequence of GHG emissions generated by forest fires in native forest and forest plantations. Towards the end of the period there is an increase in the GHG removal due to the expansion of biomass in

Karina Bahamonde

Table 33. AFOLU Sector: GHG emissions and removals (Gg CO_2eq) by category, series 1990-2013

Category	1990	2000	2010	2011	2012	2013
3.A. Livestock	5,744.6	6,161.3	5,382.8	5,291.3	5,616.9	5,818.9
3.B. Land	-43,921.6	-46,854.0	-44,132.3	-37,724.7	-32,654.9	-40,448.8
3.C. Aggregate sources and of non-CO_2 emissions sources on land	7,310.7	7,873.5	8,235.1	8,093.4	8,627.2	8,510.7
Balance	-30,866.3	-32,819.2	-30,514.4	-24,339.9	-18,410.7	-26,119.2

Source: AFOLU Technical Team of MINAGRI.

forest plantations and natural forests of second growth and to the reduction of the area affected by forest fires. On the other hand, the categories associated with agricultural activity have remained stable over time.

In 2013, the main GHG emissions and removals in absolute terms was CO_2, representing 74.3% of the sector. It is followed by N_2O with 15.2% and CH_4 with 10.5% (Table 34 and Figure 37).

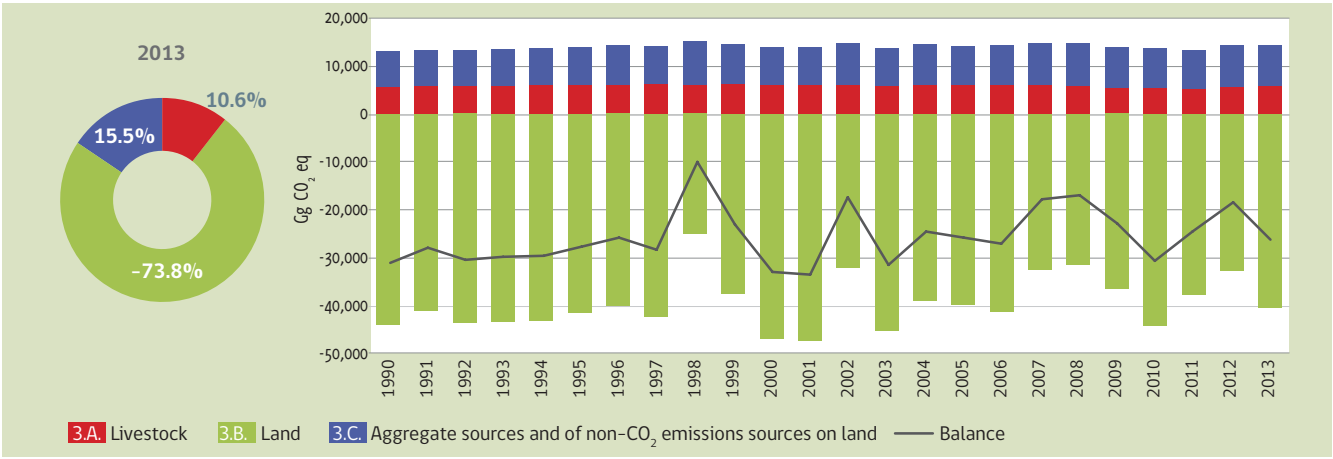
Lechera Consorcio Lechero

Table 34. AFOLU Sector: emissions and removals by type of GHG (Gg CO_2eq), series 1990-2013

GHG	1990	2000	2010	2011	2012	2013
CO_2	-43,730.2	-46,485.3	-43,638.3	-37,231.5	-32,156.6	-39,915.0
CH_4	5,949.5	6,107.0	5,331.2	5,188.3	5,657.9	5,632.4
N_2O	6,914.4	7,559.0	7,792.7	7,703.2	8,087.9	8,163.4
Balance	-30.866,3	-32.819,2	-30.514,4	-24.339,9	-18.410,7	-26.119,2

Source: AFOLU Technical Team of MINAGRI.

Figure 36. AFOLU Sector: GHG emissions and removals (Gg CO_2eq) by category, series 1990-2013



Source: AFOLU Technical Team of MINAGRI.

Figure 37. AFOLU Sector: emissions and removals by type of GHG (Gg CO_2eq), series 1990-2013

Source: AFOLU Technical Team of MINAGRI.

5.1. General methodological aspects of the sector

For the estimation of GHG emissions and removals in the AFOLU sector, Tier 1 and Tier 2 methods were applied. In Livestock category, Tier 2 method for CH_4 emissions from bovine livestock component of the subcategory Enteric fermentation using country-specific emission factors was applied; As well as for CH_4 emissions from the bovine livestock and swine component of the Manure management subcategory. In the particular case of the Land category, biomass gain and loss method was used for above ground biomass pools, underground biomass and necromass, which is based on estimating the annual change in carbon stocks. In addition, a Tier 2 method was applied for above ground biomass CO_2 and underground biomass for all components of the Forest land subcategory by the development of country-specific emission factors. For further information, the reader is encouraged to review the Chilean National Greenhouse Gas Inventory Report, series 1990-2013.

5.2. Livestock (3.A.)

This category includes the GHG emissions generated by animal production systems, in particular enteric fermentation produced in digestive systems of animals and systems and mechanisms for the storage and disposal of manure.

In 2013, GHG emissions of this category accounted for 5,818.9 Gg CO_2eq (10.6%), increasing 1.3% since 1990, and 8.1% since 2010 (Table 35). In general, the main causes of the trend of the category are the changes experienced by the animal population in the country.

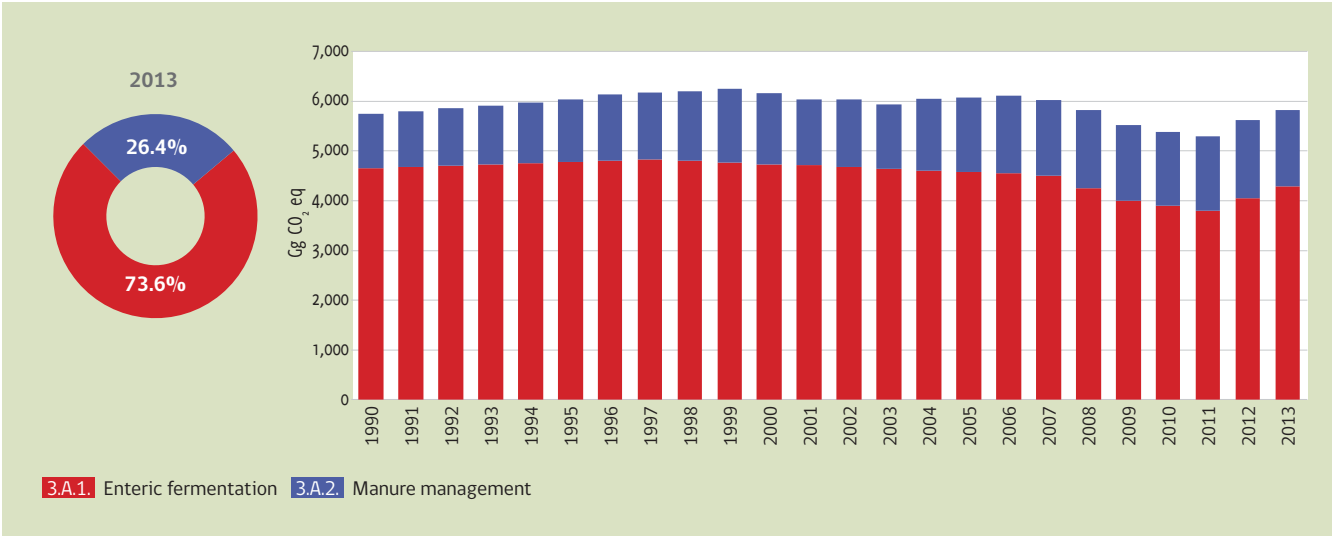
Regarding subcategories (Figure 38), Enteric fermentation is the most relevant with 73.6%, decreasing by 8.0% since 1990, but increasing again by 9.8% since 2010. Manure management contributes the remaining 26.4% of the category. The latter showed an increase of 41.1% since 1990 and 3.6% since 2010, mainly influenced by the growth of the swine and poultry population.

Table 35. 3.A. Livestock: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
3.A.1. Enteric fermentation	4,655.8	4,727.2	3,900.6	3,802.4	4,048.0	4,283.0
3.A.2. Manure management	1,088.8	1,434.0	1,482.2	1,488.9	1,568.8	1,536.0
Total	5,744.6	6,161.3	5,382.8	5,291.3	5,616.9	5,818.9

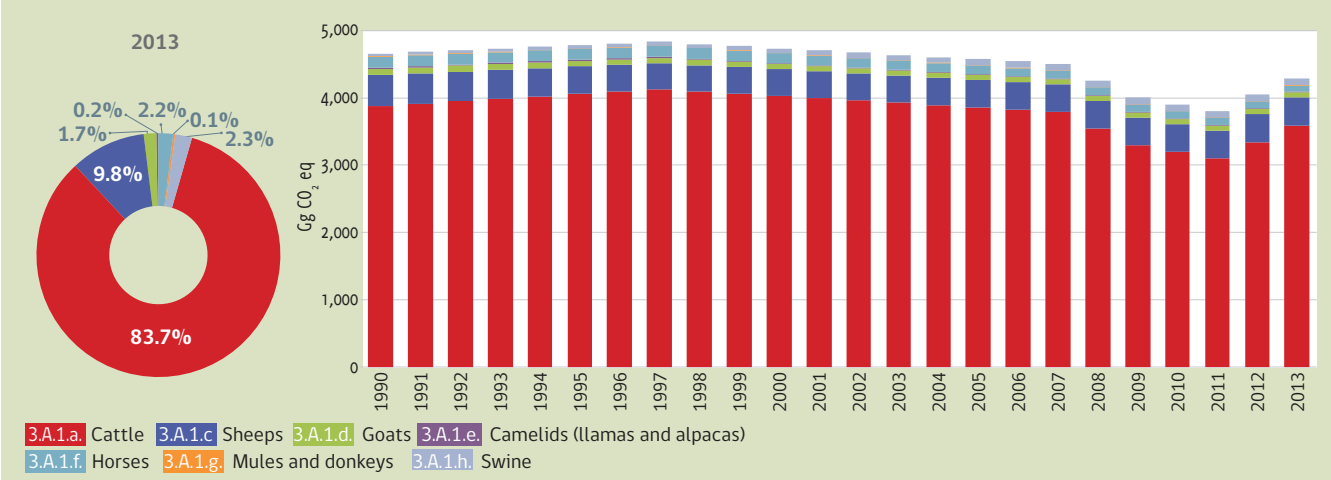
Source: AFOLU Technical Team of MINAGRI.

Figure 38. 3.A. Livestock: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013



Source: AFOLU Technical Team of MINAGRI

Figure 39. 3.A.1. Enteric fermentation: GHG emissions (Gg CO_2eq) by component, series 1990-2013



Source: AFOLU Technical Team of MINAGRI.

In spite of the relevance of the subcategory Enteric fermentation in the GHG emissions of the category, these have remained stable over time. At the component level, Cattle accounted for the majority of emissions, accounting for 83.7% of the subcategory, followed by Sheep with 9.8%, Swine with 2.3%, Horses with 2.2%, and other animals with 2.0% (Figure 39).

In the period 1990-2013, the largest fluctuation in emissions was associated to the bovine livestock specie, with a decrease that began in 2007 and entered recovery phase from 2011. The fluctuation was due to a severe drought that affected the south of the country, the main concentration zone of these animals, due to the incidence of La Niña phenomenon, associated to significant increases in the cost of fertilizers, meaning a significant reduction in forage production. As a result, animals had to be slaughtered, which implied a reduction in the populations and thus the GHG emissions of this subcategory. Subsequently, a recovery of the population and therefore of their emissions is evidenced. Population of other animal species has remained stable over time, and consequently their emissions.

5.3. Land (3.B.)

This category includes the CO_2 emissions and removals generated because of the use, management and change of land uses.

In 2013, GHG balance posted a removal of -40,448.8 Gg of CO_2eq (73.8%) Throughout the time series, the balance is favorable to removal, although it has declined by 7.9% since 1990 and by 8.3% since 2010 (Table 36). The main causes of the trend in the category are activities within Forest land, such as increased forest biomass and forest fires.

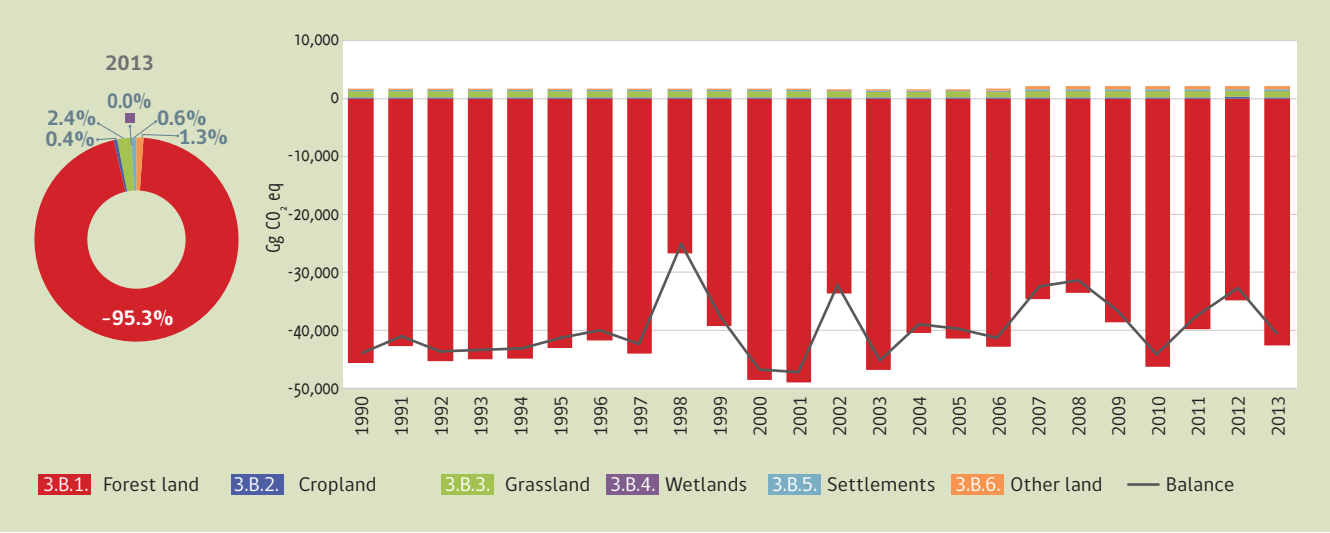
Regarding GHG emissions and removals in absolute terms by subcategory (Figure 40), 95.3% corresponds to Forest land, followed by 2.4% of Grassland, 1.3% of other lands and, lastly, 1.1% corresponding to other uses (Settlements, Cropland and Wetlands). Forest land is the only land uses that in its GHG balance presents the sinking condition, while the other uses of the land are net GHG emitters.

Table 36. 3.B. Land: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
3.B.1. Forest land	-45,598.5	-48,520.4	-46,234.6	-39,826.6	-34,807.9	-42,548.9
3.B.2. Cropland	137.7	132.7	190.7	190.2	241.1	188.2
3.B.3. Grassland	1,147.0	1,141.8	1,066.7	1,066.7	1,066.7	1,066.7
3.B.4. Wetlands	0.4	0.4	12.5	12.5	12.5	12.5
3.B.5. Settlements	218.3	218.2	268.8	269.0	269.1	269.2
3.B.6. Other land	173.5	173.2	563.6	563.6	563.7	563.6
Balance	-43,921.6	-46,854.0	-44,132.3	-37,724.7	-32,654.9	-40,448.8

Source: AFOLU Technical Team of MINAGRI.

Figure 40. 3.B. Land: GHG emissions and removals (Gg CO_2eq) by subcategory, series 1990-2013



Source: AFOLU Technical Team of MINAGRI.

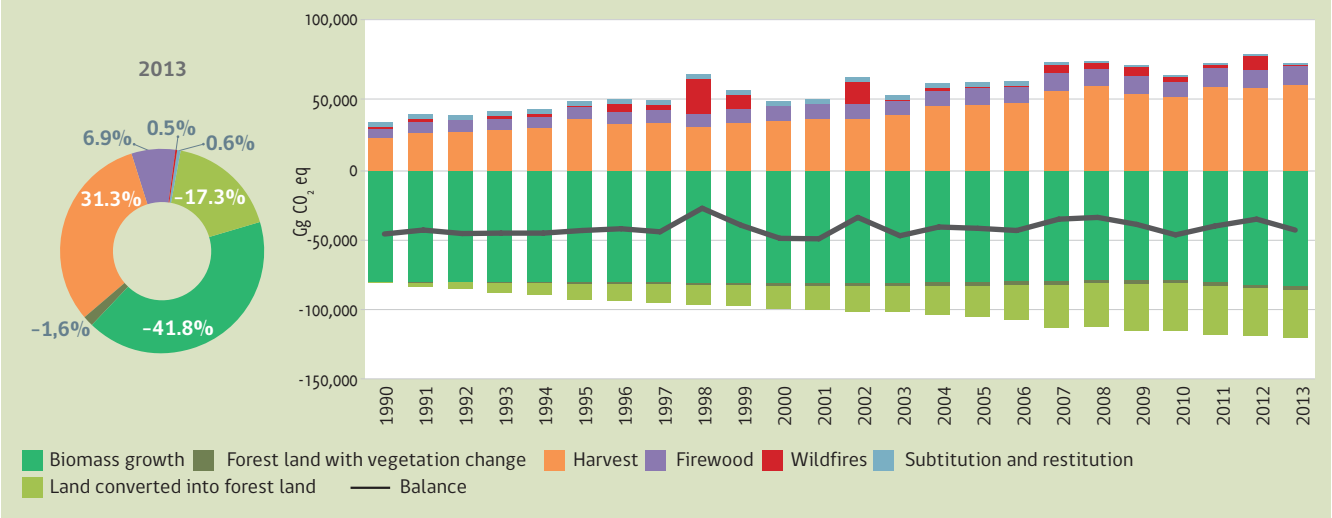
In 2013, GHG balance subcategory Forest land accounted for -42,548.9 Gg CO_2eq, decreasing its sinking condition by 6.7% since 1990 and 8.0% since 2010.

Regarding GHG emissions and removals in absolute terms by component (Figure 41), the increase of biomass is the most important with 41.8%, followed by 31.3% of Harvest, 17.3% of Land converted into Forest lands, 6.9% of Firewood (consumption), 1.6% Forest lands with change of vegetation, 0.6% from Substitution and Restitution, and 0.5% from Fire.

Regarding sinks, it can be seen that the removal by the biomass increase is stable over time, while the removal of the land converted to Forest land presents a significant increase due to the accumulation of biomass by Land of another use in transition to Forest land, which is generated by an increase in forest area in the country.

Regarding sources, GHG emissions from Harvest show an increase of 162.0% from 1990 to 2013. It highlights a deceleration of emissions in 2009 attributable to the international economic crisis. On the other hand, the influence of GHG emissions generated by Fires (in forest plantations and native forest) is clearly observed, especially in 1998 and 2002, in which this component alters the overall trend of the GHG balance, both at sector and national level. Other sources of GHG remain stable during the time series.

Figure 41. 3.B.1. Forest land: GHG emissions and removals (Gg CO_2eq) by component, series 1990-2013



Source: AFOLU Technical Team of MINAGRI.

5.4. Aggregate sources and of non-CO_2 emissions sources on land (3.C.)

This category includes GHG emissions generated by forestry and agriculture activities such as non-CO_2 emissions from biomass burning, CO_2 from liming of soils and application of urea, direct and indirect N_2O emissions from nitrogen application to soils and manure management, and CH_4 from rice cultivation.

In 2013, GHG emissions of this category accounted for 8,510.7 Gg CO_2eq (15.5%), increasing 16.4% since 1990, and 3.3% since 2010 (Table 37). In general, this increase is mainly due to the application of nitrogen as a soil fertilizer.

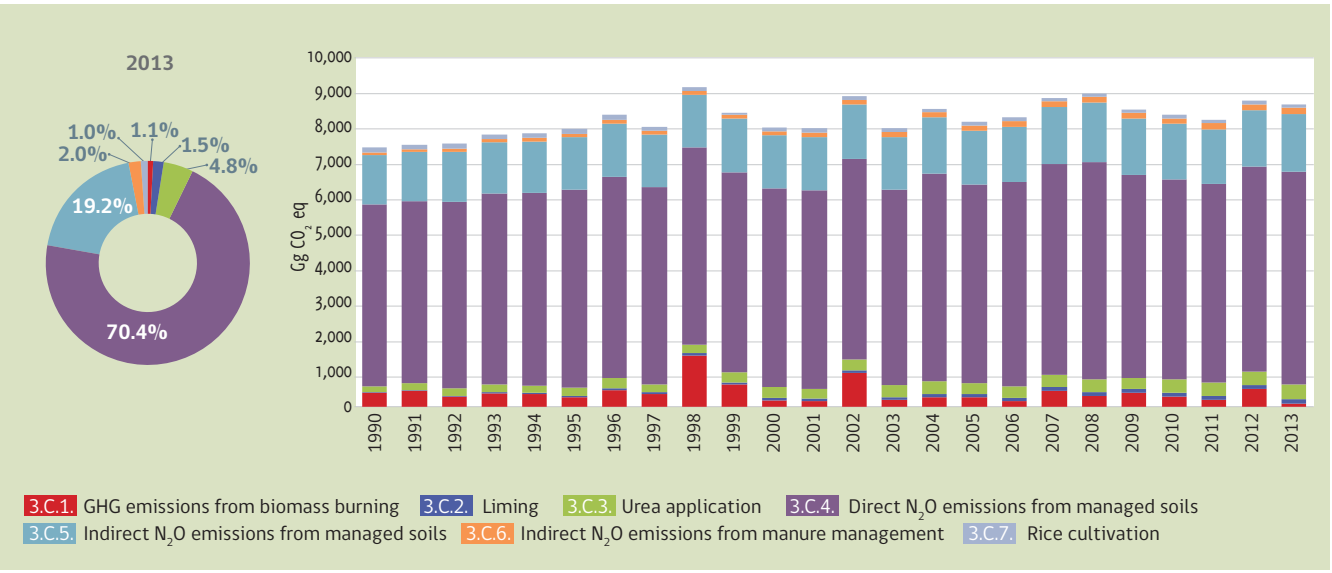
Regarding subcategories (Figure 42), 70.4% of the emissions correspond to Direct N_2O emissions from managed soils. Followed by Indirect N_2O emissions from managed soils with 19.2%, 4.8% of Urea application, 2.0% of Indirect N_2O emissions from manure management, 1.5% from Liming, 1.1% of GHG emissions from biomass burning and, lastly, 1.0% of Rice cultivation. Once again, it is observed the importance of forest fires and biomass burning in GHG emissions time series (as in the Land category). In addition, it is observed that although the subcategory Liming is not the most relevant, it has had a significant increase of 636.3% since 1990.

Table 37. 3.C. Aggregate sources and of non-CO_2 emissions sources on land: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
3.C.1. GHG emissions from biomass burning	389.8	183.2	287.9	191.8	495.8	93.0
3.C.2. Liming	17.5	63.6	114.3	119.2	124.0	128.8
3.C.3. Urea application	173.9	305.1	379.7	374.1	374.3	404.9
3.C.4. Direct N_2O emissions from managed soils	5,125.9	5,600.0	5,631.1	5,589.5	5,773.4	5,989.4
3.C.5. Indirect N_2O emissions from managed soils	1,380.2	1,498.8	1,556.1	1,548.6	1,588.2	1,635.3
3.C.6. Indirect N_2O emissions from manure management	85.5	113.7	162.2	163.9	170.1	170.3
3.C.7. Rice cultivation	137.9	109.0	103.8	106.3	101.5	88.9
Total	7,310.7	7,873.5	8,235.1	8,093.4	8,627.2	8,510.7

Source: AFOLU Technical Team of MINAGRI.

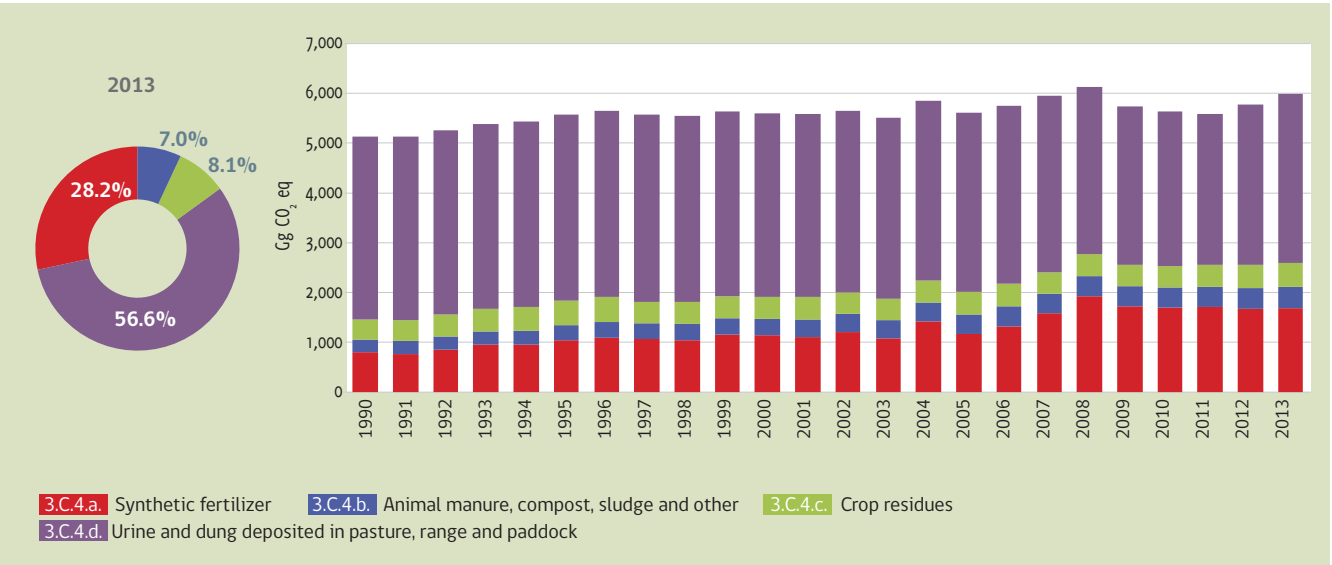
Figure 42. 3.C. Aggregate sources and of non-CO_2 emissions sources on land: GHG emissions trend (Gg CO_2eq) by subcategory, series 1990-2013



Source: AFOLU Technical Team of MINAGRI.

By analyzing in detail the subcategory Direct N_2O emissions from managed soils (Figure 43), their emissions have increased by 16.8% since 1990 and by 6.4% since 2010. Regarding the components, the main source of GHG emissions is Urine and dung deposited in pasture, range and paddock with a participation of 56.6% in 2013, followed by 28.2% of synthetic fertilizer, 8.1% of Crop residues and 7.0% of animal manure, compost, sludge and others. It is observed that the component Synthetic Fertilizers presents an important increase of 111.5% since 1990, which shows that is increasingly being used to increase agricultural production.

Figure 43. 3.C.4. Direct N_2O emissions from managed soils: GHG emissions (Gg CO_2eq) by component, series 1990-2013



Source: AFOLU Technical Team of MINAGRI.

6. Waste Sector (4)

Chile's NGHGI Waste sector includes GHG emissions resulting from microbiological processes occurring in organic matter under anaerobic degradation, mainly from solid waste disposal sites, managed or unmanaged; the emission of N_2O by the anaerobic decomposition of human excreta; and the anaerobic treatment of domestic and industrial wastewater in liquid and solid phase (sludge).

Waste sector represented 4.1% of total GHG emissions (excluding FOLU) in 2013. The same year, GHG emissions of the sector accounted for 4,478.8 Gg CO_2eq, increasing 77.3% since 1990 and 17.8% since 2010 (Table 38). The main cause is the sustained increase in the generation of solid waste and its final disposal in landfills.

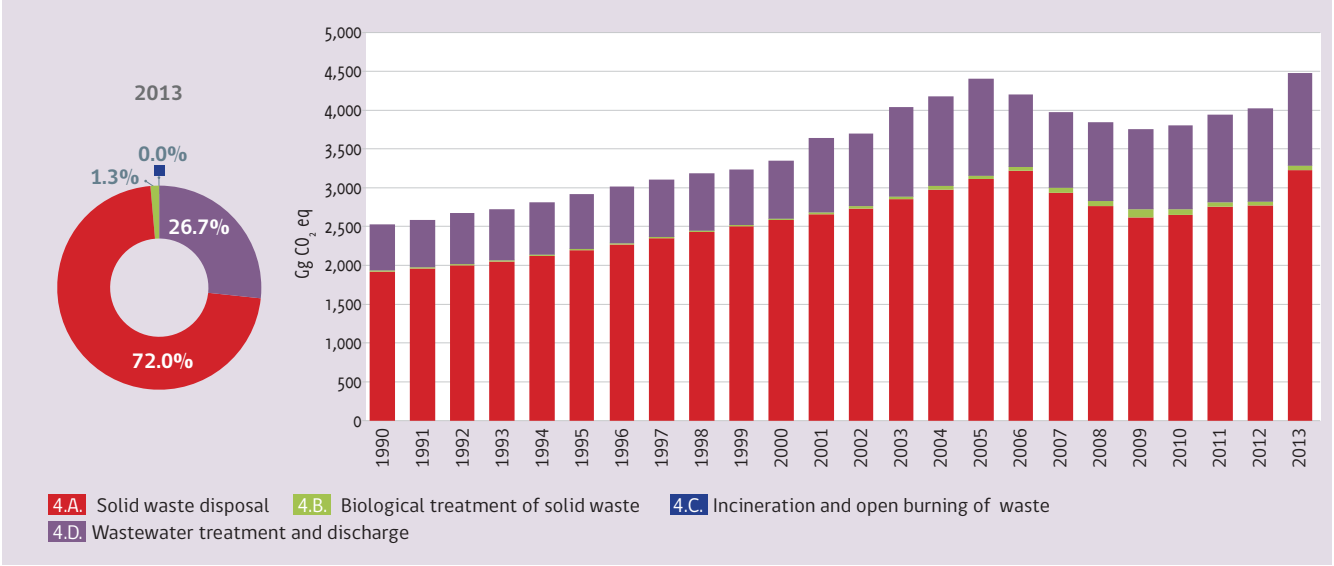
Regarding categories (Figure 44), 72.0% of GHG emissions in the sector correspond to the Solid waste disposal category, followed by 26.7% Wastewater treatment and discharge, 1.3% Biological Treatment of solid waste and, lastly, 0.01% of Incineration and open burning of waste. The main causes of the increase of the GHG emissions of the sector are the increase of the population and the generation of solid and liquid residues. The decrease in GHG emissions observed since 2007 is mainly due to the recovery of CH_4 in the Solid Waste Disposal Sites (SWDS) during the last years of the series, a situation that changes in 2013 due to the decrease in the price of Certified Emissions Reductions (CER) from Clean Development Mechanism (CDM) projects, which are an important incentive to this type of practice, so the process has become less profitable for some SWDS, reaching a lower recovery quantity, or simply abandoning this practice, even though in the future they may reintegrate.

Table 38. Waste Sector: GHG emissions (Gg CO_2eq) by category, series 1990-2013

Category	1990	2000	2010	2011	2012	2013
4.A. Solid waste disposal	1,922.5	2,580.8	2,647.1	2,757.0	2,773.9	3,225.5
4.B. Biological treatment of solid waste	15.9	19.0	73.0	52.2	44.4	57.0
4.C. Incineration and open burning of waste	0.0	0.1	0.3	0.3	0.3	0.3
4.D. Wastewater treatment and discharge	587.7	748.4	1,082.2	1,130.3	1,200.5	1,195.9
Total	2,526.1	3,348.3	3,802.6	3,939.8	4,019.2	4,478.8

Source: Waste Technical Team of MMA.

Figure 44. Waste Sector: GHG emissions (Gg CO_2eq) by category, series 1990-2013



Source: Waste Technical Team of MMA.

In 2013, the main GHG emitted by the sector wasCH_4, representing 91.9% of the sector's GHG emissions. It is followed by N_2O with 8.1% and CO_2 with less than 0.01% (Table 39 and Figure 45).

Table 39. Waste Sector: emissions by type of GHG (Gg CO_2eq), series 1990-2013

GHG	1990	2000	2010	2011	2012	2013
CO_2	NO	0.1	0.3	0.3	0.3	0.3
CH_4	2,329.4	3,102.6	3,450.5	3,589.2	3,668.9	4,117.6
N_2O	196.7	245.6	351.9	350.3	350.0	360.9
Total	2,526.1	3,348.3	3,802.6	3,939.8	4,019.2	4,478.8

NO = Not occurring
Source: Waste Technical Team of MMA.

Figure 45. Waste Sector: emissions by type of GHG (Gg CO_2eq), series 1990-2013

Source: Waste Technical Team of MMA.

6.1. General methodological aspects of the sector

For the estimation of GHG emissions in Waste sector, Tier 1 method was applied in all categories. It is important to highlight that the management of national activity data improved, especially for the statistics of the Solid waste disposal and Wastewater treatment and discharge categories. For further information, the reader is encouraged to review the Chilean National Greenhouse Gas Inventory Report, series 1990-2013.

6.2. Solid waste disposal (4.A.)

This category includes CH_4 emissions from the treatment and disposal of municipal, industrial, and other municipal solid waste, which are disposed in SWDS.

Solid waste disposal category is the main GHG emitting category of the Waste sector (72.0%). In 2013, GHG emissions of this category accounted for 3,225.5 Gg CO_2eq, increasing 67.8% since 1990, and 21.9% since 2010 (Table 40).

Table 40. 4.A. Solid waste disposal: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
4.A.1. Managed waste disposal sites	0.4	929.3	1,921.5	2,068.5	2,088.5	2,291.1
4.A.2. Unmanaged waste disposal sites	426.2	292.3	192.7	134.4	124.0	230.9
4.A.3. Uncategorized waste disposal sites	1,495.9	1,359.2	533.0	554.1	561.4	703.6
Total	1,922.5	2,580.8	2,647.1	2,757.0	2,773.9	3,225.5

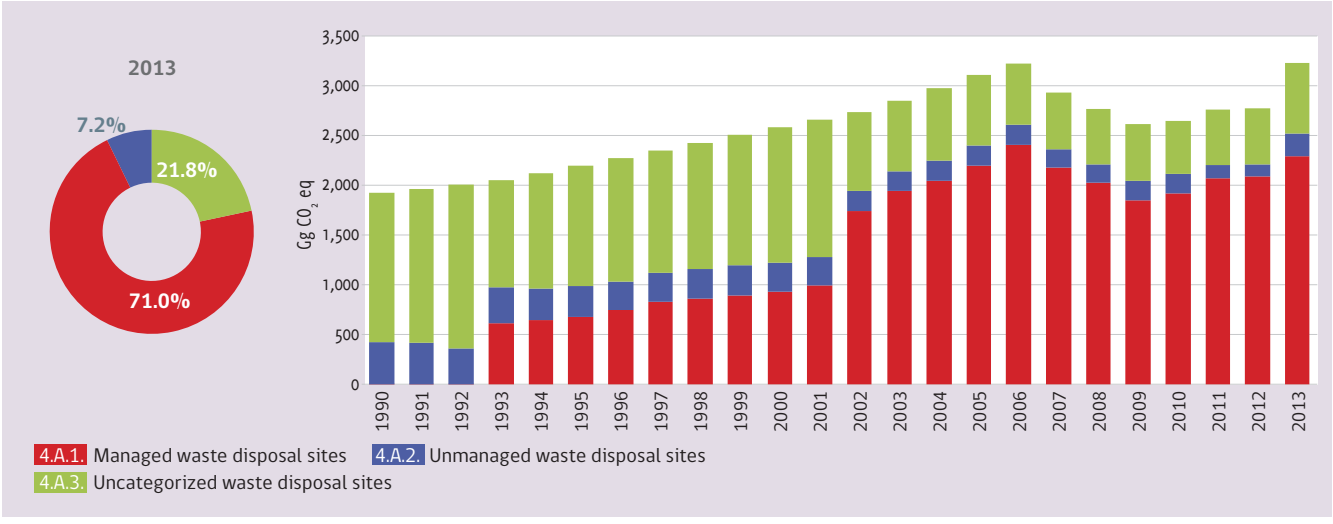
Source: Waste Technical Team of MMA.

Regarding subcategories (Figure 46), *managed disposal sites (sanitary landfills) is the most relevant with 71.0%, followed by 21.8% of unclassified waste disposal sites (landfills) and a 7.2% of unmanaged waste disposal sites (dumps).* It is observed that from 2006 onwards there is a reduction in the trend that is due to the recovery of CH4 in some sanitary landfills of the country, however, the total of CH_4 that is captured in Chile has decreased during the last years although the regulation recommends it (DS 189). This is explained by the decline in CER prices from CDM projects. As a result, between 2010 and 2013, GHG emissions increased compared to the reduction that had been steadily increasing since 2006.

6.3. Biological treatment of solid waste (4.B.)

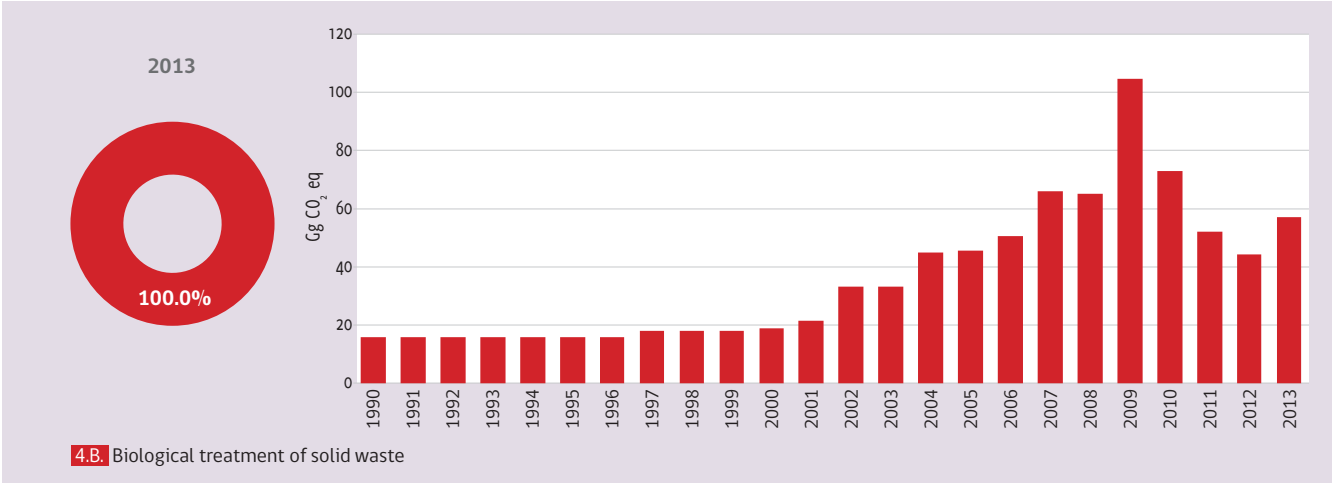
This category includes GHG processes that affect the amount and composition of waste, such as the manufacture of compost and the anaerobic digestion of organic waste. These processes allow

Figure 46. 4.A. Solid waste disposal: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013



Source: Waste Technical Team of MMA.

Figure 47. 4.B. Biological treatment of solid waste: GHG emissions (Gg CO_2eq), series 1990-2013



Source: Waste Technical Team of MMA.

Table 41. 4.B. Biological treatment of solid waste: GHG emissions (Gg CO_2eq), series 1990-2013

Category	1990	2000	2010	2011	2012	2013
4.B. Biological treatment of solid waste	15.9	19.0	73.0	52.2	44.4	57.0
Total	15.9	19.0	73.0	52.2	44.4	57.0

Source: Waste Technical Team of MMA.

volume reduction, residue stabilization, and destruction of existing pathogens. In addition, in the case of digestion, they allow the production of biogas for energy use. In the case of composting, the final product can be used as fertilizer and fertilizer in soils, or eliminated in SWDS.

In 2013, GHG emissions of this category accounted for 57.0 Gg CO_2eq (1.3%), increasing 258.1% since 1990, and decreasing 21.9% since 2010 (Table 41).

The main cause of the increase in GHG emissions in this category are new composting projects throughout the country. Interannual variations observed in Figure 47 are mainly due to the incorporation and closure of composting plants, according to the Environmental Qualification Resolutions (RCA).

6.4. Incineration and open burning of waste (4.C.)

This category includes GHG emissions resulting from the combustion of solid and liquid wastes without energy recovery, while open burning of waste points to the combustion of mainly unwanted materials, so that smoke and other emissions are released directly to the air or through incineration devices that do not control the combustion air.

According to national regulations, open incineration of waste is an illegal practice in Chile, so there are no records on incinerated quantities, which are left out of the inventory. However, the disposal of hospital waste by burning is authorized. Another of the activities considered within this subcategory corresponds to the cremation of corpses and human remains.

In 2013, GHG emissions of this category accounted for 0.3 Gg CO_2eq (0.01%), increasing 19,319.5% since 1990, and 26.8% since 2010 (Table 42).

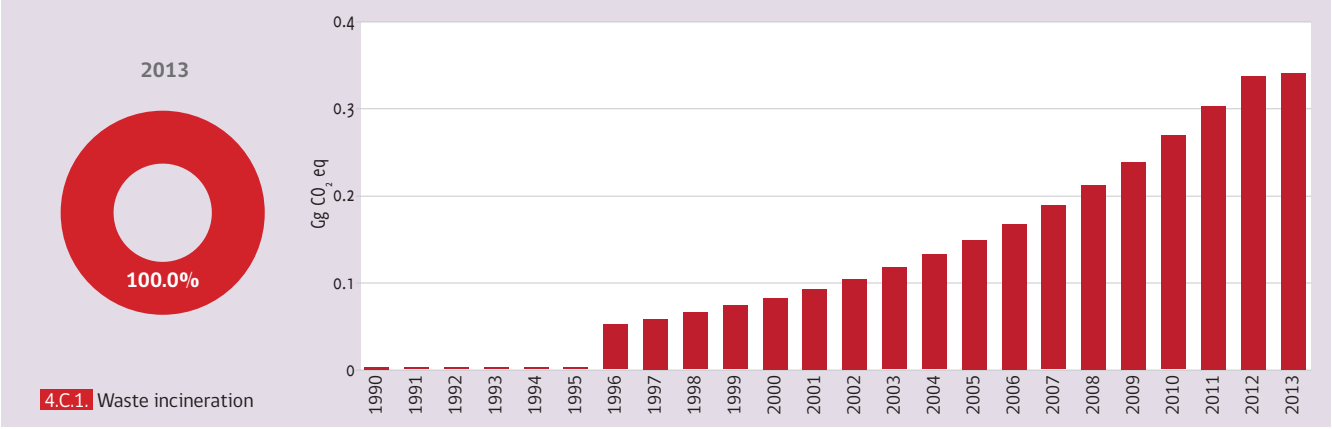
The main cause of the increase in GHG emissions in this category is the incorporation of new crematoria and the entry of new hospital waste activity data from 1996 (Figure 48).

Table 42. 4.C. Incineration and open burning of waste: GHG emissions (Gg CO_2eq), series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
4.C.1. Waste incineration	0.002	0.083	0.270	0.304	0.339	0.342
Total	0.002	0.083	0.270	0.304	0.339	0.342

Source: Waste Technical Team of MMA.

Figure 48. 4.C. Incineration and open burning of waste: GHG emissions trend (Gg CO_2eq), series 1990-2013



Source: Waste Technical Team of MMA.

6.5. Wastewater treatment and discharge (4.D.)

This category includes GHG emissions from the treatment or disposal of wastewater in an anaerobic environment, such as domestic, commercial and industrial wastewater, which can be treated in situ (not harvested), transferred by sewer to a central facility (collected), or disposed of without treatment in the vicinity or by means of drains.

In 2013, GHG emissions of this category accounted for 1,195.9 Gg CO_2eq (26.7%), increasing 103.5% since 1990, and 10.5% since 2010 (Table 43).

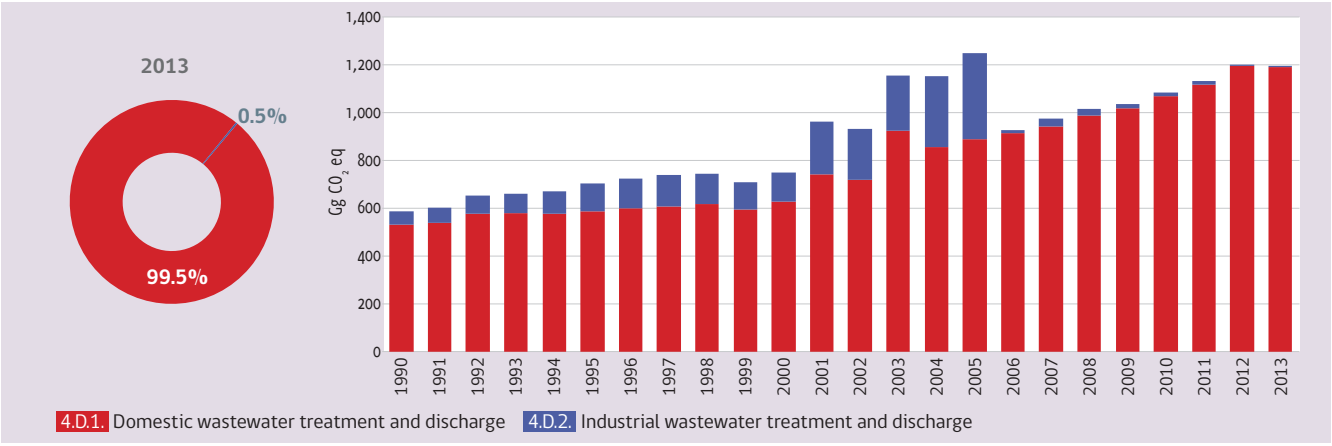
Regarding the subcategories (Figure 49), the Domestic wastewater treatment and discharge is the almost unique emitter, with a 99.5% of participation, while the Industrial wastewater treatment and discharge reaches only 0.5%. It is observed that between 2001 and 2005 there is a great increase in the trend, which is mainly due to the increase of treated industrial wastewater. The subsequent decrease is explained by the change in the type of treatment applied to industrial wastewater.

Table 43. Wastewater treatment and discharge: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013

Subcategory	1990	2000	2010	2011	2012	2013
4.D.1. Domestic wastewater treatment and discharge	531.1	626.6	1,068.3	1,117.2	1,194.3	1,189.7
4.D.2. Industrial wastewater treatment and discharge	56.6	121.8	13.9	13.1	6.2	6.2
Total	587.7	748.4	1,082.2	1,130.3	1,200.5	1,195.9

Source: Waste Technical Team of MMA.

Figure 49. 4.D. Wastewater treatment and discharge: GHG emissions (Gg CO_2eq) by subcategory, series 1990-2013



Source: Waste Technical Team of MMA.

7. Memo Items

In accordance with the requirements of the UNFCCC and the 2006 IPCC Guidelines, GHG emissions from fossil fuel consumption for international air and sea transport and CO_2 emissions from biomass burned for energy purposes have been quantified and reported as memo Items, but were not included in the country's GHG emissions and removals balance.

7.1. Fuels of international air and maritime transportation

In 2013, GHG emissions from International aviation accounted for 1,711.9 Gg CO_2eq, increasing by 407.1% since 1990, and 27.0% since 2010 (Table 44). This growth is directly due to increased fuel use due to a larger number of passengers transported per year, according to World Bank data.

GHG emissions from International navigation accounted for 1,234.3 Gg CO_2eq, increasing by 107.4% since 1990 and decreasing by 46.8% compared to 2010. A downward trend has been observed since 2008, due to the decline in international trade due to the economic crisis of this period.

7.2. Biomass CO_2 emissions

In 2013, CO_2 emissions from biomass burned for energy purposes accounted for 43,876.5 Gg CO_2eq, increasing 265.6% since 1990, and 101.7% since 2010 (Table 45). The main cause of the increase in fuelwood consumption is the sustained expansion of demand in the residential sector, coupled with a change in the methodology for gathering activity data from 2012 on the BNE.

Table 44. Fuel of international transportation GHG emissions (Gg CO_2eq) of international aviation and navigation, series 1990-2013

Transportation	1990	2000	2010	2011	2012	2013
International aviation	337.6	1,055.7	1,348.0	1,450.4	1,713.9	1,711.9
International navigation	595.2	2,055.9	2,318.5	2,290.5	1,398.2	1,234.3
Total	932.8	3,111.5	3,666.5	3,740.9	3,112.1	2,946.2

Source: Energy Technical Team of MINENERGIA.

Table 45. Biomass CO_2 (Gg) emissions, series 1990-2013

Memo Items	1990	2000	2010	2011	2012	2013
Biomass CO_2 emissions	12,001.1	18,952.6	21,752.6	24,262.2	39,548.6	43,876.5
Total	12,001.1	18,952.6	21,752.6	24,262.2	39,548.6	43,876.5

Source: Energy Technical Team of MINENERGIA.

8. Recalculations

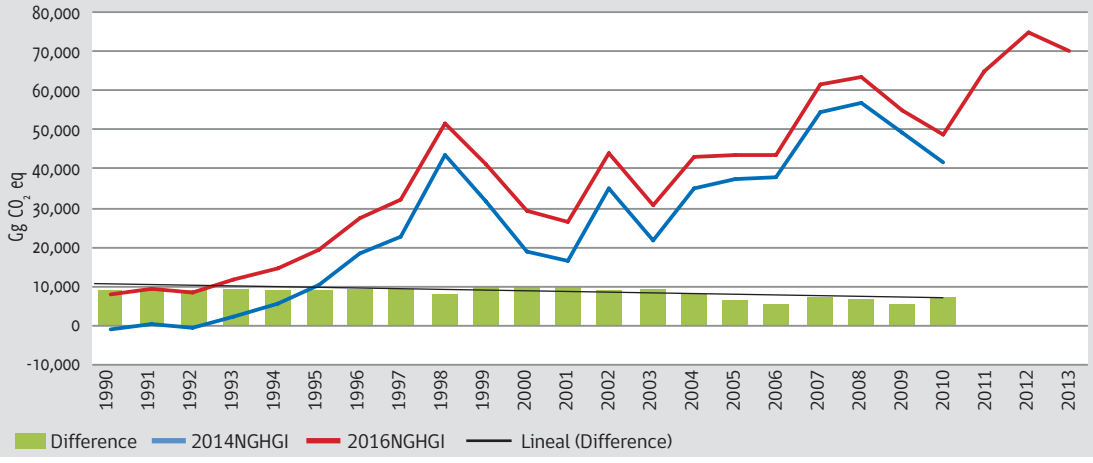
Methodological changes and refinement of activity data are an essential part of improving NGHGI quality; but when this occurs, it is necessary to recalculate the entire time series to ensure consistency. The new calculations and their implications for GHG emissions and removals of the country will then be justified.

Archivo CONAF

Both the current Chile's NGHGI (2016NGHGI, series 1990-2013) and the previous one (2014NGHGI, series 1990-2010), which was submitted by the country to the United Nations in December 2014 as part of its First Biennial Update Report, were developed according to the guidelines of the 2006 IPCC Guidelines. For the elaboration of the present Chile's NGHGI, in all the sectors, new sources of information have been used along with their respective refinement. In addition, new country-specific emission factors were developed in the IPPU and AFOLU sectors. This generated differences between previously reported GHG magnitudes.

In general, 2016NGHGIs GHG balance shows an average increase of 8,286.0 Gg CO_2eq compared to 2014NGHGI, which generated an increase of 16.8% for 2010, last comparable year (Figure 50). This is attributed in general to a

Figure 50. Recalculations: GHG balance comparison (Gg CO_2eq) of 2016NGHGI versus 2014NGHGI



Source: MMA Technical Coordinating Team.

decrease in the removal in the Land category of the AFOLU sector, in which a double accounting of removals was detected between managed native forest and native forest renewals. The other sectors of NGHGI in Chile do not show variations in their GHG magnitudes that have a notable influence on the general trend.

8.1. Energy sector recalculations

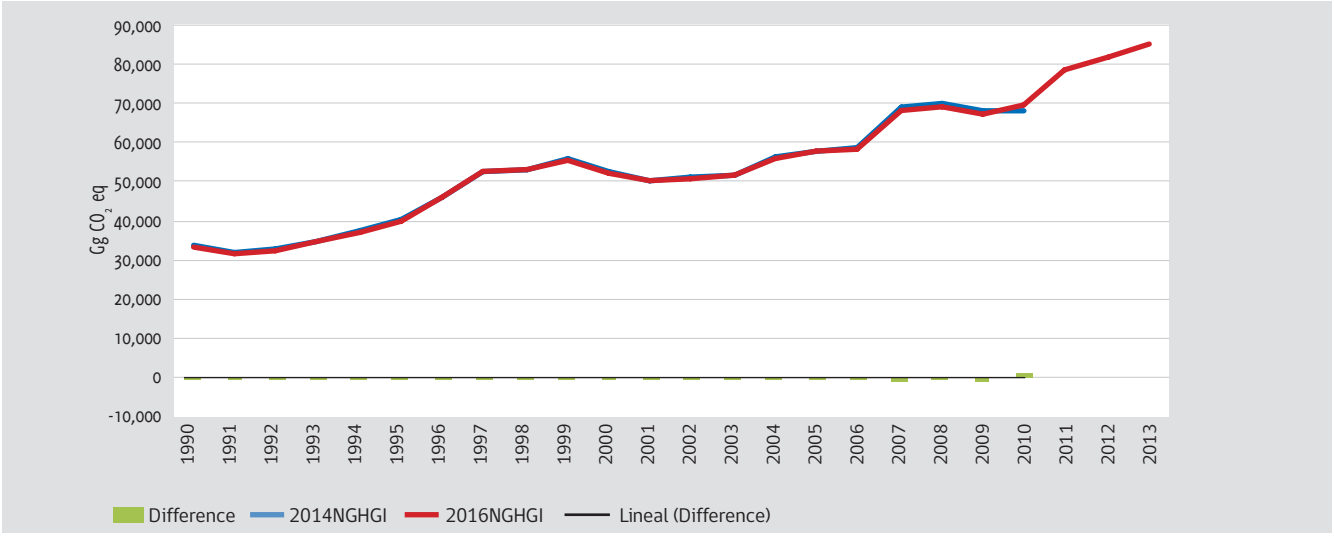
In the energy sector (Figure 51), GHG emissions from the sector in 2016NGHGI show an average decrease of 308.0 Gg CO_2eq (less than 1%) compared to 2014NGHGI. 2010, the last comparable year, is the only one with an increase in GHG emissions (1,013.7 Gg CO_2eq), which generated a 1.5% increase in the sector. The difference in the series is attributed to the fact that in this sector modifications were made in the treatment of the data of the subcategories Energy industries and their relation with the subcategory Manufacturing industries and construction, regarding to self-generation of energy from industries, with which GHG emissions were redistributed. In addition, Road transportation component was disaggregated and off-road transportation was included; For this, different emission factors were applied for non-CO_2 gases, which resulted in an increase in GHG emissions when compared to 2010.

Archivo MMA

8.2. IPPU sector recalculations

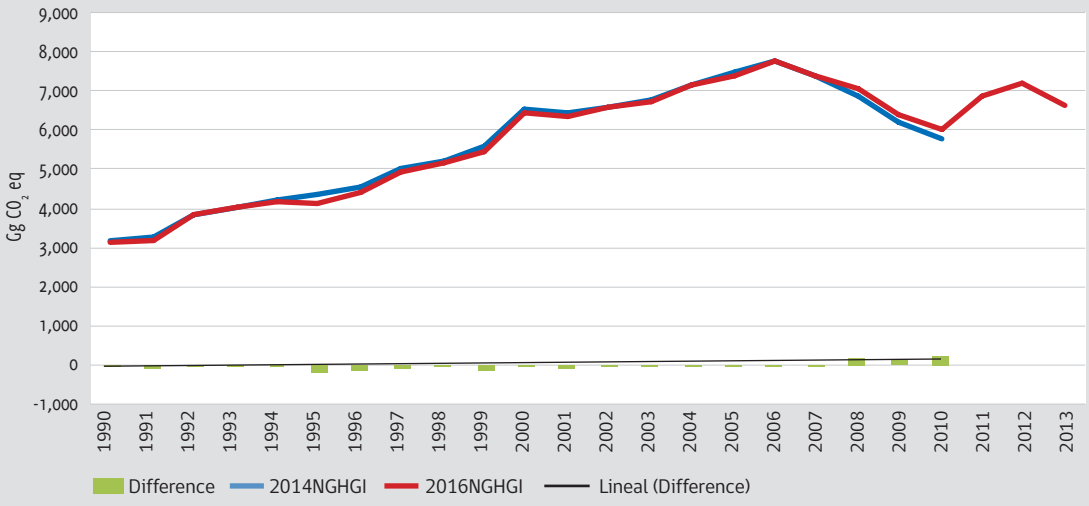
In the IPPU sector (Figure 52), GHG emissions from the sector in 2016NGHGI show an average decrease of 33.5 Gg CO_2eq (less than 1%) compared to 2014NGHGI. However, in 2010, the last comparable year, is the only one with an increase in GHG emissions (221.9 Gg CO_2eq), which generated a 3.8% increase in the sector. Although there are differences for each year of the series, they do not exceed 5%, so that the trend is maintained. The difference in the series is attributed to improvements in the methodologies for estimating emissions from the subcategories Cement production and Glass production, since SF_6 emissions were incorporated as a result of the installation, use and disposal of Electric equipment. In addition, GHG emissions from lead and zinc production were eliminated, since these metals are mined but not produced in the country.

Figure 51. **Recalculation: comparison of GHG emissions of Energy sector (Gg CO_2eq) from 2016NGHGI versus 2014NGHGI**



Source: MMA Technical Coordinating Team.

Figure 52. Recalculation: comparison of GHG emissions from IPPU sector (Gg CO_2eq) of 2016NGHGI versus 2014NGHGI

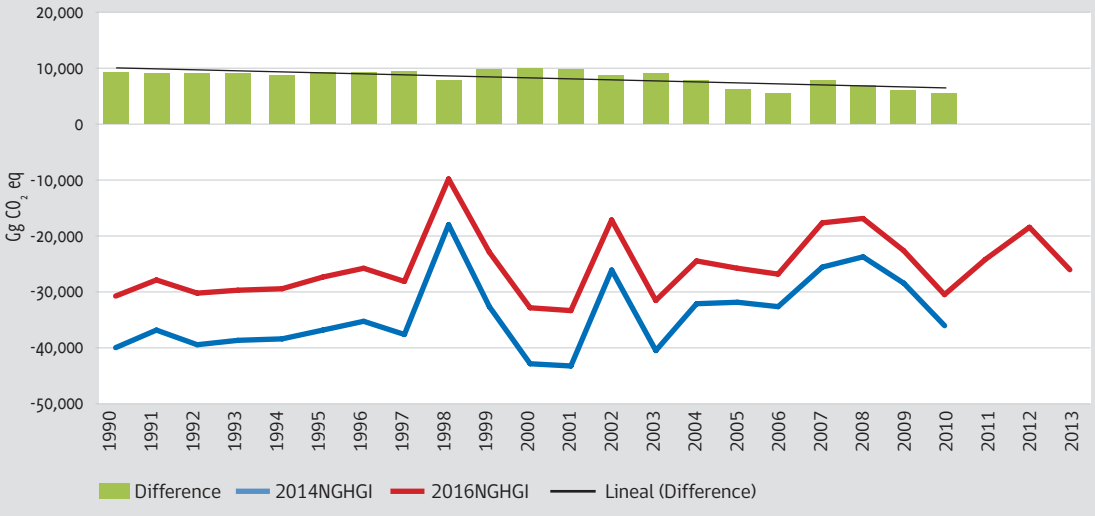


Source: MMA Technical Coordinating Team.

8.3. AFOLU sector recalculations

In AFOLU sector, 2016NGHGIs GHG balance shows an average increase of 8,336.9 Gg CO_2eq compared to 2014NGHGI, which generated an increase of 15.4% for 2010, last comparable year (Figure 53). The difference in the series is attributed to the fact that in the sector several improvements were made in the management of activity data and new country emission factors were developed. The most relevant modification is the decrease in the absorption from Land category, in which a double accounting of removals was detected between managed native forest and native forest renewals. In addition, there were changes in the carbon content of biomass and new estimates of the animal population, especially of livestock.

Figure 53. Recalculation: comparison of GHG emissions from AFOLU sector (Gg CO_2eq) of 2016NGHGI versus 2014NGHGI

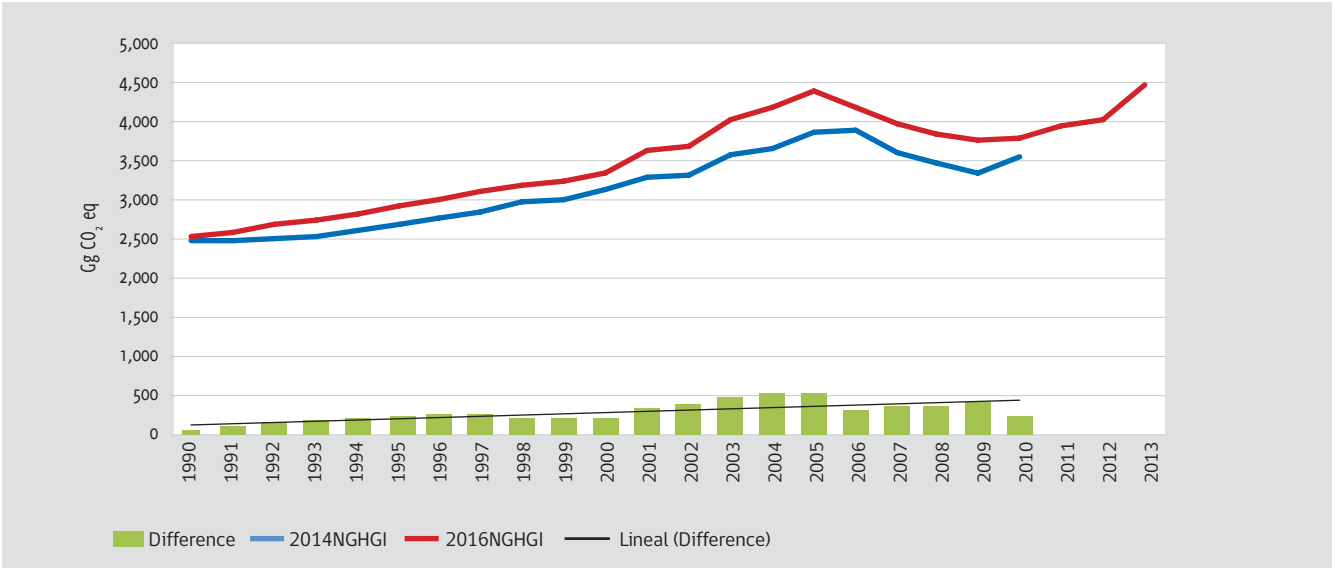


Source: MMA Technical Coordinating Team.

8.4. Waste sector recalculations

In Waste sector, 2016NGHGIs GHG balance shows an average increase of 290.6 Gg CO_2eq compared to 2014NGHGI, which generated an increase of 7.0% for 2010, last comparable year (Figure 54). The difference in the series is attributed to changes in the data handling of the subcategory Domestic wastewater treatment and disposal, specifically to an improvement in the calculation of the parameter that refers to the degree of use of the water treatment systems for each Income group, and also that changes were made in data collection from the subcategory waste incineration.

Figure 54. Recalculation: comparison of GHG emissions from Waste sector (Gg CO_2eq) of 2016NGHGI versus 2014NGHGI



Source: MMA Technical Coordinating Team.

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Cerro Santa Lucía, Claudio Badilla.

III

GHG Mitigation Policies and Actions

1. Introduction

Mitigation is a response to the phenomenon of climate change that results in the reduction of greenhouse gas (GH) emissions and/or the increase in their capture. According to the United Nations Framework Convention on Climate Change (UNFCCC), this capacity depends on socio-economic and environmental circumstances, as well as the availability of information and technology. Governments now have a wide range of policies and instruments to create incentives for mitigation, which is the main mechanism to meet the UNFCCC's objective of stabilizing GHG concentrations in the atmosphere (UNFCCC, 2015). The Convention calls on the signatory countries to take into account their responsibilities and capacities when formulating and implementing programs that contain measures intended to mitigate climate change. These actions can be transversal and cover all or just certain economic sectors.

According to the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), the increase in GHG emissions has accelerated despite reduction efforts, meaning that "without additional effort to reduce GHG emissions, beyond those currently implemented, emissions growth is expected to continue driven by tje increasing world population and economic activities." (IPCC, 2013)

Santiago después de la lluvia, MMA.

At the Summit for Sustainable Development, held in September 2015, the United Nations (UN) member states approved Agenda 2030 for Sustainable Development, which included 17 Sustainable Development Goals (SDG). Among these objectives, paragraph 13 specifically refers to the adoption of measures to fight climate change and its effects, the objective of which is not only to promote collective action by the different countries, but also to mobilize USD100,000 every year until 2020 to address the different needs of developing countries and to help mitigate the impacts of climate-related natural disasters[1].

In Chile, actions aimed at reducing GHG emissions have been developed by sectors. The Ministry of Environment, in its role as coordinator of the issues associated with climate change in the country, has collected information on the policies and initiatives that have been carried out in Chile to mitigate GHG and refers this variable as an indicator of the country's efforts to meet the objectives of the UNFCCC.

This chapter presents information on the mitigation policies and actions carried out in the country, in the sectoral or transversal context as appropriate, and analyzes how they are aligned with the international commitments that Chile has signed regarding this matter.

[1] *United Nations, "Goal 13: Take urgent action to combat climate change and its impacts". Extracted from http://www.un.org/sustainabledevelopment/es/climate-change-2/*

2. *International Context: The Paris Agreement*

In 2011, the Parties to the UNFCCC and the signatories of the Kyoto Protocol made a historic and transformational breakthrough: launching a platform to increase the ambition of the global response to climate change, the Durban Platform for Action for Strengthened Action (ADP)[2], intended to define a new protocol or other legal instrument that would be applicable to all Parties and would effectively achieve the ultimate goal of the UNFCCC and the overall goal of limiting the increase in the average temperature of the planet to no more than 2°C, a defined goal At COP15 in Copenhagen during 2009[3].

ADP represented a fundamental change from the previous framework defined by the UNFCCC and the Kyoto Protocol: now not only developed countries would have legal obligations to reduce their GHG emissions, but also all parties would be called upon to contribute and would have legal obligations of reduce their emissions. The new binding instrument to limit global GHG emissions was adopted at the 21st Conference of the Parties (COP21) in December 2015, in what is known as the Paris Agreement, and will enter into force in 2020.

Firma Prensa, Presidencia.

During 2014 and 2015, an Interministerial Technical Committee in Chile focused on preparing the Nationally Determined Contribution (NDC) document, for which it used information on options and mitigation scenarios raised during the MAPS-Chile process (www.mapschile.cl). As a result, a contribution was made on the basis of emissions according to Gross Domestic Product (GDP), in addition to a specific mitigation commitment by the forestry sector. The document was submitted to public consultation from December 2014 until April 2015, and the subsequent document was presented by President Michelle Bachelet at the United Nations General Assembly in September 2015.

Finally, the Paris Agreement for the first time involves all Parties

[2] *United Nations, "Developments of the Dedicated Working Group on the Durban Platform for Enhanced Action." Extracted from http://unfccc.int/portal_espanol/newsletter/items/6753.php.*
[3] *CMNUCC, "Copenhagen Climate Change Conference", December 2009. Extracted from http://unfccc.int/meetings/copenhagen_dec_2009/meeting/6295.php.*

in the common cause of fighting and adapting to climate change. Its main objective is to strengthen the global response to the threat of climate change, by proposing a limit of global temperature increase of less than 2 °C towards the end of the century (with respect to pre-industrial levels) and increase the effort to maintain it even below 1.5 °C. Regarding mitigation, it calls on all Parties to focus their best efforts on their respective national contributions, and states that countries should regularly report on their emissions and efforts to implement measures, and that every five year it is expected that they provide reports on their mitigation goals, which at every opportunity should increase in ambition.

Negociación, CEPAL.

3. Chile Facing Mitigation

The UNFCCC, in force since March 1994, is the international framework within which it is sought to stabilize GHG emissions to avoid negative and unmanageable consequences on the climate system. One of the guiding principles of this convention is "common but differentiated responsibilities and respective capacities", i.e. the need for all parties to address the problem but differentiating efforts for the developed countries have more responsibility on emission reduction, and support developing and less developed countries to grow sustainably. All parties must report through their national communication means their efforts to implement the convention.

In 2002, Chile ratified the Kyoto Protocol, which entered into force only in 2005. This instrument states that the countries included in Annex I of the UNFCCC must comply with a reduction percentage with respect to 1990. Since Chile belongs to the group of non-Annex I developing countries, it does not have binding commitments to reduce emissions under this protocol, but it can participate in the flexible mechanisms that it establishes, specifically in the Clean Development Mechanism (CDM).

Carretera Austral, Parque Eólico.

In the international context Chile is not a relevant emitter of GHG. Its contribution to global emissions is approximately 0.25%, and at the Latin American level, it contributes 4.9% of emissions, which is below Brazil, Mexico, Argentina and Venezuela[4].

The world average CO_2 emission per person is 4.5 tons. According to the calculations of the National Inventory of Greenhouse Gases, Chile slightly exceeds the above-mentioned figure, with 4.8tCO_2/pp, and is well below the average of the OECD countries, which is 9.6 tCO_2/pp (IEA, 2015).

[4] *Data taken from the International Energy Agency (IEA, 2015), which only considers emissions from fuel combustion and not all inventory sectors addressed by IPCC guidelines.*

3.1. Chile's voluntary commitment to the mitigation of its GHG emissions

With a view to reaching a new agreement on long-term cooperation between the Parties, in 2009 the UNFCCC COP15 Conference of the Parties was held in Copenhagen. In that instance, the Minister-President of the Chilean National Environment Commission (Conama) said that Chile was willing to contribute to global mitigation efforts through a significant deviation from the baseline (projected since 2007) to 20% by 2020, significantly financed with national resources.

During the first half of 2010, Conama led interministerial work through the Interministerial Technical Committee on Climate Change to agree on the information that Chile had to submit to the United Nations for inclusion in Annex II of the Copenhagen Agreement. That same year, the current President of the Republic, Sebastián Piñera, in his speech to the country on May 21, declared: "In terms of greenhouse gases, global warming and biodiversity, Chile committed itself and will comply with a 20% reduction by 2020."

The Interministerial Technical Committee on Climate Change and the Interministerial Committee on Climate Change approved the declaration of Chile at meetings held on July 27 and August 13, 2010. The voluntary commitment was officially communicated to the UNFCCC Secretariat through the Chilean national focal point, a role carried out by the Ministry of Foreign Affairs, on August 23, 2010[5].

The voluntary commitment states that "Chile will undertake actions in a nation-wide basis in order to achieve a deviation of 20% below its growing trend of business as usual emissions in 2020 projected since 2007" and that "in order to achieve this goal, Chile will require a relevant level of international support." In addition, it was conveyed "measures regarding energy efficiency, renewable energy and land use, land-use change and forestry initiatives will be the main focus of Chile's appropriate mitigation actions."

Claudio Badilla.

The 2020 Voluntary Commitment has led to the development of diverse mitigation activities in the country, such as Nationally Appropriate Mitigation Actions (NAMA), which are mainly focused in the reduction of GHG emissions. In addition, it has helped to identify sectoral actions that, despite not being focused on the reduction of GHG emissions, have also contributed to the decarbonization of public policies.

Despite the efforts in this area, it is still pending to quantify the reductions obtained with the implemented policies and to evaluate the fulfillment of the voluntary commitment, besides making a solid and permanent estimation of the impact on the emissions that new actions could have. It is expected to observe progress in these aspects during the coming years.

3.2. Chilean National Contribution (NDC)

Chile has announced its NDC in September 2015, which is divided into 5 pillars: i) Mitigation, ii) Adaptation, iii) Capacity Building and Strengthening, iv) Technology Development and Transfer, and v) Financing.

The mitigation pillar considers a commitment to quantified reduction of the GHG emission intensity indicator until 2030. This reduction is based on sec-

[5] *"Letter from Sub-secretary for Foreign Affairs to Christiana Figueres, Executive Secretary of the UNFCCC", August 23, 2010. Extracted from http://unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/chilecphaccord_app2.pdf.*

tor analysis and mitigation scenarios developed under the MAPS-Chile project (Stage 2); In the results of the National Greenhouse Gas Inventory (1990-2010); In additional information provided by the Ministries of Environment, Energy, Finance and Agriculture, and in the comments received in the process of public consultation of the National Contribution Tentative (MMA, 2015a).

All sectors quantified in the National Inventory of Greenhouse Gases (INGEI) are prioritized as indicated for mitigation actions in Chile:

- Energy, which includes generation and transmission, transportation, industry, mining, housing, among other sectors consuming fossil fuels
- Industrial processes
- Use of solvents and other products
- Agriculture, which includes the livestock sector
- Land use, land-use change and forestry (LULUCF)
- Waste

Chile has chosen to present its contribution through the emissions intensity format (tons of CO_2 equivalent per unit of GDP in millions of CLP $ 2011). Methodologically, it was preferred to separate the LULUCF sector from the national mitigation commitment because of the high annual variability of the captures and emissions by the sector, and because it was less dependent on the trajectory of economic growth.

In this sense, two types of goals were defined:

- A carbon intensity target, expressed in GHG emissions per unit of GDP, which includes all sectors quantified in the National Greenhouse Gas Inventory (1990-2010), except the LULUCF sector.
- A target expressed in tons of CO_2 equivalent from the LULUCF sector.

Chart 1. **Proposed National Contribution of Chile Regarding Mitigation Matters**

Carbon Intensity Target:

a) Chile is committed to reduce its CO_2 emissions per GDP unit by 30% below their 2007 levels by 2030, considering a future economic growth which allows to implement adequate measures to reach this commitment*.

b) In addition, and subject to the grant of international monetary funds**, the country is committed to reduce its CO_2 emissions per GDP unit by 2030 until it reaches a 35% to 45% reduction with respect to the 2007 levels, considering, in turn, a future economic growth which allows to implement adequate measures to achieve this commitment.

Specific contribution from the forestry sector:

a) Chile has committed to the sustainable development and recovery of 100,000 hectares of forest land, mainly native, which will account for greenhouse gas sequestrations and reductions of an annual equivalent of around 600,000 tons of CO_2 as of 2030. This commitment is subject to the approval of the Native Forest Recovery and Forestry Promotion Law.

b) Chile has agreed to reforest 100,000 hectares, mostly with native species, which shall represent sequestrations of about 900,000 and 1,200,000 annual equivalent tons of CO_2 as of 2030. This commitment is conditioned to the extension of Decree Law 701 and the approval of a new Forestry Promotion Law.

** This commitment assumes a growth rate for the economy similar to the growth path the country has expe-rienced in the last decade, except for the most critical years of the international financial crisis (2008-2009).*

*** This commitment assumes a growth rate for the economy similar to the growth path the country has experienced in the last decade, except for the most critical years of the international financial crisis (2008-2009). In addition, for the purposes of this commitment, an international monetary grant shall be deemed any grants which allow to implement actions having direct effects on greenhouse gas emissions within adequate time frames.*

Source: National Document Chile's proposed contribution (MMA, 2015a).

Desierto florido, Romina Chiappe.

It should be noted that the gases considered in the carbon intensity target, excluding the LULUCF sector, correspond to those of the National Inventory of Greenhouse Gases (1990-2010), i.e. carbon dioxide (CO_2), methane (CH_4), Nitrous oxide (N_2O), hydrofluorocarbon (HFC), perfluorocarbon (PFC).

The 2016-2020 period should lay the foundations and prepare the country to implement this commitment since 2020. Major efforts will be required in intersectoral coordination and institutional strengthening, both for action and for assessing and projecting progress towards achieving the goals.

3.3. Environmental Assessment on Chile 2016 by the OECD

In July 2016, the Organization for Economic Co-operation and Development (OECD) released the Second Environmental Performance Assessment (EPA) to Chile (the first assessment is dated on 2005). It provided 54 recommendations to move forward over the next ten years towards more sustainable economic development.

These recommendations focus on air, waste and water management; In governance, in environmental management and green growth; In addition, this evaluation developed two chapters in depth: climate change, and conservation and sustainable use of biological diversity.

Chiloé, Macarena Mella.

The objective of the OECD in applying these instruments to its member countries is to provide evidence-based analysis (a wide range of economic and environmental data) and evaluations of the progress of its policies in this area, to promote peer learning, increase accountability of their governments and give specific recommendations to help countries improve their environmental performance.

In the chapter on climate change in Chile, the OECD evaluation notes that Chile's GHG emissions grew by 23% between 2000 and 2010 and are expected to continue to increase. For this reason, it indicates that in order to meet its commitment to reduce the intensity of its emissions by 30% by 2030, the policies of all the emitting sectors must be aligned with mitigation. Therefore it proposes to strengthen and formalize the institutional basis of climate change policy, adopt and implement a set of national policies on climate change, and implement a monitoring and evaluation framework for adaptation and mitigation policies.

Chart 2. EDA 2015 Recommendations with Impact on Mitigation

Policy development, monitoring and evaluation

- Establish and implement the suite of domestic climate policies to achieve Chile's Intended Nationally Determined Contribution (INDC) for 2030; implement the NAMAs or adopt alternative measures to ensure the 2010 target is achieved.
- Identify the long-term trajectory consistent with zero net emissions by the second half of the 2050s; communicate long-term commitment to climate policy, whether through legislative or other means.
- Implement a monitoring and evaluation framework for climate change adaptation and mitigation policies, including clear accountability mechanisms: reinforce capacity to produce timely emissions inventories; consider using intermediate milestones for longer-term emissions goals, undertake a national climate risk and vulnerability assessment, evaluate the climate resilience of larger projects and develop indicators to monitor progress towards adaptation objectives.

Integration of policies

- Analyze the consistency of current policy choices with decarbonisation in the longer term, particularly in the transport and energy sectors, and ensure that the necessary adjustments are made; design climate policy measures to ensure a coherent, aligned and integrated policy mix across key sectors responsible for emissions (e.g. energy and transport) removals (e.g. land sector).

Greening taxes and subsidies

- Consider revising the new tax on emissions of local air pollutants and CO2 from large stationary sources: i) increase the tax rate on CO2 on the basis of pre-defined steps, to better reflect the social cost of emissions; ii) include additional emission sources, such as copper smelters and other industrial plants: iii) assess the interactions between the electricity price-setting mechanisms and the CO2 tax, and consider the adjustments needed to safeguard the full effectiveness of the tax; and iv) expand the geographical basis of the air pollution component of the tax to relevant airsheds.
- Explore the introduction of a cap and trade system for relevant pollutants and Emitters that are not covered by the new tax on emissions of local air pollutants and CO_2.

Source (CEPAL/OCDE, 2016).

4. Actions and Policies Associated with Mitigation in Chile

According to the Chilean National Greenhouse Gas Inventory (Chile INGEI) (see Chapter 2), in 2013, Chile's[6] GHG emissions and absorptions account for 70,054.4 Gg CO_2 eq, while total GHG[7] emissions of the country accounted for 109,908.8 Gg CO_2 eq, increasing by 113.4% since 1990 and by 19.3% since 2010 (Table 1). The main drivers of this trend are the sectors of Energy and AFOLU. The values that escape the tendency in the balance (Figure 1) are consequences, mainly, of the forest fires; accounted for in the AFOLU sector.

Día de la aves playeras. MMA.

At the sectoral level (Figure 2), the Energy sector accounted for 77.4%, followed by the Agriculture sector (12.5%), the IPPU sector (6.0%) and finally the waste sector (4.1%).

The information presented in the inventory provides the context and basis for understanding the relevance of sectoral mitigation actions, given that the gradual implementation of these actions could be reflected in the trend of the country's GHG emissions.

Table 1. **Chile INGEI: Emissions and absorptions of GHG (Gg CO_2 eq) by sector, series 1990-2013**

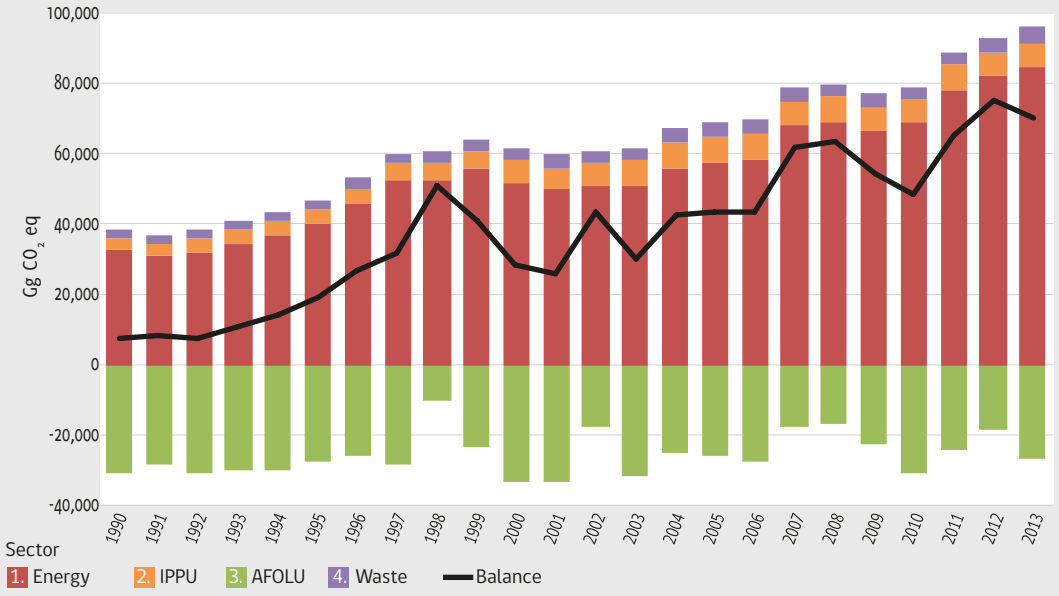
Sector	1990	2000	2010	2011	2012	2013
1. Energy	33,219.5	52,122.9	69,423.7	78,527.0	82,076.6	85,075.4
2. IPPU	3,127.5	6,449.6	6,008.1	6,868.3	7,214.9	6,619.4
3. AFOLU	-30,866.3	-32,819.2	-30,514.4	-24,339.9	-18,410.7	-26,119.2
Agriculture	12,633.5	13,580.7	12,879.8	12,741.7	13,285.0	13,735.2
FOLU	-43,499.8	-46,399.9	-43,394.2	-37,081.6	-31,695.8	-39,854.4
4. Waste	2,526.1	3,348.3	3,802.6	3,939.8	4,019.2	4,478.8
Balance (including FOLU)	**8,006.8**	**29,101.5**	**48,719.9**	**64,995.1**	**74,899.9**	**70,054.4**
Total (excluding FOLU)	**51,506.6**	**75,501.4**	**92,114.2**	**102,076.7**	**106,595.6**	**109,908.8**

Source: Technical Coordination Team of Ministry of Environment.

[6] *In this report, the term "GHG emissions and removals balance" or "GHG balance" refers to the sum of GHG emissions and removals, expressed as carbon dioxide equivalent (CO_2 eq). This term includes the AFOLU sector as a whole.*

[7] *In this report, the term "total GHG emissions" refers to the sum of nation-wide GHG emissions and removals, expressed as carbon dioxide equivalent (CO_2 eq). This term excludes sources of emissions and absorption sinks from forestry and other land uses (FOLU) from AFOLU, but includes GHG emissions from agriculture.*

Figure 1. Chile INGEI: Emissions and absorptions of GHG (Gg CO_2 eq) by sector, series 1990-2013

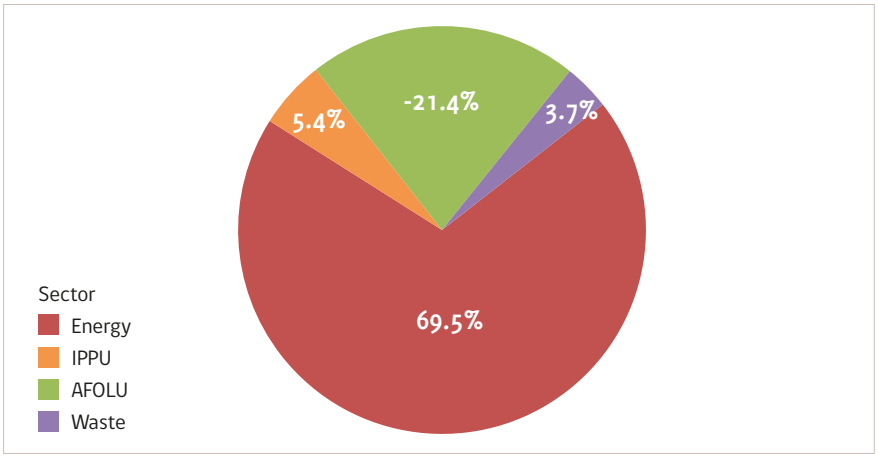


Source: Technical Coordination Team of Ministry of Environment.

4.1. Mitigation in the National Action Plan on Climate Change

The challenge of climate change involves all the actors of the society in their scales of administrative and geographical organization. The recognition of the vulnerability of Chile and the need to adapt to changes in global climate change, one of the goals of the current Government Program is to establish an instrument of public policy that integrates and guides the actions that the country will undertake In relation to climate change. It states that "a new national climate change plan with a transversal and integrated vision in adaptation, mitigation of impacts and capacity building, orienting the measures adopted toward a low carbon economy" should be carried out as quickly as possible.

Figure 2. Distribution of Chile's total GHG emissions by sector



Source: Technical Coordination Team of Ministry of Environment.

The new National Action Plan for Climate Change 2017-2022 (PANCC II) takes place in a scenario of greater knowledge and concrete progress after the experience of the National Action Plan for Climate Change 2008-2012 (PANCC I). In addition, it is part of a context of greater political commitment to the matter.

Like PANCC I, one of the axes of action of the new plan is the mitigation of GHG, to "create the enabling conditions for the implementation, compliance and follow-up of Chile's GHG emissions reduction commitments to the UNFCCC, as well contributing consistently to the country's sustainable

development and low growth in carbon emissions." In this way, the mitigation axis intends to take charge of the preparation for the implementation of this contribution since 2020, in addition to evaluating the early mitigation actions within the framework of the voluntary commitment of the country.

The purpose of the mitigation axis is expected to be achieved through four specific objectives:

- Maintaining the National Inventory System and update Chile INGEI
- Developing mitigation actions and policies
- Implementation of accounting and measurement systems, reporting and verification (MRV)
- Implementation of international commitments on climate change mitigation

These specific objectives make way to 12 lines of action and 25 specific measures.

In addition to the progress achieved at the sectoral level from PANCC I, one task remains: the development of sectoral mitigation plans. The MAPS project helped to evaluate possible reduction measures for various sectors. Also, and due to the preparation of the first Biennial Update Report, the initiatives of the relevant sectors with an impact on mitigation were identified. Given the nature of the new plan and its role in preparing for the fulfillment of Chile's reduction commitments, different sectors have committed their own measures that directly tend to the reduction of emissions or the collection of information for the design of policies. An example of this is the work carried out by the Ministry of Energy for its sectoral mitigation plan, which will be included in PANCC II, and which aligns with the goals and vision of the 2050 Energy Policy.

Bosque, MMA.

4.2. Sectoral mitigation actions

A series of actions - specific policies, laws, programs and projects - designed for sectoral purposes have had an impact on the country's GHG emissions. Thus, each sector that has developed them has measured its execution and progress, either in qualitative or quantitative terms.

While some measures provide estimates of their impact on GHG emission reductions, it is recognized that there is a need to assess the impacts of all measures and to calculate their impact as a contribution to the country's reduction targets.

The actions that contribute to the reduction of emissions of the main sectors of the country are described below.

4.2.1. Energy Sector

In this sector, the regulatory role is exercised by the government through the Ministry of Energy and its dependent or related institutions, while the private sector is responsible for making the investments.

Emissions from the sector are derived from exploration, exploitation, generation, transmission, transportation, storage, distribution, consumption, efficient use, import, export and any other matter related to electricity, gas, oil and by-products,

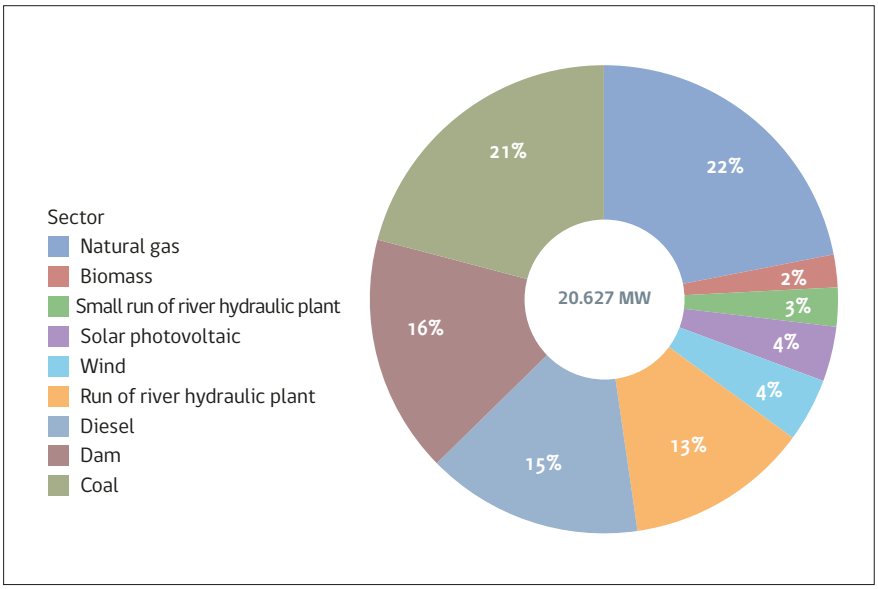
nuclear energy, geothermal energy, solar energy and other energy sources. The emissions come mainly from the generation and consumption of different types of energy (MMA, 2011).

Regarding the electricity generation matrix, in June 2016, Chile's total installed capacity was 20,627MW, separated mainly in the Central Interconnected System (ICS) (79.49% of the installed capacity) and the Greater North Interconnected System (GNIS) (19.72% of installed capacity) in addition to the small systems of Aysén and Magallanes (0.29% and 0.49% of installed capacity respectively) (CNE, 2016).

With regard to Non-Conventional Renewable Energy (NCRE), since 2010, the Chilean electricity system must comply with a defined increase of this type of energy. This quantity was increased in 2013 according to the Law 20,698, which requires that in 2025, 20% of injections come from NCRE means for contracts subject to the above-mentioned law. In recent years there has been an increase of this type of sources, from 286 MW of installed capacity in 2005 up to 2720 MW in 2016, representing 13.15% of the total capacity of Chile's electrical systems (Figure 3) (CNE, 2016).

Over the last few years the Government has taken a number of institutional, policy and regulatory measures to improve institutionality, introduce NCRE into the energy matrix, move to a cleaner matrix and a more efficient use of energy. Chile's Energy Agenda was presented on May 15, 2014, which is the result of an open and participatory

Figure 3. Total installed capacity in Chile by type of source, 2016



Source: CNE, June 2016.

debate held by the Government with social, political, parliamentary, municipal, business, civil society and subject matter experts. This agenda established within its tasks "to design and execute a long-term Energy Policy, which will be supported on social, political and technical validation", for which two working horizons are specified: a short-term time frame, to submit to discussion the lines of work in terms of standards, policies and regulations that guarantee the technical feasibility and sustainability of the energy matrix and another medium; and long-term horizon to discuss those strategic and technological aspects that define the energy matrix that the country will push towards 2050 (Ministerio de Energía, 2015).

Within the framework of the Agenda, and in order to fulfill the task of elaborating the Energy Policy, an advisory committee was constituted. Said committee published in September 2015 the "Roadmap for 2050: Towards a sustainable and inclusive energy for Chile "with the key elements that would consider the Energy Policy. The Agenda also incorporates a series of objectives and targets such as the suspension of the existing barriers to NCRE (under the commitment that 45% of the electricity generation capacity that will be installed in the country between the years 2014 and 2025 will come from this type of sources); As well as promoting the efficient use of energy as an energy resource itself (setting a 20% savings target by 2025, considering the expected growth in the country's energy consumption by that date). Some of the measures on the agenda that have been evaluated for their potential impact on emissions reduction are presented in Table 2.

Table 2. Measures of Energy Agenda with Impact calculated in GHG mitigation

Number	Measure	Description
M1	Energy Efficiency Law	Draft Law, in which the most relevant mechanisms are analyzed: decoupling measures and energy management systems.
M2	Modification of the Tender System	Measure intended to contract contractually NCRE projects, recognizing their operating characteristics.
M3	Quintero's Terminal expansion	Extension of the Quintero terminal to 20 MMm^3 / day, along with the offer of new LNG contracts for 3 MMm^3 / day.
M4	SIC-SING Interconnection	Measure that establishes the development of infrastructure with an estimated power of 1,500 MW.
M5	Continue with the Energy Efficiency Action Plan	Measure that establishes to continue with the PAEE 2013, starting from the potential PAEE 2010.
M6	Energy Efficiency Labeling	Labeling for kitchens, water heaters, dishwashers, washing machines and wood-burning heaters.
M7	MEPS Motors and Refrigerators	The MEPS correspond to the main EE measure in equipment because of its effect of removing inefficient products from the market.
M8	Set of instruments to support compliance with the NCRE Law	Compliance support measure. It is not modeled because the Law is considered baseline.
M9	Increased capacity of Pemuco	This measure corresponds to increase the Satellite Regasification Plant (PSR) Pemuco in an additional 500,000 m^3 day.
M10	Regulation of Medium Systems	Measure that would unlock the entrance of new actors ERNC, in these systems.
M11	Public Solar Ceilings	Installation of 3 MWp in public buildings.
M12	Thermal Reconditioning Subsidy in Vulnerable Housing	Continuation of subsidy program.
M13	Exploration for gas in Magallanes by ENAP	Exploration to maintain gas consumption, and replace electrical generation with diesel
M14	Impulse to the development of a national diesel substitution program by NCRE	Incorporation of ERNC in island systems such as Isla de Pascua, Juan Fernández, and the islands of Chiloé.
M15	Lighting Replacement	Replacement of 200,000 public luminaires at country level from 2015 to 2017.
M16	Change of regulation of thermal regulation	Measure that seeks to increase the requirements of thermal regulation of buildings in the residential sector.
M17	Impact of management measures and watershed study	Measure that seeks to provide information and management of watersheds, to support hydroelectric development.

Source: (e2biz y River Consultores, 2015).

In December 2015 the "2050 Energy Policy" was published, a document that was the result of a citizen participation process of nearly two years, which sets goals and guidelines that point to a diversified, cleaner and safer generation matrix, and with lower cost. This policy is part of the economic, social and institutional development strategy of the country, since it is understood that it can not confine itself to defining rules for the functioning of the market and to react to contingencies, but that the articulating role of the State in proposing visions is essential for long-term energy development, from a systemic perspective. The goal of the policy is to move towards sustainable energy in all its dimensions, based on the attributes of reliability, inclusiveness, competitiveness and environmental sustainability (Ministerio de Energía, 2015).

The Energy Policy maintains its long-term vision based in the following pillars:

1) Safety and quality of supply
2) Energy as a development engine
3) Energy compatible with the environment
4) Efficiency and energy education

Regarding the committed targets in the Energy Policy for the year 2050, he emphasizes, "at least 70% of the national electricity generation comes from renewable energies" and an intermediate goal of at least 60% by 2035 is also defined.

Table 3 presents in a chronological way a summary of the measures that have been established for the Energy sector that may have an impact on GHG mitigation. In addition to these measures, the Ministry of Energy has announced that during 2016 the "Sector Energy Mitigation Plan" will be developed and incorporated as a sectoral commitment in PANCC II.

The sectoral actions carried out by the sector are currently monitored through the various reports prepared by the Ministry of Energy and the institutions associated with it. A summary of the progress of its policies is presented year by year through the "Public Account" document where in addition to analyzing the implementation of its actions, new commitments and challenges are addressed (Ministerio de Energía, 2016).

Table 3. Measures related to the mitigation of GHG emissions in the energy sector

Name	Type[8]	Year and status	Description	Objectives/Goal	Implemented actions	Progress
Short Law I (Law 19.940) (*)	Regulatory and incentive	2004 Implemented	It establishes incentives and right of connection to the grid for non-conventional means of generation and small means of generation (less than 9MW and between 9 and 20 MW).	Short Law I: Exception of payment by transmission to means of non-conventional generation. Right to distribution connection for small generators.	Development of technical regulations and standards. Advertising campaign. Pre-investment support instruments.	Fully operational law. More than 100 projects connected to distribution using the mechanisms contemplated by the Law. Estimated quantification in the package of "Non-Conventional Renewable Energy (NCRE) in Generation"
Regulation on Geothermal Energy Concessions (Law 19,657 of 2000) (*)	Regulatory	2004 Implemented	Within the framework of this Law and its regulations, the established procedure empowers any natural or legal person to request a geothermal energy concession and to participate in a public tender for the granting of a geothermal energy concession.	The exploration concession: Perform a set of operations to determine the potential of geothermal energy. The exploitation concession: Grant the right to use and exploit geothermal energy that exists within its limits.	The Regulation was amended in July 2015: the requirements for obtaining a perpetual exploitation concession are specified and the power to incorporate conditions in the decree is added to account for the territorial reality of the concessions, among other matters.	10 Exploration concessions, 23 exploration concessions expired but with exclusive right to be granted exploitation concession and 9 exploitation concessions until September 2016. Estimated quantification in the package of "Non-Conventional Renewable Energy (NCRE) in Generation"
Non-Conventional Renewable Energy Act (NCRE) (*)	Regulatory	2008 Implemented	It introduces modifications to the General Law of Electric Services, which establishes for electricity generation companies, with installed capacity above 200MW, the obligation to provide evidence of the participation of NCRE in the electricity generation matrix in Chile.	Between 2010 and 2014, 5% of energy must come from NCRE, increasing by 0.5% per year from 2015 up to 10% by 2024.	In 2013, Law 20,257 (through Law 20,698) is amended by increasing the quantity to 20% by 2025 for contracts signed after July 1, 2013.	The compliance quota to February 2016 was 11%. As of July 31, 2016, 3,539 MW of NCRE projects were installed. By 2013, GHG mitigation is estimated to be between 0.44-3.05 MM T CO_2eq. Estimated quantification in the package of "Non-Conventional Renewable Energy (NCRE) in Generation"
Thermal solar systems in new housing Law 20.365 (*)	Fiscal	2010 Implemented	Tax exemption for thermal solar systems intended for hot water purposes in new homes and direct subsidy for installation of TSS in new social housing. The tax benefit is equal to 100% of the added cost of the investment, plus the cost of installation, plus the cost of a maintenance program for households of less than 2,000 UF, and decreases linearly to 0% for homes of 3,000 UF The maximum amount of subsidy for social housing is defined annually by Supreme Decree.	Market Development of Thermal Solar Systems (TSS) by stimulation of demand. Promote access and energy equity in the most vulnerable population with a means to obtain domestic hot water Expected impact between 2015-2020: Approx. 66,500 homes benefited.	Law 20,897 of 2016 renews the validity of the tax exemption for the installation of thermal solar systems (TSS) for the period 2015 until 2020 and adds a direct subsidy for the provision of this technology in new social housing.	Between 2010 and mid-2016, 49,150 homes have been benefited (approximately 196,500 people). In the period 2010-2016 a mitigation of 69.38 Mton-CO_2e has been achieved. In the period 2017-2022, emission reductions of around 177 MtonCO_2e are expected to be achieved.

[8] *The type of instrument is classified according to an economic, fiscal, technological, regulatory, institutional or policy measure.*

Name	Type[8]	Year and status	Description	Objectives/Goal	Implemented actions	Progress
Thermal solar systems in existing social housing	Fiscal	2011 Implemented	Direct subsidy for the installation of TSS in existing social housing, through the Family Heritage Protection Program of the Ministry of Housing and Urban Planning (MINVU)	Improve the existing housing of the most vulnerable and deprived population, with the installation of a solar system for water heating.	Transfer of funds from the Ministry of Energy (MINENERGIA) to the Ministry of Housing and Urban Planning (MINVU) Development of regulatory bodies Training to the SERVIUs to evaluate and to grant subsidies	From 2011 to 2015, TSSs have been installed in 14,988 existing social housing units.
Thermal solar systems in housing of the Reconstruction Programs	Fiscal	2015	Subsidy for the installation of thermal solar systems (SST), for the heating of sanitary water, and photovoltaic systems (PVS), for the generation of electricity, in the houses that are subject of the Reconstruction Program and where there is technical feasibility.	In response to the reconstruction needs arising from the Greater North earthquake and the fire in Valparaíso in 2014, it was decided to promote a subsidy for the installation of TSS in the houses that are the subject of the Reconstruction Program. In addition, a new Reconstruction Program had to be implemented in 2015 to deal with the consequences of the floods in the Atacama and Antofagasta regions. This time it was determined that both the houses to be rebuild and those to be repaired would benefit from TSS and PVS.	Transferences from MINENERGIA to MINVU Training to public and private actors Donation of TSS laboratories to technical training centers of the regions involved.	As of June 2016, 3,554 subsidies have been granted for TSS and about 1,000 subsidies for PVS.
Energy Efficiency Program in Public Buildings (PEEP)(*)	Economic incentive	2009 Implemented	Part of Efficient Residential Lighting and Public Lighting programs. It includes the Diagnosis, Implementation, Measurement and Verification, and Capacity Building, which aim to address energy efficiency projects in public buildings in an integral manner.	5% reduction of electricity consumption in public buildings.	Ministry of the Interior and Public Security and the Ministry of Energy formalize an instruction sheet on the application of energy saving measures in public administration. Achee led the follow-up to this instruction sheet through the Energy Consumption Registration Platform of public buildings.	In the period 2011-2016 a mitigation of 27.94 MtonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 99 MtonCO_2e are expected to be achieved.
Net Billing Law (Law 20.571) (*)	Regulatory	2012 (enactment) October 2014 (full implementation)	It grants the regulated customers of the distribution companies the right to generate their own electric energy, to self-consume it and that the value of their energy surplus contributed to the distribution network is deducted from their energy bills. The projects of self-generation can only be of renewable energies or efficient co-generation.	Establish a right without specific goals. Notwithstanding this, a growing use of this right is foreseen, especially for photovoltaic projects.	Development of normative and regulatory framework complementary to the Law. Training seminars on the law. Creation of a specialized unit to support and control projects. Support to the development of photovoltaic systems suppliers, through the Public Solar Roofs Program. Generation of public information on costs and suppliers. Implementation of online tools for self-evaluation of projects.	341 projects under the right granted by the Law, equivalent to 4.15 MW. In the period 2015-2016 a mitigation of 2,263 tonCO_2e has been achieved. In period 2017-2022, emission reductions of around 614,494 tonCO_2e are expected to be achieved.

Name	Type[8]	Year and status	Description	Objectives/Goal	Implemented actions	Progress
Energy Efficiency Action Plan (PAEE2020)	Policy	2013 Implemented	It is a guideline that is projected in several previous energy policies and strategies, but is launched as part of the National Energy Strategy for 2012-2030. Since 2014 it has been integrated into the goals proposed by the Energy Agenda. It proposes actions in the following Lines: -Industry and mining -Transportation -Building -Devices -Cordwood -Others The following actions are linked to PAEE2020: - Minimum Energy Performance Standard (MEPS) in light bulbs (*). - Minimum Energy Performance Standard (MEPS) in residential refrigerators (*). - Minimum Energy Performance Standard (MEPS) for residential air conditioners (*). - Minimum Energy Performance Standard (MEPS) in engines (*).	Reduce by 12% the final energy demand projected to 2020 compared to 2010, equivalent to a saving of 43,000 Tcal.	As part of this work, the Interministerial Energy Efficiency Committee (CIEE) was created, the artifact labeling program was strengthened, work was begun to define Minimum Standards for EE (MEPS), the Energy Efficiency Seal was launched for Companies, vehicle labeling. In addition, ACHEE has developed actions to support the implementation and progress of the Action Plan.	**Minimum Energy Performance Standard (MEPS) in light bulbs** In 2016 a mitigation of 64.03 MtonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 150 M tonCO_2e are expected to be achieved. **Minimum Energy Performance Standard (MEPS) in residential refrigerators** In period 2017-2022, emission reductions of around 92 MtonCO_2e are expected to be achieved. **Minimum Energy Performance Standard (MEPS) for residential air conditioners** In period 2017-2022, emission reductions of around 38 MtonCO_2e are expected to be achieved. **Minimum Energy Performance Standard (MEPS) in engines** In period 2017-2022, emission reductions of around 167 MtonCO_2e are expected to be achieved.
Energy Agenda (*)	Policy	2014 Implemented	Launched in May 2014, it presents concrete measures to build an energy policy for Chile, through the following axes of action: -A new role by the government regarding energy development -Reduction of energy prices, with greater competition, efficiency and diversification in the energy market -Development of own energy resources -Connectivity for energy development -An efficient energy sector that manages the consumption -Impulse to energy investment for the development of Chile -Citizen participation and territorial ordering	1. Reduce marginal costs during this period of government by 30%. 2. Reduce by 25% the prices of electricity supply tenders for the next decade compared to the prices offered in the last tender of the year 2013. 3. Promote the development of NCRE to meet the goal of a 20% injection of NCRE in the electrical system by 2025. 4. Develop the efficient use of energy as an energy resource in order to reduce by 20% the projected consumption by 2025.	Granting of "Tender for 2015-02 supply" for regulated customers in concession areas supplied by the Greater North Interconnected System (SING) and the Central Interconnected System (SIC) in Chile. -The Public Solar Roofs Program Is created -Subsidy program as complement to housing program for the installation of Thermal Solar Systems (TSS) in new housing units - "Efficient Home" Program to promote residential energy efficiency - In 2015 the program for public lighting replacement(*) begins and it will replace 200,000 luminaires throughout the country, in a period of four years.	1. In 2015, the average marginal cost was USD 89 MWh, which represents a 34% decrease compared to 2013, in a similar hydrological condition and isolated from the fall in coal and oil prices (source: 2016 Public Account 2016 by the Ministry of Energy). 2. In the tender of August 2016, the average price was 47.6 USD / MWh, 63% lower than the average price of December 2013. 3. In December 2013, NCRE installed capacity was 6.3%. As of June 2016, the matrix is composed of 13.15% of NCRE. 4. A total of 64,310 public lighting fixtures installed. In 2016, a mitigation of 2162 tonCO_2e has been achieved. In period 2017-2022, emission reductions of around 140 MtonCO_2e are expected to be achieved. 5. In general, out of 99 committed projects, 65 are completed and 33 are in execution, as of June 2016.

Name	Type[8]	Year and status	Description	Objectives/Goal	Implemented actions	Progress
Energy Efficiency Bill (included in Energy Agenda	Economic Incentive / Regulatory	2014 Planned	The bill will contemplate at least three components: (a) Energy efficiency in industry and mining; (b) Energy efficiency for households, small industries and commerce; (c) Energy Efficiency in the public sector.	It aims to promote, guide and regulate the rational and efficient use of energy resources, in order to promote improvements in productivity and competitiveness of our economy, improve the quality of life of people, and thus contribute to sustainable development of the country.	As of June 2016, this bill is in the pre-legislative review stage.	As of June 2016, this bill is in the pre-legislative review stage.
Energy for Neighborhoods Program	Policy	2015 Implemented	It is a management tool and accreditation process for the neighborhoods of Chile, which establishes both interdisciplinary plans and actions as well as short, medium and long term oriented processes for the energy management of the neighborhoods. With CE, the energy management of a neighborhood is systematically identified, analyzed, revised, coordinated and implemented according to a series of goals and objectives.	10% of all municipalities in the country involved and adhered to this program in 2018 (approximately 36 communes).	During the year 2015, the Ministry of Energy published a methodological guide for the development of local energy strategies and financed the development of five local energy strategies.	11 communes adhered until March 2016.
Energy Policy: 2050 Energy (*)	Policy	2015	It proposes a vision of the energy sector by 2050 that corresponds to a reliable, sustainable, inclusive and competitive sector. Based on 4 pillars: Safety and quality of supply, energy as a development engine, compatibility with the environment and efficiency and energy education.	**Main goals for 2035:** - 100% access to electricity supply. - **At least 60% of the national electricity generation comes from renewable energies.** - 100% of large consumers should have energy management systems. - 100% of the new vehicles of public transportation are evaluated with criteria of energy efficiency. - At least 50% of low GHG emission and atmospheric pollutants fuels in the fuel matrix. - 40% of the native forests that produce firewood and forest biomass have sustainable resource management and production regulations, according to national and / or international standards. - A GHG Emission Mitigation Plan is applied in the Energy Sector. - There is a mechanism for periodically reviewing the public policy instruments applied to achieve GHG mitigation targets. - An Adaptation Plan for the energy sector is applied regarding climate change, within the framework of a national plan in consequence.	No info	A total reduction of 2.3 MM tCO_2 is expected between 2017-2022.

Name	Type[8]	Year and status	Description	Objectives/Goal	Implemented actions	Progress
				Main goals for 2050: -At least 70% of the national electricity generation comes from renewable energies. - Energy consumption decoupled from GDP. -100% of new buildings must have OECD standards. - 100% of the main categories of appliances and equipment sold in the market correspond to energy efficient equipment. - At least 65% of low GHG emission and atmospheric pollutants fuels in the fuel matrix. - Innovation policies in industry contribute to the potential of reducing energy consumption. - Native forests that produce firewood and biomass are regulated and managed according to national and / or international standards. - GHG emissions from the Chilean energy sector are consistent with the limits defined by science at the global level and with the corresponding national reduction target, promoting cost-effective mitigation measures. - Companies representing 95% of the energy consumption of the productive sector report and manage their GHG emissions, in a manner compatible with the commitments acquired by the country.		

Name	Type[8]	Year and status	Description	Objectives/Goal	Implemented actions	Progress
Solar Strategic Program	Technologic	2016 Active	The challenge presented by this program is to take advantage of the existence of an exceptional solar resource and the need to provide economic energy solutions that contribute to improving the competitiveness of national industry, particularly mining, to develop a national solar industry with high Technological capabilities and export vocation, and a science and technology sector with research capacities at an international level connected with the needs of industry, which is expected to become a relevant sector for the country's development. Representatives of public entities such as the Ministry of Energy, the Ministry of Economy, the Ministry of National Property, Enami, Conicyt and Corfo are part of this initiative; The German Cooperation Agency GIZ; Private companies such as ACERA, ACESOL, Asociación Generadores, Asociación Distribuidoras Eléctricas, CDEC SIC, AIC (Engineering Consultants), College of Engineers, ASIMET, AIE (Electrical and Electronics Industry), Corproa (Atacama Development); Science and Technology SERC, CDEA, Chile Foundation, Fraunhofer Solar Chile, UAI. Main Initiatives (2016-2025): - Program modules and photovoltaic systems for deserts - Solar Technology Center - Strengthening of quality infrastructure - Solar Technology District (STD) (*) - Open innovation platform and financing for innovation - Solar corridor for Salado basin	The main goals of the program are: • 7 to 10% of generated solar energy (> 3.2 GW installed associated with PES). • PV technologies LCOE adapted USD 25 MWh. • Investment attraction (MM U$D 9,380). • Local value capture 55 % (MM USD 5,159). • Generation of 250 MW in PV self-supply, 2000 GWht (1,700,000 ACS systems). • Exportation of: Engineering services, technology services, photovoltaic systems, etc.	Up to date, pre-feasibility studies are being carried out.	No info

Name	Type[8]	Year and status	Description	Objectives/Goal	Implemented actions	Progress
Promoting the development of biogas energy in small and medium-sized agro-industries selected in the regions of Los Ríos and Los Lagos (Biogas dairy sector)	Proyect	2014-2017 / Implemented and active	The project aims to increase the generation of biogas in dairy industry SMEs in the regions of Los Lagos and Los Ríos, assessing waste, reducing energy costs and mitigating greenhouse gas (GHG) emissions. The focus is on dairy plants between 100 and 500 cows.	Reduce GHG emissions by promoting investment and market development of biogas energy technologies in SMEs in the dairy sector.	Study of gaps for the registration of biodigesters in SEC. Studies of technical and economic pre-feasibility of biogas projects. Promotion and dissemination of information and best practices in biogas technologies for small and medium-sized agro-industries. Construction of an experimental biodigester for the dairy sector. Manual of design, construction, operation and maintenance for biogas plants in Chile. Diagnostic development of existing digesters.	Study completed and in progress the preparation of guidelines for the registration process with the SEC. Dissemination of the project through its website, national and international technology tours and participation in seminars. Start-up of the pilot biodigestor for the dairy sector in April 2016 (INIA Remehue). In the process of bidding for pre-feasibility studies.

Source: Own elaboration based on sectoral information
(*) Further details on the estimation of the reductions that would be reached / estimated, methodologies and assumptions can be found in Annex III of this document.
N/I: No info.

4.2.2. Transportation Sector

GHG emissions from the transportation sector result mainly from the combustion of fuels used for passenger and cargo transportation, considering the subcategories air, land, rail and maritime.

The Ministry of Transportation and Communications (MTT), through the Transportation Subsecretary (Subtrans), is the public institution responsible for producing policies, standards and conditions for the development of efficient, safe and environmentally-friendly transportation systems, and ensuring equal access to the different modes of transportation, supervising that services are of quality and safeguarding the rights of users. The control of vehicles is responsibility of this Subsecretary, and includes the control of vehicular emissions associated with local and global air pollution.

In the 2000s, these institutions, along with their dependent and related programs, developed initiatives primarily aimed at reducing local pollutants and not specifically reducing GHG. However, in recent years, the Government has taken a number of measures in the areas of research, institutional strengthening, policy-making and regulation, seeking to improve the management of transportation systems and safeguard the rights of users, which also have an impact on the reduction of GHG emissions, among other things.

Bus eléctrico, MMA.

Chile's second OECD environmental performance review notes that emissions from the transport sector, especially land transportation, represent a growing challenge to meeting Chile's international commitments given its significant share of total GHG emissions of the country and its upward trend given the economic growth. Table 4 below lists the most relevant initiatives in the sector from the point of view of mitigation.

Table 4. Measures related to the mitigation of GHG emissions in the transportation sector

Name	Type of instrument	Year and status	Description	Objectives	Implemented actions	Progress
Restructuring of the Santiago Public Transportation System (Transantiago)	Economic Instrument - Subsidy (one part financed by subsidy) / passenger transportation subsector	2005 onwards / Implemented and active	Santiago Public Transportation System (Transantiago) completely reformed the mesh of routes of the old buses, designing a system based on the use of feeder and trunk services, in conjunction with the Santiago Subway (Metro).	Increase the number of public transportation users, reduce levels of air pollution, and decrease the number of vehicles.	Renovation of fleet and technological improvement of buses of the public transportation system. Enable exclusive lanes, only-bus lanes and segregated lanes. Design of a monitoring, reporting and verification (MRV) system for Transantiago.	The year 2011 estimated a 30% reduction in CO_2eq emissions compared to the year 2006[9]. 21.7 km of corridors (axes of urban mobility) in execution to 2015, with respect to the 40 new km committed for the period 2014-2018[10]. In 2015, about 70 new high standard buses were incorporated. In addition, the first bus with clean technologies Euro VI was put into normal operation[11].
Labeling of new vehicles	Information - Labeling / sub-sector of light vehicles	2013 onwards / Implemented and active	Energy efficiency labeling is mandatory for new vehicles weighing less than 2700 kg, which requires reporting on their energy consumption (km / l) and emissions (gCO_2/km). Joint initiative of Ministry of Transportation and Communications, Ministry of Environment and Ministry of Energy.	Facilitate consumers' purchasing decisions by providing reference information on the fuel consumption of the vehicles and the CO_2 emissions they present.	During 2012, the measure was voluntary and from 2013 onwards, it became compulsory. Website development: www.consumovehicular.cl	74% of the new vehicles sold during the first half of 2014 had the vehicle consumption label incorporated, a percentage higher than that shown during the year 2013[12].
Program to encourage the voluntary adoption of efficient driving techniques	Education - light vehicle subsector / passenger transportation / road haulage	2008 onwards / Implemented but inactive	Achee, through this program, makes available to users an interactive website with efficient driving material for passenger and cargo transportation, and private vehicles, thus users of these vehicles take these measures on a voluntary basis.	Make available efficient driving contents in the ground transportation; cover the largest possible number of users of motor vehicles.	Website development: www.conduccioneficiente.cl Development of graphic and multimedia material (guides, manuals and leaflets). Training of theoretical and practical instructors of drivers' schools.	During the implementation period, and through on-site evaluations, it has been possible to determine consumption decreases of up to 15%. During the period 2013-2015, 74 instructors from drivers' schools were trained, reaching 772 new drivers who received the contents of efficient driving. In the same period, 679 cargo monitors were trained.
Program of incentive to the introduction of aerodynamic improvements in the vehicles of load of the highway transport (*)	Voluntary actions - road haulage subsector	2014 / Finished	The program seeks to provide financial and professional resources with the aim of encouraging drivers to install aerodynamic devices in their road haulage vehicles, which are suitable for the operation of vehicles.	Program of incentive to the introduction of aerodynamic improvements in the vehicles of load of the highway transport	The benefit was given in 2014. In 2015 program related reductions were followed up.	In the period 2014-2016 a mitigation of 1.51 M tonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 1.5 MtonCO_2e are expected to be achieved[13].

[9] *General Coordination of Transportation of Santiago (CGTS), Transantiago Management Report 2011.*
[10] *Ministry of Transportation and Communications, 2015 Public Account.*
[11] *Ministry of Transportation and Communications, 2015 Public Account.*
[12] *Chilean Energy Efficiency Agency, Achee Report 2014.*
[13] *Information provided by E2BIZ Consultants (March 2017).*
(*) Further details on the estimation of the reductions reached / estimated, methodologies and assumptions can be found in Appendix III of this document.

Name	Type of instrument	Year and status	Description	Objectives	Implemented actions	Progress
Incentive program for the improvement of energy management standards for buses in Santiago	Voluntary actions - passenger transportation subsector	2011 onwards	Encourage the adoption of best practices in fuel consumption through the development of a pilot experience in one of the companies of Transantiago, to later extend the work done to the general system of public passenger transportation.	Implement energy efficiency measures and quantify savings potentials.	Participation of urban and interurban transport companies. Development of Energy Management Systems (EMS) based on ISO 50.001 Standard. Development of actions oriented to tire management, idle control and the incorporation of efficient driving techniques.	It is estimated that the implemented measures have achieved savings of around 5% in fuel consumption.
"Renew your bus" Program (*)	Economic incentive- Subsidy / Passenger transportation subsector	2011 onwards / Implemented and active	Subsidy associated with the Public Transportation Subsidies Act, which allows access to financing for the renovation of old public transportation buses, either in regions and in the rural area of the Metropolitan Region, with less polluting ones.	Modernize the existing park of public transportation buses for cleaner, more efficient and safer vehicles.	Implementation of the program in different regions of the country.	From the beginning of the program to January 2015, more than 2,850 buses have been renovated in the national territory[14]. In the period 2011-2016 a mitigation of 154 M tonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 92.8 MtonCO_2e are expected to be achieved.
"Renew your collective taxi" Program (*)	Economic incentive- Subsidy / Passenger transportation subsector	2015 onwards / Implemented and active	The National Subsidy for Public Transport Act creates a subsidy provided by the Regional Governments (GORE) for the replacement of collective taxis for less polluting vehicles in regions.	To modernize the existing park of collective taxis with less polluting vehicles, with standards of higher quality, more efficient and safe.	Implementation of the program in different regions of the country.	In the period 2015-2016 a mitigation of 141 tonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 1.66 MtonCO_2e are expected to be achieved.
Green tax on new motor vehicles	Tax - Light vehicle subsector	2015 onwards	Tax associated with the Tax Reform Law, which applies only once to new, light and medium cars, depending on their urban performance.	Encourage the access of less polluting vehicles, allowing the construction of a cleaner and more efficient vehicle park.	Enabling a Tax Calculation Wizard on the Internal Taxation Service website www.sii.cl	Until the first half of 2015, the tax has managed to reduce by more than 30% the share of diesel vehicles in the light sector[15].
Master Plan for bike lanes in Santiago	Other - Non-motorized modes	2013 - 2032	Initiative that contemplates the design and construction of a network of 932 km of cycle paths for the capital city, and belongs to the Master Plan of Transportation, Santiago 2025.	Design and construction of 932 kilometers of cycle paths.	Design and construction of cycle lanes.	By 2015 approximately 252 kilometers have been built.
Cycle path Plan	Other - Non-motorized modes	2014 - 2018	Initiative at the national level that contemplates the construction of 190 kilometers of cycle lanes of high standard and will be extended to the 15 regions of the country, benefiting 32 cities.	Construction of 190 kilometers of high standard bicycle lanes.	Construction of bicycle lanes.	By the first quarter of 2016, approximately 63 kilometers have been built[16].

[14] *Ministry of Transportation and Communications, 2014 Public Account.*
[15] *Ministry of the Environment, 2015 Public Account.*
[16] *Ministry of Housing and Urban Planning, 2015 Public Account.*

Name	Type of instrument	Year and status	Description	Objectives	Implemented actions	Progress
Methodological Developments for the Estimation of CO_2 Emissions in Transportation	Project	2010-2015	Initiative carried out by SECTRA, with the purpose of developing or updating methodologies and tools that allow to evaluate the changes in the CO_2 emissions in plans, policies or projects of urban transport and infrastructure, like harbors and airports, useful also for the National System Of Investment (SIN).	Develop or update methodologies and tools to assess changes in CO_2 emissions in urban transport plans, policies or projects and infrastructure.	Development of MODEM, STEP and CEPYA models.	Completed
Integrated Planning of the Urban Territory in Chile: synergies between mobility, urban development and climate change	Program	2016-2018 / introduced	The initiative seeks to identify improvements in the Community-wide Territorial Planning Instruments (TIPs) in Chile that will allow progress towards the development of sustainable cities, socially and spatially integrated, through the formulation of processes and methodologies that incorporate mobility and climate change as critical axes for urban development and as components that support the formulation of IPT in all its stages.	Define, conceptualize and apply improvements to communal urban planning instruments, so that they incorporate and articulate in their objectives and methodologies components of mobility and mitigation and adaptation to climate change.	Application to the Inter-American Development Bank (IDB) for a non-reimbursable Technical Cooperation Agreement to support the operation of the program.	Approval of the non-reimbursable Technical Cooperation Agreement by the IDB for the amount of USD 480,000.

N/I: No info
Source: Own elaboration based on sectoral information

Niños, MMA.

In the same framework of these subsectors, other actions from companies can be identified, which also have an impact on GHG reduction (Sistemas Sustentables, 2014). Table 5 summarizes these measures.

Table 5. Measures related to the mitigation of GHG emissions from companies in the transportation sector

Name	Type of instrument	Year and status	Description	Objective	Implemented actions	Progress
Expansion of the Santiago Subway (Metro) network: Construction of lines 3 and 6 (*)	Other - Private	2012-2018 / introduced	In 2012, the construction of 2 new lines was announced - line 6 and line 3 - which will begin their operation in 2017 and 2018, respectively, adding a total of 37 km to the current network.	Extend the service network of Santiago Subway. Line 3 will cover 22 km (18 stations), benefiting 6 communes of the capital. Line 6, on the other hand, will cover 15.3 km (10 stations), benefiting 7 communes of Santiago.	Construction of tunnels, stations, workshops and shelters. Start of arrival of new trains.	As of December 2015, new lines 3 and 6 together recorded 55% of physical progress[17]. In period 2017-2022, emission reductions of around 467 $MtonCO_2e$ are expected to be achieved.
Construction of new railway infrastructure: Santiago - Nos / Santiago - Rancagua Project	Other - Private	2014-2015 / introduced	The project belongs to the Master Plan of the National Railways Company (EFE), which seeks to promote urban and suburban passenger transportation services, under the concept of local trains.	Improve travel times between Santiago and the communes located to the south, towards the city of Rancagua.	Construction of new railways. Construction of new stations and elevation of crossings. Acquisition of a fleet of trains with new technologies (75% less noise emissions and 25% less energy consumption).	As of December 2015, 7 of the 10 new stations are completed. Acquisition of 16 new trains operating in these services since 2016[18].
Emission reduction plan in the aviation industry (LAN Company)	Other - Private	2011 onwards / Implemented and active	The Aviation Company LAN has been working since 2011 to reduce its CO_2 emissions according to the IATA (International Air Transport Association) sector strategy.	Improve efficiency in the use of fuel by 1.5% per year. Achieve carbon neutral growth by 2020. Reduce emissions by 50% in 2050, compared to 2005.	Management of operations. Development of programs of efficiency in the use of fuel. Modernization of the air fleet.	Average annual reduction of 2.5% in fuel usage between 2012 and 2015[19].

N/I: No info
Source: Own elaboration based on sectoral information

[17] *Ministry of Transportation and Communications, 2015 Public Account.*
[18] *Ministry of Transportation and Communications, 2015 Public Account.*
[19] *LATAM, Sustainability Report 2015.*

4.2.3. Land use, land-use change and forestry sector

Manejo Bosque, Andreas Schmidt.

The sector presents GHG emissions and removals from forested land, grasslands, croplands, wetlands, settlements and other lands. Emissions occur due to cutting (thinning or harvesting) of forest plantations, the extraction of firewood and illegal cuttings, and wildfires and other sources. The sources of removals are mainly derived from regeneration of native forest, managed native forest and forest plantations, mostly exotic.

Given the capacity to contribute to mitigation of the LULUCF sector, Chile in the NDC has a specific contribution to this sector, associated to the sustainable management and recovery of degraded forest, mainly native, and to afforestation, mostly with native species.

As a key instrument to meet this LULUCF goal contained in the NDC, the National Forestry Corporation (Conaf), through the Climate Change and Environmental Services Unit (UCCSA), is formulating and implementing the National Strategy for Climate Change and Vegetation Resources (ENCCRV).

The aim of the ENCCRV is to facilitate the establishment of a legal, technical, operational and financial platform to regulate and promote the conservation, recovery and rational use of vegetation resources, from a perspective that contributes to mitigation and adaptation to change climate, and the consequent processes of desertification, drought and land degradation, with emphasis on those areas with greater social, economic and environmental vulnerability.

The main guidelines of the ENCCRV are the Reduction of Emissions from Deforestation, Forest Degradation and Carbon Expansion (REDD +) and the concept of Land Degradation Neutrality (LDN)[20]. On the other hand, the strategy will be a tool for the achievement of the Sustainable Development Objectives approved in 2015 by the General Assembly of the United Nations.

As goals of the Strategy, a new Forestry Promotion Law stands out with the inclusion of elements of mitigation and adaptation to climate change, desertification, land degradation and drought, as well as the modification and strengthening of the Native Forest Recovery and Forest Promotion Law (Law No. 20.283), both regulations considered in the commitments indicated in the NDC.

Measures of action have as their main indicator the GHG emissions and removals through the reduction of deforestation and the degradation of forests and vegetation resources, as well as the increase of forest carbon stocks through forest management, conservation, restoration and afforestation.

The impact on forest carbon flows of the ENCCRV is based on the formulation of Forest Reference Emission Level / Forest Reference Level (FREL/ FRL), indicator submitted in January 2016 to the UNFCCC Secretariat for its official

[20] *Associated with the United Nations Convention to Combat Desertification (UNCCD), it was introduced as "land degradation neutrality" in a proposal presented at Rio + 20. It proposed to be achieved by (a) managing land more sustainably, which would reduce the rate of degradation; and (b) increasing the rate of restoration of degraded land, so that the two trends converge to give a zero net rate of land degradation.*

review, including four activities with an annual average value obtained from the period 1997-2013 (Table 6).

On the other hand, in May 2016 the Forestry Policy for 2015-2035 was established, which set up the basis for sustainable, participatory, inclusive and socially equitable forestry development.

Table 6. Preliminary NREF / NRF of subnational native forest of Chile

REDD+ activities	Total annual emissions and removals (t CO_2 eq year)
Deforestation	1,781,825
Degradation	6,424,771
Conservation	-1,838,828
Enhancement of forest carbon stocks	-7,887,089

Source: Own elaboration based on preliminary document (Conaf y Minagri, 2016).

The Forest Policy is structured around four strategic axes: 1) Forest Institutionality; 2) Productivity and economic growth; 3) Equity and social inclusion; and 4) Protection and restoration of forest heritage. Each of these axes is broken down into impact and outcome objectives, with a baseline (by 2015) and expected situations in the short (2020), medium (2025) and long (2035) term.

The guidelines set forth in this policy are the result of a year and a half of work, with meetings and workshops involving 180 representatives of the Chilean forestry sector, led by the Forestry Policy Council, composed by 31 representatives from various public organizations and Private partnerships, chaired by the Executive Director of Conaf.

With respect to the sectoral actions that contribute to the mitigation of GHG, emissions and the promotion of the captures are presented in the Table 7.

Table 7. Mitigation actions and policies in the forestry sector

Name	Type of instrument	Year and status	Description	Objectives	Implemented actions	Progress
National Strategy for Climate Change and Vegetation Resources (ENCCRV)	Economic instrument Voluntary actions Regulatory Information Research Education	2010 -2025 (in progress)	Basic principles guiding the NSCCVR: - Stimulate the provision of environmental services such as water resources, land productivity, cultural and landscape values, among others, through reduction of deforestation and devegetation, forest degradation and vegetation resources, and at the same time promoting sustainable management of forests and vegetation resources, afforestation and revegetation mainly with native species, and restoration of forests and degraded xerophytic formations. - Key instrument to meet the forest target contained in the NDC: a) 100,000 ha of afforestation mainly with native species. Indicator: Area afforested per year with spatial representation b) 100,000 ha of sustainable forest management. Indicator: Area of managed forests, including areas where degradation and deforestation with spatial representation were avoided	To reduce the social, environmental and economic vulnerability caused by climate change, desertification, land degradation and drought on vegetation resources and human communities that they depend on them, in order to increase the resilience of ecosystems and contribute to mitigate climate change, promoting emission reductions and removals of greenhouse gases in Chile	Document ENCCRV in process of public consultation includes: Definition of the main causes of GHG emissions in the sector Definition of activities and measures of action, operational goals over time in a horizon from 2017 to 2025 Determination of subnational reference levels (Maule Region to Los Lagos Region) Initiatives in the implementation of projects to restore forest ecosystems affected by fires and preventive forestry	Commitment 100,000 ha of afforestation: between 900,000 and 1,200,000 tCO_2eq / year mainly with native species, and 100,000 ha of recovery and sustainable management of native forest: 600.000 tCO_2eq / year both commitments in force since 2030 In 2018 is expected to report the first monitoring milestone and account for actual reductions and captures.

4.2.4. Waste Sector

Emissions from the sector come from the final disposal of municipal solid waste (MSW); the treatment of sewage and liquid industrial waste, and the respective sludge generated; incineration of hospital waste and nitrous oxide emissions from human excreta.

In this sector, accounting is performed on the emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) resulting from microbiological processes occurring at municipal solid waste final disposal sites due to the anaerobic degradation of organic matter, as well as the emission of N_2O by the anaerobic decomposition of human excreta and the anaerobic stage of wastewater treatment and liquid industrial waste.

Most of Chile's GHGs in the sector are generated by MSW. In Chile, the Organic Constitutional Law of Municipalities[21] provides these entities with the exclusive attribution for the management of waste generated in their communal limits, whose obligation is regulated in the Health Code[22].The municipalities of Chile develop this allocation directly with their own resources or outsourcing the services of collection, transportation and / or final disposal. Regarding the final provision, they mostly choose the option of outsourcing the service.

With respect to the financial area, the Municipal Revenue Act[23] establishes that municipalities must annually determine the actual costs of their home cleaning services, in order to establish the price lists for these services. These costs are divided equally among all users, which results in the amount of the fee, or right for the cleaning service, which is charged to each user. The same law establishes that those users whose housing or housing unit to which the service is granted will automatically be exempt from said payment will have a tax assessment equal to or less than 225 monthly tax units, which corresponds to more than 70% of the population.

Bus del Reciclaje, MMA.

The Ministry of the Environment is responsible for the design and implementation of policies, plans and programs in environmental matters, including waste management programs through a dedicated office for this purpose. At present, the policy of integral management of solid waste, of 2005, is in the updating stage.

At present, more than 90% of the municipal solid waste goes directly to final disposal, and most of it, about 50% of this waste, corresponds to organic waste. Consequently, a work area is focused on promoting the application of hierarchy in waste management, promoting prevention in the generation of waste and, if this is not possible, encouraging its recovery, including, in this order, reuse, and recycling and energy recovery, leaving the final disposal as the last alternative. This vision allows making the most of waste materials and energy before simply disposing of them.

In particular, in the search for valorization initiatives, the Ministry of

[21] *Law 18.695 (1988, updated on 2007) of the Ministry of the Interior.*
[22] *Sanitary Code 725 (1968).*
[23] *Law 3.063 (1972, updated on 1999) of the Ministry of the Interior. About Municipal Revenues.*

Environment has carried out studies in several municipalities, which have concluded the following:

- In general, waste recovery projects cannot compete with the rates applied for final disposal, which are very low.
- The collection of household solid waste in general is performed without any separation at source. Today organic waste separated in origin comes from pruning, free fairs, restaurants and hotels. The quantities of these wastes are not sufficient to develop recovery initiatives by themselves. Although in some municipalities there are initiatives to collect household organic waste separated at source, increasing this amount requires years of preparation.
- Many industries report being willing to make proper management of their organic waste, but they do not because there are no available recovery alternatives.
- High potential is identified regarding a coordinated work between the municipalities and the industries to develop programs of diversion of organic waste.

In institutional, political and regulatory matters, the Government has taken a series of measures in recent years to improve the integral management of waste, reduce the final disposal in illegal facilities and improve sanitary requirements. Law 20,920 is noteworthy as it establishes the framework for waste management, extended producer responsibility and promotion of recycling, and obligation for manufacturers and importers of six priority products to collect and value, respectively, a percentage of their products once they end their useful life. The respective decrees for each of the priority products may include associated obligations on labeling, separate delivery, eco-design and reception and storage facilities, among others. If these goals are not met, they are exposed to fines of up to 10,000 annual tax units. A first decree is expected by the end of 2017.

Table 8 shows a summary of the actions and policies associated with GHG mitigation in the waste sector.

Table 8. Measures related to the mitigation of GHG emissions in the waste sector

Name	Type	Year and status	Description	Objectives/Goal	Implemented actions	Progress
National Program for Solid waste	Policy	2005 Implemented and active	It promotes the increase of urban solid waste (USW) with adequate final disposal in sanitary landfills (SL), and the closure of facilities without sanitary or environmental authorization.	I mprove health and environmental quality conditions in urban and rural centers nation-wide through the implementation of integrated and sustainable systems for efficient management of solid household waste.	- Proposal to update the Operative Guide formulated in the year 2012, mainly guidelines in relation to the applications of funding sources and minimum requirements. - Improvement of Technical skills for professionals in the area of solid household waste (SHW) through training and enrichment days addressed to professionals competent in the subject (public).	During 2015 Investment of approx. USD260,000 in projects in 5 regions of the country.

Name	Type	Year and status	Description	Objectives/Goal	Implemented actions	Progress
D.S.N°45 Emission standard for incineration and co-incineration	Regulatory	2007 Implemented and modified	It allows the emission standard for incineration and co-incineration in cement kilns, lime rotary kilns and forest facilities using treated forest biomass.	Prevent the negative effects on the health of the population and natural resources derived from the emissions coming from the processes regulated by this decree.	No info	No info
D.S. N°4 Regulation on the management of sludge generated in sewage treatment plants	Regulatory	2009 Implemented and active	It establishes the sanitary classification of sludge and minimum sanitary requirements for its management, as well as restrictions, requirements and technical conditions for the application of these limitations in certain soils.	Regulation on the management of sludge generated in sewage treatment plants.	No info	No info
D.S. N°6 Regulation on Waste Management of Health Care Establishments	Regulatory	2009 Implemented and active	It establishes the basic sanitary and safety conditions that must be in force regarding the management of waste generated in health care establishments.	Prevent and control risks associated with waste management for those who work in health care facilities.	No info	No info
D.S. N°3 Regulation for the management of sludge from effluent treatment plants by the fruit and vegetable processing industry	Regulatory	2012 Implemented and active	It establishes the minimum sanitary requirements for the management, restrictions, requirements and technical conditions regarding the application of sludge in certain soils.	Regulate management of sludge from plants in the treatment of effluents used by the fruit and vegetable processing industry.	No info	No info
D.S. N°1 Regulation of the Register of Pollutant Releases and Transfers (PRTR)	Regulatory	2013 Implemented and active	Regulates the PRTR, which will systematize, by source or group of sources, the nature, flow rate and concentration of emissions of pollutants that are subject to an emission standard; And the nature, volume and destination of solid waste generated affected by the regulation.	Capture, collect, systematize, preserve, analyze and disseminate information on emissions, residues and transfers of pollutants potentially harmful to health and the environment, generated by industrial or non-industrial activities or transferred for recovery or disposal.	-Implementation of the Single Window System of the PRTR, which allows standardization of the information reported by industrial establishments and public services, as a result of environmental regulatory compliance, integrating through these systems all notification and reporting systems in force up to the date (May 2, 2014).	As of July 2016 there are 19,275 registered establishments. Of these, 4,821 are registered in the Non-Hazardous Industrial Waste Declaration (SINADER) and 11,368 in the Hazardous Waste Declaration and Monitoring System (SIDREP).

Name	Type	Year and status	Description	Objectives/Goal	Implemented actions	Progress
D.S.N°29 establishes Emission Standard for Incineration, Coincineration and Coprocessing.	Regulatory	2013 Implemented and active	Modifies DS 45	Prevent the negative effects on the health of the population and natural resources derived from the emissions coming from the processes regulated by this decree.	No info	No info
Law N° 20.920 Framework Law for Waste Management, Extended Responsibility by Producers and Promotion of Recycling (REP). (*)	Regulatory	2016 implemented and its respective regulations are under development	It establishes that producers (manufacturers and importers) of "priority products" must be responsible for the products, once they end their useful life. For this, the law establishes goals of collection and valorization differentiated by product. The priority products are lubricating oils, electrical and electronic equipment, batteries, containers, packaging and tires.	Reduce the generation of waste and encourage its reuse, recycling and other types of recovery, through the establishment of extended responsibility by the producer and other waste management instruments, in order to protect the health of people and the environment.	-Promulgated on May 17, 2016, and published in the Official Journal on June 1, 2016.	The budget considers 6 billion 113,340 pesos (M $ 6,133,340) in regime (about 8.7 million dollars). In period 2017-2022, emission reductions of around 38 MtonCO_2e are expected to be achieved.

Source: Own elaboration based on sectoral information
N/I: No info

Regarding the quality of the information in the sector, it is important to point out that there are no reliable and public sources that provide quality information to validate any estimates made in the sector. In this context, it should be noted that the Regulation on the Register of Pollutant Emissions and Transfers (PRTR) establishes that since 2015 onwards, the National System for the Declaration of Waste (SINADER) will be implemented, where generators and recipients of non-hazardous industrial waste generate, value or dispose of more than 12 tons per year, as well as all municipalities, must declare household waste generated in their communes. On the other hand, Law No. 20.920 proposes an important advance in the registration of information, by providing that: *"Generators and waste managers will be obliged to maintain an up-to-date electronic register of a public nature. This record shall contain, at least, antecedents associated with the quantity, origin, nature, management and destination of the waste. The information shall be available at all times, for any person and body of the State administration that by its functions requires such information, in a database, by any controllable or auditable means, for at least 5 years."* Therefore, the monitoring and registration systems for solid waste, especially those in electronic format, constitute a very relevant traceability tool for purposes of volume and emission estimates.

4.3. Other mitigation actions

This section describes initiatives that by their nature contribute to GHG mitigation, but involve actions in more than one sector.

4.3.1. Clean Production Agreements

The Clean Production Council (CPC) was created by the CORFO Directing Board Agreement 2091/2000 in December 2000, although its origins date back to 1998, with the creation of the Public-Private Clean Production Committee by the Ministry of Economy.

The CPC is defined as an instance of dialogue and joint action between the public sector, companies and their workers, in order to establish and disseminate an approach to environmental management that focuses on pollution prevention rather than its control final. With this purpose, it must be aware of and evaluate initiatives that promote clean production and prevention of pollution in the productive sector, and ensure that the necessary actions are taken in various public institutions for this purpose.

The main management tool created by the CPC is the Clean Production Agreement (CPA), defined in article 2 of the Clean Production Agreement Act, as established in article tenth of Law 20,416 of the Ministry of Economy that sets special rules for smaller companies and stating that "for the purposes of this law, a Clean Production Agreement is understood as the agreement between a business sector, company or companies and the state administration body with competence in environmental, health, hygiene and occupational safety, energy use and productive development, whose objective is to apply clean production through specific goals and actions.

In the early years, the CPA did not consider actions geared specifically to the reduction of GHG; however, a series of measures agreed upon within the framework of these agreements resulted in real reductions. That is why in 2010, with 54 CPAs implemented and certified by the Clean Production Council in the period 2002-2010,

Rutas del Vino, SERNATUR.

the Council commissioned a study to calculate the GHG reductions of sixteen CPAs in different industrial sectors. The results showed that the sectors analyzed had reduced GHG emissions by 4,050,973 tCO_2 eq.

In 2012, the Council registered the CPAs as the first Nationally Appropriate Mitigation Action (NAMA) in Chile to the UNFCCC and they were validated. It is currently in operation and has incorporated various GHG mitigation alternatives into the Clean Production Agreements, in addition to the generation of indicators to monitor its progress. More up-to-date information on this NAMA can be found in Annex IV of this report.

4.3.2. Sustainable construction and urbanism

The Ministry of Housing and Urban Planning incorporates sustainable development into its policies, plans and strategies. One of them is the formulation of the National Policy of Urban Development, which establishes five goals: Improve the quality of life of the people; Support the decentralization of the country; Promote an institutional reorganization for the development of cities and territories; Support the sense of unity and coherence in the implementation of legislation and regulations in order to respond to the new requirements of society; And generate certainties that facilitate the coexistence of citizens in the territory and provide an environment leading to the development of society and public and private investment initiatives. With these objectives in mind it defined five thematic areas:

1. **Social integration:** cities must be inclusive places where people feel incorporated into urban benefits.
2. **Economic development:** cities are sources of innovation, entrepreneurship and job creation, and public and private agents must take responsibility for both social effects and externalities.
3. **Environmental balance:** it promotes a development in balance with the natural environment and natural systems are considered a fundamental support.
4. **Identity and heritage:** considered social assets.
5. **Institutionality and governance:** establishing the need for an institutional reorganization, facilitating the existence of an integrated and decentralized system of decision-making related to urban and territorial development.

This policy, in force since March 2014, is in its implementation stage, in a process guided by the National Council of Urban Development, with wide and diverse national representation, defined by the Presidency of the Republic and by the Ministry. In terms of climate change, various guidelines and objectives of this policy contribute to the mitigation of GHG emissions; for instance, measures aimed at reducing energy consumption, adopting the life cycle concept in the evaluation of buildings, and reducing pollutant emissions in the construction and service life stages of the infrastructure. It also proposes efficient and comprehensive planning actions that can, among other actions, facilitate the processes of adaptation to climate change.

In PANC-II, the Ministry of Housing and Urban Planning also defined that its mitigation actions could be categorized in measures to reduce GHG emissions from housing through the energy efficiency of buildings and actions that would contribute to the reduction and capture of emissions through measures and programs of investment in urban design and management. These actions are summarized in Table 9 and Table 10:

Solar, MMA.

Archivo MMA.

Table 9. Mitigation actions in the housing sector

Name	Type	Year and status	Description	Objectives/Goal	Implemented actions	Progress
Thermal regulation (second stage) (*)	Regulatory - Standard	2007 onwards / Imple-mented and active	It establishes the requirements of thermal conditioning to housing, determining requirements for roofing complexes in a first stage, then continue with the walls, ventilated floors and maximum area for windows (2nd stage).	Reduce by 30% the energy demand for heating in homes meeting this standard in comparison to the one in force since 2007, according to the Energy Agenda, incorporating habitability criteria, seeking to reduce pathologies and ensure indoor air quality.	5 years for design and implementation (gradual). Development of the first stage of thermal regulation (thermal insulation in roofs). Development of a manual for the application of thermal regulation.	Studies are currently under development. In period 2017-2022, emission reductions of around 170 MtonCO_2e are expected to be achieved.

Table 9. Mitigation actions in the housing sector (Continuation)

Name	Type	Year and status	Description	Objectives/Goal	Implemented actions	Progress
Home Energy Rating	Information - Labeling	2015 onwards / Implemented and active	Initiated by the Ministry of Housing and Urban Planning and the Ministry of Energy, which qualifies the energy efficiency of homes built after 2007, considering the quality of its envelope, its consumption of hot water, lighting and heating.	Promote energy efficiency through the delivery of objective information by real estate developers to buyers (incorporate energy criteria in the purchase decision).	Development of an accreditation protocol for internal and external evaluators.	As of September 2015[24]: - About 16,000 homes already feature labels (81% social and 19% private housing units, approximately). - About 13,500 are under evaluation. - 91.6% of the social housing units evaluated have been rated E or higher, and 13% have scored at or above the C rating (homes with a good standard of efficiency). - Regarding private housing units, 66% achieve a grade C or higher.
Code and seal of Sustainable Construction	Policy	From 2016 and 2017 respectively / Implemented and active	The Code corresponds to the development of voluntary standards of sustainable construction for housing in 7 categories: health and welfare, energy, water, environmental impact, materials, waste and surrounding environment. On the other hand, the Seal corresponds to the development of a voluntary certification system that helps to encourage the market to incorporate the attributes of sustainability in the different stages of development of a residential project, that is, in the design, construction and operation	No info	Elaboration of drafts of the code of sustainable construction (October 2015).	No info
Housing Thermal Isolation Subsidy (*)	Economic incentive	2005 / Implemented and active	This subsidy allows to improve the thermal insulation of social housing or with an appraisal under 650 UF, allowing beneficiary families to access savings in heating and to reduce the effects of condensation inside the dwellings.	Decrease 30% of the demand for fuel consumption for residential heating	Within the framework of the **Energy Agenda,** Minvu committed the annual delivery of at least 1 million UF in heating subsidies for housing located between Coquimbo and Magallanes	-During 2014, 14,483 thermal conditioning subsidies were allocated. -During 2015, 2,649 subsidies to improve homes located in cities with atmospheric decontamination plans. In 2016 a mitigation of 45.46 MtonCO_2e has been achieved. In period 2017-2022, emission reductions of around 187 MtonCO_2e are expected to be achieved.

Source: Own elaboration based on sectoral information and MINVU public account
The type of instrument is classified according to an economic, fiscal, technological, regulatory, institutional or policy measure.

[24] *Ministry of Housing and Urban Planning, http://www.minvu.cl/opensite_det_20150910121137.aspx (reviewed on July 22, 2016).*

Table 10. Mitigation actions in the urban development sector

Name	Type	Year and status	Description	Objectives/Goal	Implemented actions	Progress
Reduce the deficit of green areas in the country, through investment in parks and open spaces.	Policy	2015 / Implemented and active	The parks are an urban facility offering multiple eco-systemic services. They offer open spaces that allow to realize a great variety of activities outdoors which are beneficial for the health of the people. They also fulfill an important environmental role in climate regulation, regulation of runoff, infiltration of rainwater, capture of pollutants, are habitats for wildlife and provide biodiversity to urban habitats.	- Plan of construction of parks: construction of 34 new urban parks. - Program for Conservation of Urban Parks: the conservation of 8 urban parks is programmed for 2016. According to the budget definition of the following years, the corresponding annual targets will be defined.	Progress in efforts to implement the Urban Park Construction Plan Advances in the Program of Conservation of Urban Parks: realization of the first call in 2015. Fourteen urban parks were selected.	Plan of Construction of Urban Parks - The construction of 5 urban parks has been completed. - 10 parks are under construction process. - 14 parks are in the bidding stage for works. - 5 parks are in the process of design. Program of Conservation of Urban Parks. - A park is under conservation regime. - 7 parks are in the process of bidding for their conservation. - The bidding process for the remaining 7 parks is scheduled for 2017.

Source: Own elaboration based on information from PANCC II
The type of instrument is classified according to an economic, fiscal, technological, regulatory, institutional or policy measure.

4.3.3. Local efforts regarding climate change mitigation

The inclusion of mitigation considerations and actions in public policies is increasingly necessary and evident, not only at national level but also at the municipal level. That is why, in January 2014, the Chilean Network of Municipalities for Climate Change (RCMCC) was created[25], an initiative promoted by the municipalities themselves.

This network is a community open to all municipalities in Chile that wish to take the explicit commitment to plan and manage their territory, services and goals considering climate change as the new scenario that is determining the challenges of the 21st century (Adapt-Chile, 2014).

The network provides a platform for municipalities to integrate climate change into their management and planning, and to promote mitigation, adaptability, resilience and sustainability in their territories. The work of the network is based on the conceptual approach presented in the document "Agenda for municipalities in the face of climate change" (Adapt-Chile, 2014), where an urgent appeal is made to municipalities to assume a central role in response to climate change through mitigation and adaptation measures. This agenda, designed as a guiding framework for the definition of specific plans, programs and projects, establishes eight priority thematic areas for climate change work at the local level, ensuring that they are consistent with the network's proposed objectives to strengthen the local response to climate change. In general terms, it guides local work to promote adaptive capacity in the face of climate change and low carbon development.

The work and objectives of the network are developed around three areas of action: political-strategic, technical and communicational

Policy-strategic objectives:

a) Highlight the role of local governments by integrating climate change into the management and internal policies of their members.
b) Develop local policies, strategies, plans and programs to address the challenges of climate change in terms of adaptation and mitigation.

[25] *www.redmunicc.cl.*

c) Promote the public role of the municipality and its responsibility to carry out climate actions to ensure the well-being of the community.
d) Foster the connection between different levels of governance to raise the discussion and political action on climate change in the country.
e) Promote partnerships between the public, private, academic and civil society at the local, national and international levels.
f) Ensure the continuity of local work on climate change.

Technical objectives:
a) Provide permanent information and technical capacity for the integration of climate change in municipalities.
b) Provide a permanent space for the exchange of experiences and best practices intended for the integration of climate change into local management.
c) Guide local work on climate change, in accordance with the priorities established and agreed in the Agenda of Municipalities for Climate Change.

Communicational Objectives:
a) Spread and promote the work of each member and of the network as a whole.
b) Deliver tools and capacities to strengthen communication and action on climate change at the local level.
c) Support the generation of awareness to catalyze citizen action in the face of climate change.

In July 2016, eight municipalities had a Local Energy Strategy (EEL) and fifteen were in development.

To achieve its objectives, the RCMCC operates according to a work agenda based on six objectives[26],one of which is GHG mitigation in the transportation, energy and waste management sectors, although there are also co-benefits with the objectives of biodiversity and green areas (for the ability to sequester green areas) and infrastructure (for example, green shopping).

In 2015, Adapt-Chile carried out the project "Climate Change Academies: Climate Change Plans for Local Governments, funded by the European Union through the Euroclima program. The project provides a methodological tool for the elaboration of local climate change plans that allowed six municipalities of the network - Colina, Independencia, Lampa, La Pintana, Providencia and Santiago - to develop in a participatory way their Local Climate Change Plans (Adapt-Chile, 2015)

During 2016, the Local Energy Strategies project, developed by Adapt-Chile and financed by the Ministry of Energy through the Energy Commune Program, will allow five municipalities of the network -Colina, Santiago, Recoleta, Independencia and La Pintana- to develop participatory means their Local Energy Strategies, which contemplate three central items: i) energy diagnosis and estimation of energy potentials based on the reality of the commune; ii) definition of a vision that responds to the particular interest of the commune and that integrates in some sense the EE, incorporate NCRE according to available resources of each commune and reduce CO_2 emissions, and iii) definition of goals and a plan of action that guide the work of the commune in the energy field. (Adapt-Chile, 2016)

4.4. Mitigation efforts in the private sector

The private sector is a key player in climate change mitigation. On one hand, the mitigation potential it possesses will significantly influence the actual options for compliance with international commitments; and, on the other hand, has a leading role in the implementation of possible public mitigation policies that are defined at the national level.

However, in the absence of regulations limiting GHG emissions, the implementation of mitigation measures by this sector will depend not only on strategic decisions within companies, but also on a number of national and international circumstances, which will significantly influence the willingness of companies to innovate in this area. According to information provided by trade associations and representatives of different productive sectors, voluntary circumstances with international associations, multinational corporate policies, the eventual opposition of local communities and the identification of a business opportunity. On the contrary, the main circumstance that will negatively influence the private sector's actions is the uncer-

[26] *www.redmunicc.cl/web/agenda-municipal.*

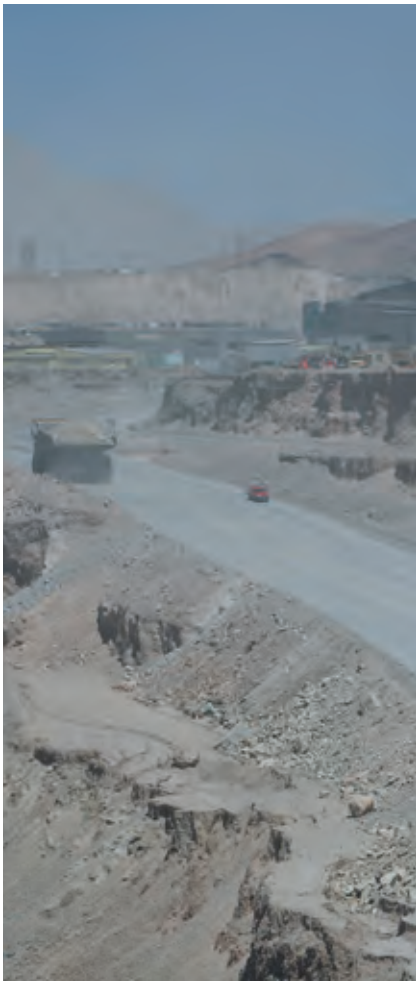
tainty regarding future mitigation requirements that may affect this sector, which discourages proactivity in terms of GHG reduction.

Regardless of this uncertainty, the various sectors increasingly recognize the economic and social benefits associated with the implementation of mitigation measures, thus increasing the willingness of the private sector to introduce such measures. Among the benefits that companies identify are the reduction of production costs, positioning in different markets (national and international), identification and reduction of economic risks, attraction of investors, reduction of local rejection, among others. A reflection of the importance and recognition of these benefits is the growing number of institutions (public and private) dedicated to disseminating the scope of these benefits among private sector actors. These institutions aim to encourage the implementation of mitigation measures in companies through the dissemination of information, the creation of instances of public-private discussion and between companies, the design and articulation of sectoral mitigation strategies, and the provision of emission quantification tools. In this regard, the private initiatives that stand out are the Center for Business Leaders against Climate Change (CLG-Chile), the Santiago Climate Exchange (SCX), Action CSR and CDP; While the public initiatives to be highlighted are the HuellaChile Program, the ProChile Sustainable Trade Subdepartment and the National Clean Production Council (CPC).

When referring to the mitigation measures that are being implemented by companies from the private world, or in the process of design, some evolution can be observed with respect to the themes and scope of the initiatives presented in the previous biennial update report. A few years ago, the measures were mainly focused on energy efficiency as a direct effect on the reduction of production costs was recognized. However, corporate policies have been further complicated by introducing initiatives associated with the calculation and management of GHG emissions, by setting internal carbon prices for project evaluation and even by setting internal emission reduction targets. It should be noted that these measures, for the most part, have been introduced proactively and voluntarily by the private sector.

When analyzing the situation that the companies face at sectoral level, it is possible to identify different motivations and difficulties that will directly influence the type and scope of the measures implemented.

On the part of the energy sector, mainly in relation to generating companies and according to information provided by its trade association (Generadoras SA), the measures aim mainly at the reduction of GHG emissions and the generation through sources of NCRE[27], since, on the one hand, is the sector identified as the main source of GHG emissions at the national level, and on the other, it is the sector subject to the next taxation in relation to its CO_2 emissions.



Chuquicamata.

In the case of the forestry sector, identified as the main emissions sink, measures implemented in addition to the same forestry activity (responsible for the sequestration of emissions) respond to the sector's own needs but have mitigation co-benefits, such as the case of co-generation of energy through biomass as a solution to the waste management industry[28].

Significant advances have been observed in the agricultural sector, especially those carried out by the wine

[27] *Personal Communication, Generadoras S.A., April 2016*
[28] *Personal Communication, CORMA, May 2016*

companies, are due to the greater experience in this area due to the requirements they have had to fulfill in order to export to certain countries. In addition, it is one of the few sectors that project climate change as an opportunity rather than a threat, which justifies the efforts to have more information applied and to introduce the necessary changes[29].

The main needs of the mining sector, as reported by its trade associations such as the Mining Council and the National Mining Society (SONAMI) are associated with the reduction of energy consumption (fuels and electricity) as it corresponds to one of the inputs more important and more costly for the industry. This is why the measures implemented by this sector focus mainly on energy efficiency, which is reflected in institutional arrangements between public and private organizations that seek to promote this type of measures in mining companies, as is the case of the Cooperation Agreement Of Energy Efficiency signed between SONAMI and the Ministry of Energy. This sector, moreover, through the Mining Council, has been the first to define specific principles of climate change that come to define the framework of future action of the member companies of this association. These principles include considerations with regard to mitigation through cost-effective and energy-efficient measures, the introduction of renewable resources and other technologies, and support in the definition and use of market-based instruments to reduce emissions, among others (Council Miner, personal communication, August 2016).

Finally, it should be noted that the cement and steel industries. In this regard, voluntary technology innovations and membership in international partnerships, such as the Cement Sustainable Initiative (CSI), have been key to the development of the cement industry in climate change mitigation, where its potential to reduce emissions, such as substitution of fossil fuels through co-processing with industrial waste has been limited in the absence of national regulations regulating sectoral mitigation activities[30]. For its part, the steel sector has been contributing to climate change mitigation through various measures such as the quantification and communication of carbon footprints, the implementation of energy management systems and through complementary initiatives for the reforestation of hills and Parks of the city of Santiago as part of corporate plans for compensation of particulate matter[31]. In relation to this sector, it is necessary to mention the lack of instances of capacity building and technology transfer to disseminate and replicate the progress made by some companies in the industry.

It is necessary to mention that the implementation of measures with direct mitigation benefits, such as the quantification, management and compensation of emissions, as well as the introduction of internal carbon prices and reduction targets; were initiatives that were found in all sectors. However, they can not be defined as a general trend since they are implemented only by some companies and respond to corporate decisions and interests. On the other hand, although the private sector's contribution to climate change mitigation has been significant, its potential and development differ widely among the different sectors analyzed. These differences are mainly due to the operational characteristics of each industry and the context in which they are developed.

There is also a series of barriers, gaps and needs that are transversal to the sector, and others that vary according to the industry analyzed, which prevent the development of the full potential of emission reduction represented by the national private sector. In this sense, the particularities of the productive processes of each sector, the lack of capacities within the companies, the few instances of technological transfer within the industrial sectors and, mainly, the absence of a national legislation that clearly defines the rules and requirements for the private sector on climate change are just a few examples of the issues that remain to be resolved in order to achieve meaningful, comprehensive and strategic progress in mitigating climate change at the national level.

[29] *Personal Communication, Wines of Chile, June 2016*
[30] *Personal Communication, Cementos Melón, July 2016*
[31] *Personal Communication, Gerdau Aza, July 2016*

5. Nationally Appropriate Mitigation Actions (NAMA)

According to the UNFCCC, the NAMA concept refers to any action that reduces emissions in developing countries and is prepared under the umbrella of a government initiative. These actions may be policies aimed at achieving transformational changes within a sector of the economy, or actions by all sectors for a broader national approach. The NAMAs are supported and facilitated by technology, financing and capacity building, and are aimed at achieving a reduction in emissions related to the business as usual scenario in 2020 (CMNUCC, 2014).

RN Coyhaique, Francisca Villalón.

5.1. Chilean NAMAs

In October 2010, the Climate Change Office (OCC) of the Ministry of the Environment initiated a process to raise NAMA ideas and proposals from Chile's main emitting sectors, which would seek international support, facilitated by a file Developed for these purposes by the Ministry. The initial portfolio of NAMA in Chile was constituted with several proposals, especially from the Ministries of Agriculture, Energy and Transport.

With the opening of the NAMA registry prototype and after the official registration (NAMA Registry), Chile was able to complete the work and in October 2012 was the first country in the world to register a NAMA before the UNFCCC. However, despite the initial enthusiasm for the instrument, it has not been possible to increase the interest of the developers of projects with potential of mitigation. It is not that there is a lack of initiatives, but rather that the added value provided by the registry does not seem to be sufficient to encourage its massive use.

In general, the developers of mitigation actions have obtained international support for their preparation through international mechanisms and projects for which it is not required to be in the register of the convention.

5.2. Summary of Chilean NAMAs

In Chile, six sectoral NAMAs are identified, with different levels of maturity and available information. Of these, five are registered in the NAMA Registry of the UNFCCC. Some of the NAMAS have undergone important changes in their design that are reflected in the sheets of Annex IV. A brief summary of the Chilean NAMAs registered in the NAMA Registry is presented in Table 11 below, in addition an update of the NAMA Carbon Capture in soils is presented, an initiative developed by the National Institute of Agrarian Innovation (INIA) of the Ministry of Agriculture.

Table 11. Nationally Appropriate Actions of Chile

Name	Description	Sector and gases	Time frame	Estimated GHG reduction	Progress
Renewable Energies for Self-consumption in Chile (SSREs)	Promote the incorporation of renewable energy systems for self-sufficiency in Chile through the creation of adequate financial and technical conditions for the early stages of the development of this emerging industry.	Energy CO_2	2015-2021	1,5 $MtCO_2eq$.	- €15 million were awarded through the NAMA Facility - The Nama Support Project (pre-implementation) is in the planning stage and detailed preparation
Green Zone for Transportation in Santiago	It consists of four specific (scalable and replicable) initiatives to promote low-carbon transport modes: 1) Promotion of zero and low emission vehicles in fleets in light vehicles; 2) More efficient buses for public transport; 3) Promotion of use of non-motor vehicles 4) Traffic management and redesign.	Transpor-tation and infrastructure CO_2	2014-2022	1,43 $MtCO_2eq$	Component 1: three operative electric taxis Component 2: one operative electric bus Component 3: public bicycle system implemented (18 stations); two new high standard bike paths Component 4: three new semi-pedestrianization axes implemented or in implementation; one hundred surface bike shelters installed In July 2016 the progress of emission reductions was under estimation process
Design and Implementation of the Climate Change and Vegetation Resources Strategy	The objective of the NAMA is comprised within the framework of the National Strategy for Climate Change and Vegetation Resources (NSCCVR), serving as technical and economic support for the development of studies and activities aimed at identifying and reducing weaknesses in baseline information in addition to enhancing the capacities of national and regional technical teams linked to The NSCCVR. The emission reduction goal considers the implementation of the NSCCVR as a whole, considering adequate international and national financing.	LULUCF	2013-2025	42 $MtCO_2eq$	Development of methodological protocol to determine the degree of reduction of vulnerability to climate change, linked to the Framework of Social and Environmental Indicators of the NSCCVR, which will be used as a basis to generate the reports that will contain the System of Implementation of Safeguards. Two territorial projects aiming to test and improve the definition of action measures related to forestry preventive forestry activities International courses in the context of vegetation resources, climate change and desertification.
Clean Production Agreements (CPA) in Chile	The purpose of the CPAs is to implement clean production through goals and actions within a given period. It is a standard that sets specific goals and actions to be implemented by a productive sector, based mainly on the best techniques available in the market.	Transversal	2012-2020	18,4 $MtCO_2eq$	- 2015: 17 agreements signed, accumulating 46 agreements since 2012 - Estimated cumulative reduction: 2.224.083 tCO_2 eq
Energy recovery program for industrial waste (former National Program for Industrial and Commercial Catalysis in Organic Waste Management in Chile)	This NAMA is in the process of redesign, changing its objective to achieve a program of energy recovery of industrial waste.	Energy, waste CO_2; CH_4	To be determined	Potential reduction in estimation process	The original design presented difficulties of implementation, reason why with international support a study is developed to modify it, focusing on the energetic benefits of the treatment of industrial waste. It is expected to count in 2016 with this new design and with the estimation of potential reductions

Name	Description	Sector and gases	Time frame	Estimated GHG reduction	Progress
Carbon sequestration through sustainable soil management	Capture of CO_2 by the soils, through their stabilization. This initiative is being worked on with the intention of registering it as NAMA before the UNFCCC. It consists of four (4) stages: Stage 1: Research base to generate a Geographic Information System to evaluate the current conditions of the soils. Design of NAMA and creation of a Software that counts the measures of C catches in soils and their impact, developed for the Chilean conditions. Stage 2: Design of the software positioning and dissemination plan. Stage 3: Dissemination to the final beneficiaries of the software. Stage 4: implementation and promotion of soil conservation management.	Agriculture, Forestry/ AFOLU CO_2	To be determined	65-80 $MtCO_2e$. Estimated CO_2 capture estimation methodology. The calculation was made on the basis that 5% of the country's agricultural area (rounded up to 100 thousand ha) will end up being managed conservatively and that the expected increase in soil organic carbon will be 4 percentage points, meaning each 45 tC or 169 tCO_2 per hectare. This comes from the assumption that: · Apparent density= 1,5 g cc-1. · Depth of soil impacted in the first 30 cm of the soil profile.	We are currently analyzing the results of the measurements made in Stage 1 and proceed in Step 2. * The main advances obtained since the first IBA, are: 1. The scenario (regions VI to IX) is to have COS contents greater than N to S, where the Andisols soils are dominant. 2. One of the four management practices - the use of compost - only occurred in Regions VIII and IX. 3. Zero tillage: Compared to natural grassland, C catching would be more promising in N + (VI, VII) regions. 4. Improved grassland: Compared to natural grasslands, the catch of C would also be more promising towards the more N regions (VI, VII). 5. Incorporation of stubble: compared to stubble burning, COS contents tend to be lower in soils without burning but with improved physical properties. Apparently, there would be interference from the residual char of the fires in the analytical determinations. 6. Incorporation of compost: compared against non-incorporation of organic matter, the results are promissory although they only have relation with the two regions more to S. 7. With these field measurements, we try to validate the CENTURY model, defined as the most appropriate for Chile, to simulate changes in the COS due to changes in management styles.

Source: Own elaboration.

6. Transversal Actions to Support a Low Carbon Economy

6.1. Emission Projection and Mitigation Options for Chile

Several projections of emissions and mitigation options have been made in Chile. The most recent work is the MAPS-Chile initiative, a government project that had broad public and private participation, and served as a basis for formulating the Chilean NPC document[32].

MAPS-Chile was conceived to deliver evidence, projections and options aimed at reducing GHG emissions in Chile, through a multi-stakeholder research and participation process that was implemented between 2012 and 2015. In particular, it aimed to support decision-making by public and private actors by offering public policy options and private initiatives compatible with the goals of inclusive, competitive and low carbon development.

Funds for implementation came from the Governments of Chile, Switzerland and Denmark, from the Children's Investment Fund Foundation, the Climate Development Knowledge Network and the United Nations Development Program (UNDP).

The MAPS-Chile project studied different scenarios for the projection of GHG emissions, relevant in order to generate the necessary evidence on different courses of action that the country can follow. Specifically, a series of emission trajectories were projected through research, modeling and simulation results.

The project was carried out in three phases. During Phase 1 (results presented in July 2013), the 2007-2030 baseline scenario or growth without restrictions and the required scenario was projected, while in Phase 2 the baseline scenario 2013-2030, which evaluated possible mitigation measures for the sectors of the economy contemplated by the project. Along with this, different mitigation scenarios were identified and evaluated and results were delivered on the economic impact of mitigation measures and scenarios from a general equilibrium model. Finally, in the third phase of the project, the results of Phase 2 were refined, the co-benefits of the mitigation measures were analyzed and mitigation options were identified for the 2030-2050 horizon with a non-traditional approach or *out of the box*. (MAPS-Chile, 2014)

MAPS.

[32] *More information on the results, sectoral projections and the process available in http://www.mapschile.cl/*

Karina Bahamonde.

Phase 3 of the project (2015) sought to complete the analysis carried out in previous phases, including aspects that broaden the view and the time horizon. In essence, in this last phase the following works were carried out:

- **Review and refinement of Phase 2 results: c**arried out in the context of the definition by the Government of Chile about the NPC. These were modeling exercises carried out by the project research team that were used to prepare the draft National Contribution.
- **Analysis of possible co-impacts:** The mitigation measures that are part of the co-impact analysis were selected in a deliberative process with the Vision Construction Group and were settled by the MAPS-Chile Steering Committee. Co-impacts were originally identified by the Vision Construction Group; subsequently, the Panel of Experts reviewed, modified and defined the final list of co-impacts analyzed.
- **Long-term mitigation:** the course of the scenario was updated based on the results of the fifth report of the IPCC (Fifth Assessment Report).
- **Analysis of public policies in the transportation sector: t**he possible effects of the mitigation measures of transportation, residential, commercial and public sectors on local pollutants were analyzed in the context of the updating of the Plan of Prevention and Atmospheric Decontamination Metropolitan Region, and the feasibility of implementing the mitigation measures of the sector.

During the four years it lasted, the MAPS project improved the country's capacity to develop mitigation scenarios. In addition, as a process in itself, it was possible to understand how to design and implement projects that directly link scientific and academic research with the development of public policies. MAPS-Chile was a relevant exercise in integrating evidence and multi-stakeholder participation to address a very complex issue and specifically contribute to decision-making. This exercise made it possible to make progress in mitigating climate change in Chile, and a careful and critical look at its process will continue to provide lessons for improving public and private decision-making in areas where the interface between science and public policies is necessary to generate knowledge (MAPS-CHILE, 2016).

6.2. LECB-Chile Project

The Low Emission Capacity Building project for Chile is part of an initiative led by the United Nations Development Program (UNDP) in 25 countries. The project, funded by the governments of Germany and Australia, and by the European Commission, seeks to foster and build public and private capacities for the measurement and mitigation of GHG emissions through appropriate actions for the country, in order to Low-carbon development and improving public policies addressing climate change.

The LECB-Chile began operating in September 2012 for a period of three years and was executed by the OCC of the Ministry of Environment, with the support of UNDP. The following results were obtained:

- **Component 1.** Update of INGEI and creation of a national GHG inventory system
- **Component 2.** Implementation of the national carbon management program
- **Component 3.** Creation of an MRV system for NAMA in the public and private sectors
- **Component 4.** Design of a national low emission development strategy (LEDS), which incorporates the results of the first three components

The achievements of this project include the institutionalization of the national INGEI update process, the implementation of the HuellaChile Program (described in the next section) and the Public Climate Expenditure Review (CPER), among others. In addition, other relevant mitigation and MRV initiatives have been promoted through the LECB project, such as the "Guidelines for a generic MRV framework for NAMA" and the evaluation of a framework for carbon budgets in Chile, both managed by the Prosperity Fund of the United Kingdom.

6.3. HuellaChile Program

The link and alliances between the public and private sector are key to the implementation of GHG mitigation actions in the country. This is why the HuellaChile program is created as an initiative that seeks to promote the management of GHG emissions and gather information on the efforts of organizations in this area.

HuellaChile is the official initiative of the Government of Chile for the quantification, reporting and management of GHG emissions by organizations located in the national territory. It is also one of the first official instances for the active participation of the private sector in the mitigation of climate change.

HuellaChile.

The program also has the following objectives:

- Disseminate the management of GHG emissions and train the organizations in this matter.
- Facilitate the quantification of GHG emissions through a free online calculation tool.
- Establish channels for facilitating voluntary GHG reporting.
- Recognize the effort and commitment to the continuous improvement with logos of recognition to the early action of the participating organizations.
- Encourage the carbon market in Chile by recognizing the acquisition of carbon credits from national projects.

HuellaChile has been developed in two stages. The first one, implemented during 2013 and 2014, consisted of the design and planning of the program in accordance with the standards NCh-ISO 14064:2013 (parts 1, 2 and 3), NCh-ISO 14065:2014, NCh-ISO 14066:2012 and NCh-ISO 14069:2014. In addition, in this phase, a tool for calculating GHG emissions at organization level and a pilot test were developed with the voluntary participation of more than forty organizations.

Karina Bahamonde.

The second phase, which began in 2015 and corresponds to the implementation of the program, highlights three key aspects:

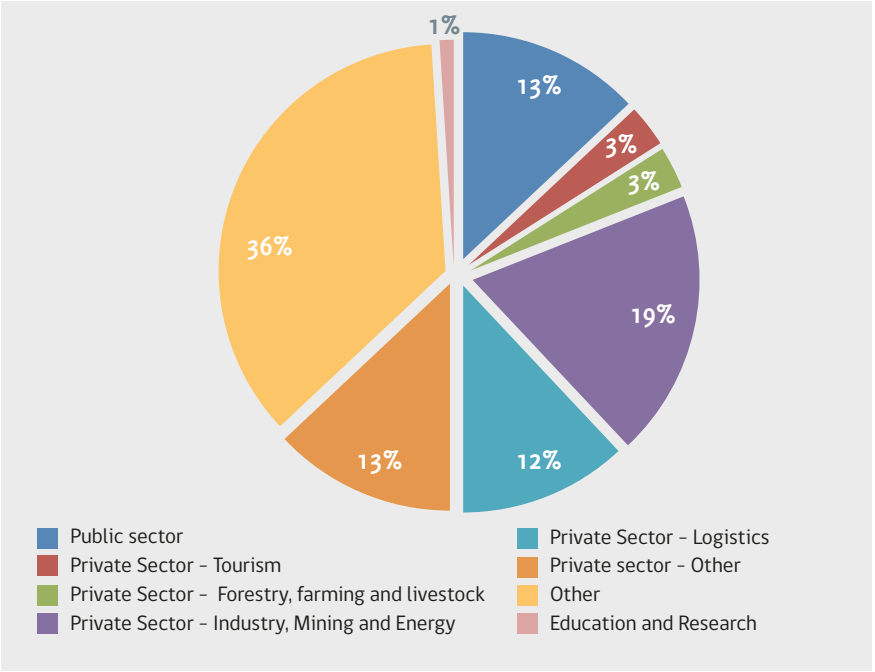
- Provision of an online and free corporate GHG emissions calculation tool, inserted in the Single Window System of the Pollutant Release and Transfer Register (PRTR).
- Technical support from the team of program professionals to participating organizations in order to propose mitigation actions and provide training on the quantification of GHG emissions and the use of the tool throughout Chile.
- Recognition with logos to participating organizations, depending on the management achieved. The levels of recognition are GHG quantification, GHG reduction, GHG neutralization and GHG management excellence.

At this stage the following activities were performed:

- The process of improvements in the calculation tool began, with the incorporation of new emission sources and emission factors approved with the SNIChile.
- Report formats and GHG quantification statements were defined.
- A working group was created in which more than ten verification organizations participated, the objective was to generate agreements regarding the verification process and propose integration actions to the program, identifying benefits and restrictions for various types of organizations.
- Training was provided on the calculation of GHG and user manuals were compiled from the HuellaChile calculation tool.
- The HuellaChile Program was included in the Ministry of Environment's public procurement requirements to encourage suppliers to join the program and begin calculating their GHG emissions so that, in the medium and long term, they take reduction actions.

Until the first half of 2016, the program had more than 60 registered organizations and nearly 700 people trained throughout Chile. Figure 4 shows the distribution of participants by sector.

Figure 4. Participating organizations by sector, first half of 2016



Source: Own elaboration.

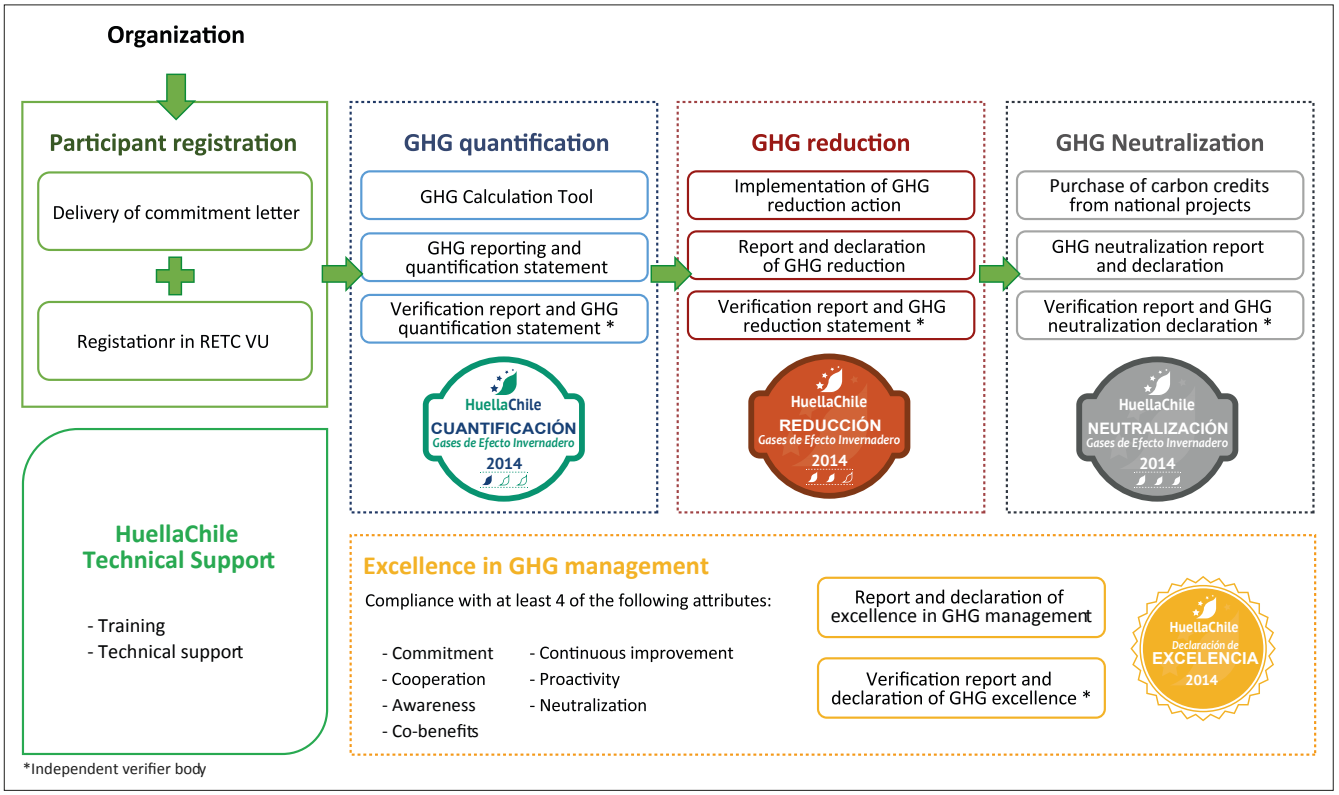
In order to participate in the program, organizations must send a letter of voluntary commitment for participation, the corresponding format is available at www.huellachile.cl, register at the PRTR Single Window and request the sector system "carbon footprint". Once registered, participants can enter activity data for one year in the calculation tool, resulting in an Excel sheet called "Report of GHG emissions". Subsequently, with the results obtained in the report, a statement and a report must be prepared, the formats of which can be found on HuellaChile's website.

One of the stages of the program is the verification by an independent body, which is a requirement for obtaining recognition logos. After the verification, a declaration is issued confirming the conformity of the report and the declaration of actions for quantification, reduction, neutralization and other attributes associated with the management of GHG emissions.

Figure 5 presents the levels and procedures required to achieve each recognition logo.

Valparaíso, Jenny Mager.

Figure 5. Process of participation of the HuellaChile Program



Source: Own elaboration.

The recognition logos show the carbon management carried out by the organization during a year, in accordance with the following guidelines:

- GHG quantification: It is granted to organizations that quantify, report and verify with an external independent party their GHG emissions for one year.
- GHG reduction: It is granted to organizations that in addition to the above-mentioned actions apply initiatives to reduce them. These GHG reductions must be verified by an independent party.
- GHG neutralization: It is granted to organizations that achieve the neutrality of GHG emissions through mitigation measures and the acquisition of carbon credits.
- Excellence in GHG management: It is granted to organizations that, in addition to meeting quantification and reduction requirements, have at least four of the following six attributes: neutralization, commitment, proactivity, cooperation, dissemination and training, and co-benefits.

The program keeps a record of all the institutions that have obtained a logo, with the respective reports and declarations. The reports will be used exclusively by the external verifier and the program.

The participants of the program will be able to make use of the different logos associating them exclusively to the organization that obtained the recognition. They will not be able to make use of the logo in their products, since the scope of the quantification of GHG emissions is organizational and not to a carbon footprint of product.

Parque Eólico Canela.

7. Carbon Pricing to Address Environmental Externalities

As the world continues to explore global GHG mitigation efforts after 2012, countries like Chile are exploring new and cost-effective ways to intensify emissions reductions and foster financial flows, including market-based instruments.

Chile has already used market instruments for the management of natural resources, mainly in water rights, fishing and air quality.

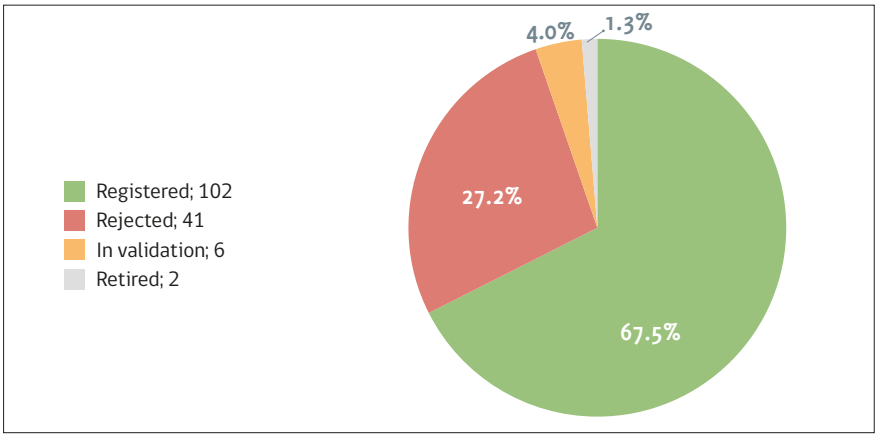
Planta Solar Quilapilun Colina, MMA.

7.1. Clean Development Mechanism of the Kyoto Protocol

Since Chile ratified the Kyoto Protocol in 2002, it has actively participated in the Clean Development Mechanism (CDM) and has become a relevant player in projects registered in Latin America and the world. In 2003, the National Designated Authority (DNA) was established, in accordance with the modality and procedures of the CDM, which has a technical committee, chaired by Ministry of Environment, in charge of reviewing and evaluating the background of each project to grant the National Letter of Approval (LOA), and report that project proponents participate in the CDM on a voluntary basis and that project activities contribute to the country's sustainable development.

From 2003 to date, the DNA of Chile has granted a National Approval Letter to 151 projects, of which 102 (67.5%) have successfully registered with the CDM Executive Board, 6 (4%) are in Stage of validation, 41 (27.2%) were rejected and 2 (1.3%) were voluntarily withdrawn by their proponents (Figure 6).

Figure 6. Status of Chilean projects submitted to the CDM Executive Board



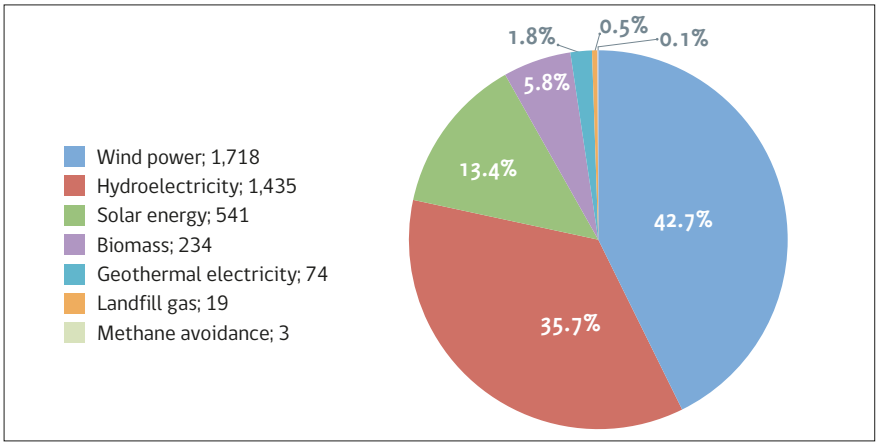
Source: Own elaboration of DNA in Chile based on information from the United Nations.

The projects registered or in the process of validation (108) represent 1.3% of all the projects carried out around the globe, bringing the country to the ninth place in the world, and 9.8% of those in Latin America, which places the country in the third regional place. Thirty of these projects (27.8%) are small scale. Figure 7 shows that the majority of the projects are related to hydroelectricity (31.5%), followed by wind energy (18.5%), landfill gas (13.9%), biomass (12%), methane avoidance (7.4%), solar energy (7.4%), nitrous oxide (2.8%), afforestation (1.9%) and other types (4.6%).

It is important to note that 77 CDM projects registered and validated correspond to new forms of energy, which have contributed 4,024 MW of installed capacity to the country. Figure 8 shows that the main contribution comes from wind energy (42.7%), followed by hydroelectricity (35.7%), solar energy (13.4%), biomass (5.8%), Geothermal (1.8%), landfill gas (0.5%) and, finally, avoidance of methane (0.1%). Chile ranks fifth among the countries with the largest installed capacity for CDM projects for solar and wind energy.

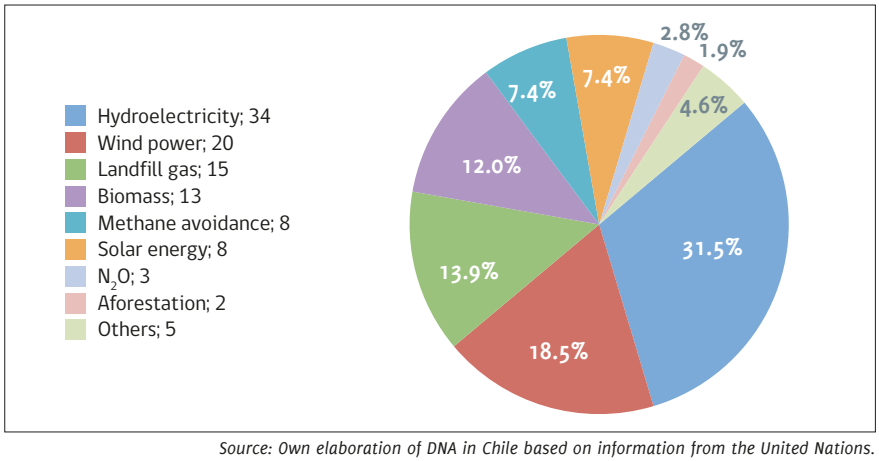
Regarding Emission Reduction Certificates (CERs) issued, 41 registered projects have already generated a total of CER 23.5 million, representing 1.4% of CER issued in the world and 10.7% in CER Latin America, which positions Chile as the sixth country with the most CER issued in the world and the third in Latin America.

Figure 8. Installed capacity (MW) of CDM projects registered and validated by typology

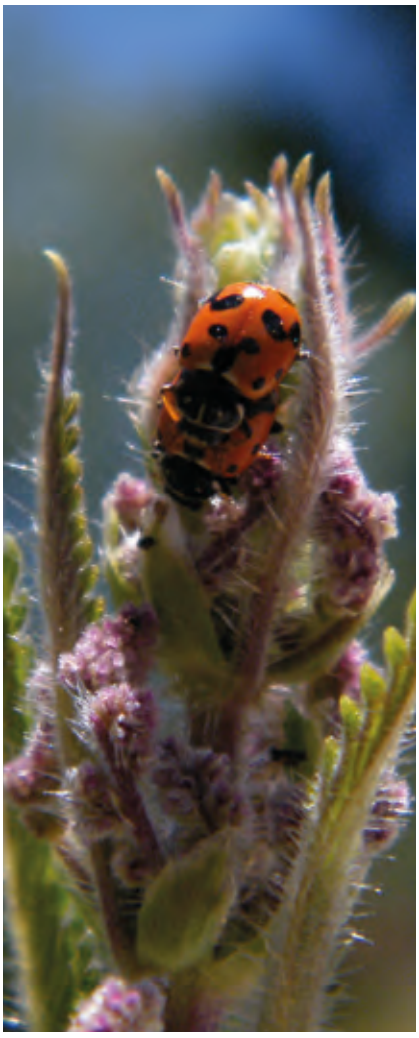


Source: Own elaboration of DNA in Chile based on information from the United Nations.

Figure 7. Typology of registered and validation CDM projects

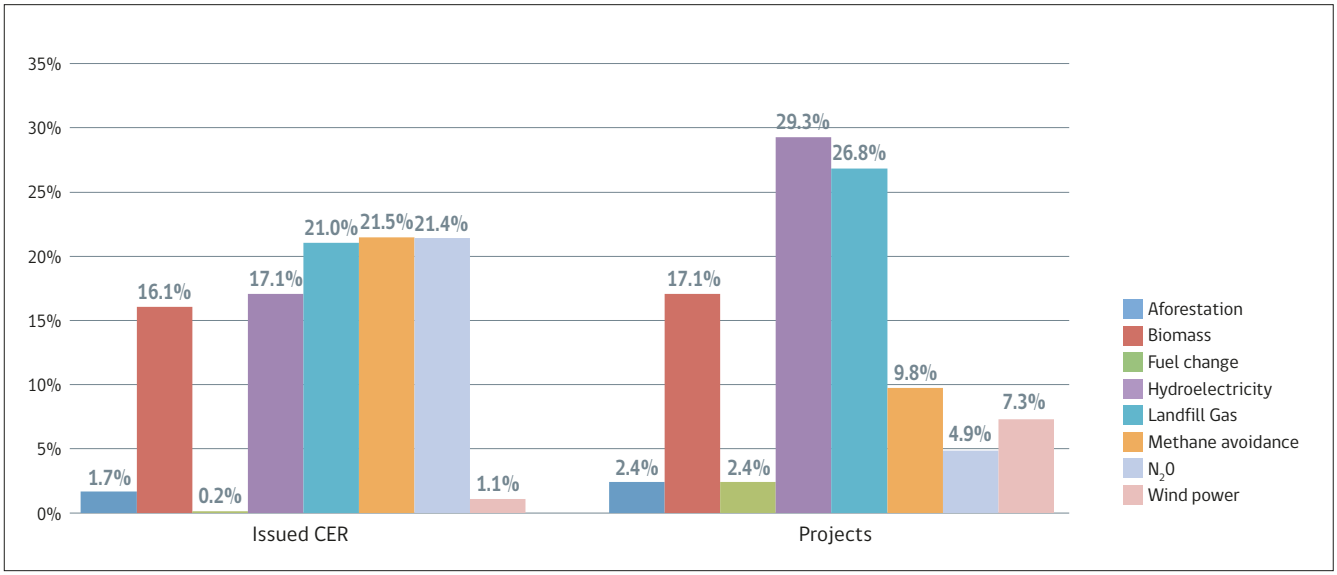


Source: Own elaboration of DNA in Chile based on information from the United Nations.



Gabriela Soto.

Figure 9. Percentage of CER issued and percentage of registered CDM projects that have issued CER, by type



Source: Own elaboration of DNA in Chile based on information from the United Nations.

Figure 9 shows that the main types of CER were methane avoidance (21.5%), followed by nitrous oxide (21.4%), landfill gas (21%), hydroelectricity (17.1% %), Biomass (16.1%), afforestation (1.7%), wind energy (1.1%) and fuel change (0.2%). On the other hand, while avoidance of methane and nitrous oxide together account for 42.9% of CERs, they represent only 4.9% and 9.8% of CER projects, respectively.

Another relevant aspect is that Chile has proposed 12 new methodologies to the Executive Board of the CDM, of which 10 have been approved, representing 6% of the methodologies approved in the world. These relate to biogas, biomass, CO_2 recycling, co-generation, fuel switching, hydroelectricity, nitrous oxide and waste.

7.2. Partnership for Market Readiness (PMR)

After the tax reform was announced and with the implementation of green taxes for the first time, adjustments were made to components 1 and 2 of the PMR-Chile project to respond to the country's priorities regarding price instruments to carbon (Chart 3), for which the first stage of the PMR project focused efforts on the implementation of the carbon tax and its MRV system. The latter was designed to be compatible with a tax escalation (towards other cur-

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rently unaffected technologies) or a potential tradable emissions system that could be linked to other markets. Despite the changes made in these components, the generation of robust information to execute the tax and to move towards more comprehensive market instruments in the future remains the central aspect of the project.

Today the PMR works in the implementation of the CO_2 tax by having the respective regulation approved and the required MRV protocol is in advanced design (see more details in the next section). National and regional meetings have been held, in particular with companies that are involved in the payment of green taxes, in order to spread the regulations and methodologies that are being designed to implement them.

Gira Coquimbo, MMA.

Regarding the possible evolution of the CO_2 tax, studies are being carried out that will give concrete proposals regarding the transition, total or partial, towards a more comprehensive system that considers offsets, other regulated sectors, or a system of Emissions trading for Chile. The first phase of the PMR-Chile project ends in September 2017, therefore it is expected to deliver these transition proposals to government authorities.

Chart 3. Context of the PMR project in Chile

Chile joined the PMR (Carbon Market Preparedness Alliance) in May 2011, after the World Bank approved its expression of interest and allocated USD 350,000 for the preparation phase. The donation was used for a series of basic analyzes, including the necessary elements for the design and implementation of a system of tradable emissions in Chile, including its MRV system, as well as proposals to design and implement mechanisms of carbon credits Sectors. In addition, it facilitated study tours to visit emission trading system (ETS) regulators in other countries.

The Ministries of Finance and Environment will support the Ministry of Energy as a focal point for the implementation of the project in Chile.

- **Component 1:** Assessing the feasibility of one or more carbon pricing instruments in the energy sector, taking into account the regulatory, institutional and economic analyzes required for its implementation.
- **Component 2:** Design and implementation of an MRV framework and a registry system to monitor and record GHGs online. Taking into account the Register of Pollutant Releases and Transfers (PRTR), the legal attributes associated with collecting data from this registry, as well as its capacity to serve as a single platform for reporting emissions, the Chilean government plans to improve and strengthen the calculation and reporting in the specific GHG area of the PRTR.
- **Component 3:** Communication strategy and participation commitment of the various actors related to the instruments being evaluated. Among other aspects, gaps and training needs will be identified in the public and private sectors, and technical visits will be made to countries with experience in these instruments.

7.3. Green taxes

On September 26, 2014, President Bachelet enacted the Tax Reform Law, introducing the first green taxes in Chile. These taxes correspond to three new charges. The first applies to the first sale of light vehicles according to their urban performance and NO_x emissions. The second applies to stationary sources and taxes the emissions to the atmosphere of SO_2, NO_x and MP local pollutants. These taxes are expected to have significant, but indirect, co-benefits in GHG reduction. The third is a direct tax on CO_2 emissions of USD 5 a ton. The tax on both local and global pollutants is aimed at establishments whose sources are made up of boilers or turbines that together add a thermal power greater than or equal to 50 MWt (thermal megawatts), considering the upper limit of the energy value of the fuel, which is mainly applied as tax to power generation plants. It is estimated that about 80 establishments will be subject to the tax, which will cover approximately 40% of total CO_2 eq. The CO_2 tax will not apply to emissions from non-conventional renewable energy sources whose primary energy source is biomass.

Firma.

To implement the tax, instruments have been developed that are in the process of socialization and discussion. These instruments include a procedural regulation, protocols to quantify the pollutant emissions to be taxed, and a registration system that identifies and lists the affected establishments and their issuing sources. In addition, with the support of the PMR initiative led by the World Bank, progress is being made in the design and implementation of an MRV that will support the implementation of the tax, whose conception considers a potential escalation of the instrument to other sources of pollution and GHG.

According to the analysis of the Ministry of Finance, the estimated tax collection from fixed sources will be USD 143 million per year by 2018. In line with national policy priorities, CO_2 will have heavier taxation. The collection by this GHG tax will be in the order of 85% of the total collection of the green taxes set.

8. Measurement, Reporting and Verification of Mitigation Actions

Measurement, reporting and verification (MRV) is an expression used to describe all measures taken by countries to collect emissions data, mitigation actions and support; Compilation of this information into reports and inventories to apply review or analysis. At UNFCCC, the concept of MRV has been implicit in multilateral decisions and mechanisms as a key part of the follow-up to the progress of each of the parties. However, it was not until the Conference of the Parties in Bali during 2007 (COP13) that the expression began to be used in a common way and to bring together all aspects of transparency in the climate regime (International Partnership on Mitigation and MRV, 2014).

Lycalopex Culpaeus, Charif Tala.

8.1. Generic framework of MRV in Chile

The objective of MRV in Chile is to promote the transparency of GHG mitigation activities through mechanisms that allow monitoring the fulfillment of its objectives. While Chile reports its mitigation actions to the international community through the Biennial Update Reports and its National Communications, as requested by the UNFCCC, having MRV systems of individual actions is key to assessing the effectiveness of these actions.

Since 2011, Chile has worked in independent MRV systems that have served as management tools for NAMA and to build capacities through the international support of various projects. During 2013, in response to the request of interested sectors to carry out mitigation actions, it was considered to developing a document that would give the guidelines to understand and develop the basic elements that an MRV system should contain. Thus, in 2014, thanks to UK sponsorship through its Prosperity Fund, the MMA developed the document "Guidelines for a Generic MRV Framework for NAMAs" (MMA, 2015b) which explains how emissions impacts can be measured, reported and verified Of GHG and other co-impacts of mitigation actions. Although developed for NAMA, it can be used for any type of action that generates mitigation of GHG emissions.

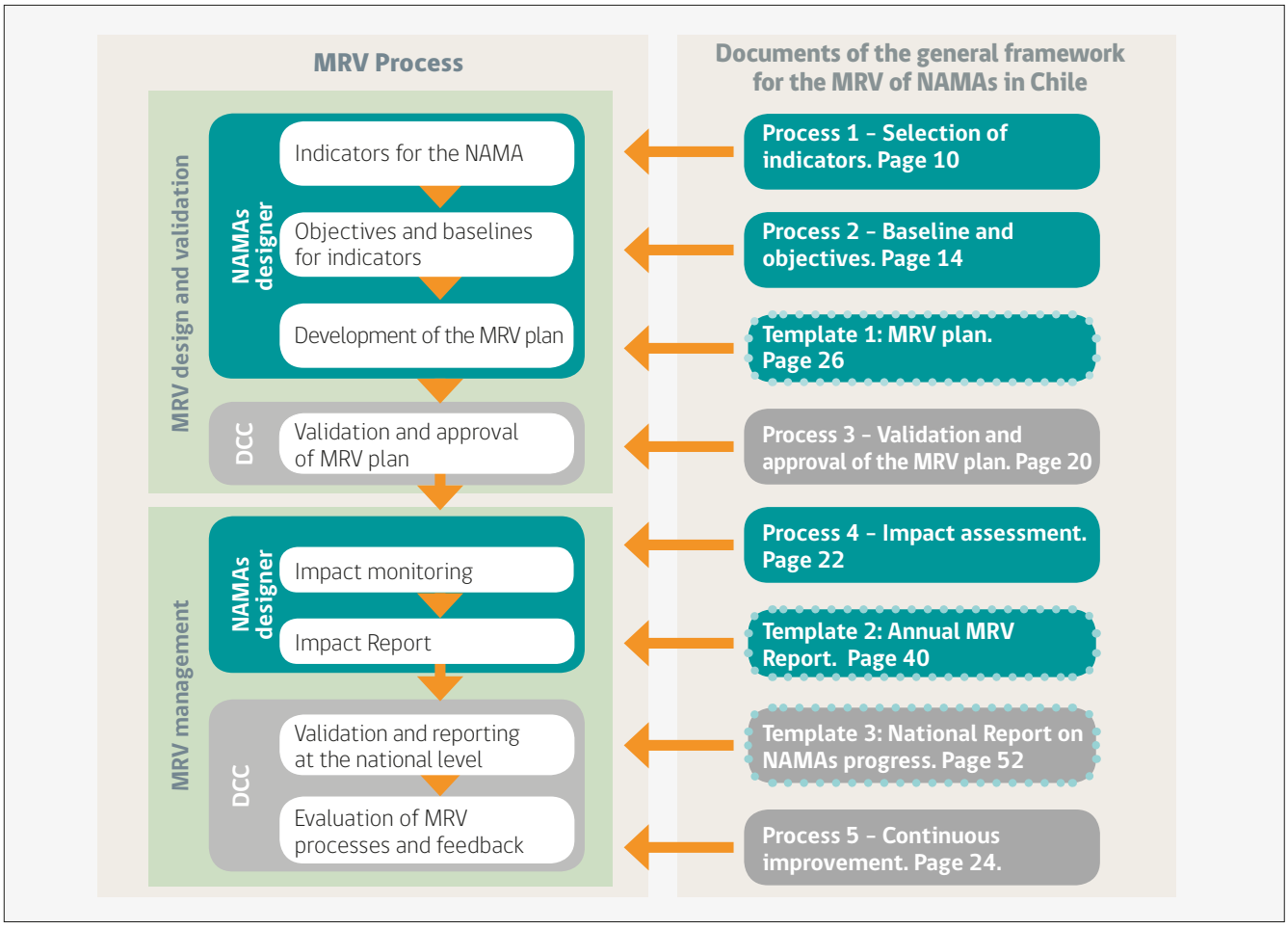
The main objective of this document is to allow the coherence of MRV approaches applied to mitigation actions in Chile and to support the coordination process between the different sys-

tems. For this purpose, the document gives technical and procedural guidelines. The technical guidance is based on the World Resources Institute's (WRI)[33] Policy and Action Standard and procedural guidance, which explains the steps to be taken by both the developers of the action and the Department of Climate Change of the Ministry of Environment in order to ensure a safe and consistent approach to MRV impacts. For example, concepts such as the order in which things should be done, who should be consulted, and when a session closure by the DCC is needed. Technical guidance explains what data will be needed and how that data should be collected and used for develop indicators, baselines and targets. The document also provides a number of templates, which are designed to be filled with relevant information to report in a consistent and timely manner in each case. Figure 10 shows the process diagram proposed by the generic framework.

8.2. Accounting and MRV Rules

During 2016, the Ministry of Environment's Climate Change Department, through the Low Emission Capacity Building (LECB) project, developed a study to define basic accounting rules for mitigation actions in Chile and to preliminarily design the contents of a possible centralized MRV platform. This study had as additional objectives to identify the links and

Figure 10. Summary of the NAMAs MRV Process



Source: (MMA, 2015b).

[33] *http://www.wri.org/publication/policy-and-action-standard*

synergies between the information generated by the National Inventory System and the MRV systems used in Chile and to have an initial analysis of aspects related to accounting rules for mitigation and MRV actions in Chile (double counting, methodological inconsistencies, assumptions, indicators, etc.).

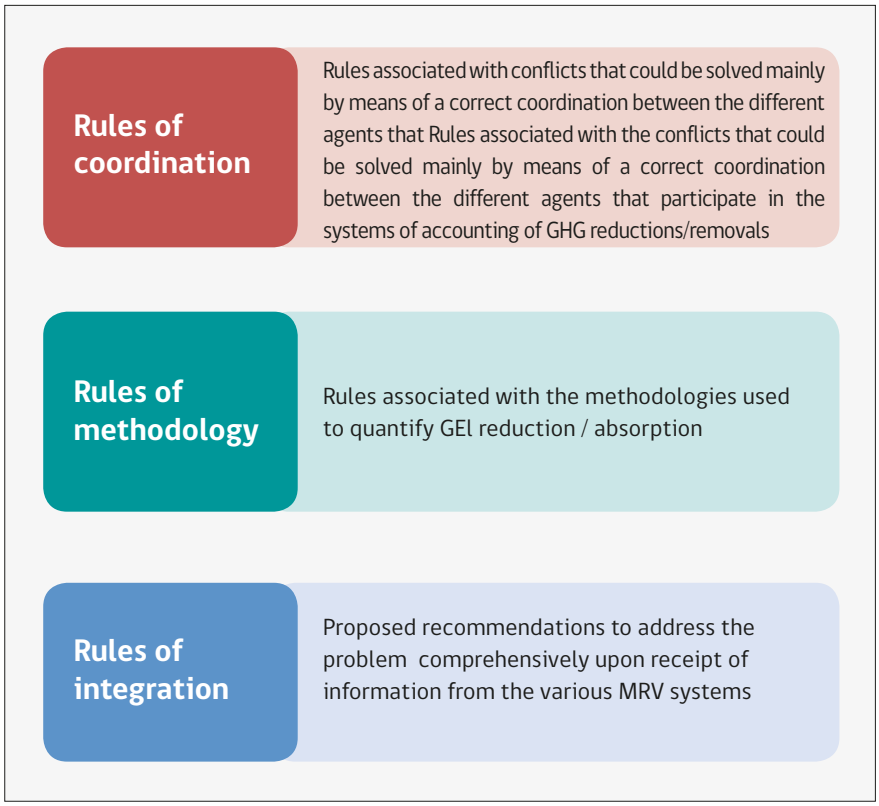
The mitigation actions that were developed in the country were identified with different scopes and limits, and an analysis structure based on information maps was proposed to identify the interrelationships between actions and policies and to be able to apply the accounting rules.

8.2.1. Accounting rules

The objective of having Chile's own accounting rules is to identify possible conflicts in the analysis of information, such as double counting, differences in scope or methodological differences, which must be considered and resolved in order to monitor the progress of mitigation actions in the country (Centro de Energía , 2016).

The developed study identifies 3 types of accounting rules that must be defined in order to follow up the mitigation actions in Chile: coordination, methodological and integration measures, see Figure 11.

Figure 11. Proposed accounting rules for Chile



Source: (Centro de Energía, 2016).

Possibly most of the technical work will focus on the development of integration rules, whose objective is to analyze the coherence of the evaluation of the mitigation measures assuming that they are incorporated jointly. In addition, the integrated analysis will allow verification of compliance with international GHG reduction commitments, which generally have an application at the national level (Centro de Energía , 2016)

8.2.2. Registration and information platform on mitigation actions

Given the different types of mitigation actions carried out in Chile, and the diversity of systems used to measure the progress of the indicators associated with these actions, the study on accounting rules also addressed the conceptual and preliminary design of the contents of a centralized MRV platform for the country.

Currently, Chile has MRV systems for NAMAs (for example, NAMA for the forestry sector or NAMA for self-sufficiency), for programs (for example, voluntary production agreements or programs monitored by ACHEE), for goals (e.g., goal of energy efficiency monitored by the Ministry of Energy), etc., all of which are or will be developed by different computing platforms (Energy Center, 2016).

The mitigation action registration platform, which will be fed from the different MRV systems, must take into account the nature of the measures monitored by these sys-

tems. The proposal of the study of accounting rules is based mainly on the creation of a database of policies or measures with an impact on the reduction and absorption of GHG. This database would have access to all institutions that adopt measures and would function as an interface between the individual MRV systems and the institution responsible for channeling the information that is reported to the UNFCCC, which is the Department of Climate Change of the MMA (Centro de Energía, 2016).

It should be noted that this database does not replace coordination activities between the institutions involved in emissions accounting, but rather as a tool to support this activity. Once the information is stored in the database, the institution in charge can apply a series of filters in order to know the coherence of the information that will be reported to the UNFCCC.

It is expected that this platform can be developed in the medium term so that an intersectoral working group will be organized in which the relevant aspects for its preparation and implementation will be discussed.

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IV

Needs and Support Received in the Area of Climate Change

Puerto Natales, Jenny Mager.

1. Introduction

This chapter presents relevant information about needs regarding climate change in Chile, including the existing barriers and gaps, and the international support received, such us financial resources, technical assistance and capacity building, and technology transfer, detected between the years 2014 and 2016.

For the development of this chapter, the methodological framework has been done according to the UNFCCC guidelines for the preparation of Biennial Update Reports For Non-annex I parties (Annex III, Decision 2/CP17[1]), which specify that those countries, including Chile, should provide updated information about:

Palafitos, Macarena Mella.

- **Needs** regarding financial resources, technical assistance and capacity building, and technology transfer. Including their gaps and barriers analysis.
- **Support** received in the form of financial resources, technical assistance and capacity building, and technology transfer that the country received from the Global Environment Facility, Parties included in Annex II to the Convention and other developed country Parties, the Green Climate Fund and other multilateral institutions.

The methodology employed to gather information with regard to the needs and support received is explained in the corresponding sections.

The information presented in this chapter covers the period from 1st August 2014 (period immediately after the gather information phase of the First BUR, submitted to the UNFCCC in 2014) to 30th June 2016

[1] *http://unfccc.int/resource/docs/2011/cop17/spa/09a01s.pdf#page=*

(cut-off date for this report to gather information). This period was established by the team in charge of this report, with the purpose of updating the information reported in the First BUR.

1.1 Definitions

The terms of financial resources, technical assistance and capacity building, and technology transfer will be viewed as follows:

Minería, Claudio Pérez FICH.

- **Financial resources (or financial support):** This refers to mobilizing funds that can come from public, private or alternative financing sources (UNFCCC, 2014). Usually, these funds are handed over the performers through an implementing agency.

- **Capacity Building and technical assistance:** Understood as a process that aims to increase/improve the individuals, organizations and institutions capacity in developing countries and countries with economies in transition regarding identifying, planning and implementing ways to mitigate and adapt to climate change. This process takes place at three different levels:

  - Individual level: through education, training and awareness activities;
  - Institutional level: through fostering cooperation between organizations and sectors, also the development of organizations and institutions, including their missions, mandates, cultures, structures, competences and human and financial resources;
  - Systemic level: for creating favorable environments, through economic and regulatory policies, and accountability frameworks operated by individuals and institutions. (UNFCCC, 2014)

- **Technology transfer:** Defined as a comprehensive set of processes that cover the knowledge, financing and goods exchange among the different parties involved, leading to the technology diffusion for the mitigation or adaptation to climate change. This includes the process which encompasses the technologies diffusion –hardware and software- and technological cooperation through and within the countries (IPCC, 2014).

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1.2 Areas

Consistent with the First BUR (MMA, 2014), the five areas (scopes) stated back then are kept, with regard to the support received and the acknowledged needs, such as financial resources, technical assistance and capacity building, and technology transfer. The information areas are as follows:

- **Report (R): It** refers to those activities, projects and programmes developed aiming to comply with the country's commitments as for the progress report on implementing the objectives of the Convention on the issue of climate change, through National Communications (NC), the Biennial Update Reports (BUR) and the respective nationally determined contributions (NDC).

- **Mitigation (M):** It refers to those actions, policies, projects and programmes developed in order to contribute directly or indirectly to reduce emission sources or increase GHG emissions removals.

- **Adaptation (A):** It refers to the development of policies, plans, programmes and actions aiming to face up and minimize climate change adverse impacts and emerging risks, and aiming to seize potential opportunities arising from changes caused by this phenomenon. The activities should focus on generating tangible and visible results effectively through the vulnerability reduction and resilience increase into human and natural systems in order to respond to climate change impacts.

- **National Greenhouse Gas Inventory (I):** Related to those actions undertaken within the aim of systematizing the biennial update of the Chile's National Greenhouse gas inventories within the country, ensuring in this way the sustainability of the preparation of GHG inventories within the country, the consistency between the reported GHG flows and the quality of results.

- **International Negotiation (N):** It refers to to the support received with the aim of strenghthening the national capacities with regard to climate change multilateral negotiation.

Ruta del Vino, SERNATUR.

2. Needs

The financing, capacity and technology needs in relation to climate change (mitigation, adaptation, reports, inventories, international negotiation) increase the vulnerability of the country, since obstacles and gaps must be constantly overcome on the elaboration and implementation of climate change policies. In a developing country like Chile, these policies come up to compete with other national priorities, such as health, education and labour. In this regard, the integration of climate change into the policies and existing programmes of public institutions represents an efficient and intelligent way to get positive results on this matter and to deal with the challenges, providing low-carbon development and a more resilient society.

The development of institutions and the capacity building on climate change issues in Chile have demonstrated notable progress over the last years. Nonetheless, it is still possible to identify needs, gaps and barriers hampering the development of a more effective climate action in the country. The main needs, which are cross-cutting in all fields, are related to an adequate institutional forum that provides the development of actions in the field of climate change within the country and a financing strategy that is consistent with requirements, which are generated during the process.

Caballos, Isidora Mella.

In December 2014, the National Adaptation Plan to Climate Change (NAP) was approved by the CMS (MMA, 2014), proposing, as an operational structure for its implementation, the creation of: a) the Inter-ministerial Technical Committee on Climate Change (ETICC), entity at national level, moderated by the MMA and conformed by Climate Change Focal Points of the relevant ministries, whose primary role is to facilitate the climate change related plans and actions implementation; and b) 15 Regional Committees on Climate Change (CORECCs) for the 15 administrative areas of the country, which can coordinate and tie the climate change policies between the national and regional levels.

The proposed structure has provided the basis to institutional strengthening, since the ETICC has focused on across all the climate change areas, engaging in the elaboration of the INDC, presented at the UNFCCC in 2015, the National Action Plan on Climate Change 2017-2022, the Third National Communication on Climate Change and this BUR.

Without prejudice to these developments, there is clearly an urgent need to develop and strengthen the institutions at national, regional and local levels and to develop supporting regulations to these institutions. Since work is nowadays carried with regard to sectors will, which rarely have ade-

quate human and financial resources to respond to the increasing demand of climate change issues.

The constant dissemination of the subject of climate change, performed by the MMA and other public institutions of the state, has increased the interest regarding this subject and relevant actors from other sectors of society have been gradually incorporated. Among them, over the last years there is the outstanding work of Adapt-Chile NGO[2], focused on the development of capacities at the territorial level and which has promoted the establishment of the first Network of Chilean Municipalities on Climate Change, institution that has held two "Mayors Forums" by the end of the years 2014 and 2015. Adapt-Chile with funding from EUROCLIMA Programme, built the "Climate Change Academies", programme to support local governments in planning and monitoring adaptation measures and greenhouse gas mitigation; education, and training. Not only local governments from Chile have benefited from this programme, but also local governments from Argentina and Uruguay.

As for the financing needs, Chile is ranked as a high-income country according to the World Bank[3] and with a very high human development index (HDI) according to the United Nations Development Programme (UNDP)[4], thus the access to international funds will be increasingly scarce. Chile has continued to conduct studies to identify and strengthen technical aspects in its response to climate, its information systems, and to strengthen its climate-related institutions in order to attract investors and donors. Furthermore, Chile has committed to reduce its own emissions in the context of its NDC, subjected to the international financial support.

Capacitación Rancagua Huella Chile MMA.

There is a barrier encountered by the national public sector to implement financial international resources, since it is not possible to directly get those resources into the ordinary annual budget, because of the Budget Law which does not take this mechanism into account. Another cross-cutting barrier identified is the complexity of some public services to allocate financial resources to climate change issues within its annual ordinary budget, as the climate change subject is not explicitly defined in its organic law.

As for the technology transfer, in 2003, Chile performed its first "Technology Needs Assessment" exercise through a consulting focused on transport, industry and electricity generating sectors (Deuman Ingenieros, 2003), identified mitigation technology options at descriptive and generic level. In 2009, CORFO (Chilean Economic Development Agency) conducted a study whose purpose was to establish criteria and priorities to define a national strategy of technology transfer for climate change mitigation and adaptation (Poch Ambiental, 2009), which has been oriented to five national priority economic sectors: copper mining, foods –including fruit growing, agriculture and processed food, construction, transport and aquaculture, conducting analyses to processes of productive tasks, technology needs activities, identification and categorization. It is necessary to involve an updated analysis of technology in order to implement climate change adaptation and mitigation measures. In general and cutting across all fields, the need of a climate change centralized information platform, as a tool to systematize the reports making and the mitigation and adaptation measures assessment, is understood as a priority at the country level.

[2] *http://www.adapt-chile.org/web/*
[3] *http://datos.bancomundial.org/pais/chile*
[4] *http://hdr.undp.org/en/content/table-1-human-development-index-and-its-components*

An information gathering has been made through this chapter with regard to the needs, gaps and barriers in a three-step process:

1) A formal survey was sent to public institutions composing the Inter-ministerial Technical Committee on Climate Change (ETICC) requesting further information on the needs, gaps and barriers by the sector.
2) A workshop with the institutions belonging to the ETICC, with the aim of deepening the identification and discussion about the needs to make progress in the climate change action, barriers, lessons, potential synergies, information gaps, opportunities, etc.
3) Bilateral meetings have been held to validate compiled information and run an analysis of additional needs, gaps and barriers.

2.1 Identified Needs by field

For each identified area in 1.2, the main needs, gaps and barriers have been identified in respect of financial resources and technical assistance and capacity building. Moreover, this report integrates for the first time the needs identified by the private sector. Gaps, barriers and needs concerning the technology transfer have been grouped in a general table that includes all the fields, shown in 2.1.1

2.1.1 Reporting

The greatest challenge for the reporting activities in Chile is the definite establishment of permanent reporting systems of National Communications, Biennial Update Reports and National Contributions, necessarily involving specific budget allocation underpinning the reporting activity iteratively. Generating capacities within the different sectors in order to systematize and provide timely and adequate information for the different report types is an absolute need within the country.

The funding from the GEF of USD 352,000 is undergoing implementation for the preparation of the Second BUR (2016). The technical and administrative DDC team develops the report based interpretation of UNFCCC guidelines. Regarding the third NC, there is a fund of USD 480,000 emerging from the GEF and the GEF document is been currently elaborated to apply for financing the preparation of the Fourth NC. As for the INDC, its elaboration is covered out of internal resources, the negotiating team under MMA coordination and the support of MAPS-Chile project of Chilean INDC, was ensured, in 2014 and 2015, both by own resources from the Chilean government and its ministerial portfolios most related, as well as by international support, mainly through MAPS-Chile project and other specific aspects, supported by the World Resources Institute (WRI).

Table 1 presents the identified needs, gaps and barriers in the report field.

Transito Santiago, MMA.

Table 1: Needs, gaps and barriers within the field of reporting summary

Report	Area	Gap	Barrier	Need	Priority
BUR	Financial Resources	Restrained budget for the technical administrative team dedicated to the document elaboration. Studies should be outsourced/ tendered by professionals and external consultancies, which implies a lack of internalization of knowledge in ministerial teams. Scarcity of continuity chances for professionals taking part in the reports.	Limited economical resources hinder the establishment of a sustainable system for the report commitments fulfillment.	Budget underpinning the activity iteratively, as established by the COP decisions.	Very High (5/5)
	Capacity building and technical support	Methodological and technical gaps for the information gathering, lack of a clear mandate about the kind of information to be permanently collected, especially concerning progress indicators related to mitigation and support received actions and policies.	Lack of specific knowledge at sectoral and institutional levels; difficulties to access to training programmes both because of financial resources and languages. Professionals from public institutions with access to required information by the BUR have other tasks and duties, slowing down and complicating the information gathering process.	Methodological guides and trainings for the implementation of guidelines, with the aim of understanding the priorization of the information to be reported and the expected detail level. Generating capacities for the sectoral report (other ministries and institutions) for the BUR elaboration. Systematizing sectoral, public and private information gathering in order to elaborate the report: active permanent system, over the years envisaged in the report.	High (4/5)
TNC	Financial Resources	Restrained budget for the technical administrative team dedicated to the document elaboration.	Limited economic resources hinder the establishment of a sustainable system for the reports obligations.	Budget underpinning the activity iteratively, as established by the COP decisions. Specialized professionals are required to give continuity to the information gathering and document elaboration, since technical content is generated by consultancies so far.	Very High (5/5)
	Capacity building and technical support	Lack of technical capacity at regional and local levels. Lack of knowledge within the sectors regarding the guides for developing the NC. Lack of systematization about the structure of the report of the information to make comparable the periods between NCs.	There is no knowledge transfer mechanism at neither sectoral nor institutional levels. Professionals from public institutions with access to the required information by the NC have other functions and priorities, slowing down and complicating the information gathering process. Financial and idiomatic difficulties to access to training. There is no information systematization procedure.	To have regional experts. Generating capacities for the sectoral report (other ministries and institutions) for the NC elaboration. Systematizing sectoral, public and private information gathering in order to elaborate the report: Active permanent system, over the years envisaged in the report. Cross-cutting platform to incorporate sectoral, regional and local initiatives.	High (4/5)
INDC	Financial Resources	As negotiation makes progress and the new communication NDC and transparency frameworks are defined, it will be possible to prepare an implementation cost estimate and identify the involved gap.	Limited economic resources hinder the establishment of a sustainable system for the reports obligations.	Financial resources for the information gathering and methodologies related to INDC updating, in accordance with review systems within the framework of the post 2020 agreement.	High (4/5)
	Capacity building and technical support	Lack of capacity for the early content definition and political agreement for its approval. Limited economic modeling capacity of mitigation scenarios.	Sectoral interests sometimes have primacy over technical criteria.	To strengthen coordination between technical design and political priorities. To establish permanent capacity within sectoral ministries in order to facilitate the INDC development systematization. Integration capacity of sectoral exercises at a national level modeling.	High (4/5)
General	Technology transfer	Lack of systematization and efficiency in the reports on climate change. Information to citizens is fragmented and non-prioritized.	Not identified.	To have a technological platform that assembles the existing information on climate change, which can be applied to sectoral report of climate change actions and efficient information management, and which is systematized. This platform should gather all the information about subjects related to climate change, generated by various institutions: public, private, academy, etc. with differentiated privileges for institutes and citizens use.	Very High (5/5)

Source: Own compilation.

2.1.2 Mitigation

Chile has made progress elaborating robust sectoral policies aiming at a low-carbon development. However, these efforts are insufficient when it comes to international acquired commitments, since it is necessary to make an additional effort at national level, ensured by a substantial international support for its fulfillment. In this respect, needs identification, gaps and barriers definition to outstrip in order to take mitigation actions are particularly important for the emissions of GHG reduction volunteer commitment for the year 2020 and for the strong foundation installation, during the NCD implementation and its future updates.

It is a priority for Chile to move forward on information management systems, especially related to design and implementation of NAMAs. The country has currently the task of making robust institutional arrangements possible, in the service of the existing and future NAMA development, also of enhancing the coordination and synergies among sectors and obtaining, if possible, common tools for better information on reductions understanding and systematization.

There have been important efforts to strengthen measurement, reporting and verification (MRV) systems, through the development of MRV guidelines for Chile. However, one priority is that all institutions, implementing actions that are likely to reduce GHG emissions, could gather adequate information allowing to keep proper track of such actions.

Nowadays there are five registered NAMA in the NAMA Registry looking for support for implementation and the CER NAMA has financing approved through "NAMA Facility" fund. Financial resources have been received for studies for different NAMA, some of them in the pipeline or in different development stages, where a part of the envisaged funding derives from national funds.

Regarding capacity building, trainings focused on NAMA and MVR have been made within the framework of national projects and the RETC Platform and the HuellaChile Programme have been implemented.

Capacity building on mitigation at a local level is particularly important. Strengthening Regional Governments and Municipalities management and improving their capacity on NAMA and other mitigation measures implementation for a proper track and results measurement are actions to be reinforced at the territorial level.

Furthermore, the new Sustainability and Climate Change Agency announced by President Michelle Bachelet in May 2016 aims to build better linkages within the private sector, allowing to generate new project opportunities and/or mitigation actions.

Some existing projects and strategies to be listed, in order to complete an overview about the current situation on mitigation in Chile, which have already been mentioned in the corresponding Mitigation chapter of this report, are: the GHG sustainable land management project, that seeks to generate a payment system for environmental services (sustainable management, carbon sequestration) from the optimization of farm support instruments and a more convenient implementation for them; the National Climate Change and Vegetation Resources Strategy of the National Forest Service; the Energy Policy to 2050, of the Ministry of Energy, subjected to Strategic Environmental Assessment, whose long-term goal contains guidelines and commitments related to GHG reduction, monitoring with indicators and delivery under the frame of energy development; the Sustainable Construction of National Approach of the Ministry of Housing and Urban Planning, which defines objectives and goals to be reached in the medium term, and which pursues the GHG reduction in households; Phases 1 and 2 of the MAPS Project, which enabled the sectoral capacities generation on climate change and defined mitigation measures for several sectors; the Energy Management System (SGE) implementation and certification of the Agency for Energy Efficiency, to systematically incorporate within the country the energy efficiency issue and the annual report on energy consumption and the annual report of GHG emissions from the Copper Mining, which involves its different processes, its evolution over time and regionalized data.

Table 2 summarizes the major needs, gaps and barriers within the field of mitigation.

Table 2: Needs, gaps and barriers within the mitigation field summary.

Type of Support	Gap	Barrier	Need	Priority
Financial Resources	**NAMAS** Difficulty in designing business models for the flow of financial assets internationally obtained. Lack of incentive to sectoral involvement for the NAMAs development and other mitigation actions.	The lack of knowledge and experience of state agencies on the flow of international financial resources allocated to NAMAs lead to delays in implementation. Lack of financial incentives for engagement of potential actors involved. Sectoral priorities that are neither in line with mitigation actions development nor its incentive.	The lack of knowledge and experience of state agencies on the flow of international financial resources allocated to NAMAs lead to delays in implementation. Lack of financial incentives for engagement of potential actors involved. Development of more cross-practice institutions capable of matching the major existing policies within the sectors.	High (4/5)
	Sectoral Actions Lack of financial resources to implement energy efficiency projects, especially co-generation. Lack of resources to finance action measures and trigger changes at institutions level. The rerouting and targeting of fiscal resources, in a coordinated and collaborative way, among the Ministry of Agriculture (MINAGRI) services and other related public entities.	Other resources use priorities. Uncertainty in the formulation process of the new forestry development act formulation and in the restructuring process of the Chilean Forestry Service.	Financial resources for energy efficiency projects implementation, specifically co-generation. Resources to finance the National Climate Change and Vegetation Resources Strategy, of the National Forestry Service.	High (4/5)
	Local Actions Lack of financing for local and regional actions.	Other use of resources priorities in the regional governments and municipalities.	Financing for design, preparation and implementation of mitigation actions in regional governments and municipalities of the country	High (4/5)
	Projections and Models Absence of allocated resources to non-energy sectoral projections elaboration and for the updating of the analysis made by MAPS-Chile regarding scenarios and potential mitigation measures.	Poor understanding at political and national levels about projections usefulness in decision-making about public policy and integration of these analyses in the sectoral policies design and resources allocation.	Budget to keep a national team installed in the state and capable of generating information and assessing different emissions scenarios with a view to a future system of international commitments follow-up and to the assessment of their aspiration.	Very High (5/5)

Claudio Badilla.

Type of Support	Gap	Barrier	Need	Priority
Capacity building and technical assistance	**NAMAs** Insufficient capable professionals and infrastructure. Lack of definition of minimum common indicators that allow a comparative assessment of the diverse NAMAs. Lack of technical capacity to elaborate base lines.	Lack of cross-sectors coordination and functions and powers, specifically on relevant information transfer and management, for NAMAs key elements definition. Lack of knowledge of technologies and suggested instruments for NAMA implementation by actors involved.	Technical assistance on key elements development for NAMAs (definition of base lines, co- benefits) Elaborate the base line and set indicators for NAMAs	High (4/5)
	Cross-cutting Sectoral Actions Lack of synergies in sectoral information systems for the mitigation activities progress follow-up. Lack of capacity and institutionalism in the public sector to universally embrace this area. Lack of comprehensive institutionalism and cross-sectoral policies.	Lack of necessary information to base lines gathering. Other priorities from the different sectors. Political will. Perspective and sectoral and biased solutions to environmental and human problems. Short-term solutions.	Institutional capacity in the different sectors to gather and prepare information for potential NAMAs design. A technical political frame which collects and synthesizes the mitigation projects outcomes of other sectors of the country (Example: NGO and private sector initiatives, civil society in general) is required. A more cross-cutting and cross-sectors institutionalism is required; this should be able to match the major existing policies: National Strategy on Biodiversity, Public Development Policy, Urban Development Policy, Land-use Management Policy, Social and Corporate Responsibility Policy.	Very High (5/5)
	Local Actions Lack of GHG mitigation local actions. Lack of a local perspective about climate change. Lack of products and topics of territorial scope or macro-zonal scope in energy policy.	The subject is not prioritized in some Regional Governments and Municipalities. Short-term solutions of ongoing administrations prevail over development with long-term strategic vision. Lack of knowledge about climate change in regions,	Institutional capacity in Regional Governments and Municipalities to gather and prepare information for potential NAMAs design and other mitigation actions. Capacities and assistance to develop locally the Energy Policy to 2050, subjected to Strategic Environmental Assessment, in order to define outcomes and products at regional and municipal level.	Very High (5/5)
	Projections and Models Lack of permanent installed capacity to maintain a system that generates updated emissions projections and mitigation scenarios similar to MAPS-Chile There is no base line 2007-2020 emissions formalization to come up with the Chilean volunteer commitment process assessment. To overcome technical errors detected in the MAPS-Chile process, due to the lack of capacities. To improve the working teams management and coordination. Lack of ministerial teams that take part in this type of systems and that systematically generate information to feed models. Insufficient information about drivers to elaborate robust projections.	Taking the MAPS-Chile process into consideration, there is a lack of sectoral political support in decision-making to validate mitigation measures. Poor general knowledge about this type of tools usefulness in the public policies elaboration process. There is no sufficient institutional procedure to validate the generated information for projections and models about mitigation actions and base lines yet. Uncertainty about future requirements to non-annex I countries concerning the mitigation projections and scenarios generation within the frame of the NDCs tracking.	It is necessary to have formalization and updating of the emissions of Chile 2007-2020 base line to be able to measure the volunteer commitment of Chile progress. It is necessary to have technical assistance and capacity to maintain a similar system to phases 1 and 2 of the MAPS Project and to update permanently mitigation scenarios. And emissions projections. It is a must to incorporate these systems to the scheme of MRV of Chile, considering the integration and assessment added to the efforts impacts on mitigation within the country.	Very High (5/5)
	Power Consumption and Energy Efficiency: Lack of capacities, knowledge and assistance to identify emissions from metal mining different from copper and non-metal mining processes, and energy consumption for these types of mining. Lack of capacity and knowledge in financial institutions, these are not prepared to finance energy efficiency projects. There are no requirements about counting on Energy Management System (SGE) on regulations ground nor on demand.	Little interest in the development and implementation of energy efficiency measures. Political will.	It is necessary to embrace all mining types in the Annual Report on GHG mining emissions and the annual report about energy consumption in copper mining (Balance of metal mining and non-metal mining) Knowledge and capacities of banking sector for energy efficiency projects financing. Regulation or requirements once SGE implemented.	High (4/5)
	Forestry Sector Absence of an appropriate financing model to the native vegetation resources reality which takes the value of all the services that these ecosystems provide to the society into account. Lack of intra-ministerial and interministerial institutional coordination. Technical and technology gaps to: keep a monitoring of technical capacities of National Forestry Service (CONAF) staff members which will take part in the implementation. Lack of knowledge and appreciation of vegetation resources and instruments for climate change mitigation, by some territorial stockholders.	Uncertainty in the formulation process of the new forestry development act formulation and in the restructuring process of the Chilean Forestry Service.	National Climate Change and Vegetation Resources Strategy of the National Forestry Service requires: Appropriate financing model. Interdepartmental coordination. Capacities for monitoring. Staff members' technical capacities for implementation.	High (4/5)

Type of Support	Gap	Barrier	Need	Priority
Technology transfer	**Transportation Sector:** Shortage of technical studies about implementation of new technologies in Chile and scarcity of incentives for the accelerated uptake of these to the national market. Information about new technologies and financing.	Lack of financial resources and incentives to develop mitigation actions in this sector. Uncertainty with respect to the technologies performance. High cost related to low emissions technologies.	To develop mitigation policies for transportation sector, in line with new technologies which foster behavior change regarding urban transportation. Low-emissions technologies incorporation, mainly electric in cars traffic, which is currently.	Very High (5/5)
	Industry Sector: Lack of modernization of technologies through innovative equipment and processes, for the energy and water efficiency in mining and industry production.	It requires processes flexibility, allowing new technologies quicker introduction. It requires more demanding future potential regulations incorporation.	Introduction of innovative equipment and processes in order to decrease the energy use and to enhance the energetic and water efficiency within mining and industry processes.	High (4/5)
	Power Generation Sector: Lack of information about new technologies and financing for its uptake.	Relative cost of technologies Uncertainty with respect to the performance. The generating market is competitive and technology neutral.	Testing phase and diverse technologies incorporation with the aim of seizing the country's energy potential according to the resource (solar PV, aeolian, geothermal, mini-hydro, concentrated solar).	High (4/5)
	Building Sector: Lack of information about new technologies and financing for its uptake.	Uncertainty with respect to the technologies performance. High relative cost of more efficient technology solutions.	Sustainable (materials) construction technologies incorporation in a massive way at a national level according the geographical and social context.	High (4/5)

Source: Own compilation of the MMA Climate Change Office.

2.1.3 National greenhouse gas inventory

Regarding emissions and removals of GHG in Chile, the country has been working methodically since the elaboration of its Second National Communication (2NC) to operate the National GHG inventory System (SNICHILE). To this end, there has been a permanent line of work in the ministries of Agriculture, Energy and Environment, which have collaborated with personnel and basic technical and financial resources.

SNICHILE not only enables the elaboration and coordination of Chile's NGHGI, but also seeks to make systematic progress in technical aspects such as the continuous improvement on the quality of GHG estimates, quality of the data used, elaboration of country specific emission factors of the key used categories, quality control and assurance, development of guidelines for the application of cross-cutting issues (uncertainty, key categories, documentation and archive, etc.) and the building and support of adequate technical capacities. Further details on SNICHILE are available in Chapter 2.

With respect to financial resources, during 2015-2016 SNICHILE was funded by the Chilean Government's budget and also by funds from international projects, such as LECB-Chile and the Biennial Update Report.

The professionals that lead the technical teams in SNICHILE are permanent staff of Chilean government and financed under the national budget. The professionals in charge of routine tasks in the elaboration of NGHGIs are financed in various different ways; some are state employees while others are hired as external consultants specifically for the elaboration of Chile's NGHGI with funds from international projects. In recent years, there have been important advancements in the matter, considering that several technical teams have hired their external consultants as permanent personnel or have included, within the job description of their professionals, the role of elaborating GHG inventories.

As for the necessary information for the elaboration of Chile's NGHGI, there have been improvements in national statistics, financed mainly with national funds; as well as in the development of new country specific emission factors on the part of permanent professionals and external consultants. In this line, the work of the researches of the technical team AFOLU is highlighted, which along with scholars and international funding sources, has made significant progress in the matter.

SNICHILE looks to have a maximum number of permanent and competent professionals as possible that are permanent employees of the State and can hence establish stable technical

teams and guarantee the sustainability of the system and the quality of GHG estimates. In addition, the hope is to have as many country specific emission factors as possible so as to accurately reflect national reality in terms of GHG emissions and captures, especially for the key categories identified by Chile's NGHGI.

During 2015-2016, SNICHILE's technical capacity made important progress due to the acquired experience in the elaboration of the previous Chilean NGHGI, presented by the country in its first Biennial Update Report. Additionally, capacity building and support is a permanent line of action of SNICHILE.

Chile's current NGHGI is the result of the collective and permanent effort of the ministries of Agriculture, Energy and Environment, strengthening the elaboration of the NGHGI by adding the experiences of the different sectoral ministries involved.

As per July, 2016 there are seven qualified professionals as expert NGHGI reviewers of the Annex I parties of the convention. These professionals apply their specific knowledge in different stages of the NGHGI process in Chile and collaborate on quality assurance.

At least one professional of each technical team of the SNICHILE has participated in international workshops and exchanged experiences towards capacity building in NGHGI matters. Without a doubt, this has been useful to increase the capacity of the technical teams.

The capacities of SNICHILE professionals dedicated to research need to be strengthened to promote scientific research related to NGHGI issues and to develop country specific emission factors which will improve the accuracy of estimates in Chile's NGHGI.

Table 3 contains a brief summary of the needs related to NGHGI in Chile; it also shows the most significant gaps and barriers identified.

Table 3: Summary of gaps, barriers and needs of the NGHGI area

Need Area	Gap	Barrier	Need	Priority
Financial Resources	With regard to professionals, there is still a deficit of permanent and competent professionals on technical teams, due to personnel turnover, that are inherent to state bodies, and the hiring of external consultants that leave the teams when they finish providing the service. This occurs across all technical teams of the SNICHILE. Regarding the necessary information, there are still relevant gaps in statistical information, particularly in the sector of Waste. Moreover, it is critical to move forward on the development of country specific emission factors for the sectors of Energy and AFOLU, since both are the most important sectors within Chile's NGHGI.	Except for the MMA, the preparation of the NGHGI in the country has little relevance within political and technical priorities of the active members of the SNICHILE, which affects in the lack of an adequate budget to fund the recruitment of permanent personnel and the necessary scientific research for the development of country specific emission factors. This also includes the availability of financial resources to train the permanent professionals of the SNICHILE. Furthermore, an important barrier has developed, related to the administration of international funds from the World Bank for the elaboration of the Chile's Biennial Update Report. This reflects in the delay and inability to use the funds allocated to Chile's INGEI, which has hindered the compliance of part of the SNICHILE work plan.	Increase national funding for the recruitment of new permanent and competent professionals across the different technical teams of the SNICHILE. Additionally, there is a need for permanent financing towards scientific research and development of country specific factors, especially in the sectors of Energy and AFOLU. Moreover, and considering the low feasibility of sufficient national funding in the short term, financial support need to be sought from external sources, such as the Global Environment Fund, Parties included in Annex II of the Convention and other Parties which are developed countries, the Green Climate Fund and other multilateral institutions.	Very high (5/5)

Need Area	Gap	Barrier	Need	Priority
Capacity building and technical assistance	There are still gaps related to technical capacities of professionals part of the technical teams of the SNICHILE, particularly in terms of implementation and interpretation of the IPCC Guidelines of 2006 and the development of country specific emission factors. This is due to a combination of variables such as: •All SNICHILE professionals have other responsibilities of office and along with the reduced number of staff this is generating a work overload and forcing each professional to prioritize their working times and leave no time for NGHGI related training. •The limited number of NGHGI experts in the country, both in the public and private sectors, which reduces the possibilities of frequent exchange of experiences at a national level.	NGHGI is a low political and technical priority for the ministries collaborating with SNICHILE. This is evidenced in the lack of job profiles to capture professionals with the proper technical qualifications to elaborate Chile's NGHGI. Lack of government incentives for the promotion of scientific research in NGHGI matters, especially for the scientific and academic community. Lack of budget allocated for capacity building activities. Limited interest in the scientific and academic community on research that allows the development of country specific emission factors.	Increase the technical capacities of the SNICHILE professionals through face-to-face courses, online courses, workshops, seminars or experience exchange instances with international experts. Technical support is required from the Parties included in Annex I of the Convention, of the same UNFCCC or other expert parties, such as the IPCC. Increase and promote scientific research on development of country specific emission factors, especially for the sectors of Energy and AFOLU. Technical support is required from Annex I Parties of Convention that share similar national circumstances, understanding that these Parties have already made significant progress on the matter and that the similarity of conditions makes the replication of GHG measurement methods viable.	High (4/5)
Technology transfer	Despite significant advancement has been made in terms of country specific emission factors, the majority of GHG emissions and captures are estimated using default emission factors set by the IPCC Guidelines of 2006, which seem to overestimate the country's GHG emissions.	NGHGI is a low political and technical priority of the ministries involved in the SNICHILE, which is evidenced in the absence of suitable technology equipment to develop scientific research. Lack of government incentives for the promotion of scientific research in NGHGI matters, especially for the scientific and scholar community, therefore, there is no incentive for development or acquisition of new technologies. Lack of budget allocated for development or acquisition of new technologies. Bureaucracy and procedures constitute barriers to development or acquisition of technology equipment and software.	Development or acquisition of equipment (software and hardware) for the development of country specific emission factors. •The following is explicitly required: Acquisition of a GHG chromatograph to increase the analytical capacity in research centers. •Acquisition of mobile equipment for semi-automated quantification of GHG, including its implementation and training, for N_2O emission measurement from agricultural soils. •Equipment for field monitoring of forest and other vegetation systems. •Software for satellite information monitoring related to land use and changes to land use. •Equipment to improve the communication and network systems, such as GPS for more accurate activity data.	High (4/5)

Source: MMA Technical Coordinating Team.

2.1.4 Adaptation

The constant line of work that has been followed in the field of adaptation[5], has facilitated, at this time, the creation and approval of the National Climate Change Adaptation Plan (NAP) (MMA, 2014), a commitment made in the 2008-2012 National Action Plan for Climate Change. In addition to the specific sectoral plans for Agriculture and Forestry (2013) and Biodiversity (2014) sectors, the Climate Change Adaptation Plan in Fishing and Aquaculture was approved in 2015, and the Climate Change Adaptation Plan in the Health sector in 2016. There are five other sectoral plans in different stages of development and they will be focused in the Infrastructure (2017), Cities (2017), Water Resources (2018), Energy (2018) and Tourism (2018) Sectors. The creation of these policies has been possible thanks to the active participation of the sectoral ministries, leading their adaptation processes in joint efforts of identification of vulnerabilities and de-

[5] *More information in the Third National Communication of Chile to the UNFCCC and inhttp://portal.mma.gob.cl/vulnerabilidad-y-adaptacion/*

velopment of lines of action in order to face the impacts of climate change, coordinated by the Ministry of the Environment.

Currently, there is a permanent work team for adaptation issues, working in the Climate Change Department (DCC) of the MMA, made up of three professionals: two of them hired by the MMA and one partially financed by the Federal Republic of Germany and the MMA.

Between 2014 and 2016, some vulnerability studies and consultancies have been financed to implement actions of the National Adaptation Plan, with national funds and funds derived from the TNC project, with the objective of identifying any additional vulnerability, as well as supporting the implementation of the existing adaptation plans. With the objective of identifying additional vulnerabilities, as well as supporting, the implementation of the existing adaptation plans (Agriculture and Forestry, Biodiversity, Fishing and Aquaculture); it is expected to develop pilot projects focused on some of the lines of action of these plans, with national and international financing. An example is the project "Enhancing resilience to climate change of the small agriculture in the Chilean Region of O'Higgins", approved by the Adaptation Fund, which is currently under implementation and will allow the execution of a series of measures extracted from the Climate Change Adaptation Plan for Agriculture and Forestry in rain-fed agriculture zones in the center of the country. Other two projects financed with international funds will enable the

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implementation of actions in the Biodiversity and Fishing and Aquaculture sectors: National Biodiversity Monitoring Network (CTCN) and Strengthening the adaptive capacity to climate change in the fisheries and aquaculture sector of Chile (GEF). In the line of projects, other initiatives external to the public institution, with regards to adaptation in basins, can be highlighted, for example the FONDEF Project "Decision Making Support System in order to reduce vulnerability when facing variability and climate change in irrigated agriculture" and the MAPA Project, Adaptation Plan for the Maipo basin[6].

In order to have an efficient adaptation, it is highly relevant to properly coordinate the national and sectoral policies with the policies of the Regional Governments, this is why the creation of ETICC and the regional CORECCs was proposed in the framework of the National Adaptation Plan. The ETICC is currently in full operation and already issued its first official document by the end of 2015: the first PAN Report. On the other hand, the CORECCs are starting to be gradually implemented. Currently, there is minimal capacity in the Regions of Chile to develop actions and implement adaptation plans, with no effective coordination, at the level of territory, of the different policies that affect it (climate change, risks of disasters, territorial planning). The Ministry of the Environment has a permanent Program of Municipal Environmental Certification and a Permanent Program of Environmental Certification for Educational Establishments, in which aspects related to the adaptation of climate change are progressively being added.

Regarding scientific research, there are currently some Universities and Research Centers, along with two centers of excellence in Santiago working on climate change adaptation-related issues.

Finally, cross-sectorial collaborative work has been developed to integrate the issues of adaptation to climate change and reduction of disaster risks, specifically with the national institution responsible for Risk Issues: the Chilean National Office for Emergencies (ONEMI) . This field of work is increasingly gaining relevance in the national agenda.

The gaps, barriers and needs in the field of adaptation are summarized in Table 4.

[6] *http://cambioglobal.uc.cl/en/proyectos/proyectos-en-curso.html*
[7] *http://www.onemi.cl/*

Table 4: Summary of needs, gaps and barriers in the field of adaptation

Need Area	Gap	Barrier	Need	Priority
Financial Resources	Lack of permanent budget from the public sector, at the ministry level, regional and local governments, for hiring skilled personnel to work on climate change issues and the implementation of adaptation measures in the country.	Adaptation to climate change has not been given sufficient prominence within the financing priorities of the ministries and regional and local governments. Lack of alignment and agreement to increase public expenditure in issues that are already prioritized.	Raise financial resources in order to have permanent full-time staffing that works on climate change adaptation issues in institutions belonging to ETICC and regional and local institutions, considering the growing requirements.	Very High (5/5)
	Lack of financing for the elaboration of studies and implementation of measures that already been approved in the plans.	Lack of normative tools to allocate financing to specific needs in terms of adaptation to climate change.	Permanent financing is required in the Ministry of the Environment and in each one of the sectoral ministries that have been prioritized for the adaptation, development and updating of vulnerability studies and the implementation of the plan measures. International financial support is needed for the implementation of the measures of the national adaptation plan and the approved sectoral plans.	Very High (5/5)
	Lack of permanent budget for research in the field of adaptation to climate change. Lack of Budget for the implementation of water and energy efficiency projects promoted by the academy.	The country has other priorities in terms of resource allocation. Lack of effective mechanisms to allocate public resources of scientific research towards the interests of the public institutions.	Permanent financing is needed for research and the Academy's initiatives and in order to give continuity to projects.	High (4/5)
	Need to strengthen coordination and combine criteria between the different entities responsible for monitoring and financing, in order to improve the monitoring systems of the different variables.	There is coordination among public entities depending on the wills of the institutions, with no regulatory requirement in terms of the responsibilities of each institution.	Financing to improve and extend the monitoring of climatic and environmental variables: oceanographic data, river flows, extension of ice, glaciers, monitoring of high Andean wetlands.	High (4/5)

Isla de Pascua, Fundación Imagen de Chile.

Need Area	Gap	Barrier	Need	Priority
Capacity building and technical assistance	Lack of a robust and appropriate institutionality for climate change in the sectoral ministries and in the local governments and municipalities. Lack of agreements or strategic alliances between the different sectoral entities, which will allow the development of joint initiatives.	Adaptation has not been given sufficient prominence within the financing priorities of the ministries and regional and local governments. Intermittent political will, depending on the interest to develop the issue of adaptation, shown by those who are responsible for government agencies.	Skilled personnel in every one of the public ministries at a national and regional level. Trained personnel -in terms of adaptation and risk- in regional governments and municipalities. Improve inclusion of local actors in the complete process of the measures, from its design to its monitoring, considering its environmental implications and coordination with other policies and projects.	High (4/5)
	There is a limited number of experts and other human resources that have specific knowledge of policy issues related to climate change adaptation at a central and regional level.	Limited interest in the national scientific community to develop research in issues related to adaptation to climate change.	Include researchers and academics specialized in vulnerability and adaptation; develop up-to-date climate scenarios from regional models. Develop permanent research and promote excellence in dealing with issues relating to adaptation to climate change, from a national and territorial perspective both in the Metropolitan region and other regions in the country, focused on the specific characteristics of lands and finding solutions that respond to local issues concerning adaptation.	High (4/5)
	There is a lack of capacity and knowledge in the public sector at a national, regional and local level to elaborate projects and submit proposals for funding from specific funds or financial entities. There is a lack of information on existing funds and their characteristics that could different institutions to identify suitable projects. Scarcity of expert consultants for submission of successful funding applications to international funds.	Institutions provide little or no dissemination of information on existing funds.	Develop the skills and knowledge necessary to understand requirements, scope, presentation formats and other specific aspects of international funds that lead to a successful application of funding applications.	Very High (5/5)
	Lack of personnel with capacity in public institutions and/or academics that have the expert knowledge required for broadening out to new issues related to climate change adaptation (for example, indicators, follow-up, reporting, technological solutions). There is a need for strengthening inter-institutional coordination to promote the development of these issues.	Limited information of basic concepts required for the development of impacts studies on climate change in different sectors.	Capacity building and use of methodological tools for cost benefit analysis, priority adaptation options and personnel management in national and local public institutions. Capacity building and support for identifying and developing milestones in the adaptation process, indicators of effectiveness and assessment of the efficacy of the adaptation to climate change. Capacity building to develop reporting, monitoring and updating systems on climate change adaptation and skills development for professionals working in the sectorial ministries, members of the Inter-Ministerial Committee on Climate Change and local and regional institutions related to reporting of actions and measures for adaptation to climate change. Increase capacity to elaborate more precise models to project future climate adaptation such as the effect of temperature rises on the sublimation of snow in the northern zone of the country or the impact of rock glaciers on the run off regime of rivers. Increase knowledge related to climate change analysis applied to the development of ports and coastal infrastructure based on future waves climate projections.	High (4/5)
	Lack of knowledge of Ecosystem-based Adaptation (AbE) and Ecosystem-based Disaster Risk Reduction (Eco-DRR) and other techniques that enable the implementation of these projects.	Distrust regarding the possibilities and results of these solutions due to lack of knowledge.	Increase knowledge and build capacity for the implementation of Ecosystem-based Adaptation (AbE) and Ecosystem-based Disaster Risk Reduction (Eco-DRR).	High (4/5)

Need Area	Gap	Barrier	Need	Priority
Capacity building and technical assistance	There is a need for strengthening the Cross-sectoral integrated vision to combine issues related to land-use and to enable a development strategy aligned with the impacts of climatic change and the particular issues in each specific region and commune. Efforts must be made to increase coordination of regional governments, regional ministries and municipalities.	Limited legal faculties related to the legal requirements for the use of tools for planning and spatial planning.	Strengthen coordination issues around the following issues: climate change adaptation, risk disaster management and territorial planning through effective coordination of development plans that include objectives related to sustainable development and the indicated policies. These issues are currently being tackled through the National Spatial Planning Policy.	High (4/5)
	Lack of knowledge at a local level of climate change and its impacts. Lack of personnel with capacity for handling these issues at a local level.	Municipalities are independent entities and the development and implementation of actions depend on the will of the ongoing administration.	Capacity building for all municipalities throughout the country related to climate change adaptation issues and impacts specific to each locality. Develop local adaptation plans in each municipality.	High (4/5)
	Need for a greater involvement of the private sector and more awareness of how climate change will affect them.	Part of the private sector has not given importance to this topic or believes that it will not be affected.	Develop strategic alliances and agreements with the private sector for the implementation of adaptation measures.	High (4/5)
	Lack of knowledge and capacity in diverse levels of society (formal education, education professionals and general public) related to the impacts, vulnerabilities and adaptation to climate change.	There is no compulsory permanent training for teachers and professionals belonging to public institutions.	Develop content related to adaptation to climate change and incorporate at all levels of education managed by the Ministry of Education (MINEDUC). Disseminate information on issues related to adaptation to climate change to children, young people and the general public. Build teaching capacity for teachers to include adaptation to climate change topics at different levels of education. Include the topic of adaptation to climate change in post graduate study programs.	High (4/5)
Technology transfer	Water resources: Lack of introduction of diverse technologies in the different sectors that aim to face the water shortage, with long-term solutions	Resistance to changes in the use of water resources and of new sources of supply. The use of continental water is subject to the acquisition of water rights.	Introduce diverse technologies and technological management to adapt to water scarcity.	Very High (4/5)
	Meteorology: Lack of new technological solutions and state-of-the-art equipment and meteorological radars to monitor climate for appropriate climate risk management.	There are monitoring stations in different institutions and inter-institutional agreements need to be established for efficient data transfer.	Develop the use technologies to improve and widen the scope of information services and products required to support climate risk management.	High (4/5)
	Infrastructure: Requires implementation of monitoring measures to reduce the vulnerability of the public works infrastructure.	Not identified.	Equip coastal infrastructure with control and remote monitoring systems, (Directorate of Port Works), river defenses (Directorate of Hydraulic Works) and bridges (Directorate of Road Protection) for disaster risk reduction.	High (4/5)
	Health: Insufficient prediction capacity of the possible geographical distribution and probable proliferation of zoonotic and vector-borne diseases throughout the country to enable an appropriate prevention of the effects on health associated to these at a local level.	Limited resources due to other priorities in the health sector.	Need of technological solutions to understand the burden of disease associated to climate change and the establishment of predictive models for the behavior of vector-borne and zoonotic diseases, associated to climate change.	High (4/5)
	Biodiversity: Lack of funding for the implementation of a biodiversity and climate change monitoring network which already has a design proposal.	Lack of inter-sectorial coordination and capacity building.	To acquire sensing, data analysis and statistical analysis software, specific technologies and storage capacity for the climate change and biodiversity monitoring network: https://www.ctc-n.org/system/files/dossier/3b/red_monitoreo_chile_altar_39mb_1.pdf	High (4/5)
	Lack of knowledge and solution implementation methodologies based on ecosystems for adaptation to climate change.	There is little dissemination of technologies and methodologies used in AbE projects.	Improve knowledge on technologies and methodologies related to adaptation to climate change.	

Source: Own compilation of the MMA Climate Change Office.

2.1.5 International Negotiation

Concerning international negotiation, the main requirement is to strengthen the climate change negotiation team of the Ministry of Environment and establish permanent teams in the relevant sectorial ministries with adequate financial and technical capacity for strategic development and to complete follow-up of negotiations. The Chilean delegation presently depends on the financial efforts made by each ministry or service which covers the very basic needs for relevant negotiation processes and sessions. The team of experts that participates in negotiations does not have the human resources necessary to provide strategic follow-up to negotiations: Sectorial ministries (energy, agriculture) lack representation in these negotiations. Issues related to negotiations are part of a busy and diverse work schedule that this inter-ministerial team carries out, reducing the time available to elaborate a detailed agenda for planning and coordination for international negotiations.

Table 5 is a summary of the needs in this area.

Table 5: Summary of needs, gaps and barriers to international negotiation

Need area	Gap	Barrier	Need	Priority
Financial Resources	Lack of a specific budget that enables the establishment and maintenance of a specialized and permanent negotiation team.	Lack of understanding that mainstreaming climate resistance and low carbon development must be part of the country's development objectives. The existing budget is minimum and insufficient. An increased budgetary allocation is needed.	Although it must be acknowledged that there have been significant donations that have enabled a minimum functioning of the negotiating capacity, it is fundamental to count on resources that respond to the variety of strategic issues involved in negotiation.	Very High (5/5)
Capacity building and technical assistance	Insufficient resources to satisfy the demand of adequate negotiation skills. There are employees that have the technical capacity to negotiate but that do not speak a level of English necessary for negotiation efforts.	Lack of knowledge of how negotiation issues are related to the sectorial public policy agenda.	Lack of understanding of the links between negotiation issues and the public sector policy agenda Chile requires a permanent capacity to tackle negotiations strategically. Capacity building in different sectors and ministries related to international negotiation in issues specific to each sector. Develop the capacity to communicate in English.	High (4/5)
	Insufficient time allocated to preparation of content for negotiation agendas.	Limited availability of experts in negotiation and support professionals who must see to other priorities on the climate change agenda.	Forward planning and permanent meetings related to negotiation agenda by an inter-sectorial team of professionals from different ministries to tackle international negotiation issues in a coordinated and coherent fashion with a unified vision of the country's needs.	Very High (5/5)

Source: Developed by the Office for Climate Change of the Ministry of Environment.

2.1.6 Needs, gaps and barriers identified by the private sector

The national private sector has had a fundamental role both in investment and in the implementation of innovative climate change mitigation and adaptation measures, contributing to improve conditions for attaining the country's NDC. Also mentioned above, the private sector will play an important role when regulatory measures are eventually designed and implemented to comply with international commitments. Therefore, it is crucial to improve our understanding of the private sector scenario: its main motivations and most significant barriers that influence its actions related to climate change, above all in the companies that have shown progress and have more experience related to this topic. The information provided in this document is based on information gathered from interviews with entities from the private sector such as trade associations, companies and economic development organisms among others, together with an exhaustive revision of sustainability reports, both national and international.

The industries that have shown progress in greenhouse gas reduction measures for their operations are mainly those related to the generation sector; the agricultural sector (especially efforts carried out by the food sub-sector); the forestry sector; the mining sector and the cement and steel industry. These sectors are considered relevant by players that are constantly working with and providing support to the private sector in climate change related topics, such as the Center for Corporate Leaders against Climate Change (CGL-Chile) and the HuellaChile Program.[8]

Each one of these industry sectors has been able to gather the appropriate information and invest the necessary resources to implement mitigation measures in line with the characteristics of their sector and according to the sectorial contexts of each one. Some have even gone beyond isolated measures and have declared these initiatives as part of their corporate policies, which adds a note of optimism to the tendencies that have arisen in the public sector related to climate change.

Notwithstanding, just as there are circumstances that promote investment and implementation of mitigation measures in companies, there are others that discourage the private sector. Some of these situations are present across all industry sectors and others are only attributable to one specific sector. Whatever the case, they must be identified and tackled, not only for the pending efforts in the development of a low carbon economy but also because of the valuable contribution that this sector can make towards achieving compliance with international commitments.

The following table details the main needs, gaps and barriers to the implementation of climate change measures identified in the private sector, both across sectors and sector specific.

Table 6: **Summary of needs, gaps and barriers identified by the private sector**

Sector	Gaps	Barriers	Needs
Transversal	Although there is willingness to implement mitigation measures because of the benefits associated, these are not implemented since future sector demands are unknown. There are no clear regulations or objectives for reduction in the private industry sector that would enable companies to outline corporate and/or commercial policies.	Aversion to risk and fear of innovating with mitigation measures because the future scenario in this area is unknown. Efforts to integrate issues related to climate change depend on the interest, commitment and continuity of the people in charge of sustainability or environment in companies.	Definition of climate change legislation or regulation that clearly establishes objectives and conditions for the private sector with specific terms for each industry sector.
Transversal	Scarcity of skilled personnel that can design and implement mitigation measures according to operating conditions of each company.	Personnel in companies must tackle other issues related to operations and do not see climate change issues as a priority. There is little interest in tackling the issue because there is no apparent direct relation between climate change and operations in companies.	Capacity building at sector level to tackle climate change issues according to their scope, size and productive processes.
Transversal	Companies have no incentive to design mitigation measures; they do not see this as a business opportunity or do not be certain if these efforts will be recognized in the future.	When companies implement mitigation measures they consider these as an increase in costs and not as a business opportunity. The efforts already made in a proactive way by companies have not been recognized, to decrease and/or manage their GHG emissions.	Definition of a programme of various different incentives to speed up actions from the private sector through the promotion of cost efficient measures. Develop a recognition system for emission reduction that is relevant to companies and provides alternative means of compliance to regulations.

[8] *For further details on the main actors of the private sector and the measures implemented at a sector level, refer to the mitigation chapter, section 5.4. About efforts of mitigation in the private sector.*

Sector	Gaps	Barriers	Needs
Transversal	Lack of financial resources and/or tools that promote the implementation of new technologies, especially for small companies that have no access to credit.	The high cost of technology or other costs associated to required changes within the company are a disincentive for investment.	Mobilization of financial resources and/or development of cross-sectoral tools that will enable the introduction of technologies and the implementation of mitigation measures within companies.
Transversal	Lack of coordinated strategic implementation of mitigation measures within the private sector. Measures that have been implemented respond to particular interests of each company.	Lack of dialog within the private sector and between private and public sectors to reach and appropriate design of mitigation measures.	Development of instances for dialog in the public-private domain and within the private sector towards the design of strategic mitigation public policies applicable to both sectors.
Energy	The development of NCRE projects meets with the disincentive of uncertainty in land use projections and possible rejection by the local community.	Restrictions in the use of land for NCRE projects. Rejection of energy projects by the local communities.	Definition of appropriate spatial planning regulations that clearly establish where NCRE projects can be implemented, also reducing possible rejection by local communities.
Forestry	Smaller companies do not have the financial resources for sustainable forest management, increasing the gap with big companies and losing the potential for mitigation associated to small companies.	There are no financial tools that promote planting or afforestation with native species, which is currently not economically attractive to companies.	Development of tools that promote planting and afforestation of native species, sustainable forest management and that include all company sizes.
Mining	High energy consumption that cannot be covered 100% by NCREs, making it necessary to use fossil fuel.	Due to energy shortages mining companies have signed long term power purchase agreements with generating companies to ensure production, therefore, the option to introduce new energy sources if there are changes in regulations will not be in the foreseeable future. Since companies must pay for energy contracted under the power purchase agreements and not just for energy consumed, there is no incentive to complement energy consumption with NCREs. Since any potential reduction is attributed to the energy sector, there is a disincentive to introduce renewable energies.	Increased flexibility in establishing climate change mitigation regulations to consider internal deadlines and other particularities of the mining sector. Incentive program to promote the penetration of NCREs in the country's energy matrix.
Cement	There is a huge amount of potential waste that is not being used in co-processing operations, greatly reducing the potential to replace fossil fuels at a national level and renders useless any investments in technology made in companies.	The lack of regulation and monitoring of eligible waste that can be integrated into co-processing of waste in the cement industry means that the potential that companies have to replace fossil fuels is not being used.	Development of regulations and/or monitoring mechanisms for the cement industry that will assist in identifying waste appropriate for co-processing. This will promote the use of waste to replace fossil fuels in generation processes.

Source: Elaborated by our team based on interviews with players from the private sector.

2.2 Needs identified in the international consultation and analysis process

During 2015, Chile's first Biennial Update Report (BUR) was submitted for the process of International Consultation and Analysis (ICA). The main objective of this process is to help Non Annex I countries to identify their capacity-building needs. In the case of Chile, the process resulted in an analysis report published on the website of the UNFCCC on December 18th, 2015[9]. Section III.D of the report presents the needs in terms of capacity building. The status of these needs up to June of 2016 is addressed in Table 7 below.

[9] *http://unfccc.int/resource/docs/2015/tasr/chl.pdf*

Table 7: Needs identified in ICA

Needs identified in ICA of the 1st BUR	Status of the Need
a) With regard to GHG inventory development, Chile mentions the importance of ensuring a sufficient number of qualified technical staff in the National Greenhouse Gas Inventory System to increase the quality of the inventories. In addition, it mentions the need to create the internal capacity to generate country specific emission factors, especially for the key categories. (CMNUCC, 2015)	At present, the technical capacity of professionals in SNICHILE has increased through different training initiatives such as workshops, seminars, courses, exchange of experiences, etc., however, there is still a gap in terms of the lack of permanent professionals involved in GHG inventories; hence, it becomes necessary to increase the number of professionals on permanent contracts, where their functions include the creation of GHG inventories. In this way, the preparation of Chile's NGHGI can be sustainable over time. Regarding internal capacities for the development of country specific emission factors, the Sectoral Technical Teams have made progress; particularly, the AFOLU Technical Team has begun new research to determine country specific emission factors for N_2O emitted directly from agricultural soils, identified as key categories. In Addition, this same team is still doing research and measurements to improve the parameters used for forestry and for changes in land use such as biomass carbon content, biomass increase rates, forest allometric equations, etc. Conversely, there is still no progress on the determination country specific emission factors for CO_2 generated by the burning of solid fuels (main source of emission of the country) due to lack of information. Nonetheless, since the uncertainty of the default emission factors of CO_2 from solid fuel burning is low, the priority now is towards the development of country specific emission factors in the AFOLU sector, where the focus is the uncertainty of Chile's NGHGI.
b) Chile indicates that capacity building activities are needed to address knowledge gaps in the energy sector of the GHG inventory, resulting from the turnover of the expert team involved. Specifically, the staff require training on how to understand and apply the 2006 IPCC Guidelines to the energy sector. (CMNUCC, 2015)	While there is personnel turnover on the Energy Technical Team in the Energy Planning and Policy Division (DPPE) of the Ministry of Energy –responsible for the National Energy Balance and for the Energy GHG Sectoral Inventory (ISGEI), among others– there are professionals on the team with the necessary technical competences to elaborate the Energy ISGEI. These competences have been developed during the previous update process and also through international trainings encouraged by the Coordinator Technical Team. Moreover, the DPPE has incorporated to their activities the elaboration of the Energy ISGEI; hence, these activities are already part of the 2017 work plan. The DPPE is also including the Energy ISGEI elaboration in the job description of their professionals, which means progress in terms of the sustainability of the Energy ISGEI elaboration and consequently, of Chile's GHG National Inventory (NGHGI).
c) In order to enable continuous and sustainable reporting on the support needed and received in its BURs, Chile requires capacity building assistance to address technical and knowledge gaps to enable the systematic collection of relevant data and information, through adequate mechanisms and institutional arrangements. (CMNUCC, 2015)	Although in the present report a methodology was developed which best included the sectors in the information gathering for the BUR, mainly through surveys and workshops, there is still a need to collect information in a systematic manner, one that is considered within the duties of the sector as part of the inclusion of the climatic change issue in the design of public policies.
d) Establishing procedures and specific arrangements to guarantee the continuous involvement of relevant institutions in the systematic collection, compilation and validation of data and information on constraints and gaps, and support needed and received in each of the action a reas identified in the BUR is needed. (CMNUCC, 2015)	Work has been continued with focal points within the Government institutions that are relevant in this matter. Through the work developed for the National Action Plan, multiple institutions have taken part in the challenges for the following years in matters of Mitigation, Adaptation and Implementation Means. It is still a need to have institutional arrangements or mandates which allow gathering of information in a systematic and permanent manner.
e) In order to implement and assess impacts from key NAMAs, Chile indicated that capacity building and exchange of good practices associated with the design of monitoring (e.g. identifying suitable methodologies), reporting (e.g. collecting and tracking information) and verification "MRV" systems for mitigation measures, in particular those associated with improving energy efficiency, but also other sectors, is needed. (CMNUCC, 2015)	Work has been carried out on the capacity building for impact assessment of the mitigation actions as well as for having clear rules of accounting to be used in the designs of MRV systems. In addition, a guideline has been developed for a generic MRV framework that provides clear standards about technical information and procedures to be considered during the design of MRV systems for the actions of mitigation. It is necessary to move forward in this matter, since the assessment of the direct and indirect impacts of the NAMAs are still not fully understood, therefore the task of performing this type of analysis is outsourced.
f) Chile indicated that capacity building to conduct a technology needs assessment is necessary, particularly with regard to facilitating the systematic collection of data and information for preparing BURs, but also for implementing MRV systems for planned mitigation actions. (CMNUCC, 2015)	Information in regard to this point has improved; nonetheless, it is still a need of the country as reflected in the previous sections.

3. Support for Climate Action

This chapter of the report presents information about received support (international) and provided support (national) destined to activities related to climate change. The support information is presented in the following three categories and corresponding subcategories:

- Support destined to the preparation and publication of national communications
  - International and national financial resources
  - Training activities
- Support received for activities related to climate change
  - Financial Resources
  - Capacity building and technical assistance
  - Technology transfer
- Local support received for activities related to climate change

The collection of information of this section was performed using the following methodology:

- Stage I: Identification of the multiple initiatives and international support received around climate change in the country, those coordinated by the Ministry of Environment (MMA) and those implemented by other public institutions. The information reported in the first BUR was reviewed along with all of the initiatives known to the MMA.

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- Stage II: Once the information was collected and the multiple initiatives and received support actions were identified, a formal survey was sent to the public institutions that compose the Inter-ministerial Technical Team for Climate Change (ETICC) requesting the validation of these Initiatives and the incorporation of new information for the reporting period of the present report.
- Stage III: A review was performed with some public institutions to clarify and/or complete the reported information. A cross-check was also carried out with some of the sources of support (donors), implementers and/or administrators of such initiatives, with the purpose of comparing and analyzing the coherence in reported information.
- Stage IV: In the case of information of support to initiatives coming from the private sector, an analysis was run on the websites of multilateral funds and institutions that contribute with concessional loans or other financial instruments. The type of funded project was also checked.
- Stage V: For the information concerning local support, the Chilean International Cooperation Agency

was requested to submit a report of the resources allocated for climate action in the period.

The time scope of the information included in this section is focused on those initiatives that received support between **July of 2014 and July of 2016**. This means this section not only includes new initiatives but also presents information of initiatives that began prior to July 2014, however, are still underway.

3.1 Support destined to the preparation and publication of national communications

3.1.1 Financial Resources

During the period 2014 – 2016 Chile has continued to develop activities related to the preparation of the periodic reports established by the UNFCCC, partly due to the financial contribution received through the Global Environment Facility (GEF). By means of the GEF, Chile has received approximately USD$ 830,000 in financial support for the preparation and publication of the Third National Communication and the second Biennial Update Report.

For the preparation and publication of the Third National Communication, the committed support amounts to USD$ 480,000, allocated in the period 2012 – 2016 (Table 8).

Table 8: Chile's Third National Communication before the United Nations Framework Convention on Climate Change (TCN)

Title of the project Activities of support to prepare Chile's Third National Communication before the United Nations Framework Convention on Climate Change (TCN)					
Objective: Communicate to the Conference of the Parties information of Chile, in accordance with Article 12 of the UNFCCC					
Description of the project: Inform to the UNFCCC the status of the country situation regarding climate change, in the period subsequent to that of the First BUR.					
Source of support	Sector	Total Fund (USD)	Status of the Fund	Start year	End year
Global Environment Facility (GEF)	Transversal	480,000	Received	2012	2016

Source: Department of Climate Change, MMA.

Table 9 summarizes the budget allocation by report item and its content. Approximately 51% of the budget has been destined to generate new information for the item of vulnerability and adaptation, through the development of research and sectoral consultancy. Around 30% is meant for activities of capacity strengthening and dissemination. 10% of the budget is assigned for the gathering of information pertaining to the mitigation area and 8% for project management expenses.

Table 9: GEF Contribution to the preparation of the Third National Communication

GEF Contribution to the preparation of the Third National Communication GEF Contribution to the preparation of the Third National Communication		
Component	General content	Budget (USD)
Vulnerability and Adaptation	Consultancy: Sectoral studies (health, water resources, land-use management, others)	244,261
Mitigation	Consultancy: NAMAs report and NAMAs dissemination activities	49,855
Capacity development and dissemination activities	Training workshops and dissemination, participation in international knowledge networks, preparation of chapters for the Third National Communication Editing and publishing of Third National Communication, Activities of dissemination of TCN.	144,524
Project management	Administrative coordination, audits, equipment purchase, agency fee	41,360
Total		**480,000**

Source: Department of Climate Change, MMA.

In the case of the second Biennial Update Report (BUR) 2016, the GEF contributed with an amount of USD$ 352.000 destined to activities of preparation and publication of the report (Table 10).

Table 10: Second Biennial Update Report (BUR) 2016

Title of the project: Second Biennial Update Report (BUR) 2016					
Objective: Enhance the information to be communicated to the Conference of the Parties in relation to the application, in accordance with Article 12 of the UNFCCC.					
Description of the project: The BUR 2016 will update and provide further details on the information included in the Second National Communication (2011) and in the First Biennial Update Report (2014).					
Source of support	Sector	Total Fund (USD)	Status of the Fund	Start year	End year
Global Environment Facility (GEF)	Transversal	352,000	Approved	2015	2016

Source: Department of Climate Change, MMA.

Table 11 shows the budget allocation for the BUR 2016 project and Chile's contribution to it. Around 60% of the resources are assigned to activities for the collection and update of information on GHG inventories, mitigation actions and accounting measures, reporting and verification. Chile contributes by appointing civil servants to work specifically on the report preparation tasks; contribution that is equivalent to approximately 300 hours, valued at USD$ 55,000.

Table 11: GEF Contribution to the preparation of the Biennial Update Report (BUR) 2016

GEF Contribution to the preparation of the Biennial Update Report (BUR) 2016	
Report Item	Budget (USD)
Information on national circumstances and arrangements relevant to the preparation of national communications	15,000
National GHG inventory	79,000
Information on mitigation actions and their effects, including methodologies and assumptions	77,000
Information on MRV systems implementation	77,000
Constraints/gaps and associated needs (financial, related to technology capacity), including details of received support and support needs	7,000
Information on received support for the preparation and dissemination of reports	3,000
Other relevant information for the scope of the objectives of the Climate Change Convention	2,000
Monitoring, reporting of audits	15,000
Publication of reporting	45,000
Project management	32,000
Total	352,000

GEF Contribution to the preparation of the Biennial Update Report (BUR) 2016	
Contribution in-kind (hours/person) according to public institution	Valuation (USD)
Ministry of Environment: Approximately 730 hours	43,000
Other Ministries: Approximately 285 hours	12,000
Total	55,000

Fuente: Departamento de cambio climático, MMA.

3.1.2 Training activities for the preparation of national communications

This section contains a summary of the information about training activities for the preparation of national communications in which civil servants from the Chilean Government participated for the period 2014 – 2016. Table 12 presents the summary of these activities by year of implementation, objective and organizer.

Table 12: Support in terms of capacity strengthening for the preparation of national communications (2014 – 2016)

Year	Name of the Initiative	Objective	Organizer
2016	Regional training workshop for the Latin America and Caribbean region on the preparation of biennial update reports (BURs)	To improve capabilities of the national experts of the non-Annex I Parties in the usage of the "Guidelines for Biennial Update Reports elaboration for Parties non-included in the Annex I of the Framework Convention" and to make known the consultation process and the international analysis	UNFCCC
2016	Workshop on the revision of the guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications	To discuss the revision of the guidelines of the report for National Communication of the United Nations Framework Convention on Climate Change (UNFCCC), based on the technical papers prepared by the convention's Secretary.	UNFCCC
2016	Technical analysis of biennial update reports (BURs) from developing country Parties	To develop the technical analysis for the Biennial Update Reports of Mexico, Uruguay and Lebanon, under what was stipulated in the 1/CP. 16, paragraph 63, of the Conference of the Parties signing UNFCCC.	UNFCCC
2015	Exchange among peers under the Information Matters project - Experiences and lessons learned regarding sustainable reporting systems	Exchange experiences among the four countries participating in the Information Matters project (Chile, Dominican Republic, Philippines, and Ghana) in the process of preparation of national reports related to Mitigation of Greenhouse Gases (GHG); and elaborate sustainable MRV systems.	Information Matters Project, German Government
2014	Expert Workshop to review draft materials for the training programme for the technical team of experts (TTE)	To revise and discuss the guidelines proposed by the CGE for the development of the experts analysts courses for Biennial Update Reports for the non-participating countries in the Annex 1 of the Convention	UNFCCC

Source: Department of Climate Change, MMA.

3.2 Support received for activities related to climate change

This section contains a summary of climate change initiatives for which Chile, as a developing country, has received international support for their development and/or implementation. The information is classified according to the type of support received:

- Financial Resources
- Capacity building and technical assistance
- Technology transfer.

The information on financial resources includes the ones allocated for the preparation and publication of national communications presented separately in the previous section.

Most of the financial resources received in period 2014 – 2016 correspond to resources classified as Official Development Assistance (ODA). This source of international cooperation has played an important role in the progress of Chile's climate agenda. However, given the current level of Gross Internal Product per capita of the country, it is expected that Chile will cease to be a recipient of ODA resources as of 2017.

3.2.1 Support received in terms of financial resources

Financial resources managed by the public sector

This section contains a summary of the information on those financial resources assigned to Chile to facilitate the compliance with its commitments in the areas of reporting, mitigation, NGHGI, adaptation and international negotiation. These contributions refer to direct money flows received by the country in order to develop activities or programs specific to the national climate agenda. It does not include money flows to the private sector.

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The flows of financial resources have been classified, by donor type, as follows:

- **Bilateral:** Resources coming from a specific country that is jointly developing a project either with the Chilean Government or sponsored by it.
- **Multilateral Funds and Institutions:** These funds or institutions receive contributions from multiple developed countries to be later allocated to developing countries (e.g. Global Environment Facility, Adjustment Fund, and UNFCCC).
- **International Financial Institutions:** International financial institutions are those whose activities are also carried out due to funding from multiple donor parties, but following management practices common to international development banking (e.g. Inter-American Development Bank, KFW). Services include allocation of donations, but also the assignment of loans or other financial instruments. However, information in this section is limited to those resources that fall into the donation category.
- **Other multilateral contributions:** These are donations by two or more countries or organizations working together around a specific initiative (e.g. NAMA Facility).

During the reporting period (July 2014 to July 30th 2016), the donor countries and institutions have granted a total of USD$ 22,150,625 to Chile for the execution of activities part of the national climate agenda (Table 13).

Bilateral contributions represent, approximately, 7% of the financial resources approved for the period. Resources channeled through multilateral funds and institutions amount to 70%, while resources handled by international financial institutions make up 10%. Other multilateral contributions make up around 13% of the total support.

Table 13: Summary of support received in terms of financial resources, 2014 – 2016

Donor Type	Financial Resources (USD)	Area					Sectors
		R	M	I	A	N	
Bilateral	1,574,714						Transversal| Energy | Transportation | Agriculture | Forestry | Water | Waste
Multilateral Funds and Institutions	15,493,683						Transversal| Energy | Forestry | Fishing and Aquaculture | Biodiversity
International Financial Institutions	2,178,000						Energy | Financial Instruments | Transportation | Forestry
Other multilateral contributions	2,904,228						Transversal
Total	**22,150,625**						

Source: Developed by author. Department of Climate Change, MMA.

Figures according to funding sources (Table 14) indicate that, in terms of bilateral donations and for the period under analysis, the main contributions in the form of direct money flows come from the United Kingdom; support channeled mainly through the Foreign and Commonwealth Office's Prosperity Fund. These figures also show financial resource contributions from the Canadian and Mexican Governments, the latter by means of the Chile-Mexico Joint Cooperation Fund.

Under the 'Multilateral Funds and Institutions' category, the World Bank is the institution through which the majority of the resources, equal to 48%, are channeled. Flows are concentrated on two initiatives that transfer their resources through the Bank: Partnership for Market Readiness and the Carbon Finance Unit. The Global Environment Facility (GEF) shows the second highest participation, with approximately 30% of the resources.

Under the category of 'International Financial Institutions', the Inter-American Development Bank (IADB) shows flows of about 76% of the total of resources in that category.

Under 'Other Multilateral Contributions' the resources are channeled through initiatives where donor countries participate directly and jointly with non-government organizations, that at the same time capture and transfer resources from other donors. In this category, the main donors are the Federal Republic of Germany, Australia, the United Kingdom, the Swiss Confederation and the European Commission.

With regard to the international negotiation area, the Federal Republic of Germany contributes with financial resources for the operations of a technical secretariat, that supports the Independent Association of Latin America and the Caribbean (AILAC) of which Chile is a member along with other countries of the region, however, this contributions are meant to fund the technical support to this alliance; for that reason there are no further details on the specific support allocated to Chile.

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Table 14: Details of allotted financial resources, per type of donor, period 2014 - 2016

Donor Type	Financial resources (USD)	Area					Sectors
		R	M	I	A	N	
Bilateral/countries	**1,574,714**						
United kingdom	1,171,934		■				Transversal| Energy |
Canada	198,000				■		Transversal| Infrastructure
Mexico (Chile-Mexico Fund)	204,780				■		Biodiversity | Risk | Water resources
Multilateral Funds and Institutions	**15,493,683**						
Global Environment Facility (GEF)	5,333,683	■	■		■		Transversal| Energy | Forestry | Fishing and Aquaculture
UNFCCC	250,000				■		Biodiversity
Adaptation Fund	1,900,000				■		Agroforestry
UN REDD	560,000		■				Forestry
World Bank	7,450,000		■				Energy, Forestry
International Financial Institutions	**2,178,000**						
Inter-American Development Bank (IADB)	1,607,000		■				Transportation | Forestry
KFW	571,000		■				Energy
Other multilateral contributions	**2,904,228**						
NAMA Facility (Germany - United Kingdom)	29,850		■				Energy
Federal Republic of Germany | Commonwealth of Australia | European Commission	1,584,000		■	■			Transversal
Swiss Confederation, The Children's Investment Fund Foundation	1,290,378		■				Transversal
Total	**22,150,625**						

R = Report; M = Mitigation; I =NGHGI; A = Adaptation; N= International Negotiation
Source: Department of Climate Change, MMA.

Table 15 presents information on the main projects that receive financial resources in the period. The chart contains information about the following projects: 'Mitigation Action Plans and Scenarios (MAPS)', 'Low Emission Capacity Building (LECB)' and 'Partnership for Market Readiness (PMR)'. These initiatives have strengthen local capacities and cross-supported the design of instruments and public policies on climate change. These projects in particular correspond to carryover initiatives, which began operating prior to 2014, however, are still in force and in progress in the period relevant to this report's elaboration.

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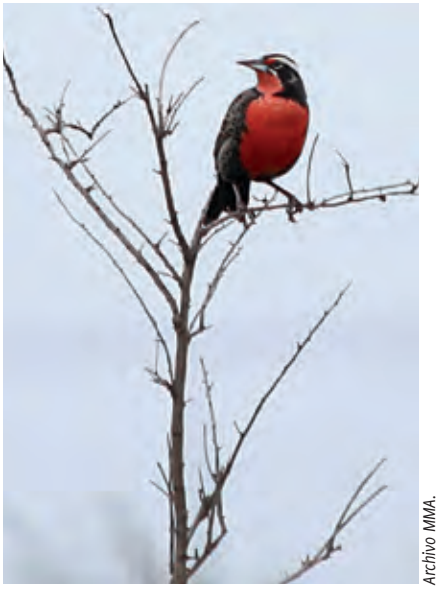
Table 15: Main projects receiving support in terms of financial resources; period 2014-2016

Project	Objective	Description	Donor Institution Fund	Financial resources (USD)
Mitigation Action Plans and Scenarios (MAPS Chile) 2014-2015	Facilitate decision-making on potential actions of mitigation at national level	The project involves long term modeling scenarios and mitigation options, based on a participative and multi-sectoral technical process. MAPS products were a critical input for the construction of the mitigation component of Chile's INDC.	Swiss Confederation Children's Investment Fund Foundation	1,290,378
Low Emission Capacity Building - Chile (LECB-Chile) 2012 - 2016	Promote and create capacities in the public and private sector regarding the measurement of GHG emissions.	The project started in 2012 and is part of an initiative leaded by the United Nations Development Program (UNDP) in 25 countries.	European Commission, Federal Republic of Germany, Commonwealth of Australia	1,584,000
Partnership for Market Readiness (PMR) 2011-2017	Generate technical capacities, asses, design and eventually implement market instruments to reduce GHG emissions.	Feasibility assessment of one or more instruments of fixation on carbon pricing in the energy sector; design and implementation of an MRV framework and a registration system; and a communication strategy and commitment of participation of the multiple related actors.	Several donors by means of the World Bank	3,000,000
National Strategy for Efficient Lighting (2013-2017)	Develop and implement a National Strategy for Efficient Lighting (ENIE)	Promotes technology innovation by enabling the use of efficient lighting products, helping reduce GHG emissions.	GEF	2,744,683
Carbon Finance Unit (preparation phase 2015 - 2018)	Promoting a more sustainable use of forest resources.	Conduct pilot activities to reduce CO_2 emissions from deforestation and forest degradation. Introduce improvements in forest land use to generate sustainable income flows.	World Bank	3,800,000
Enhancing resilience to climate change of the small agriculture of O'Higgins Region in Chile (2016-2019)	Increase the resilience capacity in rural communities along the coast and dry land of O'Higgins region, Chile.	Design and implement measures to reduce vulnerability of small agriculture to changes in agricultural production, ecosystem services and biodiversity.	Adaptation Fund	1,900,000

Source: Department of Climate Change, MMA.



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Financial resources channeled towards private sector projects

This sections presents information on financial resources channeled towards private sector projects related to climate change. It includes financial support from development banking institutions and funds focused on funding actions for climate change mitigation and the transition to a low carbon economy. Projects included in this section do not necessarily count on the sponsorship of the Chilean Government, since this is a requirement that depends on the rules of each source of funding.

Table 16 shows the summary of the financial flows for the considered projects. The amount of resources reaches two hundred and seventeen million dollars[10], mainly in the form of loans for investment in energy projects. Under the 'Multilateral Funds and Institutions' category, the Green Climate Fund (GCF) is the institution that shows resource transfers towards private sector projects. In the category 'International Financial Institutions', the Inter-American Development Bank and the International Finance Corporation (pertaining to the World Bank) have assigned loans to private investment projects.

[10] *Information of resources from international financial institutions for period 2013-2014 available on website www.oecd.org/dac/stats/climate-change.htm. No information available for period 2011-2013 and 2015 - 2016, consequently, it is estimated that the sums registered in this report probably correspond to a conservative estimate.*

Table 16: Financial resources - channeled towards private sector – includes concessional and non-concessional contributions

Type of donor / benefactor	Financial resources (USD)	Area					Sectors
		R	M	I	A	N	
Multilateral Funds and Institutions	**49,000,000**						
Green Climate Fund	49,000,000		■				Energy
International Financial Institutions	**168,700,000**						
Inter-American Development Bank (IADB)	103,700,000		■				Energy
International Finance Corporation (World Bank)	65,000,000		■	■			Energy
Total	**217,700,000**						

Source: Developed by author. Department of Climate Change, MMA.

Table 17 contains further details on the projects according to the fund or institution that provides the financial support. Supported projects focus on the energy sector, mainly those based on solar technology. This allocation of resources according to project type and funding need is aligned with the kind of barrier that these institution and instruments are seeking to resolve.

Table 17: Details on financial resources channeled towards private sector (2014-2016)

Fund/Institution	Project	Description	Funding sum (USD)
Green Climate Fund (GCF)	Climate Action and Solar Energy Development Program in the Tarapacá Region in Chile. 2016	Photovoltaic solar project of 143MW, to be implemented by Sonnix company.	49,000,000
Inter-American Development Bank (IADB)	Arica I Solar PV 2014	Construction, operation and maintenance of 40MW photovoltaic solar plant.	27,700,000
	Crucero Solar PV 2014	Photovoltaic solar project	50,400,000
	Los Loros Solar PV 2014	Construction, operation and maintenance of 53MW photovoltaic solar plant.	25,600,000
International Finance Corporation (IFC)	Solar - Lending for renewable energy generation 2014	Not available	65,000,000
Total			**217,700,000**

Elaborated by the author, the Department of Climate Change, MMA, based on information from www.greenclimatefund.org, www.oecd.org/dac/stats/climate-change.htm

3.2.2 Capacity building and technical assistance

This section addresses the support received by the country in the areas of capacity building and technical assistance. In Chile, the concepts of capacity building and technical assistance have been developed via two lines of work:

- **National:** The National Strategy on Climate Change (2006) established a strategic line of creation and promotion of capacities, which was later ratified on the National Action Plan on Climate Change (2008-2012). Its main objective was defined as follows: 'Disseminate and create awareness among citizens about environmental issues and, particularly, those stemming from climate change; promoting education, sensitization and research on this matter in Chile'. Work has been centered in formal and informal education for the citizens, for other institutions and for public and private services, supporting the inclusion of basic concepts among teachers, students and professionals; in addition to proposing practical activities to facilitate this inclusion.

- **International:** Chile has received generous support from diverse countries, that have contributed with training projects and technical support on the many topics related to climate change, through projects and programs with specific objectives in the areas of mitigation, reporting, adaptation along with several workshops and technical visits for capacity building at an institutional level.

It is also important to mention that Chile's INDC (2015) includes among its commitments a specific pillar for the capacity building and strengthening.

In terms of projects, programs and relevant alliances for capacity build-

ing and technical assistance, Table 18 contains a summary with information on the international initiatives in which Chile participates permanently, where the support received by the Federal Republic of Germany, the European Commission, Spain, World Bank, etc., is highlighted and appreciated. It is worth noting that the Federal Republic of Germany is the main collaborating country with regard to capacity building and technical assistance; cooperating through specific projects, workshops, studies and programs, which have had a favorable impact on the increase of the country's installed technical capacity.

Since these initiatives and their corresponding funding means are of a global nature, there is no information available of the sums allocated to specific activities in Chile.

Table 18: Main international initiatives focused on capacity building where Chile has permanent participation, 2014-2016

Area	Name of the Initiative	Objective	Description	Donor	Start year	Status	Notes
R,M,I	Information Matters	Support institutions from counterpart countries in the analysis of their monitoring and communication processes, in closing gaps, and in the improvement of said processes in compliance with international standards and UNFCCC requirements.	The project provides technical assistance to four selected countries: Philippines, Ghana, Dominican Republic and Chile. In consultation with the counterparts, specific needs and priorities of the MRV and GHG monitoring systems are identified and then those systems are improved through workshops and custom courses.	Federal Republic Of Germany	2013	In progress	Chile is currently designing its work plan for the next stage of the initiative.
M,A	EUROCLIMA	Facilitate the inclusion of strategies and measures of mitigation and adaptation to climate change in public policies and development plans in Latin America.	Regional cooperation program between the European Union and Latin America focused on climate change. The Program seeks to achieve the following results: Improve the exchange of information and experiences on climate change, increasing political sensitization and strengthening the institutional capacity; Identify and prioritize adaptation and mitigation measures that are 'useful in any case' and/or with additional benefits; and strengthen food safety in Latin America, hence contributing to sustainable agriculture with a better capacity to mitigate the effects and adapt to climate change.	European Commission	Phase I 2010-2013 and Phase II 2014-2016	In progress	Global funding Phase I: USD 6,831,000 (EU Contribution: USD 6,600,000). Global funding Phase II: USD 16,615,500 (EU Contribution: USD 15,114,000). 18 Latin American associated countries.
M,A	Regional Platform for Latin America and the Caribbean: LEDS LAC	Strengthen quality, support and leadership of the LEDS in the region, effectively implementing them by promoting their national and subnational development.	It is part of the Low Emissions Development Strategies Global Partnership (LEDS-GP) founded in 2011, which operates by means of an innovative model of distributed leadership, where regional institutions manage local platforms providing technical support from international organizations (LEDS-GP, 2012)	Multilateral	2011	In progress	Chile leaded the initiative in 2014. The third regional workshop was carried out in Santiago that same year.
M,A	Climate Change Latin American Network of Offices (LARIOCC)	Function as an instrument for permanent dialog on climate change mitigation and adaptation.	It is formed by the climate change national offices or units under the ministries of environment of countries pertaining to the Ibero-American Community of Nations (21 countries). The network establishes relations with other networks, organizations and institutions, especially with the regional ones, in order to promote synergies among studies and experiences in the region (LARIOCC, 2012).	Kingdom of Spain	2004	In progress	Since its creation in 2004, there has been a meeting every year. The most recent meeting where Chile participated was in 2015 at COP21 in Paris.
M,I	Global Research Alliance (GRA)	Bring countries together to find ways of producing more food without increasing GHG emissions.	The GRA focuses on research, development and dissemination of technologies and practices that help offer ways of producing more food with no increase of GHG emissions. The members of the Alliance share the objective of deepening and widening research efforts through mitigation in the agricultural sub sectors of rice, crops and cattle; and cross-cutting issues related to soil carbon measurement, nitrogen cycle and GHG inventories.	New Zealand | GRA	2011	In progress	GRA has conducted several global meetings, where Chile has been a participant thanks to the support of diverse members of the alliance.

Area	Name of the Initiative	Objective	Description	Donor	Start year	Status	Notes
M,N	International Partnership on Mitigation and MRV	Support practical exchange in activities related to GHG mitigation among developing countries and first world countries, with the idea to help close the global gap.	This alliance is focused mainly on the collaborative design of national strategies for low emission development, NAMAs and MRV systems. It is formed by approximately 60 country members, of which more than half are developing countries (International Partnership on Mitigation and MRV, 2014).	Federal Republic of Germany/ Republic of South Africa/ Republic of Korea	2010	In progress	Development of capacity building activities and exchange of experiences though seminars, summer schools, and webinars, among others.
M,N	Mitigation Action Implementation Network (MAIN)	Encourage ambitious mitigation actions by identifying optimal procedures, effective funding mechanisms and MRV.	Technical cooperation, organization of workshops and dialogues at regional and global levels about the development and implementation of specific NAMAs in the sectors of transportation, energy and waste.	Federal Republic of Germany/ World Bank '	2012	In progress	The main technical collaborators are the Center for Clean Air Policy (CCAP) and the World Bank Institute
M	The Mitigation Momentum project	Promote and accelerate the actions for greenhouse gases reduction.	Supports the development of NAMAs, contributing to the solid development of proposals, besides boosting the cooperation and exchange of knowledge throughout NAMAs community.	Federal Republic of Germany | World Bank	2012	In progress	This project is collaboration between ECN Studies and Ecofys Germany. In addition, it is part of the international climate initiative and supported by the BMUB.
N,M,A	Cartagena's Dialogue for the progressive action	Build an ambitious, comprehensive and legally binding regime under the UNFCCC.	Chile participates of the informal dialogue forum on climate change that brings together all countries that maintain a high level of commitment with GHG reduction goals and which also support a process that ends with a universal and legally binding agreement. Chile has participated in the Dialogue since the first meeting held in Cartagena, Colombia in March of 2010.	Multilateral	2011	In progress	The Dialogue is still active post COP21, analyzing potential changes to adjust to the current context of the negotiations.
N	Ambition Leaders: Supporting the AILAC countries at the climate negotiations	Support AILAC countries to provide counseling to the delegations, to their experts and to perform logistic tasks, during negotiations and in the periods in between sessions.	In order to meet the objectives, an infrastructure is being built for reliable and efficient support that will allow analyzing complex matters and summarize this information for the delegations, also to develop strategies of negotiation, to establish effective communications strategies and to provide training in negotiation skills.	Federal Republic Of Germany	2013	In progress	AILAC is formed by eight members: Chile, Colombia, Honduras, Peru, Guatemala, Costa Rica, Panama, and Paraguay.

R = Report; M = Mitigation; I =NGHGI; A = Adaptation; N= International Negotiation
Source: Department of Climate Change, MMA.

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In addition to projects, programs and alliances aforementioned, Chile has received support in the area of capacity building and technical assistance through other initiatives that have encompassed projects and/or development of specific studies, which were funded directly by the donors, without a financial resource transfered to Chile. For that reason there is no valuation of the activities associated to those studies.

3.2.3 Technology transfer

This section approaches to the supports received by the country in the technological transfer field. Table 19 presents information about initiatives destined to the direct transfer of some specific technology, as well as to the technical support and the the specific capacity building to develop it.

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Table 19: Initiatives related to technology transfer, period 2014-2016

Area	Start year	End year	Name of the Initiative	Objective	Description	Donor
EE	2016	2016	Financing Program for the co-generation	To accelerate the technological replacement in the industrial area, energy field.	Initiatives are focused on improving the energetic performance and the competitiveness of companies, forming human capital and develop replicable initiatives in the co-generation field.	KFW
M	2012	2016	Solar Energy for electricity and heat generation	To generate electricity and heat through thermic small-scale photovoltaic and solar plants.	In this framework it is considered the execution of several activities, among them stands out the installation of photovoltaic laboratories for the training in formation centers and also the support to the Energy Ministry program of spreading these systems on the public sector. The applications are located on the residential, commercial and industrial sectors. Through the improvement of the actual conditions of the regulatory framework, the development of innovative business models, the strengthening of local competences, new markets for the solar energy technologies should be driven.	German government
M	2014	2019	Promotion of the Solar Energy (focused on CSP)	To establish large-scale markets for renewable energies focused on the utilization of solar energy with Concentrating Solar Power (CSP) and photovoltaic systems.	Working lines include topics like training, the integration of large scale NCRE, the identification of new technological applications and spreading the Chilean experiences in these subjects at an international level. This technical cooperation project is part of an agreement between Chile and Germany that also has a financial component covered by the German Development Bank, Kreditanstalt für Wiederaufbau (KfW).	German government

R = Reporte; M = Mitigación; I = INGEI; A = Adaptación; N= Negociación internacional
Fuente: Elaboración propia, Departamento de Cambio Climático MMA

In the Annex V, a summary of all registered initiatives developed with external support by the country during the period 2014-2016 is presented. A summary of training and capacity strengthening activities involving representatives of the public sector is also presented.

3.3 Local support received for activities related to climate change

It is important to emphasize that, although the country has been receiving important financial contributions and various types of support, in recent years, funds have been dedicated to financing actions to address climate change locally.

To develop a climate financing strategy (commitment in its Intended Nationally Determined Contribution INDC), the Chilean Government is

now implementing measures to define and evaluate the domestic resources destined for actions related to climate change.

The Ministry of Environment in collaboration with the Ministry of Finance and The Low Emission Capacity Building (LECB)-Chile program, is now implementing the 'Climate Expenditure' project in the 2015-2016 period. To evaluate the public expenditure, a pilot is being applied under The 'Climate Public Expenditure and Institutional Review (CPEIR)' methodology. This tool evaluates the links in 3 areas: politics, institutionality and the assignment of resources in the climate change area. Its application aims to support the development in an integral fiscal climate framework; contributing to improve the consistency of public policies with the priorities and commitments adopted by the country. It also seeks to strengthen the capabilities of the public sector, generating an consolidated accounting of the resources mobilized in adaptation and mitigation matters. The application is centered in energy and agroforestry sectors (given the importance of these sectors in the total GHG emissions of Chile).

The execution of the 2015 pilot exercise has allowed to identify the actual conditions of access, disposition and consistency of the information required, besides of the strengths and limitations of the CPEIR methodology to obtain a robust number of expenditure in climate change. To obtain a reliable and robust figure of public climate expenditure it will be necessary to advance in actions that allow perfecting the methodology and the elements of the information available. During the year 2016 and given the grade of advance, learning achieved and validity of the current report for the first estimate of the public expenditure in climate change, a new estimate and analysis of the public expenditure are being done.

The objective and available information in this moment corresponds to the resources destined for projects and climate initiatives developed in Chile through the Chilean International Cooperation Agency (AGCID). The AGCID leads and coordinates the Chilean labor in international cooperation matters. In the case of climate change, co-financing resources are registered for bilateral activities with the German and Switzerland governments that combine climate benefits with other environmental benefits. The total amount for the 2011-2016 period reaches USD$20,370,000. This information is presented in Table 20.

Table 20: Domestic support for climate projects and initiatives developed in Chile

Organism				
Chilean International Cooperation Agency (AGCID)				
Year	**Project**	**Description**	**Sector**	**Contribution (USD)**
2014 (start)	Solar Program (solar concentration plant)	Developed with the government of The Federal Republic of Germany	Energy	20,000,000
2014 (start)	Clean Air and Climate in Latin-American Cities Program	Developed with the government of Switzerland	Transversal	300,000
2014 (start)	Development of a national eco-label system: opportunities for sustainable public purchases and benefits related to the climate change and biodiversity.	Developed with the government of The Federal Republic of Germany	Transversal	70,000
Total				**20,370,000**

Source: Own elaboration, Department of Climate Change MMA, based on information from AGCI.

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Acronyms and Abbreviations

2014NGHGI : National Greenhouse Gas Inventory in Chile series 1990-2010. Submitted by the country to the United Nations Framework Convention on Climate Change on its First Biennial Update Report (MMA, 2014)

2016NGHGI : National Greenhouse Gas Inventory in Chile 1990-2013 temporal series. Submitted by the country to the United Nations Framework Convention on Climate Change on its Second Biennial Update Report (MMA, 2016)

AD : Activity Data

AFOLU : Agriculture, Forestry and other land uses

ASPROCER A.G. : Pork Producers Trade Association of Chile

BNE : National Energy Balance

BUR : Biennial Update Report

C : Confidential

CH_4 : Methane

CIP : Continuous Improvement Plan

CN : National Communications

CO : Carbon monoxide

CO_2 : Carbon dioxide

CO_2eq : Carbon dioxide equivalent

COCHILCO : Chilean Copper Commission

CONAF : National Forestry Corporation

CS : Country specific

D : Default

EF : Emission Factor

FAO : United Nations Food and Agriculture Organization

FOLU : Forestry and other land uses

Gg : Gigagrams (10^9 grams)

GHG : Greenhouse gas

GHGSECI : National Greenhouse Gas Sectoral Inventory

GIZ : Gesellschaft für Internationale Zusammenarbeit (German Society for International Cooperation)

GWh : Gigawatt hour

GWP : Global Warming Potential

HFC : Hydrofluorocarbons

IE : Included elsewhere

IEA : International Energy Agency

INE : National Statistics Institute

INFOR : Forestry Institute of Chile

INIA : Agricultural Research Institute

IPCC : The Intergovernmental Panel on Climate Change

IPPU : Industrial processes and product use

LECB : Low Emission Capacity Building (LECB-Chile)

LPG : Liquefied petroleum gas

MINAGRI : Ministry of Agriculture

MINENERGIA : Ministry of Energy

MMA : Ministry of Environment

MSW : Municipal solid waste

M_w : Moment magnitude

N_2O : Nitrous oxide

NA : Not applicable

NDC : Nationally determined contribution

NE : Not estimated

NGHGI : National Greenhouse Gas Inventory

NIR : National Greenhouse Gas Inventory Report

NMVOC : Non-methane volatile organic compound

NO : Not Occurring

NO_x : Nitrogen oxides

ODEPA : Office of Agrarian Studies and Policies

ODS : Ozone depleting substances

PFC : Perfluorocarbons

QA/QC Quality Assurance and Quality Control

RCA : Environmental Qualification Resolution

SAR : IPCC Second Assessment Report

SERNAGEOMIN : National Geological and Mining Service

SF_6 : Sulfur hexafluoride

SISS : Superintendency of Sanitation Services

SNICHILE : National Greenhouse Gas Inventory System of Chile

SO_2 : Sulfur dioxide

SWDS : Solid waste disposal sites

T1 : Tier 1 (method Tier 1)

T2 : Tier 2 (method Tier 2)

T3 : Tier 3 (method Tier 3)

TJ : Terajoules

TRS : Tabular Registration System

UNDP : United Nations Development Programme

UNFCCCN : United Nations Framework Convention on Climate Change

USGS : United States Geological Survey

ANNEX

Annex I. Completeness Complement

Categories not estimated (NE) in the Chile's NGHGI, series 1990-2013, for lack of data of activity are the following:

- 1.A.3.b.vi. Urea based catalysts
- 1.A.5.a. Stationary
- 1.B.1.b. Spontaneous combustion and landfills for coal burning
- 1.B.2.a.ii. Flaring
- 1.B.2.a.iii.3. Transport
- 1.B.2.a.iii.4. Refining
- 1.B.2.a.iii.5. Distribution of oil products
- 1.B.2.a.iii.6. Other
- 1.B.2.b.ii. Flaring
- 2.A.4.a. Ceramics
- 2.A.4.b. Other uses of soda ash
- 2.A.4.c. Non-metallurgical magnesia production
- 2.A.4.d. Other (Specify)
- 2.F.2. Foam blowing agents
- 2.F.5. Solvents
- 2.G.3. N_2O from product uses
- 3.A.1.j. Other species
- 3.A.2.j. Other species
- 3.B.1.a.v.4. Restitution
- 3.B.1.b.iii. Wetlands
- 3.B.1.b.iv.1. Settlements converted into native forest
- 3.B.1.b.v. Other land
- 3.B.2.b.iii. Wetlands
- 3.B.3.b.iv. Settlements
- 3.B.4.a. Wetlands that remain as such
- 3.B.4.b.iv. Settlements
- 3.B.4.b.v. Other land
- 3.B.5.a. Settlements that remain as such
- 3.B.5.b.iv. Wetlands
- 3.B.6.a. Other lands that remain as such
- 3.B.6.b.iv. Wetlands

Categories not estimated (NE) in the Chile's NGHGI, series 1990-2013, for lack of data of activity are the following:

- 1.B.3. Other emissions from energy production

The categories included elsewhere (IE) in the Chile's NGHGI, series 1990-2013, for lack of data disaggregation and the category in which they were included, are presented in Table A.1.1:

Table A.I.1.: Categories included elsewhere (IE) and the corresponding category that includes it

Category included elsewhere (IE)	Corresponding category
1.A.1.a.ii. Combined heat and power generation (CHP)	1.A.2. Manufacturing industries and construction
1.A.1.a.iii. Heat plants	1.A.2. Manufacturing industries and construction
1.A.2.b. Non metallic metals	1.A.2.i. Mining (fuels excepted) and quarrying
1.A.2.g. Transport equipment	1.A.2.m. Non-specified industries
1.A.2.h. Machinery	1.A.2.m. Non-specified industries
1.A.2.j. Wood & Wood Products	1.A.2.m. Non-specified industries
1.A.2.k. Construction	1.A.2.m. Non-specified industries
1.A.2.l. Textiles and leather	1.A.2.m. Non-specified industries
1.A.3.e.i. Transport by pipelines	1.A.4.a. Commercial / Institutional, 1.A.3.b Road transportation
1.A.4.c.i. Stationary	1.A.4.c.iii. Off-road vehicle and other machinery, 1.A.2.m. Non-specified industries
1.A.5.b. Mobile	1.A.4.a. Commercial / Institutional
1.A.5.c. Multilateral operations	1.A.4.a. Commercial / Institutional
2.C.1. Iron and steel production (CH_4)	1.A.2.a. Iron and steel

Source: MMA Technical Coordinating Team.

Annex II. GHG emissions and removals from Chile in format not included in Annex I of the Convention

Table A.II.1.a. CHILE'S NGHGI: anthropogenic emissions by sources and anthropogenic removals by sinks of all GHGs not controlled by the Montreal Protocol and precursors of GHGs. Year 1990

Source and sink categories of greenhouse gases	Emissions of CO_2 (Gg)	Removals of CO_2 (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NOx (Gg)	COVDMs (Gg)	SO_2 (Gg)
Total of national emissions and removals	71,519.3	-81,963.3	514.3	24.5	132.0	933.0	99.3	255.2
1. Energy	30,405.6	0.0	118.1	1.1	123.0	608.5	99.3	255.2
A. Fuel combustion activities (sector method)	30,403.0		28.0	1.1	120.1	578.7	86.9	255.2
1. Energy industry	5,822.2		0.1	0.1	30.3	12.9	0.2	114.5
2. Manufacturing industries and construction	12,139.4		1.8	0.3	13.2	68.4	4.6	98.1
3. Transport	9,061.5		2.5	0.4	60.9	132.0	19.6	9.5
4. Other sectors	3,380.0		23.6	0.3	15.8	365.4	62.6	33.1
5. Other (not specified)	IE, NE		IE, NE	IE, NE	IE, NE	IE, NE	IE, NE	IE, NE
B. Fugitive emissions from fuels	2.6		90.1		2.9	29.9	12.4	0.0
1. Solid fuels			22.9		NE	NE	9.3	NE
2. Oil and natural gas	2.6		67.1		2.9	29.9	3.2	NE
2. Industrial Processes	2,805.4	0.0	2.0	0.5	0.0	0.0	0.0	0.0
A. Mineral products	982.8				NE	NE	NE	NE
B. Chemical industry	572.9		2.0	0.5	NE	NE	NE	NE
C. Metals production	1,249.7		0.0	NA, NO	NE	NE	NE	NE
D. Other production	NO				NO	NO	NO	NO
E. Production of halocarbons and sulfur hexafluoride								
F. Consumption of halocarbons and sulfur hexafluoride								
G. Other	NO		NO	NO	NO	NO	NO	NO
3. Solvents and other products use	75.1			0.0			0.0	
4. Agriculture			277.3	22.0	5.1	187.1	0.0	0.0
A. Enteric fermentation			221.7					
B. Manure management			43.5	0.6			0.0	
C. Rice cultivation			6.6				0.0	
D. Agricultural soils			NE	21.3			0.0	
E. Prescribed burning of savannas			NO	NO	NO	NO	NO	
F. Field burning of agricultural residues			5.5	0.1	5.1	187.1	NE	
G. Other			NO	NO	NO	NO	NO	
5. Land use, land-use change and forestry	38,233.1	-81,963.3	6.0	0.3	3.9	137.4	0.0	0.0
A. Forest land	36,333.8	-81,932.3	5.9	0.3	3.8	135.2	NE	NE
B. Cropland	332.3	-3.1	0.0	0.0	0.0	0.0	NE	NE
C. Grassland	1,174.8	-27.7	0.1	0.0	0.1	2.2	NE	NE
D. Wetlands	0.4	NE	NE	NE	NE	NE	NE	NE
E. Settlements	218.4	-0.1	NO	NO	NE	NE	NE	NE
F. Other land	173.5	NO	NO	NO	NE	NE	NE	NE
G. Other	NO	NO	NO	NO	NO	NO	NO	NO
6. Waste	0.0		110.9	0.6	0.0	0.0	0.0	0.0
A. Solid waste disposal in land			91.5		NE		NE	
B. Wastewater handling			19.0	0.6	NE	NE	NE	
C. Waste incineration	NO		0.0	0.0	NE	NE	NE	NE
D. Other			0.4	0.0	NE	NE	NE	NE
7. Other	NO	NO	NO	NO	NO	NO	NO	NO
Memo items								
International bunker	923.9		0.1	0.0	15.2	1.6	0.6	17.1
International aviation	334.6		0.0	0.0	0.7	0.2	0.1	0.6
International navigation	589.3		0.1	0.0	14.5	1.4	0.5	16.5
Biomass CO_2 emissions	12,001.1							

C = Confidential Information; CS = Country specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring
Source: MMA Technical Coordinating Team.

Table A.II.1.b. Chile's GHG: anthropogenic emissions of HFC, PFC and SF_6. Year 1990

Source and sink categories of greenhouse gases	HFC's (Gg)							PFC's (Gg)	SF_6 (Gg)
	HFC-32	HFC-125	HFC-134a	HFC-152a	HFC-143a	HFC-227ea	HFC-236fa	CF_4	
Total of national emissions and removals	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
1. Energy									
A. Fuel combustion activities (sector method)									
1. Energy industry									
2. Manufacturing industries and construction									
3. Transport									
4. Other sectors									
5. Other (not specified)									
B. Fugitive emissions from fuels									
1. Solid fuels									
2. Oil and natural gas									
2. Industrial Processes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
A. Mineral products									
B. Chemical industry									
C. Metals production	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Other production	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Production of halocarbons and sulfur hexafluoride	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Consumption of halocarbons and sulfur hexafluoride	NO	NO	NO	NO	NO	NO	NO	NO	0.003
G. Other									
3. Solvents and other products use									
4. Agriculture									
A. Enteric fermentation									
B. Manure management									
C. Rice cultivation									
D. Agricultural soils									
E. Prescribed burning of savannas									
F. Field burning of agricultural residues									
G. Other									
5. Land use, land-use change and forestry									
A. Forest land									
B. Cropland									
C. Grassland									
D. Wetlands									
E. Settlements									
F. Other land									
G. Other									
6. Waste									
A. Solid waste disposal in land									
B. Wastewater handling									
C. Waste incineration									
D. Other									
7. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items									
International bunker									
International aviation									
International navigation									
Biomass CO_2 emissions									

C = Confidential Information; CS = Country specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring
Source: MMA Technical Coordinating Team.

Table A.II.2.a. CHILE'S NGHGI: anthropogenic emissions by sources and anthropogenic removals by sinks of all GHGs not controlled by the Montreal Protocol and precursors of GHGs. Year 1994

Source and sink categories of greenhouse gases	Emissions of CO_2 (Gg)	Removals of CO_2 (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	COVDMs (Gg)	SO_2 (Gg)
Total of national emissions and removals	86,593.9	-91,095.4	514.6	26.3	153.9	1,059.4	116.9	287.6
1. Energy	34,632.1	0.0	97.5	1.3	144.6	729.3	116.9	287.6
A. Fuel combustion activities (sector method)	34,630.2		34.1	1.3	141.7	701.0	109.6	287.6
1. Energy industry	4,577.4		0.1	0.0	25.2	11.2	0.2	104.7
2. Manufacturing industries and construction	13,191.5		1.9	0.3	15.3	70.8	4.9	121.9
3. Transport	12,298.9		3.4	0.6	82.9	176.3	22.1	17.2
4. Other sectors	4,562.4		28.6	0.4	18.3	442.7	82.4	43.8
5. Other (not specified)	IE, NE		IE, NE	IE, NE	IE, NE	IE, NE	IE, NE	IE, NE
B. Fugitive emissions from fuels	1.9		63.5		3.0	28.3	7.3	0.0
1. Solid fuels			9.5		NE	NE	3.3	NE
2. Oil and natural gas	1.9		53.9		3.0	28.3	4.0	NE
2. Industrial Processes	3,720.9	0.0	2.0	0.7	0.0	0.0	0.0	0.0
A. Mineral products	1,497.4				NE	NE	NE	NE
B. Chemical industry	586.4		2.0	0.7	NE	NE	NE	NE
C. Metals production	1,637.1		0.0	NA, NO	NE	NE	NE	NE
D. Other production	NO				NO	NO	NO	NO
E. Production of halocarbons and sulfur hexafluoride								
F. Consumption of halocarbons and sulfur hexafluoride								
G. Other	NO		NO	NO	NO	NO	NO	NO
3. Solvents and other products use	86.2			0.0			0.0	
4. Agriculture			285.3	23.2	5.1	187.1	0.0	0.0
A. Enteric fermentation			226.5					
B. Manure management			48.6	0.6			0.0	
C. Rice cultivation			6.1				0.0	
D. Agricultural soils			NE	22.5			0.0	
E. Prescribed burning of savannas			NO	NO	NO	NO	NO	
F. Field burning of agricultural residues			4.0	0.1	5.1	187.1	NE	
G. Other			NO	NO	NO	NO	NO	
5. Land use, land-use change and forestry	48,154.8	-91,095.4	6.2	0.4	4.2	143.0	0.0	0.0
A. Forest land	46,207.4	-91,064.4	6.0	0.3	3.8	136.5	NE	NE
B. Cropland	383.9	-3.1	0.0	0.0	0.0	0.0	NE	NE
C. Grassland	1,171.7	-27.7	0.2	0.0	0.4	6.5	NE	NE
D. Wetlands	0.4	NE	NE	NE	NE	NE	NE	NE
E. Settlements	218.3	-0.1	NO	NO	NE	NE	NE	NE
F. Other land	173.2	NO	NO	NO	NE	NE	NE	NE
G. Other	NO	NO	NO	NO	NO	NO	NO	NO
6. Waste	0.0		123.6	0.7	0.0	0.0	0.0	0.0
A. Solid waste disposal in land			101.1		NE		NE	
B. Wastewater handling			22.1	0.7	NE	NE	NE	
C. Waste incineration	NO		0.0	0.0	NE	NE	NE	NE
D. Other			0.4	0.0	NE	NE	NE	NE
7. Other	NO	NO	NO	NO	NO	NO	NO	NO
Memo items								
International bunker	1,715.4		0.1	0.0	15.2	1.6	0.6	17.1
International aviation	655.6		0.0	0.0	0.7	0.2	0.1	0.6
International navigation	1,059.8		0.1	0.0	14.5	1.4	0.5	16.5
Biomass CO_2 emissions	14,268.6							

C = Confidential Information; CS = Country specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring
Source: MMA Technical Coordinating Team.

Table A.II.2.b. Chile's GHG: anthropogenic emissions of HFC, PFC and SF6. Year 1994

Source and sink categories of greenhouse gases	HFC's (Gg)							PFC's (Gg)	SF_6 (Gg)
	HFC-32	HFC-125	HFC-134a	HFC-152a	HFC-143a	HFC-227ea	HFC-236fa	CF_4	
Total of national emissions and removals	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,003
1. Energy									
A. Fuel combustion activities (sector method)									
1. Energy industry									
2. Manufacturing industries and construction									
3. Transport									
4. Other sectors									
5. Other (not specified)									
B. Fugitive emissions from fuels									
1. Solid fuels									
2. Oil and natural gas									
2. Industrial Processes	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,003
A. Mineral products									
B. Chemical industry									
C. Metals production	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Other production	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Production of halocarbons and sulfur hexafluoride	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Consumption of halocarbons and sulfur hexafluoride	NO	NO	NO	NO	NO	NO	NO	NO	0,003
G. Other									
3. Solvents and other products use									
4. Agriculture									
A. Enteric fermentation									
B. Manure management									
C. Rice cultivation									
D. Agricultural soils									
E. Prescribed burning of savannas									
F. Field burning of agricultural residues									
G. Other									
5. Land use, land-use change and forestry									
A. Forest land									
B. Cropland									
C. Grassland									
D. Wetlands									
E. Settlements									
F. Other land									
G. Other									
6. Waste									
A. Solid waste disposal in land									
B. Wastewater handling									
C. Waste incineration									
D. Other									
7. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items									
International bunker									
International aviation									
International navigation									
Biomass CO_2 emissions									

C = Confidential Information; CS = Country specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring
Source: MMA Technical Coordinating Team.

Table A.2.3.a. CHILE'S NGHGI: anthropogenic emissions by sources and anthropogenic removals by sinks of all GHGs not controlled by the Montreal Protocol and precursors of GHGs. Year 2000

Source and sink categories of greenhouse gases	Emissions of CO_2 (Gg)	Removals of CO_2 (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	COVDMs (Gg)	SO_2 (Gg)
Total of national emissions and removals	108,978.5	-100,561.7	547.6	29.3	210.6	1,216.2	153.3	304.4
1. Energy	49,367.0	0.0	102.3	2.0	204.0	978.2	153.3	304.4
A. Fuel combustion activities (sector method)	49,365.3		40.7	2.0	200.6	946.2	147.4	304.4
1. Energy industry	14,855.1		0.2	0.2	44.3	22.6	0.4	107.4
2. Manufacturing industries and construction	12,856.2		2.3	0.3	22.5	103.9	7.8	117.6
3. Transport	16,946.8		4.3	1.0	111.1	225.2	28.7	33.2
4. Other sectors	4,707.2		33.9	0.5	22.7	594.6	110.5	46.3
5. Other (not specified)	IE, NE		IE, NE	IE, NE	IE, NE	IE, NE	IE, NE	IE, NE
B. Fugitive emissions from fuels	1.7		61.6		3.5	32.0	5.9	0.0
1. Solid fuels			3.5		NE	NE	0.8	NE
2. Oil and natural gas	1.7		58.1		3.5	32.0	5.1	NE
2. Industrial Processes	5,420.2	0.0	6.7	2.2	0.0	0.0	0.0	0.0
A. Mineral products	1,619.1				NE	NE	NE	NE
B. Chemical industry	1,952.1		6.7	2.2	NE	NE	NE	NE
C. Metals production	1,849.0		NO	NA, NO	NE	NE	NE	NE
D. Other production	NO				NO	NO	NO	NO
E. Production of halocarbons and sulfur hexafluoride								
F. Consumption of halocarbons and sulfur hexafluoride								
G. Other	NO		NO	NO	NO	NO	NO	NO
3. Solvents and other products use	114.8			0.0			0.0	
4. Agriculture			288.6	24.3	5.1	187.1	0.0	0.0
A. Enteric fermentation			225.1					
B. Manure management			54.9	0.9			0.0	
C. Rice cultivation			5.2				0.0	
D. Agricultural soils			NE	23.3			0.0	
E. Prescribed burning of savannas			NO	NO	NO	NO	NO	
F. Field burning of agricultural residues			3.4	0.1	5.1	187.1	NE	
G. Other			NO	NO	NO	NO	NO	
5. Land use, land-use change and forestry	54,076.5	-100,561.7	2.2	0.1	1.5	50.9	0.0	0.0
A. Forest land	52,010.3	-100,530.8	2.2	0.1	1.4	49.3	NE	NE
B. Cropland	504.6	-3.1	0.0	0.0	0.0	0.0	NE	NE
C. Grassland	1,169.6	-27.7	0.1	0.0	0.1	1.6	NE	NE
D. Wetlands	0.4	NE	NE	NE	NE	NE	NE	NE
E. Settlements	218.4	-0.1	NO	NO	NE	NE	NE	NE
F. Other land	173.2	NO	NO	NO	NE	NE	NE	NE
G. Other	NO	NO	NO	NO	NO	NO	NO	NO
6. Waste	0.1		147.7	0.8	0.0	0.0	0.0	0.0
A. Solid waste disposal in land			122.9		NE		NE	
B. Wastewater handling			24.4	0.8	NE	NE	NE	
C. Waste incineration	0.1		0.0	0.0	NE	NE	NE	NE
D. Other			0.4	0.0	NE	NE	NE	NE
7. Other	NO	NO	NO	NO	NO	NO	NO	NO
Memo items								
International bunker	3,082.1		0.2	0.1	15.2	1.6	0.6	17.1
International aviation	1,046.4		0.0	0.0	0.7	0.2	0.1	0.6
International navigation	2,035.6		0.2	0.1	14.5	1.4	0.5	16.5
Biomass CO_2 emissions	18,952.6							

C = Confidential Information; CS = Country specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring
Source: MMA Technical Coordinating Team.

Table A.II.3.b. Chile's GHG: anthropogenic emissions of HFC, PFC and SF_6. Year 2000

Source and sink categories of greenhouse gases	HFC's (Gg)							PFC's (Gg)	SF_6 (Gg)
	HFC-32	HFC-125	HFC-134a	HFC-152a	HFC-143a	HFC-227ea	HFC-236fa	CF_4	
Total of national emissions and removals	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
1. Energy									
A. Fuel combustion activities (sector method)									
1. Energy industry									
2. Manufacturing industries and construction									
3. Transport									
4. Other sectors									
5. Other (not specified)									
B. Fugitive emissions from fuels									
1. Solid fuels									
2. Oil and natural gas									
2. Industrial Processes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
A. Mineral products									
B. Chemical industry									
C. Metals production	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Other production	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Production of halocarbons and sulfur hexafluoride	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Consumption of halocarbons and sulfur hexafluoride	NO	NO	NO	NO	NO	NO	NO	NO	0.004
G. Other									
3. Solvents and other products use									
4. Agriculture									
A. Enteric fermentation									
B. Manure management									
C. Rice cultivation									
D. Agricultural soils									
E. Prescribed burning of savannas									
F. Field burning of agricultural residues									
G. Other									
5. Land use, land-use change and forestry									
A. Forest land									
B. Cropland									
C. Grassland									
D. Wetlands									
E. Settlements									
F. Other land									
G. Other									
6. Waste									
A. Solid waste disposal in land									
B. Wastewater handling									
C. Waste incineration									
D. Other									
7. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items									
International bunker									
International aviation									
International navigation									
Biomass CO_2 emissions									

C = Confidential Information; CS = Country specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring
Source: MMA Technical Coordinating Team.

Table A.II.4.a. CHILE'S NGHGI: anthropogenic emissions by sources and anthropogenic removals by sinks of all GHGs not controlled by the Montreal Protocol and precursors of GHGs. Year 2010

Source and sink categories of greenhouse gases	Emissions of CO_2 (Gg)	Removals of CO_2 (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	COVDMs (Gg)	SO_2 (Gg)
Total of national emissions and removals	144,567.1	-117,256.2	512.8	32.6	274.7	1,404.9	170.8	327.4
1. Energy	66,655.7	0.0	92.5	2.7	265.4	1,072.4	170.8	327.4
A. Fuel combustion activities (sector method)	66,654.4		44.1	2.7	262.7	1,047.0	166.2	327.4
1. Energy industry	25,523.5		0.4	0.3	77.9	35.1	0.6	186.5
2. Manufacturing industries and construction	14,614.8		2.9	0.4	28.1	114.6	9.9	75.3
3. Transport	20,403.6		4.5	1.5	121.3	263.8	44.3	14.9
4. Other sectors	6,112.4		36.2	0.5	35.5	633.4	111.4	50.7
5. Other (not specified)	IE, NE		IE, NE	IE, NE	IE, NE	IE, NE	IE, NE	IE, NE
B. Fugitive emissions from fuels	1.3		48.4		2.7	25.4	4.6	0.0
1. Solid fuels			1.9		NE	NE	0.8	NE
2. Oil and natural gas	1.3		46.5		2.7	25.4	3.7	NE
2. Industrial Processes	4,052.2	0.0	2.2	3.6	0.0	0.0	0.0	0.0
A. Mineral products	2,215.1				NE	NE	NE	NE
B. Chemical industry	627.4		2.2	3.6	NE	NE	NE	NE
C. Metals production	1,209.7		NO	NA, NO	NE	NE	NE	NE
D. Other production	NO				NO	NO	NO	NO
E. Production of halocarbons and sulfur hexafluoride								
F. Consumption of halocarbons and sulfur hexafluoride								
G. Other	NO		NO	NO	NO	NO	NO	NO
3. Solvents and other products use	241.0			0.0			0.0	
4. Agriculture			247.5	24.8	5.1	187.1	0.0	0.0
A. Enteric fermentation			185.7					
B. Manure management			55.3	1.0			0.0	
C. Rice cultivation			4.9				0.0	
D. Agricultural soils			NE	23.7			0.0	
E. Prescribed burning of savannas			NO	NO	NO	NO	NO	
F. Field burning of agricultural residues			1.5	0.0	5.1	187.1	NE	
G. Other			NO	NO	NO	NO	NO	
5. Land use, land-use change and forestry	73,618.0	-117,256.2	6.3	0.4	4.2	145.4	0.0	0.0
A. Forest land	70,897.2	-117,131.8	6.2	0.3	3.9	140.5	NE	NE
B. Cropland	689.3	-4.5	0.0	0.0	0.0	0.0	NE	NE
C. Grassland	1,186.1	-119.4	0.2	0.0	0.3	4.9	NE	NE
D. Wetlands	12.5	NE	NE	NE	NE	NE	NE	NE
E. Settlements	269.3	-0.5	NO	NO	NE	NE	NE	NE
F. Other land	563.6	NO	NO	NO	NE	NE	NE	NE
G. Other	NO	NO	NO	NO	NO	NO	NO	NO
6. Waste	0.3		164.3	1.1	0.0	0.0	0.0	0.0
A. Solid waste disposal in land			126.1		NE		NE	
B. Wastewater handling			36.6	1.0	NE	NE	NE	
C. Waste incineration	0.3		0.0	0.0	NE	NE	NE	NE
D. Other			1.7	0.1	NE	NE	NE	NE
7. Other	NO	NO	NO	NO	NO	NO	NO	NO
Memo items								
International bunker	3,631.9		0.2	0.1	15.2	1.6	0.6	17.1
International aviation	1,336.2		0.0	0.0	0.7	0.2	0.1	0.6
International navigation	2,295.7		0.2	0.1	14.5	1.4	0.5	16.5
Biomass CO_2 emissions	21,752.6							

C = Confidential Information; CS = Country specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring
Source: MMA Technical Coordinating Team.

Table A.II.4.b. Chile's GHG: anthropogenic emissions of HFC, PFC and SF_6. Year 2010

Source and sink categories of greenhouse gases	HFC's (Gg)							PFC's (Gg)	SF_6 (Gg)
	HFC-32	HFC-125	HFC-134a	HFC-152a	HFC-143a	HFC-227ea	HFC-236fa	CF_4	
Total of national emissions and removals	0.000	0.003	0.182	0.002	0.003	0.010	0.000	0.001	0.011
1. Energy									
A. Fuel combustion activities (sector method)									
1. Energy industry									
2. Manufacturing industries and construction									
3. Transport									
4. Other sectors									
5. Other (not specified)									
B. Fugitive emissions from fuels									
1. Solid fuels									
2. Oil and natural gas									
2. Industrial Processes	0.000	0.003	0.182	0.002	0.003	0.010	0.000	0.001	0.011
A. Mineral products									
B. Chemical industry									
C. Metals production	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Other production	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Production of halocarbons and sulfur hexafluoride	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Consumption of halocarbons and sulfur hexafluoride	0.000	0.003	0.182	0.002	0.003	0.010	0.000	0.001	0.011
G. Other									
3. Solvents and other products use									
4. Agriculture									
A. Enteric fermentation									
B. Manure management									
C. Rice cultivation									
D. Agricultural soils									
E. Prescribed burning of savannas									
F. Field burning of agricultural residues									
G. Other									
5. Land use, land-use change and forestry									
A. Forest land									
B. Cropland									
C. Grassland									
D. Wetlands									
E. Settlements									
F. Other land									
G. Other									
6. Waste									
A. Solid waste disposal in land									
B. Wastewater handling									
C. Waste incineration									
D. Other									
7. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items									
International bunker									
International aviation									
International navigation									
Biomass CO_2 emissions									

C = Confidential Information; CS = Country specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring
Source: MMA Technical Coordinating Team.

Table A.II.5.a. CHILE'S NGHGI: anthropogenic emissions by sources and anthropogenic removals by sinks of all GHGs not controlled by the Montreal Protocol and precursors of GHGs. Year 2013

Source and sink categories of greenhouse gases	Emissions of CO_2 (Gg)	Removals of CO_2 (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NOx (Gg)	COVDMs (Gg)	SO_2 (Gg)
Total of national emissions and removals	168,312.9	-122,044.2	562.9	35.4	165,623.4	1,508.3	13,032.1	449.1
1. Energy	81,823.1	0.0	98.1	3.8	165,617.3	1,285.0	13,032.1	449.1
A. Fuel combustion activities (sector method)	81,821.6		56.2	3.8	165,615.4	1,270.9	13,025.7	449.1
1. Energy industry	38,320.4		1.2	0.6	146.4	92.4	1.8	333.4
2. Manufacturing industries and construction	13,807.4		7.5	1.0	30.5	153.9	13.8	64.6
3. Transport	23,924.7		4.8	1.7	165,410.9	274.5	12,871.9	6.9
4. Other sectors	5,769.1		42.7	0.6	27.5	750.2	138.2	44.1
5. Other (not specified)	IE, NE		IE, NE	IE, NE	IE, NE	IE, NE	IE, NE	IE, NE
B. Fugitive emissions from fuels	1.5		42.0		1.9	14.2	6.4	0.0
1. Solid fuels			4.4		NE	NE	2.0	NE
2. Oil and natural gas	1.5		37.6		1.9	14.2	4.4	NE
2. Industrial Processes	4,218.2	0.0	0.5	4.0	0.0	0.0	0.0	0.0
A. Mineral products	2,496.7				NE	NE	NE	NE
B. Chemical industry	137.3		0.5	4.0	NE	NE	NE	NE
C. Metals production	1,584.3		NO	NA, NO	NE	NE	NE	NE
D. Other production	NO				NO	NO	NO	NO
E. Production of halocarbons and sulfur hexafluoride								
F. Consumption of halocarbons and sulfur hexafluoride								
G. Other	NO		NO	NO	NO	NO	NO	NO
3. Solvents and other products use	142.0			0.0			0.0	
4. Agriculture			266.6	26.2	5.1	187.1	0.0	0.0
A. Enteric fermentation			204.0					
B. Manure management			57.3	1.1			0.0	
C. Rice cultivation			4.2				0.0	
D. Agricultural soils			NE	25.1			0.0	
E. Prescribed burning of savannas			NO	NO	NO	NO	NO	
F. Field burning of agricultural residues			1.1	0.0	5.1	187.1	NE	
G. Other			NO	NO	NO	NO	NO	
5. Land use, land-use change and forestry	82,129.2	-122,044.2	1.6	0.1	1.1	36.1	0.0	0.0
A. Forest land	79,370.9	-121,919.8	1.5	0.1	1.0	34.4	NE	NE
B. Cropland	726.5	-4.5	0.0	0.0	0.0	0.0	NE	NE
C. Grassland	1,186.1	-119.4	0.1	0.0	0.1	1.7	NE	NE
D. Wetlands	12.5	NE	NE	NE	NE	NE	NE	NE
E. Settlements	269.7	-0.5	NO	NO	NE	NE	NE	NE
F. Other land	563.6	NO	NO	NO	NE	NE	NE	NE
G. Other	NO	NO	NO	NO	NO	NO	NO	NO
6. Waste	0.3		196.1	1.2	0.0	0.0	0.0	0.0
A. Solid waste disposal in land			153.6		NE		NE	
B. Wastewater handling			41.2	1.1	NE	NE	NE	
C. Waste incineration	0.3		0.0	0.0	NE	NE	NE	NE
D. Other			1.3	0.1	NE	NE	NE	NE
7. Other	NO	NO	NO	NO	NO	NO	NO	NO
Memo items								
International bunker	2,919.1		0.1	0.1	15.2	1.6	0.6	17.1
International aviation	1,697.0		0.0	0.0	0.7	0.2	0.1	0.6
International navigation	1,222.1		0.1	0.0	14.5	1.4	0.5	16.5
Biomass CO2 emissions	43,876.5							

C = Confidential Information; CS = Country specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring
Source: MMA Technical Coordinating Team.

Table A.II.5.b. Chile's GHG: anthropogenic emissions of HFC, PFC and SF_6. Year 2013

Source and sink categories of greenhouse gases	HFC's (Gg)							PFC's (Gg)	SF_6 (Gg)
	HFC-32	HFC-125	HFC-134a	HFC-152a	HFC-143a	HFC-227ea	HFC-236fa	CF_4	
Total of national emissions and removals	0.007	0.050	0.228	0.002	0.049	0.019	0.000	0.001	0.013
1. Energy									
A. Fuel combustion activities (sector method)									
1. Energy industry									
2. Manufacturing industries and construction									
3. Transport									
4. Other sectors									
5. Other (not specified)									
B. Fugitive emissions from fuels									
1. Solid fuels									
2. Oil and natural gas									
2. Industrial Processes	0.007	0.050	0.228	0.002	0.049	0.019	0.000	0.001	0.013
A. Mineral products									
B. Chemical industry									
C. Metals production	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Other production	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Production of halocarbons and sulfur hexafluoride	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Consumption of halocarbons and sulfur hexafluoride	0.007	0.050	0.228	0.002	0.049	0.019	0.000	0.001	0.013
G. Other									
3. Solvents and other products use									
4. Agriculture									
A. Enteric fermentation									
B. Manure management									
C. Rice cultivation									
D. Agricultural soils									
E. Prescribed burning of savannas									
F. Field burning of agricultural residues									
G. Other									
5. Land use, land-use change and forestry									
A. Forest land									
B. Cropland									
C. Grassland									
D. Wetlands									
E. Settlements									
F. Other land									
G. Other									
6. Waste									
A. Solid waste disposal in land									
B. Wastewater handling									
C. Waste incineration									
D. Other									
7. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items									
International bunker									
International aviation									
International navigation									
Biomass CO_2 emissions									

C = Confidential Information; CS = Country specific; D = Default; IE = Included elsewhere; NA = Not applicable; NE = Not estimated; NO = Not occurring
Source: MMA Technical Coordinating Team.

Annex III. *Information on methodology and assumptions of mitigation actions*

Measures beginning implementation in the period 2007-2016.

Name of action: ENERGY AGENDA
Official Institution: Ministry of Energy
Description / **Objectives:** Launched in May 2014, it presents concrete measures to build an energy policy for Chile, through the following axes of action: - A new role by the government regarding energy development - Reduction of energy prices, with greater competition, efficiency and diversification in the energy market - Development of own energy resources - Connectivity for energy development - An efficient energy sector that manages the consumption - Impulse to energy investment for the development of Chile - Citizen participation and territorial ordering
Sector(s): Industry and Mining; Commercial, Public, Residential; Transportation; Electricity generation
Gas(es) covered: CO_2; CH_4; N_2O
Methodology: To estimate the change in GHG emissions as a result of the Agenda, a baseline trajectory was established without this policy[1]. The analysis is based on the modeling of long-term energy systems and GHG emissions through the use of scenarios. It contemplates the modeling of the following measures, which if implemented as stated, would have a relevant impact on the reduction of national GHGs: - Energy efficiency law - Modification of the tender system - Expansion of the Quinteros Bus Station - Interconnection SIC-SING - Continue with the Energy Efficiency Plan - MEPS engines and coolers - Set of instruments to support compliance with the NCRE law - Increase of capacity in Pemuco - Regulation of medium-sized systems - Public solar roofs - Subsidy for thermal reconditioning in vulnerable housing units - Exploration of gas in Magallanes by ENAP - Impulse to the development of a national diesel replacement program by NCRE - Replacement of luminaires - Change of thermal regulation - Impact of management measures and study on basins
Assumptions: - The Law on NCRE or other programs prior to the development of the Agenda were considered within the baseline of the study. - For the construction of scenarios, information was used for public use and with a certain level of validation. For sectoral energy consumption, a baseline or trend line is taken from the results of the MAPS Phase II Project, since it considers a consistent base of projection assumptions with a high degree of validation. In the case of electricity generation, MAPS assumptions are complemented by some of the National Energy Commission's (CNE) price reports. No greater penetration of NCRE is forced except that associated with regulation.
Expected / **Reached Reductions:** A cumulative reduction of 200 $MMtCO_2eq$ is expected during the period 2014-2030.

[1] *Energy to Business, 2015. Impact of the energy agenda on mitigating climate change.*

Name of action: PROGRAM FOR CLIMATE ACTION AND SOLAR ENERGY DEVELOPMENT IN TARAPACÁ IN CHILE
Official Institution: Private
Description / Objectives: The Green Climate Fund (GCF) approved the first nine projects to be financed in 2016 for a total of USD 256.6 million, of which USD 49 million will be managed by CAF (Latin America Development Bank) within the framework of the Program of Climatic Action and Development of Solar Energy in the region of Tarapacá, Chile. Solar Atacama consists of a 143 MW photovoltaic solar plant in the Atacama Desert region, located in an area with the highest solar radiation level in South America. With the commitment to have 20% of non-conventional renewable energy generation by 2025, the decisions and investments that will take place now will shape the transition to an energy system based on renewable energies. When fully completed, the site will have an installed capacity of at least 250 MW to be carried out in two phases: - Phase I: 143 MW - Documentation and financing (this project) - Phase II: 107 MW - In development (future growth).
Sector(s): Electric generation
Gas(es) covered: CO_2; CH_4; N_2O
Methodology: The emission factor of the interconnected systems is estimated from the ratio between the sum of the CO_2 emissions of each of the plants that make up the interconnected system and the energy delivered by this system. For each plant, an emission factor is estimated based on fuel consumption, lower fuel calorific value and emission factors indicated in the IPCC 2006 Guidelines. Specific emissions data were taken from the website of the Ministry of Energy (http://huelladecarbono.minenergia.cl/). Until December 2017, five-year averages (2010-2014) were taken for both SING and SIC. From January 2018 onwards, when the two systems are expected to interconnect, we calculated a weighted average based on installed capacity in July 2015 (4,829.1 MW for SING and 18,458.4 MW for SIC) .
Assumptions: The project was compared to a selection of solar pairs based in the Atacama desert region. Approaches and associated assumptions are listed below: - The estimation of the annual departure and end dates for the solar pairs of the project, as well as their connections to the national network, were extracted from the latest publications of www.bnamericas.com or other sources. - An expected lifetime of 20 years is assumed for all pairs, to allow comparison of CO_2 generation. - Declared data of CO_2e compensated by the pairs are published, available (and probably not adjusted for the P90 result and the 0.98% annual loss of efficiency applied to the Atacama Project). - An annual efficiency loss of 0.98% on the calculation of CO_2 emissions was incorporated. - An average value of 2,160 kWh / year was used for the use of energy in the home (Source: Ministry of Energy of Chile).
Expected / Reached Reductions: Estimated reduction of 184,872 tCO_2e / year (3,697,442 tCO_2e in 20 years of useful life, 0.98% of annual efficiency loss).

Name of action: NON-CONVENTIONAL RENEWABLE ENERGY ACT (NCRE)
Official Institution: Ministry of Energy
Description / Objectives: It introduces modifications to the General Law of Electric Services, which establishes for electricity generation companies, with installed capacity above 200MW, the obligation to provide evidence of the participation of NCRE in the electricity generation matrix in Chile.
Sector(s): Electric generation
Gas(es) covered: CO_2; CH_4; N_2O
Methodology: The emission reduction is quantified using the following formula: **$\Delta E=E(MWh)\times FE(tCO_2eq/MWh)$** Where E is the energy generated and FE is the emission factor. In the SING the reduction is calculated considering the energy generated in the SIC and the emission factor of the SIC. The emission reduction in the SING is calculated analogously. Only the reduction of emissions associated to projects that started operations between 2007 and 2013 is counted.
Assumptions: - The real energy information generated during the year 2013 is raised with NCRE sources for both SIC and SING. According to these references, the SIC and SING generated 3,245 GWh[2] and 22 GWh with NCRE during 2013, respectively. - A sensitivity analysis is performed with respect to the emission factor: 1) Emission factor for the SIC and SING estimated in the study of the electricity generation sector of the MAPS-Chile project. The 2013 emission factor was estimated based on the energy projection for 2013, not real energy from 2013. The values used are: 1,03 tCO_2e/MWh for SING and 0,31 tCO_2e/MWh for SIC. 2) Emission factor for the SIC and SING estimated from the real energy generated by the plant during the year 2013, considering the specific consumption, higher calorific value and the emission factor of the IPCC 2006 guidelines. The resulting emission factors are: 0.78 tCO_2e/MWh for SING and 0.38 tCO_2e/MWh for SIC. 3) Emission factor of a diesel engine was calculated assuming that, had there been no generation with NCRE sources, it would have been replaced by the generation of one or more diesel units. The emission factor used in this case is 1,06 tCO_2e/MWh. - Sensitivity analysis regarding the recognition of contribution due to the promulgation of the Law. Five scenarios are defined: **Scenario 1 (most optimistic one):** 100% of the emission reduction associated to the NCRE sources is recognized. **Scenario 2:** It recognizes 100% of the reductions associated with solar and wind sources. Only 75% of biomass and hydraulic sources are recognized. **Scenario 3:** It recognizes 50% of the energy generated for all types of sources. **Scenario 4:** It recognizes 25% of the energy generated from wind, solar and biomass sources. The contribution of the hydraulic energy is not recognized. **Scenario 5 (most pessimistic one) :** The contribution of any ERNC source is not recognized.
Expected / Reached Reductions: The estimated reduction to the year 2013 ($MMtCO_2e$) is estimated between 0.44-3.05

[2] *This reference indicates 12% less generation with NCRE compared to the "SIC-SING Gross Generation" report of the CNE.*

Name of action: SOLAR TECHNOLOGY DISTRICT
Official Institution: Solar Committee
Description / Objectives: It consists of the development and implementation of large-scale solar farms (750-1000 MWp), in fiscal areas, where the State will carry out the territorial and mining authorization of the previous, the necessary pre-investment studies that will provide the necessary conditions for the execution of projects Solar, enabling a common electrical infrastructure and defining lots within the district, where solar projects and state-of-the-art energy storage will be tendered. In addition, the development of the District project will generate incentives for the capture of local value within the value chain of the development, implementation, operation and maintenance of solar projects contributing, with this project, to the displacement of energy sources based on fossil fuel, as well as local and national economic development, through new sources of work, national technological development, associated services companies and research promotion around the solar resource. Its objectives are: - Have a high quality, flexible and safe solar supply, and that meets the requirements of the electric demand in terms of price and consumption profile. - Contribute to the security and flexibility of operating the system through the joint operation of robust solar technologies and storage systems that provide complementary services to the network in a clean and low cost manner. - Create an axis of industrial development, technological research and innovation through the strengthening of local capacities (human and technological) around solar energy. - Contribute to climate change mitigation by developing a clean energy supply solution capable of meeting the needs of industry and population.
Sector(s): Energy
Gas(es) covered: CO_2
Methodology: A master plan will be developed for its development, which will determine the optimum mix of solar technologies and capacities, which will be tendered in the District as well as the business model of the project. To determine the optimum mixture, multiple optimization criteria will be established, each criterion with a relative importance assignment.
Assumptions: Compliance with the long-term expansion plan of the Chilean electricity system, except in specific exceptions. - Electricity demand growth of around 3.5% per year in the long term. - The SIC-SING interconnection will be operational 2019. - The Polpaico-Cardones line will be operational in 2019. - The long-term base technology system expansion will be NGL combined cycle.
Expected / Reached Reductions: Once in operation, it is estimated that by operating, with an installed capacity of 750 MWp, it can contribute annually to the reduction of approximately 1.5 million tons of CO_2 eq.

Name of action: NON-CONVENTIONAL RENEWABLE ENERGIES (NCRE) IN GENERATION
Official Institution: Ministry of Energy, CNE
Description / Objectives: Development of laws and regulations to promote the development of NCREs in the electricity generation matrix. The actions listed below all contribute to the development of NCREs in the country. Actions quantified within the package and indicated in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Short Law I (Law 19.940) Regulation on Geothermal Energy Concessions (Law 19,657 of 2000) Non-Conventional Renewable Energy Act (NCRE) Energy Agenda Energy Policy: 2050 Energy Actions quantified within the package and indicated in ANNEX III: Program for Climate Action and Solar Energy Development in Tarapacá in Chile Solar Technology District
Sector(s): Generation
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction is quantified using the following formula: ΔE [tonCO_2e] = (EGNCRE [MWh]-EG2010[MWh]) * FE [tonCO_2e/MWh] Where: ΔE [tonCO_2e] = CO_2e Emissions reduced during the period considered EGNCRE [MWh] = Energy Generated in the Year by Renewable Systems NCRE (Biomass, Geothermal, Hydraulics less than 40MW (between 20MW and 40MW is considered proportionally, Solar, Wind, Tidal) EG2010 [MWh] = Energy Generated in the Year by NCRE renewable systems installed before 2010 FE [tonCO_2e / MWh] = Average annual emission factor of the electrical system (may correspond to SIC or SING, depending on which corresponds to the quantified project). There is no official information on isolated systems of AYSÉN and MAGALLANES.
Assumptions: FE [tonCO_2e/MWh]: Source: http://datos.energiaabierta.cl/dataviews/237133/factores-de-emision-sic-y-sing-promedio-anual/). It is assumed that for years after 2016, these will remain constant at the value of 2016. 2016 values EGNCRE [MWh]: Source: https://www.cne.cl/wp-content/uploads/2015/05/generacion_bruta_sic_sing.xlsx EG2010 [MWh]: Source: https://www.cne.cl/wp-content/uploads/2015/05/generacion_bruta_sic_sing.xlsx 2017-2022 Values EG2010 [MWh]: average 2010-2016 of existing plants, with previous data. EGNCRE [MWh]: Source: 2050 Roadmap Projection, http://www.energia.gob.cl/sites/default/files/hoja_de_ruta_cc_e2050.pdf, pag. 75
Expected / Reached Reductions: For the package of these measures, the following is estimated: In the period 2010-2016 a mitigation of 5.5 MM tonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 31.5 MM tonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/ERNCChile.xlsx

Name of action: NET BILLING LAW (LAW 20,571)
Official Institution: Ministry of Energy, CNE
Description / **Objectives:** Regulates the payment of electric tariffs of residential generators. Distributed generation. It is published in 2012, but goes into effect in 2014. Relationship with other actions in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Energy Agenda. It is considered that the goal of Public Solar Ceilings is within this estimate, since the tenders include the procedure associated with the Law Net Billing.
Sector(s): Generation
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction is quantified using the following formula: ΔE [tonCO_2e] = EG [MWh] * FE [tonCO_2e/MWh] To obtain the EG [MWh], the following methodology was used: Ex_ante EG [MWh] = CAPh [MW] * PF * 8760 Ex_Post EG [MWh] = CAPp [MW] * PF * 8760 Where: ΔE [tonCO_2e] = CO_2e Emissions reduced during the period considered EG [MWh] = Energy Generated in the Year by Renewable Systems FE [tonCO_2e / MWh] = Average annual emission factor of the electrical system (may correspond to SIC or SING, depending on which corresponds to the quantified project). There is no official information on isolated systems of AYSÉN and MAGALLANES. CAPh [MW] = Installed historical capacity of systems CAPp [MW] = Projected capacity of PV systems PF = Regional Plant Factor of PV systems
Assumptions: FE [tonCO_2e/MWh]: Source: http://datos.energiaabierta.cl/dataviews/237133/factores-de-emision-sic-y-sing-promedio-anual/). It is assumed that for years after 2016, these will remain constant at the value of 2016. CAPh [MW]: Source: http://datos.energiaabierta.cl/dataviews/235587/generacion-distribuida-instalaciones-declaradas/. Data are available until 2016. CAPp [MW]: Source: http://www.minenergia.cl/archivos_bajar/2017/03/propuesta_plan_mitigacion_gases_efecto_invernadero.pdf PF: http://walker.dgf.uchile.cl/Explorador/Solar3/, taking into account the regional capitals.
Expected / **Reached Reductions:** In the period 2015-2016 a mitigation of 2.26 MtonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 614 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/NetBilling.xlsx

Name of action: ENERGY POLICY: 2050 ENERGY
Official Institution: Ministry of Energy, Ministry of Environment, Ministry of Mining, Ministry of Transportation and Communications, Ministry of Housing and Urban Planning
Description / Objectives: It proposes a vision of the energy sector by 2050 that corresponds to a reliable, sustainable, inclusive and competitive sector. Based on 4 pillars: Safety and quality of supply, energy as a development engine, compatibility with the environment and efficiency and energy education. Actions quantified within the package and indicated in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Short Law I (Law 19.940) Regulation on Geothermal Energy Concessions (Law 19,657 of 2000) Non-Conventional Renewable Energy Act (NCRE) Energy Agenda Actions quantified within the package and indicated in ANNEX III: Program for Climate Action and Solar Energy Development in Tarapacá in Chile Solar Technology District Actions linked to Energy Efficiency Action Plan (PAEE2020) Actions quantified within the package and indicated in Table 4. Measures related to the mitigation of GHG emissions in the Transportation sector (Chapter III: GHG Mitigation Policies and Actions): Restructuring of the Santiago Public Transportation System (Transantiago) Labeling of new vehicles Master Plan for bike lanes in Santiago Cycle path Plan Integrated Planning of the Urban Territory in Chile: synergies between mobility, urban development and climate change Actions quantified within the package and indicated in Table 5. Measures related to the mitigation of GHG emissions from companies in the transportation sector (Chapter III: GHG Mitigation Policies and Actions): Expansion of the Santiago Subway (Metro) network: Construction of lines 3 and 6
Sector(s): Generation, Transportation, Industry
Gas(es) covered: CO_2
Methodology: A report was made, associated to the impact of the implementation of the National Energy Policy. The estimates details can be found at: http://www.minenergia.cl/archivos_bajar/2017/03/propuesta_plan_mitigacion_gases_efecto_invernadero.pdf The model used to this estimate is the following: http://e2biz.cl/e2biz_manual/#referencia It should be noted that these estimates are in public consultation, and for the months of April-May 2017, there will be a modeling document with modeling assumptions, which can not yet be public.
Assumptions: The estimates details used can be found at: http://www.minenergia.cl/archivos_bajar/2017/03/propuesta_plan_mitigacion_gases_efecto_invernadero.pdf
Expected / Reached Reductions: A total reduction of 2.3 MM tCO_2 is expected between 2017-2022.

Name of action: PROGRAM FOR THE REPLACEMENT OF PUBLIC LUMINAIRES
Official Institution: Ministry of Energy
Description / Objectives: It subsidizes the replacement of public luminaires in municipalities of the country by LED luminaires, with the aim of replacing 200,000 luminaires by 2018. Relationship with other actions in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Energy Agenda: Program for the replacement of public luminaires. Energy Efficiency Action Plan (PAEE2020): Promote Energy Efficiency in lighting vehicular roads and pedestrian areas of urban areas.
Sector(s): Public
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction is quantified using the following formula: Ex post: ΔE [tonCO_2e] = (CEB [MWh] - CEP[MWh])*FE [tonCO_2e/MWh] Ex ante: ΔE(t) [tonCO_2e] = (CLPB [kWh/year]*NLB(t) [lighting] - CLPP [kWh/year]*NLP(t) [lighting])*FE(t) [tonCO_2e/MWh] Where: ΔE [tonCO_2e] = CO_2e Emissions reduced during the period considered CEB [MWh] = Energy consumption of replaced luminaires (baseline) in each project over the period considered. CEP [MWh] = Energy consumption of new luminaires (policies scenario) in each project over the period considered. FE [tonCO_2e / MWh] = Average annual emission factor of the electrical system (may correspond to SIC or SING, depending on which corresponds to the quantified project). CLPB [kWh / year] = Annual consumption of a replaced average luminaires (baseline). NLB [lighting] = Number of luminaires withdrawn accumulated per year t. CLPP [kWh / year] = Annual consumption of an average new luminaires (policies scenario). NLP [lighting] = Number of luminaires installed accumulated per year t.
Assumptions: CEB[MWh]: Source "Integrate the measurement and verification of results in the programs implemented by the energy efficiency action plan at the level of AChEE - Measurement and Verification in Public Lighting - Energy Savings Demonstration Reports (IDA)". Report at: http://e2biz.cl/wp-content/uploads/2017/03/Luminarias_Publicas.docx Appendixes and IDA can be download at: http://e2biz.cl/wp-content/uploads/2017/03/Luminarias_Publicas_anexos.rar CEP[MWh]: Source "Integrate the measurement and verification of results in the programs implemented by the energy efficiency action plan at the level of AChEE - Measurement and Verification in Public Lighting - Energy Savings Demonstration Reports (IDA)". FE [tonCO_2e/MWh]: Source: http://datos.energiaabierta.cl/dataviews/237133/factores-de-emision-sic-y-sing-promedio-anual/). It is assumed that for years after 2016, these will remain constant at the value of 2016. CLPB [kWh/year]: Source: Calculating in base to "Integrate the measurement and verification of results in the programs implemented by the energy efficiency action plan at the level of AChEE - Measurement and Verification in Public Lighting - Energy Savings Demonstration Reports (IDA)". NLB [lighting]: Source "Integrate the measurement and verification of results in the programs implemented by the energy efficiency action plan at the level of AChEE - Measurement and Verification in Public Lighting - Energy Savings Demonstration Reports (IDA)". CLPP [kWh/year] = Source Calculating in base to "Integrate the measurement and verification of results in the programs implemented by the energy efficiency action plan at the level of AChEE - Measurement and Verification in Public Lighting - Energy Savings Demonstration Reports (IDA)". NLP [lighting]: Source "Integrate the measurement and verification of results in the programs implemented by the energy efficiency action plan at the level of AChEE - Measurement and Verification in Public Lighting - Energy Savings Demonstration Reports (IDA)".
Expected / Reached Reductions: In the period 2016 a mitigation of 2.16 MtonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 140 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/Recambio_luminarias_p%C3%BAblicas.xlsx

Name of action: ENERGY EFFICIENCY PROGRAM IN PUBLIC BUILDINGS (PEEEP)
Official Institution: AChEE
Description / Objectives: State subsidy for energy improvements in public buildings including hospitals. From 2014 it has focused exclusively on the latter. To 2015, this program has made the following interventions: 21 energy diagnostics in Regional Hospitals. 21 energy efficiency projects in public and armed forces buildings. 8 energy management projects in public office buildings. 5 smaller projects of energy efficiency. 5 diagnostics of energy efficiency. 3 technical assistance to projects with own resources.
Sector(s): Public
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction was obtained directly from AChEE measurement and verification information for 2011, 2012 and 2015. For 2012 and 2013 the following formula was used: $\Delta E\ [tonCO_2e] = AE\ [MWh] * FE\ [tonCO_2e/MWh]$ Where: $\Delta E\ [tonCO_2e]$ = CO_2e Emissions reduced during the period considered AE [MWh / year] = Energy saved from the baseline of the projects entered that year for a particular year. $FE\ [tonCO_2e/MWh]$ = Emission factor of the saved energy source.
Assumptions: AE [MWh/year]: Source: For 2011 and 2012 values were published in http://www.peeep.cl/proyectos/dataee/web/proyectos# For 2015, information provided by the AChEE is used in the "Ahorros PEEEP 2015_Noviembre 2016_1801.xlsx" - Hoja GEI Evitados - Ahorro Monetario. (http://e2biz.cl/wp-content/uploads/2017/03/Ahorros_PEEEP_2015.xlsx) FE [tonCO2e/MWh]: Source: "2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Stationary Combustion". Details of specific tables in sheet "Emission factors" It is assumed that from 2016 onwards a similar mitigation will be obtained to the average of the last 4 years of application of the program. It is not considered the first year since is for trial phase. Measures continue to generate savings over time within the analysis period.
Expected / Reached Reductions: In the period 2011-2016 a mitigation of 27.94 $MtonCO_2e$ has been achieved. In the period 2017-2022, emission reductions of around 99 $MtonCO_2e$ are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/EE_Edificios_Publicos_PEEEP.xlsx

Name of action: MINIMUM ENERGY PERFORMANCE STANDARD (MEPS) IN LIGHT BULBS
Official Institution: Ministry of Energy
Description / Objectives: Prohibition of incandescent bulbs on Chile's market. This measure is also quantified in the following actions indicated in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Energy Efficiency Action Plan (PAEE2020): Establish Minimum Energy Efficiency Standards Energy Policy: 2050 Energy
Sector(s): Commercial, Public and Residential
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction was quantified using the following formula for each type of dwelling (house or department) and for each region of the country: $\Delta E(t)$ [tonCO_2e] = {CUB(t) [kWh/dwelling - year] - CUP(t) [kWh/dwelling-year]}*NR(t) [units]*FEi(t) [tonCO_2e/kWh] Where: ΔE [tonCO_2e] = CO_2e Emissions reduced during in year t CUB (t) [kWh / dwelling-year] = Annual consumption of an average dwelling in illumination in base case in year t CUP (t) [kWh / dwelling-year] = Annual consumption of an average dwelling in illumination in year t considering MEPS. NV (t) [units] = number of dwelling in the country in year t FEi (t) [tonCO_2e / kWh] = emission factor of the electrical system in year t
Assumptions: CUB(t) [kWh/dwelling-year]: It is calculated based on "End-use studies and energy conservation curve in the residential sector", CDT, 2010. (https://goo.gl/zjzH0f) CUP(t) [kWh/dwelling-year]: Source: Based on the methodology of the energy prospective Tool generated by E2BiZ for the Ministry of Energy, which can be seen in more detail in: http://e2biz.cl/e2biz_manual/#medida-ee-meps-artefactos-r. This methodology is based on simulating the temporal evolution of lighting bulbs park, considering different penetration rates of incandescent, compact fluorescent and LED technology. LED Penetration according to "Energy Savings Forecast of Solid-State Lighting in General Illumination Applications" (https://www1.eere.energy.gov/buildings/publications/pdfs/ssl/energysavingsforecast14.pdf) The same penetration of the cited document is used for the residential sector, but delayed in 5 years compared to the projected for the United States. NV(t) [dwelling]: Source: Casen surveys 2006 http://observatorio.ministeriodesarrollosocial.gob.cl/layout/doc/casen/vivienda2006cuadro1.xls) and 2013 (https://goo.gl/EwDm7Q) FE i(t) [tonCO_2e/kWh]: Source: http://datos.energiaabierta.cl/dataviews/237133/factores-de-emision-sic-y-sing-promedio-anual/) 1-year shelf life is considered for incandescent, 5 for compact fluorescents and 20 for LEDs. For calculation is considered the residential sector, which is characterized for use in lighting
Expected / Reached Reductions: In 2016 a mitigation of 64.03 MtonCO_2e has been achieved. In period 2017-2022, emission reductions of around 150 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/MEPS_ampolletas.xlsx

Name of action: HOUSING THERMAL ISOLATION SUBSIDY
Official Institution: Ministry of Housing and Urban Planning
Description / Objectives: Subsidy to the improvement in the thermal insulation of homes of vulnerable families. This measure is also quantified in the following actions indicated in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Energy Policy: 2050 Energy Energy Efficiency Action Plan (PAEE2020): Improve the energetic quality of the insulation and the equipment in buildings built without Energy Efficiency standards Energy Agenda. Thermal reconditioning subsidy in vulnerable housing
Sector(s): Residential
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction was quantified using the following formula for each type of dwelling (house or department) and for each region of the country: $\Delta E(t)$ [tonCO_2e] = {$\sum$iCUBi(t) [kWh/dwelling-year]*%UCi(t) [%]*FEi(t) [tonCO_2e/kWh] - $\sum$iCUPi(t) [kWh/dwelling-year]*%UCi(t) [%]*FEi(t) [tonCO_2e/kWh]}*NV(t) [dwelling] Where: $\Delta E(t)$ [tonCO_2e] = CO_2e Emissions reduced in year t CUBi(t) [kWh/dwelling-year] = Baseline consumption of an average dwelling using fuel i for heating in year t CUPi(t) [kWh/dwelling-year] = Consumption in scenario with a policy of an average dwelling that uses fuel i for heating in year t (this value considers that a certain amount of dwelling is reconditioned every year, after which Improves its thermal efficiency) %UCi(t) [%] = Percentage of dwellings that use fuel i for heating in year t NV(t) [dwellings] = number of dwellings in the country in year t FEi(t) [tonCO_2e / kWh] = emission factor of the fuel (or electrical system) in year t
Assumptions: CUBi(t) [kWh/dwelling-year]: Source: Based on the methodology of the energy prospective Tool generated by E2BiZ for the Ministry of Energy. More details about assumptions of this factor at http://e2biz.cl/e2biz_manual/#consumo-real CUPi(t) [kWh/dwelling-year]: Source: Based on the methodology of the energy prospective Tool generated by E2BiZ for the Ministry of Energy, which can be seen in more detail in: http://e2biz.cl/e2biz_manual/#medida-ee-reacond-vulnerable. This methodology modifies the energy loss factors of the thermal insulation of the average dwelling as a weighted sum by number of dwelling, considering that a reconditioned dwellings has 30% less thermal losses than a non overhauling housing. The number reconditioned housing annually was delivered directly by the Ministry of Energy. %UCi(t) [%]: Source: Based on the methodology of the energy prospective Tool generated by E2BiZ for the Ministry of Energy. The original value is obtained from the study "Measurement of domestic consumption of fuelwood and other solid fuels derived from wood (CDT, 2015)" (https://goo.gl/Uv80DL) NV(t) [dwelling]: Source: Casen surveys 2006 (http://observatorio.ministeriodesarrollosocial.gob.cl/layout/doc/casen/vivienda2006cuadro1.xls) and 2013 (https://goo.gl/EwDm7Q) FEi(t) [tonCO_2e/kWh]: Source: Fuels: "2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Stationary Combustion ". Details of specific tables in sheet "Emission factors". Electricity: http://datos.energiaabierta.cl/dataviews/237133/factores-de-emision-sic-y-sing-promedio-anual/) The housing stock after 2016 grows on the basis of population growth and the variation in the number of inhabitants per housing, which decreases as GDP per capita increases. Housing life span is not considered. Existing dwellings consider different coefficient of thermal loss for each region, depending on the construction characteristics of the area and the thermal zone. New dwellings consider a coefficient according to what is established by current regulations.
Expected / Reached Reductions: In the period 2008-2016 a mitigation of 45.46 MtonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 187 MM tonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/Reacondicionamiento_termico.xlsx

Name of action: THERMAL SOLAR SYSTEMS IN NEW HOUSING LAW 20,365
Official Institution: Ministry of Energy
Description / **Objectives:** Tax exemption for real estate for the installation of solar thermal systems for domestic hot water (DHW) in new dwellings, included in Law 20,365 and modified by law 20,897. In addition, for quantification purposes, the collectors installed with the complementary subsidy to housing programs of the Ministry of Housing and Urban Planning to install thermal solar systems in existing social housing and with the subsidy to include solar collectors in the reconstruction programs are considered. This measure is also quantified in the following actions indicated in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Energy Policy: 2050 Energy
Sector(s): Residential
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction was quantified using the following formula for each type of dwelling (house or department) and for each region of the country: $\Delta E(t)$ [tonCO_2e] = NV(t)*UACS(t)*{$\sum$iUCBi(t)*CUi(t)*FEi(t) - $\sum$iUCPi(t)*CUi(t)*FEi(t)} UCPi(t) [%]: UCPsolar(t) = NSA(t)*CS/NV(t) UCPothers(t) = UCBothers(t)*(1-UCPsolar(t)) Where: $\Delta E(t)$ [tonCO_2e] = CO_2e Emissions reduced in year t NV(t) [dwellings] = number of dwellings in the country in year t UACS(t) [%] = percentage of dwellings with DHW in the country in year t UCBi(t) [%] = percentage of DHW demand that in the base scenario supplied by fuel i in year t UCPi(t) [%] = percentage of DHW demand that in the policy scenario supplied by fuel i in year t CUi(t) [kWh/dwelling-year] = average annual fuel consumption i for a dwelling using that fuel in year t FEi(t) [tonCO_2e/kWh] = emission factor of fuel i in year t NSA [systems] = number of systems installed accumulated to year t CS [%/system] = minimum solar contribution of a system to the consumption of DHW of a home
Assumptions: NV(t) [dwelling]: Source: Casen surveys 2006 (http://observatorio.ministeriodesarrollosocial.gob.cl/layout/doc/casen/vivienda2006cuadro1.xls) and 2013 (https://goo.gl/EwDm7Q). UACS(t) [%] and UCBi(t) [%]: Source: 2014 E2Biz Energy Prospecting Tool for the Ministry of Energy (http://e2biz.cl/e2biz_manual/#proyecci-n-energ-tica) CUi(t) [kWh/dwelling-year]: Source: 2014 E2Biz Energy Prospecting Tool for the Ministry of Energy (http://e2biz.cl/e2biz_manual/#acs-y-cocci-n) FE i(t) [tonCO2e/kWh]: Source: Fuels: "2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Stationary Combustion ". Details of specific tables in sheet "Emission factors". Electricity: http://datos.energiaabierta.cl/dataviews/237133/factores-de-emision-sic-y-sing-promedio-anual/). NSA(t) [systems]: Source: "Monthly report on solar thermal systems subsidies January 2017", document delivered directly by personnel of the Ministry of Energy. (http://e2biz.cl/wp-content/uploads/2017/03/Reporte__Colectores_Solares_Ene_2017.pdf) CS [%/system]: Source: Technical Standard that determines algorithm for the verification of the minimum solar contribution of the Solar Thermal Systems based on the tax exemption of Law Nº 20.365 (http://www.programasolar.cl/images/pdfs/rex%20502%20norma%20tcnica%20actualizada.pdf).
Expected / **Reached Reductions:** In the period 2010-2016 a mitigation of 69.38 MtonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 177 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/Sistemas_solares_termicos_ACS.xlsx

Name of action: "RENEW YOUR BUS" PROGRAM
Official Institution: Ministry of Transportation and Communications
Description / Objectives: Replace old buses with newer, more efficient buses in areas other than Santiago. The program considers scrapping and the possibility of replacement by used vehicles.
Sector(s): Transportation
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: TThe emission reduction is quantified using the following formula: ΔE(t) [tonCO_2e] = (1/RBA [km/l] – 1/RBN [km/l])*NBN(t) [bus]*DR(t) [km/year]*FE [tonCO2e/l] DR(t) [km/year] = NA(t) [pax-km/year]/(TO [pax/bus]*PB(t) [bus]) Where: ΔE [tonCO_2e] = CO_2e Emissions reduced during in year t RBA [km/l]= Performance of an old urban bus on average RBN [km/l]= Performance of a new urban bus on average NBN(t) [bus] = Number of replacement buses operating in year t DR(t) [km/year] = Distance traveled by an average urban bus in year t NA(t) [pax-km/year] = Level of activity of urban buses in year t TO [pax/bus] = Average occupancy rate of an urban bus PB(t) [bus] = Park of urban buses in year t FE [tonCO_2e/l] = Diesel Emission Factor
Assumptions: RBA [km/l] and RBN [km/l]: Own calculation based on 2016 efficiency obtained from 2016 Energy Prospecting Tool, E2Biz for the Ministry of Energy (http://e2biz.cl/e2biz_manual/#fuentes-de-informaci-n). Corresponds to information provided by Sectra for regional average efficiencies. Starting from the value of 2016, a trend line is generated using the same evolution trend used by EPA for light vehicles (Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2016, EPA, 2016 https://www.epa.gov/fueleconomy/download-co2-and-fuel-economy-trends-report-1975-2016) NBN(t) [bus]: Source: Data provided directly by the Ministry of Transportation. NA(t) [pax-km/year]: Source: Values obtained from 2016 Energy Prospecting Tool, E2Biz for the Ministry of Energy (http://e2biz.cl/e2biz_manual/#fuentes-de-informaci-n). These values are obtained from the STEP model of SECTRA, delivered directly by SECTRA when making the tool. TO [pax/bus]: Source: Values obtained from 2016 Energy Prospecting Tool, E2Biz for the Ministry of Energy (http://e2biz.cl/e2biz_manual/#demanda-de-transporte-de-pasajeros). PB(t) [bus]: Source: http://usuarios.subtrans.gob.cl/estadisticas/parques-vehiculares.html FE [tonCO2e/MWh]: Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Mobile Combustion
Expected / Reached Reductions: In the period 2011-2016 a mitigation of 154 M tonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 92.8 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/Cambia_tu_micro.xlsx

Name of action: "RENEW YOUR COLLECTIVE TAXI" PROGRAM
Official Institution: Ministry of Transportation and Communications
Description / Objectives: Program to replace collective taxis with more efficient vehicles. Delivery of subsidies for the replacement of light vehicles used as collective taxis by more modern vehicles considering the scrapling of vehicles replaced in some cases.
Sector(s): Transportation
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction is quantified using the following formula: $\Delta E(t)$ [tonCO_2e] = (1/RVA [km/l] - 1/RVN [km/l])*NVCH(t) [cars]*DR(t) [km/year]*FE [tonCO2e/l] DR(t) [km/year] = NA(t) [pax-km/year]/(TO [pax/car]*PC(t) [cars]) Where: $\Delta E(t)$ [tonCO_2e] = CO_2e Emissions reduced in year t RVA [km/l]= Performance of an old car on average RVN [km/l]= Performance of a new car on average NVCH(t) [car] = Number of replacement cars that replaced scrap vehicles operating in year t DR(t) [km/year] = Distance traveled by an average collective taxi in year t NA(t) [pax-km/year] = Level of activity of collective taxis in year t TO [pax/taxi] = Average occupancy rate of a collective taxi PC(t) [car] = Park of collective taxis in year t FE [tonCO_2e/l] = Fuel Emission Factor (diesel or gas)
Assumptions: RVA [km/l]: Own calculation based on efficiency 2016, calculated as the average of the efficiencies of new vehicles entered in 2016 (data provided directly by the Ministry of Transportation). Starting from the value of 2016, a trend line is generated using the same evolution trend used by EPA for light vehicles: Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2016, EPA, 2016 https://www.epa.gov/fueleconomy/download-co2-and-fuel-economy-trends-report-1975-2016) RVN [km/l]: Average values for each year of data provided directly by the Ministry of Transportation for each spare vehicle. NVCH(t) [car]: Source: Data provided directly by the Ministry of Transportation. NA(t) [pax-km/year]: Source: Values obtained from 2016 Energy Prospecting Tool, E2Biz for the Ministry of Energy (http://e2biz.cl/e2biz_manual/#fuentes-de-informaci-n). These values are obtained from the STEP model of SECTRA, delivered directly by SECTRA when making the tool. TO [pax/bus]: Data calculated from the taxi occupation rate obtained from the 2016 Energy Outlook Tool, E2Biz for the Ministry of Energy (http://e2biz.cl/e2biz_manual/#demanda-de-transporte-de-pasajeros). It is considered that the occupancy rate of a collective taxi is 1 higher than that of a basic taxi. PC(t) [car]: Source: Yearbook of vehicles in circulation, INE. http://www.ine.cl/canales/chile_estadistico/estadisticas_economicas/transporte_y_comunicaciones/parquevehiculos.php FE [tonCO_2e/MWh]: Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Mobile Combustion There is no level of activity data for collective taxis, so the level of activity of taxis as a whole is used. For this reason, to calculate the annual distance traveled by a collective taxi, it is divided by the total number of taxis (and not only by collective taxis). This can be done under the assumption that the annual distance traveled by a basic taxi and a collective taxi is similar, since they are vehicles that are most of the time in movement. Only vehicles that have been replaced and scrapped are considered. Non-scrap vehicles can be resold to operate as a private vehicle or to continue as a collective taxi, so mitigation in these cases is uncertain, and may be null.
Expected / Reached Reductions: In the period 2015-2016 a mitigation of 141 tonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 1.66 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/Cambia_tu_colectivo.xlsx

Name of action: PROGRAM OF INCENTIVE TO THE INTRODUCTION OF AERODYNAMIC IMPROVEMENTS IN THE VEHICLES OF LOAD OF THE HIGHWAY TRANSPORT
Official Institution: Chilean Energy Efficiency Agency (AChEE)
Description / Objectives: Subsidy for the installation of aerodynamic elements and measurement of the impact of aerodynamics of cargo transport. This measure is also quantified in the following actions indicated in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Energy Policy: 2050 Energy
Sector(s): Transportation
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The annual mitigation value is derived from the report "Annual Fuel Savings Program: Support for the implementation of aerodynamic devices, Sociedad Consultora Sistemas Sustentables (SCSS) for the Chilean Energy Efficiency Agency (ACHEE), 2015" (http://e2biz.cl/wp-content/uploads/2017/03/Mejoras_aerodin%C3%A1micas_camiones.docx). The value used is obtained via "measurement of impacts directly with recorded data".
Assumptions: It is assumed that the savings remain in the time for a term of 4 years. This value was suggested by the consultant who implemented and monitored the program, considering that there are no data that allow to affirm that the systems will be maintained or if the companies will replace them at the end of their useful life.
Expected / Reached Reductions: In the period 2014-2016 a mitigation of 1.51 M tonCO_2e has been achieved. In the period 2017-2022, emission reductions of around 1.5 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/Mejoras_aerodinamicas_camiones.xlsx

Measures to be applied in period 2017-2022

Name of action: MINIMUM ENERGY PERFORMANCE STANDARD (MEPS) IN RESIDENTIAL REFRIGERATORS.
Official Institution: Ministry of Energy
Description / Objectives: All refrigerators sold in the country will be subject to a minimum standard of energy efficiency, not allowing the sale of equipment with efficiencies below the standard. From 2017, sale of equipment with a standard lower than B (level 75 of efficiency) is prohibited. From 2018 sale of refrigerators with a standard lower than A (level 55 of efficiency) is prohibited. This measure is also quantified in the following actions indicated in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Energy Efficiency Action Plan (PAEE2020): Establish Minimum Energy Efficiency Standards Energy Policy: 2050 Energy Energy Agenda: MEPS engines and refrigerators
Sector(s): Residential
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction was quantified using the following formula for each type of housing (house or department) and for each region of the country: $\Delta E(t)$ [tonCO_2e] = {CUB(t) [kWh/dwelling - year] - CUP(t) [kWh/dwelling-year]}*NR(t) [units]*FEi(t) [tonCO2e/kWh] Where: $\Delta E(t)$ [tonCO_2e] = CO_2e Emissions reduced in year t CUB(t) [kWh / dwelling-year] = Annual consumption in base line of an average refrigerator in year t CUP(t) [kWh / dwelling-year] = Annual consumption of an average refrigerator in year t considering MEPS. NR(t) [units] = number of refrigerators in the country in year t FEi(t) [tonCO_2e / kWh] = emission factor of the electrical system in year t
Assumptions: CUB(t) [kWh/dwelling-year]: It is calculated based on "End-use studies and energy conservation curve in the residential sector", CDT, 2010. (https://goo.gl/zjzH0f) CUP(t) [kWh/dwelling-year]: Source: Based on the methodology of the energy prospective Tool generated by E2BiZ for the Ministry of Energy, which can be seen in more detail in: http://e2biz.cl/e2biz_manual/#medida-ee-meps-artefactos-r. This methodology is based on comparing the unit consumptions of a new equipment that would enter base line with that defined by the MEPS, and based on this efficiency and the proportion of new equipment entering each year, calculating the new level of average unit consumption from the park. Refrigerators distribution data is used by efficiency level according to the report "Generación de metodología para la medición de línea base del consumo energético en artefactos domésticos Propuesta de seguimiento y aplicación en artefactos domésticos etiquetados, Fundación Chile, 2009". (https://goo.gl/YTXn5B) NR(t) [housing]: Calculated based on the number of housing in the country (https://goo.gl/EwDm7Q) And the saturation of refrigerators according to CASEN 2006 and 2013(http://observatorio.ministeriodesarrollosocial.gob.cl/layout/doc/casen/vivienda2006cuadro22.xls) FE i(t) [tonCO2e/kWh]: Source: (http://datos.energiaabierta.cl/dataviews/237133/factores-de-emision-sic-y-sing-promedio-anual/) The housing stock after 2016 grows on the basis of population growth and the variation in the number of inhabitants per housing, which decreases as GDP per capita increases. It is considered entry of equipment by growth of the park, indexed to the GDP with a saturation of 135% (1.35 refrigerators per household) and natural replacement for 15 years.
Expected / Reached Reductions: In period 2017-2022, emission reductions of around 92 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/MEPS_refrigeradores.xlsx

Name of action: MINIMUM ENERGY PERFORMANCE STANDARD (MEPS) FOR RESIDENTIAL AIR CONDITIONERS EQUIPMENT
Official Institution: Ministry of Energy
Description / Objectives: All air conditioners equipment of residential use sold in the country will be subject to a minimum standard of energy efficiency, not allowing the sale of equipment with efficiencies below the standard. Year 2017 it will generate a study to define the level to be set for the standard, which is expected to begin to be applied in 2018. This measure is also quantified in the following actions indicated in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Energy Efficiency Action Plan (PAEE2020): Establish Minimum Energy Efficiency Standards
Sector(s): Commercial, Public and Residential
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction was quantified using the following formula for each type of housing (house or department) and for each region of the country: $\Delta E(t)$ [tonCO_2e] = {CUB(t) [kWh/dwelling- year] - CUP(t) [kWh/dwelling-year]}*NA(t) [units]*FEi(t) [tonCO_2e/kWh] Where: ΔE [tonCO_2e] = CO_2e Emissions reduced during in year t CUB(t) [kWh / dwelling-year] = Annual consumption in base line of an average air conditioner equipment in year t CUP(t) [kWh / dwelling-year] = Annual consumption of an average air conditioner equipment in year t considering MEPS. NA(t) [units] = number of air conditioners equipment in the country in year t FEi(t) [tonCO_2e / kWh] = emission factor of the electrical system in year t
Assumptions: CUB(t) [kWh/dwelling-year]: It is calculated based on "End-use studies and energy conservation curve in the residential sector", CDT, 2010. (https://goo.gl/zjzH0f) CUP(t) [kWh/dwelling-year]: Source: Based on the methodology of the energy prospective Tool generated by E2BiZ for the Ministry of Energy, which can be seen in more detail in: http://e2biz.cl/e2biz_manual/#medida-ee-meps-artefactos-r. This methodology is based on comparing the unit consumptions of a new equipment that would enter base line with that defined by the MEPS, and based on this efficiency and the proportion of new equipment entering each year, calculating the new level of average unit consumption from the park. It has been assumed that the current standard is at labeling level D (SEER = 3.9) and that the MEPS will strictly enter a level B (SEER = 4.85). NA(t) [dwelling]: Calculated based on the number of dwelling in the country (https://goo.gl/EwDm7Q)) FE i(t) [tonCO_2e/kWh]: Source: http://datos.energiaabierta.cl/dataviews/237133/factores-de-emision-sic-y-sing-promedio-anual/ The housing stock after 2016 grows on the basis of population growth and the variation in the number of inhabitants per housing, which decreases as GDP per capita increases. It is considered entrance of equipment by growth of the park and by natural spare by life span of 10 years. The growth of the park has been indexed to GDP per capita and modeled following the evolution of countries such as the United States and Spain.
Expected / Reached Reductions: In the period 2017-2022, emission reductions of around 38 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/MEPS_aire_acondicionado.xlsx

Name of action: THERMAL REGULATION (SECOND STAGE)
Official Institution: Ministry of Housing and Urban Planning
Description / Objectives: Modify the General Ordinance of Urbanism and Constructions (OGUC) to increase the minimum requirements of thermal envelope of new buildings. A 30% improvement in the efficiency of the housing compared to the previous regulation is expected, by increasing the current requirements and including new requirements, whose objective is to impact on the energy performance of the housing and its habitability (Ventilation and Infiltrations of air, thermal bridges, doors and condensation). This measure is also quantified in the following actions indicated in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Energy Policy: 2050 Energy
Sector(s): Residential
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction was quantified using the following formula for each type of housing (house or department) and for each region of the country: $\Delta E(t)$ [tonCO_2e] = {$\sum$iCUBi(t) [kWh/dwelling-year]*%UCi(t) [%]*FEi(t) [tonCO_2e/kWh] - $\sum$iCUPi(t) [kWh/dwelling-year]*%UCi(t) [%]*FEi(t) [tonCO_2e/kWh]}*NV(t) [dwelling] Where: ΔE [tonCO_2e] = CO_2e Emissions reduced during in year t CUBi(t) [kWh/dwelling-year] = Baseline consumption of an average dwelling using fuel i for heating in year t CUPi(t) [kWh/dwelling-year] = Consumption in scenario with policy of an average housing that uses fuel i for heating in year t (this value considers that each year after 2018, houses built are more efficient). %UCi(t) [%] = Percentage of housing that use fuel i for heating in year t NV(t) [dwellings] = number of dwellings in the country in year t FEi(t) [tonCO_2e / kWh] = emission factor of the fuel (or electrical system) in year t
Assumptions: CUPi(t) [kWh/dwelling-year]: Source: Based on the methodology of the energy prospective Tool generated by E2BiZ for the Ministry of Energy. More details about assumptions of this factor at http://e2biz.cl/e2biz_manual/#consumo-real CUBi(t) [kWh/dwelling-year]: Source: Based on the methodology of the energy prospective Tool generated by E2BiZ for the Ministry of Energy, which can be seen in more detail in: http://e2biz.cl/e2biz_manual/#medida-ee-reacond-vulnerable. This methodology modifies the energy loss factors of the thermal insulation of the average housing as a weighted sum by number of housing, considering that a new housing with thermal regulation has 30% less thermal losses than a house built on previous years. %UCi(t) [%]: Source: Based on the methodology of the energy prospective Tool generated by E2BiZ for the Ministry of Energy. The original value is obtained from the study "Measurement of national consumption of fuelwood and other solid fuels derived from wood (CDT, 2015)" (https://goo.gl/Uv80DL) NV(t) [dwelling]: Source: Casen surveys 2006 (http://observatorio.ministeriodesarrollosocial.gob.cl/layout/doc/casen/vivienda2006cuadro1.xls) and 2013 https://goo.gl/EwDm7Q FE i(t) [tonCO_2e/kWh]: Source: Fuels: "2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Stationary Combustion ". Details of specific tables in sheet "Emission factors". Electricity: http://datos.energiaabierta.cl/dataviews/237133/factores-de-emision-sic-y-sing-promedio-anual/ The housing stock after 2016 grows on the basis of population growth and the variation in the number of inhabitants per housing, which decreases as GDP per capita increases. Housing life span is not considered. Existing housing consider different coefficient of thermal loss for each region, depending on the construction characteristics of the area and the thermal zone. New housing consider a coefficient according to what is established by current regulations.
Expected / Reached Reductions: In period 2017-2022, emission reductions of around 170 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/Reglamentaci%C3%B3n_t%C3%A9rmica_viviendas_OGUC.xlsx

Name of action: EXPANSION OF THE SANTIAGO SUBWAY (METRO) NETWORK: CONSTRUCTION OF LINES 3 AND 6
Official Institution: Metro S.A./ Ministry of Transportation and Communications
Description / Objectives: 2 new lines to the current layout of the Santiago's subway Metro, which in total will add an additional 37 km to the current network, equivalent to an additional 36% compared to the current network length. The new line 6 (15 km) will begin its operation in 2017 and the new line 3 (22 km) in 2018. This measure is also quantified in the following actions indicated in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Energy Policy: 2050 Energy
Sector(s): Transportation
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction is quantified using the following formula: $\Delta E(t)$ [tonCO_2e] = CEC(t) [MWh/year]*FEF [tonCO_2e/MWh] - CAE(t)[MWh/año]*EEF(t) [tonCO_2e/MWh] Where: ΔE (t) [tonCO_2e] = CO_2e Emissions reduced in year t CEC(t) [MWh/year] = Fuel consumption avoided of vehicles due to the subway existence. Corresponds to the consumption in base line of the trips that the subway displaces in a year t. CAE(t) [MWh/year] = Additional consumption of electricity resulting from the operation of the subway one year t. FEF and EEF(t) [tonCO_2e/MWh] = Emission factors of displaced fuels and electricity of the SIC, respectively.
Assumptions: CEC(t) [MWh/year]: Calculated based on the passengers-km transported by the subway in the analyzed sections. Data provided by SECTRA of the Ministry of Transportation CAE(t) [MWh/year]: Calculated based on length data of the analyzed sections and the consumption of the subway per km traveled, reported by Metro in its Annual Reports (https://www.metrosantiago.cl/corporativo/memoria) FEF [tonCO_2e/MWh]: Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Mobile Combustion EEF(t) [tonCO_2e/kWh]: Source: http://datos.energiaabierta.cl/dataviews/237133/factores-de-emision-sic-y-sing-promedio-anual/). It is assumed that for years after 2016, these will remain constant at the value of 2016. It is assumed that passengers-km transported per subway are distributed between private vehicles and buses by 15% and 85%, respectively. For years after 2015, electricity consumption per km of the subway constant and equal to that of 2015 is considered.
Expected / Reached Reductions: In the period 2017-2022, emission reductions of around 467 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/Nuevas_l%C3%ADneas_metro.xlsx

Name of action: MINIMUM ENERGY PERFORMANCE STANDARD (MEPS) IN ENGINES
Official Institution: Ministry of Energy, SEC
Description / Objectives: Regulation that generates minimum standards of energy efficiency for engines under 10 HP sold in the country. Standard fixed is IE2. This measure is also quantified in the following actions indicated in Table 3. Measures related to the mitigation of GHG emissions in the Energy sector (Chapter III: GHG Mitigation Policies and Actions): Energy Efficiency Action Plan (PAEE2020): Establish Minimum Energy Efficiency Standards Energy Agenda: MEPS Engines and Refrigerators Energy Policy: 2050 Energy
Sector(s): Industry and mining. To a lesser extent commercial, residential and public
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The emission reduction is quantified using the following formula: $\Delta E(t)$ [tonCO_2e] = (CMB [MWh/year]-CMP[MWh/year])*FE [tonCO_2e/MWh] Where: $\Delta E(t)$ [tonCO_2e] = CO_2e emissions reduced in year t CMB [MWh/year]= Motor consumption without MEPS (base scenario) CMP [MWh/year]= Motor consumption with MEPS (policy scenario) FE [tonCO_2e / MWhl] = Emission factors of SIC and SING electrical systems
Assumptions: CMB [MWh/year] and CMP[MWh/year]: Source: "Economic technical impact assessment for the implementation of minimum energy efficiency standards in electric motors, River Consultores, 2014" (https://goo.gl/9Nd4aX). this study bases its calculations on the PAMS model (Policy Analysis Modeling System for Mandatory Efficiency Standards) generated for the case of electric motors in Chile FE [tonCO_2e/MWh]: Source: http://energiaabierta.cl/visualizaciones/factor-de-emision-sic-sing/ The study provides a decrease in the aggregate energy consumption at the country level. Data from the 2014 Regionalized National Balance are used to separate consumption in SIC and SING. The emission factors of years after 2016 are assumed equal to the year 2016.
Expected / Reached Reductions: In the period 2017-2022, emission reductions of around 167 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/MEPS_Motores.xlsx

Name of action: **LAW N° 20,920 FRAMEWORK LAW FOR WASTE MANAGEMENT, EXTENDED RESPONSIBILITY BY PRODUCERS AND PROMOTION OF RECYCLING (REP)**
Official Institution: Ministry of Environment
Description / Objectives: The law objective is to reduce the generation of waste and encourage its reuse, recycling and other types of recovery, through the establishment of extended responsibility by the producer and other waste management instruments, in order to protect the health of people and the environment .
Sector(s): Solid waste
Gas(es) covered: CO_2, CH_4, N_2O
Methodology: The reduction was obtained from the study "Projection Scenario Baseline 2013 and Scenarios for Mitigation of the Antropical Waste Sector", part of the MAPS Chile project. Emissions data were used in baseline and policy scenario and mitigation was calculated using the following formula: $\Delta E(t)$ [tonCO_2e] = ELB(t) [tCO_2] - ECP(t) [tCO_2] Where: $\Delta E(t)$ [tonCO_2e] = CO_2e Emissions reduced in year t ELB(t) [tCO_2] = Baseline emissions one year t ECP(t) [tCO_2] = Emissions with policy in one year t
Assumptions: ELB(t) [tCO_2]: Source: "Projection 2013 Base Line Scenario and Mitigation Scenarios for the Antropical Waste Sector"(https://goo.gl/Xn3lSJ) ECP(t) [tCO_2]: Source: Source: "Projection 2013 Base Line Scenario and Mitigation Scenarios for the Antropical Waste Sector"(https://goo.gl/Xn3lSJ) The quantification presented in the MAPS project considered a start of the measure in 2014. For the purposes of the current quantification, it has been assumed that the mitigation percentages are maintained with respect to the year of the start of the measure (2017).
Expected / Reached Reductions: In the period 2017-2022, emission reductions of around 38 MtonCO_2e are expected to be achieved. http://www.e2biz.cl/wp-content/uploads/2017/03/Ley_reciclaje.xlsx

Annex IV. NAMA update sheets

Chart 1. Renewable energy for self-consumption in chile (SSREs).

Antecedentes generales de la NAMA		
Full name	Renewable Energies for Self-consumption in Chile (SSREs).	
Short name	Self-consumption NAMA	
Stage	☐ Conceptual/Feasibility. x Planned or under planning process	☐ Adopted: under implementation ☐ Implemented
Registered in United Nations	x Yes	☐ No
Category	☐ Unilateral in search of recognition ☐ Bilateral in search of planning support	x Bilateral in search of implementation support ☐ Credits
Description	The Ministry of Energy and the Economic Development Agency of the Government of Chile (CORFO) have developed a NAMA in self-supply energy systems based on renewable energies. The objective is to promote the incorporation of renewable energy systems for self-sufficiency in Chile through the creation of adequate financial and technical conditions for the early stages of the development of this emerging industry. The NAMA will address technical and financial barriers to small and medium-scale renewable energy systems for self-sufficiency in the industrial, agricultural and commercial sectors, through financial instruments, technical assistance, and outreach and awareness-raising activities with the support of the Ministry of Energy and CORFO. NAMA's objective is: 1. Increase the insertion of small and medium-scale non-conventional renewable energy systems for self-consumption in the different productive sectors, through the creation of technical and financial conditions for the early stages of the development of this emerging industry. 2. Reduce GHG, and in turn contribute to the achievement of Chile's NPC to achieve a reduction of 30% of GHG per unit of GDP by 2030, compared to the level achieved in 2007. 3. Overcome barriers for SSREs. 4. Encourage the development of an industry and market maturity for non-conventional renewable energy technologies intended for self-consumption by Chile. 5. Improve local knowledge and skills in SSRE technologies through technical support. The NAMA will achieve these objectives through a comprehensive program that simultaneously addresses the technical and financial barriers to the implementation of small-scale renewable energy. The NAMA will be coordinated by the Renewable Energy Division of the Ministry of Energy. The components of NAMA are the following: 1. Financial Component: i) Co-financing for pre-investment studies; (ii) Co-financing for project investment; (iii) Partial credit guarantee fund for local financial institutions; And (iv) Advisory services for financial sector institutions. 2. Technical Support Component: i) Spreading and awareness: The NAMA will help raise awareness of the options for the use of NCREs for self-consumption in the Chilean industry. Technologic and field visits sponsored by NAMA will contact potential investors with current technologies and users. ii) Training and capacity building: Through workshops and training courses. Private and public sector interest groups (excluding the financial sector, which is covered by the financial component) will be trained in the following areas: feasibility analysis of SSRE projects; Evaluation and management of projects; Introduction to ERNC technologies; etc. Formulate and carry out an exchange program with national and international experts, to share experiences and knowledge. iii) Project preparation: A technical support desk and virtual platform, providing technical guidance and support to project developers on technology-related queries, project development, networking, regulatory and legal issues. The technical assistance service will be the main entry point for project developers and other stakeholders. iv) Measurement, Reporting and Verification (MRV): Development of an MRV system for the NAMA. Design of templates and formats for reporting, data inclusion and verification process for the NAMA.	
Nature or type of action	x Strategy, Policy or Programs. Specify the instrument related[3]: Pre-investment subsidies, investment subsidies, guarantee fund to facilitate access to bank loans and capacity building. ☐ Project or group of projects (investment in technology or infrastructure) ☐ Other (s)	

[3] *Economic, fiscal, investment, voluntary agreements, information management, capacity building, research, etc.*

Sector(s) considered by NAMA	x Agriculture ☐ Constrution x Power generation x Energy utilization ☐ Forestry/LULUCF	x Industrial and industrial processes x Waste ☐ Transportation and its corresponding infrastructure x Transversal (check all that apply)) ☐ Other (s).....
Technology	Solar energy, geothermal energy, bioenergy, hydroelectric power, and wind energy.	
Gas covered by NAMA	x Carbon dioxide (CO_2) x Methane gas (CH_4) x Nitrous oxide (N_2O)	☐ Hydrofluorocarbons (HFC) ☐ Perfluorocarbons (PFC) ☐ Sulfur hexafluoride (SF_6) ☐ Nitrogen Trifluoride (NF3)
Jurisdiction	x National ☐ Regional ☐ Interregional	
Implementation dates	Time frame	6 years
	Start year or expected start year	2015
	Completion year	2021

NAMA objectives

1. Increase the insertion of small scale non-conventional renewable energy systems for self-consumption in the different sectors, through the creation of technical and financial conditions for the early stages of the development of this emerging industry.
2. Reduce GHG, and in turn contribute to the achievement of Chile's NPC to achieve a reduction of 30% of GHG per unit of GDP by 2030, compared to the level achieved in 2007.
3. Overcome barriers for SSREs.
4. Encourage the development of an industry and market maturity for non-conventional renewable energy technologies intended for self-consumption by Chile.
5. Improve local knowledge and skills in SSRE technologies through technical support.

NAMA barriers

1. Human resources:
   - (i) SSRE projects face a lack of access to qualified technicians as the market is new and underdeveloped. There is a limited number of consultants or consulting firms specialized in the development of projects. At the same time, there is a limited availability of installers who can implement the projects.
   - (ii) Insufficient companies with experience and a low follow-up to the development of projects, this condition causes an increase in the perception of the risk that the SSRE projects entail.
   - (iii) Once SSRE projects have been implemented, there is a limited number of technicians qualified to operate and maintain plants and equipment, especially in those cities that are located outside the Metropolitan Region.

2. Financial barriers:
   - (i) There is a lack of SSRE projects that can be financed mainly due to a lack of willingness to invest in (pre) feasibility studies, especially in less developed technologies in Renewable Energies, due to high initial costs and a high risk perception.
   - (ii) There is limited access to loans offered by banks as these banks prefer to invest in projects of greater capacity in order to achieve economies of scale.
   - (iii) The lack of familiarity by banks with respect to investment in SSRE projects leads to higher credit costs resulting from the perception of risk, which reduces the financial viability of SSRE projects.
   - (iv) The high incremental costs in Renewable Energy technologies, or rather the perception of risk (e.g., long periods of recovery of investment or payback, low rates of return), compared to the investment in other traditional businesses, results in barriers to investment for developers and project promoters.
   - (v) The high transaction costs for "Small Distributed Generation Means" (PMGD) projects could become significant economic barriers.
   - (vi) Generally the high expectations as to the return of the investment and payback of the investors, could also restrain the investment in SSRE projects since the return of the investment and the payback could be less attractive in comparison to other investment opportunities.

3. Sensibility barriers:
   - (i) There is still a lack of general knowledge regarding renewable energy systems, especially in specific applications in SSRE directed towards certain industrial sectors.
   - (ii) Business owners in various industrial sectors do not understand the operation of SSRE technologies, so they are not certain about the technological and economic potential that technologies offer in the operation of their businesses. This is due in part to the fact that information regarding SSRE projects is not publicly available, and only a few demonstration projects are accessible to the public.

NAMA Quantitative Goals		
Quantitative goals (reductions)	Indicators of progress for each goal (reductions)	Additional information for each goal
It produces a reduction of around 1.5 $MtCO_2e$.	Cumulative reduction in $MtCO_2e$	The expected reduction considers the useful life of projects implemented in an average of 25.1 years, at an average cost per program of USD $ 11.3 per ton.

Methodologies and assumptions (scope, effects, goals and evaluation of progress)	
Methodologies	Assumptions
1. Projection construction with NAMA	**Composition of the portfolio:** PV 72%, thermal biomass 2%, thermal biogas 4.5%, biogas cogeneration 6%, solar water heaters 7%, micro hydraulic 8.5%. **Average cost of supply:** PV 2,046 $ / kWe, thermal biomass 812 $ / kW, thermal biogas 4,000 $ / kWe, biogas cogeneration 4,500 $ / kWe, solar water heaters 1,345 $ / kW, micro hydraulics 5,500 $ / kWe. **Expected annual change in costs:** PV -6%, 0% thermal biomass, thermal biogas and cogeneration 0%, solar water heaters 0%, micro hydraulics 0%. **Average Emission Factors:** 598 gCO_2e/kWhe replacing electrical installations and 204 gCO2e/kWh replacing thermal installations. **Average life of the facilities:** PV 25 years, 25 years thermal biomass, thermal biogas and cogeneration 25 years, solar water heaters 20 years, micro hydraulic 30 years. **Average Plant Factor:** PV 18.5%; 50% in thermal biomass; thermal biogas 50%; biogas cogeneration 80%; solar water heaters 27%; micro hydraulic 50%.

Planning and progress regarding implementation		
Planning	Progress	Results achieved and expected (progress indicators)
Step(s) of action(s): activities/years	Condition of progress	Reductions achieved or expected[4]
Technical component: 2016-2020 1. Disclosure and awareness - Elaboration of information material regarding economic and technical feasibility and seminars. - Technological and field visits to contact prospective investors and users. 2. Capacity building - Design and implementation of trainings and trainings. 3. Project preparation: - Support for the development of potential SSRE projects. - Implementation of a technical help desk to support project developers. - Development of a virtual information platform in relation to SSRE projects. 4. Measurement, Reporting and Verification (MRV) - Support to the design of an MRV system for the SSRE sector that includes the NAMA Support Project (NSP) Financial component: 2017-2021 1. Design and implementation of a subsidy for studies of pre-investment of self-consumption projects of renewable energies 2. Design and implementation of a subsidy for investment of self-consumption projects of renewable energies 3. Training and consultancy of financial institutions 4. Design and implementation of a partial guarantee fund for credits for renewable energy self-consumption projects	Currently the NSP is in the planning stage and detailed preparation.	No results yet. It is expected to: Reduce about 1.5 $MtCO_2e$, considering the life of the projects implemented, at an average cost per program of USD $ 11.3 per ton.

[4] *They may be indicated as time series.*

Co-benefits achieved or expected per stage		
Steps (previously defined)	Name of indicator[5] (co-benefit)	Results achieved and expected
- Development of a portfolio of fundable projects - Training and advisory services for the financial sector - Investment support - Support for pre-investment studies - Creation of guarantee fund - Training of project developers and other relevant entities - Technical support table - Spreading and awareness: - MRV System	- Installed renewable energy capacity: Indicates the total amount of MW of installed renewable energy. This indicator is divided into subsets according to technology. - Job creation: It indicates the number of permanent and temporary posts that are created as a result of renewable energy projects that are part of the program. Expressed in units of full-time equivalents. - Private sector leverage ratio: It indicates the contribution of the private sector to renewable energy projects under the program. It is expressed as a proportion of the funds (NAMA: private funds).[6]	- Installed renewable energy capacity: 44.9 MW. - Leverage of about USD$ 100 million. - Increase in the number of NCRE project developers: 10 companies. - 100 trained people (developers, project installers). - 40 people participated in visits to plants of good practice or in programs of exchange of international knowledge. - 200 potential projects received technical support through the help desk. - A virtual information platform is working. - Spreading and sensitization events for at least 300 people from at least 3 industrial sectors in 3 regions. - An MRV system for the NSP is implemented and functioning

NAMA costs		
Estimation of preparation cost	Cost	USD 100.000
	Calculation description	No info
Estimated cost of implementation	Cost	No info
	Calculation description	No info
Incremental implementation cost	Cost	No info
	Calculation description	No info

Funding source	
Own resources	USD 18,32 millions
Received sources	EUR 15 millions for NAMA Facility
Resources to be requested (total, as detailed below)	The resources for the technical component are approved and awarded. The financial component is still in the final design phase due to the structure of the NAMA, different financial vehicles will be designed and implemented according to the specific needs of each of the sectors and the stage of market development. The total amount of financial aid is USD 12,000,000 plus USD 3,000,000 for technical support.

Required support		
Financial resources	Required amount	EUR 12 millions (USD 14,497,608).
	Type of required resources	Subsidy
	Comments	N/A
Technology	Required amount	N/A
	Type of required resources	N/A
	Comments	N/A
Capacity building	Required amount	EUR 3 millions (USD 3,320,063).
	Type of required resources	Subsidy
	Comments	No info

[5] Co-benefits may consider social, economic and environmental effects other than GHG reduction. They can be qualitative or quantitative.
[6] For example, a value of 1:2 would indicate that for every $1 spent on the program $2 was provided by the private sector.

Description of MRV
The National Center for Innovation and Promotion of Sustainable Energies (CIFES, (CIFES, an institution that has now been dissolved), fulfilled the task of creating a digital platform to obtain a database of NCRE projects. Initially the platform was conceived as a project management system that allows standardizing and organizing projects; supervise the variables of each project; collect information, indicators, status, etc., of different types of NCRE projects. From its initial conception, the possibility has arisen that this platform will become an MRV system for the management of the information of SSRE projects that are implemented with the support of the NAMA Support Project. At the moment the platform is not updated and is not being used, therefore it will be necessary to modify and adapt it according to the requirements of an MRV system. At the same time, it will be analyzed whether the information provided by the platform complies with the requirements of other entities, such as the information needed by the Ministry of the Environment (MMA) for the preparation of reports to be submitted to the UNFCCC. In addition, at the level of the Ministry of Energy, it is being evaluated how the platform created can be articulated with other initiatives (e.g. programs, projects) recently implemented within the Ministry. In this way, the future objective of the platform is that the professionals of the public institutions have the information available so that they can develop reports that they deem necessary, according to the established requirements, for example, by the MMA or the funds from donors . The platform should specify, at each stage, what parameters should be controlled and generate the indicators that allow the optimization of project management. It is important to note that there are elements involved in the NAMA registered with UNFCCC that have not yet been solved by the platform. For example, reports of emission factors, indicators of collateral benefits, specifically "leverage ratio of the private sector", "benefits for sustainable local development", etc., nor has the frequency of reporting, which depends on the ability to update the base information that is required per project. Finally, in terms of verification, this is not yet incorporated in the platform so it is an issue that remains pending to be developed.
Related policies and regulations
Energy Policy of Chile / Energy 2050, link: http://www.energia2050.cl/uploads/libros/libro_energia_2050.pdf NPC, Intended Nationally Determined Contribution of Chile Towards the Climate Agreement of Paris 2015, link: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Chile/1/INDC%20Chile%20english%20version.pdf
Related NAMAs
CPC NAMA, whose clean production agreements may consider some SSRE projects co-funded by the NAMA SSRE funds.

Contact details of the individual coordinating and managing NAMA	
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Alternative contact	N/A

Chart 2. Green Zone for Transportation in Santiago

General background on NAMA		
Full name	Green Zone for Transportation in Santiago	
Short name	NAMA ZVTS	
Stage	☐ Conceptual/Feasibility ☐ Planned or under planning process	x Adopted: under implementation ☐ Implemented
Registered in United Nations	x Yes	☐ No
Category	☐ Unilateral in search of recognition ☐ Bilateral in search of planning support	x Bilateral in search of implementation support ☐ Credits
Description	The NAMA consists of four specific initiatives to promote low-carbon modes of transportation: 1) Promotion of zero and low emission vehicles in fleets in light vehicles (taxis and municipal fleet) and cargo stations; 2) More efficient buses for public transportation; 3) Promotion of the use of non-motorized vehicles, including the implementation of new high standard bicycle lanes, a public bicycle system, a connectivity solution for existing bicycle lanes and bicycle signage in two areas of the ZVTS; 4) Traffic management and redesign, with new pedestrian and semi pedestrian streets, exclusive roads for zero and low emission buses, and bicycle parking. These initiatives are scalable and replicable. The first goal defined for the NAMA (2011 and in implementation since 2014) would be carried out within a defined area in the center of Santiago, Chile, which corresponds to the jurisdiction of the Municipality of Santiago. The geographical perimeter proposed for the ZVST was defined jointly with the Municipality of Santiago. The area includes the historical triangle of downtown, which covers about two square kilometers. There are many historical places of interest within the ZVST, including the Plaza de Armas, Santiago Cathedral, La Moneda Government Palace, the Municipal Theater, Santiago's Central Market and Parque Forestal, among others. The selected area is a very popular area, for tourism and commercial purposes, which guarantees a high impact and high visibility for all initiatives of the ZVST. One of the main conclusions of the participatory process with the stakeholders interested in developing the ZVST is that it should be considered as a pilot project with great potential for scaling and replicability, contributing to the redefinition of the urban passenger transportation model with a new approach In integrated and sustainable transportation. Implementation of the ZVTS would also provide new ways to reduce emissions of greenhouse gases and local pollutants. In its 2016 update (April and September), scalability is being worked on throughout the city of Santiago and replicating two (2) green zones: one in a city in the north of the country and another in the south of the country.	
Nature or type of action	x Strategy, Policy or Programs. Specify the instrument related[7]: Sector policy or program... x Project or group of projects (investment in technology or infrastructure) ☐ Other (s)	
Sector(s) considered by NAMA	☐ Agriculture ☐ Construction ☐ Power generation ☐ Energy utilization ☐ Forestry/LULUCF	☐ Industrial and industrial processes ☐ Waste x Transportation and its corresponding infrastructure ☐ Transversal (check all that apply) ☐ Other (s).....
Technology/ methodology	Vehicles of zero or low emission. Modal change, from private vehicle to other modes like bicycle or public transportation	
Gas(es) covered by NAMA	x Carbon dioxide (CO_2) ☐ Methane gas (CH_4) ☐ Nitrous oxide (N_2O)	☐ Hydrofluorocarbons (HFC) ☐ Perfluorocarbons (PFC) ☐ Sulfur hexafluoride (SF_6) ☐ Nitrogen Trifluoride (NF_3)
Jurisdiction	☐ National x Regional RM ☐ Interregional	
Implementation dates	Time frame	Implementation goal between 2014 and 2018. Implementation of scalability in Greater Santiago and replicability in regions 2017 to 2022.
	Start year or expected start year	2014, with implementation of measures of pedestrianization, semi-pedestrianization and cycle paths.
	Completion year	2018-2022, depending on renewal of Transantiago contracts, technological change.

[7] *Economic, fiscal, voluntary agreements, regulatory, information management, capacity building, research, etc.*

NAMA objectives
Reduce GHG emissions in the Transportation Sector by promoting sustainable, scalable and replicable transportation initiatives through the use of new low carbon vehicle technologies and promoting modal integration and change.

NAMA barriers
Tecnologic: The two technological initiatives have the problem of requiring specialized technical assistance. This capacity is not within the resources that maintain the fleet in buses or taxis. However, at this early stage in the use and testing of technologies, technology providers would provide support by delivering a complete after-sales service and training of technology takers. Economic: The technological measures imply a high increase in the capital cost that makes the technology taker (bus operators and taxis) take too much risk on investment, considering that it is an untested technology in the country. For this early stage, the suppliers are offering, in several cases, the operational leasing financial instrument, where the fee comes included. Cultural: The measures of promotion of non-motor vehicles and the management and redesign of traffic are less popular because it involves taking away space for private vehicles to give space to bicycles and pedestrians, respectively. To overcome this barrier, there is technology of automatic flow meters, both pedestrians and bicycles, which can support with real numbers the impact of these measures in terms of mobility of person and not of vehicles. Also, electric vehicular technologies are unknown by operators and by users, which requires diffusion of results and tests such as those contemplated by the first goal of the NAMA Green Zone for Transportation in Santiago.

NAMA Quantitative Goals		
Quantitative goals (reductions)	Indicators of progress for each goal (reductions)	Additional information for each goal
1.43 $MtCO_2e$ in total, during the whole period (10 years).	Accumulated tCO_2 emission reduction	Considering 10-year evaluation of the goal fully implemented: 10 municipal electric light vehicles 5 light vehicles in municipalities 38 electric taxis 5 electric buses 5 hybrid buses 1,25 km of bike lanes 130 public bicycles 150 bicycle parking lots 8 tandem bikes
Great Santiago goal: 260.6 M tCO_2	Accumulated tCO_2 emission reduction	Considering 10-year evaluation of the goal fully implemented: 250 electric vehicles 200 electric buses 300 hybrid buses 300 km of bike lanes
Scalability goal: 120.4 MM tCO_2	Activities carried out (number of ZLEV vehicles, number of ZLEV buses, distances of high standard bicycle lanes, managed crossings)	Considering 10-year evaluation of the goal fully implemented: 300 electric vehicles 150 electric buses 300 hybrid buses 18 km of bike lanes

Methodologies and assumptions (scope, effects, goals and evaluation of progress)	
Methodologies	Assumptions
Expected reduction estimate.	The indicated target represents the emission reductions estimated in 10 years, in a scenario of greater coverage to the ZVTS. It includes 15% of the taxi fleet in Santiago (3,525 units replaced) and 15% of the fleet of Transantiago buses (975 units replaced), both cases replacing existing technology with electrical technology. This reduction potential could be more if a larger fleet percentage is replaced. If the ZVTS only considers the two square kilometers of the intervention in Santiago, it reduces 13,000 tCO_2e in 10 years

Planning and progress regarding implementation		
Planning	Progress	Results achieved and expected (progress indicators)
Step(s) of action(s): activities/years	Condition of progress	Reductions achieved or expected[8]
Initiative 1: promotion of ZLEV (vehicles of zero and low emission) light vehicles.	In December of the year 2015 were inaugurated 3 electric taxis, whose quotas were granted by Metropolitan Region SEREMITT. For the operation of these vehicles there are 2 chargers installed in the area comprised by ZVTS.	Initiative 1 includes 39 taxis and 15 municipal vehicles. Reduction expectation in estimation process.

[8] *They may be indicated as time series.*

Planning and progress regarding implementation		
Planning	Progress	Results achieved and expected (progress indicators)
Initiative 2: More efficient buses for public transportation	In May 2016, the first electric bus was inaugurated in Chile for the transportation of passengers, with free and communal transportation.	Initiative 2 includes 5 electric buses and 5 hybrid buses. Reduction expectation in estimation process.
Initiative 3: Promotion of non-motorized vehicles	Regarding the public bicycle system, the SIPB[9] has been implemented with great success. 18 stations were installed in the territory instead of the 13 projected ones, surpassing widely the estimates of demand for this service. The cycle paths of Rosas and Teatinos streets are in operation with high rates of daily use.	Reduction expectation in estimation process.
Initiative 4: Traffic management and redesign	Axis for Compañía street implemented in 2016 (semi pedestrianization) Axis for San Antonio street under implementation process in 2016 (semi pedestrianization) Axis for Santo Domingo street to be implemented during 2016 (semi pedestrianization) 100 surface bike parkinglots have been implemented.	Reduction expectation in estimation process.
Co-benefits achieved or expected per stage		
Steps (previously defined)	Name of indicator[10] (co-benefit)	Results achieved and expected
Initiatives 1 to 4.	- Funds donated by donors. - Funds disbursed by local government and the private sector. - Accidentability - Generation of technical capacities associated to the use of new technologies - Improvements in trade activities within the area of intervention in the ZVTS - Reduction of MP and NOx emissions	No info
NAMA costs		
Estimation of preparation cost	Cost	USD $193,070
	Calculation description	It contemplates the development of three technical assists that have helped to design, update and strengthen the NAMA Green Zone for Transportation: - Design of the NAMA ZVTS, funded by the British Embassy in Santiago 2011 (USD $ 73,500) - Update of the NAMA ZVTS for its implementation, financed by the IDB, 2014 (USD $ 25,600) - Design of MRV by NAMA ZVTS and its proposed scalability, funded by CAF, 2016 (USD $ 93,970)

[9] SIBP: Integrated System of Public Bicycles, integrates 10 communes.
[10] Co-benefits may consider social, economic and environmental effects other than GHG reduction. They can be qualitative or quantitative.

NAMA costs		
Estimated cost of implementation	Goal cost, defined as the first Green Zone that is currently led by the Municipality of Santiago	USD 51.1 millions
	Calculation description	The 2016 update of the target that defines the first Green Zone for Transportation in Santiago includes: 50 electric light and low emission vehicles, 21 electric recharge points, 5 parking spots, 21 electric taxis and municipal fleet demarcations, 5 hybrid buses and 4 electric buses for Transantiago, 1 municipal electric bus, 4 km of new cycle paths, 4 automatic counter of bicycle flows, 104 crossings used to expand spaces for pedestrians, 1 underground parking, and 7 tricycles with electric assistance in pedaling to transport people.
	Goal cost (Great Santiago) Defined as the escalation at the city level (Greater Santiago) of the first Green Zone that is currently led by the Municipality of Santiago.	USD 366 million, within 3 years
	Calculation description	The total cost includes 200 light vehicles of zero and low emission, 100 electric buses and 300 hybrids buses (both for the Transantiago), 300 km of cycle paths and according to the number of inhabitants the management and the urban redesign of transit of the initiative 4. It should be noted that the total implementation cost considers the complete execution of each initiative, for instance, in the case of initiative 1, it includes: points of loading, stops, demarcations. These figures are additional to those considered in the goal or first Green Zone.
	Replicating cost (Regions) Defined to replicate the Green Zone for Transport but in other regions of the country, other than the Metropolitan Region.	USD 215 million, within 3 years
	Calculation description	The total cost includes 300 light vehicles of zero and low emission, 150 electric buses and 300 hybrids buses, 180 km of cycle paths and according to the number of inhabitants the management and the urban redesign of transit of the initiative 4. It should be noted that the total implementation cost considers the complete execution of each initiative, for instance, in the case of initiative 1, it includes points of loading, stops, demarcations.

NAMA costs		
Incremental implementation cost	Goal cost	USD 3.6 millions
	Calculation description	Referred only to the differential cost for the complete implementation of initiatives 1 and 2 that are of a technological nature. Then, it includes the capital cost difference between the conventional light vehicle and the zero and low-emission vehicles with their load systems. (Initiative 1); Difference in capital cost between a Euro VI diesel bus and the zero and low emission buses, with their load systems.
	Scalability cost (Great Santiago)	USD 58.5 millions
	Calculation description	Referred only to the differential cost for the complete implementation of initiatives 1 and 2 that are of a technological nature. In addition, it considers 200 loading points for Great Santiago.
	Replicating cost (Regions)	USD 74 millions
	Calculation description	Referred only to the differential cost for the complete implementation of initiatives 1 and 2 that are of a technological nature. In addition, it considers 200 loading points in regions.

Funding source	
Own resources for the goal	In relation to what has already been implemented, for the case of the Target, defined as the first Green Zone for Transport in Santiago, the National Contribution is USD 31.7 millions (public contribution 95% and private contribution 5%). The contribution has been implemented mainly in initiatives 3 and 4 of the NAMA ZVTS, which are those of integration of sustainable modes of transportation Another contribution considered in the future implementation of the Target corresponds to the amount equivalent to a conventional technology for light vehicles and buses, equivalent to USD 2.8 million
Own resources for escalation (Great Santiago)	The contribution considered in the future implementation of escalating ZVTS NAMA in Great Santiago corresponds to the amount equivalent to a conventional technology for light vehicles and buses, equivalent to USD 83.4 million (within 3 years)
Own resources to replicate (regions)	The contribution considered in the future implementation of replicating ZVTS NAMA in regions within Chile corresponds to the amount equivalent to a conventional technology for light vehicles and buses, equivalent to USD 95.1 million (within 3 years) In addition, it is considered for the case of electric taxis in regions, a public contribution (subsidy of the Ministry of Transport to renew fleet of this segment). For 300 taxis in regions, the additional public contribution would be USD 2.7 million (additional to the previous amount)
Received sources	No international resources have been received
Resources to be requested for achieving the goal (for initiatives 1 and 2)	USD 3.6 millions
Resources to be requested for escalation (for initiatives 1 and 2)	USD 58.5 millions
Resources to be requested for replication (for initiatives 1 and 2)	USD 71.3 million (incremental cost less the subsidy of regions to renew taxis)

Required support		
Financial resources	Required amount	The amounts required, estimated over a horizon of 2 to 3 years, are: - Goal: USD 3.6 millions -Escalation of Great Santiago: USD 58.5 millions -Replicability in regions: USD 71.3 millions
	Type of required resources	Soft credit and State subsidies and private investment
	Comments	The financing required for the current level of implementation (2016) is focused on financing the technological components of the NAMA Green Zone for Transportation, in its initiatives 1 and 2.
Technology	Required amount	0
	Type of required resources	N/A
	Comments	There is no need for technology support in this first stage, since it features the suppliers of vehicles of zero and low emission, who will provide technical support and after-sales service required.
Capacity building	Required amount	USD 0.36 millions
	Type of required resources	Institutional development, human resources, institutional and normative.
	Comments	The Santiago Municipality would require additional human resources in order to properly lead the NAMA ZVTS during the implementation process and the MRV process. In addition, the execution of international financing will require a high administrative work to execute the budget and to support it properly, and to inform the international donors.

Description of MRV
The MRV approach is variable, since it will be adjusted for the correct monitoring of the impacts generated by the implementation of each measure, which are briefly described below: - **Initiative 1:** MRV will be based on the annual kilometers traveled and the performance of each electric or hybrid vehicle in circulation. The Santiago Municipality has strict control of the mileage of its fleet while the taxis provide this information in the Vehicle Inspection Station. - **Initiative 2:** The MRV of the measures contemplated in this initiative will be based on a recent study that established the protocol of MRV for the incorporation of new technologies to the system of buses for public transportation in Chile, based on the data that are generated in the DTPM to regulate the operation and services of the dealers. - **Initiatives 3 and 4:** The measurement will be based on the quantification of the pedestrian and cyclist flows and the measurement of the modal shift through the design and application of surveys. There is no methodology developed in the country to quantify the impact of measures that promote more sustainable modes of transportation, such as non-motorized modes and modal shift. Considering this reason, in the year 2015, international financing was obtained from CAF for the development of a consultancy that establishes the Baseline (BL) and the MRV system of the impacts associated to the implementation of ZVTS, considering the best and most appropriate indicators to measure the progress of NAMA measures, taking into account key aspects of local reality.

Related policies and regulations	
1. The Metropolitan Region SEREMIT made a tender at the end of 2013 for exclusive taxicabs with electric motorization, adjudicating a total of 19 seats for basic taxis. As reported by these bodies of the MTT is expected to continue this initiative to the extent that they have the results of the first vehicles operating in October 2014. 2. The DTPM[11] is developing a study to improve the incentives program in contracts to operators to promote the use of clean technologies, in view of the fleet renewal associated with current contracts and for the next concessions beginning in 2018. 3. The promotion of non-motorized vehicles is being targeted mainly in alliances between local governments or municipalities, which are backed by the central government, represented by SEREMIT and MTT 4. For the case of management and redesign something similar happens in comparison with the previous initiative, the mayors are watching over improving their civic center giving more space to the pedestrian.	
Related NAMAs	
N/A.	
Contact details of the individual coordinating and managing NAMA	
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Alternative contact	N/A

[11] *DTPM: Metropolitan Public Transportation Board.*

Chart 3. Support to the Design and implementation in the NSCCVR

General background on NAMA		
Full name	Support to design and implementation of the National Strategy for Climate Change and Vegetative Resources (NSCCVR)	
Short name	Technical supplies for NSCCVR	
Stage	☐ Conceptual/Feasibility x Planned or under planning process	x Adopted: under implementation ☐ Implemented
Registered in United Nations	x Yes[12]	☐ No
Category	☐ Unilateral in search of recognition x Bilateral in search of planning support	x Bilateral in search of implementation support ☐ Credits
Description	The objective of the NAMA is comprised within the framework of the National Strategy for Climate Change and Vegetation Resources (NSCCVR), serving as technical and economic support for the development of studies and activities aimed at identifying and reducing weaknesses in baseline information in addition to enhancing the capacities of national and regional technical teams linked to The NSCCVR. During the preparation phase of the NSCCVR, funding obtained through the NAMA has been used to: 1. - Define initial conceptual frameworks and preliminary approaches for estimating changes in forest carbon content and xerophytic formations, which will be key inputs for the future development of reference levels of forest emissions for the northern regions and island territories. 2. - Develop a preliminary design of the scope that should contemplate an MRV System and a Carbon Registration System. 3. - Design indicators of adaptation and vulnerability to climate change. 4. - Develop territorial management models for prevention of forest fires. 5. - In a transversal way, training activities have been developed aimed at the creation and development of regional capacities through the South-South exchange on issues related to the NSCCVR.	
Nature or type of action	x Strategy, Policy or Programs[13]: Chilean National Strategy for Climate Change and Vegetative Resources (NSCCVR) ☐ Project or group of projects (investment in technology or infrastructure) ☐ Other (s)	
Sector(s) considered by NAMA	☐ Agriculture ☐ Construction ☐ Power generation ☐ Energy utilization x Forestry/LULUCF	☐ Industrial and industrial processes ☐ Waste ☐ Transportation and its corresponding infrastructure ☐ Transversal (check all that apply) ☐ Other (s).....

[12] *http://www4.unfccc.int/sites/nama/Lists/NAMA/DispForm.aspx?ID=5*
[13] *Economic, fiscal, voluntary agreements, regulatory, information management, capacity building, research, etc.*

General background on NAMA		
Technology/ methodology	The NSCCVR aims to reduce the social, environmental and economic vulnerability generated by climate change, desertification, land degradation and drought on the vegetation resources and communities that depend on them, as well as reduce the emissions of effective gases greenhouse of Chile. In order to meet this objective, 28 action plans have been proposed with their operational goals, encompassed in the 8 activities of the strategy, which respond to various areas of application: institutional, operational, regulatory, control, environmental education, research, territorial planning and development. For the NSCCVR, activities and action measures have been elaborated based on multiple studies, projects, programs and participatory processes, which have allowed the necessary inputs to be generated for the implementation phase, an important part of them generated the framework for NAMA which has technical and financial support by the Swiss Agency for Development and Cooperation (COSUDE), representing the first international support received by CONAF within the framework of the NSCCVR. Likewise, it is important to clarify that all the actions developed with the technical support and funds of the NAMA forest are inserted and aligned within the activities that are developed within the framework of the NSCCVR. Currently under this financing, a methodological protocol is being developed to determine the degree of reduction of vulnerability to climate change. Through this framework, attributes of adaptation and vulnerability to climate change are being effectively, technically and economically measurable, generating a protocol for evaluating the measures implemented to reduce vulnerability and strengthen the resilience where these are implemented. The inputs used to create the protocol were technical studies carried out by experts and professionals from CONAF and the participatory consultation process already described. This protocol contributes with key inputs in the determination of the Social and Environmental Indicators Framework of the NSCCVR, which will be used as a basis to generate the reports that will contain the System of Implementation of Safeguards. This study is being carried out with the support of a consortium formed by the Santiago Climate Exchange (SCX), FORECOS, CQuest Capital, Global Adaptation Institute (GAIN) and Winrock International. Simultaneously, two territorial projects are being carried out in order to test and improve the definition of action measures related to the prevention of forest fires. Preventive fire projects are being implemented with technical support from the Forest Fire Protection Management (GEPRIF) of CONAF and the University of Chile in the Valparaíso and Maule Regions, and aim to generate inputs and management models in the territory scalable at national level, to reduce the potential danger of the spread of fire, with replicable activities in other areas of the country, including modeling to determine levels of risk in other areas of the country. It is also contemplated to set up demonstration modules of various field activities that prevent the occurrence and dispersion of fire, which will be used for practical training to various stakeholders such as decision makers (members of the parliament, government authorities) and forest landowners, in order to have communities more aware and adapted to forest fires. Together, a powerful line of work that has been fostered by COSUDE is the South-South Cooperation with Latin American countries, strengthening the dissemination of the work carried out by CONAF within the framework of the NSCCVR inside and outside the country through the realization of thematic courses with international assistants in the context of vegetation resources, climate change and desertification. As well as the generation of cooperation alliances with other regional projects financed by the Swiss government, such as the Andean Forests Program. The international courses are held in conjunction with the Chilean Agency for International Development Cooperation (AGCID) of the Ministry of Foreign Affairs, offering scholarships to ensure the attendance of participants from countries that maintain governmental actions that link climate change to their vegetative resources, developing their strategies to face climate change and fight against desertification.	
Gas covered by NAMA	x Carbon dioxide (CO_2) x Methane gas (CH_4) x Nitrous oxide (N_2O)	☐ Hydrofluorocarbons(HFC) ☐ Perfluorocarbons (PFC) ☐ Sulfur hexafluoride (SF_6) ☐ Nitrogen Trifluoride (NF_3)
Jurisdiction	x National ☐ Regional ☐ Interregional	
Implementation dates	Time frame	2012-2025 referred to NSCCVR
	Start year or expected start year	2012
	Completion year	The activities of NSCCVR are contemplated until the year 2025, nevertheless it intends to constitute itself as a permanent line of action within the current and future normative and fomentation instruments guaranteed by law.
NAMA objectives		
The objectives of the NAMA are framed in the general and specific objectives of the NSCCVR described in the item referred to the sector land use, land use change and forestry.		
NAMA barriers		
The barriers and risks of the NAMA are included within those determined by the future implementation of the different strategic activities and measures of action contemplated by the NSCCVR, which are described in the item referred to the land use sector, change in the use of land and forestry.		

NAMA Quantitative Goals		
Quantitative goals (reductions)	Indicators of progress for each goal (reductions)	Additional information for each goal
Contribution with inputs for the capture of 42,000,000 tCO_2e up to the year 2025, which have been determined within the framework of the NSCCVR to have adequate international and national funding.	Operational Goals and Indicators have been determined for each of the activities and their respective action measures of the Strategy, which are described in the item referred to the sector of land use, land use change and forestry.	NOTE: This NAMA contributes integrally with inputs for the fulfillment of the NSCCVR goal (42,000,000 tCO_2e).
Methodologies and assumptions (scope, effects, goals and evaluation of progress)		
Methodologies	Assumptions	
Support with inputs for the development of the following actions: 1. Preparation phase: design and validation of the basic elements of the NSCCVR; construction of forest emission reference levels; design of the forest monitoring system; the participatory formulation and validation phase of the NSCCVR. 2. Implementation phase: Implementation in the territory of the activities and measures of action determined in the preparation phase with the aim of reducing the social, environmental and economic vulnerability generated by climate change, desertification, land degradation and drought on vegetation resources and communities that depend on them, along with reducing greenhouse gas emissions in Chile. 3. Coordination and institutional and inter-institutional coordination activities for the execution of activities and measures of action. 4. Preparation and development of national capacities for implementation. 5. Permanent maintenance of the Safeguards Information System (SIS). 6. Maintenance of the National System of Monitoring, Reporting and Verification (MRV).	Inclusion of issues of climate change and desertification, land degradation and drought in the new Forest Development Law. Modification and strengthening of Law Nº. 20,283 regarding the Recovery of Native Forests and Forest Development and its regulations. Adjustments for the inclusion of landowners with little legal security of tenure. Strengthening and updating of Management Plans of SNASPE areas in the context of the NSCCVR. Inclusion of elements of preventive management and post fire restoration in Law Nº. 20,283 and its regulations. Development of an integrated system of regulation and tax exemption for the promotion of productive chain. Implementation of buffer strips for livestock activity and strengthening and extension of summer management advice. Modification Law No. 19,561 exempting from reforestation to agricultural recovery. Incorporation of forest conservation variables into Law No. 18,450. Limitation of the application of Law No. 20,412 on soils of Preferentially Forestry Aptitude. Development and implementation of the programs considered in the activities (adaptation program for management of vegetation resources, restoration and control program in areas with risk of substitution, afforestation program and revegetation in prioritized communes, among others). For this chart, the operational goals of the action measures were considered as assumptions, more detail of these goals and their respective measures of action are described in the item referred to the sector of land use, change in land use and forestry.	

Planning and progress regarding implementation		
Planning	Progress	Results achieved and expected (progress indicators)
Step(s) of action(s): activities/years	Condition of progress	Reductions achieved or expected[14]
1 NSCCVR Design (2010-2016), preparation phase.	The design of the NSCCVR started with the technical and financial support of COSUDE, and progress was gradually made in the application of different approaches, in an international scenario of progressive awareness on climate change. To date, various studies, projects, institutional arrangements, participatory processes of preparation and validation have been developed with the support of various national and international funds that have allowed the development of the very robust document in the technical terms of the NSCCVR[15].	Does not consider direct reductions
2 Participatory process, preparation phase of the NSCCVR (2010-2016).	The results of 15 regional consultation workshops and a national workshop have been implemented and analyzed. The data obtained in macrozonal self-assessment workshops with key actors have been made and analyzed. The citizen consultation of the NSCCVR document is being elaborated.	Does not consider direct reductions
3 Reference Level Estimate (2012-2017).	Consigned at the subnational level to the UNFCCC in January 2016. The current estimate includes the territory between the Maule and Los Lagos Regions, it will be scaled at national level in the period 2016-2017.	Does not consider direct reductions
4 Determination of the causes of deforestation, devegetation, degradation of vegetation resources and difficulties in increasing carbon pools and other associated co-benefits (2012-2016).	The main causes of deforestation, devegetation, degradation of vegetation resources and difficulties in increasing carbon pools and associated co-benefits have been identified. In conjunction with the above, activities have been determined with their respective measures of action between other studies and relevant models. Work is currently under the premise that with adequate funding can be replicated at the national level with the support of related government programs. In addition, as a result of this process, the priority communes for the intervention have been identified.	Does not consider direct reductions
5 Early implementation of enabling measures to determine management models (2015-2017).	Projects are underway to determine management models in order to reduce emissions from unsustainable use of biomass, to implement preventive forestry measures against forest fires, rehabilitation of areas affected by forest fires, revegetation in watershed areas and models for improving the connectivity of the landscape.	Part of the objectives of these projects is to estimate the reduction of emissions with the implementation of various measures of action, thus there is no target, but the effective emission reduction will be monitored.
6 Implementation and adjustments MRV systems for effective verification of GHG reductions / catches (2016-2030).	Work has begun on the design of the MRV system with the joint support of INFOR.	Does not consider direct reductions

[14] *They may be indicated as time series.*
[15] *http://www.enccrv-chile.cl/*

Co-benefits achieved or expected	
The different dimensions to determine the co-benefits and associated variables for the corresponding monitoring are in the process of being formulated by CONAF professionals with the support of specialists. Progress to date is detailed in the item on land use, land use change and forestry sector	
Costs of the NAMA and source of financing	
Resources received to date under the NAMA framework	The budget related to the NSCCVR, which includes the activities of the NAMA forestry, are included in the item referred to the sector of land use, land use change and forestry. Specifically framed within the NAMA alone, funds for USD 1,600,000 have received for technical and financial support from the Swiss Agency for Development and Cooperation (COSUDE).
Required support	
The financial support required for the implementation phase of the NSCCVR is specified in the item referred to the sector of land use, land use change and forestry.	
Related policies and regulations	
Policies and regulations related to NAMA and that are part of the NSCCVR are described in the item referred to in the sector of land use, land use change and forestry.	
Related NAMAs	
‣ NAMA of Georgia funded by the Austrian Ministry of Agriculture, Forestry, Environment and Water entitled "Adaptive, Sustainable Forest Management in Borjomi-Bakuriani Fores District". ‣ NAMA in Mali, which expects funding for its implementation, entitled "NAMA in the forestry sector" ‣ "Green Route of the Panama Canal". NAMA Initiative It integrates reductions for ships that transit through the Canal, intended for energy efficiency and use of renewable energies in the operation of the Canal and forest carbon projects in the Panama Canal basin.	
Contact details of the individual coordinating and managing NAMA	
Responsible institution	National Forestry Corporation (CONAF) of the Ministry of Agriculture.
Contact of professional	Angelo Sartori, NSCCVR National Officer, Head Unit for Climate Change and Environmental Services (UCCSA), Forest Development and Development Management (GEDEFF), CONAF. angelo.sartori@conaf.cl

Chart 4. Clean Production Agreements in Chile

General background on NAMA		
Full name	Clean Production Agreements in Chile	
Short name	NAMA CPA	
Stage	☐ Conceptual/Feasibility ☐ Planned or under planning process	x Adopted: under implementation ☐ Implemented
Registered in United Nations	x Yes	☐ No
Category	x Unilateral in search of recognition ☐ Bilateral in search of planning support	☐ Bilateral in search of implementation support ☐ Credits
Description	In Chile, the promotion of Clean Production is promoted and coordinated by the National Clean Production Council (CNPL), an institution under the Ministry of Economy. One of CNPL's goals for 2020 is to contribute to the reduction of greenhouse gases through its main instrument, the Clean Production Agreement (CPA). This voluntary agreement is negotiated and signed by a representative of the industrial organization on behalf of the companies of a particular productive sector and of a sector of the public administration. The purpose of the agreement is to implement clean production through goals and actions within a given period. This instrument is backed by specific national legislation (DS No. 20416/2012), and by the National Standards Institute, which has developed a set of rules (NCh2796-Of2003, NCh2797-Of2009, Nch2807-Of2009, NCh2825-Of2009) in order to create the framework for its creation, implementation and certification. An CPA is a standard that sets specific goals and actions to be implemented by a productive sector, based mainly on the best techniques available in the market. This instrument is co-financed by the Government of Chile, which will co-finance about 70% of the costs covering the diagnosis of sector sustainability, intermediate audits, technical guidance, training, certification, impact studies and general coordination of the implementation of the CPA. The remaining 30% is financed by the sector, particularly by private companies that adhere to the CPAs. However, the financing provided by the CPC does not offer support for the purchase and acquisition of technology. The Government of Chile wishes to thank the UNEP-RISO Center for its support in the preparation of this NAMA template.	
Nature or type of action	x Strategy, Policy or Programs. Specify the instrument related[16]: Policy or National or Sectorial Program, through Clean Production Agreements. ☐ Project or group of projects (investment in technology or infrastructure) ☐ Other (s)	
Sector(s) considered by NAMA	x Agriculture x Construction x Power generation x Energy utilization x Forestry/LULUCF	x Industrial and industrial processes x Waste x Transportation and its corresponding infrastructure x Transversal (check all that apply) ☐ Other (s).....
Technology/ methodology	Various technologies for different sectors. The CPC, through the Clean Production Agreements, is intended to promote the insertion of clean technologies in the different industrial and sectoral processes, but it is the entrepreneur who decides which of the technologies will be implemented. Therefore, the technologies to incorporate are diverse.	
Gas covered by NAMA	x Carbon dioxide (CO_2) x Methane gas (CH_4) x Nitrous oxide (N_2O)	x Hydrofluorocarbons (HFC) x Perfluorocarbons (PFC) x Sulfur hexafluoride (SF_6) x Nitrogen Trifluoride (NF_3)
Jurisdiction	x National ☐ Regional ☐ Interregional	
Implementation dates	Time frame	9 years
	Start year or expected start year	2012
	Completion year	2020
NAMA objectives		
Register 10 CPAs per year between 2013 and 2020. These CPAs would focus on developing good practices that reduce GHG emissions through the implementation of energy efficiency measures, best practices in solid waste management, liquid waste management, water use efficiency and sustainable practices in specific areas, such as fertilization.		

[16] *Economic, fiscal, voluntary agreements, regulatory, information management, capacity building, research, etc.*

NAMA barriers
1. The barriers to this NAMA are associated with the lack of knowledge and capabilities of the companies that adhere to the CPA. In particular, the lack of awareness regarding the need to record data associated with GHG emissions, and their ability to collect and deliver appropriate information. 2. Information barriers: Access to all information recorded throughout the CPA process is necessary to manage the assessment of CPA compliance and effects. The owner of the company must be the one who compiles the data. On the other hand, there is no standardized method for data quality control throughout the CPA process. 3. Coordination policies: There is a lack of coordination with other NAMAs that have been developed, in terms of predetermined methodologies and parameters considered. 4. Barriers to MRV: The low availability of data in companies is a major barrier. SMEs do not have a record of the background that is required to calculate GHG emission reductions, so that from now until 2020 all CPA signing companies must register their data to allow calculation of the baseline and emission reduction. 5. Methodological barriers: The current NAMA will be based on CDM methodologies that have been adapted to the smallest scale according to the capacities of SMEs. Therefore, the monitoring plans are similar to the CDM, but several parameters have been taken by default. However, there is no consensus on what parameters should be calculated or should be taken as the default, so it is considered a barrier. 6. Finally, the lack of specifications on verification and certification requirements is another barrier.

NAMA Quantitative Goals		
Quantitative goals (reductions)	Indicators of progress for each goal (reductions)	Additional information for each goal
Expected reduction of 18.4 $MtCO_2e$ in total, with an average of 2.25 $MtCO_2e$ per year.	- CPA signed per year - Cumulative reduction in $MtCO_2e$ - CPA Reduction in ($MtCO_2e$)	N/A

Methodologies and assumptions (scope, effects, goals and evaluation of progress)	
Methodologies	Assumptions
The methodology for estimating the reduction potential begins with a survey to collect information on GHG emissions prior to the implementation of a CPA. The CPC collects information from participating companies regarding solid and liquid waste, transportation, energy and water consumption, energy use and fertilizers, and uses this information to continuously monitor each company's GHG emissions. This allows the calculation of indicators that are presented in the final impact report, once the CPA has been completed.	Relevant assumption: A previous study indicates that in 16 CPA, implemented between 2002 and 2010, they reduced in average 31.6 $KtCO_2e$ per year by CPA. To estimate the reductions of this NAMA, this value is extrapolated, assuming that each CPA has a reduction potential of 31.6 $KtCO_2e$ per year. It is considered a total number of 45 CPAs at the diagnostic stage, to be implemented in the NAMA period, and 80 new CPAs expected to be signed in the full period. This amount is currently under review, as the baseline is being recalculated considering the UNFCCC / IPCC criteria and conducting a sensitivity analysis on reduction potentials for different economic sectors.

Planning and progress regarding implementation		
Planning	Progress	Results achieved and expected (progress indicators)
Step(s) of action(s): activities/years	Condition of progress	Reductions achieved or expected[17]
It is expected that 10 agreements per year are to be signed and implemented in the period 2012-2020. For this purpose the following steps are being carried out: 1. Base diagnosis of the sector 2. CPA proposal 3. Negotiation with the sector and signature of the agreement. 4. Implementation, consisting of: an initial diagnosis of the companies attached to the agreement; implementation of the actions, with the monitoring and control of the agreement; and intermediate audits. 5. Final audit. 6. Evaluation of public services. 7. Issuance of the Clean Production Certificate (valid for 3 years, with 2 maintenance audits). The entire process lasts for a maximum of 3 years.	During the year 2015, 17 agreements were signed, giving a cumulative total of 46 agreements signed from the year 2012 to 2015.	No validated results yet. To date, an accumulated reduction of 2,224,083 tCO_2eq is estimated.
Co-benefits achieved or expected per stage		
Steps (previously defined)	Name of indicator[18] (co-benefit)	Results achieved and expected
It is expected that 10 agreements per year are to be signed and implemented in the period 2012-2020.	They are annual indicators that cover social and productive aspects. **Economic / Productivity:** • Increase of productivity • Better corporate image • Savings in costs associated with waste management, water consumption and energy consumption • Opening to international markets for exports of more sustainable products. **Environmental:** • Reduction of the contamination of the liquid effluents through improvement in the management and prevention. • Reduction of the environmental problems associated with the irregular management of residues (uncontrolled landfills). • Reduction of water consumption through the incorporation of clean technologies and sustainable practices. • Reduction of the carbon footprint of facilities and / or companies. **Social:** • Improvement in working conditions through the assurance of compliance with labor regulations. • Improvement of workers' skills. • Minimization of occupational risks through prevention practices.	No measured results yet. There is no information regarding the expected results.
NAMA costs		
Estimation of preparation cost	Cost	USD 35,500
	Calculation description	No info
Estimated cost of implementation	Cost	USD 160 millions
	Calculation description	No info
Incremental implementation cost	Cost	0.05
	Calculation description	No info

[17] *They may be indicated as time series.*
[18] *Co-benefits may consider social, economic and environmental effects other than GHG reduction. They can be qualitative or quantitative.*

Funding source		
Own resources	USD 160 millions	
Received sources	N/A	
Resources to be requested (total, as detailed below)	N/A	
Required support		
Financial resources	Required amount	N/A
	Type of required resources	N/A
	Comments	N/A
Technology	Required amount	N/A
	Type of required resources	N/A
	Comments	N/A
Capacity building	Required amount	N/A
	Type of required resources	N/A
	Comments	N/A

Description of MRV
The MRV system is in operation, through the project funded by the Corfo Innova Chile Program "Public Goods for Competitiveness" 12BPC2-13428, where the Center for Management and Strengthening for the Clean Development Mechanism (CGF) -MDL) of the Pontificia Universidad Católica de Valparaíso, associated with the Undersecretary of the Environment, with the technical advice of the National Clean Production Council. Through this project the indicators have been constructed in order to measure the performance of the companies attached to a CPA. The indicators correspond to those described above (GHG reductions and co-benefits), which will be built on the basis of the information requested from the companies. They are annual indicators and cover social, productive and other environmental impacts including GHGs. In the platform, the carbon footprint is recorded with scopes 1, 2 (and 3 depending on the productive sector), but the main axis are indicators of co-benefits of CPA and, therefore, NAMA. The companies are monitored before and after the implementation of Clean Production Agreements, through a set of environmental, social and productive indicators generated through the Innova Project. The calculation methodologies will respond to those internationally validated; the basic information and the indicators are systematized and calculated through the digital platform www.compitemas.cl (watch the video at http://www.compitemas.cl/index.php/vt_principal/accedes). Companies are responsible for uploading the base information required to estimate the indicators; The CPA auditors must verify that the information is correct; And the Clean Production Board (CPB) issues the CPA certificates to the extent that it complies with the actions and goals committed in the CPA term.
Related policies and regulations
Law N° 20,416 sets special standards for smaller companies. Link: http://www.munitel.cl/Actualidad_Legislativa/Ley_20.416.pdf
Related NAMAs
In general, this NAMA may be related to all sector NAMAs that count reductions achieved by companies participating in any of the CPAs that are signed in the 8 years of this NAMA. These may include: NAMA Self-supply. NAMA Industrial Waste.

Contact details of the individual coordinating and managing NAMA	
Responsible institution	National Council of Clean Production, CORFO Committee of the Ministry of Economy, Government of Chile.
Contact of professional	Ambrosio Yobánolo, CPA Business Development Manager. Amanda Labarca 124, 2nd floor, Santiago, Chile. (56 2) 2688 4500 ambrosio.yobanolo@cpl.cl
Alternative contact	Ximena Ruz, Chief Subdirectorate, Clean Production Agreements. Amanda Labarca 124, 2nd floor, Santiago, Chile. (56 2) 2688 4500 ximena.ruz@cpl.cl
Alternative contact	Verónica Baquedano, National Coordinator of Clean Production Agreements. Amanda Labarca 124, 2nd floor, Santiago, Chile. (56 2) 2688 4500 veronica.baquedano@cpl.cl

Annex V. Support received for the period 2014-2016 for financial resources, capacity building and technical assistance and technology transfer

Table 1. Summary of initiatives in the country with international support, period 2014 - 2016

Area	Name of the Initiative	Donor/Organizer	Type of support		
				Capacity building and technical support	Technological Transference
Programs that have international support in financial resources					
R	Support Activities to prepare the Third National Communication of Chile to the United Nations Framework Convention on Climate Change	Global Environmental Facility			
R	Biennial Update Report (BUR)	Global Environmental Facility			
M,I	Low Emission Capacity Building-Chile (LECB-Chile)	European Commission | Federal Republic of Germany | Commonwealth of Australia			
R,M,I	Information Matters	Federal Republic Of Germany			
M	Mitigation Options to Address Climate Change (MAPS Chile) Phase II	Swiss Confederation| The Children's Invest Fund Foundation			
M	Partnership for Market Readiness (PMR)	World Bank			
Other initiatives and projects					
M	Efficient management of infrastructure and contracts in the LNG industry (2016)	United kingdom			
M	Design and evaluation of a mechanism to demonstrate savings on energetic efficiency(2016)	United kingdom			
M	Promoting green finance: exploring opportunities for green banks and bonds (2016)	United kingdom			
M	Development of a "2050 calculator" for the energy sector based on a British model(2016)	United kingdom			
M	Climate Change Integration to the National System of Investment (2016)	United kingdom			
M	Design of an scheme for budgets of GHG for the achievement of reduction of emissions goals(2016)	United kingdom			
M	National Strategy for Efficient Illumination(NSEI)/ Delivering the Transition to Energy Efficient Lighting (2013-2017)	GEF			
M	CALAC Program Clean Air and Climate in Latin-American Cities Program(2013-2015)	Swiss Confederation			
M	System of Certification of Climate Change for Municipalities of Chile (2014)	United kingdom			
M	Integration of transportation plans in urban planning and emissions impact	BID			
M	MRV of the Green Zone of Santiago (2016)	CAF			
M	Energy valorization of organic waste / National program for industrial and commercial catalysis in the management of organic waste in Chile. (2015-2020)	Multilateral - LECB			
M	Support in the Design of an Environmental Forestry Fund as a tool of the financial architecture of the National Strategy for Climate Change and Vegetable Resources of Chile (2015-2017).	ONU-REDD			

Area	Name of the Initiative	Donor/Organizer	Type of support		
			Financial Resources	Capacity building and technical support	Technological Transference
M	Energy efficiency in the copper industry (2015)	United kingdom			
M	Sustainable public purchase policy	UNEP / United kingdom			
M	NAMA Design for sustainable schools	ADMIRE Fund			
M	Strengthening program for the local capabilities and development of projects with ERNC at a small-scale (2015 - 2017)	UNPD			
M	Support to the Chilean Energetic Agenda(2015-In execution)	IDB			
M	Financing Program for the development of preliminary Energetic Efficiency projects (2015-2018)	KFW			
M	Design of a sustainable construction code for Chile (2014)	United kingdom			
M	Cooperative Carbon Fund(Payment stage for 2015 results)	World Bank			
M	Carbon Cooperative Fund (preparation phase 2015 - 2018)	World Bank			
M,A	Legal and Institutional framework proposal for Climate Change in Chile(2015)	United kingdom			
M,A	Considerations for a Climate Change Financial Strategy (2015)	United kingdom			
A	Evaluation of risks and ecosystemic services because of climate change in watersheds of Chile and Mexico	Chile - Mexico Fund			
A	Initiative of Emerging and Sustainable Cities(IESC) in Chilean intermediate cities (2015 -2017)	IDB			
A	Enhancing resilience to climate change of the small agriculture of O'Higgins Region in Chile (2016-2019)	Multilateral - Adaptation Fund			
A	Reducing climate vulnerability and flood risk in coastal urban and semi urban areas in cities in Latin America/ Chile+Ecuador (2016-2019)	Multilateral - CAF			
A	Valuation and Inclusion of biodiversity objectives in the Regional Plans Territorial Ordering(PPTO) in the context of adaptation to climate change	GEF			
A	Ecosystemic solutions for the protection of infrastructure and communities in pilot site Nevados del Chillan, in the adaptation to climate change (2013-2017)	IUCN			
A	Design of a terrestrial, aquatic and marine biodiversity monitoring network in the context of climate change (2014-2015)	UNFCCC			
Main International Initiatives with Chilean permanent participation					
R,M,I	Information Matters	Federal Republic Of Germany			
M,A	EUROCLIMA	European Commission			
M,A	Regional Platform for Latin America and the Caribbean: LEDS LAC	Multilateral			
M,A	Climate Change Latin American Network of Offices (LARIOCC)	Kingdom of Spain			
M,I	Global Research Alliance (GRA)	New Zealand | GRA			
M,N	International Partnership on Mitigation and MRV	Federal Republic of Germany|Republic of South Africa| Republic of Korea			
M,N	Mitigation Action Implementation Network (MAIN)	Federal Republic of Germany |World Bank|Canada			

Area	Name of the Initiative	Donor/Organizer	Type of support		
			Financial Resources	Capacity building and technical support	Technological Transference
M	The Mitigation Momentum project	Federal Republic of Germany | World Bank			
N,M,A	Cartagena's Dialogue for the progressive action	Multilateral			
N	Ambition Leaders: Supporting the AILAC countries at the climate negotiations	Federal Republic Of Germany			
Initiatives related to Technology Transfer					
M	Promotion Program for the co-generation	KFW			
M	Solar Energy for the generation of electricity and heat	Federal Republic Of Germany			
M	Promotion of the Solar Energy(focused on CSP)	Federal Republic Of Germany			
Workshops, courses and seminaries related to capacity building and technical assistance					
M	The VIIIth REDD+ Capacity Buiding Programme.	Korea Forestry Service (KFS).			
M	Circumscription Workshop Expanded from the World Fund for the Environment of South American countries.	GEF			
M	Exchange of Experiences Workshops in Social and Environmental Safeguard Matters	Chile-Mexico Fund			
M	Analysis of the engagement in different Payment Schemes for Results of REDD+	UN-REDD Secretariat			
M	Euroclima Workshop for the Desertification, Degradation of Soil and Drought	Joint Research Center			
M	Collecting the lessons learned from early UNFCCC REDD+ Reference Levels	Environmental Defense Fund, International Union for the Conservation of Nature, The Nature Conservancy, Union of Concerned Scientists, and World Wildlife Fund			
M	Study visit to the UK in the context of the FCO funded Project "Carbon Budget framework for Chile"	UK FCO/ LECB			
R	Regional training workshop for the Latin America and Caribbean region on the preparation of biennial update reports (BURs)	UNFCCC			
M	2016 Multisectorial Dialogues and effective participation for the Latin American Weather compatible development	CDKN			
M, R	UNDP global workshop on NDCs	UNPD			
M, R	NDC regional dialogue	UNPD			
T	Training courses specialized in the management of CC for public lawmakers at a Municipal level in Chile	United Kingdom - Newton-Picarte Fund			
R	Workshop on the revision of the guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications	UNFCCC			
R	Technical analysis of biennial update reports (BURs) from developing country Parties	UNFCCC			
M	Successful Experiences Facing the Climate Change in Latin America and Tracking the Peer to Peer Program	Euroclima, Cepal, EuropeAid			
R	Exchange among peers under the Information Matters project - Experiences and lessons learned regarding sustainable reporting systems	Information Matters Project, German Government			
M	Regional Workshop "National Contributions: Challenges for the implementation and monitoring of INDCs "	International Partnership in Mitigation and MRV, Partnership for Market Readiness			
R	Expert Workshop to review draft materials for the training programme for the technical team of experts (TTE)	CMNUCC			

R = Report; M = Mitigation; I =NGHGI; A = Adaptation; N= International Negotiation
Source: Own compilation of the MMA Climate Change Office.

Table 2. Workshops, courses and seminars related to capacity building and technical assistance, period 2014 - 2016

Area	Year	Name of the Initiative	Objective	Donor/Organizer
M	2016	The VIIIth REDD+ Capacity Building Programme	Exchange of successful experiences in policy approaches and positive incentives on REDD + between Korea and countries of Latin America and the Caribbean	Korea Forestry Service (KFS).
M	2016	Circumscription Workshop Expanded from the World Fund for the Environment of South American countries	The workshop will focus on the exposition of the performance of the new policies, procedures and approaches integrated to the GEF6 facing the following cycle of reposition 7, the GEF2020 long-term strategy that also will provide the opportunity of making concrete actions to eventually initiate instances of negotiation for the development of projects for the GEF7	GEF
M	2016	Exchange of Experiences Workshops in Social and Environmental Safeguard Matters	To exchange experiences with the present countries Mexico, Colombia and Chile- to meet the advancements in formulation of national and international requirements that have developed in their REDD+ National and Policy Strategies and how the social and environmental safeguards are being addressed and respected in this context	Chile-Mexico Fund
M	2016	Analysis of the engagement in different Payment Schemes for Results of REDD+	To analyze and compare the implications of the participation of the countries in different payment schemes for results of REDD+	UN-REDD Secretariat
M	2016	Euroclima Workshop for the Desertification, Degradation of Soil and Drought	To analyze the usage of the early warning tool TerraMA2 and the global products generated by the Joint Research Center of the European Commission	Joint Research Center
M	2016	Collecting the lessons learned from early UNFCCC REDD+ Reference Levels	To recollect and analyze the experiences and lessons learned in the construction, presentation and revision of REDD+ Reference Levels in the UNFCCC	Environmental Defense Fund, International Union for the Conservation of Nature, The Nature Conservancy, Union of Concerned Scientists, and World Wildlife Fund
M	2016	Study visit to the UK in the context of the FCO funded Project "carbon Budget framework for Chile"	Framework for Chile" Project that seeks to develop a tracking system in the progress of GHG reduction goals based on the United Kingdom experience. The previously mentioned project includes among its activities a study visit to meet with the Department of Energy and Climate Change of the United Kingdom, with the purpose of exchanging experiences and better practices about the establishment of intermediate reduction milestones.	UK FCO/ LECB
M	2016	Multisectorial Dialogues and effective participation for the Latin American Weather compatible development	To meet different experiences of participatory processes related to climate change projects, for strengthening decision making processed be transparent and sustainable, furthermore facilitating relations between public, private and civil society sectors. Workshop held in Lima, Peru	CDKN
M	2016	Successful Experiences Facing the Climate Change in Latin America and Tracking the Peer to Peer Program	To support the exchange of successful experiences between Latin American countries and promoting the south-south co-operation between the countries members of the Euroclima projects	Euroclima, Cepal, EuropeAid
R	2016	Regional training workshop for the Latin America and Caribbean region on the preparation of biennial update reports (BURs)	To improve capabilities of the national experts of the non-annex I Parties in the usage of the "Guidelines for the Biennial Reports elaboration of Updating for the Parts Updating non-included in the Annex 1of the Convention Framework" and to make known the consultation process and the international analysis	UNFCCC
R	2016	Workshop on the revision of the guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications	To discuss the revision of the guidelines of the report for National Communication of the United Nations Framework Convention on Climate Change (UNFCCC), based on the technical papers prepared by the convention's Secretary. The result of this workshop will be used as inputs in the discussion of the new guides revised under the negotiations of the "Subsidiary Body for the Implementation"	UNFCCC

Area	Year	Name of the Initiative	Objective	Donor/Organizer
R	2016	Technical analysis of biennial update reports (BURs) from developing country Parties	To develop the technical analysis for the Biennial Update Reports of Mexico, Uruguay and Lebanon, under what was stipulated in the 1/CP. 16, paragraph 63., of the Conference of the Parties signing of the United Nations Framework Convention on Climate Change (UNFCCC). The main objective of this analysis is to support the mentioned countries to identify their needs of creating capabilities in the different aspects contemplated in such document.	UNFCCC
M, R	2016	UNDP global workshop on NDCs	Facilitate peer-to-peer exchange among countries and to discuss technical and process-related aspects of implementing NDCs. Workshop held in Brussels, Belgium	UNPD
M, R	2016	NDC regional dialogue	Offer a regional forum for exchanging country experiences in preparing for NDC implementation and envisioned NDC implementation processes. Workshop held in San Jose, Costa Rica	UNPD
T	2016	Training courses specialized in the management of CC for public lawmakers at a Municipal level in Chile	To broadcast methodologies and knowledge for the elaboration of measures in Mitigation and Adaptation plans, considering all the stages of the process, its design, implementation and evaluation	United Kingdom - Newton-Picarte Fund
M	2015	Circumscription Workshop Expanded from the World Fund for the Environment of South American countries.	The Workshop is focused on the exposure of new policies, procedures and approaches integrated from the GEF6, the GEF2020 long term strategy and will provide the opportunity for making practical interactive exercises for the development of projects to the GEF6	GEF
M	2015	To make a technical Exchange for the strengthening of capabilities for the construction of Reference Levels and construction of MRV system at different scales	To expose the advancements of the design and implementation of the National System for Forest Monitoring, emphasizing in Reference Lines of Forest Carbon and Monitoring, Reporting and Verification System	UN REDD
M	2015	20th Meeting of the Committee of Participants of the Forest Carbon Cooperative Fund (FCPF) and to the 15th meeting of the Normative Board of the UN-REDD Program	Chilean Presentation of its proposal of a National Program to the UNREDD Program to Access to support and financing from the program, Besides the half time Report for the Forest Carbon Partnership Facility was presented, this allows to Access to a second part of financing in the framework of REDD+ activities that are developing at a Country level under the National Strategy of Climate Change and Vegetative Resources.	UN-REDD program and by the FCPF
M	2015	Regional Workshop "National Contributions: Challenges for the implementation and monitoring of INDCs "	To create an instance for national teams and political decision makers and technical experts of 10 countries of the Latin American region and the Caribbean members of different global alliances, share experiences and challenges in the development of their national contributions to the Paris Agreement	International Partnership in Mitigation and MRV, Partnership for Market Readiness
R	2015	Exchange among peers under the Information Matters project - Experiences and lessons learned regarding sustainable reporting systems	To exchange experiences among the four countries participating in the Information Matters project (Chile, Dominican Republic, Philippines, Ghana) in the preparation of national reports related to GHG Mitigation and to develop sustainable Measurement, Reporting and Verification (MRV)	Information Matters Project, German Government.
M	2014	Workshop about the definition of the strategy Program UN-REDD 2016-2020	To participate in the process of consultation organized by the UN-REDD Secretariat for the participant countries of the program, to define the modifications that Strategy for the Program will have in the 2016-2020 period	UN-REDD Secretariat
M,A	2014	Practical Experiences towards the implementation of the Varsovia Framework for the REDD+ Opportunities and Challenges, under the REDD Program(UNREDD)	To expose the advancements on the implementation of a National Strategy for Climate Change and Vegetative Resources and the specific labor that is made under the named Varsovia Framework for REDD+	UN REDD
R	2014	Expert Workshop to review draft materials for the training programme for the technical team of experts (TTE)	To revise and discuss the guidelines proposed by the GEC for the development of the experts analysts courses for Biennial Reports for the non-participating countries in the Annex I of the Convention	UNFCCC

R = Report; M = Mitigation; I =NGHGI; A = Adaptation; N= International Negotiation
Source: Own elaboration, Department of Climate Change, MMA.