



CHILE'S LONG-TERM

CLIMATE STRATEGY

THE PATH TO CARBON NEUTRALITY
AND RESILIENCE BY 2050

CHILE'S LONG-TERM CLIMATE STRATEGY

THE PATH TO CARBON NEUTRALITY AND RESILIENCE BY 2050



In its October 21, 2021 session, the Council of Ministers for Sustainability agreed to decide in favor of the contents of this Long-Term Climate Strategy. The strategy was approved by the President of the Republic and subsequently presented during COP26 to the United Nations Framework Convention on Climate Change.

The Path to Carbon Neutrality and Resilience by 2050

Climate change is the biggest challenge facing humanity. Having the will, urgency and responsibility to address this challenge is the great mission of our generation. Science has spoken loud and clear, and has shown us time and again that the only way to prevent the temperature from rising more than 1.5°C is to exponentially increase our efforts to reduce emissions and our vulnerability to Climate Change. This requires a multisectoral transformation that opens the way towards sustainable, emission-neutral and climate-resilient development no later than the year 2050. To achieve this goal, we must change course, make up for lost time and accelerate our efforts today.

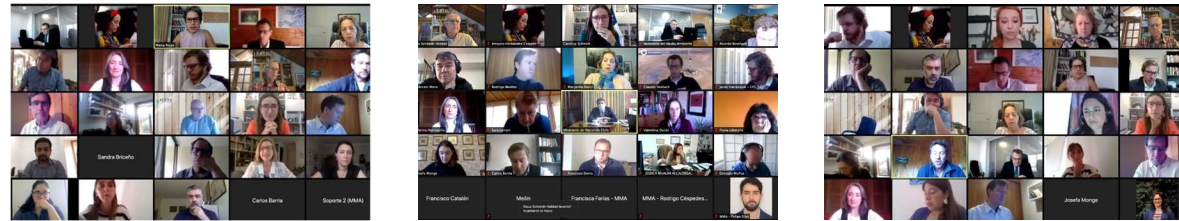
This is how we have understood the situation in Chile, establishing a binding goal of carbon neutrality in our Framework Law on Climate Change bill, which was recently passed nearly unanimously in the Senate and is now undergoing a second constitutional review.

Even in the difficult context in which we find ourselves as a result of the COVID-19 pandemic, our country has continued to move forward with strength and conviction to fulfill its commitments, and as established by the Paris Agreement of April 2020, we presented an updated, more ambitious NDC to the UNFCCC, establishing a carbon budget of 1.1 billion tons of CO_{2eq} for 2020-2030. In other words, we set a maximum emissions limit at the national level and established that our peak emissions will occur no later than 2025, thus ensuring our path to carbon neutrality.

Today, we are fulfilling a new and important commitment required by the Paris Agreement by presenting Chile's Long-Term Climate Strategy (ECLP), which defines the roadmap that we must follow over the coming decades to achieve carbon neutrality and climate resilience.

Science has shown us that how we reach this objective is just as important as achieving it. Setting ambitious targets is not enough; we must also define how we are going to meet them. To this end, the ECLP defines sectoral limits on CO_{2eq} emissions based on the limit determined in our NDC and establishes more than 400 transition goals. These include all sectors of society in an integrated manner that will allow progress in climate action at the regional and local levels, in accordance with the regional development planning and strategies established for each territory.

The targets are science-based, setting demanding and ambitious actions and measures to achieve carbon neutrality and climate resilience. This amounts to a new, unprecedented commitment for Chile.



This is the first time our country has established sectoral limits on carbon emissions by 2030 that will be mandatory and binding following approval of the Draft Framework Law on Climate Change, a legal initiative that establishes a goal of carbon neutrality no later than 2050.

To implement these actions and measures, the various sectors of the economy must develop mitigation and adaptation plans based on the five basic principles of the ECLP. The first of these is robust and transparent Climate Governance to facilitate adequate intersectoral coordination with a view toward a common goal. The second is cost-effectiveness as a tool to prioritize the implementation of actions and measures. Third, prioritizing Nature-Based Solutions as the key to implementing actions that contribute to both mitigation and adaptation. Fourth, respecting the Social Pillar of the NDC, which means putting people at the center. The fifth and final principle is making permanent progress in meeting Sustainable Development Goals (SDGs), based on science as an essential requirement for decision-making.

To implement this path, we require coordinated, comprehensive and multidisciplinary work with broad participation and consensus. For this reason, despite the difficulties brought on by the pandemic, more than 4,000 people participated in over 100 workshops throughout Chile to prepare this ECLP, in all regions and with more than 700 formal observations. This participation allowed us to strengthen the ECLP with measures that ensure compliance with the goals set. Thus, the commitment, enthusiasm and participation of all citizens was a key element in the preparation of the ECLP.

In addition, throughout the development process we had the support and advice of the Scientific Committee through its Report on Nature-Based Solutions and the Preliminary Report of the ECLP Proposal. We also had the contribution of the Advisory Committee on climate action, led by the Minister of the Environment with the participation of the Ministers of Finance, Energy and Science, and representatives of civil society, the private sector, academia, the financial sector, local governments, young volunteers and communities.

I appreciate their collaboration, advice, and commitment to the development and future implementation of this public policy that is so necessary to advance our commitments and achieve comprehensive, sustainable, inclusive, carbon-neutral, and climate-resilient development.

Each generation has its own challenges and missions. The challenge of our generation is to face and overcome the climate crisis with will, courage and urgency. The mission of our generation is to ensure the survival of humanity on planet Earth.

Science has spoken loud and clear, warning us of an environmental apocalypse. Citizenship requires us, as a moral imperative, to change the course we are on, make up for lost time and act now. Technology provides us with the tools to face climate challenges successfully.

Only selfishness, blindness or cowardice can divert us from achieving carbon neutrality to ensure our survival on planet Earth.

The time for words and skepticism is over. The time for action and determination has come.

Our new ECLP is a clear and effective response to this challenge, the great mission of our generation, by which we will be judged by our children, grandchildren and those to come. They will all ask us what we did when there was still time to protect and save human life on planet Earth. We cannot fail them!

**Sebastian Piñera E.,
President of Chile**

TABLE OF CONTENTS

01

1.1 Paris Agreement and Long-Term Strategies	14
1.2 Draft Framework Law on Climate Change	14
1.3 Nationally Determined Contribution (NDC) and Sustainable Development Goals	15
1.4 Greenhouse gas (GHG) emissions and trends in Chile	16
1.5 Chile, a country vulnerable to climate change	20
1.6 Humanity at a crossroads and the role of civil society	26
1.7 Participatory drafting of the ECLP	28

02

Chile's long-term vision: Transition to sustainable and inclusive development by 2050	34
2.1 Chile, Carbon neutral by 2050	36
2.2 Chile, resilient to climate change by 2050	36
2.3 Basic principles of the ECLP	38

03

Mitigation: Path to Carbon Neutrality by 2050	56
3.1 Context for emissions budgets or cumulative emissions target	57
3.2 Allocation of emission budgets and mitigation efforts at the sectoral level	59
3.3 Implementation of sectoral budget allocations	76
3.4 Sectoral budgets and regional issues	78
3.5 Black Carbon Component	81

04

Adaptation: The Path to Climate Resilience	88
4.1 Conceptual framework of vulnerability and adaptation	88
4.2 Guidelines for adaptation at the national, sectoral, regional and local levels	92
4.3 Indicators for Monitoring, Reporting, Verification and Evaluation	100

TABLE OF CONTENTS

05

Sector contributions and integration components	106
5.1 Energy	108
5.2 Mining	113
5.3 Agriculture and Forestry	118
5.4 Fishing and Aquaculture	125
5.5 Waste and Circular Economy	130
5.6 Buildings and Cities	133
5.7 Infrastructure	140
5.8 Transportation	145
5.9 Health	153
5.10 Tourism	156
5.11 Coastal Areas	160
5.12 Biodiversity	164
5.13 Water resources	170
5.14 The Ocean	176

06

A territorial and intersectoral issue	
6.1 National, regional and local coordination of climate change management tools	185
6.2 Capacity building for regional and community management of climate change	186
6.3 Coordination of financing mechanisms for regional and local climate action	187
6.4 Goals for implementing climate change management at regional and local levels	188

07

Cost effectiveness (economic, environmental and social)	193
7.1 Indirect Costs of Inaction on climate change	194
7.2 Cost Effectiveness of Carbon Neutrality	200

08

Means for implementing and monitoring the ECLP	205
8.1 Means of implementation	206
8.2 Monitoring, reporting and verification of the ECLP	237



Photo by Bryan Contreras

01 BACKGROUND

02 CHILE'S LONG-TERM VISION

03 MITIGATION

1.1 Paris Agreement and Long-Term Strategies

Chile has addressed climate change as a State Policy, maintaining a proactive position in the international climate change agenda and negotiations with a sustained increase in the issue's importance in public policy and the ambition of the country's commitments.

Chile presented its Long-Term Climate Strategy (ECLP) at COP26 to consolidate its state vision to address climate change and comply with the provisions of Article 4(19) of the Paris Agreement. The article states that, in formulating their long-term strategies, the parties should take into account the target temperature they establish and «consider their common but differentiated responsibilities and respective capabilities in the light of different national circumstances»¹.

Although the Paris Agreement does not define in detail the format or content of these strategies, the collective efforts of its member countries (33 of which have delivered strategies to date²), international institutions and other experts have established some fundamental principles and best practices. Based on this experience and taking into account its national reality, Chile has established the main contents of the ECLP in its Draft Framework Law on Climate Change, the long-term tool for determining how to achieve the goal of GHG neutrality and increased resilience by 2050.

1.2 Draft Framework Law on Climate Change

Considering the importance that the problem of climate change has reached at the national level and the vulnerability of the country to its impacts, the Ministry of the Environment, through the Office of Climate Change and its Legal Division, led a broad, multi-sectoral and multi-stakeholder participatory process starting in July 2018 to prepare the Draft Framework Law on Climate Change³, based on the vision and experience of its representatives in society.

The Draft Framework Law on Climate Change, submitted as a top priority to the National Congress on January 13, 2020, establishes the target of achieving and maintaining carbon neutrality and advancing towards resilience to climate change no later than 2050. Along with this, it establishes principles, system

1 | https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_spanish_.pdf

2 | <https://unfccc.int/process/the-paris-agreement/long-term-strategies>

3 | Senate - Bill passage

of governance, management tools and adequate systems of information and participation for moving towards a development model with neutral greenhouse gas emissions, reducing vulnerability, increasing resilience and guaranteeing compliance with the international commitments assumed by the State of Chile to face the challenge posed by climate change.

This bill received general approval in the Senate in August 2020, and at the time of presenting this ECLP, it is undergoing a second constitutional review in the National Congress. The bill serves as the country's main state climate policy and is distinguished by its wide-ranging nature, having been signed by 17 ministries⁴.

One of the climate change management tools established in the draft bill Framework Law on Climate Change corresponds to Long-Term Climate Strategy. This tool defines the general long-term guidelines that the country will follow in a multidisciplinary and integrated manner, establishing how Chile will achieve compliance with the purpose of this bill and setting the Nationally Determined Contribution (NDC) as an intermediate target on this path. The Long-Term Climate Strategy will be updated every 10 years, through a multi-sector and multi-stakeholder participatory process.

1.3 Nationally Determined Contribution (NDC) and Sustainable Development Goals

Standing by its commitment to address climate change, on April 9, 2020, in the midst of the COVID-19 pandemic, Chile presented the Update to its Nationally Determined Contribution (NDC).⁵ This was the result of a process that involved actors from the public and private sectors, academia and civil society at the national and subnational levels.

The new NDC incorporates various goals for the year 2030 in terms of GHG mitigation and short-lived climate pollutants (henceforth, climate forcers), adaptation and resilience, highlighting water security, oceans, circular economy, forests, peatlands and ecosystems, with the aim of advancing towards an integrated and synergistic vision in the design and implementation of climate action in Chile. The science-based diversity of commitments that Chile assumed in its NDC correspond to intermediate goals in meeting the target of carbon neutrality and resilience by 2050.

To move as a country towards that goal, the NDC incorporated an unprecedented social pillar focusing on a fair transition and sustainable development. It establishes as a priority maximizing synergies between climate commitments and the 2030 Agenda for Sustainable Development and Sustainable Development Goals

4 | Ministry of the Interior and Public Security; Ministry of Foreign Affairs; Ministry of National Defense; Treasury; Ministry of Economy, Development and Tourism; Ministry of Education, Ministry of Public Works; Ministry of Health; Ministry of Housing and Urban Development; Ministry of Agriculture; Ministry of Mining; Ministry of Transport and Telecommunications; Ministry of Energy; Ministry of the Environment; Ministry of Science, Technology, Knowledge and Innovation; Ministry of Social Development and Family; Ministry of Women and Gender Equity.

5 | [NDC_Chile_2020_espaol-1.pdf](https://mma.gob.cl/NDC_Chile_2020_espaol-1.pdf) (mma.gob.cl)

(SDGs), which, with its 17 objectives and 169 targets, seeks to achieve balanced and integrated development in economic, social and environmental terms.

As President of COP25, Chile has been a prominent supporter of the Paris Agreement at the international level, taking science as a basis for decision-making and calling on all parties to deliver ambitious NDCs and long-term plans before COP26.

1.4 Greenhouse gas (GHG) emissions and trends in Chile⁶¹

Since 2012, Chile has had a National GHG Emissions Inventory System (SNI), led by the Ministry of the Environment. Chile's GHG Emissions Inventory (INGEI) is updated every 2 years under the rules of the United Nations Framework Convention on Climate Change (UNFCCC) and is reported in the country's Biennial Update Reports (future Biennial Transparency Reports). Chile is a small emitter, historically accounting for approximately 0.25% of global emissions. However, it is an active and ambitious actor with regard to its commitments to mitigate emissions, as demonstrated in its carbon neutrality goal and updated NDC with ambitious, science-based goals for the year 2030.

The most recent INGEI was presented in 2020 to the United Nations Framework Convention on Climate Change. It contains the GHG Emissions Inventory for the period between 1990 and 2018. The inventory is prepared following the 2006 IPCC Guidelines for national inventories of greenhouse gases, covers the entire national territory, and includes emissions and absorption of carbon dioxide (CO₂) and methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). In 2018 in particular, the country's total greenhouse gases emissions (excluding the Land Use, Land-Use Change and Forestry (LULUCF) sector) were 112,313 kt CO_{2eq}, having increased by 128% since 1990 and by 2% since 2016. The main GHG (Greenhouse Gas) emitted was CO₂(78%), followed by CH₄(13%), N₂O (6%), and fluorinated gases (3%).

The Energy sector (consumption of fossil fuel for energy purposes) is the main emitter of GHG, representing 77% of total emissions in 2018, mainly due to emissions from burning coal

61 | The sectors referred to in this section correspond to those defined in Chile's National Greenhouse Gas Inventory Report (INGEI), covering the period from 1990-2018. The definitions are also in line with the 2006 IPCC Guidelines for the preparation of INGEI. The Energy sector includes all emissions from the burning of fossil fuels and fugitive emissions related to their processing and distribution; the Industrial Processes and Product Use (IPPU) sector, which includes emissions from physicochemical transformations during production and product use; the Agriculture sector, including emissions caused by enteric fermentation, handling of manure and fertilizer use. The LULUCF sector corresponds to all emissions related to land use and its changes; and the Waste sector includes emissions from the methanogenesis processes of the organic components of solid and liquid waste.

and natural gas for electricity generation, and liquid fuels for ground transportation.

LULUCF, in this case the forestry sector, is the country's only GHG absorber. It is a net absorbing sector and remains a sink throughout the time series. In 2018, net GHG absorption accounted for -63,992 kt CO_{2eq} mainly due to an increase in forest biomass and wood products. Maximum emissions from the sector were recorded in 2017, when 570,000 hectares of forest land, crop land and pasture were affected by fires.

With this, the balance between GHG emissions and absorption in Chile (including LULUCF) reached 48,321 kt CO_{2eq}. The main drivers of this trend are the burning of fossil fuels and forest Values that escape the trend in the balance sheet (Table 1 and Figure 1) are mainly the result of forest fires recorded in the LULUCF sector.

Table 1 Chile's INGEI: balance of and total GHG emissions (kt CO_{2eq}) by sector, from 1990-2018.

Sector	1990	2000	2010	2013	2016	2017	2018
1. Energy	33,631.4	51,746.4	66,607.7	79,901.3	86,191.0	86,896.1	86,954.3
2. Industrial processes and product use (IPPU)	2,224.2	4,803.6	4,279.6	5,084.5	5,977.1	6,079.8	6,611.3
3. Agriculture	11,834.8	13,708.9	12,921.1	12,597.4	11,881.3	11,724.0	11,789.4
4. LULUCF	-60,152.6	-73,364.3	-76,966.4	-77,561.5	-74,697.9	-11,710.3	-63,991.9
5. Waste	1,519.0	2,742.6	4,133.6	5,095.1	6,106.6	6,515.7	6,957.6
Balance ⁷¹	- 10,943.1	- 362.9	10,975.6	25,116.9	35,458.2	99,505.3	48,320.7
Total ⁸¹	49,209.5	73,001.4	87,942.1	102,678.4	110,156.0	111,215.6	112,312.6

Source: 4th Biennial Update Report on Climate Change, Chile

7 | The term «GHG balance» refers to the sum of GHG emissions and absorptions, expressed in its carbon dioxide equivalent (CO_{2eq}). This term includes LULUCF sector as a whole.

8 | The term "total GHG emissions" refers only to the sum of national GHG emissions, expressed in carbon dioxide equivalent (CO_{2eq}). This term excludes sources of emissions and absorption sinks in the LULUCF sector.

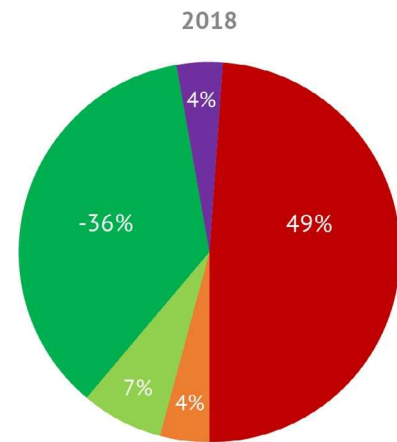
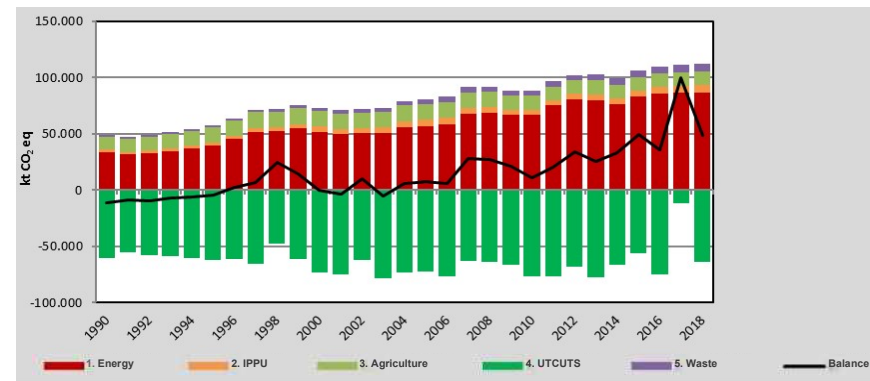


Figure 1: Chile's National Greenhouse Gas Inventory: GHG balance (kt CO_{2eq}) by sector, 1990-2018 series.



Source: 4th Biennial Update Report on Climate Change, Chile.

It is worth mentioning that, in accordance with the requirements of the Convention and the 2006 IPCC Guidelines, GHG emissions generated by the consumption of fossil fuels for international air and maritime transport are quantified and reported, but are not included in the country's balance of GHG emissions and removals, in an attempt to make the inventories of all countries comparable.

1.4.1 GHG emissions and trends, by sector⁹

The Energy sector, representing fossil fuels consumption at the national level, accounted for 77% of total national emissions in 2018, an increase of 159% since 1990 and 1% since 2016. These data correspond to the behavior of the country's energy consumption, including consumption of fossil fuels (coal, diesel and natural gas) mainly for electricity generation, and consumption of liquid fossil fuels (mainly diesel and gasoline) for land transport.

Since 2016, emissions from this sector have stabilized due to the entry of natural gas plants, which are responsible for approximately 25% of electricity generation since 2010. Added to this is the role of new renewable energy sources (especially wind and solar energy, which together grew by 73% since 2016, reaching 31,685 TJ in 2018, which generated 17.8% of the country's electricity) that have replaced coal-fired power generation. This decrease is offset by increased consumption of gasoline and diesel in land transport. The main subcategories of the energy sector are: energy industries (mainly electricity generation),

⁹ | For more details about emissions and the methodology used to estimate them, please see Chile's National Greenhouse Gas Inventory Report, 1990-2018 series, online resource: https://unfccc.int/sites/default/files/resource/7305681_Chile-BUR4-1-2020_IIN_CL.pdf

39%; followed by transportation, 33%; manufacturing and construction industries, 18%; and 9% from other sectors. The remaining 1% corresponds to fugitive fuel emissions¹⁰.

The Industrial Processes and Product Use (IPPU) sector accounted for 6% of total emissions in 2018, an increase of 197% since 1990 and 11% since 2016. This can be explained mainly by the increased use of hydrofluorocarbons (HFCs) in refrigeration, added to the sustained, albeit irregular, growth in emissions from the cement, lime and glass industries. In 2018, 58% of GHG emissions from the IPPU sector corresponded to the category Use of Substitute Products for Substances that Deplete the Ozone Layer, followed by 23% from the Minerals Industry, 8% Metals Industry, 8% Chemical Industry, 2% non-energy fuel products and use of solvents, and 1% Manufacturing and use of other products.

The Agriculture sector accounted for 11% of total GHG emissions in 2018, a decrease of 0.4% since 1990 and 0.8% since 2016, mainly due to the decline in the cattle and sheep population recorded over the last decade. By category, 42% of GHG emissions correspond to Enteric Fermentation, followed by 40% from Agricultural Soils and 13% from Manure Management. Lesser categories included 3.1% for Urea Application, 1.3% for Rice Cultivation, 0.6% for Liming, and 0.3% for Burning of Agricultural Residues in the countryside.

The Waste sector represented 6% of total GHG emissions in 2018, an increase of 358% since 1990 and 14% since 2016, due to population growth and an increase in industrial waste. 67% of Waste emissions were in the Solid Waste Disposal category, followed by Wastewater Treatment and Discharge with 30%. 1.4% and 1.1% corresponded to incineration and open burning of waste and biological treatment of solid waste, respectively.

LULUCF is the only sector in the country that consistently absorbs CO₂, and is therefore one of the most relevant due to its mitigation potential. In 2018, it increased its status as a sink by 6% since 1990 and decreased by 14% since 2016. Forest Land Categories and Products
The categories of Forest Land and Harvested Wood Products are the most important in the sector in absolute terms for carbon emissions and removals, accounting for 83% and 10%, respectively. They are followed by Grasslands, 4.5%; Crop Land, 1.3%; Settlements, 0.4%; Other Land, 0.4%; and, finally, 0.005% corresponding to Wetlands. Forest fires have a significant effect on GHG emission and removal because they are capable of altering these trends, generating maximum emissions in 1998, 1999, 2002, 2015 and 2017.

¹⁰ | These account for all intentional or unintentional GHG emissions released during extraction, processing, storage and distribution of fossil fuels.

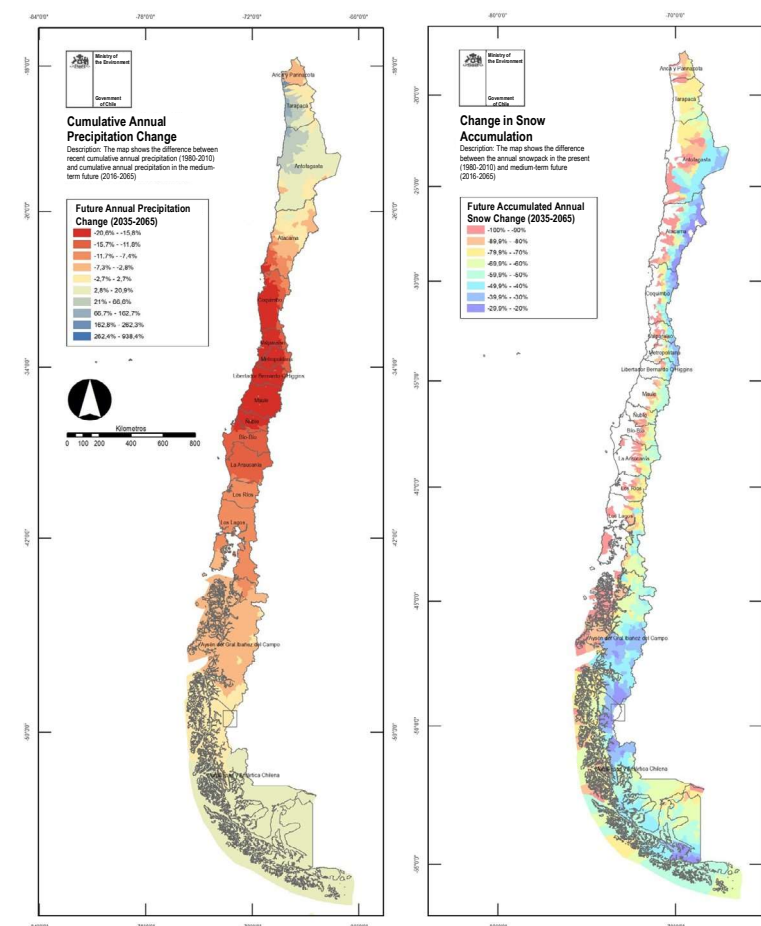
1.5 Chile, A Country Vulnerable to Climate Change

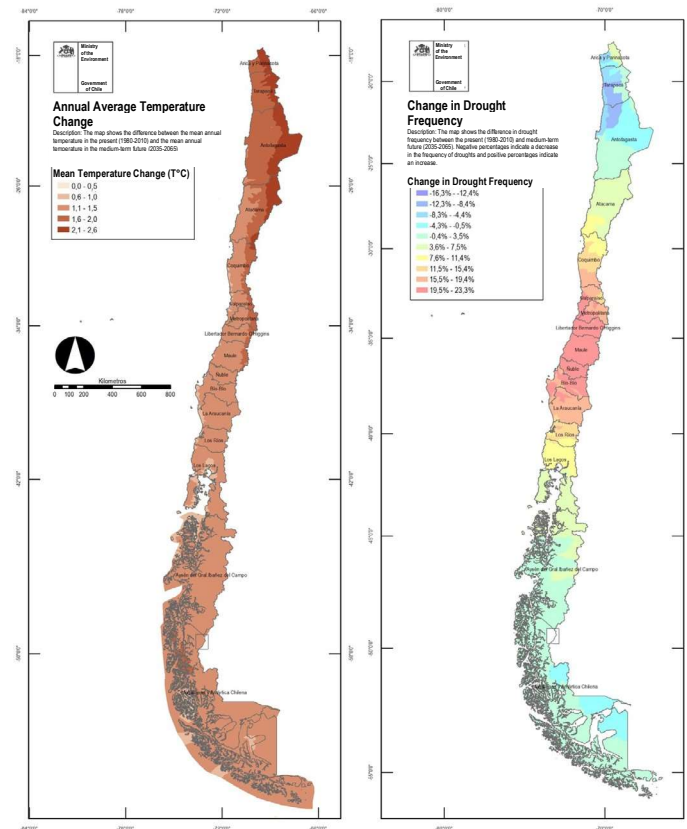
Chile is considered a country highly vulnerable to climate change according to the United Nations Framework Convention on Climate Change (UNFCCC, 1992) due to presenting seven of the nine characteristics defined by the organization: low-lying coastal areas; arid and semi-arid zones; areas with forest cover and areas exposed to forest deterioration; areas prone to socio-natural disasters; areas exposed to drought and desertification; areas of high urban air pollution, and areas of fragile ecosystems, including mountainous ecosystems.

The impacts of climate change affect the natural habitat and society across the country, and in a cross-cutting manner, various sectors fundamental to the nation's livelihood. For this reason, Chile has been developing tools to assess and monitor climate threats, associated risks and the vulnerability of its various territories and sectors. Of these, the "Atlas of Climate Risks (ARClím)" Adaptation Platform, launched in November 2020, stands out for the information it provides for the entire country at the community level. The platform contains climate projections presented through a Climate Threats Browser and Climate Risk Maps, with information that serves as the basis for planning adaptation measures to address climate risks that affect the national territory.

According to the Climate Threats Browser, temperatures are expected to continue their upward trend in 2035-2065, with increases of 1.15°C to 2°C with respect to 1980-2010. This increase is also reflected in a spike in extreme temperatures, a trend that is maintained in the projections. This affects the height of the 0°C isotherm, as is evident in the ARClím projections for cumulative snowfall between past and future averages, with snowfall in the Andes range decreasing by as much as 100% in the foothills and fjords of the extreme south. As for rainfall, Chile has maintained a water deficit over 14 consecutive dry years. Cumulative rainfall in central Chile will decrease by an average of 15% in the medium term compared to historical values. The frequency of droughts is also projected to increase by 10%-23% between the Coquimbo and Los Lagos regions in the medium-term future.

Figure 2 Change in Annual Mean Temperature, Change in Drought Frequency, Change in Cumulative Annual Precipitation and Change in Cumulative Snowfall (2035-2065)





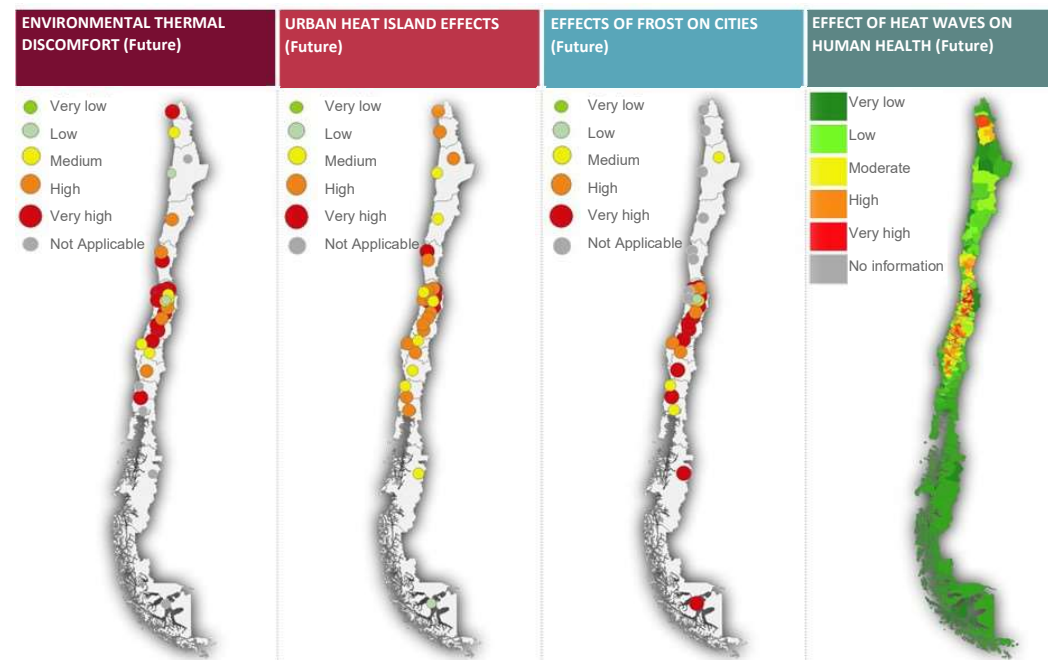
Source: ARClm Climate Risk Atlas Platform. More information at: <https://arclim.mma.gob.cl/amenazas/>

Regarding Climate Risk Maps at the community level, projected impacts and risks are presented for the entire national territory for Human Settlements, Health, Cities, Coastal Zones, Aquaculture and Coastal Fishing, Hydrology, Water Resources, Biodiversity, Forests and Plantations, Agriculture, Electricity Generation and Transmission, Mining and Tourism. Among the main results, out of a total of 345 communes across the country ¹¹, 84% are subject to one or more high climate-related risk. Systems that concentrate more communes with high risk levels include those associated with Health and Human Settlements, Biodiversity, Agriculture, Forests and Water Resources.

The analysis of climate risks for Cities and Human Settlements obtained through ARClm allows us to understand the effects of climate change on the human component, revealing the great variety of threats and the heterogeneity of the effect on risk in the different geographical areas of Chile.

¹¹ | ARClm takes into account 345 communes. It hopes to incorporate the commune of Antarctica, but this is still pending.

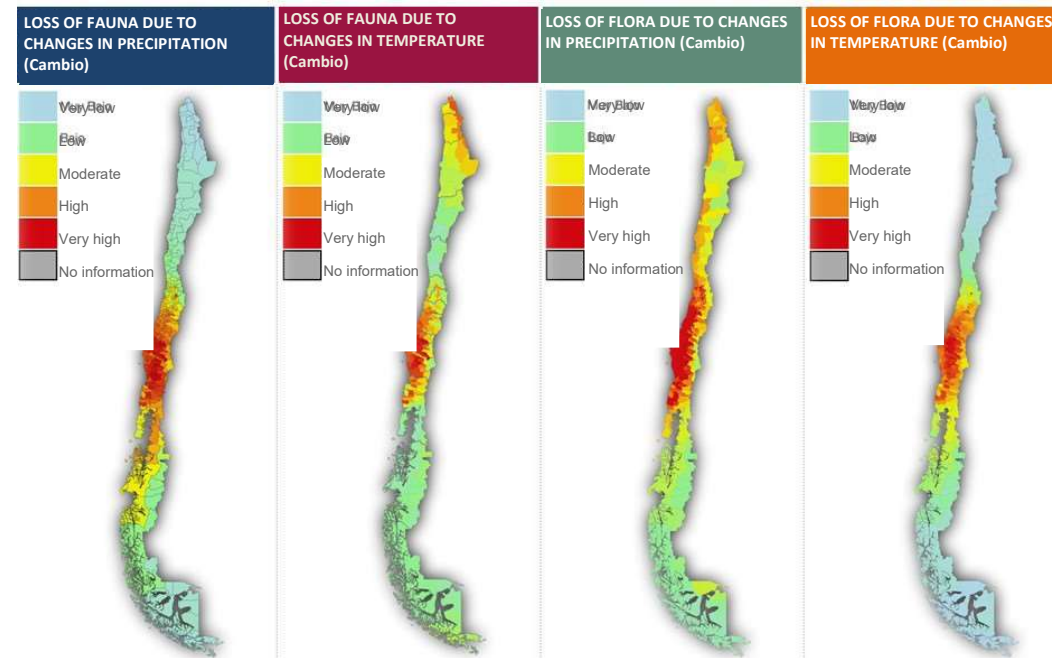
Figure 3: Climate-related relative risks: Thermal Comfort, Urban Heat Islands, Effect of Frost and Heat Waves on Human Health (future)



Source: ARClm Climate Risk Atlas Platform. More information available at: https://arclim.mma.gob.cl/atlas/sector_index/salud_humano/

With regard to risks for Biodiversity, the analysis includes loss of flora and fauna due to changes in precipitation and temperatures. This involves specific impacts on the geographical distribution of certain species, including their future spatial movement based on current distribution and projected climate variables. The results indicate the highest risk as being concentrated in the Ñuble and Los Ríos regions. The south-central area of continental Chile is identified as the area with the greatest risk from climate change, which is interpreted as a lower capacity of flora and fauna species to subsist in the areas of their current distribution. Thus, the species currently found in the south central area would be the most affected. This presents the opportunity to speed up the preservation of ecosystems and avoid greater anthropogenic pressure.

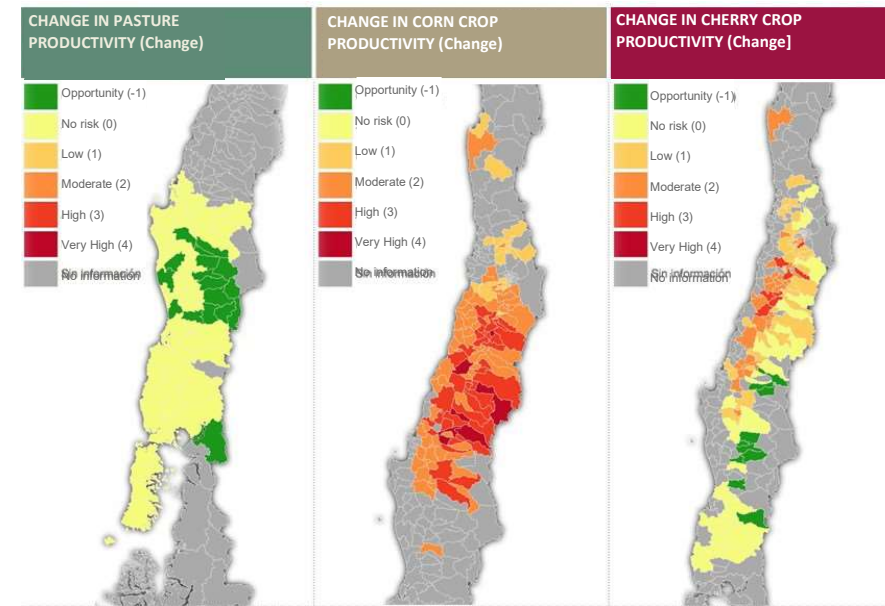
Figure 4: Climate-related relative risks for Fauna and Flora due to changes in precipitation and temperature (change)



Source: ARClím Climate Risk Atlas Platform. More information available at: https://arclim.mma.gob.cl/atlas/sector_index/biodiversidad/

As for the country's Agriculture, the analysis includes risks to the productivity of representative annual crops (Wheat, Corn, Beans, Potatoes), Fruit trees (Almond, Walnut, Cherry, Apple) and natural meadows and ability to sustain animal grazing, given climatic variations in temperature, precipitation, sunlight, relative humidity and wind speed. The results obtained vary from one subsystem to another. All annual crops are expected to be subject to risks. In general, if a crop is produced under irrigation, the greatest relative risk is seen in coastal areas and in the center-north of the country. If not irrigated, the greatest relative risk is found in the mountainous southern region. With regard to grasslands and animal carrying capacity, productivity is expected to increase due to climate change in the areas studied. Finally, based on the results for fruit trees, the coastal zone and the intermediate depression between the Coquimbo and Biobío regions are the areas with the greatest relative risk as a result of climate change.

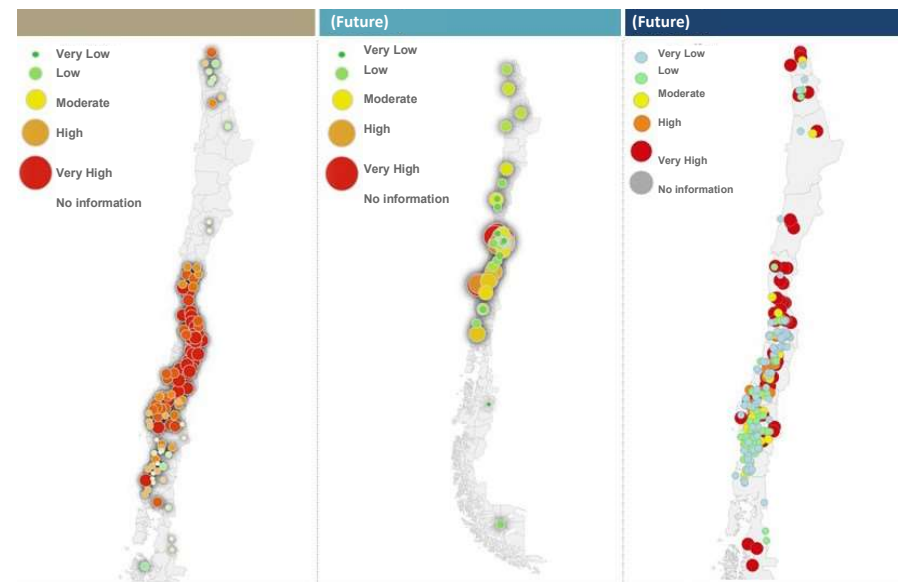
Figure 5: Relative risks in annual crop productivity (change)



Source: ARClím Climate Risk Atlas Platform. More information available at: https://arclim.mma.gob.cl/atlas/sector_index/agricultura/

Threats from extreme rainfall and drought are considered to be the main climate risk factors for water resources. The highest levels of relative risk for floods are in the Atacama and Valparaíso regions, due to precarious or absent critical infrastructure for mitigating floodwater effects. In the Maule and Biobío regions, the high levels of risk are mainly due to the magnitude of flooding. The magnitude of extreme precipitation events will increase in the future, and the sectors with the greatest risk will be those that have precarious or no infrastructure capable of transporting water to channels or mitigating its effects. The central-northern area of the country is at the greatest risk for drought, with projections of an increase in both frequency and severity.

Figure 6: Relative risks of drought (change), urban floods (future), and river floods (future)



Source: ARCLim Climate Risk Atlas Platform.

1.6 Humanity at a crossroads and the role of civil society

Humanity started the year 2021 submerged in a multidimensional and global crisis that threatened the sustainability of the ecosystems that make life possible, as well as the guarantee of human rights for broad sectors of the population. The COVID-19 pandemic has aggravated social and economic problems, and has acted as a wake-up call for urgent transformation toward sustainable and inclusive development.

Of the problems facing humanity, climate change is the most relevant challenge, crossing economic sectors, borders, ideologies and people. This global phenomenon affects all communities and ecosystems, not only in the future, but also in the present, demanding urgent and immediate attention.

In this regard, both the scientific and local communities are calling with increasing urgency for the need to forge ahead with transformations focused on resilience, adaptation and human needs. These transitions cannot be postponed and require government initiative, although this by itself is insufficient. What is needed is a grand alliance that commits society as a whole and all people at an individual level.

The conviction at the international and national level of the need and importance of involving all of society in climate action manifested itself in 1992 within the United Nations Framework Convention on Climate Change (UNFCCC) and its article 6 on education, training and public awareness. This was later reinforced by the Doha Work Program (2012-2020) reaffirming the need to promote changes in lifestyle and sustainable consumption, attitudes and behavior to promote sustainable development, as well as preparation for adapting to the impacts of climate change and strengthening institutional and sectoral capacities. Likewise, these elements are incorporated in the 2030 Agenda of the UN's Sustainable Development Goals (SDGs).

4. Quality Education, 5: Achieve gender equality and empower all women and girls, 8. Decent work and economic growth, 11. Sustainable cities and communities, 13. Climate action, 16. Peace, justice and solid institutions, 17. Alliances for achieving these goals.

Since the Paris Agreement (2015), efforts have been made to accelerate the action of governments, the private sector and civil society to achieve concrete progress toward limiting the increase in temperature to no more than 1.5°C by 2100. To this end, article 12 of the Paris Agreement has established that:

Parties shall cooperate in taking the appropriate measures to improve climate change training, public awareness, public participation and public access to information, recognizing the importance of these steps with respect to enhancing actions under this Agreement.

The SDG Summit in September 2019 acknowledged that progress up to that point had been insufficient, calling on

all sectors of society to mobilize for a decade of action on three levels: global action to ensure better leadership, more resources and smarter solutions with regard to the Sustainable Development Goals; action at the local level that includes necessary transitions in the policies, budgets, institutions and regulatory frameworks of governments, cities and local authorities; and action by people, including youth, civil society, the media, the private sector, trade unions, academia and other stakeholders, to generate an unstoppable movement to drive the necessary transformations.

Involving all people in climate challenges is, at present, a critical and unavoidable task.

The changes to be made compromise and affect lifestyles, patterns of consumption and sustainable production, as well as self-images and the

ways in which peoples and societies conceive of communal living. For these to occur, communities and citizens must be aware of the magnitude and importance of the task and accept shared responsibility for driving it. The effort to accomplish this is known as taking Action for Climate Empowerment (ACE).

At the national level, the first National Action Plan on Climate Change (NAPCC) 2008-2012 established an axis for creating and promoting capacities, including courses of action for institutional strengthening, education and awareness, international cooperation, and the generation of scientific information. This axis has been reinforced over the years and consolidated under the Framework Law on Climate Change bill, which establishes that the ECLP must provide the guidelines and objectives for the development of capacities and climate action (see Chapter 8.1. Means of implementation). The bill also establishes an obligation to develop transparent citizen participation for all climate management tools introduced by the Ministry of the Environment and the corresponding sectoral ministries.

1.7 Participatory drafting of the ECLP

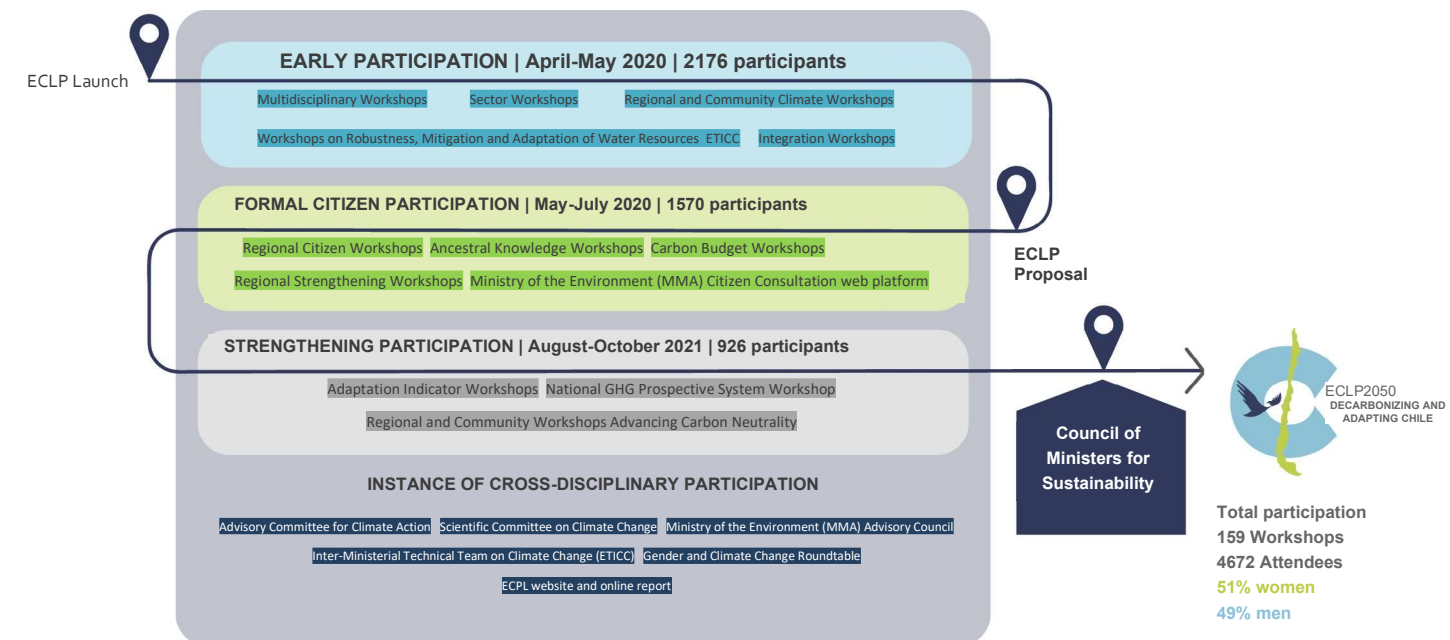
The design and drafting of the ECLP involved multi-stakeholder, multi-level, wide-ranging and transparent participation through various participatory instances. The goal was to present an inclusive and representative vision encompassing different instances of coordination, dialogue, analysis, discussion and involvement by the public sector, local authorities, civil society, social organizations, youth, indigenous peoples, unions, the private sector and academia, all of whom discussed and debated the construction of a vision for Chile to «Move towards low greenhouse gas emissions, until reaching and maintaining neutrality, reduce vulnerability and increase resilience to the adverse effects of climate change by 2050.” The multiplicity of participatory instances involved in drafting the ECLP are framed in the following principles:

Citizen participation in climate change management

- Encourage the participation of any person or group of people in the preparation, review and updating of climate change management tools.
- Facilitate instances of citizen participation in a transparent and inclusive manner, taking special consideration of vulnerable sectors and communities, and applying a multicultural and gender approach.
- Facilitate timely and adequate access to information on climate change, promoting dissemination and awareness on the matter, and reducing information asymmetries.
- Articulate adequate coordination between the different institutions and representatives linked to climate change management.

The following diagram presents the 3 main stages that constituted the ECLP participatory process and the multidisciplinary instances that accompanied the entire process. Each is described below.

Figure 7: ECLP participatory process



Source: Authors' research.

1) Early participation: This consisted of a multi-stakeholder participation process to draft the ECLP proposal through 71 participatory online sessions with 2,176 attendees, of whom 52% were women and 48% men. This process made it possible to identify visions, objectives and tools for long-term climate management at the sectoral and inter-sectoral level; analyze the robustness of the ECLP, strengthening the evaluation of measures towards carbon neutrality and the methodology for defining water security indicators for adaptation; and identify opportunities and challenges to incorporate and relate the vision, reality and objectives of subnational (regional and local) climate action with the national one.

2) Formal citizen participation: weeks to make it known to various actors in the country, collect their opinions and suggestions to improve the proposal. The process included citizen workshops in all regions of the country, workshops focused on ancestral knowledge for climate action, and workshops with all the Regional Climate Change Committees. The process had 44 online participatory sessions in all regions of the country, involving 1,570 attendees with gender parity (50% women, 50% men). During this period, the citizen participation platform of the Ministry of the Environment (MMA) ¹² | was activated and received 777 observations from individuals, organizations, study centers, union groups, NGOs and the private sector, which were analyzed and weighted by technical teams to determine their relevance for being incorporated into the final document.

3) Participation for strengthening the proposal: After the ECLP proposal was drafted, a series of technical workshops were held with the goal of deepening specific aspects of the document. These included Workshops on Climate Change Adaptation Indicators, a National GHG Prospective System Workshop, and Subnational Workshops Advancing Carbon Neutrality, carried out in all regions of the country for municipalities, companies and citizens. These 44 online sessions made it possible to strengthen the proposal and generated training spaces that had a total of 926 attendees, of whom 51% were women and 49% were men.

Throughout the entire period of drafting the ECLP, a website ¹³ | and electronic report ¹⁴ | disseminated the tool, recorded all the activities carried out and gave transparency to the process. In addition to the three stages described above, the process included a cross-disciplinary participation of groups of experts, among them:

- **Advisory Committee for Climate Action:** Committee with a multidisciplinary, multi-stakeholder and multi-level vision that advises the Ministry of the Environment in the process of preparing the ECLP. Composed of 32 representatives, including state authorities, local authorities, academia, the private sector, non-governmental organizations, youth, indigenous people and the COP25 high-level champion.

- **Scientific Ministerial Advisory Committee on Climate Change** ¹⁵ |. preparation, design and implementation of climate change management. This committee developed recommendations for incorporating Nature-Based Solutions and prepared a Preliminary Report for the ECLP proposal on existing environmental regulations,

¹² | Available at: <https://consultasciudadanas.mma.gob.cl/portal/consulta/107>

¹³ | <https://cambioclimatico.mma.gob.cl/estrategia-climatica-de-lar-go-plazo-2050/descripcion-del-instrumento>

¹⁴ | <https://cambioclimatico.mma.gob.cl/estrategia-climatica-de-lar-go-plazo-2050/expediente-electronico-del-proceso/>

¹⁵ | <https://www.bcn.cl/leychile/navegar?idNorma=1153096>

the Draft Framework Law on Climate Change and the latest scientific evidence available, and proposed improvements to be incorporated into the document.

- **National Consultative Council of the Ministry of the Environment** ¹⁶ | Collegial body made up of civil society representatives that issues opinions regarding environmental matters of relevance and general interest, among other functions. In this framework, the council analyzed and offered opinions on the ECLP proposal to enrich its content with the visions and perspectives of diverse civil society representatives.

- **Inter-Ministerial Technical Team on Climate Change (ETICC):** Supports the Ministry of the Environment in the preparation, implementation and monitoring of climate change management. Made up of representatives of institutions involved in matters of climate change. In addition to the 3 workshops held with the ETICC within the early participation framework, it participated in the entire process by informing, working on and coordinating the different components of the process.

- **Gender and Climate Change Roundtable:** A multi-sectoral body that brings together more than 25 public institutions to advise on policies and tools for the effective incorporation of gender. It is part of the activities that the Ministry of the Environment holds in its role as technical secretariat of the Inter-Ministerial Technical Team on Climate Change (ETICC). The roundtable held two ECLP workshops that oversaw the «Checklist for integrating a gender approach into climate change management tools» ¹⁷ | and conducted a wide-ranging review of the objectives and targets of the 14 sectors involved in the strategy. At the end of this process, the roundtable delivered a proposal for integrating a gender approach into the ECLP.

Details of the participatory drafting process (dates, presentations, lists of attendees, reports, etc.) is available in Annex 1: Deepening the participatory process for the ECLP, which lists all the participatory instances with their dates, objectives and participants, among other data.

¹⁶ | Under the Climate Change Framework Law, it becomes the National Council for Sustainability and Climate Change.

¹⁷ | <https://mma.gob.cl/wp-content/uploads/2020/07/GENERO-5.pdf>

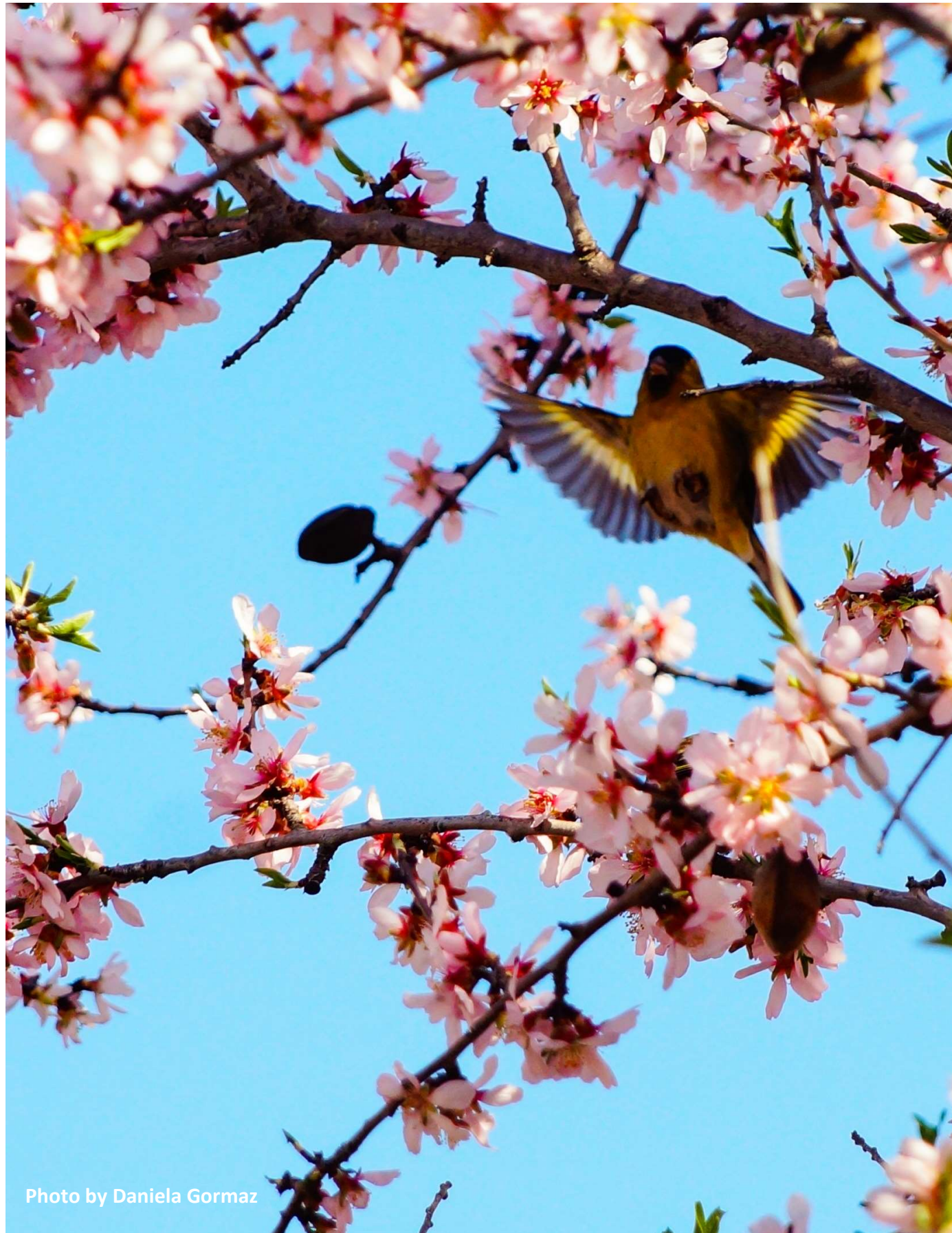


Photo by Daniela Gormaz

02 CHILE'S LONG-TERM VISION

Transition to Sustainable and Inclusive Development by 2050

03 MITIGATION

04 ADAPTATION

Chile's Long-Term Vision: Transition to Sustainable and Inclusive Development by 2050

The ECLP will be the guiding instrument for climate policy to align it with the long-term vision and goal defined for Chile and proposed in the Framework Law on Climate Change, which establishes the progress that must be achieved by mid-century to be consistent with global efforts to prevent global temperature rise as established by the Paris Agreement. Chile has committed to achieving GHG emission neutrality and increasing its resilience by 2050, requiring an unprecedented coordination and synergy effort in terms of the country's environmental policy.

This strategy, together with the NDC, are contained in the highest priority climate change management instruments at the national level, establishing medium- and long-term objectives, targets, and guidelines on climate change at the national, sectoral, and subnational levels.

The ECLP calls on all territories and sectors of the national economy to incorporate climate change in their daily management and planning in the short, medium and long terms, under the legal bases proposed by the Framework Law of Climate Change bill for effective climate change management.

The ECLP's guidelines, objectives and long-term goals for climate change will be achieved through various instruments implementing concrete actions and measures for mitigating and adapting to climate change, such as:

- **Sectoral Mitigation Plans:** Establish actions and measures to reduce or absorb GHG and stay within the sectoral emissions budget, ensuring compliance with the objectives and targets set by each sector. Sectoral Mitigation Plans must be prepared by the following sectoral authorities: the Ministries of Energy, Transport and Telecommunications, Mining, Health, Agriculture, Public Works, and Housing and Urban Development.
- **Sectoral Adaptation Plans:** Establish actions and measures for ensuring the implementation of the objectives and targets set by each sector to adapt those most vulnerable to climate change. The following Sectoral Adaptation Plans

will be prepared¹⁸ | Biodiversity, Water Resources, Infrastructure, Health, Mining, Energy, Forestry, Agriculture, Fisheries and Aquaculture, Cities, Tourism and Coastal Areas.

- **Regional and Local Action Plans for Climate Change:** Prepared by the Regional Committees for Climate Change (CORECC) and the Municipalities, respectively, to consolidate the Sectoral Plans to be implemented in the territory and to define additional actions by the same region with regional financing. The Regional Action Plans must be in line and consistent with the guidelines of the Long-Term Climate Strategy, the Sector Mitigation and Adaptation Plans, community mitigation and adaptation plans, when they exist.

18 | The Ministries responsible for the sectoral adaptation plans are: Ministry of the Environment (Biodiversity), Ministry of Public Works (Water Resources), Ministry of Public Works (Infrastructure), Ministry of Health (Health), Ministry of Mining (Mining), Ministry of Energy (Energy), Ministry of Agriculture (Forestry and Livestock), Ministry of Economy (Fishing and Aquaculture), Ministry of Housing and Urban Development (Cities), Ministry of Economy (Tourism) and Ministry of Defense (Coastal Areas).

2.1 Chile, carbon neutral no later than 2050

In 2019, the Chilean government announced that the country will become carbon neutral no later than 2050, following scientific recommendations, and in line with the Paris Agreement. This announcement was concretized in the goal established in article 4 of the draft Framework Law on Climate Change presented to the National Congress for legislative processing, with the aim of developing a robust legal system to strengthen climate policy as a state policy. It sets a binding goal of carbon neutrality no later than 2050, with an obligatory review every 10 years to advance it.

An emission neutrality goal not only means an important commitment to the country's sustainable development, it also confirms Chile's commitment to firmly adhere to global agreements to keep temperature rise under control and follow the recommendations made by the panel of experts on climate change (IPCC) in its report on the 1.5°C target (SR1.5) and the Sixth Assessment Report (AR6).

This commitment has therefore become Chile's most important goal in terms of mitigation and part of the long-term climate vision that guides not only the country's environmental policies, but also its economic and social policies, seeking to create an economy that respects the ecosystem limits of its territory. This mainly involves policies and instruments for the control of local pollutants, since many actions to reduce the concentration of said pollutants also have a positive effect on the reduction of GHG and other short-lived climate pollutants.

Achieving this goal implies sustained work for Chile in two equally relevant lines of action: i) achieving a sustained reduction in GHG emissions; and ii) increasing and maintaining carbon sinks. To achieve this, the ECLP establishes sectoral goals and milestones for 2030 based on the national target defined in the NDC, and identifies management instruments at the national, sectoral and subnational levels (Chilean regions and municipalities) that should be used and improved to achieve these goals in line with those established in the Draft Framework Law on Climate Change.

It is important to recognize the considerable effort that must be made at a multi-sectoral and territorial level to ensure that the necessary policies and measures are implemented to achieve a sustained reduction in GHG emissions. This implies a progressive decarbonization of the power grid and production processes, and at the same time a change in consumption patterns, underscoring the importance of the circular economy. With regard to captures, tools to maintain and increase natural carbon sinks must be created, while taking into account the multiple ecosystem services they provide (conservation and protection of biodiversity, water resources, ecosystems, reduction of disaster impacts, among others).

2.2 Chile, resilient to climate change by 2050

The country's resilience, understood as the capacity of interconnected social, economic and ecological systems to face a dangerous event, trend or disturbance by responding or reorganizing in such a way that they maintain their essential function, identity and structure, while conserving the ability to adapt, learn and/or transform at the same time, is one of the fundamental goals of this strategy. Increased resilience will be achieved through actions to adapt to climate change, and enabling actions for addressing this phenomenon by minimizing risks and avoiding damage while taking advantage of territorial opportunities that arise.

To move towards building a country that is resilient to the effects of climate change, the ECLP establishes medium- and long-term adaptation targets and objectives. These are set based on the NDC, which establishes intermediate goals based on the development of sectorial and regional adaptation plans, the generation of risk information at the community level, the development of indicators for monitoring, evaluation and reporting, as well as the definition of areas of greatest urgency to advance in the capacity to respond to extreme climate events and the goal of water security. In addition, the guidelines for adaptation at the national, sectoral and subnational levels (Chilean regions and municipalities), contained in the Chapter

on «Adaptation: the path to climate resilience,» recognize the close relationship with the UN's Sendai Framework in accordance with the provisions of Chile's National Policy for Disaster Risk Reduction¹⁹ | The complexity of adaptation in the context of our country confronts us with the need to meet a series of conditions, among which the following stand out:

- A solid scientific base of climate scenarios and impact projections of the sensitivity of the systems affected by climate change and adaptation options in the various sectors, available in platforms for public use that support decision-making.
- Broad and representative climate governance by the different social actors involved to enable a dynamic and flexible response capacity that takes into account the uncertainty and speed of change.
- Inclusive and transparent participatory processes that attend to the specific needs of Chile's territories in terms of the impacts of climate change, taking into account their social and cultural characteristics and development expectations.
- Generation of alliances between the public and private sectors to optimize the design and implementation of adaptive actions.
- Vulnerability and adaptation monitoring and assessment systems that channel permanent learning and adjustments based on new knowledge and experiences, and that allow timely reporting of results and experiences.
- Recognition of the multidisciplinary and inter-sectoral nature of adaptation and the breadth of interest groups and areas of action that must permeate national public policy in areas as diverse as land use planning, environmental assessment of projects, and disaster risk management, among others.

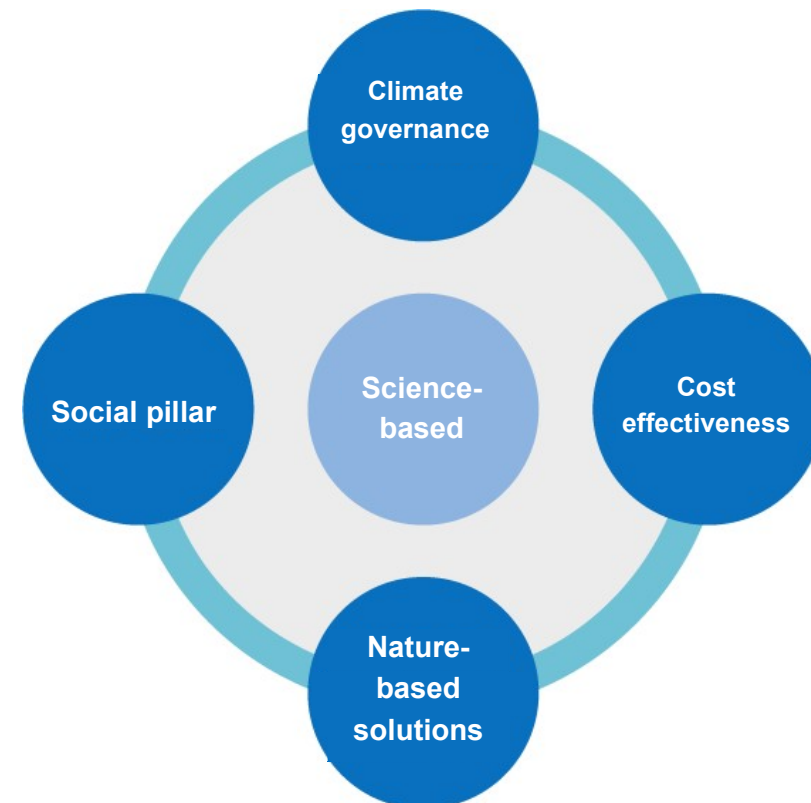
With these factors in mind, the long-term vision for adaptation and resilience is that Chile, aligned with the objectives of the Paris Agreement, will manage to reduce the risks resulting from the impacts of climate change, increase its adaptive capacity and reduce its vulnerability, advancing towards water and food security, social welfare and the protection, conservation and restoration of biodiversity with an eye towards the country's sustainable development.

¹⁹ | Chile's NDC contains a specific commitment that by 2030, implementation of the National Policy for Disaster Risk Reduction 2019-2030 will have been completed and harmonized with the Sendai Framework for Disaster Risk Reduction, the Paris Agreement, and the 2030 Agenda for Sustainable Development.

2.3 Basic principles of the ECLP

To further the long-term climate vision described above, this strategy is based on five main principles that guide its long-term commitment. These principles were defined according to the four pillars of sustainability (economic, social, institutional and environmental) with a clear basis in scientific information, as shown in the following figure.

Figure 8 Main principles of the ECLP



Source: Authors' research.

2.3.1 Science-based

The ECLP's vision is based on science. The latest IPCC assessment report (AR6) is clear in concluding that the observed effect of climate change is due to anthropogenic GHG emissions. This report is an alarm or red alert for humanity, in the words of UN Secretary General Antonio Guterres, for ambitious climate action that takes into account the messages delivered by the IPCC.

In this context, Chile has a Scientific Ministerial Advisory Committee on Climate Change, created to advise on issues related to climate change matters, and to analyze and contextualize the evidence available at the national and international level. Its goal is to provide relevant information that contributes to the development, design, implementation and updating of climate change management tools. This committee is officially incorporated into Chile's climate institutions by the Draft Framework Law on Climate Change.

Chile's extensive territory encompasses diverse climates with different risks and vulnerabilities. The study and investigation of the impacts of climate change in the national territory is essential in developing climate policies. To this end, Chile, through the Ministry of Science, will create a Climate Change Observatory to make climate change data available to citizens and experts, guided by interoperability standards, to take advantage of existing information.

Having a climate data observatory will boost the predictive and statistical modeling of processes associated with climate change and facilitate studies to mitigate economic and social effects, among other benefits of having access to scientific information. The Observatory will have 3 components:

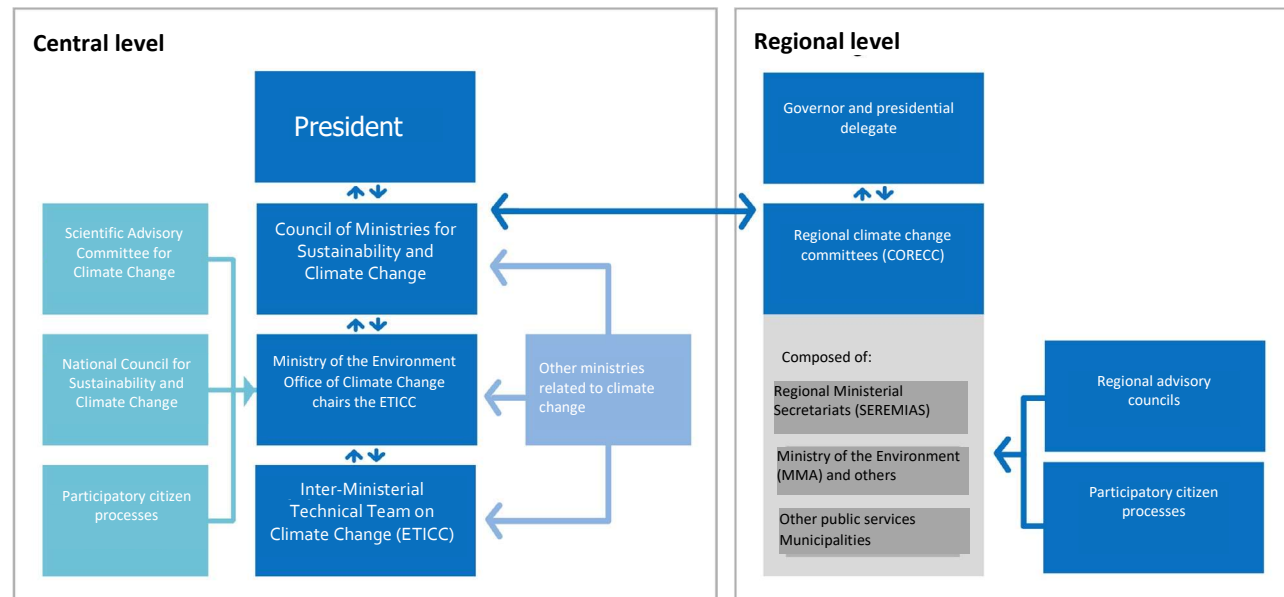
- I) An Integrated Sensor and Data Network, which will initially include the existing instruments that monitor our territory and its data, starting with the oceans and the cryosphere.
- II) A Data Access Platform for integrating Earth observation data in a virtual and decentralized format connected to the various sources of this information (e.g., public services and research centers).
- III) High-level governance and technical team.

2.3.2 Climate governance (multi-level and multi-stakeholder)

The goals and objectives will take into account the new and strengthened governance proposed in the Draft Framework Law on Climate Change, which contemplates a vertical (national and regional) and horizontal structure incorporating state institutions and non-state agents, and underscoring the importance of science. The institutional structure established in the bill and deepened throughout the ECLP is conceived of as a state architecture; in other words, one that keeps functioning permanently under successive government administrations, always with the main objective of promoting multi-level and inter-institutional coordination, avoiding duplication, and promoting synergies and permanent collaboration for managing climate change in Chile.

At the national level, it recognizes different roles and responsibilities for addressing climate change in response to international requirements, and national and regional characteristics. The figure below shows the various actors involved in climate governance, as well as the main links between them. It is characterized by the breadth of its representation: individuals from the public or state sector (central, regional and local; technical experts and decision-makers), and non-state actors (academia and citizenship; in other words, civil society as a whole, including non-governmental organizations and the private sector).

Figure 9 Climate governance



Source: Prepared by the authors, based on the governance established in the Draft Framework Law on Climate Change.

At the central level, the Ministry of the Environment (MMA) plays a central role. In addition to collaborating with the President of the Republic in the design and application of environmental policies, plans and programs, it is in charge of coordinating the work of the ministries and institutions involved in matters of climate change through its Climate Change Office. The Ministry of the Environment chairs the Council of Ministers for Sustainability and Climate Change, which promotes environmental policies and regulations and proposes their approval to the President of the Republic. It should be noted that once the Draft Framework Law on Climate Change is enacted, the Ministry of Education and the Ministry of Science will become part of the Council of Ministers for Sustainability. In turn, the Climate Change Office leads the Inter-Ministerial Technical Team on Climate Change (ETICC), a coordinating body whose members are focal points of the competent ministries on Climate Change.

The scientific community supports the work of government institutions at the central level through the Scientific Ministerial Advisory Committee on Climate Change, which provides relevant scientific information for decision-making as established in the Draft Framework Law on Climate Change. This work is also supported by non-state agents, including representatives of unions, non-governmental organizations, and citizens in general, through the National Council for Sustainability and Climate Change.

The Regional Climate Change Councils (CORECC) are in charge of coordinating climate change management at the regional level by developing climate change management tools, promoting synergy with national and sectoral policies. Currently, the CORECCs are chaired by the presidential delegate, a situation that will change with the entry into force of the Framework Law on Climate Change. After this, they will be chaired by the regional governor with the participation of regional and municipal authorities and citizens through the Regional Consultative Councils, allowing them to show leadership on climate issues.

• International Negotiation

Chile has been part of the United Nations Framework Convention on Climate Change since 1994 and ratified the Paris Agreement in 2017. As part of these agreements, Chile is recognized for its active commitment, compliance and transparency, and the ambition of its targets. It also actively participates in the different areas of international negotiation that are generated annually in this framework. Participation in these instances requires a delegation of professionals from different ministries that ensures the necessary climate ambition and promotion of the country's interests in the different negotiating issues, with a state vision that transcends the governments in power.

In this regard, ministerial coordination is key to identifying and generating necessary strategies that allow linking more than one negotiating issue, as well as promoting Chile's priorities and needs in the context of this global problem. The Ministry of Foreign Affairs, through its Office for the Environment and Oceanic Affairs, leads and coordinates the Chilean negotiating team, whose experts carry out specific monitoring of negotiating issues of interest to the country. The team is staffed by professionals from the following ministries:

Table 2 Chilean negotiating team.

Negotiation area	Ministry responsible
Adaptation (Art. 7)	Ministry of the Environment
Agriculture and Forestry	Ministry of Agriculture
Science	Ministry of Science, Technology, Knowledge and Innovation
General Coordination	Ministry of Foreign Affairs
Finance	Treasury
Gender and Human Rights	Ministry of Foreign Affairs and Ministry of the Environment
Response Measures	Ministry of Foreign Affairs (SUBREI)
Market and Non-Market (Art. 6)	Ministry of Energy
Losses and Damages (Art. 8)	Ministry of the Environment
Transparency (Art. 13)	Ministry of the Environment

Source: Authors' research.

It should be noted that the responsible ministries have the role of coordinating specific negotiating areas. These ministries also collaborate with each other and other state institutions whenever there are implications, relationships or common issues that must be addressed by more than one ministry.

In the international negotiations, Chile has sought to involve young people in the negotiation process. During COP25 in Madrid, for the first time, Chile included two young people on its negotiating team. It committed to maintaining that figure for COP26 through the International Course for Young Negotiators for UN Climate Change Negotiations, and two applicants were selected to participate in the process in Glasgow as part of the national delegation.

2.3.3. Social pillar

Chile's NDC is unprecedented for including a social pillar that contemplates the synergy of each commitment with Sustainable Development Goals (SDG). It also incorporates specific criteria and commitments regarding **equity and gender equality, fair transition, active participation, ancestral knowledge and water security**. This social pillar is also part of the Long-Term Climate Strategy, and can be seen reflected and reinforced in the following chapters.

In turn, the ECLP, like the NDC, recognizes the need to maximize synergies between this state policy, the 2030 Agenda for Sustainable Development and the Sustainable Development Goals. For this reason, it defines how each objective and target of the strategy contributes to meeting SDGs so that they can be included as part of Chile's progress with respect to the 2030 Agenda, ensuring an integrated and wide-ranging vision of sustainable development in Chile.

• Gender Equity and Equality

Climate change is a global phenomenon that affects all spheres of society. Its impacts have effects on different production sectors and the supply of basic services such as water, energy, transportation, among others. However, it does not affect all people in the same way. Certain differentiated effects are produced based on pre-existing conditions of social vulnerability exacerbated by climate change. Gender inequalities and inequities are one of those conditions. Basic gender gaps, such as lesser access by women to participation, decision-making, ownership and use of natural resources (quality water, land, ocean and energy resources), a fair salary, education, formal employment and credit, information, technology use and training, as well as other structural gaps and gender roles, make women more vulnerable to climate change. Additional gaps apply to available information on the impacts of climate change for use in decision-making when disaggregated by sex. The draft Framework Law on Climate Change addresses this problem by establishing that, in preparing Sector Plans, the Sector Authorities must collaborate with the competent bodies, especially the Ministry of Women and Gender

Equity and the Ministry of Social Development and Family, in order to incorporate a gender approach and focus on vulnerable groups.

For this reason, the implementation of the targets and actions for achieving the long-term objectives of this strategy must incorporate gender considerations in a wide-ranging manner. Sectors must generate their own gender analyses to identify gaps and challenges to informed decision-making regarding this approach or perspective, and propose concrete actions that allow progress towards gender equality²⁰, in collaboration with the Ministry of Women and Gender Equity. The following specific targets are proposed to meet this objective.

20 | In line with the goals of Collective and Environmental Rights of the Fourth National Plan for Equality between Women and Men 2018-2030, which aims to ensure access by women, especially peasant, rural and indigenous women, to land, water, sustainable management of natural resources, and the adoption of urgent measures to address climate change and its effects, via

mitigation efforts that reduce negative impacts on their development (Specific Objective 6.1) and recognize the contribution of women as subjects in the preservation of biodiversity, promoting their incorporation into decision-making for strategies, policies and sustainable development programs to preserve diverse forms of local production (Specific Objective 6.2).

Table 3 Medium- and long-term objectives and targets for gender equity and equality.

Objective		
Close the gender gaps identified in the different climate change management instruments at the national and subnational levels to reduce the vulnerability of women to climate change, and to ensure women's equality, autonomy and gender equality.		
Targets		
Year 2030	Year 2040	Year 2050
<p>1) All the sectors included in the ECLP will have an analysis that identifies specific gender gaps considered in the design of sectoral plans for mitigation and/or adaptation to climate change (Sectoral Authorities Draft Framework Law on Climate Change).</p> <p>2) At least 50% of the current Regional Action Plans on Climate Change (PARCC) will have an integrated analysis that identifies specific gender gaps considered in the design of mitigation and/or adaptation measures (Regional Government (GORE) - Seremis Ministry of the Environment (MMA) - Ministry of Women and Gender Equity).</p> <p>3) As of 2025, progress will be reported toward promoting the equitable participation of women and men in all national, regional and local institutional and governance bodies related to climate change management (MMA).</p>	<p>4) All current Regional Action Plans on Climate Change (PARCC) will have an integrated analysis that identifies specific gender gaps considered in the design of mitigation and/or adaptation measures (Regional Governments).</p> <p>5) At least one experience per region will be systematized on the incorporation of a gender approach in actions for addressing climate change (Ministry of the Environment).</p> <p>6) All climate change management instruments at the national and subnational levels will integrate gender-responsive and/or transformative actions (sectoral authorities / Regional Governments).</p>	<p>7) The gender gaps identified in the different climate change management tools at the national and subnational levels (MMA) will have been reduced.</p>

Source: Authors' research.

• Fair Transition

A transition to a socially and environmentally sustainable and fair economy can be an important driver for decent job creation, social justice and poverty eradication. These goals are of great importance in understanding that climate change is an enhancer of existing inequalities, particularly those that occur in our country.

Having a fair transition strategy makes it possible to enhance the synergy between Chile's climate commitments and the national agenda, given the close link between the climate and socio-environmental considerations.

The social pillar of Chile's NDC 2020 promised to create a Fair Transition Strategy by 2021 that protects the rights of the most vulnerable in the decarbonization of the power grid, with active citizen participation in its design and implementation.

This commitment is about to be fulfilled, as the Fair Transition Strategy completed its citizen consultation process²¹ on September 16. The comments received are currently being analyzed and adjustments to the document are being made in preparation for the publication of a final version this year. The document published during the public consultation detailed the principles, pillars and commitments that this strategy must include to put people at the center, and ensure that Chile's energy transition towards carbon neutrality incorporates fair and equitable social and environmental development, promotes the creation of jobs that improve people's quality of life, and improves environmental conditions in the territories where energy infrastructure is located. The Fair Transition Strategy is designed to create a framework for addressing energy transition in the territories, given that the integration of local perspective is key to moving towards participatory processes that allow compliance with the actions proposed in the strategy.

The Fair Transition Strategy proposes a series of commitments that ensure compliance with the objective described above, based on four pillars:

- A people-focused transition: Actions must be designed and executed in a participatory manner during the closure and/or new uses of coal-fired power plant spaces and infrastructure. Progress will be made in promoting a fair energy transition in the social and labor spheres that promotes job skills training and re-orientation towards quality jobs that promote the local development of communities and the well-being of people.
- Promoting economic development and productivity: Progress will be made to facilitate the conditions for promoting new investments and implementing new technologies and productive opportunities (goods and services) associated with sustainable development linked to productive vocations through promotional tools, innovation

21 | <https://energia.gob.cl/mini-sitio/estrategia-de-transicion-justa-en-energia>

and the circular economy, furthering the economic reactivation of communities and sectors affected by the closure and/or new uses of coal-fired power plant spaces and infrastructure.

- Environmental development and territorial approach: The closure and/or new uses of coal-fired power plant spaces and infrastructure will be promoted to generate positive environmental and social impacts, and prevent negative impacts through actions consistent with the vision of local and regional development.

- Participatory governance and public-private articulation: The challenges of the energy transition require working collectively to establish a model of local governance informed and created through participatory processes of social dialogue through the entire process of closing coal-fired power plants. This governance must be in coordination with the Regional Governments according to the new attributes established in Law 20,074, and with the respective municipalities. Local actions coordinated and articulated with existing strategies, sectoral policies and private initiatives will be developed and implemented through participatory processes to promote a transition towards clean energy in the territories involved in the closure and/or new uses of coal-fired power plant spaces and infrastructure.

• Active participation: Carbon neutrality and climate resilience are impossible without citizen involvement.

The Action for Climate Empowerment (ACE) recognizes that policies and strategies for mitigation and adaptation to climate change or other problems require an important citizen consensus and participation of all civil society interest groups at all levels and spheres of action. The generation of alliances between civil society and the public and private sectors is the cornerstone for the design and implementation of climate change policies and actions that take into account ACE guidelines and transversality. Each sector offers different possibilities through instruments, resources, skills, knowledge and experiences, as well as opportunities to assume responsibilities essential to complying with the global commitments established by the Paris Agreement and national commitments established in the NDC and ECLP. The private sector, for example, offers resources, experience and the ability to innovate in search of solutions; and civil society has a deep empirical knowledge of the national territory, ecosystems and capacity for action at the local level²².

Many aspects of climate change management will be irrelevant if women, men, girls and boys do not take shared responsibility for them in their daily lives and in their individual and collective practices. ACE goes beyond formal and non-formal education and popular awareness; rather, this concept is situated in the generation

22 | [Action_for_climate_empowerment_guidelines.pdf \(unfccc.int\)](#)

of capacities to act, influence and transform. It is based on education, training, awareness, public participation, access to information and internal cooperation at the national and international levels, making up the six elements of ACE.

Chile's Capacity Development and Climate Empowerment Strategy thus becomes a means of implementing its Long-Term Climate Strategy, whose objective is to **“strengthen the national, regional and local capacities of people and organizations, both PUBLIC and private, in academia and civil society, to achieve the country's mitigation and adaptation goals,”** considering the elements of the Action for Climate Empowerment mentioned in article 6 of the UNFCCC and article 12 of the Paris Agreement, which proposes addressing five components: a) Information and participation to strengthen climate action; b) Promotion of capacity building; c) Research and science for climate action; d) Awareness and education for climate action; and e) Cooperation and sharing of experiences. These components, detailed in Chapter 8, seek to guide the different climate change management tools and their long- and medium-term targets at the national, sectoral, regional and local levels. As well as other public policy instruments, or others generated by the private sector and civil society, to address the development of the required capacities and citizen empowerment to implement actions for addressing climate change and achieving carbon neutrality and climate resilience by 2050, contributing to global climate change goals.

- **Best practices and ancestral knowledge**

Regarding the best practices of local communities and indigenous peoples, Chile's ECLP seeks to permeate the process of sustainable and inclusive development at the national, sectoral and subnational levels (Chilean regions and municipalities) with a consideration of the role of communities in climate change management. On the one hand, Chile's local communities and native peoples inhabit territories rich in biodiversity that possess ancestral knowledge and nature-based practices that contribute to their conservation and ability to mitigate and adapt to climate change. On the other hand, the pressure of climate change on the ecosystems they inhabit makes them especially vulnerable to these threats.

Considering the above, and following the guidelines of the Paris Agreement and Platform of Local Communities and Indigenous Peoples (LCIPP), the ECLP establishes 2 commitments in this area:

a) Showcase best practices of local communities and indigenous peoples, along with their ancestral knowledge, to promote their incorporation in the development of climate change management tools at the national, sectoral and subnational levels.

By 2023, a platform will be created to showcase and disseminate best practices and ancestral knowledge of local communities and indigenous peoples for the protection of biodiversity, and mitigation and adaptation to climate change. The platform will be updated every two years to continuously improve and complement information based on scientific evidence with the empirical knowledge of local communities and ancestral peoples.

The platform will make this knowledge and experience available to the public to promote its incorporation in the design and implementation of public sector climate change management tools at the sectoral, regional and community levels. Additionally, it may serve to encourage other communities or members of civil society to replicate these practices in other parts of the country with strong roots in a connection to and understanding of nature.

The participation of local communities and indigenous peoples will be promoted in a wide-ranging manner in elaborating and implementing climate change management tools at the regional and community levels, taking advantage of their local knowledge, ancestral wisdom and understanding of the land. These participatory processes will inform the platform whenever replicable best practices and knowledge are identified.

b) Assess the vulnerability of local communities and indigenous peoples to climate change, considering possible adaptation solutions specific to their culture and society with the aim of incorporating adaptation solutions that meet their specific needs and allow them to increase their resilience to the climate risks to which they are exposed.

This commitment is expected to materialize by 2023, within the framework of the updated National Adaptation Plan, which will address the vulnerability of local communities and indigenous peoples to climate change, and provide adaptation solutions to these issues.

The evaluation included in the National Adaptation Plan will be developed through a participatory process of indigenous dialogue, with the technical and financial support of the Green Climate Fund. The measures identified will be evaluated for consideration in the country's adaptation instruments at the sectoral, regional and local levels, and will include indicators for reducing vulnerability and increasing the adaptive capacity of indigenous peoples.

• Water Security

Water security is a priority for adaptation as outlined in the draft Framework Law on Climate Change, and is defined as:

The possibility of access to water at adequate levels of quantity and quality, considering the natural particularities of each basin, for sustenance and use over time for health, subsistence, socioeconomic development, ecosystem conservation and preservation, promoting resilience to threats associated with droughts and floods, and the prevention of pollution.

Faced with a worsening water crisis, the government has designed an Emergency Plan to increase the availability of water and improve the efficiency of its use, with the aim of ensuring supply for human consumption and food production, known as the **Plan Against Drought**.²³ The plan has four axes or key measures: use of salt water, modernization of irrigation for food production, expansion of the coverage of the rural drinking water program, and the efficient use of water in cities.

23 | Gob.cl - Plan Sequía
(www.gob.cl)

The 2020 update of the Chilean NDC also incorporates commitments on water security focused on the development of indicators that establish water security targets at the territorial and organizational level, water management at the basin scale, and increased resilience of the health services sector. The goal is to advance in areas where the greatest urgency has been identified, allowing action to be focused on creating a resilient country.

Likewise, the Long-Term Climate Strategy includes a chapter on Water Resources (See Chapter 5: Sector contributions and integration components – Water Resources) that presents management tools, objectives and specific targets. In addition to the commitments established by other sectors (forestry, agriculture, infrastructure, biodiversity, etc.), these will enable progress towards addressing the country's main challenges in water matters, such as ensuring the supply of water for human consumption, ensuring water quality, protecting ecosystems, and modernizing the legal and institutional framework around water resources.

2.3.4. Cost effectiveness for mitigation and adaptation

Climate change management will prioritize effective measures for mitigation and adaptation that have the lowest economic, environmental and social costs, and take into account the indirect costs of inaction for adaptation in the short, medium and long terms. This will scale the benefits of investing in adaptation to climate change to strengthen resilience, identify and evaluate the local co-benefits of implementing global climate policies, and show the importance of coherence in the design of national policies

and their subnational appropriation for achieving compliance with cost-effective climate management goals.

The ECLP considers that the effectiveness of mitigation and adaptation requires recognizing the different impacts of climate change across territories, as well as differentiated solutions to meet the long-term objectives established for the country. This is key because it strengthens the vision of subnational and regional integration through regional and local strategic planning tools (Regional Action Plans for Climate Change - PARCC and Local Action Plans for Climate Change - PACCC) that allow territorial actors to contribute to commitments relevant to their communities and circumstances.

2.3.5. Nature-based Solutions

Taking into account the international literature, particularly the International Union for Conservation of Nature (IUCN), Nature-based Solutions (NbS) are defined as:

Actions to protect, sustainably manage, and restore natural or modified ecosystems that effectively and adaptively address societal challenges such as climate change, food and water security, or disaster risk, while contributing to sustainable development, delivering well-being to human beings and benefits to biodiversity.

The country will privilege its incorporation of such solutions into mitigation and adaptive measures to climate change by including them in policies, plans and programs for climate change management at the sectoral, regional and local levels as alternatives. As established in the NDC, these will allow for a wide-ranging and integrated reduction in emissions, enhance carbon capture and sequestration, promote adaptation to climate change, generate co-benefits for biodiversity, and provide ecosystem services and social welfare.

They constitute cost-effective options to protect, restore and sustainably manage systems while helping achieve carbon neutrality and increase the country's resilience by 2050 in an integrated fashion. Multidisciplinary guidelines for mitigation and adaptation measures that consider NbS include:

- Incorporating NbS in climate change management tools.
- Improving normative and regulatory frameworks in territorial planning to promote the incorporation of Ecological Infrastructure and the application of NbS.
- Carrying out integrated territorial management to increase resilience, incorporating multisectoral actors and local communities.

24 | More information about blue carbon in Virtual Blue COP | An Initiative of Future Earth (virtualblue-cop25.org); The Blue COP begins to materialize in Madrid – COP25 (mma.gob.cl)

- Improving management of protected areas and ecosystem services.
- Implementing integrated management of water resources and native forests at the basin level.
- Compiling indigenous local and ancestral knowledge and scientific information for decision making in these matters.
- Promoting environmental education and research on NbS and ecosystem services.

The Scientific Ministerial Advisory Committee on Climate Change contributed to this planning through the report "Scope Document: Nature-based Solutions" (2021), which provides scientific evidence that will guide its incorporation into the country's climate action strategy with recommendations in 6 areas, emphasizing those NbS with the greatest mitigation and adaptation potential for the country.

- **Forests:** NbS to prevent forest fires, recommendations for fire prevention, and implementation of reforestation and forest restoration.
- **Agriculture:** Sustainable land management, including generation and addition of biochar derived from agricultural crop residues to the soil, nutrient management and reduced fertilizer use, integrating trees into cropland, and carbon enhancement on grazing land.
- **Wetlands:** A series of NbS are proposed to preserve and increase the multitude of services provided by wetlands, including efforts to halt their degradation and transformation, restore existing wetlands and incorporate artificial ones, given their importance for carbon sequestration and multiple ecosystem functions.
- **Marine ecosystems:** Given the importance of these ecosystems in carbon storage, the strategy proposes including marine habitats and ecosystems (blue carbon) ²⁴ | in national GHG budgets, protecting and restoring brown algae forests, and creating climate refuges, with special emphasis on Chilean Patagonia.
- **Nature-based solutions for cities:** These stand out as alternatives for addressing a variety of urban problems, especially those linked to the adaptation process, such as rainwater drainage and its potential for achieving vibrant, healthy, resilient and sustainable cities that incorporate green corridors, green roofs, reforestation of urban areas, water

management incorporating aquatic ecosystems in urban and peri-urban environments, and restoration of urban island hills.

• **Andean cryosphere:** The recommendation is to prevent direct intervention and minimize possible indirect impacts of human activities on glaciers, given their importance in the provision of various ecosystem services, including water supply. Stronger monitoring systems are recommended, such as the alert system for hydro-geological risks of glacial origin, as well as the creation of new monitoring systems and studies to determine the amount and characteristics of permafrost and periglacial areas in the country.

• **Mobility:** NbS stand out as options to address mobility infrastructure associated with sustainability, especially pedestrian environments and cycling infrastructure, where green corridors are alternatives that promote friendly and habitable spaces.

The sectoral responses to these recommendations are addressed by the long-term objectives and committed goals in Chapter 5: Sectoral contributions and integration components in the Mining, Forestry, Agriculture, Building and Cities, Infrastructure, Biodiversity, Water Resources, Ocean, Fisheries and Aquaculture, and Coastal sectors²⁵ |.

For its part, the Ministry of the Environment will act as a technical counterpart in the preparation and updating of sectoral mitigation and adaptation plans, guiding the sectors and contributing to the creation of enabling conditions for the incorporation of NbS in said plans. Specifically, the Biodiversity sector, which is under the jurisdiction of this ministry, in its Objective No. 5, commits to:

Strengthening the incorporation of biodiversity objectives and using nature-based solutions (NbS) in public and private sector policies, plans and programs, including transversal territorial management and planning instruments.

25 | It is worth mentioning that consideration of the Draft Framework Law on Climate Change has introduced the concept of Coastal Zones. Once the legislative process has been completed and the the law is passed, the exact nomenclature to be used will be determined.



Photo by Bryan Contreras

03 MITIGATION

The Path to Carbon
Neutrality by 2050

04 ADAPTATION

05 SECTOR CONTRIBUTIONS

Mitigation: Path to Carbon Neutrality by 2050

Chile has established its goal of carbon neutrality by 2050 in the Draft Framework Law on Climate Change. This goal implies an ambitious reduction in emissions by 2050, going from 130 million tons of CO_{2eq} (in the baseline scenario) to 65 million tons of CO_{2eq} in a carbon neutrality scenario in which, by the year 2050, these emissions will be neutralized through captures in our forestry sector (Figure 10). As part of this roadmap, the new NDC establishes intermediate targets for the year 2030 to ensure progress toward carbon neutrality. To this end, its integration component defines specific targets for the forestry sector (detailed in the next section), and its mitigation component for GHG-emitting sectors states that emissions will peak no later than the year 2025, that there will be a national budget of 1.1 billion tons of CO_{2eq} between 2020 and 2030, and that emissions will reach a maximum level of 95 million tons of CO_{2eq} by 2030. For the corresponding period between 2020 and 2050, it is estimated that the indicative national budget will be 2.6 billion tons of CO₂. The economic assessment of this exercise showed the benefits of taking the path towards neutrality for Chile (see Chapter 7).

It is worth mentioning that Chile's emissions target includes all GHGs²⁶, which are estimated in Chile's INGEI every two years and reported in Chile's climate change reports, as mentioned in Chapter 1. In accordance with the IPCC guidelines, Chile quantifies and estimates emissions from international air and maritime transport, even though these are not included in the NDC mitigation commitment. This strategy takes into account specific actions to contribute to their reduction in a way consistent with international mitigation efforts, and Chile's participation in efforts to achieve global agreements to reduce said emissions (see Chapter 5).

It is important to note that since the 6th IPCC assessment report (AR6), countries are being urged to make additional efforts to reduce short-lived climate forcing methane (CH₄), which in Chile represents 13.1% of GHG emissions. The transversal emissions budget target seeks to encourage the development of measures and public policies that allow a reduction of this gas, which in Chile is emitted mainly by raising livestock and treating waste.

Regarding the captures by the forestry sector required to reach the goal of carbon neutrality, it is important to mention that Chile must increase and maintain its carbon sinks with a consideration of the multiple ecosystem services they provide. According to the projections developed for the Carbon Neutrality commitment (Figure 10), Chile will need to possess and maintain a carbon capture level of approximately 65 million tons of CO_{2eq}. To achieve this, steps must be taken to increase the forest biomass

²⁶ | The GHGs taken into account are Annex A of the Kyoto Protocol: Carbon dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Hydrofluorocarbons (HFC), Perfluorocarbons (PFC), Sulfur Hexafluoride (SF₆) and Nitrogen trifluoride (NF₃), the latter included since the Doha amendment in 2012).

and reduce the uncertainty of said captures, as indicated in item 6.2 of the integration components in the NDC. The NDC also specifies the 2030 goal for the forestry sector to ensure progress on the path to carbon neutrality. It is an ambitious goal that requires coordination among various state agencies. Carbon neutrality depends 50% on maintaining the carbon sequestration of our forests at 65 million tons of CO₂ through the year 2050. To achieve this, the forestry sector is considering measures and targets to reduce uncertainty factors, among them: forest fires, low yield/growth of forests, high-frequency forest harvesting, among others. The development of these actions and measures will incorporate the general criteria established in the 2020 update of the NDC's social pillar on fair transition and sustainable development, as well as specific criteria for the integration commitments presented for the LULUCF sector.

Regarding the use of reduction certificates and participation in transaction schemes through international cooperation, Chile recognizes that Article 6 of the Paris Agreement is a mechanism that can allow countries to implement mitigation actions in a cost-effective manner, as well as advance the implementation of new technologies through voluntary collaboration with other parties. According to the rules, this collaboration must ensure environmental integrity and transparency, and avoid double accounting (see Chapter 8).

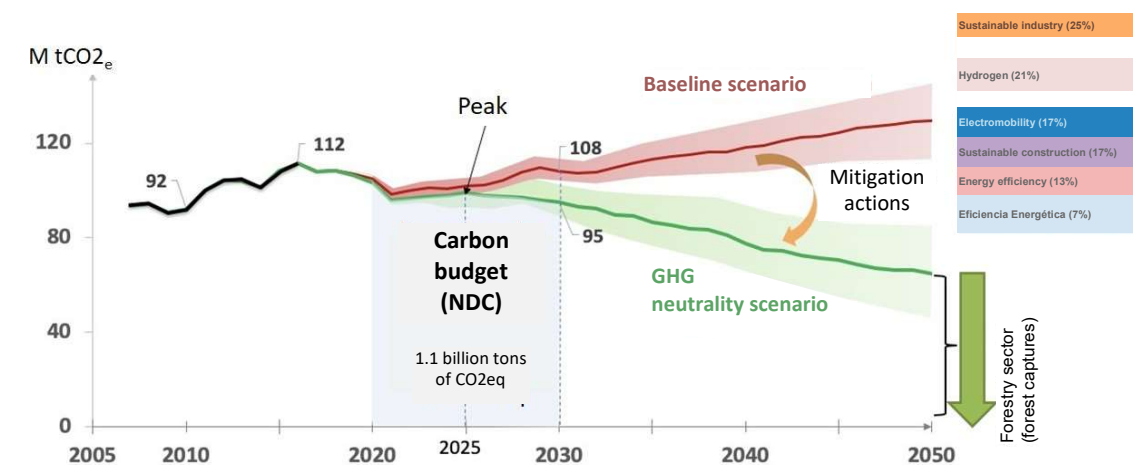
3.1 Context for emissions budgets or cumulative emissions target

The latest IPCC reports confirm that the increase in temperature is directly related to cumulative CO₂ emissions and not to the level of those emissions in a given year. The quantity of cumulative CO₂ emissions that results in a given temperature increase is known as the global carbon budget (GCB). The IPCC determines the GCB to identify the total mass of CO₂ that can be emitted into the atmosphere to avoid exceeding a 1.5°C increase in mean atmospheric temperature. This carbon budget approach has been adopted by various countries around the world. Chile incorporated it into its commitment for emitting sectors in the last update of its NDC.

It is important to clarify that the carbon neutrality commitment cannot be achieved through the mitigation efforts of the GHG emitting sectors alone; it also depends on the captures associated with the forestry sector, as can be

observed in the following figure. In this sense, the NDC established that by 2030 the forest sector is committed to the sustainable management of 200,000 hectares that will represent captures on the order of 0.9 to 1.2 MtCO_{2eq} and to sustainably forest 200,000 hectares, which will represent captures of between 3.0 to 3.4 MtCO_{2eq}; both commitments provide clear conditions that must be met to relieve the benefits of adaptation to climate change. Likewise, it undertakes to reduce emissions from the forest sector due to degradation and deforestation of the native forest by 25% by 2030, establishing actions such as the enhancement of management models in prevention of forest fires and restoration of burned areas, along with sustainability management models of the use of natural resources, among others.

Figure 10: Baseline and carbon neutrality scenario, with the emissions budget defined in the NDC (Chapter 8, Transparency)



Source: Authors' research.

The gray area in the previous figure corresponds to the area under the GHG neutrality scenario estimated in Chile's NDC; in other words, cumulative emissions, and therefore, GHG budget taken into account for the respective time period. In accordance with the provisions of the NDC, the national GHG budget contemplates the same emitting sectors as the greenhouse gas inventory. In Chile, the forestry sector is a net GHG sink, for which it is not considered within the emission budget defined in the NDC. Instead, the NDC defines specific goals for this sector (as detailed in the previous paragraph).

It should be noted that Chile's commitment to work with carbon budgets is established in the Draft Framework Law on Climate Change, which specifies that the ECLP must define sectoral carbon budgets based on the national budget defined in the NDC.

It is also worth mentioning that the bill addresses the possibility of updating sectoral carbon budgets according to their commitments

assumed in the new Nationally Determined Contribution. To address the above concern, the bill provides for an abbreviated procedure to modify the Long-Term Climate Strategy and incorporate updated budgets, objectives and targets, as appropriate.

This ECLP constitutes the first effort made by Chile to allocate sectoral budgets based on the NDC. It establishes a base that can be improved and complemented in future updates and definitions contained in the new NDC, especially in terms of evaluating examples such as the inclusion of forestry sector captures in the budget methodology through 2025.

3.2 Allocation of emission budgets and mitigation efforts at the sectoral level

The Draft Framework Law on Climate Change proposes two fundamental criteria for allocating sectoral carbon budgets: cost-effectiveness and burden equity. It also notes that emission reductions to comply with the assigned sectoral budgets must be made through the measures considered in the respective Sectoral Mitigation Plans issued for this purpose. The following guidelines have been taken into account for budget allocations made through this ECLP.

The principle of cost-effectiveness is related to the fact that climate change management will prioritize those measures that pose the lowest economic, environmental and social costs while being effective for mitigation and adaptation. In other words, this criterion corresponds to the potential for reducing both GHG emissions and the cost of implementing mitigation measures.

Likewise, the principle of equity is associated with the fact that it is the state's duty to ensure a fair allocation of burdens, costs and benefits that safeguards the ability of future generations to meet their needs, with a focus on gender and sectors, territories, communities and ecosystems vulnerable to climate change. The criterion makes it clear that the strategy must go beyond cost-effectiveness to guarantee a fair allocation of carbon budgets related to the opportunity and feasibility for sectors and territories to implement mitigation measures. It considers the development needs of each sector, some of which may need further progress to contribute optimally to sustainable and inclusive development at the national or subnational level (Chilean regions and municipalities).

Both concepts correspond to the guiding principles for assigning sectoral responsibilities in accordance with the mitigation capacity of each sector. The allocation process takes into account total reduction potential and its respective cost-effectiveness, which can be attributed directly to the sectors through the mitigation measures they carry out according to their respective capacities.

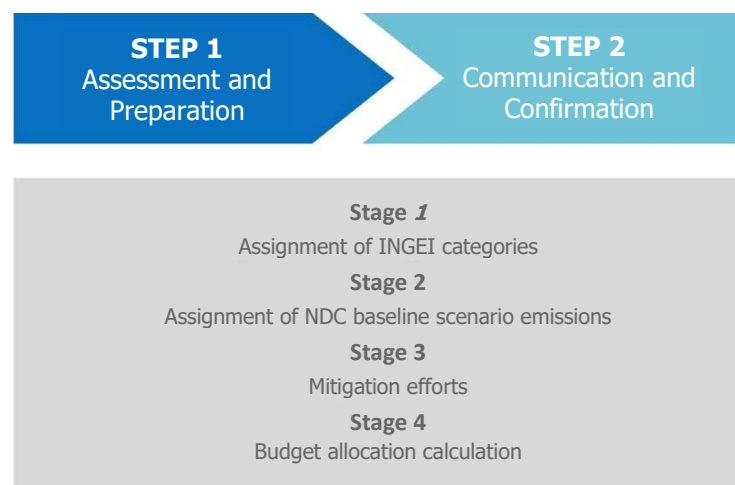
The ECLP presents the first exercise for assigning sectoral carbon budgets based on the NDC's national carbon budget for the 2020-2030 period, using a methodology that takes into account international experience and national reality.

The methodology was designed through two main steps:

Step 1: Assessment of information and preparation of sectoral targets. This was done with the support of international experts, who considered experiences from other countries and Chile's existing capacities, the best available information on emissions and activity levels, and processes and roles in collecting and using such information.

Step 2: Communication and confirmation with sectoral authorities, accomplished in meetings and informative workshops for developing the methodology in question. The process was also informed by feedback for adjusting the methodology, obtained through public consultation and mechanisms such as the Advisory Committee for Climate Action.

Figure 11: Sectoral budget allocation process.



Source: Authors' research.

Based on this two-step process, the methodology for allocating carbon budgets was developed to include four stages:

- 1) INGEI emission categories were assigned to each sectoral authority established in the bill, according to their responsibility and capacity for action.
- 2) The NDC baseline scenario emissions for 2020-2030 were distributed based on this allocation.
- 3) The mitigation efforts to be carried out by the different sectoral authorities in the 2020-2030 period will be subtracted from the allocations, provided that the country attains the carbon neutrality target set out in the NDC.
- 4) This made it possible for each sectoral authority to obtain its respective allocation of the emissions budget for 2020-2030, which can be summarized in the following equation.

Equation 1: Calculation of the sectoral budget for GHG emissions

$$\text{Sectoral budget}_i = \text{Baseline scenario}_i - \text{Mitigation actions}_i$$

i = sectoral authority

Source: Authors' research.

The former corresponds to a direct and relatively simple approach to the sectoral allocation of emissions budgets. This approach ensures compliance with the national budget for the 2020-2030 period by relying on progress toward the carbon neutrality goal; that is, the baseline emissions scenario minus the required mitigation effort. It also has the advantage of taking the cost-effectiveness and burden equity criteria established by the Draft Framework Law on Climate Change as the basis for the sectoral allocation of the emissions budget.

Below, each stage is addressed in detail, including the technical considerations and decision criteria adopted, specifying how the cost-effectiveness and burden equity criteria are taken into account.

Stage 1: Assignment of responsibilities in INGEI categories

The National Inventory of Greenhouse Gases allows for a disaggregation of national emissions into different categories corresponding to sectors of activity. This poses an immediate challenge for the sectoral allocation of emissions budgets, given that the latter are not reported in a disaggregated way by each sectoral authority or ministry.

Taking this challenge into account, direct allocation of each INGEI category was made to the various sectoral authorities provided for in the Draft Framework Law on Climate Change, taking into consideration their powers and degree of influence on such emissions. The table below shows the authorities corresponding to each INGEI category.

Table 4: Assignment of INGEI categories to different sectoral authorities

Sectoral Authority	INGEI Category
Ministry of Housing and Urban Development	1.A.4.b. Residential
	2.F.2. Foaming agents
	1.A.1.a.i. Electricity generation* (Residential Consumption)

Sectoral Authority	INGEI Category
Ministry of Energy	1.A.1.b. Oil refining
	1.A.1.c. Solid fuel manufacturing and other energy industries
	1.A.2.c. Chemical substances
	1.A.2.d. Pulp, paper and printing
	1.A.2.m. Unspecified industry
	1.B. Fugitive emissions from fuels
	2.B.8. Petrochemical and black carbon production
	2.G.1 Electrical equipment
	1.A.4.a. Commercial / Institutional**
	1.A.2.a. Iron and steel
	1.A.2.f. Non-metallic minerals
	2.F.1.c. Industrial refrigeration
	2.F.1.a. Commercial refrigeration
	2.F.1.b. Domestic refrigeration
	2.F.1.e. Fixed air conditioning
	1.A.1.a.i Electricity generation* (Commercial, Industrial, Public and Own Consumption)
	Ministry of Agriculture
Agriculture	1.A.2.e. Food, beverage and tobacco processing
	1.A.4.c. Agriculture / Forestry / Fishing / Fish Farms

Sectoral Authority	INGEI Category
Ministry of Transport and Telecommunications	1.A.3.a. Civil aviation
	1.A.3.b. Ground transportation
	1.A.3.c. Railways
	1.A.3.d. Maritime and river navigation
	1.A.3.e. Other type of transport
	1.A.5.b.i. Mobile (aviation component)
	2.F.1.f. Mobile air conditioning
	2.D. Non-energy products from fuels and solvent use
	2.F.1.d. Refrigerated transport
	1.A.1.a.i. Electricity generation* (Residential Consumption)
Ministry of Mining	1.A.2.i. Mining (except fuels) and quarrying
	2.A.2. Lime production
	2.B.2. Nitric acid production
	1.A.1.a.i. Electricity generation* (Mining Consumption)
Ministry of Public Works	1.A.4.a. Commercial / Institutional**
	2.A.1. Cement production
	2.A.3. Glass production
	2.C. Metal industry
	5.D. Wastewater treatment and discharge

Sectoral Authority	INGEI Category
Ministry of Health	5.A. Solid waste disposal
	5.B. Biological treatment of solid waste
	5.C. Incineration and open burning of waste
	2.F.3 . Fire protection
	2.F.4. Aerosols
	2.F.5. Solvents
	2.G.3. N ₂ O from product use

Source: Authors' research.

It is important to mention two key points about these allocations:

1) Emissions associated with electricity generation are distributed among the different ministries that have an impact on respective total electricity consumption according to the specifications in Table 4, except for in those cases where, due to a lack of disaggregated information, allocations could not be adjusted (Ministry of Health, Ministry of Agriculture, Ministry of Public Works).

2) Emissions associated with Industrial Processes and Product Use (IPPU) and Hydrofluorocarbons (HFCs) were assigned to the respective ministries for the corresponding sectors, and to the Ministry of Energy in the case of energy consumption that was not assigned to a specific sectoral ministry.

Stage 2: Emissions estimates in the NDC baseline scenario

The allocations made in the previous step makes it possible to estimate cumulative emissions from the baseline scenario by making the reduction for each sectoral authority proposed in the Draft Framework Law on Climate Change. In other words, the NDC baseline scenario for the 2020-2030 period is disaggregated by each Ministry, according to the following equation:

Equation 2: Calculation of baseline scenario cumulative emissions by each sectoral authority.

$$\text{Baseline scenario} = \sum_{i=1} \text{Category } INGEI_{ij} + \sum_{j=1} \text{Proportion of electricity generation emissions}_{ij}$$

Where:
 i = sectoral authority
 j = categoría asignada

Source: Authors' research.

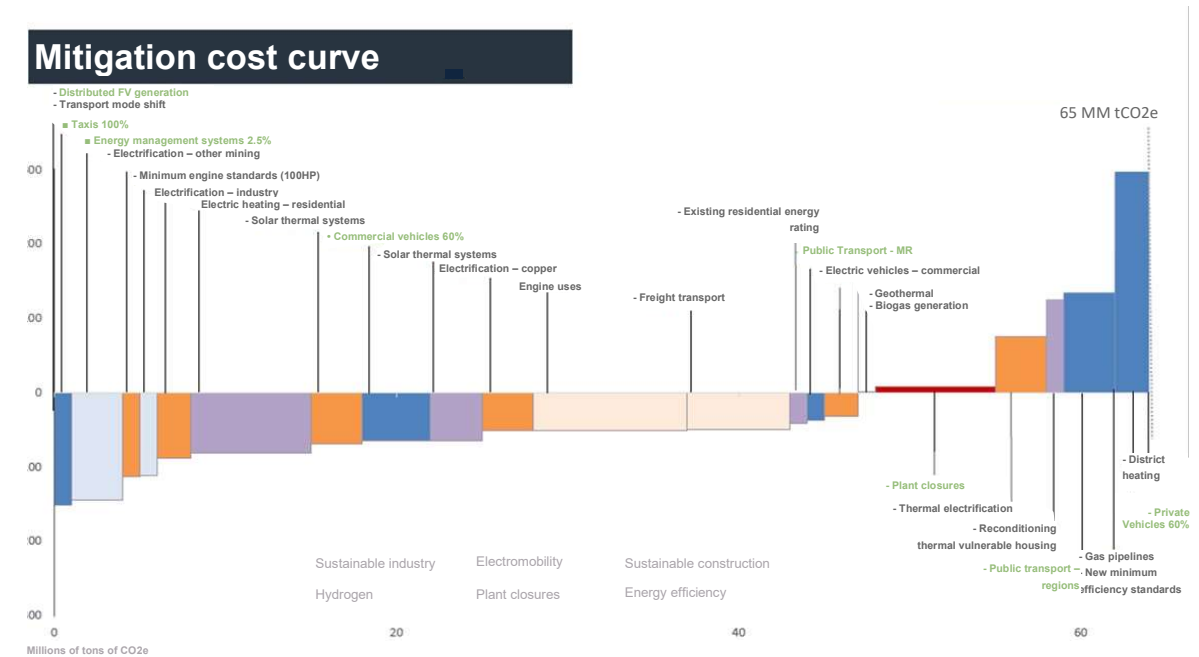
Stage 3: Mitigation Efforts

The identification of mitigation efforts takes into account the base analysis of each sector's mitigation capacity. This is directly related to the **potential mitigation measures** contemplated in the carbon neutrality scenario outlined in Chile's NDC. They represent the country's opportunity to achieve this objective, and therefore, the 1.1 billion tons of CO_{2eq} emissions budget for the 2020-2030 period. This information is indicative in terms of measures, but when defined by a cost abatement curve, it meets the criteria defined above to determine the mitigation capacity of each sector, and therefore aligns with the cost-effectiveness principle referred to in the Draft Framework Law on Climate Change.

A marginal abatement cost curve, or a MAC curve, shows the reductions (width of the bar) and cost-effectiveness (height of the bar) of a set of mitigation measures. The following figure represents the MAC curve presented in the NDC.

a

Figure 12: Marginal Abatement Cost (MAC) Curve of Chile NDC



Source: Nationally Determined Contribution (NDC) of Chile, 2020 Update.

This MAC curve provides information regarding the cost effectiveness of the mitigation potential required by 2030 to comply with the carbon neutrality commitment, and therefore, with the national emissions budget for 2020-2030.

27 | Study developed by the Inter-American Development Bank, together with the Pontifical Catholic University of Chile and the University of Chile using Robust Decision Making (RDM) methodology. Available at: <https://publications.iadb.org/es/opciones-para-lograr-la-carbono-neutralidad-en-chile-una-evaluacion-bajo-incertidumbre#:~:text=Chile%20busca%20alcanzar%20la%20carbono,carb%C3%B3n%2C%20fomentar%20la%20electromovilidad%20y>

In addition, a report on “Options to Achieve Carbon Neutrality in Chile: An Assessment under Uncertainty”²⁷ analyzed multiple scenarios to strengthen potential mitigation measures for achieving carbon neutrality. The study demonstrated the robustness of the country’s target, but also showed that certain uncertainty factors make it necessary to consider a safety margin to ensure compliance with the NDC. This safety margin is also aligned with the principle of equity for future generations by seeking to strengthen carbon budgets for 2020-2030 to reduce uncertainties associated with NDC compliance that could result in a greater burden for future generations. Specifically, it considered a 90% safety margin, under which the mitigation potential of each measure is reduced by 10% in the allocation calculations.

Based on the above, each potential mitigation measure considered in the preparation of Chile’s NDC was assigned to the different categories of the National GHG Inventory. This exercise is much more direct and simple when compared to the one in the previous subsection for the baseline NDC scenario, presenting each mitigation measure with a clear scope of action in terms of its reductions.

In addition, by assigning an INGEI category to each measure, it allows allocations to be made to the seven sectoral authorities proposed in the Draft Framework Law on Climate Change, thereby making it possible to know in which areas they have an impact, if they are leaders in their execution, and whether the institutions with which they are directly involved see any results from their actions.

The measures considered in the NDC and in this exercise are indicative of the effort level that each institution can make. In other words, these measures are used as a calculation basis, but at no time in this ECLP is the execution of these measures imposed on the sectoral authorities, since they are the ones that must prepare Sectoral Mitigation Plans specifying the measures to be developed and implemented to achieve the mitigation efforts established in the ECLP. This does not prevent the assigned sectoral budgets from being mandatory for the sectoral authorities identified in this ECLP.

The following table shows the allocation of mitigation measures. This allocation makes it possible to identify the sectoral authorities that play a leadership role, taking into account their ministerial powers and implementing role. This degree of responsibility, in parentheses in the table, is quantified from 1 to 4, with 4 indicating the leading institution and the others scored from 1 to 3, where 1 is the least degree of involvement.

Table 5 Allocation of NDC Mitigation Measures

NDC measure	Sector Inventory of GHG emissions	Ministry of Energy	MTT	Ministry of Mining	MINSAL	MINAGRI	MOP	MINVU
Distributed Generation	Energy* - Commercial, Public and Residential	Leader (4)					Involved (1)	Involved (2)
Transport mode shift	Energy* - Transportation		Leader (4)				Involved (1)	Involved (2)
Energy Management Systems	Energy* - Industry and Mining	Leader (4)		Involved (2)				
Electric taxis	Energy* - Transportation	Involved (3)	Leader (4)					Involved (1)
Electric vehicles - other mining	Energy* - Industry and Mining	Leader (4)		Involved (3)				
Promotion of household energy renewal	Energy* - Commercial, Public and Residential	Leader (4)						Involved (2)
Electric vehicles - industry	Energy* - Industry and Mining	Leader (4)						
Electric commercial vehicles	Energy* - Transportation	Leader (4)	Involved (1)					
Engine MEPS up to 100HP	Energy* - Industry and Mining	Leader (4)		Involved (2)				

NDC measure	Sector Inventory of GHG emissions	Ministry of Energy	MTT	Ministry of Mining	MINSAL	MINAGRI	MOP	MINVU
Capture or use of biogas from landfills	Waste	Involved (2)			Leader (4)			
Public transport – Regions	Energy* - Transportation	Involved (1)	Leader (4)					
Thermal use via gas pipelines – Hydrogen	Energy* - Commercial, Public and Residential	Leader (4)						Involved (1)
District heating	Energy* - Commercial, Public and Residential	Leader (4)		Involved (1)			Involved (1)	Involved (1)
New MEPS	Energy* - Commercial, Public and Residential	Leader (4)						
Private electric vehicles	Energy* - Transportation	Leader (4)	Involved (1)	Involved				Involved (1)

* Energy as a sector in the GHG Inventory corresponds to all activities that involve the consumption and production of fossil fuels, as defined by the guidelines of the United Nations Framework Convention on Climate Change (UNFCCC) to develop GHG inventory.

Source: Authors' research.

Through the assignment of roles by indicative measures in the NDC, bases were established for determining **mitigation efforts** for each sectoral authority, resulting in the corresponding calculation of the percentages of responsibility for each authority. These percentages were calculated as the total proportion of the degree of involvement of an institution versus the measure's total score. This allocation is based on the principle of burden equity, since it is sustained by the direct allocation of emissions to each sectoral authority depending on their involvement with the activity causing the respective emissions (e.g. GHG emissions from mining, transportation, etc.), and each sectoral authority's potential to reduce emissions, taking into account whether they are involved in or can lead the execution of the different measures identified. This is done through the authorities' legal powers within the limits of what is possible for them to implement in practice.

Applying the principle of cost-effectiveness, the measures are then ranked according to their abatement cost, from lowest to highest. Based on this ranking, measures are selected until the necessary reductions have been made to reach the national carbon budget for the 2020-2030 period established in the NDC.

Taking into account equity and cost-effectiveness criteria, each institution is assigned a proportion of the estimated reductions for each measure, making it possible to obtain the total reductions assigned for each of the seven sectoral authorities included in the Draft Framework Law on Climate Change, taking into account the safety margin mentioned earlier.

Based on this analysis of cost-effective measures, mitigation efforts are determined with respect to the baseline scenario that each sectoral authority is expected to carry out based on its powers and scope of action. These mitigation efforts are key to taking action and implementing carbon budgets, since they will allow the sectoral authorities to advance in the preparation of their respective Sectoral Mitigation Plans. The **indicative** mitigation efforts for the 2020-2030 period are key for the allocation of sectoral carbon budgets for the same period; but it is also relevant to consider, based on currently available information, what future mitigation efforts will be like (2031-2040 and 2041-2050).

Table 6 Indicative mitigation efforts by sectoral authority in the sectoral emissions budget

Sectorial Authority	Indicative mitigation effort		
	2020-2030 (MT CO _{2eq})	2031-2040 (MT CO _{2eq})	2041-2050 (MT CO _{2eq})
Ministry of Energy	35 - 43	149 - 182	328 - 400
Ministry of Mining	6 - 8	25 - 31	59 - 72

Ministry of Housing and Urban Development	5 – 6	13 - 16	32 - 39
Ministry of Transport and Telecommunications	2.7 – 3.3	17 - 21	43 - 53
Ministry of Health	1.9 – 2.4	9 - 11	13 - 15
Ministry of Public Works	0.36 – 0.44	1.9 - 2.3	1.8 - 2.2
Ministry of Agriculture	0.36 – 0.44	6 – 7	7 – 9

Source: Authors' research.

Considering the above, it can be concluded that in Chile, to achieve the goal of carbon neutrality by 2050 as science asks, the sectoral authorities must realize that in later periods the efforts they will have to make will be increasingly demanding. Considering the principle of equity and cost effectiveness, some authorities should take a greater role in their mitigation efforts with respect to their role in the 2020-2030 allocation. This confirms the relevance of the sectoral allocation of emissions budgets to achieve adequate climate planning and action for meeting the NDC goal by 2030 and carbon neutrality by 2050.

Stage 4: Calculation of budget allocation

Based on the methodology above and the mitigation efforts for each sectoral authority provided for in the Draft Framework Law on Climate Change, we can calculate the sectoral allocation of emissions budgets for 2020-2030.

As previously discussed, the allocation of the national emissions budget of 1.1 billion tons of CO_{2eq} for the 2020-2030 period is calculated based on the emissions assigned to each sectoral authority in the NDC's. Therefore that once equation 1 has been applied, based on the calculations set out above, it is possible to obtain the sectoral allocation of the GHG emissions budget, which **is due to the total CO_{2eq} emissions that the country can have in the period 2020-2030 at the most to meet its commitment under the NDC of 1,100 MtCO_{2eq}**. This establishes a country responsibility among various economic sectors and institutions to fulfill said commitment, laying the foundations for the long-term objective with which the assignment proposal is shown below.

Table 7: Sector allocation of the emissions budget for 2020-2030

Sectorial Authority	Baseline scenario NDC 2020-2030 (MtCO _{2eq})	Indicative effort - for Mitigation 2020-2030 (Mt- CO _{2eq})	Emissions Budget 2020- 2030 (MtCO _{2eq})
Ministry of Energy	306.4	38.9	271.8
Ministry of Transport and Telecommunications	305.9	2.8	303.1
Ministry of Mining	180.9	6.8	174.1
Ministry of Agriculture	123.4	1.0	122.4
Ministry of Housing and Urban Development	100.1	4.8	95.3
Ministry of Health	53.6	2.4	51.1
Ministry of Public Works	48.3	0.7	43.3
TOTAL (NDC target)			1,100

Source: Authors' research.

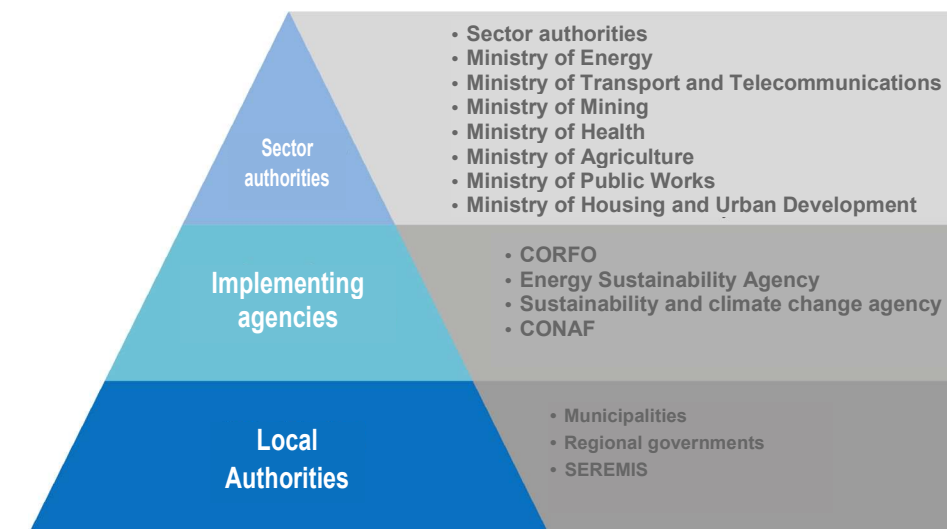
3.3 Implementing the allocation of sectoral budgets

To comply with the emission budgets assigned to the sectoral authorities, the Draft Framework Law on Climate Change requires each of them to prepare their respective Sectoral Mitigation Plans, which establish actions and measures to reduce greenhouse gases so as not to exceed the sectoral budget for emissions assigned in the ECLP. These guidelines are also included in this Strategy, requiring the previously identified sectoral authorities to prepare their respective Sectoral Mitigation Plans so they do not exceed the assigned sectoral budget. **These sectoral plans require cross-cutting and multilevel coordination between the sectoral authorities and the other state bodies that play a role in their implementation.**

From the point of view of the sectoral allocation of emissions budgets, sectoral authorities must indicate in their plans the level of involvement and responsibility of other authorities related to the execution of the mitigation measures established. Likewise, the sectoral authorities are expected to indicate in their plans the degree of involvement they will have in the measures laid out in the other sectoral plans to ensure collaboration.

The ECLP proposes identifying at least three levels of action for the sectoral authorities established in the Draft Framework Law on Climate Change, as well as the implementing agencies and local authorities. The two levels of action apply to organizations that play a role in supporting the implementation of mitigation actions in the territories, without prejudice to the participation of others according to the objectives and targets established in this Strategy. They also take into account the nature of the measures laid out in the Sectoral Mitigation Plans and the potential for the intervention of various state bodies to ensure their implementation.

Figure 13 PUBLIC sector coordination for the implementation of mitigation actions



Source: Authors' research.

In addition, the Ministry of the Environment and the Ministry of Finance are technical counterparts in the design and evaluation of carbon budgets. These Ministries, although they do not have direct responsibilities assigned with respect to sectoral emissions budgets, play a fundamental role in supporting the implementation of actions and measures through intersectoral coordination, the development of GHG emission standards, and the creation and promotion of financing instruments at the national and international levels. State implementing agencies have been identified to complement these efforts and support the sectoral authorities. Examples include CORFO, a state agency focused on private sector innovation and development, and regional and local authorities, including those that support and promote the implementation of climate action in the territories, taking advantage of the opportunities and synergies that climate action presents for them.

The future implementation of emissions budgets poses accounting challenges, given the importance of properly monitoring progress at the national level and among the sectoral authorities, in terms of their commitments. These challenges involve the following aspects:

- **The relationship between prospective emissions and energy consumption processes.** Specifically, the future **National Emissions Prospective System**²⁸, must work jointly with the the Ministry of Energy's Long-Term Energy Planning process (PELP). The latter aims to model and develop energy scenarios that include long-term projections, along with

28 | The National Prospective System (SNP) was born within the framework of the Capacity Building Initiative for Transparency (CBIT) project (financed by GEF and executed by UNEP), with the aim of coordinating and standardizing updates of national emission projections for long-lived and short-lived greenhouse gas (GHG) emissions, while also considering their socioeconomic impacts. The SNP will make it possible to facilitate and streamline the evaluation of prospective scenarios and GHG mitigation measures, installing the necessary capacities in the Ministry of the Environment and establishing a system for coordination and transfer of information between the pertinent agencies.

national consumption behavior and future energy supply, in the terms established by the General Law of Electric Services.

Both tools will be of great relevance in updating future emissions and energy consumption trajectories. Among other things, they will make it possible to estimate future compliance with sectoral emissions budgets and provide key information for updating the country's commitments.

- **Accounting for the emissions budget based on the National Inventory of Greenhouse Gases.** Chile's National Inventory System (SNI) provides emissions accounting every two years for categories in each sector, following IPCC methodology. According to the allocation determined in this strategy, it will also be necessary to gauge progress in each sectoral authority's budget based on said estimates.

- **Measurement, monitoring and verification of the mitigation measures proposed in the Sectoral Mitigation Plans.** Sectoral Mitigation Plans explain how each sectoral authority will comply with its commitments derived from the allocation of emissions budgets, through the different mitigation measures included. To this end, a monitoring, reporting and verification (MRV) system of policies and actions should be developed to estimate the effectiveness of the established mitigation measures and check progress toward meeting the respective commitments. Details of the MRV system for mitigation policies and actions are provided in the ECLP's Chapter 8.2 Monitoring, Reporting and Verification.

3.4 Sectoral budgets and regional considerations

According to the proposals in the Draft Framework Law on Climate Change, Sector Mitigation Plans must consider the macro-zones, regions and municipalities where the measures detailed in them will be implemented or focused. This is fundamental, given that the different actions have an impact not only on the fulfillment of goals at the country level, but also have an effect at the regional level, with the respective benefits.

Therefore, in defining the actions and measures to be considered in their mitigation plans, sectoral authorities must consider the feasibility of territorial implementation and existing regional action plans that specify potentially related measures or actions.

The following examples illustrate the territorial challenges of implementing the sectoral emissions budget scheme:

- **Transport: e.g., conversion of taxi fleets to electric alternatives.**

Passenger taxis are a means of transport generally present in all regions of the country, concentrated mainly in regional or provincial capitals. This measure envisions the conversion of taxi fleets that currently operate with combustion engines (gasoline, diesel or natural gas) to electric alternatives, resulting in reduction in emissions. The evaluation of this conversion will check to see that it occurs at different times in different regional and provincial capitals, with clear guidelines given to the territories regarding what is expected and in which specific geographical areas targeted for a reduction in GHG emissions.

- **Mining: e.g., introduction of "green" hydrogen-powered trucks for use in copper mining.**

Copper mining has different direct sources of greenhouse gas emissions, one of which is the operation of high-tonnage mining trucks (CAEX) fueled with diesel. These could be replaced with alternatives that operate with "green" hydrogen, bringing GHG emissions related to their mining operations to zero. Given that copper mining is mainly concentrated in the northern macro-zone of the country, the territorial impact of the GHG reductions associated with this measure would be mainly in that geographical area, with a lower incidence in other areas of the country, such as the center-south.

- **Energy: e.g., increased installation of photovoltaic systems on the rooftops of commercial and public buildings.**

Distributed generation carries great potential for the roofs of commercial and public buildings, allowing them to supply themselves with their own electricity and inject the respective surpluses. The introduction of this type of system makes it possible to reduce indirect greenhouse gas emissions from electricity consumption not supplied by renewable sources. Given that there are these types of buildings throughout the country, the impact would be distributed over a large portion of the national territory. However, the implementation of this measure in the short term would have a higher potential for solar generation in the northern and central macro-zones.

- **Housing: e.g., improving the thermal insulation required for new housing.**

Home insulation represents an important opportunity to reduce energy consumption for heating purposes. Reducing energy consumption, depending on what type of fuel is used for heating, can lower greenhouse gas emissions associated with the residential sector. The territorial impact of such a measure would be concentrated in areas of the country where homes are heated (a large part of the territory). But its greatest relevance would be in the central and southern macro-zones, given the high use of heating in winter months and the associated problem of air pollution.

- **Waste: e.g., capture and use of biogas in landfills.**

As organic solid waste decomposes in landfills, it produces emissions of methane, carbon dioxide, and other gases included in the category of Greenhouse Gases. If these are captured before they are released into the atmosphere, they can be used as biogas for various purposes, such as electricity generation.

The mitigation potential of a measure like this depends strongly on the different characteristics of landfills depending on their location in the national territory, the composition of the organic waste they contain, and the climate conditions to which they are exposed. These factors trigger different levels of biogas generation, and therefore, affect the reductions associated with each landfill that implements an action of this type.

- **Agriculture: e.g., implementation of pig manure biodigesters.**

Pigs, given their natural digestive process and depending on the food they are provided, generate purines in their solid and liquid excrement. These purines, if not managed correctly, emit greenhouse gases, including methane and nitrous oxide.

An opportunity to mitigate such emissions involves the use of biodigesters to capture the gases emitted by these purines and use it as a biogas. Cogeneration plants can then use this biogas as an input to generate electricity and heat. The resulting electricity and heat can be used by the livestock industry to replace energy sources that emit greenhouse gases.

This type of measures applied to the agricultural sector, if included in the respective Sectoral Mitigation Plan, should consider the location of the pig herd in the national territory, given that respective mitigation efforts will have a local and regional impact depending on where the projects are implemented, as well as where there is greater livestock activity.

- **Infrastructure: e.g., Life Cycle Analysis of projects.**

The development of public infrastructure and buildings must analyze the life cycle of projects to minimize their structural and operational carbon. Solutions such as renewable energies and energy efficiency must be fundamental principles in building design. In this regard, each territory offers different solutions depending on its local renewable energy resources or possible nature-based solutions, depending on its hydro-meteorological conditions.

These examples highlight the importance of the respective Sectoral Mitigation Plans in establishing the territorial incidence of the proposed measures or actions. The sectoral authorities, therefore, must address the impact of their actions on territories in light of the above considerations, as well as what is determined by the regions and communes themselves in their respective action plans, which are established as a tool for climate change management at the subnational level in the Draft Framework Law on Climate Change.

3.5 Black Carbon Component

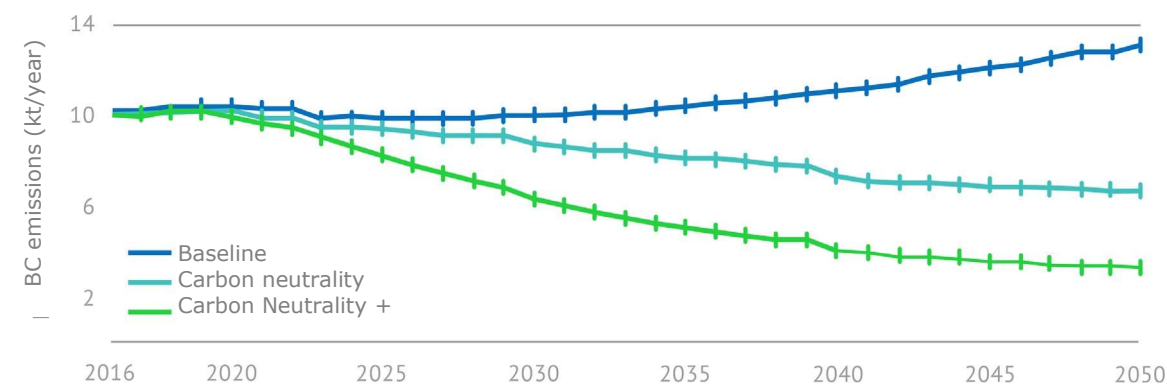
Reducing emissions of short-lived climate forcers is essential to meeting climate change targets and commitments. Black carbon (BC) is a climate-forcer, and part of fine particulate matter (PM_{2.5}), which is the main air pollutant in Chile. BC has a large capacity to absorb radiation and emit it in the form of heat, resulting in warming of the atmosphere. In addition, PM 2.5 is harmful to human health. Considering these effects, BC is of interest for both climate change and air quality. Its mitigation is important and is considered a national goal in the NDC, **which commits to a reduction of at least 25% by 2030 compared to 2016. In line with this objective, a set of mitigation policies for local pollutants will contribute to the reduction of black carbon at the national level.**

Black carbon in a long-term perspective

Taking a long-term view of black carbon emissions results in a range of emissions mitigation scenarios for fuel burning, which accounts for more than 90% of black carbon emissions in Chile.

Three scenarios are considered in this long-term vision, as can be seen in the figure below. The first is a Baseline Scenario that considers all the mitigation measures implemented by 2018. The second focuses on GHG mitigation efforts with the aim of achieving carbon neutrality in Chile. The third considers the previous measures plus additional mitigation measures focused on black carbon, and is known as Carbon Neutrality +.

Figure 14: BC emission trends according to the scenarios considered in the updated NDC



Source: Adapted from (Gallardo et al., 2020).

Considering the scenarios for black carbon emissions, the sectoral vision for 2030 includes expected reductions in black carbon. The table below shows the measures associated with each sector and the percentage reduction they are expected to produce. In particular, the measures for intensifying district heating and new standards are among the measures included in the Carbon Neutrality + scenario; therefore, the reductions shown correspond to this scenario.

Table 8: Expected reduction in black carbon emissions by sector.

Scope of reduction	Measures ²⁹	2030	Comments
Commercial, Public and Residential (CPR), Ministry of Housing and Ministry of Public Works (Office of Architecture)	Sustainable construction District heating intensification	30 - 52%	For the most part, black carbon reductions in the CPR sector come from changes in energy use, intensifying the use of electricity in homes. In addition, housing improvements are expected to result in reduced demand for electricity.
Generation, Ministry of Energy	Plant closures	40 - 52%	The decarbonization of the power grid and the intensification of the use of renewable energy reduces black carbon emissions.
Off-road machinery, Ministry of Public Works (Feasibility Office)	Hydrogen-powered vehicles New standards	20 - 44%	The reductions are due to the zero emissions produced by hydrogen.
Mining, Ministry of Mining	Hydrogen-powered vehicles	10 - 17%	The use of hydrogen and intensified use of electricity reduce black carbon emissions.
Transport, Ministry of Transport	Electromobility Hydrogen in cargo transport	60% - 75%	The use of electric vehicles is not thought to generate emissions. The increase in electricity consumption is taken into account within the Generation sector.
NDC target		25%	This target projects a reduction of at least 25% by 2030 compared to 2016.

Source: Authors' research.

29 | Measures considered in Chile's 2020 updated NDC. https://mma.gob.cl/wp-content/uploads/2020/04/NDC_Chile_2020_espan%CC%83ol-1.pdf

Black Carbon Management in Chile

Chile has an important battery of environmental management tools for the control and reduction of local air pollutants such as $MP_{2.5}$, which contribute significantly to reducing levels. These instruments include air quality standards, emission standards, and air decontamination [plans](#).³⁰

³⁰ | <https://ppda.mma.gob.cl/>

³¹ | Environmental Regulation Program 2020-2021: Official publication of the Environmental Regulation Program 2020-2021 (mma.gob.cl)

³² | PPDA – Atmospheric prevention and/or decontamination plans (mma.gob.cl)

³³ | <https://snichile.mma.gob.cl/principales-resultados/inventario-nacional-de-carbono-negro/>

³⁴ | <https://sinca.mma.gob.cl/>

Regarding emission standards³¹, Chile is one of the first countries in Latin America to adopt the Euro 6 standard for light, medium and heavy vehicles. This regulatory advance means a substantial improvement in black carbon emissions from transportation. The development of stricter regulations for off-road machinery and generator sets will also mean progress in reducing black carbon and other local pollutants. The country's Atmospheric Decontamination Plans (PDA)³², seek to improve people's quality of life by improving the air quality of cities saturated by PM 2.5. The measures included in these plans have a direct impact on black carbon emissions by helping to improve urban air quality and mitigate the effects of climate change.

Most of the measures included in the plans address the reduction of emissions resulting from the burning of firewood. Others involve adapting buses and filters for off-road machinery.

Chile has two tools to measure and monitor black carbon (BC) emissions:

I) The National Black Carbon Inventory, which identifies and reports BC emissions to verify progress and compliance with BC reduction commitments. This inventory is part of the national GHG inventory system.³³

II) The Air Quality Monitoring System,³⁴ which monitors concentrations of $MP_{2.5}$ and other pollutants throughout Chile. In addition, BC concentration measurement equipment contributes to improve local understanding of black carbon by generating consistent time series to verify its presence.

Challenges to Strengthen Black Carbon Management by 2030

The ECLP strengthens Chile's long-term vision for managing black carbon, and with a view toward meeting the reduction target established in the NDC, it sets the following objectives regarding the control and verification of black carbon emissions.

I) Black Carbon information and reporting system, national and regional, 2022

a) Biannual update of the Black Carbon Inventory in accordance with reports to the UNFCCC. The inventory will be updated to reflect real conditions, taking into account updated information from all sectors.

b) Regional Black Carbon Emissions. A regional BC inventory will accompany regional inventories of greenhouse gases.

c) Black Carbon Emissions Projection System. This will be developed in line with the implementation of the National Prospective System, which seeks to coordinate and standardize the prospective capacity of GHG and black carbon emissions in Chile. The system will be national in scope, disaggregated on a regional scale, and form part of the National Prospective System.

II) Generation of knowledge

a) Updating of decision elements. Survey and updating of local emission factors for black carbon and other pollutants, deterioration of technology, etc.

b) Health and ecosystem impacts in Chile.

c) Inclusion of black carbon analysis in Regional Action Plans for Climate Change and other tools.

III) Black Carbon Measurements

International collaboration will be sought for the online publication of black carbon measurements and the extension of the measurement network at a regional level.



Photo by Bryan Contreras

04 ADAPTATION

The Path to Climate Resilience

05 SECTORAL CONTRIBUTIONS

06 CLIMATE CHANGE MANAGEMENT

Adaptation: The Path to Climate Resilience

Given its vulnerability to climate change, Chile needs national, regional and community adaptation plans to anticipate and deal with the current and future impacts of climate change. The global adaptation goal established in the Paris Agreement (Art. 7) calls for strengthening resilience by increasing adaptive capacity and reducing vulnerability to climate change, while recognizing the importance of avoiding, or minimizing, loss and damage related to the adverse effects of change climate (Art. 8).

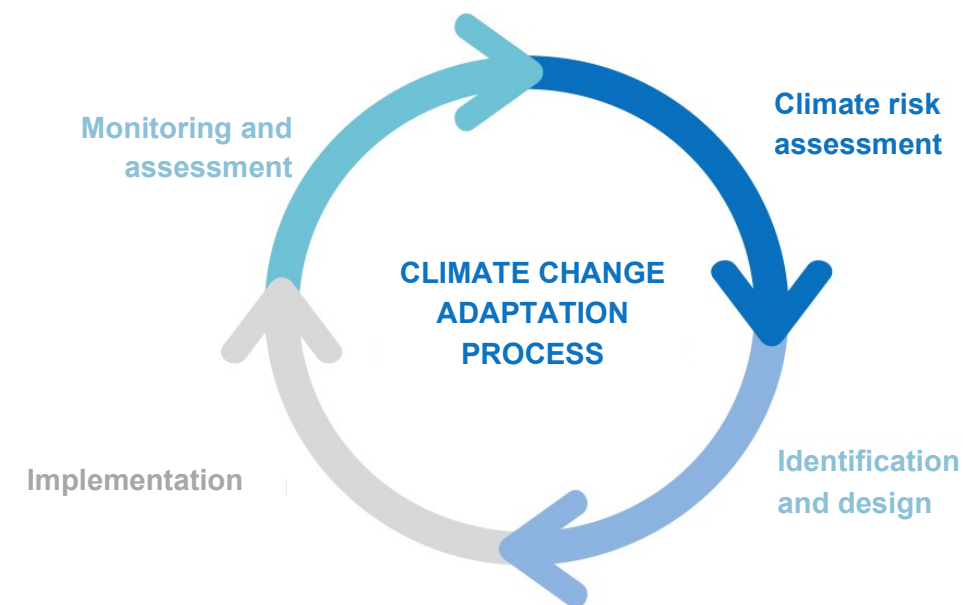
As part of its main objective, the Draft Framework Law on Climate Change calls for reducing vulnerability and increasing the country's resilience to the adverse effects of climate change. It establishes management instruments at the regional, local and sectoral levels, as well as organizations responsible for their preparation, updating and implementation. The bill also states that, through the ECLP, these main guidelines, objectives and targets aim to make progress towards climate resilience by 2050. This chapter contains the guidelines for the adaptation process and the definition of indicators. Chapter 5 details the guidelines, objectives and targets for adaptation and mitigation to which the country commits in various sectors and integration components. Chapter 6 details the guidelines, objectives and targets for advancing regional and local action.

4.1 Conceptual framework of vulnerability and adaptation

Adaptation is a development planning process at the national, regional and local levels to face climate impacts and risks, with the aim of reducing vulnerability and increasing resilience to the adverse effects of climate change. The process begins with the identification and assessment of present and future climate risks that affect natural, human and productive systems. Using this information as their basis, adaptive measures are defined and designed to address and minimize the risks identified. These measures can be implemented to reduce the level of exposure to threats, reduce vulnerability to them, or increase

adaptive abilities, depending on what is determined to be the most appropriate and cost-effective solution. Subsequently, the monitoring and assessment phase seeks to monitor and measure the effectiveness of these measures and incorporate lessons learned in a continuous cycle that increases the country's resilience, as shown in the following figure.

Figure 15: Process of adaptation to climate change, implemented through different tools and scales.



Source: Authors' research.

The conceptual framework of climate risk³⁵ that we have determined corresponds to the latest framework available from the IPCC in its Fifth Assessment Report (2014). Within this framework, climate risk is understood as the probability of occurrence of impacts on a territory, and the social and natural systems that inhabit it, as a result of climate events or trends, as well as the human response to them. The factors that determine this and must be present simultaneously for it to occur are hazard, exposure and vulnerability. Their definitions and relationships are outlined below:³⁶

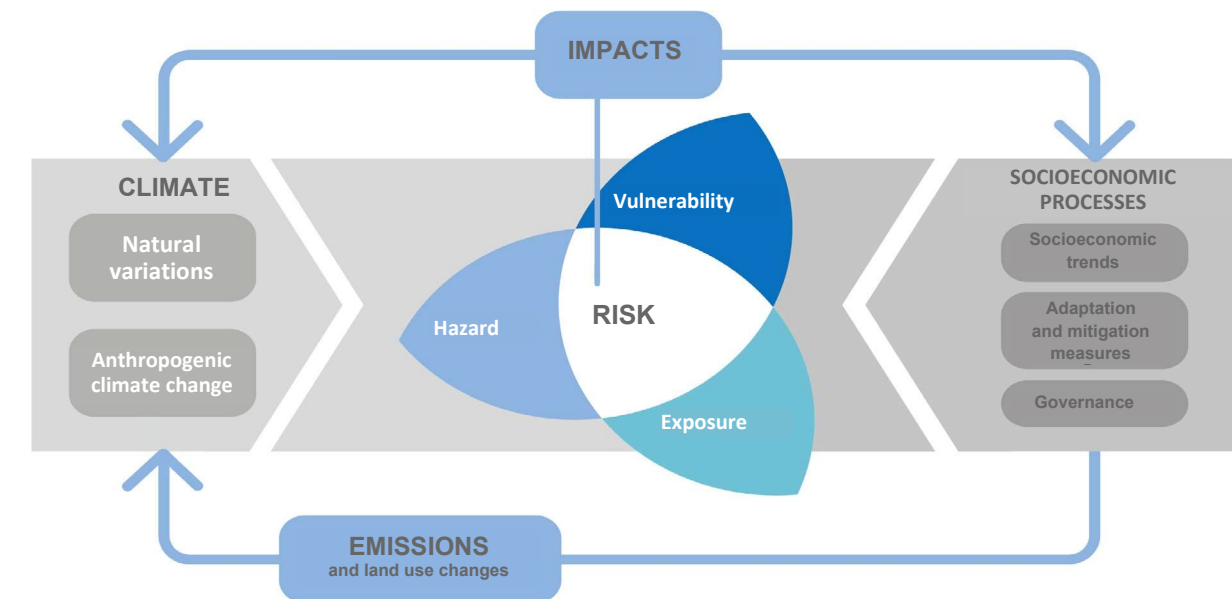
³⁵ | This issue is also addressed in point 4.2, "Disaster Risk Reduction," and point 4.3, «Assessment of Climate Risks – Platform for Adaptation: Atlas of Climate Risks (ARClim)» in this Strategy.

³⁶ | ARClim, 2020; based on GIZ Eurac, 2017 and IPCC, 2014

- **Hazard:** Climate condition whose potential occurrence can result in loss of life, accidents and other health impacts, as well as loss of property, infrastructure, means of subsistence, provision of services, ecosystems and environmental resources.
- **Exposure:** The presence of people, livelihoods, environmental services and resources, infrastructure, or economic, social, or cultural assets in places and times that could be negatively affected.
- **Vulnerability:** The propensity or predisposition to be negatively affected. In turn, this is made up of **Susceptibility**, determined by all the non-climate factors that directly affect the consequences of a climate event (including the physical, social, economic and cultural attributes of the sector or sub-sector), and **Adaptive Capacity**, understood as the capacity of people, institutions, organizations and sectors to address, manage and overcome adverse conditions in the short and medium terms, using available skills, values, beliefs, resources and opportunities.

Susceptibility, Adaptive Capacity and Exposure can be changed by adaptive measures to reduce climate risk. It is important to note that each of these factors contains uncertainty, in particular hazard, whose estimation involves projections about the future that involve uncertainties inherent to modeling and the impacts on various systems. These uncertainties or lack of scientific certainty should not be used as a reason to postpone the adoption of measures to avoid said risks or dangers, or prevent the adverse effects of climate change, considering the principle of cost effectiveness. We recommend integrating climate risk analysis into each of the development phases of climate change management and Disaster Risk Reduction tools, especially in the preparation, updating, implementation and monitoring stages.

Figure 16: Conceptualization of Vulnerability from the IPCC Fifth Assessment Report



Source: IPCC (2014, p.3).

4.2 Guidelines for adaptation at the national, sectoral, regional and local levels

The National Plan for Adaptation to Climate Change (NAP)³⁷¹ has been to date the main instrument for the implementation of adaptive measures at the national, sectoral and subnational levels (regions and communes of Chile). The Draft Framework Law on Climate Change, taking into account Chile's most vulnerable sectors, recommends that the country have 11 Sectoral Adaptation Plans, in Forestry, Agriculture, Biodiversity, Fisheries and Aquaculture, Health, Infrastructure, Energy, Cities, Tourism, Water Resources, Mining and Coastal Areas. These plans are mandatory public policies of the central government, which seek to integrate the guidelines contained in this Strategy and incorporate climate change into the work of each sector, to minimize negative effects and take advantage of opportunities that may be generated.

These adaptation plans are the responsibility of the competent sectoral authorities, who coordinate their design and implementation with the Ministry of the Environment and other relevant actors. After five years of implementation, they must have a final external evaluation and be updated for an addition period, incorporating lessons learned to date.

Chile has advanced in the development and implementation of these plans, generating capacities in its institutions and incorporating climate change in its programs, policies, visions and structures. Through the NAP, intersectoral coordination has been generated at different scales. This process is recognized as part of the formal institutionalization of climate change and strengthened in the Draft Framework Law on Climate Change, with examples including the ETICC and CORECC.

While capacity building and adaptation at the sectoral level is necessary, similar efforts at the sub-national level are also critical to moving towards a climate resilient society. The need for instruments to address with climate change at the subnational level is recognized in the Draft Framework Law on Climate Change, which stipulates developing and implementing Regional Climate Change Action Plans (PARCC) and Local Climate Change Action Plans (PACCC), which must be prepared and approved by the CORECC and municipalities, respectively. All these plans will guide their adaptive measures to cover a wide range of specific requirements and needs, in accordance with the long-term objectives and targets committed to in this strategy.

³⁷¹ | Plan prepared within the framework of the National Climate Change Action Plan 2008-2012 and approved by the Council of Ministers for Sustainability and Climate Change on December 1, 2014, available at: <https://mma.gob.cl/wp-content/uploads/2016/02/Plan-Nacional-Adaptacion-Cambio-Climatico-version-final.pdf>

Guidelines for adaptation at the sectoral level

The sectors prioritized for adaptation at the national level have, as a whole, 46 long-term objectives in this Strategy. These are presented by sector with the mitigation and integration objectives in Chapter 5: Sectoral contributions and integration components. The objectives set for the different sectors reflect similar response needs, with specificities that can be summarized as follows:

- Strengthen sectoral governance at different territorial levels by installing capacities in public institutions, ensuring diversity of stakeholders in each sector, and deepening citizen participation in the development of sectoral climate change policies.
- Deepen and expand scientific knowledge and technological development in the different sectors, as well as in the interactions and synergies between them, to support decision-making.
- Reduce risk from the impacts of climate change through an integrated approach in policies and instruments designed to reduce vulnerability, exposure and increase adaptive capacity, monitoring the evolution of risk based on changing climate threats.
- Integrate climate change into sectoral policy instruments at the territorial level, recognizing the diversity of impacts and local realities.
- Implement actions prioritizing nature-based solutions.
- Protect, restore, avoid and reduce the degradation of ecosystems by promoting the sustainable use, production and consumption of natural resources.
- Promote sustainable production capabilities in the fishing and aquaculture, agriculture, livestock and forestry sectors, considering adaptation to climate change as a way to contribute to food security and the sustainability of natural resources.
- Promote water security for human consumption and sanitation, and provision of water for ecosystems and productive activities, contributing to the efficient use of water resources in the territories. This guideline is cross-disciplinary and will be observed in the fulfillment of the other objectives, targets, guidelines and directives of this Strategy.

Cross-disciplinary guidelines for adaptation in the territories

Coordination among the various territorial sectors and administrative levels is essential to the design and implementation of adaptive measures, to give coherence to policy instruments, account for the wide-ranging nature of adaptation, create synergies and avoid poor adaptation. This coordination is in the hands of different authorities depending on each instrument's stage of development. Those involved may include the Council of Ministers for Sustainability (CMS), the Interministerial Technical Team on Climate Change (ETICC), the Regional Councils of Climate Change (CORECC), and the Ministry of the Environment (MMA) and its Ministerial Regional Secretariats (SEREMIs). The CMS brings together the main sectors that contribute most to GHG emissions and those most vulnerable to the adverse effects of climate change and are able to submit their policies, plans, programs, and sectoral instruments that have an impact on the management of climate change for a multisectoral analysis allowing the introduction of criteria for mitigation and/or adaptation to climate change in the proposed regulations. For its part, the ETICC brings together technical counterparts in various state bodies with competencies related to the subject of climate change to carry out technical analysis of the instruments submitted. The various sectoral authorities are represented at the regional level in the CORECC through their respective Ministerial Regional Secretariats, and within said body they are linked with regional and local authorities to generate synergies between their respective instruments. In addition to these authorities, the Ministry of the Environment acts as a technical counterpart in the preparation and updating of climate change management tools and is empowered to support sectoral organizations in integrating climate change criteria into their policies, plans and programs. Finally, the Ministry of the Environment SEREMIs make up the CORECCs and serve as the technical secretariat for these organizations, providing administrative and technical support in their operation. Other integration and coordination mechanisms will be established to regulate the preparation and updating of the various climate change management instruments, both the Sectoral Adaptation Plans and the Regional Action Plans, to guarantee coordination between sectors and at the national, regional and community levels. Priority will be given to measures that generate synergies between adaptation and mitigation, optimize resources, promote the use of nature-based solutions, consider actions for addressing the risk of extreme climate events, include a gender approach, take into account the ancestral knowledge of local communities and native peoples of our country, and promote private sector involvement in the country's adaptation process. Additionally, external factors that could increase vulnerability to climate change and are related to other environmental problems should be taken into account, such as air pollution and the loss of biodiversity and its ecosystem services, due to changes in land use, etc. This implies linking adaptation policies

with other policies, such as decontamination or prevention plans for saturated or latent air pollution, to create synergies between both types of instruments.

• Disaster Risk Reduction (DRR)

Disasters associated with climate change are affecting the country more intensely and more frequently, making it a priority to prevent, minimize and address the losses and damages that these may cause through the early planning of adaptive solutions.

Solutions aimed at reducing disaster risk must consider Integrated Risk Management and address hazards of a varied nature. In the case of climate-related threats, these solutions must consider both extreme and slowly developing events. We therefore recommend adopting an ecosystem approach to DRR that considers the use of nature-based solutions to increase resilience to emergencies and disasters³⁸. Non-economic losses (human life, health and well-being, social, environmental, cultural and spiritual aspects, among others) and human mobility must also be addressed in the context of climate change.

The National Emergency Office (ONEMI) of the Ministry of the Interior and Public Security is the institution responsible for the implementation of the Sendai Framework in the country. It leads the National Platform for Disaster Risk Reduction (PNRRD)³⁹, a body that provides multisectoral and cross-disciplinary advice to the ONEMI and whose main function is to promote disaster risk reduction as a strategy for the country's sustainable development.

In 2020, ONEMI created the Roundtable on Human Mobility, Climate Change and Disasters, a body made up of representatives from the public sector, academia and civil society. It is preparing guidelines on the dynamics of human mobility, climate change and disasters in Chile, with the aim of expanding knowledge about the expression of this phenomenon in our country to guide the creation of public policies and the formulation and/or adaptation of related tools at the national and subnational levels. In so doing, it seeks to integrate this theme into a common scheme that informs coordinated and synergistic decision-making and advances in the construction of more resilient and sustainable communities and territories.

Through its work, the roundtable has determined that this phenomenon is in an incipient stage of study in Chile; therefore, one of its challenges will be to generate actions that allow progress towards a research agenda to obtain data for guiding future public policies.

Compliance with the adaptive goals of this strategy, with a view to disaster risk reduction, will reduce losses and damages. The National Plan for Adaptation to Climate Change, the National Policy for Disaster Risk Reduction, with its National Strategic Plan 2020-2030, and its future updates

³⁸ | The Sendai Framework 2015 – 2030 highlights the importance of applying this approach in points 28 d) and 30) n. Document available at: https://www.unisdr.org/files/43291_spa_nishsen-daiframeworkfordisasterri.pdf

³⁹ | <https://www.onemi.gov.cl/plataforma-de-reduccion-de-ries-gos-de-desastres/>

are key instruments for integrating solutions for adaptation and disaster risk reduction to allow for sustainability in the fulfillment of long-term objectives and targets.

Likewise, the linking of criteria for mitigation and adaptation to climate change with DRR is fundamental in the territorial planning process carried out by various state entities with competences in the matter, such as the Ministry of Housing and Urban Planning, and regional and municipal governments.

Commitments:

- By 2023, wide-ranging aspects of disaster risk management (DRM) or disaster risk reduction (DRR) will have been incorporated into the work plans of the Regional Climate Change Committees (CORECC) - (ONEMI, Ministry of the Environment).
- By 2025, an awareness program will have been enacted regarding the link between Disaster Risk Reduction with Climate Change and related topics (e.g., human mobility) - (ONEMI, Ministry of the Environment).

Adaptive needs of groups most vulnerable to climate change

Climate change will especially affect society's most vulnerable groups, aggravating pre-existing conditions of vulnerability. For this reason, the design of adaptive tools and measures must prioritize these groups by incorporating differentiated approaches and indicators that make it possible to assess their vulnerability with the aim of identifying their specific needs. For the same reason, the development of participatory mechanisms that address the needs of vulnerable groups and allow their involvement in climate change management is essential for the preparation, updating and implementation of climate change management tools.

Indigenous peoples have a special vulnerability due to their relationship with and dependency on natural resources affected by climate change. At the same time, it is recognized that their ancestral knowledge can constitute solutions and contributions to adaptation, as is specified in Chapter 2: Chile's Long-Term Vision: Transition to Sustainable and Inclusive Development by 2050.

To complement this approach, the design and implementation of adaptation measures will seek to reduce gender gaps and create a better understanding of the differentiated impact of climate change on men and women, promoting qualitative and quantitative participation

by women. The process of preparing this strategy identified gender gaps associated with various sectors regarding gender inequality in access to participation and decision-making; ownership and use of natural resources (water, land, sea and high-quality energy); a fair salary, formal work and access to credit; access to information, training, technology and use of technology; information gaps with regard to the impacts of climate change disaggregated by gender; and shortcomings in the use of language and the recognition of local and ancestral knowledge.

Facilitating private sector participation in climate change adaptation

Just as progress has been made with regard to adaptation in the public sector, it is becoming increasingly important for private companies to participate in the planning, implementation, monitoring and evaluation of the country's adaptation at the national, regional and community levels.

Depending on their activity and the sector to which they belong, private sector actors may be strongly affected by direct or indirect impacts on their own operations or components of their value chain. Resulting changes in regulation or the consumption patterns of their products have the potential to affect their customers, suppliers, natural environment and the communities where they live or operate⁴⁰. However, companies are also in an excellent position to visualize and capitalize on the potential benefits of adaptation. Having a long-term strategy that sets adaptive guidelines and priorities sends a clear signal to the private sector to avoid investments that are inconsistent with resilient and sustainable development.

To date, various instances of exchange and collaboration have been developed between the public and private sectors in this regard, but their inclusion must be advanced throughout the entire adaptive process⁴¹. The various adaptation instruments will seek to promote the participation and collaboration of private companies and activities in the design, financing and implementation of adaptation measures to contribute to the country's climate resilience.

For their part, state bodies for the promotion of the private sector will prioritize projects and initiatives that are compatible with climate adaptation and mitigation measures, integrating nature-based solutions and others with a focus on the local sphere and/or vulnerable communities, as well as those that include the active participation of civil society.

Projects that have state support will also promote information gathering regarding the risks and impacts associated with climate change.

⁴⁰ | Acción Empresas, 2018.

⁴¹ | IISD, 2019. Retrieved from napglobalnetwork.org

Nature-based solutions

Chile's NDC and ECLP both consider nature-based solutions for adaptation and mitigation, a concern that must also be addressed at the subnational level. These efforts will draw on the report prepared by the Scientific Ministerial Advisory Committee on Climate Change, which makes an initial proposal for the type of solutions to be considered for the various sectors. In Chapter 5: Sectoral contributions and integration components, objectives that take these into account are incorporated. In addition, in the process of preparing and updating the Sectoral Adaptation Plans for application to the Green Climate Fund, the inclusion of this type of measure is explicitly established, and studies have been planned to help sectors include them, such as the evaluation of co-benefits, links with productive sectors, economic evaluation, among other aspects.

Due to the uncertain and dynamic nature of the impacts of climate change, the implementation of adaptation solutions must be accompanied by a periodic evaluation of vulnerability to assess the effectiveness of measures and identify factors that facilitate or hinder them to allow for adjustments for continuous improvement.

Considering the diversity of the national territory, where there are significant differences in terms of risk and vulnerability between sectors, ecosystems, groups and territories, having information on the impacts of climate change for decision making is essential. To this end, the **Climate Risk Atlas (ARClim)**⁴² was created. It is an evolving tool in the form of an integrated and dynamic web platform covering the entire national territory, showing relative risk in the face of climate change, taking into account projections under the RCP 8.5 greenhouse gas emissions scenario of the IPCC (AR5).

This tool uses the conceptual framework of climate risk that was previously presented, and can be used to improve the design and implementation of adaptation policies and measures. From the user's perspective, the platform has two main sections: Risk Maps and a Threat Explorer. The Risk Maps feature risk indices formulated based on 52 impact chains for native forests, forest plantations, mining, agriculture, coastal infrastructure, water resources, tourism, traditional fishing, aquaculture, biodiversity, electricity, and human health and well-being (health, human settlements, cities and coasts). The climate Threat Explorer is a tool to facilitate access to, visualization, analysis and download of climate indices. It allows users to analyze new impact chains.

The impact chain methodology with which it was built makes it possible to evaluate the increase in risk due to climate impact, comparing risks for the current period (1990-2010) and the future (2035-2065). Risk indicators

42 | <https://arclim.mma.gob.cl/>

can be disaggregated by municipality or aggregated by region to guide the design of adaptive measures at different territorial levels. This can also be done for the sectors associated with the various systems evaluated.

This information should be considered by those responsible for national, regional and community planning, both public and private, to identify areas that require greater attention according to the relative risk they present. The diversity of threats and systems analyzed allow different actors to install the capacity to anticipate the effects that could occur in their territory and adequately plan the most pertinent adaptation measures.

The ARClim platform will be maintained, updated and expanded to deepen the risk assessment for each sector. It will also incorporate an intersectoral dimension, among other aspects, with the goal of continuous improvement. The system will also be supplied with information generated through the vulnerability studies carried out for the preparation and updating of the Sectoral Adaptation Plans and the Regional Climate Change Action Plans. The ARClim platform will go hand in hand with a system of adaptation indicators, for which a roadmap will be established with the relevant actors. The role of the platform will be included in this objective.

4.3 Indicators for Monitoring, Reporting, Verification and Evaluation of Adaptation in the long term

MRV and evaluation is an essential part of the adaptation process, since it allows for the identification of adaptation needs, the measurement of progress in the implementation of measures, their effectiveness, and the incorporation of lessons learned in the evaluation, in a process of continuous improvement that seeks to increase the country's resilience. Adaptation indicator systems serve multiple purposes (IPCC, 2014) and in the context of a long-term strategy where conditions of uncertainty exist, they require a permanent review of their pertinence, relevance and trajectory. As dynamic systems, they can be perfected and modified as information becomes available or needs change.

In recent years, efforts have been made to advance in the monitoring of adaptation plans, as is reflected in the national reports presented annually to the Council of Ministers for Sustainability.

In addition, progress has been made in monitoring climate threats, their impacts on the various systems of interest, and climate risk, both current and projected. This is reflected in ARClim, which yields indicators that help determine factors that should be modified through adaptation, constituting a solid basis for decision making.

The work carried out and lessons learned to date allow us to move towards a system that integrates monitoring of the implementation process with indicators that allow us to evaluate the fulfillment of the objectives set and the results of the adaptation process.

A challenge to be addressed is how to cross these types of indicators to measure the effectiveness of adaptation tools in reducing vulnerability, increasing adaptive capacity and resilience. Through the NDC (2020), Chile has committed to strengthen the current evaluation and monitoring system by integrating process indicators (implementation) and results indicators (progress and effectiveness) for all tools for adapting to climate change.

Process Indicators: Measurement of the Implementation of Adaptation Policy Tools

The process indicators assess the level of compliance with adaptive measures and their integration by public and private institutions at different levels of governance. Through these types of indicators, the country has been measuring progress in the implementation of climate change tools since 2015, considering the objectives and measures established by the adaptation plans, and measuring progress towards compliance with them.

- **Commitment:** Within the framework of the NAP, implementation of the Monitoring, Reporting, Verification and Evaluation of process indicators for adaptation to climate change in the country will begin by 2023. This will include adaptive measures at the national and regional levels, as well as sectoral plans. The MRV&E design will consider standardizing processes and indicators, and establish common criteria that make them comparable and reliable, while providing transparency to the monitoring and evaluation process. The MRV&E will be an evolving tool that will be constantly updated to incorporate the results of the implementation of the indicated plans and their corresponding updates. It will be publicly accessible and will allow improving the reporting of progress in adaptation at the national and territorial levels to the United Nations Framework Convention on Climate Change, through Biennial Transparency Reports, National Communications and Adaptation Communication.

Outcome indicators (progress and effectiveness): Climate risk assessment

The ARClim indicators will be used as a basis for robust monitoring and evaluation of the country's vulnerability to climate change and the adaptation process. The platform will be fed new information on Threats, Sensitivity, Adaptive Capacity, Exposure and Risks for various systems according to the needs that emerge from the continuous process of Monitoring, Reporting, Verification and Evaluation (M&E). These indicators will allow us to indirectly evaluate the results of the adaptation plans and other policies that address climate change. A continuous improvement mechanism will be established to integrate instrument monitoring into the results monitoring system.

These types of indicators are classified into:

- Progress indicators, which refer to the effect of adaptation measures on reducing sensitivity to climate change (vulnerability), reducing exposure or increasing adaptive capacity.

- Efficacy indicators, which do not necessarily refer to a specific adaptation measure, but instead indicate how climate risk changes as a result of the adaptation process.

There is currently work in progress to advance the definition of results indicators, both sectoral and intersectoral, to evaluate needs and gaps still to be covered based on existing indicators. Based on the main challenges and vulnerabilities defined through participatory processes by the different public and private actors, academia and NGOs for the 11 sectors prioritized for adaptation, as well as expert analysis and a review of the international state of the art, it seeks to develop new indicators as part of the country's vulnerability and adaptation monitoring system.

ARClim has indicators for 52 impact chains, representing a first baseline at the national level on which new impact chains can be built to complement the available information. Although this information is recent and was not part of the construction of the existing sectoral adaptation plans, it will serve as the basis for updating these and developing the next ones to be drawn up, as well as the Regional Action Plans and Local Action for Climate Change Plans.

For the development of this type of indicators, a special focus will be placed on the future availability of water as one of the greatest pending challenges in Chile. This approach will take into account metrics for an intersectoral review of resources common to sectors, such as water and soil, where "no regrets" practices such as Nature-based Solutions (NbS) and Hydraulic Resources Management (HRM), among others, are considered to be key in the long term. Progress will also be made in the development of indicators that account for the relationship between gender and climate change, which will be integrated into the ARClim platform's Climate Risk Maps.

Commitments:

- By 2022, Chile will have at least one result indicator (progress and effectiveness) for each of the 11 sectors prioritized for adaptation, making progress towards evaluating the effectiveness of the adaptation.
- By 2022, a governance framework and a long-term roadmap will have been defined for the construction of a system of vulnerability and adaptation indicators. The goal is to build consensus on permanent and sustained work over time, with common criteria and broad and multi-stakeholder participation from academia, the private sector and NGOs, to have a robust, legitimate and transparent monitoring, reporting and evaluation system for adaptation⁴³.
- By 2025, there will be a system of vulnerability and adaptation indicators that encompasses progress and result indicators for all

⁴³ | This work, implemented 2020-2021, is framed in the Capacity Building Initiative for Transparency (CBIT), a project financed by the GEF, executed by UNEP and implemented by the Ministry of the Environment.

instruments for adaptation to climate change. This will translate into an evolving, publicly accessible and permanently updated tool that will improve the reporting of adaptation effectiveness at the national and territorial levels.

Costs of Inaction and Losses and Damages due to Adaptation Limits

Significant progress has been made in recent years in evaluating the costs of inaction; that is, how much it costs the country not to adapt to climate change. This assessment supports the decisions regarding making necessary investments for adaptation. However, recent evidence shows that countries and communities are suffering significant damage and loss that adaptation cannot avoid. As the IPCC Sixth Assessment Report (2021) indicates, many changes are irreversible in the coming centuries and millennia, especially changes in the ocean, ice sheets and global sea level. The frequency and intensity of heat waves and extreme precipitation, agricultural and ecological droughts, and other threats are expected to increase, and if emissions are not sharply reduced, global warming will exceed 1.5°C and 2°C during the 21st century, making the impacts more acute and further jeopardizing the effectiveness of adaptation.

Adaptation will therefore have limits in cases where no options exist that can be implemented in a given time horizon to achieve one or more management objectives, maintain current levels of development or sustain natural systems. This implies that certain goals, practices or livelihoods, as well as natural systems, may not be sustainable in a changing climate. It means that transformation will take place, whether deliberate or inadvertent. We need to be prepared and anticipate the limits to adaptation, estimating associated damages and losses to seek paths for transformation that are more acceptable, sustainable and cost-effective for ecosystems and communities. To this end, the costs of inaction will be included as a line of work in the country's strategy to determine how much of these costs corresponds to unavoidable losses due to the limits of adaptation. Future adaptation plans, as well as the PARCC, will identify those limits and propose the necessary transformations to compensate for these losses. This needs to be part of periodic estimates of the costs of inaction, which are relevant inputs for decision-making regarding adaptation.

• Commitment:

The country's potential losses and damages in the case of inaction will be evaluated by 2025, and by 2030 a consensus methodology will be incorporated into all sectoral adaptation plans and the National Plan for Adaptation to Climate Change.



Photo by Daniel Pineda

05 SECTOR CONTRIBUTIONS

and Integration Components

06 CLIMATE CHANGE MANAGEMENT

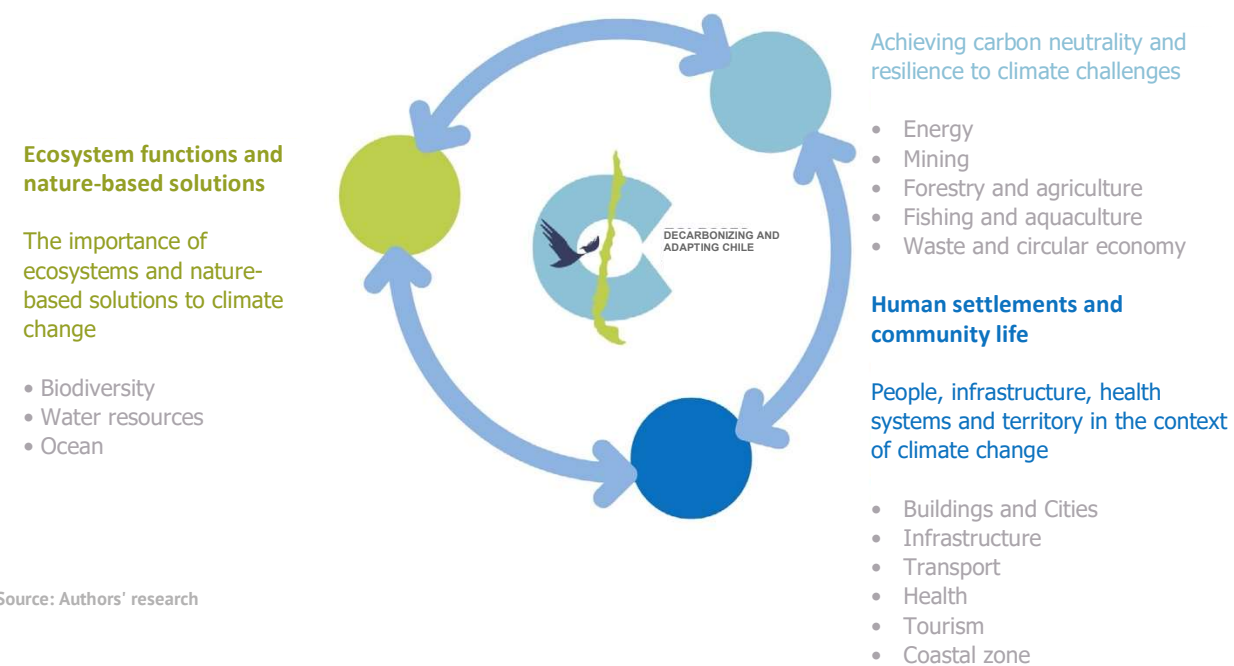
07 COST EFFECTIVENESS

Sector Contributions and Integration Components

Chile's transition to carbon neutrality and resilience to climate change over the next three decades will be the result of a series of social, institutional and sectoral transformations, implemented through mitigation and adaptation measures in organizations, industries, infrastructure and key ecosystems. This chapter presents the long-term visions conceived for these transformations, specifying the medium- and long-term objectives and targets that are involved in the national transition process and describing the main instruments and institutions involved.

These transformations must be carried out in an integrated manner that generates synergies between them, and addresses the multiple interrelationships between institutions and sectors that are part of the country's transition, while being linked to Sustainable Development Goals (SDG). Throughout the strategy development process, the following cross-cutting issues were addressed:

Figure 17: Cross-cutting issues



• **Transition of manufacturing sectors. Achieving carbon neutrality and resilience to climate challenges:** The country's unions, industries, activities and manufacturing sectors face the challenge of moving towards sustainable development based on science, in harmony with the environment and local communities, to promote good practices in the sustainable use of resources, advance transversally towards an innovative and circular economy low in GHG emissions, and with actors and institutions whose capacities and attributes have been strengthened to face climate threats.

• **Human settlements and community life. People, infrastructure, health and territories in the context of climate change:** Cities, settlements and services focused on people and communities have the challenge of contributing to the formation of an equitable, inclusive and resilient society that integrates ecosystems, identity and local knowledge for the development of each territory considering its vulnerabilities and opportunities in the face of climate change. This requires intersectoral coordination, effective multi-stakeholder participation, integrated planning and effective management to reduce GHG emissions and adapt to the impacts of climate change.

• **Ecosystem functions and nature-based solutions The importance of ecosystems and NbS in the face of climate change:** Our country has the challenge of recognizing, valuing and protecting biodiversity and the multiple ecosystem services that nature provides to contribute to sustainable development and climate management. Likewise, carbon sequestration and sinks must be maintained and increased. We need to advance in the sustainable use and conservation of water resources and promote the use of Nature-based Solutions in the various areas of national activity.

Although this transition will materialize in a transversal and integrated manner, the description of visions, for the most part, the objectives and targets in the ECLP correspond to the sectoral classification established in the Draft Framework Law on Climate Change, with the designation of a leading state body for execution, monitoring and reporting. This body is the one with the greatest powers for the implementation and coordination of associated public policies. Nevertheless, implementation of the actions required for the fulfillment of goals and objectives demands co-responsibilities and coordination between state institutions.

For example, although the Ministry of the Environment has a central role in the definition and development of public adaptation and resilience policies at the national level, in practice these are the product of close collaboration between multiple state agencies responsible for promoting nature-based solutions, regulating national infrastructure, and studying the climate vulnerability of different ecosystems and manufacturing sectors, among other crucial functions. In turn, mitigation actions

related to fuel consumption are led mainly by the Energy authorities, but are closely related to other fields, such as transport, mining and cities. This also occurs in the area of waste/circular economy, which links issues that are closely related to health in terms of transport and final disposal of waste. These types of measures will be addressed jointly with the different agencies involved.

In light of the above, the different visions, long-term climate objectives and targets established by the sectors of Energy, Mining, Forestry, Agriculture, Fisheries and Aquaculture, Waste and Circular Economy, Buildings and Cities, Infrastructure, Transportation, Health, Tourism, Coastal Areas, Biodiversity, Water Resources and Oceans are presented below.

5.1 Energy

Energy is a basic and fundamental element for achieving carbon neutrality in Chile by 2050. It is the sector with the highest emission of greenhouse gases in the country, responsible for 77% of total emissions in 2018; but at the same time, it has the greatest potential for mitigating emissions. The energy transition that the country is experiencing involves the mass incorporation of renewable energy technologies, voluntary decommissioning of coal-fired thermoelectric plants, energy efficiency, electromobility, and the incorporation of green hydrogen and lithium management as cornerstones.

The Ministry of Energy has the greatest participation in the design and implementation of mitigation measures to achieve carbon neutrality. The integration and articulation of these measures is carried out through the establishment of long-term public policy instruments led by the Ministry of Energy, such as the National Energy Policy, which encompasses the Strategic Environmental Assessment (SEA),⁴⁴ and the Long-Term Energy Planning (PELP) regulatory mechanisms, informed by the development strategies defined for green hydrogen, electromobility, energy use at the residential level, and those laws and programs with a direct impact on compliance with carbon neutrality goals, such as the Energy Efficiency Law, among others.

Given the drive and enormous potential for developing renewable energy in Chile, permanent efforts are underway to innovate and integrate new technologies. The country's solid regulatory institutional framework has resulted in a significant number of initiatives, including laws, strategies, programs and projects that contribute substantially to the direct mitigation of greenhouse gas emissions.⁴⁵

In the context of adaptation, according to the Climate Change Adaptation Plan in the Energy Sector (Ministry of Energy, 2018), national and international experience shows that climate change will have considerable impacts that affect the availability of energy resources, energy generation infrastructure, and the transport of energy, both electric and fuel. It will also impact their final use, including greater variability in the


⁴⁴ | The Strategic Environmental Assessment (SEA) is the procedure carried out by the respective state administrative body to ensure that environmental Sustainable Development considerations are incorporated into the process of formulating policies and plans of a general regulatory nature that have an impact on the environment or sustainability, so that they are integrated into the respective policies, plans and their modification.

⁴⁵ | See details of the measures in Chapter III of Chile's 4th Biennial Update Report on Climate Change. Available at: https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/574160_Chile-BUR4-1-Chile_4th%20BUR_2020.pdf

availability of water for hydroelectric generation, and have an effect on transmission lines and fuel logistics systems due to phenomena such as tidal waves, floods and fires, among others.

Energy has an important role in meeting the mitigation commitments of the NDC, specifically the goals of reducing GHG emissions and black carbon by 2030 at the national level. It also significantly contributes to advancing the Social Pillar of the NDC via the Fair Transition Strategy, led by the Ministry of Energy. The entry into operation of new electricity transmission lines is recognized as essential to considerations of justice and national ambition, and their regulation is addressed in the Long-Term Energy Planning (PELP) processes of the Ministry of Energy and the National Energy Commission. The NDC calls for updating the Climate Change Adaptation Plan for the Energy sector by 2023. The plan outlines the actions that must be implemented in accordance with the long-term objectives established in this document.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

Energy Sector	SDGs
Goal 1: Achieve a low-carbon energy matrix by 2050.	
<p>Target 1.1: By 2030, a 25% reduction in GHG emissions from the energy sector (according to the INGEI) compared to 2018.</p> <p>Target 1.2: By 2040, a 20% reduction in direct GHG emissions from the use of fuels in the transportation sector (including land, sea, and air transportation) compared to 2018.</p> <p>Target 1.3: By 2050, a 40% reduction in direct GHG emissions from the use of fuels in the transportation sector (including land, sea, and air transportation) compared to 2018.</p> <p>Target 1.4: By 2050, at least a 60% reduction in GHG emissions from the energy sector (according to the INGEI) in relation to 2018.</p> <p>Target 1.5: By 2050, a 70% reduction in direct GHG emissions from the use of fuels in Industry and Mining, compared to 2018.</p>	

Goal 2: Establish energy efficiency as a pillar of development in industrial and residential sectors, among others. Energy efficiency as a fundamental enabling action for decarbonization.

Target 2.1: By 2030, 10% reduction in energy intensity in the country compared to 2019.
Target 2.2: By 2030, develop and update Minimum Energy Performance Standards (MEPS) associated with air conditioning and refrigeration equipment in the residential sector, as well as for other residential appliances such as televisions, clothes dryers, dishwashers, and others that have the potential to improve energy efficiency. Advance in the development of metrics to establish performance requirements and good practices in the installation of equipment in the commercial and public sector.
Target 2.3: By 2050, 35% reduction in energy intensity in the country compared to 2019.
Target 2.4: By 2050, minimum energy efficiency standards (MEPS) will be established for all refrigeration, air conditioning, and climate control equipment and systems in the commercial, public, and residential sectors.
Target 2.5: By 2050, 500,000 users will be connected to district energy networks, reducing pollution in cities in the south central zone of the country.



Goal 3: Increase the use of low-emission technologies and energy, such as green hydrogen, in all sectors of the economy.

Target 3.1: Target 3.1: By 2035, 100% of sales of new land vehicles in the light and medium category will be zero emissions, along with 100% of new vehicles in urban public transport (buses, taxis and vans).
Target 3.2: By 2030, zero-emission fuels (such as green hydrogen and its derivatives, as well as synthetic fuels) will account for 15% of non-electric final energy uses.
Target 3.3: By 2040, 100% of the public and private urban transport bus, taxi, and urban logistics fleet will be zero-emission vehicles, with the necessary infrastructure.
Target 3.4: By 2045, 100% of freight transportation and intercity buses will be zero emissions.
Target 3.5: By 2050, at least 60% of the country's private and commercial fleet will be zero emissions, with the necessary infrastructure in place for this purpose.
Target 3.6: By 2050, zero-emission fuels (such as green hydrogen and its derivatives, as well as synthetic fuels) will account for at least 70% of non-electric final energy uses.



Goal 4: Achieve equitable access to quality energy services that satisfy people's energy needs and contribute to human development.

Target 4.1: By 2030, 100% of households will have permanent access to electricity.
Target 4.2: By 2050, 100% of households will have access to energy to meet their needs for heating, clean hot water and cooking from low-emission clean energy sources*.
Target 4.3: By 2050, 100% of households will have affordable energy expenditure in relation to their income, eliminating energy poverty in terms of affordability; that is, people will be able to afford energy services (energy + appliances) without sacrificing other household needs, considering housing, socioeconomic and geographic characteristics.
(By low-emission clean energy, we mean electricity, renewable sources, certified solid biofuels, and also some low-emission fossil sources such as natural gas, provided that their household use (energy + devices or technologies) does not have adverse effects on human health.*



Goal 5: Decentralization and diversification of energy resources for a more resilient and low-emission energy sector, including both self-consumption of energy and large-scale renewable technologies.

Target 5.1: By 2025, 65% of the national electricity system's coal-fired thermoelectric generating units will have been closed and/or converted.
Target 5.2: By 2030, 80% of the energy produced for the country's electricity generation will come from renewable resources. The nation's electrical systems must be prepared to achieve this.
Target 5.3: We will work to generate the spaces to allow the complete closure and/or conversion of the national electricity system's coal-fired power plants in the first years of the next decade.
Target 5.4: By 2050, 100% of the energy produced for power generation in the country will come from zero-emission energy sources.



Goal 6: Reduce vulnerability to climate change and facilitate its integration in the development and management of the energy sector.

Target 6.1: By 2030, energy regulations, planning and standards, including the electricity and fuel sectors, will explicitly incorporate resilience and adaptation to climate change. To this end, the country must adopt tools such as the analysis of climate change scenarios and risk indices, and facilitate the introduction of technological, digital and other types of solutions (for example, storage systems) to reduce the recovery times of energy services in emergencies.

Target 6.2: By 2040, the country will have high international standards for reliability and resilience of the energy system (electricity and the fuel sector), serving as a model of renewable energy integration for other countries.

Target 6.3: By 2050, 100% of the country's municipalities and regions will have implemented plans to reduce risks and emergencies in the energy sector.

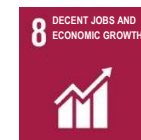


Goal 7: Design and promote the use of economic instruments, incorporating improvements in existing ones, to accelerate energy transition in line with climate objectives and scientific mandates.

Target 7.1: Between 2025 and 2030, the country will have defined a trajectory for increasing the price of carbon by the year 2050.

Target 7.2: By 2030, Chile will have a comprehensive and efficient system of carbon price instruments and other externalities, which could include taxes on emissions and use of fossil fuels, complemented by market mechanisms or other instruments that are evaluated as efficient on that date, to send a coherent and predictable economic signal.

Target 7.3: By 2050, all electricity generation with a renewable attribute will be certified by regimes recognized by the Ministry of Energy.



5.2. Mining

Mining, a key driver of economic activity in Chile and an industry that makes intensive use of energy and water, represents a critical area for carbon neutrality and building climate resilience. Climate change impacts the mining industry by increasing vulnerability to droughts, natural disasters and socio-environmental conflicts. The country's mineral production and reserves are concentrated in areas of climate risk and water stress. Emissions will be substantially reduced in the different stages of the mining process during the coming decades. Changes in electricity supply and use of less polluting fuels will be implemented gradually, as innovative technologies and measures allow the industry to increase its efficiency and adapt to future climate conditions, especially in the case of small- and medium-sized mining operations.

Possessing the world's largest reserves of copper and lithium, Chile has the potential to become a key player in solutions to global warming, increasing the demand for minerals that are essential for worldwide electrification, the implementation of renewable energies and electromobility.



Due to the sustained growth of copper extraction in recent decades, the contribution of mining and quarrying to GHG emissions at the national level has been increasing, reaching 7% of the national total by 2018, accounting for 7,981 kt CO₂_{eq} from direct emissions and 10% of total national indirect emissions associated with electricity. This represents a great potential to advance towards neutrality by 2050. Efforts directed toward mining should also address one of the main climate-related threats to this industry: changes in precipitation due to an increase in the occurrence of extreme climate phenomena, such as floods or prolonged droughts. On the one hand, heavy rainfall causes floods and landslides that damage infrastructure and supply networks, paralyze mining operations and cause environmental pollution, generating a risk to the health and safety of workers. On the other hand, low rainfall, or drought, impacts the water supply, resulting in a loss of mining productivity. Faced with these threats, the mining industry is committed to developing solutions that integrate economic, sociocultural and environmental considerations through policy instruments, strategies and sectoral climate action plans.

The Ministry of Mining leads the sector and has the greatest interest in making progress in matters related to climate change. This is demonstrated by the preparation of the National Mining Policy 2050, which was published on August 31, 2021 and refers to the Strategic Environmental Assessment (SEA) to ensure the consistency of its design with environmental and climate goals and citizen participation processes. The policy is conceived as a driver of sustainable development and job creation in Chile to ensure a positive net impact of the sector, and it has created a consensus about the country's commitment to a new mining development model.

This model poses a challenge for maintaining the level of production of minerals such as copper and lithium without losing competitiveness, with respect for the environment, community relations and a solid institutional framework.

The industry has also committed to develop a Climate Change Adaptation Plan for the Mining Sector in 2022 in accordance with the 2020 updated NDC, and a Mitigation Plan for the Mining Sector in accordance with the proposals in the Draft Framework Law on Climate Change. These plans will establish the actions that must be fulfilled, in accordance with the long-term objectives established in this document.

The long-term sectoral objectives of the mining sector are as follows:

Mining Sector	SDGs
<p>Goal 1: Develop strategies and/or projects in a collaborative manner, promoting the direct participation of neighboring communities and indigenous peoples.</p> <p>Target 1.1: Carry out a participatory process with all indigenous peoples in accordance with ILO Convention 169, creating an indigenous chapter that identifies main challenges and establishes concrete proposals for mining with indigenous peoples.</p>	
<p>Goal 2: Minimize environmental effects by harmonizing mining activities with the environment, promoting projects to reduce the use of fresh water in mining operations and encouraging nature-based solutions to adapt to climate change.</p> <p>Target 2.1: By 2022, directly protect glaciers, regardless of their shape, prohibiting any type of activity that involves their removal, transfer or coverage with any material and/or debris.</p> <p>Target 2.2: Provide and facilitate information regarding mining projects, determining their relationship with the glacial environment, to protect glaciers by 2025.</p> <p>-2.2.1: By 2022, compile information on best practices for the development of mining projects in glacial environments.</p> <p>-2.2.2: By 2025, implement the necessary collaboration mechanisms between Sernagiomin (National Geology and Mining Service) and the Glaciology Unit of the DGA, in collaboration with the Ministry of the Environment, to facilitate information regarding mining projects and their relationship with the glacial environment.</p>	

Target 2.3: By 2025, promote the publication of guides to understand the legal framework, regulations and permits necessary for the development of seawater desalination plants.

Target 2.4: Reduce the percentage of inland water used in the mining industry, so that by 2030 it does not exceed 10% of total water used, promoting other sources that do not compete with human consumption.

Target 2.5: All large and medium-sized mining projects developed will generate a net positive impact on biodiversity by 2050, starting in 2021.

Target 2.6: The percentage of inland water consumed by the mining industry will decrease, so that it does not exceed 5% of total water used by 2050, promoting other sources that do not compete with human consumption.

Goal 3: Minimize, address and manage the impacts generated by active, abandoned and critical tailings from mining activity.

Target 3.1: Eliminate the effect of critical tailings on the population by 2030.

Target 3.2: Develop integrated monitoring programs and updated information on active deposits with a risk approach.

- 3.2.1: By 2030, 100% of the operational tailings of large and medium-sized mines will have a Comprehensive Monitoring Plan that will report information to SERNAGEOMIN regarding physical and chemical stability.

- 3.2.2: By 2030, 100% of the active tailings of large-scale mining operations will have a Comprehensive Construction, Operation and Monitoring Management System (SGCOM).

Target 3.3: Reduce the generation of conventional tailings, promoting other deposit forms, such as filtered, thickened or paste deposits, establishing a reduction percentage by 2022 and ensuring compliance by 2030.

Target 3.4: Eliminate abandoned tailings by 2050.



Goal 4: To be at the forefront of mitigating climate change by promoting renewable energy sources, and promoting research, technological development and innovation (R+D+i) for the use of low or neutral technologies in emissions.

Target 4.1: Generate zero-emission fleet plans by 2025 for large-scale mining, with implementation beginning by 2030.

- 4.1.1: By 2025, all large-scale mining operations will have plans for zero emission fleets for both light and cargo vehicles.
- 4.4.2: By 2030, 100% of large-scale mining companies will begin implementing zero-emission fleets.

Target 4.2: By 2030, large-scale mining operations will reduce CO_{2eq} emissions by at least 50%.

Target 4.3: By 2030, 90% of the electricity contracts in the mining sector will rely on renewable sources, reaching 100% by 2050. **Target 4.4:** Establish scope 1, 2 and 3 Greenhouse Gas (GHG) emission goals, reaching compliance by 2030 with subsequent monitoring and updating.

- 4.4.1: By 2030, goals will have been established, monitored and under compliance.
- 4.4.2: By 2050, compliance with the established targets.

Target 4.5: By 2050, 100% of companies will have a management system and audits for energy efficiency.



Goal 5: Incorporate climate change adaptation and risk criteria in the design and operation of mining operations with a multidisciplinary and local focus (considering all necessary infrastructure: high-mountain and coastal operations).

Target 5.1: By 2022, have a Climate Change Adaptation and Mitigation Plan for the Mining Sector in line with the Paris Agreement and PANCC, with subsequent monitoring and updating every five years.

Target 5.2: By 2025, prioritize the development of a technology action plan for the mining sector, within the framework of technology development and transfer strategy for climate change.



Goal 6: Lead the circular economy model with a focus on the development of local solutions, reuse of waste and infrastructure, and efficient use of resources.

Target 6.1: By 2022, promote the generation of circularity indicators in line with the NDC commitments. By 2025, introduce a multisectoral work table, circularity study and circularity indicators.*

Target 6.2: By 2030, promote the inclusion of other non-mining waste in the REP (Extended Producer Responsibility) Law, in addition to the seven priority waste categories.

Target 6.3: By 2030, promote the circular economy through secondary mining. To this end, by 2025, implementation opportunities will be identified to generate value from mining waste.

() Oriented toward suppliers. Cochilco (Chilean Copper Commission) will carry out a diagnostic study in 2021.*



5.3 Forestry and Agriculture

The forestry and agricultural sector has a vision for 2050 to contribute to the sustainable development of current and future generations, promoting an agri-food model that is resilient to the effects of climate change and low in GHG emissions, making efficient and sustainable use of resources, ensuring food production, contributing to the five pillars of food security⁴⁶ and incorporating a joint vision of adaptation and mitigation for the land and production systems. The sector must be able to adapt to future climate conditions, such as drought and extreme events, and in particular, increase the adaptive capacity of the most vulnerable farmers. The forestry sector's net GHG capturing role will be maintained and increased, as well as its adaptive and resilient functions, promoting comprehensive policies and actions that contribute to both mitigation and adaptation, considering the different characteristics of the land, flora and fauna, communities and vulnerable groups. It is important and necessary to advance in terms of financial instruments that allow progress in agricultural challenges and encourage reforestation, restoration and sustainable management of forests to generate the conditions for achieving the commitments made.

GHG emissions from agriculture correspond mostly (55%) to enteric fermentation and manure management, with 40% coming from agricultural soils.⁴⁷ For their part, forest ecosystems have the ability to capture and sequester large amounts of CO₂ through the accumulation of aerial and underground biomass, and the deposit of organic matter in the soil. In this sense, land use, land use change and Forestry (LULUCF) is the only sector of the National GHG Inventory that remains as a net sink for the 1990-2018 series. In the last year it reaches -63,992 kt CO_{2eq}, mainly due to the increase in biomass in native forest renovations and forest plantations. This capacity of the LULUCF sector, where the forestry sector represents more than 80% in absolute terms, is essential to achieving carbon neutrality in the country by 2050.

One of the main climate threats that affects the sector is the decrease in precipitation and increase in average temperatures, which makes the sector highly vulnerable to climate change. This, together with more intense and frequent extreme events, have affected the central and northern areas of the country since 2007, causing severe impacts, such as increased soil degradation, livestock stress, the appearance of new pests and diseases, and increased risk of forest fires. In this context, the sector plays a key role in mitigating and adapting to climate change, and in the sustainable management of agricultural and forest land for water flow regulation and water security.

The main body responsible for forestry and agriculture is the Ministry of Agriculture (MINAGRI), which has various instruments and policies relevant to the objectives of this strategy. Among these, the National Rural Development Policy, created on May 5, 2020, works to improve quality of life and increase opportunities for the population

⁴⁶ | Availability (1), accessibility, (2) food consumption (3), biological utilization of food (4) and stability (5)

⁴⁷ | INGEI information, 2020.

in rural areas, generating adequate conditions for comprehensive development through the gradual, planned and sustained adoption of a paradigm for public action with a territorial approach, integrated at different levels and fostering synergies between public, private and civil society initiatives. In this way, it aims to contribute to achieving a greater territorial balance in the country; in particular, promoting the sustainable development of smaller populated settlements. Additionally, MINAGRI's Agrifood Sustainability Strategy includes a Climate Change area, and it is updating the Climate Change Adaptation Plan for the Forestry and Agriculture sector, which will be completed in 2022.

For its part, the National Forestry Corporation (CONAF), a subsidiary of MINAGRI, manages Chile's forestry policy. Since 2013, CONAF has worked on the National Strategy for Climate Change and Vegetation Resources (ENCCRV), which seeks, through adequate management of vegetation resources, to avoid or reduce the historical rates of deforestation, vegetation and degradation of native forests, xerophytes and other vegetative resources; as well as promoting the recovery, reforestation, revegetation and sustainable management of these native resources of Chile.

It will contribute to the fulfillment of the NDC's forestry mitigation commitments, specifically, its goal of reducing emissions and increasing GHG absorptions by 2030. In its Adaptation component, the NDC calls for updating the climate change adaptation plan for the forestry and agricultural sector. The plan will establish actions for sector compliance in accordance with the long-term objectives established in the ECLP.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

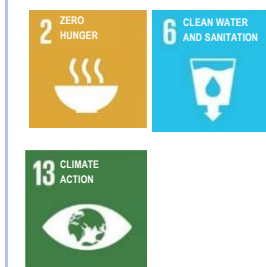
AGRICULTURAL AND FORESTRY SECTOR

SDGs

Goal 1: Create and strengthen institutional and territorial capacities in the forestry and agricultural sector, especially for the most vulnerable producers, to face the challenges of climate change.

Target 1.1: By 2025, develop and execute a training plan for MINAGRI institutions and regional technical committees on climate change in the forestry and agricultural sector.⁴⁸

⁴⁸ | For the development of the plan, a diagnosis of skill gaps must first be made.



Target 1.2: By 2025, establish a capacity building program on adaptation to climate change for male and female producers, technicians, and professionals in the sector, including workshops on adaptation to climate change for small farmers in all regions of the country.⁴⁹¹ **Target 1.3:** By 2025, define a roadmap for the development of climate change mitigation capabilities in the sector.

Target 1.4: By 2030, update the training plan to feature at least four annual trainings, including one on gender and climate change, and incorporate traditional knowledge.

Target 1.5: By 2030, update capacity building programs for climate change adaptation.

Target 1.6: By 2030, have a capacity development program for producers for mitigating emissions in the sector.

Target 1.7: By 2050, hold annual trainings for at least 1,000 small producers who are users of MINAGRI about climate change issues, starting in 2025.

Target 1.8: By 2050, update the training plan for MINAGRI institutions and the regional technical committees on climate change in the forestry and agricultural sector.

Goal 2: Promote R&D&i and rural extensions that contribute to climate action to develop a resilient and low-emission forestry and agricultural sector.

Target 2.1: By 2025, develop a MINAGRI R&D&i plan for climate action aligned with the Technology Development and Transfer Strategy for Climate Change by the Ministry of Science.

Target 2.2: By 2025, have a diagnosis on the rural extension of MINAGRI in terms of climate change.

Target 2.3: By 2025, maintain the line of FIA (Foundation for Agricultural Innovation) competitive funds in innovation for adaptation to climate change.

Target 2.4: By 2025, have a proposal for the incorporation of innovation for climate action in the Fund for the Promotion of Productivity (FOMPRO) in transfers from MINAGRI to CORFO.

Target 2.5: By 2030, update the MINAGRI R&D&i plan for climate action.

Target 2.6: By 2030, develop a rural extension plan on climate change.

Target 2.7: By 2030, focus FIA's line of competitive funds on innovation for climate action to address both climate change adaptation and mitigation.

Target 2.8: By 2050, update the MINAGRI R&D&i plan for climate action.

Target 2.9: By 2050, update the rural extension plan on climate change.

Target 2.10: By 2050, update FIA's line of competitive funds in innovation for climate action.

49 | This program will include the following activities: Training and transfer program on climate change adaptation measures linked to water resources for small producers (between the Tarapacá and Los Lagos regions) – CNR (National Irrigation Commission); four programs that aim to train and/or strengthen Water User Organizations, irrigators and extension agents – CNR; and Training in matters of climate change in agriculture – INIA (Agricultural Research Institute). In collaboration with the Ministry of the Environment.



Goal 3: Promote agrifood systems that are low in greenhouse gas (GHG) emissions and which, through the efficient and sustainable use of natural resources, ensure the production of food of agricultural origin.

Target 3.1: By 2025, consolidate the Inventory and Prospective System for the Forestry and Agricultural Sector, incorporating new emission coefficients for the sector. In collaboration with the Ministry of the Environment.

Target 3.2: By 2025, develop a national plan for the efficient use of nitrogenous fertilizers, which covers at least the crops prioritized by the ministry.

Target 3.3: By 2025, treat 75% of pig manure to reduce GHG emissions (activated sludge plant, biodigesters and/or biofilters).

Target 3.4: By 2025, have sustainability standards for the poultry, pork, and dairy sectors that incorporate requirements related to climate action, and have a proposal for three new subsectors to develop their standards. In collaboration with the Ministry of the Environment.

Target 3.5: By 2025, incorporate practices that contribute to mitigate the impacts of climate change in programs for the agro-environmental improvement of soils.

Target 3.6: By 2025, have a plan for the prevention and reduction of Food Loss and Waste (FLW) that considers measures to reduce emissions.

Target 3.7: By 2025, evaluate different production strategies focused on mitigating climate change, such as regenerative, organic, biodynamic agriculture, agroforestry, and agroecology, among others.

Target 3.8: By 2025, develop a roadmap for carbon neutrality in cattle farming.

Target 3.9: By 2030, update and improve the inventory and prospecting system of the Forestry and Agricultural Sector.

Target 3.10: By 2030, evaluate the results of the implementation of the Plan for efficient use of nitrogenous fertilizers.

Target 3.11: By 2030, increase the number of biodigesters in the pig sector by at least 30% compared to 2021.*

Target 3.12: By 2030, evaluate the results of the implementation of sustainability standards in the first three subsectors, and develop standards in three additional subsectors.

Target 3.13: By 2030, evaluate the implementation of mitigation practices in agro-environmental soil improvement programs, and evaluate the incorporation of new practices.



Target 3.14: By 2030, evaluate the results of the implementation of the FLW prevention and reduction plan.

Target 3.15: By 2030, through MINAGRI policies and programs, adopt productive management that best adapts to and mitigates climate change.

Target 3.16: By 2030, evaluate the results of the implementation of the roadmap for carbon neutrality in cattle farming.

Target 3.17: By 2050, continuous improvement of inventory information.
(* This target covers the medium and large companies in the sector.)

Goal 4: Reduce vulnerability and generate resilience in the agricultural and forestry sector, promoting the implementation of measures to adapt to climate change to contribute to food security.

Target 4.1: Implement the Climate Change Adaptation Plan for the agricultural and forestry sector for 2023-2027.

Target 4.2: By 2025, develop and monitor indicators for the adaptation of the Forestry and Agricultural Sector.

Target 4.3: By 2025, design the MINAGRI Services Water Resources Action Plan to focus on climate change in coordination with the Ministry of Public Works and the Ministry of the Environment.*

Target 4.4: By 2025, have ex situ conservation of key plant varieties for climate change adaptation and mitigation.

Target 4.5: By 2025, develop three local farmers market pilots with climate action considerations.

Target 4.6: By 2030, carry out an impact assessment of the National Climate Change Adaptation Plan for the Forestry and Agriculture sector (PANCC SAP 2023-2027), and prepare the new public-private sectoral adaptation plan.

Target 4.7: By 2030, evaluate adaptation indicators for the forestry and agriculture sector.

Target 4.8: By 2030, evaluate the results of the updated MINAGRI action plan for water resources.

Target 4.9: By 2030, have at least one local farmers market per region, with climate action considerations.

Target 4.10: By 2050, update MINAGRI's water resources action plan.

(* The plan will be aligned with the NDC, the Long-Term Climate Strategy, the Climate Change Adaptation Plan for the Water Resources sector and the Strategic Plans for Water Resources in Basins, and will consider the following measures: Comprehensive studies of irrigation for dryland expansion zones (O'Higgins, Maule and Ñuble Regions) and the south (La Araucanía, Los Ríos and Los Lagos Regions), and developing technological kits to increase irrigation efficiency.



Goal 5: Strengthen the institutional climate change framework of the Ministry of Agriculture.

Target 5.1: By 2025, have 16 Ministry of Agriculture Regional Technical Committees on Climate Change (CTRCCs) formalized and operational, in coordination with the regional Committees on Climate Change.

Target 5.2: By 2025, ensure the continuity of the Operational Forestry and Agricultural Advisory Board on Climate Change.

Target 5.3: By 2025, expand ODEPA's (Office of Agricultural Studies and Policies) climate change unit.

Target 5.4: By 2025, have an institutional public forestry framework to reflect the strategic importance of the sector, developed to include inter-institutional political and technical coordination, as well as the design, execution and evaluation of sectoral public policies.

Target 5.5: By 2030, the Ministry of Agriculture, with the support of MINAGRI'S 16 operational regional technical committees for climate change, will develop regional sectoral policies.

Target 5.6: By 2030, give continuity to the Forestry and Agricultural Advisory Board on climate change.

Target 5.7: By 2030, create climate change units in at least 6 of the 12 MINAGRI services, according to their established roles, functions and mandates.

Target 5.8: By 2050, promote technical, political, and financial decision-making that allows positioning the role of vegetative resources in mitigating and adapting to climate change, the fight against desertification, land degradation and drought, as priority axes in sectoral development policies.

Goal 6: Promote initiatives focused on avoiding and/or reducing deforestation and the degradation of vegetative resources, contributing to mitigation of and adaptation to climate change, reducing the occurrence and risk of forest fires to achieve harmonious economic, social and environmental growth.

Target 6.1: By 2030, reduce emissions from the forestry sector due to degradation and deforestation of native forests by 25%, compared to average emissions in the 2001-2013 period.

Target 6.2: By 2030, carry out a Severity Analysis for large fires (greater than 200 hectares), incorporating fires larger than 50 hectares by 2030, to generate knowledge for establishing future prevention and mitigation strategies, as well as preparing a response to forest fires.

Target 6.3: By 2030, carry out an Analysis of the Damage Avoided in High-Magnitude Forest Fires (greater than 200 hectares).*



Target 6.4: By 2050, maintain the percentage reduction of emissions from the forestry sector due to degradation and deforestation of the native forest achieved by 2030.

(*) *Damage Avoided: Analysis of management in prevention and mitigation tasks, preparation for response (control and extinction) to forest fires, difference between the perimeter to extinguish the fire versus the fire's potential in free spread.*

Goal 7: Promote the management and conservation of native vegetative resources (forests and xerophytes) and wetlands,⁵⁰ orienting them towards the production of ecosystem goods and services, nature conservation and the needs of local communities.

Target 7.1: By 2030, 200,000 hectares of native forests will have recovered and be under sustainable management.

Target 7.2: By 2050, enough native forest will have been sustainably managed and recovered to achieve the carbon neutrality committed to in the NDC.



Goal 8: Promote initiatives that increase the creation of forests and the permanent coverage of vegetative resources in priority areas for restoration at the landscape scale, increasing resilience and reducing the vulnerability of communities and territories.

Target 8.1: By 2021, have a National Landscape Scale Restoration Plan, which will consider the incorporation into restoration processes of 1,000,000 hectares of landscapes by 2030, prioritizing those with the greatest social, economic, and environmental vulnerability.

Target 8.2: By 2030, reforest 200,000 hectares, of which at least 100,000 hectares correspond to permanent forest cover, and at least 70,000 hectares to forests with native species. The recovery and reforestation will be carried out on soils preferably suitable for forestry and/or in priority conservation areas, and in general, will observe the criteria established in Chile's updated 2020 NDC, Contribution in Integration – LULUCF – Forests (15).

Target 8.3: By 2050, enough areas will have been reforested to achieve the 2050 carbon neutrality commitment in the NDC.



⁵⁰ | For the application of this objective, as well as the implementation of its goals, the scope of action of the forestry sector is defined as per the legal powers in this matter. Wetlands shall be understood as "Ecosystems associated with substrata temporarily or permanently saturated with water, in which aquatic biota exists and develops and have been declared Priority Conservation Sites by the National Commission for the Environment, or Ramsar sites, as established in Supreme Decree No. 82, of 2010, of the Ministry of Agriculture Law No. 20.283."

Goal 9: Promote participation in the design of actions and policies with a gender approach and an emphasis on local communities and native peoples, showing respect for the rights of people and their cultural heritage.

Target 9.1: By 2030, the mitigation goals of the forestry sector should integrate a gender approach, allowing the development of more transparent and inclusive initiatives aimed at reducing and/or eradicating existing gender gaps. Gender will be addressed in 100% of projects and initiatives related to the ENCCRV.

Target 9.2: By 2050, forestry development in Chile will be effectively inclusive and all actors and sector agents will feel themselves to be an integral part of the process. The state, the productive forestry sector, and the indigenous and peasant communities will engage in formal relations, using institutionalized mechanisms accepted by all. Environmental and social safeguards will be addressed in 100% of the projects and initiatives related to the ENCCRV.



5.4 Fishing and aquaculture

To increase the adaptability and resilience of the sector to climate change, the conservation and sustainable use of hydrobiological resources with a precautionary approach, an ecosystem approach in fisheries and aquaculture management, and safeguarding of the marine ecosystems in which these resources exist is crucial.

Stronger conservation and management measures must be adopted for fishing and aquaculture, considering biological and socio-economic objectives, food security, and the benefits for the communities that extract or cultivate hydrobiological resources on a small-scale as their main means of subsistence. This will require the effective participation of strategic agents in the sector and the permanent generation of traditional and scientific knowledge that considers the impacts of climate change and allows for the reduction of risks and successful management for the sector's adaptation and resilience.

The physical, chemical and biological conditions that determine the productivity, development, feeding, reproduction, abundance and distribution of marine species will be affected by climate change. In the case of fishing, climate change can affect the distribution of resources due to the increase in the temperature of the oceans and consequent changes in the marine ecosystem. Changes in sea temperature will directly affect the physiological limits of the species, their food or habitats, and the reduction in rainfall will affect the inflow of fresh water to the coastal and estuarine zones, at a risk of reducing the abundance of the catch at the local level.

Traditional fishing will also be affected by the impacts of extreme hydrometeorological events on the coasts, which translate into loss of days of operation and loss of coastal infrastructure to support extractive activity. For aquaculture, the main climate threats are the increased risk of loss of biomass/production due to the reduction in the supply of fresh water from decreased rainfall, losses due to an increase in diseases and parasites, and a greater frequency/magnitude of HAB events (harmful algal blooms), given the greater availability of light for phytoplankton, as well as losses due to destruction of infrastructure as a consequence of the increased frequency and magnitude of extreme events. Ocean acidification is also considered a threat to farmed species, particularly mollusks and crustaceans. In addition, overexploitation of resources, pollution and habitat loss are aggravating factors that increase the risk that the sector will be affected by the impacts of climate change.

Along with establishing the scientific bases of the impact of climate change on fishing and aquaculture, and thus, contributing to the sector's sustainability, governance aspects must be considered, among them the decision-making bodies, advisors and instruments referred to in the General Law on Fisheries and Aquaculture (National Fisheries Council, Zonal Fisheries Councils, National Aquaculture Commission, Management Committees, Technical Scientific Committees for Fisheries and Aquaculture, Management Plans); the integration of a gender approach to expand the participation of women in sector decision-making; the integration of native peoples; the creation and strengthening of spaces for the broad and effective participation of local, fishing and aquaculture communities; sectoral and intersectoral coordination at different levels, as well as adapting the rules and regulations of fishing and aquaculture and improving controls.

Regarding intersectoral coordination, it is essential to strengthen and maintain adequate and effective coordination with other related sectors, such as coastal areas, biodiversity, tourism, infrastructure, water resources and ocean sectors, to ensure conservation and sustainable use of ecosystems and land use planning, among other goals.

The measures designed to meet the proposed goals and objectives should have a special focus on local communities and take into account socio-cultural aspects and other issues, such as the development of the best possible scientific information for the construction of baselines, monitoring and follow-up, the integration of information about marine-coastal zones, and education, training and dissemination to the population.

The Ministry of Economy, Development and Tourism's Undersecretary of Fisheries and Aquaculture is in charge of the matter, and presented a Climate Change Adaptation Plan for fisheries and aquaculture, which was approved in 2015 and is in the process of being updated. Other relevant management tools include:

- General Law on Fisheries and Aquaculture and its Regulations.
- Inland Fishing Law.
- National Aquaculture Policy (Ministry of Economy, Development and Tourism, 2003).

The NDC calls for the Climate Change Adaptation Plan for the Fisheries and Aquaculture sector to be updated in 2022. This plan will establish the actions that must be implemented in accordance with the long-term objectives established in this document.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

FISHERIES AND AQUACULTURE SECTOR

SDGs

Goal 1: Generate and have access to knowledge and scientific information for adapting to climate change and increasing the sustainability of fishing and aquaculture, incorporating local knowledge and the mechanisms to access said information by society and decision makers.

Target 1.1: Annually propose and develop research on key aspects for the adaptation and mitigation of climate change in the sector, through the respective permanent sectoral fund programs, such as the Comprehensive Advisory Program for Fisheries and Aquaculture (ASIPA), Fisheries and Aquaculture Research Fund (FIPA), glossary Subtitle 22, and funds from the National Institute for the Sustainable Development of Artisanal Fisheries and Small-Scale Aquaculture (INDESPA).

Target 1.2: By 2025, have an integrated and interoperable information system with data collected from public and private platforms about environmental, biological, ecological, economic and social variables, publicly accessible at the municipal level, to allow attributing the impacts of climate change and identifying indicators for decision-making for adapting to climate change and ensuring the sustainability of fishing and aquaculture. The data is technologically interoperable for and with the Climate Change Observatory (OCC) and the Chilean Ocean Integrated Observation System (SIOOC).



Goal 2: Strengthen governance for the adaptation and resilience of fisheries and aquaculture to climate change at the national, regional and local levels, together with knowledge and awareness with a gender approach, among sector agents and the fisheries and aquaculture communities.

Target 2.1: By 2030, strengthen capacities for adaptation to climate change in 70% of scientific-technical committees, as well as national fisheries and aquaculture management committees.

Target 2.2: By 2030, promote, facilitate and encourage the training of 50% of representatives of the main fishing and aquaculture unions in issues related to adaptation to and mitigation of climate change.

Target 2.3: By 2030, identify public-private entities and implement actions to make effective the participation of women in fishing and aquaculture at different geographical scales, according to current sector regulations.

Target 2.4: By 2030, strengthen capacities for adaptation to climate change in fishing and aquaculture among the regional, municipal and local authorities that influence the sector.



Goal 3: Develop nature-based solutions and strengthen the application of the ecosystem approach in fisheries and aquaculture.

Target 3.1: By 2025, have a national strategy for the protection and sustainable management of brown macroalgae ecosystems.

Target 3.2: By 2030, national fisheries and aquaculture should incorporate the ecosystem approach, considering climate risks and the role of conservation and sustainable use of resources for economic and social well-being and the increased resilience of the sector.

Target 3.3: By 2050, actions related to co-benefits in mitigation and adaptation to climate change will be identified and incorporated into 100% of the General Administration Plans of marine protected areas.



Goal 4: Design and apply an integrated approach to risks in policies and instruments that address other threats and impacts other than climate in the fishing and aquaculture sector.

Target 4.1: By 2030, develop a risk research program in coastal areas that considers all aspects of these localities (economic, social, ecological, connectivity, ports or others relevant to the quality of life of coastal communities dependent on fishing activity in a direct or complementary way).



Target 4.2: The fishing and aquaculture sector will be trained and informed about the risks associated with climate change in accordance with the conservation and sustainable use of resources under an ecosystem and precautionary approach. **Target 4.3:** Climate change risks will be incorporated into the design and implementation of fisheries management plans with an ecosystem approach.

Target 4.4: Provide annually, or as required, sectoral information to update the Climate Risk Atlas. **Target 4.5:** By 2030, the spatial planning of aquaculture and the areas suitable for aquaculture will be revised to consider risks from climate change under the framework of an ecosystem approach to aquaculture.

Goal 5: Promote the diversification of livelihoods and sustainable production practices of communities dependent on fishing and aquaculture, considering their vulnerability to climate change.

Target 5.1: Starting in 2025, provide annual technical and financial support for the diversification of livelihoods and sustainable production practices of vulnerable communities dependent on fishing and aquaculture.

Target 5.2: By 2030, traditional fishermen and small-scale fish farmers in 30% of the most vulnerable inland fishing areas will be trained in climate change, incorporating nature-based solutions, best practices and productive diversification as climate change adaptation and mitigation.



Goal 6: Contribute to the reduction of greenhouse gas emissions and national carbon neutrality and resilience goals.

Target 6.1: By 2030, with the collaboration of the Ministry of the Environment, develop estimates of the carbon footprint of national fishing and aquaculture activities.

Target 6.2: By 2030, promote technological innovations (R+D+i) and create capacities to reduce CO₂ and other greenhouse gas emissions in the fishing and aquaculture sector.

Target 6.3: By 2030, promote energy efficiency in fishing and activities related to aquaculture.



5.5 Waste and Circular Economy

51 | OECD (2021) Municipal waste data.

52 | MMA (2020) Chile's Fourth Biennial Update Report on Climate Change

53 | OECD (2021) Material productivity (indicator). Available at: <https://data.oecd.org/materials/material-productivity.htm>

54 | EMF (2019) Climate change – How the circular economy tackles climate change

Chile currently faces the challenge of moving towards a more sustainable and efficient economic model for which important gaps must be addressed, among them promoting the prevention of waste generation. Between 2000 and 2017, the country increased its generation of municipal waste per capita by 49%⁵¹. This waste mostly ends up in final disposal sites, contributing 4.2% of total GHG emissions at the national level. These emissions have increased more than fivefold since 1990, and 23% between 2016 and 2018.⁵² Added to the problem are numerous illegal micro dumps and landfills that generate serious problems for the environment and people's quality of life.

The construction and industrial manufacturing sectors are major generators of greenhouse gases. In terms of material productivity, Chile has the lowest value among the OECD countries.⁵³ In addition to this, the country has a low rate of recovery of household organic waste, more than 99% of which ends up in final disposal sites, releasing methane emissions into the atmosphere instead of being put to alternative uses such as the generation of natural fertilizers to replace the synthetic ones that predominate today. This shows the potential for adaptation and mitigation of climate change in terms of the circular economy. Regeneration strategies for natural systems that are promoted for the biological cycle, such as the development of green infrastructure, can improve the resilience of our ecosystems, recover degraded soils, and promote biodiversity.

The circular economy is a solution to this linear scheme, which is based on extracting, producing, using and discarding. The three principles of the circular economy are: (1) eliminate waste and pollution by design; (2) keep products and materials in use for as long as possible; and (3) regenerate natural systems. The circular economy is a critical step in addressing the 45% of total global GHG emissions associated with the production of goods and materials.⁵⁴

To move towards this model, two strategic planning instruments have been developed in recent years in conjunction with other initiatives:

- National Roadmap to the Circular Economy 2020-2040: The Ministry of the Environment (MMA), in conjunction with the Ministry of Economy, the Corporation for the Promotion of Production (CORFO) and the Agency for Sustainability and Change (ASCC), have generated a roadmap that serves as the basis for promoting a transition towards the "Circular Chile" of the future through four axes: innovation, regulation, culture and territories. It was prepared through a participatory process with representatives of civil society, the public sector, the private sector and academia.

- National Organic Waste Strategy: The Ministry of the Environment promoted this instrument through a participatory process to propose a goal of increasing the recovery of organic waste generated at the municipal level from 1% to 66% by 2040. Specifically, its goal is for citizens to generate less organic waste and separate what they cannot avoid at the source, in their homes, offices, educational establishments, parks, markets and free fairs, in addition to having infrastructure, equipment and logistics systems that allow organic waste to be used as a resource in the production of soil improvers or electrical or thermal energy, taking advantage of the nutrients, water and energy they contain.

The Circular Economy will contribute to the fulfillment of the mitigation commitments of the NDC. Specifically, it is incorporated in its Integration component as an element that contributes in an integral way to both the causes and the effects and impacts of climate change. The proposal is to generate and implement circularity metrics and indicators for monitoring the country's progress toward a circular economy and identify its contribution to climate change mitigation and adaptation by 2022.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

WASTE AND CIRCULAR ECONOMY

SDGs

Goal 1: Eliminate litter and pollution starting with the design phase.

- Target 1.1:** By 2025, implement mandatory recyclability labeling.
- Target 1.2:** By 2030, reduce the generation of municipal solid waste per capita by 10% compared to 2020.
- Target 1.3:** By 2030, reduce the generation of waste per unit of gross domestic product by 15% compared to 2020.
- Target 1.4:** By 2030, have an integrated eco-labeling system in place.
- Target 1.5:** By 2040, reduce the generation of municipal solid waste per capita by 25% compared to 2020.
- Target 1.6:** By 2040, reduce the generation of waste per unit of gross domestic product by 30% compared to 2020.



Goal 2: Keep products and materials in use for as long as possible.

- Target 2.1:** By 2025, implement an extended producer responsibility regulation for textiles.
Target 2.2: By 2030, increase the municipal solid waste recycling rate to 30%.
Target 2.3: By 2030, increase the overall recycling rate to 40%. **Target 2.4:** By 2040, increase the municipal solid waste recycling rate to 65%.
Target 2.5: By 2040, increase the overall recycling rate to 75%.



Goal 3: Significantly increase the recovery rate of organic waste managed at the municipal level (homes, free fairs, parks and gardens) to regenerate natural systems.

- Target 3.1:** By 2025, reach 200,000 families using composters and/or vermicomposters in their homes.
Target 3.2: By 2040, significantly increase the recovery rate of organic waste managed at the municipal level (homes, free fairs, parks and gardens) to 66%.



Goal 4: Restore sites affected by illegal waste disposal.

- Target 4.1:** By 2030, restore 50% of the area occupied by sites affected by illegal waste disposal.
Target 4.2: By 2040, restore 90% of areas occupied by sites affected by illegal waste disposal.



5.6 Buildings and Cities

Cities are responsible for GHG emissions from electricity consumption, ground transportation, use of fuels for heating and cooking, use of air conditioning and refrigeration, and waste generation. In addition, construction uses energy and large quantities of materials whose production and transport generate GHG emissions. At a global level, cities are estimated to generate 70% of GHG emissions⁵⁵, and the construction industry is responsible for 38%.⁵⁶ At the same time, climate change presents new challenges to the physical security of human settlements and the well-being of their inhabitants.

In this context, Chile's vision for the next 30 years is to plan inclusive, climate-resilient and low-emission urban development throughout the life cycle of cities, considering sustainable design and construction, efficient management of energy and waste, and harmony with the natural resources of the territory, in accordance with Chile's National Urban Development Policy⁵⁷ (UNDP).

About 90% of the country's population⁵⁸ lives in urban areas, and these are increasingly pressured by climate change, hence the need for territorial planning to be a tool to reduce the vulnerabilities to which its inhabitants are exposed, and harmonize their relationship with the areas of environmental value and rural territories that surround them. Cities are exposed to a series of climate risks, among them heat waves; urban heat islands, which cause environmental thermal discomfort; frost; energy poverty; coastal flooding; droughts and domestic water insecurity; forest fires that affect human settlements, and others. These risks generate premature mortality among citizens due to climate change in cities. Air pollution and the spread of emerging and re-emerging communicable diseases are other factors that affect the quality of urban life.

Integration of the long-term vision of the co-benefits of mitigation and adaptation to climate change is essential in territorial planning processes at the community, regional and national levels to advance towards sustainable development. For example, the use of land destined for human settlements directly influences the consumption of natural resources, energy consumption, risk exposure and adaptive capacity, among other things. Planning that considers climate change in the medium and long term, therefore, can contribute to carbon neutrality and resilience.

The Ministry of Housing and Urban Development assumes leadership of planning for buildings and cities, and has management tools that contribute to reducing the effects of climate change:

- The National Territorial Planning Policy (2021) guides actions for the development of harmonious, integrated, safe and inclusive settlements over a broad and diverse geography, and promotes a process

⁵⁵ | Muñoz, J.C., J. Barton, D. Frías, A. Godoy, W. Bustamante, S. Cortés, M. Munizaga, C. Rojas, and E. Wagemann (2019) Ciudades y cambio climático en Chile: Recomendaciones desde la evidencia científica. Santiago: COP25 Scientific Committee; Ministry of Science, Technology, Knowledge and Innovation.

⁵⁶ | Chilean Chamber of Construction (2019). The Construction Sector in the Face of the Global Climate Challenge

⁵⁷ | <http://cndu.gob.cl/wp-content/uploads/2014/10/L4-Politica-Nacional-Urbana.pdf>

⁵⁸ | United Nations Organization, «Sustainable Development Goal 11: Cities.» [Online]. Available at: <https://www.un.org/sustainabledevelopment/es/cities/>. Global ABC, IEA, and UNEP, 2019 global status report for buildings and construction: Towards a zero-emission, efficient and resilient buildings and construction sector. 2019.

59 | INE (2018). Population and Housing Census 2017. Santiago, National Statistics Institute

60 | Collaboration Framework Agreement on Sustainable Construction Ministry of Public Works, Ministry of Energy, Ministry of the Environment, Ministry of Social Development and Family, and Ministry of Economy, Development and Tourism.

of sustainable development with territorial identity. It is a key instrument for the transfer of powers to the Regional Governments, together with the methodology and regulations for the preparation of the Regional Plans for Territorial Organization (PROT).

- Climate Change Adaptation Plan for Cities (2018-2022), aiming to propose adaptation guidelines for cities in the face of climate change, and strengthening the capacity to respond to different impacts going forward. It's a public sector endeavor to formulate actions in five strategic areas that promote significant progress⁵⁹ toward defining a path for adaptation to climate change, with an eye toward synergies in the area of mitigation.

- The National Urban Development Policy (2014), led by the National Council for Urban Development and the Ministry of Housing and Urban Development, covers urban areas and human settlements, proposing sustainable growth for Chilean cities. It also proposes profound reforms to legislation and institutions that affect cities, and therefore is a state policy that transcends governments. The implementation of this policy is led by the National Council for Urban Development and the Ministry of Housing and Urban Development.






- The National Sustainable Construction Strategy (2013) provides guidelines for sustainable construction. Based on the Inter-Ministerial Roundtable for Sustainable Construction (MICS)⁶⁰, it strongly promotes the incorporation of sustainability in the country's construction sector. This Strategy is currently being updated as the National Sustainable Construction Plan for 2050 (under preparation), which will be aligned with the ECLP, is being developed.

One of the MICS' most important lines of work in recent years has been an intersectoral work agenda to promote Carbon Footprint Management in the sector through a public-private committee. The purpose of this committee is to identify and validate work methodologies, collect and make available footprint data and information, and implement a National System for Monitoring, Reporting and Verifying the Sector's Carbon Footprint. The committee is currently developing the National Carbon Footprint Strategy for the Construction Sector (EHCSC 2050), to be published in November 2021 and aligned with the ECLP.

For its part, the Ministry of Housing and Urban Development has developed a Sustainability and Climate Change Policy by 2050, which seeks to establish a long-term ministerial strategy to ensure the integration of city and housing policies with Chile's policies and commitments with regard to climate change. This policy will be released at the end of October 2021.

In its Adaptation component, the NDC calls for updating the Climate Change Adaptation Plan for Cities by 2023. The plan outlines the actions that must be implemented in accordance with the long-term objectives established in this document.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

BUILDINGS AND CITIES SECTOR	SDGs
Goal 1: Reduce GHG emissions and local pollutants in cities, and throughout the life cycle of the construction and management of cities.	
<p>Target 1.1: By 2025, have information about and define a national baseline for embodied carbon and operational carbon in new and existing residential buildings.</p> <p>Target 1.2: By 2025, 100% of new buildings that have sustainability or energy efficiency certification and rating must publicly report their operational carbon footprint.</p> <p>Target 1.3: By 2030, 100% of new residential buildings must publicly report their carbon footprint (embodied carbon and operational carbon).</p> <p>Target 1.4: By 2030, new residential buildings must reduce their operational footprint by at least 10% with respect to the 2025 baseline.</p> <p>Target 1.5: By 2050, all new residential and nonresidential buildings must achieve net zero emissions.</p> <p>Target 1.6: By 2050, achieve a 50% reduction in GHG emissions from new residential construction with respect to the 2020 baseline.</p>	  
Goal 2: Achieve efficient new buildings and retrofit existing buildings to increase their energy efficiency.	
<p>Target 2.1: By 2025, have the fourth version of the Thermal Regulation under development with a "zero net energy" approach.</p> <p>Target 2.2: By 2025, define baselines for energy consumption in the full cycle of the residential sector and establish targets.</p> <p>Target 2.3: By 2025, all new residential buildings must include equipment to allow subsequent installation of charging stations for electric vehicles.</p> <p>Target 2.4: By 2030, implement the Fourth version of the Thermal Regulation setting net zero energy standards.</p> <p>Target 2.5: By 2030, refurbish at least 36,000 homes annually. Target 2.6: By 2050, 100% of new residential and non-residential buildings will be «zero net energy.»</p> <p>Target 2.7: By 2050, refurbish at least 50,000 homes annually.</p>	 

Goal 3: Develop compact and/or polycentric cities characterized by social integration, and inclusive and equal access to services and equipment.

Target 3.1: By 2025, develop a national diagnosis of municipal coverage of community centers.

Target 3.2: By 2030, 50% of regions will have a land and social integration policy, with an inclusion approach, that establishes efficient management of space, resources, risks and climate vulnerabilities in the definition of uses, considering that land is a scarce resource, and that expressly indicates what is understood as the protection of non-developable land.

Target 3.3: By 2030, strengthen land use planning in rural areas through legal, juridical and regulatory changes that restrict settlements outside of urban planning, and set minimum urban standards that take into account climate risks and vulnerabilities in usage definitions.

Target 3.4: By 2030, legally establish the development and implementation of Instruments at the inter-municipal and municipal level (PRI, PRM and PRC) with minimum urban standards that take into account climate risks and vulnerabilities in usage definitions to ensure the quality of urban life over time.

Target 3.5: By 2030, prioritize 75% of MINVU sectoral investments in urban infrastructure based on the gaps established by the System of Indicators and Standards for Urban Development (SIEDU).

Target 3.6: By 2030, all Chilean communes will have community centers.

Target 3.7: By 2050, 100% of the regions will have implemented a land and social integration policy and strategic plan, with an inclusion, climate change and Disaster Risk Management approach.

Target 3.8: By 2050, prioritize 100% of MINVU sectoral investments in urban infrastructure based on the gaps established by the System of Indicators and Standards for Urban Development (SIEDU).

Target 3.9: By 2050, attain national coverage of municipal centers at the neighborhood level, using 2025 diagnostics.



Goal 4: Promote integrated planning of cities, incorporating different institutions, urban governance and integration mechanisms.

Target 4.1: By 2030, Territorial Planning Instruments at the inter-municipal level (PRI and PRM) will include the definition of criteria and conditions for sustainable development, adaptation and mitigation criteria in coordination with the strategic framework defined in the PROTs.

Target 4.2: By 2040, 100% of Territorial Planning Instruments (PRI, PRM and PRC) will have climate change adaptation and mitigation criteria.



Target 4.3: By 2050, have a consolidated territorial planning system in place. This involves updating and implementing the main territorial policies (PNOT, PNDU, PNDR) and all regulatory plans at the inter-municipal and municipal level in accordance with the guidelines provided by the PROTs, with attention to the variables of mitigation and adaptation to climate change.

(*) *Territorial planning instruments at the Regional and Coastal level (PROT and ZBC) are covered in Chapter 6 of this document.*



Goal 5: Integrate environmental considerations in investment in the different stages of the building life cycle, minimizing negative impacts on ecosystems, biodiversity and the use of resources.

Target 5.1: By 2025, have standards and databases that promote labels or stamps with environmental information on products and services in the construction sector.

Target 5.2: By 2025, the management, handling and treatment of at least 80% of the construction and demolition waste (CDW) from MINVU projects that generate more than 12 tons per year will be traceable through technology platforms

Target 5.2: By 2025, the management, handling and treatment of at least 80% of the construction and demolition waste (CDW) from MINVU projects that generate more than 12 tons per year will be traceable through technology platforms.

Target 5.4: By 2025, define environmental information baselines for construction products.

Target 5.5: By 2025, conduct a survey and establish baselines for national construction materials with a percentage of recycled content from other production processes.

Target 5.6: By 2025, have a set of technical standards that define quality conditions for recycled aggregates in different categories of non-structural construction elements and parts, pavement bases and sub-bases, urban fixtures and gravel.

Target 5.7: By 2025, have information on the environmental effects and costs (social and private) derived from different CDW management alternatives considering different types of waste and construction projects, companies' willingness for such management, and the opportunities and impacts resulting from making separation at source and recovery of this waste mandatory for smaller companies.

Target 5.8: By 2030, the General Urban Development and Construction Ordinance (OGUC) will require labels with environmental information for construction products.

Target 5.9: By 2025, make information publicly available about the complete cycle and value of the environmental effects of construction processes and products.

Target 5.10: By 2030, the General Urban Development and Construction Ordinance (OGUC) will require labels with environmental information for construction products.



Target 5.11: By 2030, at least 50% of the volume of CDW will be reused and recycled for the manufacture of new products.

Target 5.12: By 2030, construction and demolition waste from MINVU projects (housing and urban works), as well as Sustainable Housing Certification (CVS) projects, will be 100% traceable.

Target 5.13: By 2030, 30% of construction materials will incorporate recycled content from other processes, with respect to the 2025 baseline.

Target 5.14: By 2050, all construction products and systems will include environmental and circular economy information, and demonstrate a 30% reduction in impacts compared to 2030.

Target 5.15: By 2050, industry competition costs will take into account environmental and social costs to reward environmentally responsible projects.

Target 5.16: By 2050, new buildings will certify zero waste in their processes.

Target 5.17: By 2050, construction and demolition waste will be 100% traceable at the national level.

Goal 6: Strengthen the multilevel governance of cities, Public-private cooperation and inclusive citizen participation in territorial development processes.

Target 6.1: By 2030, have an organization in continuous operation and with intersectoral coordination between Comicivyt, Corecivyt, the Regional Governments (GOREs) and Mayors, in the planning and management of cities.

Target 6.2: By 2030, have an early, constant and inclusive citizen participation policy for planning and territorial organization.

Target 6.3: By 2030, have a multisectoral plan with public-private participation and financing for Infrastructure and Public Land Management for Equity and Urban Regeneration, incorporating the climate change mitigation and adaptation approach for the metropolitan regions of Valparaíso, Santiago and Concepción.

Target 6.4: By 2050, have a multisectoral plan with public-private participation and financing for Infrastructure and Public Land Management for Equity and Urban Regeneration with a Climate Change approach in 100% of regions.



Goal 7: Reduce the risk to people caused by the increase in number and magnitude of extreme climate events affecting buildings and cities.

Target 7.1: By 2030, 30% of the Territorial Planning Instruments in force by 2021 will have been updated to incorporate all present and future threats, incorporating them into the respective climate risk analysis using climate projections and the ARClm platform (the scope is approx. 100 municipalities out of 331 with current Territorial Planning Instruments to date).

Target 7.2: By 2030, formalize mandatory regulations for construction elements that fulfill the function of prevention and mitigation in the event of disasters, such as anti-seismic elements, collapsible materials, etc.

Target 7.3: By 2050, 100% of Territorial Planning Instruments will incorporate all present and future threats in the territory, incorporating them into the respective climate risk analysis, and proposed structural and non-structural measures for risk management.

Goal 7.4: By 2050, all new constructions must use elements appropriate to their geographical location, containing anti-seismic elements, collapsible materials, seismic insulators, thermal panels, etc.



Goal 8: Encourage the use of urban ecological infrastructure in cities and promote the use of Nature-based Solutions in ecosystem services to mitigate environmental and climate risks that may affect communities, and contribute to urban resilience.

Target 8.1: By 2030, all cities and municipalities with more than 100,000 inhabitants will have an implemented Ecological Infrastructure Plan linked to Territorial Planning Instruments and regulations, plans and programs for urban, municipal and inter-municipal development. These plans will promote the use of Nature-based Solutions and ecological connectivity between green areas and areas of environmental value, such as urban wetlands.

Target 8.2: By 2050, all cities and communes with more than 50,000 inhabitants will have an Ecological Infrastructure Plan linked to Territorial Planning Instruments and regulations, plans and programs for urban and community development. These Plans will promote the use of nature-based solutions and ecological connectivity between green areas and areas of environmental value.

Target 8.3: By 2050, all Territorial Planning Instruments and land use plans will incorporate and recognize ecological infrastructure strategies and nature-based solutions for adaptation to and mitigation of climate change.



Goal 9: Sustainable Urban Mobility by prioritizing and considering the needs of the various types of pedestrians and non-motorized modes of transport in the planning of more inclusive cities.

Target 9.1: By 2030, all functional cities or city systems with more than 50,000 inhabitants will have bicycle-inclusive Infrastructure Master Plans and begin their implementation.

Target 9.2: By 2030, all cities with more than 50,000 inhabitants will have Mobility Plans that include provisions for the reduction of emissions of local and global air pollutants derived from mobile sources.

Target 9.3: By 2050, all cities or functional city systems in Chile will have Master Plans for bicycle-inclusive Infrastructure (i.e., road bike lanes, bike lanes in parks or greenways, calm traffic zones for shared use, pedestrianization, bike parking and intermodal bike parking).

Goal 9.4: By 2050, achieve a 30% reduction in GHG emissions from urban mobile sources (lower than the base year 2018) derived from the implementation of Mobility Plans mentioned in goal 9.2 in collaboration with MINVU, MTT and MINING.



5.7 Infrastructure

In Chile, public infrastructure is overseen by the Ministry of Public Works, the Secretary of State in charge of planning, study, projection, construction, expansion, repair, conservation, and exploitation of fiscal public works, and the coordinating body for the execution plans of public works carried out by the Services that constitute it.⁶¹

For this purpose, the Ministry of Public Works (MOP) has the mission of «Recovering, strengthening and advancing the provision and management of infrastructure projects and services for connectivity, protection of territory and people, public construction and optimal use of water resources; ensuring the provision and care of water resources and the environment to contribute to economic, social and cultural development, promoting equity, quality of life and equal opportunities for human beings»⁶². To fulfill its mission, the MOP proposes four strategic pillars:

1. Promoting the country's economic development through infrastructure with an integrating territorial vision.
2. Promoting social and cultural development through infrastructure, improving people's quality of life.
3. Contributing to the sustainable management of the environment, water resources and ecosystems.

⁶¹ | Decree with Force of Law 850 of 1960, Ministry of Public Works, establishing the Consolidated, Coordinated and Systematized Text of Law 18,840 of 1960 and DFL 206 of 1960.

⁶² | <https://www.mop.cl/acercadel-mop/Paginas/ValoresMisionyVision.aspx>

4. Achieve the level of efficiency defined in the use of resources.

The mandate of the MOP, as well as its strategic pillars, is threatened due to climate change. Therefore, facing and managing the challenges that climate change imposes on infrastructure requires an unprecedented transformation of the sector compatible with carbon neutrality at the national level and resilience to extreme weather events. This should be developed within a broad framework of sustainability, contributing to mitigation of and adaptation to climate change throughout the life cycle of the country's public infrastructure projects.

The main climate threats to infrastructure are changes in rainfall patterns and an increase in the intensity and frequency of droughts, an increase in the intensity of river floods, and an increase in the intensity of coastal floods (MOP, 2017). Added to this is the increase in hot days and heat waves, floods, and an increase in the average wind speeds (waterspouts). These events will have a direct impact on the country's infrastructure, affecting road, airport, hydraulic and rural drinking water, rainwater drainage, port infrastructure, and rainwater collection, among other things. In this context, the definition and implementation of the critical infrastructure for the supply of essential goods and services in the country is especially relevant for being prepared for these events to ensure appropriate stocks and avoid supply breaks.

This sector has the following climate change management tools:


- The Plan for Climate Change Adaptation and Mitigation by Infrastructure Services (2017-2022) is a reference framework that establishes guidelines for adaptation and mitigation for the offices that are part of the MOP, to help them adapt to climate change within a framework of resilience and sustainability, in addition to contributing to reducing the generation of GHG in the different phases of the project life cycle.
- The National Infrastructure Plan for Mobility 2050 (2020), aims to adapt the country's infrastructure to the challenges of the next 30 years.
- Roadmap for a Circular Chile by 2040 (2021), led by the Ministry of the Environment in conjunction with other public institutions, seeks to guide and assess progress in the transition to a Circular Economy through a set of long-term goals by 2040, with MOP as a key actor.

In terms of infrastructure, the commitments of the Ministry of Public Works addressed in the carbon budgets address the areas in which the Ministry can advance today in terms of mitigating climate change. It is possible to commit to having a carbon stock for

the sector by 2050 and make progress with the proposed reductions to the extent that a baseline is available. The Ministry of Public Works, with the support of the Ministry of the Environment, will work toward defining the baseline for outlining the steps to reduce GHG emissions for the sector's future mitigation plan and the fulfillment of its reduction goals.

In its Adaptation component, the Climate Change Adaptation Plan for the Infrastructure sector sets a schedule to be updated by 2023. This plan will establish the actions that must be taken to meet long-term objectives established in this document. In addition, the NDC establishes that, by 2030, the evaluation of public water infrastructure project will address protecting the population and territory (through river works) and/or prioritize meeting demands associated with urban and rural human consumption, in its area of influence.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

INFRASTRUCTURE SECTOR	SDGs
<p>Goal 1: Promote the integration and participation of vulnerable groups (gender approach, indigenous communities, among others) in the planning processes for infrastructure services.</p>	
<p>Target 1.1: By 2030, generate/update procedures for the inclusion of vulnerable groups in infrastructure and building planning processes.* Target 1.2: By 2030, have at least 20% inclusion of vulnerable groups in participatory processes. Target 1.3: By 2050, have 40% of planning processes consider the analyses of vulnerable groups, if applicable in the study area.**</p>	
<p>(*) Annual inclusion will be measured for the budget year. (**) Measurement will be carried out annually from 2024 onwards, after the conceptual framework is established.</p>	

Goal 2: Advance in a circular economy approach to construction and infrastructure, using Life Cycle Analysis to promote the efficient use and reuse of resources, and prioritize the use of recycled materials, as long as it does not affect the technical quality standards required for the projects.

- Target 2.1:** Identify the Circularity criteria for construction and public infrastructure, considering the Life Cycle Analysis (LCA) in infrastructure projects.
- Target 2.2:** By 2030, have Circularity criteria for 20% of infrastructure and public building initiatives.
- Target 2.3:** By 2030, 60% of public bids for construction and infrastructure will implement sustainable management plans for construction and demolition waste.
- Target 2.4:** By 2050, implement circular economy criteria with an LCA approach in 50% of infrastructure initiatives.
- Target 2.5:** By 2050, 80% of public bids for construction and infrastructure will sustainably manage Construction and Demolition Waste.



Goal 3: Promote the development of low-carbon infrastructure and buildings through the incorporation of renewable energies, energy efficiency and environmental comfort.

- Target 3.1:** By 2030, develop low-carbon infrastructure and building development criteria (with an LCA approach) and carbon footprint management in at least 20% of infrastructure and building initiatives.
- Target 3.2:** By 2050, implement low-carbon infrastructure and building criteria in at least 40% of MOP projects.



Goal 4: Advance in the development of a multisectoral planning system for sustainable infrastructure that incorporates the determining factors of the territory with adequate governance and PUBLIC-private articulation to ensure that services provided by the country's infrastructure (multimodal connectivity [land, sea and air], territorial protection, provision of drinking water, among others) are sustainable, low in carbon, and resilient to the current and future climate, and can generate social, environmental and territorial benefits through multisectoral integration (cities, energy, water resources and others).

Target 4.1: By 2030, develop a governance mechanism for the ministerial planning processes to coordinate the parties related to the provision of infrastructure and public construction that the country requires to face climate change, both in terms of adaptation and mitigation (academia, civil society, other state sectors, among others).

Target 4.2: By 2050, application of at least 40% of the multisectoral climate governance framework in infrastructure planning processes and ministerial public construction.



Goal 5: Advance in the development of a risk monitoring system focusing on resilience; in other words, identifying vulnerability, exposure and susceptibility.

Target 5.1: By 2030, generate/adapt an infrastructure monitoring system through a climate risk approach.

Target 5.2: By 2050, at least 50% monitoring of the infrastructure and buildings built based on the country's climate risks.



Goal 6: Promote the development of sustainable buildings and infrastructure that consider territorial aspects and nature-based solutions (green and hybrid) as an alternative or complement to gray infrastructure.

Target 6.1: By 2030, generate criteria for nature-based solutions by type of project; and if feasible, implement at least 20% projects that integrate said solutions.

Target 6.2: By 2050, implement at least 50% of infrastructure projects and public buildings with nature-based solutions.⁶³



⁶³ | The annex to Ministry of Works Infrastructure Sector Official Letter No. 281 of 27 from October 2021, detailing commitments to each objective in ECLP 2050. Public details Office targets.

5.8. Transport

The commitment to carbon neutrality in Chile's NDC (2020) and the achievement of Sustainable Development Goals imply profound transformations in mobility and transport systems. Increasing the use of clean technologies, the promotion of active and safe mobility, the adoption of innovations associated with «smart mobility» and systems of territorial organization that result in more efficient and synergistic travel patterns at the national, regional and local scale, and designing the necessary technical and financial instruments constitute key components to advancing progressively toward development that is more sustainable and less dependent on the use of private vehicles and fossil fuels.

In the plans for this sector, mobility must be oriented towards integral human development through collaboration for achieving social and economic well-being, without compromising the needs of future generations. To achieve this goal, transportation systems must continuously contribute to reducing environmental pollution, mitigate greenhouse gas emissions and reduce local pollutants while promoting adaptation to a changing climate. Mobility must be economically sustainable, facilitate access to destinations, goods and services, improve the performance of logistics chains, strengthen economic and territorial integration, and promote the innovation, adoption and availability of new communication technologies. These principles must also consider approaches to inclusion and gender, equity and participation, which are achieved by promoting sustainable, inclusive, clean, efficient and safe transport systems that expand access to opportunities, especially for the most vulnerable groups.

GHG emissions from the sector are generated by the burning of fossil fuels in the operation of air, land, rail, sea and river transportation. In 2018, GHG emissions accounted for 28,615 kt CO_{2eq}, an increase of 215% since 1990 and 8% since 2016, fundamentally due to the growth of the national automotive fleet as a result of urban and demographic expansion, greater economic activity and purchasing power, and the improvement of road infrastructure in the country. Additionally, the sector is responsible for local air pollutant emissions (particulate matter and precursor gases) that directly impact the health of the inhabitants. To reduce GHG emissions from mobile sources to comply with the 2020-2030 sector budget and achieve the absolute reductions committed to in the NDC, a continuous and progressive emissions reduction path must be sustained until a rate of 0.79 Ton CO_{2eq}/per capita is reached in 2050, the equivalent of a 40% reduction in direct GHG emissions compared to those reported for 2018 (INGEI) from the use of fuels in the transport sector. This percentage will be subject to improved projections (SNP) and the development of particular goals for each region and city.

Climate change mitigation strategies for the sector depend on multisectoral and multilevel management, among which the following stand out: optimization of land use patterns and ordering of land occupation, regulated by urban standards (MINVU); progress in research, promotion and use of new fuels and new energy sources; the development of electrical infrastructure networks enabling electromobility (MINENERGIA), as well as spaces for charging centers and electro-terminals; the development of incentives and the promotion of new technologies (MINECON); the development of roads and interurban infrastructure such as highways, railways, ports, and logistics platforms (MOP) oriented toward sustainability; and the implementation of urban road infrastructure (MINVU-SERVIU), among other competencies based on different state bodies and multiple levels of government administration (national, regional and local). Among these institutions, the Ministry of Transport and Telecommunications (MTT) plays a lead role in matters of planning and public policy; supervision of public and private companies that operate means of transport; the development, management and planning of road infrastructure; and the promotion of public transport improvements, in addition to ensuring the operational aspects of the sector.

Approximately half of emissions from mobile sources come from trips that occur in the urban area, where the demand for travel is mainly explained by the location of homes, employment centers, services and equipment, manufacturing and logistics distribution centers. The other half of emissions are from travel in the interurban area, whether as a result of the interaction of cities with their areas of influence, interprovincial and interregional connectivity, and the movement of cargo, goods, raw materials and waste transport that supply both the internal market (cities) and the external market (ports, airports and border crossings).

To move towards sustainable mobility, strategies are required to continue providing connectivity and access to people and goods, but with a significant effort to reduce the use of and dependence on the use of fossil fuels. In urban areas, policies and measures that increase the use of modal alternatives with energy efficiency and lower GHG emissions per person or item transported should be emphasized, including active mobility options such as non-motorized transport, human energy mobility or zero-emission mobility.⁶⁴ In interurban areas, a technological shift towards cleaner engines and energies, as well as mass transport systems, are fundamental given the great distances that characterizes such travel and the movements of people between the functional areas of cities and their urban centers. For cargo, the coordination of planning and technology strategies with intermodal transfer strategies enables greater efficiency in the transport of goods.

Within the institutional sphere, the MTT is developing two key instruments that will guide sector action in terms of mitigation and adaptation to climate change, to be developed fully by 2022:

- The National Strategy for Sustainable Mobility will guide sustainable mobility decisions and actions, and strengthen sectoral governance, in accordance with the commitments established on climate issues in the NDC and ECLP.
- The National Urban Mobility Program for Climate Change Adaptation and Mitigation is a technical-financial instrument for systematizing, organizing, dimensioning, targeting and financing sustainable mobility initiatives to enable the country's regions to design, implement and monitor their own Sustainable Mobility Plans.

To complement these efforts, the MTT has a series of instruments that favor sustainable development and are aimed at meeting long-term climate objectives, among them: Mobility Master Plans (or Transport Master Plans, as they were formerly known) and Public Transport Infrastructure Master Plans (PMITP); Pedestrian Accessibility Plans, Cycle-inclusive Infrastructure Master Plans and Traffic Management Plans, complemented by Investment Plans in Mobility Infrastructure and Public Space developed at the municipal level and in alliance with MINVU; the Electromobility Promotion Program; the Fleet Renewal Program, and Methodologies for the Estimation and Economic Evaluation of Emissions from Mobile Sources (MODEM and MODEC). All are conceived as technical resources and instruments to achieve comprehensive mobility performance.

Transport as a variable dependent on activity systems requires the design and application of holistic and multisectoral approaches that consider three fundamental strategies in any solution: (1) Avoid (reduce trips and manage demand), (2) Change (use more sustainable alternatives), and (3) Improve (introduce progressive improvements in clean technologies). The success of these measures depends on the coordination and co-responsibility of multiple public and private actors to promote a culture of mobility based on education, governance, participation and environmental awareness.

⁶⁴ | For the purpose of this document, the concept of active mobility will be used to emphasize co-benefits regarding health.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

TRANSPORTATION SECTOR

SDGs

Goal 1: Guide decisions regarding mobility and urban and territorial development to prioritize the most sustainable and efficient modes of travel, both urban and interurban, using integrated, multimodal and well-being and quality of life-oriented mobility systems for this purpose, putting users at the center and addressing the social dimension of mobility. [Strategy 1: Avoid]

- Target 1.1:** By 2021, have a methodology and processes to measure the Carbon Footprint of Rail Transport.
- Target 1.2:** By 2023, include sustainable mobility norms and methodology in territorial and infrastructure planning.
- Target 1.3:** By 2025, build inter-institutional and collaborative communities of practice for the promotion of low or zero emission mobility involving the national government, local governments, regional governments, civil society, academia and private institutions.
- Target 1.4:** By 2025, generate training programs in sustainable mobility aimed at traffic officers, Traffic and Planning Directorate municipal staff, Municipal Corporations of Education, Health, Sports and Culture, and Environmental Departments, among others.
- Target 1.5:** By 2030, ensure that all state institutions that prepare Territorial Planning Instruments and/or develop the planning of urban and interurban road infrastructure works include sustainable mobility objectives, and promote territorial planning that helps improve accessibility, reducing travel times and distances.
- Target 1.6:** By 2030, reduce emissions rates in maritime transport progressively, starting from 5% in 2023 to 11% in 2026, using the 2008 baseline.
- Target 1.7:** By 2030, within the framework of the CORSIA agreement (Carbon Offsetting and Reduction Scheme for International Aviation) promoted by the International Civil Aviation Organization (ICAO), Chile will join the emissions compensation program through the purchase and offsetting of emissions units by local operators.
- Target 1.8:** By 2040, 100% of the electricity consumption of Empresa de Ferrocarriles del Estado will be carbon neutral.



Goal 2: Incorporate sustainable mobility and climate change objectives into the formulation processes of land use and urban planning instruments (e.g., integrated planning considering mobility and transport components, encouraging the development of compact, polycentric cities with a mixture of land uses, and more efficient travel patterns). [Strategy 1: Avoid]

Target 2.1: By 2030, include the concept of sustainable mobility in the Strategic Environmental Assessment of the Territorial Planning Instruments and PROT, to be developed in 2025, via specific mobility studies that support the preparation of the SEA and complement current Road Capacity Studies.



Goal 3: Promote initiatives to strengthen PUBLIC transport and active, efficient and sustainable means of transport to prioritize them over the use of private vehicles. [Strategy 2: Change]

- Target 3.1:** By 2025, work with MINVU to develop Cycle-inclusive Infrastructure Master Plans in the country's main cities (over 50,000 inhabitants) and with the MOP to develop interurban networks that allow connecting these cities with nearby towns and other cities within their functional area of influence.
- Target 3.2:** By 2030, develop and update Master Mobility Plans in 28 regional capitals and mid-sized cities with more than 80,000 inhabitants, as well as Traffic Management Plans in 23 mid-sized cities with less than 80,000 inhabitants, with a sustainable mobility approach and specific emission reduction targets.
- Target 3.3:** By 2030, develop Strategic Plans for Modal Exchange Stations in the Greater Valparaíso, Greater Concepción and Temuco-Padre las Casas metropolitan areas, and update the Greater Santiago Plan.
- Target 3.4:** By 2030, reduce the proportion of private transportation powered by fossil fuels in all regions relative to the base year 2017.
- Target 3.5:** By 2030, generate and implement Pedestrian Mobility Plans in the cities and neighborhoods that present the greatest limitations and barriers to pedestrian traffic.
- Target 3.6:** By 2030, ensure that all cities in the country have an appropriate road network for the movement of pedestrians and bicycles with levels of safety, quality and comfort that meet regulatory standards, channeling the initiatives through Mobility and Public Space Infrastructure Plans developed at the community level.



Target 3.7: By 2040, develop and update Mobility Master Plans in the country's 35 cities with more than 80,000 inhabitants, following a sustainable mobility approach and with specific emission reduction goals; and develop and update Transit Management Plans in 25 mid-sized cities with less than 80,000 inhabitants, using a sustainable mobility approach and with specific emission reduction goals.

Target 3.8: By 2040, have updated Strategic Plans for Modal Exchange Stations in the Metropolitan Areas of Greater Valparaíso (1), Greater Concepción (2), Greater Santiago (3), Temuco-Padre las Casas (4), and develop new Plans for the Metropolitan Areas of Iquique-Alto Hospicio (5), Coquimbo-la Serena and Rancagua-Machalí (6) and (7), respectively.

Target 3.7: By 2040, develop and update Mobility Master Plans in the country's 35 cities with more than 80,000 inhabitants, following a sustainable mobility approach and with specific emission reduction goals; and develop and update Transit Management Plans in 25 mid-sized cities with less than 80,000 inhabitants, using a sustainable mobility approach and with specific emission reduction goals.

Target 3.10: By 2050, update the Strategic Plans for the Modal Exchange Stations in the nine Metropolitan Areas potentially enacted to date.

Goal 4: Strengthen the planning, management, and operation of urban PUBLIC transportation systems to make them attractive, effective, and efficient alternatives to individual transportation. [Strategy 2: Change]]

Target 4.1: By 2030, develop Public Transport Infrastructure Master Plans in six potential Metropolitan Areas and two mono-communal cities (Arica and Valdivia).

Target 4.2: By 2030, consolidate existing public bicycle systems in the metropolitan areas of Iquique-Alto Hospicio, Gran Concepción, Puerto Montt-Puerto Varas; Rancagua Machali; La Serena Coquimbo; Valparaiso.

Target 4.3: By 2040, develop and update Public Transportation Infrastructure Master Plans in nine Metropolitan Areas.

Target 4.4: By 2050, develop and update the Public Transportation Infrastructure Master Plans potentially in effect in 10 Metropolitan Areas, as well as the city of Antofagasta.



Goal 5: Promote the use of technological innovations as allies for sustainable development, favoring improved efficiency, flexibility and adaptability of transport systems in terms of coverage, accessibility, safety, operability, monitoring and planning. [Strategy 3: Improve]

Target 5.1: By 2030, strengthen mechanisms for collecting, storing and disseminating mobility information, through passive and digital means, to allow the treatment and analysis of massive, standardized and continuous data, as well as the generation of information in open formats and platforms for the entire mobility ecosystem.

Target 5.2: By 2030, improve the availability of mobility information and analytics for users and operators, advancing towards the digital transformation of mobility management through the automation of processes and the application of predictive systems managed by Mobility Observatories, whether public or private.

Target 5.3: By 2030, improve universal accessibility standards in public spaces through the adoption of technological systems that facilitate the inclusion and development of sustainable modes, such as the extension of coverage of signalized intersections for people with visual disabilities.

Target 5.4: By 2030, move progressively toward the creation of a culture of mobility based on information, conceived of as a resource for integration, safety and environmental responsibility, strengthening information services to citizens, expanding their coverage and improving their channels.

Target 5.5: By 2050, promote the creation of a mobility ecosystem based on innovation, the adoption of technology and the development of new management models under the concept of mobility as a service, through exploration and pilot projects, research into new business models and the development of enabling regulatory frameworks.

Target 5.6: By 2050, configure a participatory, robust and inclusive public-private mobility ecosystem and promote communities of practice that foster innovation and sustainable technological solutions appropriate to respective local realities.

Target 5.7: By 2050, optimize the operation of road networks in the main cities, and improve travel conditions and the efficiency of road infrastructure by integrating the network of traffic lights into traffic control centers.



Goal 6: Increase the use of clean technologies (low or zero carbon emissions) in urban public transport, private transport, interurban passenger transport, and urban and interurban freight transport. [Strategy 3: Improve]

Target 6.1: By 2030, have started a program to transition to clean technologies in Urban Logistics through pilot experiences in electromobility and green hydrogen, vehicle certification, promotional and informational campaigns, data management and dissemination, and international coordination with Holland and H2/Chile for Green Hydrogen.

Target 6.2: By 2030, update information on transport activity at the urban level (MTT): flows and speeds enabling the Ministry of the Environment to calculate annual emissions estimates from mobile sources for Chile's 28 main cities to monitor, follow-up and control the evolution of polluting emissions in urban areas (MRV).⁶⁵

Target 6.3: By 2030, enable regulations for vehicle reconversion processes to low-emission technologies to support technology reconversion processes.

Target 6.4: By 2040, have urban public transportation systems based 100% on zero-emission technologies in all regions of the country. **Target**

6.5: By 2040, convert 100% of basic taxis and collective taxis to a zero-emission model.

Target 6.6: By 2050, achieve progress in electromobility equivalent to 58% of the vehicle fleet, both private and commercial vehicles.

Target 6.7: By 2050, convert 71%

of freight vehicles to zero-emission vehicles.

65 | MRV: Monitoring, Reporting and Verification



Goal 7: Incorporate the active and effective participation of citizens in decisions and planning, reinforcing local identities and values, strengthening decentralization and multilevel articulation for coherent and synergistic national development. [Strategies 1,2 and 3]

Target 7.1: By 2025, implement programs and projects aimed at civil society non-profit organizations that facilitate, promote and accompany the modal change towards mobility with low or zero emissions, encouraging active and effective citizen participation.

Target 7.2: By 2030, implement broad and multi-state participatory processes in the preparation of all mobility and transport planning instruments, as well as in project pre-feasibility studies, final design and execution.

Target 7.3: By 2030, design and implement multilevel governance for sustainable mobility, in accordance with government changes to strengthen regionalization.

Target 7.4: By 2050, consolidate multilevel and decentralized mobility governance based on a participatory, plural and democratic model developed in a decentralized and integrated manner.



5.9. Health

According to the World Health Organization (WHO), Climate Change is the greatest threat to global health in the 21st century. Health is and will be affected by changes in climate through direct impacts such as: heat waves, droughts, severe storms and rising sea levels; and indirect impacts such as respiratory diseases, emerging diseases, vector-borne diseases, food insecurity, water supply insecurity, malnutrition and forced displacement. The health sector therefore has an important responsibility in terms of climate change: On the one hand, contributing to efforts to achieve carbon neutrality at the national level, and on the other, increasing resilience to the environmental stresses that the country will face, focusing above all on the most vulnerable populations. This will require a systemic and preventive approach and policies that integrate social, economic, cultural and environmental dimensions with natural factors, bearing in mind the WHO's definition of health as:

«A state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity.»⁶⁶ That is why it is essential that all public policies consider the impacts of climate change on the health and physical, mental and social well-being of human beings

The main climate threats for the sector are the increase in average temperature and heat waves, decrease in precipitation, increase in the intensity of precipitation, and increase in extreme weather events affecting health, including: increased morbidity and mortality due to changes in temperature and extreme weather events, diseases transmitted by vectors (such as the dengue mosquito), diseases associated with food and water consumption, allergic diseases, diseases caused by atmospheric pollution, and diseases associated with greater exposure to UV rays, among others. Also, it should be noted that the human invasion of ecosystems, together with the climate crisis, has caused more and more diseases to be transmitted from animals to humans, such as COVID-19 or Ebola.

Regarding GHG emissions, the health sector has jurisdiction over the regulation of biogas control in landfills (4.2% of total emissions at the national level); design and operation of energy-intensive health facilities; and regulations applicable to the generation, storage, transportation, treatment or recycling of controlled substances and products, including substitutes for substances that deplete the ozone layer, mainly HFCs (3.4% of total GHG emissions at the national level).





The main agency in charge of the sector is the Ministry of Health, which will lead the development of mitigation and adaptation plans for the sector, in accordance with the Draft Framework Law on Climate Change.

The health sector will contribute to the fulfillment of the NDC's mitigation commitments, specifically its goal of reducing national GHG emissions by 2030. In its Adaptation component, the NDC calls for

⁶⁶ | WHO (1946) Preamble to the Constitution of the World Health Organization, adopted by the International Health Conference held in New York from June 19 to July 22, 1946 and signed on July 22, 1946 by the representatives of 61 States (Official Records of the World Health Organization, No. 2, p. 100), in force since April 7, 1948.

updating the health sector's climate change adaptation plan by 2022. This plan outlines the actions that must be implemented in accordance with the long-term objectives established in this document.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

HEALTH SECTOR	SDGs
<p>Goal 1: Strengthen national knowledge and evidence regarding the environmental variables linked to climate change and how these could affect people's health and well-being.</p>	
<p>Target 1.1: By 2025, have relevant indicators for supervising respective monitoring zones, considering local environmental conditions linked to climate change. Target 1.2: By 2025, implement a system that allows regional risk matrices to be kept up to date, considering the health risks associated with climate change through the application of a methodological tool designed especially for this purpose. Target 1.3: By 2025, have dynamic maps (geographical representation system in real time) of population groups vulnerable to heatwaves.</p>	 
<p>Goal 2: Educate, empower and involve citizens in issues of climate change and its impacts on the health and well-being of the population, both nationally and regionally, to raise awareness in communities and promote prevention, preparedness and response to the expected impacts of climate change on health.</p>	
<p>Target 2.1: By 2024, implement a health education strategy for safe and responsible water consumption in homes. Target 2.2: By 2025, develop a risk communication axis on issues involving water, zoonosis and emerging and re-emerging vector diseases, addressing their impacts on health, raising awareness at the community level and promoting self-care measures through information and participatory education. Target 2.3: By 2030, increase the knowledge base among key national health sector teams, including Primary Care and more complex levels, regarding health impacts due to climate change.</p>	 

Goal 3: Include the health implications of mitigation and adaptive measures in economic and fiscal policies (beginning with the design stage) in the different sectors, adopting a «health» approach in all policies.

Target 3.1: By 2024, determine the scope I, II and III Carbon Footprint of 100% of High-, Medium- and Low-Complexity Hospital Establishments affiliated with the national Health Services.

Target 3.2: By 2025, modify health regulations to allow safe water consumption from new sources such as rainwater harvesting and fog catchers, and provide technical training at the regional levels for sanitary controls in implementing these alternatives.

Target 3.3: By 2025, determine the gap in energy consumption (consumption of fossil fuels and firewood) and technologies (equipment) that contributes to the generation of Greenhouse Gases in High-, Medium- and Low-Complexity Hospital Establishments affiliated with the national Health Services, based on calculation of their Carbon Footprint.

Target 3.4: By 2025, compile information about and define the national baseline for embodied carbon and operational carbon in new and existing health buildings.

Target 3.5: By 2030, new health buildings must publicly report their carbon footprint (embodied carbon and operational carbon).

Target 3.6: By 2030, all landfills with sanitary authorization will comply with biogas control regulations.

Target 3.7: By 2030, 90% of the urban population will have access to sanitary landfills for the disposal of non-recovered household solid waste.

Target 3.8: By 2030, all new landfill closures will comply with health regulations on biogas management.

Target 3.9: By 2030, there will be standardized sustainability criteria for all health buildings, and limits will have been established on carbon emissions for health buildings. **Target 3.7:** By 2030, 90% of the urban population will have access to sanitary landfills for the disposal of non-recovered household solid waste.

Target 3.7: By 2040, 100% of the urban population will have access to sanitary landfills for the disposal of non-recovered household solid waste.



Goal 4: Surveillance and monitoring of the effects of extreme weather events on people's health and well-being.

Target 4.1: By 2023, determine the location of and quantify the population vulnerable to health risks due to decreased access to clean water, and coordinate with the competent institutions to address the issue.

Target 4.2: By 2025, have a permanent and updated monitoring and surveillance system to identify relevant zonal indicators associated with climate change.

Target 4.3: By 2025, implement an integrated monitoring and communication system for unusual findings, in time and space, of vectors and reservoirs with public health implications associated with climate change.



5.10 Tourism

The variation in temperatures and precipitation, the loss of biodiversity and the occurrence of extreme weather events, put the sector at risk due to the loss or disappearance of natural tourist attractions, in addition to the increased incidence of extreme events with the corresponding risk that they entail. These impacts have an unequal distribution in the industry, and are particularly harmful for nature-based tourism and small companies, whose business models are less flexible. The industry's ability to adapt will be essential to the sustainability and growth of the sector.

Rising temperatures, decreased precipitation, elevation of the zero isotherm and reduced snow accumulation will affect the conditions for snow-related activities in the winter season. As for extreme climate events, the increase in tidal and storm events will affect the coastline, causing coastal erosion, loss of beaches, closure of coves and ports. Finally, conditions that favor the occurrence of forest fires, such as high temperatures, drought and wind patterns, threaten the tourism associated with the natural landscape and ecosystems in the country's different territories, with the consequent loss of attractiveness and decline in the sector's economic condition. The challenge will be to assess the climate risk of heritage and tourist sites related to the loss of terrestrial biodiversity, decreased availability of fresh water in lakes, lagoons, rivers, waterfalls and rapids, and risks associated with extreme rainfall and droughts.

In addition, the sector should promote adaptation to climate change among companies, tourists, and tourist destinations, while implementing measures to mitigate GHG emissions as required by the Davos Declaration⁶⁷ and reflected in its long-term goals.

⁶⁷ | World Economic Forum (2007). Davos Declaration, Climate Change and Tourism. Davos, Switzerland. [Declaracion_de_Davos._Cambio_Climatico_y_Turismo.pdf](#) (ucipfg.com)

In this context, the tourism sector has a long-term vision of building new capacities to adapt to and face the effects of climate change with resilience, and strengthen the sustainability of reducing GHG emissions from the sector.

At the national level, the Ministry of Economy, Development and Tourism, through the Undersecretary of Tourism, is in charge of designing public policies and coordinating the parts that make up the sector. The National Tourism Service (Sernatur) has regional representation and is the executing public body for plans and programs based on the National Tourism Strategy, encouraging sustainability, quality, competitiveness and specialization in the industry.

In 2019, the Council of Ministers for Sustainability and the Committee of Ministers of Tourism decided favorably on the *Sectoral Plan for Adaptation to Climate Change in the Tourism Sector*, prepared by the Undersecretary of Tourism, Sernatur and the Ministry of the Environment. The plan includes 21 measures that seek to install capacities and generate enabling conditions for the implementation of initiatives for adapting to and facing the current and future effects of climate change, increasing the resilience and sustainability of the sector by 2024. Its update will establish the actions the sector must take in accordance with the long-term objectives established in the ECLP.

Below are long-term sectoral objectives and goals that the tourism sector must implement in coordination with the different bodies involved, and their contribution to the SDGs.

TOURISM SECTOR	SDGs
Goal 1: Promote tourist experiences that contribute to the sustainable and climate change resilient development of local and indigenous communities, and that value their cultural and natural heritage.	

Target 1.1: By 2030, generate a space for public-private coordination at the national level for the development of prioritized tourism experiences (nature, rural, astrotourism, wine tourism, indigenous tourism, adventure, sports and gastronomy) aimed at sustainable development and climate change resilience of local and indigenous communities.

Target 1.2: By 2030, have planning instruments (roadmaps or strategic guidelines) in at least three lines of prioritized experiences (rural tourism, indigenous tourism and nature tourism) that incorporate components of inclusion and sustainability, taking charge of climate change issues and recognizing the importance of local and indigenous communities.



Target 1.3: By 2050, generate space for public-private articulation for the development of all tourism experiences (nature, rural, astrotourism, wine tourism, indigenous tourism, adventure and sports, gastronomy and others to be defined according to sector priorities) oriented toward sustainable development resilient to climate change by local and indigenous communities.

Target 1.4: By 2050, have current planning instruments (road maps or strategic guidelines) in at least seven lines of prioritized experiences (rural tourism, indigenous tourism, nature tourism, astrotourism, wine tourism, adventure and sports, gastronomy and others to be defined according to sector priorities).

Goal 2: Strengthen the institutional framework and governance of the tourism sector to address the challenges posed by climate change through the development of capacities at the national, regional, and local levels and PUBLIC-private partnerships.

Target 2.1: By 2030, coordinate the joint work between Regional Directorates and Regional Governments to implement management plans for tourist destinations in at least 30% of prioritized tourist destinations.

Target 2.2: By 2030, ensure that at least 50% of the members of the public-private boards of tourism interest zones (ZOITs) declared by 2028 are trained in sustainability and climate change issues.

Target 2.3: By 2050, coordinate the joint work of the Regional Directorates and Regional Governments to implement tourist destination management plans in at least 60% of prioritized tourist destinations.

Target 2.4: By 2050, ensure that at least 70% of the members of the public-private boards of ZOITs declared by 2048 are trained in sustainability and climate change issues.



Goal 3: Promote sustainable management that is resilient to climate change in the territories associated with tourist destinations, through local management instruments, land use planning and the generation of local capacities.

Target 3.1: By 2030, at least 40% of communities in tourist destinations will have a current and operational Tourism Development Plan.

Target 3.2: By 2030, have an operational mechanism that can be updated to identify the tourist destinations that are most vulnerable to climate change.

Target 3.3: By 2030, have a system to visualize metrics for the Saturation of Tourist Destinations* to support decision-making for tourism sustainability.



Target 3.4: By 2030, 50% of the prioritized (consolidated) tourist destinations most vulnerable to climate change will implement the Tourist Destination Saturation Index (IST) and will take action to avoid saturation.

Target 3.5: By 2030, 50% of the ZOITs most vulnerable to climate change will have climate actions incorporated into their action plans.

Target 3.6: By 2050, at least 70% of communities in tourist destinations will have a current and operational Tourism Development Plan.

Target 3.7: By 2050, 90% of the prioritized (consolidated) tourist destinations most vulnerable to climate change will implement the Tourist Saturation Index (IST) and will take action to avoid saturation.

Target 3.8: By 2050, 90% of the ZOITs most vulnerable to climate change will have climate actions incorporated into their action plans.

() This system will deliver metrics that support decision-making to avoid saturation in each of the following dimensions: infrastructure and environment, quality of life, tourism capacity, and management.*

Goal 4: Increase the resilience of tourist destinations to the impacts of climate change through PUBLICinfrastructure.

Target 4.1: By 2030, 30% of Tourism Infrastructure Master Plan projects must have a climate change adaptation approach.

Target 4.2: By 2050, implement at least 80% of Tourism Infrastructure Master Plan projects with a climate change adaptation approach.



Goal 5: Reduce the sector's carbon footprint through circular economy strategies, efficiency in energy and water consumption, and the use of renewable energy sources, especially in the transportation and accommodations sector.

Target 5.1: By 2030, measure the sector's carbon footprint.

Target 5.2: By 2030, generate spaces for public-private coordination (Ministry of Energy, Ministry of Transport) to promote electromobility in tourist transport.

Target 5.3: By 2050, become a carbon neutral sector.



5.11. Coastal Border ⁶⁸ |

⁶⁸ | In this document, the term “Coastal Areas” will be used in accordance with the territorial powers of the Ministry of National Defense specified in DFL 340 of 1960 and in the National Policy for the Use of Coastal Areas (PNUBC). However, it will be updated to “Coastal Zone” following passage of the Framework Law on Climate Change.

Increasing adaptive capacity for coastal resilience to climate change requires sustainable strategic planning that integrates the diverse geographical realities of the national territory, focusing on sustainable development and adequate management of existing resources. All this should be part of a vision for the conservation and constant protection of maritime, terrestrial and aerial habitats to ensure the compatibility of economic-productive activities and those related to human settlements. The application of an integrated risk approach with the capacity to take into account all types of threats, and generate knowledge and constant training for adapting to possible future impacts is of vital importance to this matter. Given that coastal areas are affected by the dynamics of estuaries and continental basins that transport fresh water and sediments, and have an impact on the physical habitat and ecosystems, these elements must be integrated systematically into coordinated planning.

Coastal ecosystems, communities and economic activities will be threatened mainly by the increased intensity and frequency of extreme events, such as droughts, river floods, heatwaves, floods and an increase in average wind speeds (waterspouts). In addition, the sector is exposed to coastal flooding as a result of extreme wave events (swells) associated with high-recurrence periods, which will increase markedly by mid-century on the central coast of Chile especially. An increase in the flood level is projected, mainly due to sea level rise, with more homes, populations, ecosystems and infrastructure exposed to its impacts. By mid century, the latitudinal gradient of sea level rise could reach 0.14 m in the north, with further increases towards the end of the century. Finally, beach erosion between Arica and the Chacao Channel is projected at between 3 and 25 m. Estimates for the end of the century (2081-2100) indicate that the rise in sea level will be on the order of 0.58 ± 0.25 m, generating significant impacts such as the flooding of coastal settlements, effects on the operation of ports and fishing coves, a decline in tourist activity due to loss of beaches, damage to infrastructure, saline intrusion into aquifers, and effects on cultural and natural heritage areas.

Regarding sea level rise, it is important to consider that our country is permanently affected by vertical deformations associated with tectonic activity, which can trigger gradual or immediate changes in flood levels that may even outpace those attributed to the rise in mean sea level due to climate change. As a complement to this Strategy, both phenomena should be studied together to improve the information on ground deformation.

The impacts derived from these events affect human settlements, natural systems, urban and port infrastructure, and the economic activities carried out there. These threats are intensified by those attributable to human activities that, directly or indirectly, alter the atmospheric composition and affect ecosystems. Examples include incursions into coastal wetlands, and the biological and chemical modification of fresh water for various associated uses. Therefore, an integrated approach that incorporates the different vulnerabilities of natural and human systems is vital to the ability of coastal areas to adapt to climate change, as well as for their sustainable development.

Climate change is already significantly affecting coastal infrastructure. In particular, the national port system is suffering the effects of this phenomenon, which manifests itself through port closures due to tidal waves and storms, with significant costs at the different stages of the logistics chain. There is a vital need for both ports and other infrastructure to adapt their facilities to minimize flooding and coastal erosion, as well as to improve shelter conditions and early warning systems.

For such efforts to succeed, strengthening intersectoral coordination to address common issues is essential for the implementation of measures aimed at meeting the long-term objectives and the goals proposed for the coastal sector. The coastal sector has important interrelationships with the fishing and aquaculture, biodiversity, water resources and infrastructure sectors, among others, and with the ocean integration component.

The generation and improvement of basic scientific information is a key part of designing and implementing adaptive solutions for meeting the goals and objectives of this Strategy. This will require the integration of information and data from different institutions, the broad participation of Regional Governments, Municipalities and local communities along the coast, including the private sector and civil society organizations, as well as education, awareness and dissemination of issues related to climate risk on the coastline, the protection, conservation and sustainable use of Chile's sea, the biodiversity of coastal marine systems, and the safeguarding of ecosystem services.

The Ministry of National Defense's Undersecretariat for the Armed Forces is responsible for administering the country's coastline and is currently developing a climate change adaptation plan. The following instruments are available for coastal management: i) the Ministry of National Defense's National Policy for Use of the Republic's Coastline (1994, as amended); ii) the General Law on Fisheries and Aquaculture ⁶⁹ |; iii) National Ocean Policy (MINREL, 2018); iv) Port and Coastal Infrastructure Policy as of 2020 (MOP, 2009); v) National Policy for Protected Areas (MMA, 2005), and vi) National Policy for Disaster Risk Reduction and National Strategic Plan 2020-2030 (ONEMI, Ministry of the Interior and Public Security, 2020).



Coordination with other sectoral plans and their updates is relevant for the sector, such as the plan for adaptation to climate change in biodiversity, and the plan for adaptation and mitigation of infrastructure

⁶⁹ | Ministry of Economy, Development and Reconstruction Decree No. 430 (1991), which establishes the consolidated, coordinated and systematized text of Law No. 18,892 and its amendments

services to climate change, as well as with instruments that provide related guidelines, such as the «Guide to incorporate climate change in territorial planning instruments», being prepared by the Ministry of the Environment, Undersecretariat of the Armed Forces, Ministry of Housing and Urban Development, and Undersecretary of Regional and Administrative Development.

The Adaptation component of the 2020 NDC calls for developing a climate change adaptation plan for coastal areas by 2022. This plan outlines the actions that must be implemented in accordance with the long-term objectives established in this document.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

COASTAL SECTOR	SDGs
<p>Goal 1: Increase and disseminate information and studies about coastal areas and the development of ocean technologies.</p> <p>Target 1.1: By 2025, develop a database that contains the geographical background and systematized attributes of all maritime and aquaculture concessions, as well as others affecting coastal areas.</p> <p>Target 1.2: By 2025, have a free public Geoportal for viewing and downloading information on maritime concessions and similar projects.</p> <p>Target 1.3: By 2030, as part of meeting Targets 1.1 and 1.2, identify concentrations of activities, territorial vocations and risk analysis for critical and strategic infrastructure* and other vulnerable essential coastal facilities.</p> <p>Target 1.4: Integrate the national data platforms to support studies related to climate change.</p> <p>Target 1.5: By 2030, update the National Oceanographic Plan, which systematically establishes national oceanographic scientific activities.</p> <p>Target 1.6: By 2050, contribute to the development of systemic observation programs or projects related to oceanography, meteorology and glaciology.</p>	 

Target 1.7: Contribute to the initiatives being carried out by the Ministry of Science, Knowledge, Technology and Innovation for the creation of a Climate Change Observatory (OCC), and the implementation of the Integrated Observation System of the Chilean Ocean (SIOOC).

(*) The concepts of critical and strategic infrastructure are those described in the National Territorial Planning Policy (PNOT).

Goal 2: Promote inclusive participation in the development of coastal land use planning instruments.

Target 2.1: By 2025, establish information, instructional and training programs aimed at the personnel of organizations that participate in the preparation of Territorial Planning Instruments on the effects of climate change on the coastline, the importance of the role of natural coastal spaces, and associated risk management through workshops, seminars, talks and other activities.

Target 2.2: Promote the civil society participation in the different stages of development of future Coastal Zoning (ZBC) through dissemination, education and awareness programs on the importance of the role of natural coastal spaces and associated risk management.



Goal 3: Contribute to disaster risk management and adaptation to climate change through the promotion of safe and resilient occupation of coastal areas.

Target 3.1: By 2025, include considerations related to disaster risk management in updates of the National Policy for the Use of Coastal Areas and other sectoral plans and instruments.

Target 3.2: By 2025, incorporate into the Regulation of Maritime Concessions (CCMM) criteria that allow positive weighting of the granting of maritime concessions that contribute to the reduction of disaster risk and adaptation to climate change, such as: infrastructure for coastal and fluvial protection, green infrastructure to improve coastal resilience, etc. These weighting criteria will make it possible to access a reduced marine concession, preferably in cases that overlap with other applications that do not have preference criteria in terms of disaster risk management, consistent with the provisions of Law No. 20,249 and its Regulations.



Goal 4: Promote resilience through policies and instruments that promote the protection, conservation and sustainable use of Chile's seas, the biodiversity of coastal marine systems, and the protection of ecosystem services, considering the impacts of climate change.

Target 4.1: By 2025, include considerations related to the care of coastal areas under official protection in the updating of the National Policy for the Use of Coastal Areas and other sectoral plans or instruments.



5.12 Biodiversity

Chile's biodiversity stands out for its high degree of endemism, singularity and multiple types of ecosystems, which deliver countless ecosystem services that maintain and improve the well-being of the population by providing food, water, energy, materials, medicines, genetic resources and cultural value, among other things. However, climate change generates a series of negative impacts on biodiversity, affecting the ecological patterns and processes that determine the composition, abundance and geographic distribution of ecosystems and the species that compose them. This in turn changes the ecosystem services they provide and may even lead to the collapse of ecosystems and the extinction of some species, to the consequent detriment of ecosystem services.

Climate risk analyses for species predict a decrease in current distribution areas, as well as an upward movement from the coast towards the mountains and a poleward movement from north to south in response to increased drought and aridification. The central-southern zone of the country is the one at greatest risk to future variations in the climate, due to a lower capacity of flora and fauna to exist in the areas where they are currently distributed and present.

Manmade pressures, such as changes in land use or disruption of the water cycle, aggravate this situation, thus relieving the direct effects of climate change on biodiversity.

In this context, the vision established in the National Strategy for Biodiversity 2017-2030, declares that:

By 2030, Chilean society understands, values, respects and integrates the country's biodiversity and ecosystem services as a source of its own well-being, stopping their loss and degradation, restoring them, protecting them, using them sustainably and distributing the benefits of biodiversity in a fair and equitable manner, maintaining the possibility of satisfying the needs of future generations.



At the institutional level, the Ministry of the Environment is in charge of generating policies, plans and programs for the protection of biodiversity, a role that it fulfills with the support of various state institutions.

Other instruments in the field of biodiversity that stand out are the following:

- The Biodiversity Sector's Climate Change Adaptation Plan (2014) aims to strengthen the country's capacity to face climate challenges and the pressure they exert on ecosystem goods and services, implementing measures to conserve biodiversity and facilitate its adaptation to climate change. Based on this general objective, 50 measures have been established under four specific goals for biodiversity research and capacity building, the promotion of sustainable production practices, the consideration of biodiversity objectives in territorial planning, and the strengthening of the National System of Protected Areas through the implementation of adaptive measures at the level of ecosystems and species. The updating of this Plan will begin in the coming months.
- Law 21,202 for the Protection of Urban Wetlands (2020), which aims to specifically regulate wetland ecosystems within urban areas (wetlands totally or partially within the urban limit), and introduce the concept of urban wetlands into national legislation for the first time, given the great relevance that these ecosystems have for cities in the form of green areas, spaces for recreation, flood control, climate change mitigation, among others, as well as the strong threats under which they find themselves.

In terms of biodiversity, it will contribute to the fulfillment of the commitments in the adaptation and integration components of the NDC, which are established as: i) update of the Biodiversity Adaptation Plan by 2022 and 2027; ii) commitments about forests, iv) peatlands, v) ecosystems, and vii) oceans.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

BIODIVERSITY	SDGs
<p>Goal 1: Contribute to the recovery and conservation of the diversity of living organisms that are part of the country's terrestrial and marine ecosystems, including coastal and continental waters and sea islands.</p> <p>Target 1.1: By 2025, design scientific evidence-based proposals for necessary modifications to maritime management instruments for the protection of marine mammals in areas relevant to conservation.</p> <p>Target 1.2: By 2030, official Species Recovery, Conservation and Management Plans will be implemented for between 15% and 30% of species classified as threatened by 2020.*</p> <p>Target 1.3: By 2030, at least between 10 and 15 plans for the control and/or eradication of terrestrial and hydrobiological Invasive Alien Species (IAS) will have been implemented, according to the list of prioritized IAS by 2022.</p> <p>Target 1.4: By 2050, Species Recovery, Conservation and Management Plans will have been formalized and implemented for at least 30% to 50% of species classified as threatened by 2020.*</p> <p>Target 1.5: By 2050, at least between 35 and 40 terrestrial and hydrobiological IAS control and/or eradication plans will have been implemented, according to the list of prioritized IAS by 2040.</p> <p>Target 1.6: By 2050, 20% of species classified as threatened in 2020 will have improved their conservation status. (Species classified as threatened are those that are critically endangered, endangered or vulnerable).</p> <p><i>(*) These goals were established in light of the fact that the Biodiversity and Protected Areas Service (SBAP) has not yet been implemented.</i></p>	
<p>Goal 2: Promote the protection of ecosystems that are important for biodiversity to increase their representativeness through protective measures and other conservation and restoration mechanisms.</p> <p>Target 2.1: By 2030, a network of marine protected areas (MPAs) and other effective area-based conservation measures (OEMC) will have been established over at least 10% of the surface of each of the marine regions underrepresented in the Chilean Exclusive Economic Zone (EEZ), mainly along the coast and in areas identified as climate refuges for biodiversity. These measures will be implemented within a scientific framework and take into account the criteria for facing the adverse effects of climate change.</p>	

Target 2.2: By 2030, 100% of the country's marine protected areas (MPAs) will have management plans designed and in the process of implementation, with programs and actions for monitoring, enforcement, community involvement and threat control that take into consideration the criteria and actions for adaptation to climate change.

Target 2.3: By 2030, continental land-based and aquatic ecosystems with officially protected status will have been expanded by at least 1,000,000 hectares in underrepresented eco-regions of the National System of State Protected Areas, as well as in areas identified as climate refuges for biodiversity. Designation as protected areas (PA) and other effective conservation measures (OECM) will contribute to the global target of protecting at least 30% of the planet's land and oceans by 2030.

Target 2.4: By 2030, management plans will have been updated or in effective implementation for 100% of public protected areas within the National System of State Protected Areas, including land, marine and inland water areas, and will include measures for adapting to climate change (subject to implementation of the Biodiversity and Protected Areas Service - SBAP).*

() Subject to implementation by the Biodiversity and Protected Areas Service (SBAP).*

Goal 3: Promote efforts at the landscape scale to restore native biodiversity, functionality and structure of the different types of ecosystems (land, marine-coastal and inland waters, including native forests, seagrass, peatlands, wetlands, among others) and the provision of ecosystem goods and services, increasing regional and local resilience to climate change and other forces leading to their degradation.

Target 3.1: By 2030, 1 million hectares will be included in the restoration process, in accordance with the National Plan for Landscape-Scale Restoration. **Target 3.2:** By 2050, at least 1.5 million more hectares will have been incorporated into the restoration process. This will bring at least 2.5 million hectares under restoration, with a system for monitoring and reporting progress (subject to implementation by the SBAP).

Goal 4: Provide and mobilize financial resources to close the financing gap for the conservation and restoration of biodiversity in the context of climate change, in order to comply with Chile's international and national commitments on the matter. This will be accomplished through the implementation of a strategy for mobilizing economic resources by integrating different sources and mechanisms of financing, both PUBLIC and private.

Target 4.1: By 2024, a national strategy will be developed to mobilize financing for the conservation and restoration of biodiversity in the context of climate change, with a view to eliminating the financing gap for biodiversity by 2050. This strategy will be developed in conjunction with the Ministry of Finance.*



Goal 4.2: By 2030, the financing gap for biodiversity established in the national strategy for this purpose will have been reduced by least 30%.

Target 4.3: By 2050, the financing gap for biodiversity established in the national strategy for this purpose will have been reduced by 100%. **

(*) A progressive reduction of the gap will be sought. This will be updated every five years.

(**) The gap to be considered will reflect the most current figures available, with regular calculations performed every five years.

Goal 5: Strengthen the incorporation of biodiversity objectives and the use of nature-based solutions (NbS) in PUBLIC and private sector policies, plans and programs, including territorial management and planning instruments.

Target 5.1: By 2022, define a standard methodology and planned updates (every five years) for taking a national inventory of wetlands and evaluating land use change in wetlands.

Target 5.2: By 2025, determine information and financing needs to include GHG emissions and absorption by wetlands in the national GHG inventory, and identify the funding source for obtaining the required information. (MINAGRI-MMA).

Target 5.3: By 2025, Chile will have regulations that promote the conservation and rational use of peatlands.

Target 5.4: By 2025, between 10,000 and 15,000 hectares of wetlands throughout the national territory will have been recognized as protected urban wetlands for incorporation as ecological infrastructure in territorial planning instruments.

Target 5.5: By 2025, instructions will have been defined for the application of nature-based solutions in different sectors and integration areas, in accordance with the standards of the International Union for the Conservation of Nature.

Target 5.6: By 2025, there will be a system for prioritizing restoration and NbS that considers socio-ecological aspects and climate risk, and an NbS standard will have been adopted that allows these to be identified and monitored.

Target 5.7: By 2025, protect at least 20 coastal wetlands as new protected areas.

Target 5.8: By 2025, peatland areas, as well as other types of wetlands, will have been identified through a national inventory.

Target 5.9: By 2030, NbS standards will have been implemented in at least 50% of sectors prioritized by 2025.



Target 5.10: By 2030, standardized metrics will have been developed by type of wetland, especially peatlands and coastal wetlands, to evaluate the adaptation or mitigation capacity of this type of ecosystem to climate change.

Target 5.11: By 2030, conservation, restoration and rational use of wetlands will have been implemented to enhance the co-benefits provided by wetlands, particularly peatlands and coastal wetlands, in five pilot sites in public or private protected areas of the country.

Target 5.12: By 2030, between 20,000 and 25,000 hectares of wetlands throughout the national territory will have been recognized as protected urban wetlands, for incorporation as ecological infrastructure in territorial planning instruments.

Target 5.13: By 2050, between 75,000 and 100,000 hectares of wetlands throughout the national territory will have been recognized as protected urban wetlands, for incorporation as ecological infrastructure in territorial planning instruments.

Goal 5.14: By 2050, maintain the balance of GHG emissions from wetlands, especially urban wetlands and peatlands, with actions being considered to restore degraded or lost wetlands.

Goal 6: Avoid, reduce and reverse the degradation of ecosystems by promoting the sustainable use, production and consumption of natural resources.

Target 6.1: By 2022, guidelines will be developed for the application of minimum criteria for the sustainability of urban wetlands, to be implemented by the country's municipalities.

Target 6.2: By 2025, there will be official mechanisms to strengthen, promote and ensure the protection of biodiversity within the framework of environmental compensation.

Goal 6.3: By 2025, best practice guides will be developed for the conservation and rational use of wetlands in the construction, tourism, forestry, agriculture, mining and extraction sectors.

Target 6.4: By 2025, 10% of the country's urban wetlands will have wetland management plans that promote the conservation and rational use of these ecosystems.

Target 6.5: By 2030, between 7% and 20% of the country's drainage basins and between 5% and 10% of its bays will be regulated by Secondary Environmental Quality Standards in prioritized aquatic ecosystems.

Target 6.6: By 2030, with the support of the GEF, a certification system for biodiversity and ecosystem services, and a payment mechanism for ecosystem services will be developed and implemented to contribute to the recognition and promotion of best production practices in the sectors with a big influence on biodiversity.

Target 6.7: By 2030, at least 60% of Chile's main fisheries will be fully exploited.



5.13 Water resources

70 | First report of the National Water Roundtable, February 2020.

In Chile, three fundamental challenges have been recognized in the management of water resources: Water Security, the Quality of Water and Related Ecosystems, and the Legal and Institutional Framework for water resources.⁷⁰ | The Draft Framework Law on Climate Change and Chile's 2020 NDC presented water security as vital for ensuring the resilience of ecosystems and human activities, and therefore as a priority for the country's adaptation to climate change. Consequently, it is imperative to ensure water supply for human consumption, the provision of water for ecosystems and strategic productive activities, and the water and sanitation infrastructure required at the national level. Similarly, ensuring strategic planning for water basins that balances conservation and use of water resources, with adequate supply and quality for health, subsistence, socioeconomic development and ecosystem conservation, is challenge the country will face by 2050.

In the last 30 years, the availability of water resources has steadily and increasingly decreased, up to 20% in the southern macrozone and 50% in the north-central macrozone. Rising temperatures and the zero isotherm lead to premature melting of ice and liquid precipitation in the snow reserve, generating greater runoff and reducing water reserves in mountain ranges, mainly in the form of glaciers, which have decreased by 8% during the last decade. It has been observed that precipitation patterns follow these same trends due to the early manifestation of climate change in the form of a mega-drought that has affected an important part of the country. Climate change would expand the hyper-arid zone, both latitudinally and longitudinally, increasing it by an average of approximately 13,000 km². At the same time, approximately 10% of the continental surface (70,000 km²) will become more arid. The main demand for water resources comes from agriculture, followed by urban and rural drinking water, industrial use and mining, with significant regional differences in relative demand. Given this context, proposing solutions for access to and equitable use of water resources, efficient use (saving and reuse) and quality control (regulation and monitoring) is a priority.

The transversality inherent to water resources characterizes water governance in Chile. More than 40 organizations and institutions at the national level have varying degrees of influence on water management. Currently, in terms of adaptation and mitigation to climate change, the Ministry of Public Works (MOP), through the General Water Office (DGA) and Superintendence of Sanitary Services (SISS), is the main body responsible for the water resources sector in the ECLP. The strategic role of the MOP in this matter translates into coordinating the consolidation of a joint, wide-ranging and multisectoral vision involving all institutions with jurisdiction, needs and influence in the management of water resources, among them: the Ministry of the Environment (MMA); Ministry of Agriculture (MINAGRI); Ministry of Mining; Ministry

of Energy; Ministry of Science, Technology, Knowledge and Information; Ministry of Defense, and Ministry of Health.

The challenge posed requires an institutional framework that allows for the strengthening of governance, planning and information management, as well as improved management and control of water resources. This new institutional framework will be key to dealing with increased water scarcity in the national territory, generated both by climate change and increased demand for water due to population growth and economic activity, as well as the unsustainable use of the resource, among other factors. It will require greater prioritization and management capacities to coordinate the different authorities involved, along with their functions related to water resources. Likewise, the implementation and monitoring of a long-term National Water Policy is needed to integrate analysis and decision-making regarding water scarcity, and to strengthen governance through action plans that coordinate multisectoral preventive and reactive programs for dealing with extreme events that threaten water security.

The Ministry of Public Works has formalized its commitment to action in favor of a single, solid and coordinated governance mechanism through a «Bill to create an Undersecretary of Water Resources in the Ministry of Public Works, and give institutional status to National Water Resources.» The bill would create a new Ministry of Public Works and Water Resources, including an Undersecretariat for Water Resources, a cross-cutting National Council, a Ministerial Commission for interministerial coordination, and a Technical Panel of Experts. This decision creates an opportunity make coordinated progress towards water security under different climate change scenarios.

The integrated management of water resources, recognized in the ECLP, incorporates relevant transversal elements in Chile's various water basins. These include the strategic management of risk and vulnerability information, the application of nature-based solutions, technological development, and the participation of local communities, indigenous peoples and other regional interest groups.

The main management instruments in the sector include:

- Changes in the legal and institutional framework proposed through the creation of the New Public Institutionality of Water Resources.
- A drought plan (2021),⁷¹ | that seeks to increase water availability and efficient use to ensure supplies for human consumption and food production through four approaches: use of desalinated water, irrigation technology for food production, rural drinking water, and efficient urban use.
- National Adaptation Plan to Climate Change for Water Resources (PANCC RH)⁷² |
- Strategic Water Management Plans (PEGH) for each of the 101 administrative basins defined in Chile, led by the MOP and with citizen participation,

71 | Available at: <https://www.gob.cl/plansequia/>

72 | Its design will commence in 2021 and it will be published in 2022, with updates through 2027.

73 | Available at: <https://www.mop.cl/MesaAgua/index.html>

74 | Specifications are detailed in section 5.2.2 Areas of greatest urgency in climate action adaptation, Contribution to Adaptation No. 7 (A7), Page 43 NDC_Chile_2020_español-1.pdf (mma.gob.cl)

which will effectively promote national and subnational integration (regions and municipalities of Chile) and regional management.

- The Agency for Sustainability and Climate Change (ASCC)'s Clean Production Agreement Program (APL-Blue Certificate), which promotes the management of companies' water footprint.
- The Huella Chile footprint program, led by the Ministry of the Environment, will create a project certification system that encourages improved availability, access, conservation and/or quality of water through nature-based solutions or innovative technologies.
- The Health Sector Agenda 2030, corresponding to the long-term plan of the Sanitary Services Superintendence (SISS), aims to address the challenges facing Chile's Health Sector through 12 projects.

The technical discussions of the National Water Roundtable (MNA) have also produced future proposals for water governance and an integrated water information system.⁷³

The NDC establishes water security as one of eight key criteria to be considered in Chile's climate commitments, and presents specific commitments in its Adaptation Component, such as the design of the Climate Change Adaptation Plan for Water Resources, and the development and updating of strategic basin management plans for the country's 101 basins. It also calls for the country's information and management mechanisms regarding the impacts of climate change on water resources to be increased, strengthening resilience through a series of specific actions.⁷⁴

The Integration component of the NDC calls for prioritizing reforestation in areas where it contributes to the conservation and protection of soils, wetlands, basin headwaters, watercourses and bodies of water. Adaptive management of vegetation resources in view of climate change, desertification and land degradation will be considered in the NDC's commitment to reduce emissions from the forestry sector.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

WATER RESOURCES SECTOR

SDGs

Goal 1: Promote water security, prioritizing supplies for human consumption, followed by the provision of water for ecosystems and strategic production activities.

Target 1.1: By 2025, the General Water Office or other institution with the powers of the Ministry of Public Works will validate and publish a definition of water security for Chile. It will also incorporate the validated concept of water security in the Strategic Plans for Water Resources in Basins and their updates.

Target 1.2: Review and monitor targets for Sustainable Development Goal 6 (SDG6), on clean water and sanitation; specifically, to contribute reports and information on a permanent basis, build SDG6 indicators, and maintain permanent communication with custodian agencies and relevant national agencies in the process. This will occur within the framework of the powers and priorities of the General Water Office.



Goal 2: Encourage the integrated management of hydrographic basins aimed at the SEARCH FOR innovative solutions that prospectively investigate the gap between water supply and demand.

Target 2.1: Permanently develop, update and monitor the Strategic Plans for Water Management. By 2030, all basins will have a Strategic Plan for Water Management.

Target 2.2: Conduct studies that analyze the implementation of nature-based solutions (NbS) as an alternative for water management in the country's main water basins.

Target 2.3: Study possible improvements in public and private instruments to minimize the effects of extreme drought, human consumption and sanitation, such as voluntary agreements for water redistribution or General Water Office scarcity decrees.

Target 2.4: By 2030, have a battery of Nature-Based Solutions (NbS) projects applicable to the basins of Chile.

Target 2.5: By 2050, evaluate the robustness of climate change adaptation measures in the short, medium, and long term as part of the implementation process of the Strategic Plans for Water Management.

Target 2.6: By 2050, carry out diagnostic studies on the state of governance in all updating processes for the Strategic Plans for Water Management.



Goal 3: Promote research, development and innovation in inventories, knowledge generation systems, dissemination and education, monitoring of water use and extraction in water basins.

Target 3.1: By 2023, the General Water Office will issue resolutions regulating Effective Extraction Monitoring (EEM) of surface waters.

Goal 3.2: By 2025, support the coordination and generation of information from public-private sources, civil society and academia. Formalize agreements with all public institutions that have responsibilities in matters of climate change and water resources.

Target 3.3: Expand the Public Glacier Inventory, the network of glacier stations, and the monitoring of glaciers, glacial lakes, and permafrost.

- 3.3.1: By 2030, expand the Public Glacier Inventory to cover permafrost and glacial lakes.

- 3.3.2: By 2030, increase the number of glaciers monitored for mass balance from 9 to 18.

3.3.3: By 2030, expand the network of glacio-meteorological stations from 30 to 45.

- 3.3.4: By 2030, expand the network of glacier and river metrics stations from 7 to 11.

- 3.3.5: By 2030, increase the number of glacial lakes monitored by on-site stations from 1 to 3.

- 3.3.6: By 2030, implement a national permafrost network with at least 10 stations.

Target 3.4: By 2030, modernize 100% of fluvial and meteorological stations, making information available to the public online.

Target 3.5: By 2030, the General Water Office will issue groundwater Effective Extraction Monitoring resolutions for all of the country's municipalities.

Target 3.6: By 2030, create a Platform for the Unified National Water Information System (SNUIH) or a similar tool, providing access to a standardized water information platform that facilitates public and private decision-making. This platform will contain all updated water data and information.



Goal 4: Facilitate coordination between relevant state agencies, as well as their technical competencies, ensuring the training of PUBLIC service personnel to promote strategic connections on issues related to water resources and climate change.

Target 4.1: Encourage the executive branch to approve the bill creating the Undersecretariat for Water Resources at the Ministry of Public Works and a new national water resources institution, and modifying the relevant legal bodies.



Goal 5: Promote, in the context of climate change, the strengthening of strategic actions necessary to achieve the desirable coverage and quality of universal sanitation and adequate management of liquid waste in the national territory. The targets for this goal will be reported by the Superintendence of Sanitary Services.

Target 5.1: By 2030, 90% of the population will have continuity of service during disruptive events.

Target 5.2: By 2030, 100% of concessionaires will have implemented a management process that covers the entire risk cycle.

Target 5.3: By 2030, the volume of non-billed water will be reduced by at least 25%.

Target 5.4: By 2030, at least 30% of wastewater discharged into the sea and 20% of treated wastewater discharged into surface watercourses will be available for reuse.

Target 5.5: By 2030, 100% of the urban population will have access to sanitation services.

Target 5.6: By 2030, at least 50% of new homes will be built through a coordinated urban planning process.

Target 5.7: By 2030, the number of events related to untreated sewage discharges resulting from non-sewage water entering the sewage system will be reduced by at least 75%.

Target 5.8: By 2030, all public infrastructure projects for water resources will include in their evaluation the consideration of a portion to meet demands associated with urban and/or rural human consumption.

Target 5.9: By 2030, the environmental footprint of the sanitation sector (water footprint, waste footprint, and GHG footprint) will be reduced by at least 10% compared to its baseline.

Target 5.10: By 2030, a network of public-private actors will promote responsible water use at all levels.

Target 5.11: By 2030, the responsible use of water will be incorporated into the national school curriculum.

Target 5.12: By 2030, 100% of urban areas will have a Blue Seal of efficiency.

Target 5.13: By 2030, 100% of the products used in home installations will be authorized by the Superintendence of Sanitary Services and will have their respective efficiency certification.



The Ocean

Chile's goal with regard to the ocean is to consolidate its position as the custodian of a healthy ocean that is resilient to the effects of climate change, guaranteeing its ecosystem services, and preventing the threats it currently faces from having an impact on its biodiversity and human activities in coastal and insular territories.

The conservation of the ocean and the sustainable use of its resources is essential for the development and survival of ecosystems and the human species. The ocean produces 55% of the oxygen we breathe and regulates the global climate. In the last 20 years, it has captured between 20% and 30% of excess carbon in the form of CO₂ resulting from human activity since the industrial era. The ocean is also capable of absorbing 1000 times more heat than the atmosphere, and has the capacity to redistribute it through currents and interaction and exchange with the atmosphere, given that it absorbs more than 90% of the heat produced by human activity through the increase in greenhouse gases (GHG). Consequently, the ocean plays a fundamental role in mitigating and adapting to climate change, and at the same time, climate change affects the ocean to the point of altering its functions. Some of the threats to which the ocean is exposed are: an increase in temperature that alters the distribution of heat; the melting of continental ice (glaciers) and sea ice (Arctic and Antarctic oceans) and the consequent rise in sea level; ocean acidification and stratification; and the loss of biodiversity and increase in dead zones (deprived of oxygen). These elements endanger many of the biogeochemical processes and human activities that depend on a healthy ocean; for example, the food supply, protection from extreme events, the world economy and tourism.

Chile's coastline measures 83,850 km, taking into account the perimeter of all its insular and oceanic territories, and 25% of its population is distributed along 100 coastal municipalities. It also has one of the largest Exclusive Economic Zones (EEZ) in the world, and is one of the countries with the greatest fishing and aquaculture activity. As a result, Chile has historically been oriented toward the ocean, as is reflected in its geography and cultural, social, economic and political aspects, as well as in its foreign policy.

In terms of ocean conservation, Chile's policy of creating marine protected areas means that today, 43% of the country's EEZ is under some protection regime.⁷⁵

Chile has a multisectoral state policy on oceans: the National Oceanic Policy (PON)⁷⁶ which establishes strategic guidelines, as well as a set of orientations, scopes, priorities and interests in ocean management whose implementation, updating, monitoring and compliance will be carried out through the National Oceanic Program. The National Oceanic Policy recognizes the heterogeneity of stakeholders with an interest in the ocean and the importance of integrating participatory management based on

⁷⁵ | This made us the 6th leading country in terms of Marine Protected Area coverage, quadrupling the AICHI goal of 10%.

⁷⁶ | Available at: https://www.acanav.cl/wp-content/uploads/2021/07/politica_oceanica_nacional_de_chile_ok-1.pdf

innovative solutions that incorporate nature-based solutions for adaptation to climate change.

Likewise, climate action recognizes the importance of conservation areas in the design and implementation of Management Plans for the protection of conservation targets that are essential to the reduction of CO₂.

Chile has participated in important international initiatives to strengthen the link between the ocean and climate, including *Because the Ocean, and Friends of the Ocean and Climate*. The role of the two declarations promoted by Chile and signed by 39 countries⁷⁷ was important in the articulation of these initiatives, leading to the inclusion of the ocean in NDCs as the main vehicle for climate action. The NDC therefore includes an ocean component that takes an integrative approach, with goals for mitigation and adaptation in the ocean.

It is important to note that Chile, in its capacity as president of COP25 in 2019, highlighted the link between climate change and the ocean by opening spaces for discussion, developing what would become known as the *Blue COP*. The Santiago Decision 1/CP.25 recognized the *IPCC's Special Report on the Ocean and Cryosphere*, reinforcing the link between science and policies at the national level. Subsequently, this important achievement was supported by the mandate to hold an Ocean and Climate Dialogue to strengthen the mitigation and the adaptation of the ocean to climate change. The results of this dialogue were released through a report prepared by the Subsidiary Body for Scientific and Technological Advice (SBSTA) in April 2021. It is conceived as a starting point for the preparation of a roadmap that allows the ocean to be included in the different actions carried out under the United Nations Framework Convention on Climate Change.

National ocean management for climate action must also be coordinated with:

- i)** Biodiversity, through the promotion of marine protection instruments and other conservation and restoration mechanisms, the protection of coastal wetlands, and guidelines for compensation in biodiversity in marine and continental coastal ecosystems;
- ii)** Fisheries and Aquaculture, through the incorporation of the ecosystem approach in aquaculture and fisheries management plans, and the promotion of good fishing and aquaculture practices with co-benefits in the conservation and sustainable use of resources;
- iii)** Coastal Areas, through goals for the safe and resilient occupation of coastal territories, and policies and instruments for the protection and sustainable use of ecosystem services.
- iv)** Waste and Circular Economy, by promoting the circular economy of waste management and the use of fishing gear that protects the seabed;

⁷⁷ | Information available at: <https://www.becausetheocean.org/second-because-the-ocean-declaration/>

v) Infrastructure, through adequate multisectoral governance of the territory for the provision of low-carbon, resilient and sustainable infrastructure;

vi) and Water Resources, by improving the management of liquid waste discharged into the sea.

The national commitment on ocean management in the NDC takes into account three important contributions in relation to marine protected areas and marine ecosystems. These commitments are: i) New protected areas will be created in underrepresented marine ecoregions and coastal ecosystems for wetlands, public lands and national assets for public use that complement the marine network; ii) All Chilean marine protected areas created before 2020 will have a management or administration plan and will be under effective implementation to facilitate their adaptation to the effects of climate change; and iii) Actions will be evaluated and implemented to enhance the co-benefits offered, in terms of mitigation and adaptation to climate change, by the different marine ecosystems in marine protected areas.

The following are the long-term sectoral goals and targets and their contribution to the SDGs:

THE OCEAN	SDGs
<p>Goal 1: Strengthen national institutions in different fields to promote coordination, capacity development, information and decision making for action in mitigation and adaptation of the ocean to climate change.</p>	

Target 1.1: By 2025, Consolidate the National Ocean Program, designed by the Council of Ministers for the Development of Ocean Policy and led by the Minister of Foreign Affairs, as the practical mechanism for implementing the Ocean component in the ECLP and NDC, reinforcing the commitment to national and international governance of the oceans to reduce the effects of climate change.

Target 1.2: By 2025, promote the coordination of the different state institutions with competence in ocean matters and of coastal and insular territories for the implementation of the National Oceanic Program with the ECLP.



Target 1.3: By 2025, implement an education, awareness and public outreach program on marine conservation and the value of marine biodiversity, both coastal and oceanic, aimed especially at local, regional and national decision-makers (both public and private), teaching staff at all levels, and staff of public inspection services.

Target 1.4: By 2025, generate and finance lines of research to assess changes that allow maintaining and strengthening biodiversity and ecosystem services in the oceans in the face of climate change.

Target 1.5: By 2025, promote public policies that facilitate environmental research and education on the ocean and climate change.

Goal 2: Generate actions based on the best possible ocean science for the preservation of carbon stock and sequestration in marine and coastal ecosystems.

Target 2.1: By 2023, have a Blue Carbon Roadmap to identify and obtain financing for the implementation of the National Oceanic Program.

Target 2.2: By 2025, the National Oceanic Program will promote mitigation and adaptation through nature-based solutions in the oceans to reduce impacts on ecosystems and strengthen the role of the sea as an ally in carbon sequestration, with an emphasis on the concept of blue carbon.

Target 2.3: By 2025, three marine protected areas in Chile will have standardized metrics for evaluating their capacities to adapt to or mitigate climate change.

Target 2.4: By 2025, 100% of the marine protected areas created before 2020 will have management or administration plans that include actions for adaptation to climate change.

Target 2.5: By 2025, the management or administration plans of at least 40% of the marine protected areas created before 2020 will implement, at the very least, monitoring, enforcement, community involvement and threat control programs.

Target 2.6: By 2025, promote the establishment of a Marine Protected Area in Antarctica, protecting the ocean around the Antarctic Peninsula.



Target 2.7: By 2025, Promote the creation of the first Marine Protected Area on the high seas, specifically in the Nazca Ridge, an area identified as fabulously rich in biodiversity, abundant in endemic species of the bottom and that has been designated as an area of ecological and biological importance under the United Nations Convention on Biological Diversity.

Target 2.8: By 2025, management plans for coastal wetlands that are within protected areas such as Nature Sanctuaries will include specific actions related to the control of threats such as aggregate extraction and other factors that affect these aquatic ecosystems.

Target 2.9: By 2030, the metrics developed to allow monitoring and verification of adaptation or mitigation capacities will have been implemented in at least five marine protected areas, integrating the strengthening of co-benefits in their management plans.

Target 2.10: By 2030, prepare plans for the recovery, conservation and management of 10 marine and coastal species classified by conservation status in accordance with the provisions of the Regulation for the preparation of RECOGE plans.

Goal 3: Promote the development of information for managing the climate change impacts of production activities associated with the ocean.

Target 3.1: By 2023, evaluate alternatives for implementing Extended Producer Responsibility (REP) in industrial fishing activities, salmon farming, and traditional fishing, as appropriate.

Target 3.2: By 2025, the Climate Change Observatory (OCC) will have an integrated network of sensors for observing Chile's territory and ocean, making it possible to analyze the evolution of the climate change threat and contributing to the adaptive management of communities across the country.

Target 3.3: By 2030, implement the action plan of the National Strategy for the Management of Marine Waste and Microplastics to reduce and prevent deposits of waste into the sea and on beaches by 40%.

Target 3.4: By 2030, measure the carbon footprint of the aquaculture sector.



Target 3.5: By 2030, strengthen observation systems to routinely and continuously provide relevant and high-quality data and information on the current and future status of relevant variables for monitoring of and adaptation to change climate.

Target 3.6: By 2030, ensure that 20% of port initiatives manage their carbon footprint.

Target 3.7: By 2050, ensure that 40% of port projects measure and manage their carbon footprint.

Target 3.8: By 2030, 50% of port projects executed between 2022 and 2030 will have some system for monitoring climate risks.

Target 3.9: By 2050, 100% of port projects executed between 2022 and 2030 will have some system for monitoring climate risks.



Photo by Daniel Pineda

06 MANAGING CLIMATE CHANGE AT THE REGIONAL AND LOCAL LEVEL

A territorial and intersectoral issue

07 COST

08 METHODS

In Chile, climate action will be formally and permanently integrated into the management of regional and local governments⁷⁸ through existing strategic tools for territorial development and planning, as well as those being prepared and updated, and the climate change management and planning tools proposed in the Draft Framework Law on Climate Change. The formation of the Regional Committees on Climate Change (CORECC), the development of the first four Regional Action Plans on Climate Change (PARCC), and the notable efforts of some municipalities to develop Community Action Plans on Climate Change (PACCC) show the beginning of a multilevel coordination process for the main objectives established in national public policies and management instruments at the regional and community levels.

At the regional level, the CORECC is the intersectoral entity in each region that coordinates efforts for the transversal integration of long-term objectives and strategic guidelines related to mitigation of and/or adaptation to climate change. At the community level and within the framework of their respective capacities, the municipalities will prepare the Local Action Plans for Climate Change.

As interdepartmental entities within the municipalities, the Municipal Environmental Committees (CAM) of those municipalities that are part of the Municipal Environmental Certification System (SCAM) of the Ministry of the Environment (MMA) will play an important role in the coordination of efforts for the transversal integration of long-term objectives, and regional and/or community strategic guidelines related to climate change, in the different community instruments. For these purposes, they can use the processes for the development and/or updating of their PACCC or other relevant instruments, such as the Community Environmental Strategy (EAC), to formalize the mainstreaming of climate change in community instruments. The CAMs will therefore participate in updating the community instruments implemented by different municipal departments and services to determine the feasibility and best way of integrating climate change considerations.

Chile recognizes that all territories must act to reduce their emissions, contribute to carbon neutrality and increase their resilience to climate change, in line with the long-term objectives established for the country by 2050. Coordination and integrated cooperation between the country's regions and municipalities will be key to achieving these goals while maintaining coherence with national policies. Specific strategies and actions may differ between different territories, depending on their contexts and realities.

78 | Regional and local governments refer to regional and municipal governments and services. They are the state entities closest to the population, and have powers and responsibilities in different areas of great importance for climate management (energy, territorial planning, risk management, waste management, water management, transport and mobility, infrastructure, etc.).

6.1 National, regional and local coordination of climate change management instruments

Strengthening coherence between national, regional and local instruments, as well as between the different strategic, sectoral, regulatory and financing instruments in the regions and municipalities will be key to the effective integration of long-term objectives.

The Ministry of the Environment, together with the ETICC and the CORECCs, will develop the methodological guidelines and generate the necessary coordination to ensure coherence between Regional and Local Climate Change Action Plans and national instruments, as well as with strategic regional and municipal planning instruments.

This coherence does not negate the possibility for each territory's instruments to integrate elements that reflect its own context and priorities. On the contrary, to adapt successfully to climate change, it is essential for subnational instruments to consider the territorial, political, institutional and economic particularities of each region.

Likewise, new climate change action plans at the regional and community levels are expected to integrate their own strategic territorial, planning, regulatory and financing instruments.

From a long-term perspective, there is an urgent need for coordination among local, regional and national instruments to make progress towards resilience and carbon neutrality across the country's territories.

6.2 Capacity building for regional and local management of climate change

Integrating long-term objectives into regional and local management requires strengthening the technical capacities of public service teams. Professionals and officials in government and regional and local services must be trained in new knowledge that gives them an integrated understanding of climate change, and new skills to strengthen the planning and strategic management of plans and policies that contribute to long-term objectives at the subnational level.

79 | Examples include the Municipal Environmental Certification System (SCAM), the Green State Program and the HuellaChile program, led by the Ministry of the Environment (MMA); the Energy Commune program, administered by the Energy Sustainability Agency of the Ministry of Energy; and SUBDERE's Prevention and Risk Mitigation Program (PREMIR), among others. Online course offerings, education and training programs with content related to climate change are also available; for example, the SUBDERE Regional and Municipal Training Academy and the MMA's Adriana Hoffman platform. In addition, spaces such as the Chilean Association of Municipalities' Summer and Winter Academy are opportunities to train municipal authorities, commissioners and officials in different subjects.

The design and implementation of Regional and Local Climate Change Action Plans requires new local capacities to incorporate climate change adaptation and mitigation. Regional and local governments must be able to coordinate and carry out territorial risk and vulnerability assessments, measure and maintain GHG emission inventories at the territorial and organizational level, manage methodologies for dialogue and participatory planning between groups from different sectors, identify and prioritize adaptation and mitigation actions, develop and maintain indicator and information systems, formulate viable projects that integrate climate change criteria, and identify and access adequate financing sources and mechanisms for the implementation of different measures, among others. For this, the ECLP proposes the Capacity Development and Climate Empowerment Strategy (ACE, Action for Climate Empowerment) in its means of implementation, which will contribute to the strengthening of local institutional capacities. Likewise, Chile has state programs to strengthen the capacities of regional and local governments in matters related to climate change⁷⁹ |.

6.3 Coordination of financing mechanisms for regional and local climate action

National and regional funds are essential in promoting the implementation of regional and local projects and sectoral measures that incorporate environmental and climate change. In addition to existing funding⁸⁰ |, regional funds allocated to other areas and sectors, for example, social and cultural development, agriculture, energy, transportation, urban and territorial development and improvement, and water management, among others, can support the implementation of projects that contribute to tackling climate change. An effort will be made for these funds to incorporate climate change criteria as a fundamental part of their application requirements.

It is important that regional and communal governments incorporate adaptation and mitigation criteria in traditional projects, for example, the construction or renovation of critical infrastructure (bridges, roads, schools, hospitals, etc.), ensuring that they are aligned with the objectives of Chile's long-term plan to achieve resilience and carbon neutrality.

Fostering public-private partnership is important to enhance financing opportunities at a regional and community level. Partnerships between private companies, NGOs, functional, local and regional organizations, universities and research centers, and national and international associations and networks make more mechanisms available for the financing of projects through different sources and mechanisms. The leveraging of resources between different entities also increases the possibility of accessing both public and private resources, technical assistance, and national and international funds. In this regard, Chile's multinational strategic projects on climate financing issues include the Global *Subnational Climate Fund*, whose objective is to catalyze long-term climate investment at the regional and community levels for mitigation and adaptation solutions through a transformative financing model (*more details in Chapter 8.1, Means of Implementation*).

It is also important to incorporate climate change into Regional Development Strategies and Regional Investment Projects

80 | The Ministry of the Environment's Environmental Protection Fund and Recycling Fund are two funds available for projects directly related to climate change and circular economy strategies.

81 | Estado Verde (mma.gob.cl) Instructivo-de-Compras-Públicas-Sustentables.pdf (mma.gob.cl).

to enable the use of regional funds such as the National Regional Development Fund, the Regional Innovation and Competitiveness Fund, and the Regional Local Investment Fund to finance climate change projects. At the municipal level, it is important to incorporate circular economy and climate change criteria in the purchase and contracting of different goods and services, applying sustainable public procurement criteria for office supplies, vehicle fleets, and the construction and/or maintenance of municipal real estate, ensuring that the associated expenses support climate change adaptation and mitigation actions⁸¹. Solid waste management, irrigation of public spaces, and transportation services also represent opportunities to integrate adaptation and mitigation criteria into contracts.

It is essential to generate information, training opportunities and greater innovation in accessibility to different sources and financing mechanisms to enable the proper integration of long-term objectives into territorial management, and ensure that subnational governments can carry out concrete actions that contribute towards the fulfillment of said objectives. Consequently, it will be important to enhance the participation and accessibility of regional and municipal governments to these resources, promoting the strengthening of their capacities to implement existing or potential climate and environmental actions into their respective regional and local action plans.

6.4 Goals to implement climate change management at the regional and local level

Objectives and goals have been established to promote subnational integration in the areas discussed in this chapter based on the different public policy instruments for climate management by 2050, which are detailed below:

MANAGING CLIMATE CHANGE AT THE REGIONAL AND LOCAL LEVEL

SDGs

Goal 1: Develop Regional Climate Change Action Plans (PARCC) and Local Climate Change Action Plans (PACCC) that consider the visions, objectives and goals of the ECLP by 2050

Target 1.1: By 2025, 50% of Chilean municipalities will be registered and have access to the HuellaChile Program's GHG emissions quantification tool at the community level.

Target 1.2: By 2030, the CORECCs and Regional Governments will have developed PARCCs in the country's 16 regions, integrating the objectives and goals of the Long-Term Climate Strategy.

Target 1.3: By 2030, 80% of SCAM Municipalities at the "Environmental Governance" level⁸² will declare mitigation actions implemented at the local level.

Target 1.4: By 2035, 50% of the municipalities certified through the SCAM program will have a self-declared local (territorial) inventory, through the MMA's HuellaChile program or another internationally recognized standard such as the Global Protocol for GHG Emissions Inventories at a Community Scale (GPC).* **Target 1.5:** By 2040, PACCCs will have been developed in at least 100% of SCAM municipalities, integrating the objectives and goals of the Long-Term Climate Strategy.

82 | Environmental Governance (formerly AVAC) is a process of continuity and deepening of the System the Municipal of Environmental Certification which municipalities that in the chosen attained the level of excellence finished, can choose. The for duration of this process is 3 years deepening its work

including at the preparation, implementation and consolidation stages, 1 year for each. For the first two years, the municipality will obtain pre-accreditation, while the

definitive accreditation is obtained in the third year, when the Ministry of the Environment recognizes compliance with (SCAM), the commitments established field. Once the cycle is the municipality may continue another 3 years, further

in the chosen environmental field or pursue a new line. Duration: 3 years per field cycle (SCAM (mma.gob.cl)).



Goal 2: Promote the integration of climate change adaptation and mitigation criteria in planning and territorial ordering instruments at the level of regional and local PUBLIC policy.

Target 2.1: By 2030, 60% of municipalities certified through the SCAM program will have integrated climate change criteria in their Community Regulatory Plans and their Community Development Plans.

Target 2.2: By 2030, 80% of regional governments will have integrated climate change into their Regional Development Strategies (ERD).

Target 2.3: By 2030, 100% of regional governments will have conducted a strategic environmental assessment to integrate climate change criteria into their Regional Plans for Land Use and Coastal Zoning.

Target 2.4: By 2040, 100% of Regional Planning Instruments will integrate climate change criteria through Strategic Environmental Assessments.



Goal 3: Promote the implementation of mitigation and adaptation actions at the regional and local levels.

Target 3.1: By 2030, at least 60% of the country's municipalities will be integrated into at least two state programs associated with climate change ⁸³.

Target 3.2: By 2050, 90% of SCAM municipalities will have the highest Environmental-Climate Governance certification.

⁸³ | For example, SCAM (<https://educacion.mma.gob.cl/gestion-local/sistema-de-certificacion-ambiental-municipal/>), HuellaChile (<https://huellachile.mma.gob.cl/>), Comuna Energética (<https://www.comunae-energetica.cl/>), among others.





Photo by Daniel Pineda

07 COST EFFECTIVENESS

(economic, environmental and social) of carbon neutrality and resilience by 2050

08 METHODS

09 ANNEXES

Cost effectiveness (economic, environmental and social) of carbon neutrality and resilience by 2050

The sense of urgency for facing the climate crisis requires making significant progress in increasing resilience and reducing GHG emissions in Chile. These advances require focusing efforts and resources to allow effective progress in the implementation of science-based actions.

The visions, commitments and climate goals addressed in the ECLP highlight the importance of prioritizing those measures that, while effective for mitigation and adaptation, represent the lowest possible economic, environmental and social costs. In this regard, the establishment of measurable national goals and the information associated with the regional effects of climate change will determine the economic evaluation options associated with different implementation strategies for mitigation and adaptation.

The economic evaluation of the national target of carbon neutrality will recognize the cost associated with the feasibility of implementing a set of effective measures to reduce emissions within a given timeframe. Additionally, existing information regarding the co-benefits associated with these measures will strengthen the evaluation of the cost-effectiveness of this national target, incorporating regional and local aspects.

The national target for resilience poses explicit challenges in this strategy regarding the effectiveness indicators and metrics that are among the enabling measures for meeting the target. Thus, a cost-effectiveness analysis is not yet feasible. Instead, the cost of inaction in the face of climate change is used as a base reference scenario to evaluate the economic benefits of potential adaptation measures.

The design of future adaptation and mitigation plans, sectoral and local, must consider the evaluation of the adverse effects of climate change and current and projected risks, including those associated with latent areas, that are declared at the time of the plans' preparation. The identification of cost-effective measures should recognize the potential provided by nature-based solutions for meeting climate ambition goals, compared to alternative measures. To this end, measuring the benefits and co-benefits of ecosystem services in economic terms is key, bearing in mind that their costs and benefits may not be achieved at the same time. Any appropriate discounted effects must also be taken into account.

Efficacy in mitigation and adaptation requires recognition of the differing impacts of climate change by region, and an understanding that objectives and actions cannot be implemented uniformly across the country, but rather depend on the regional realities, capacities and climate projections. Thus, the cost-effectiveness evaluation should support the prioritization of actions oriented toward regional and local integration to support the design and implementation of regional planning and climate management tools.

This ECLP takes as its starting point both the benefits of investing in adaptation to Climate Change to strengthen regional resilience, and the identification and valorization of the co-benefits perceived locally by the implementation of global climate policies, highlighting the necessary coherence in the design of national policies and their regional and local adoption to achieve compliance with cost-effective climate management targets.

Below are the results of the evaluation of the costs of inaction and the co-benefits of meeting the carbon neutrality goal, yielding information on economic, environmental and social impacts that are key to defining future instruments at the local level.

7.1 Indirect Costs of Inaction on Climate Change

If altering current trends in global greenhouse gas emissions is not possible, changes in climate that are already evident and imminent will continue to generate important effects on countries' socioeconomic and environmental well-being, accentuating their vulnerability due to failing to consider actions that prepare us for the consequences of climate change.

Assessing the economic cost of losses and damages associated with the increase and intensity of extreme climate and meteorological events is increasingly plausible, making it possible to recognize the benefit of climate action in estimating the damage avoided.

Globally, between 2000 and 2019, more than 11,000 extreme weather events claimed the lives of more than 475,000 people, with economic losses estimated at nearly 2.56 trillion dollars [Global Climate Risk Index, 2021]⁸⁴.

In Chile, droughts and floods have been identified as the main meteorological phenomena that impact the country, generating losses of more than USD 4 billion and USD 5 billion, respectively, and impacting more than seven million people between 1926 and 2019.⁸⁵

⁸⁴ | See [Germanwatch](#)

⁸⁵ | WB study of hydrometeorological threats and their fiscal and socioeconomic impacts in Argentina, Chile, Mexico and Peru. 2020

86 | Inaction was understood as the counterfactual or the future reference without planned mitigation or adaptation actions, against which possible actions or policies are compared. The Cost of Inaction. Case studies from Rwanda and Angola. Harvard University Press. Boston. ((2012); The cost of inaction in the implementation of the Nagoya protocol in (Mexico (2014)); Climate Change: The Cost of Inaction and the Cost of Adaptation. EEA Technical Report No. 13/2007, European Environmental Agency (EEA), Office for Official Publications of the European Communities, Luxembourg, Luxembourg, 67 pp.)

87 | The RCP 8.5 scenario represents one of the most extreme scenarios in terms of greenhouse gas (GHG) concentration in the atmosphere, corresponding to a situation of inaction with respect to the reduction of emissions.

88 | Study: Evaluation of the Costs of Inaction Against Climate Change in Chile MMA-CEPAL (2021).

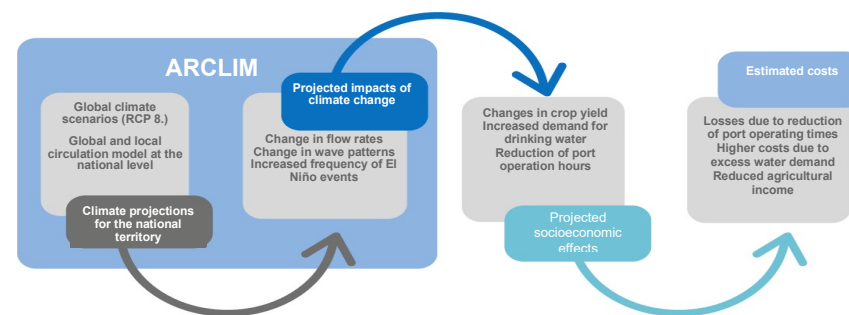
89 | The evaluation of the costs of inaction considers a range of effects and costs based on the available information; not all sectors or subsectors susceptible to climate change were considered. In some cases it was not possible to analyze known effects worldwide due to the lack of quantified information for Chile. In several sectors, the main costs are concentrated in the central zone of the country, in part due to the high population density in that zone.

Costs of Inaction in Chile by 2050

To show the benefits of adaptation actions and policies in monetary terms, the economic costs of inaction must be estimated⁸⁶. The Ministry of the Environment, together with the Economic Commission for Latin America and the Caribbean (ECLAC) and the support of the European Union (EU), recently carried out an evaluation of the costs of inaction for Chile in the face of a RCP 8.5 scenario of climate change⁸⁷ by 2050, based on the information developed by ARCLim, which included the Agriculture, Fisheries and Aquaculture, Ports and Beaches, Biodiversity and Health sectors, among others.⁸⁸

In calculating the economic value of inaction, climate projections and their respective changes in physical events allow establishing socioeconomic effects in each sector under study, as well as economically evaluating said effects. A simplified outline of the general methodology implemented to estimate the cost of inaction is presented below.

Figure 19: General methodological scheme for estimating the cost of inaction



Source: Authors' research.

Understanding and quantifying the effects of climate change is key to designing adaptive measures that are effective in reducing the costs of climate change inaction in Chile and that consider differentiated territorial impacts at the national level.

Some of the most relevant sectoral and regional results for the analysis of implications in the design of environmental policies are presented below.⁸⁹

• Agricultural

For the agricultural sector, the cost associated with changes in the yields of 13 crops⁹⁰ due to increased temperatures and reduced rainfall was quantified, which translate into changes in net agricultural income and labor.

USD 428 million in one year, representing a 29% reduction in the sector's net income by 2050. The greatest economic impacts are generated in the northern and central zones⁹¹. The 10 crops which will suffer from the greatest impact are: North Zone: cherry, peach, walnut, wheat, beans, corn, potato; Central Zone: corn, apple, walnut, peach, plum and beans. The expected change in productivity will generate unequal changes in the central zone, with the O'Higgins, Maule and Santiago metropolitan regions most affected. Their costs represent more than 10% of the regional agricultural Gross Domestic Product (GDP) as of 2018, and close to 1.6% of the regional GDP as of 2019 for O'Higgins and Maule, mainly due to the loss of income from fruit trees and crops such as corn.

The South Zone is the one which will see the least impact from climate change, according to the risks and opportunities inferred from the analysis of results. Although the Biobío, La Araucanía and Los Ríos regions would suffer some relevant impacts from the loss of income from fruit trees and corn, these could be partially offset by the increase in income from alfalfa and potatoes. The impact on the labor requirements of the agricultural sector negatively affects the Maule and Coquimbo regions, and positively affects the Los Lagos region⁹², creating a need to generate employment options in the affected regions, perhaps outside the agricultural sector, as an adaptation measure to climate change.

These results suggest the existence of clear challenges and opportunities for the implementation of adaptive actions in agriculture. For the northern and central areas of the country, the challenges point to capacity building in sectoral adaptation that consider research or innovation of vegetable varieties adaptable to climate scenarios, sustainable soil management, access to financial incentives for innovation in adaptation, development of local markets that support impacts on labor, among others. For the southern zone, the results allow us to recognize clear opportunities for the implementation of sustainable management for crops such as wheat, oats and corn.⁹³

90 | Annual crops and pastures were considered: alfalfa, beans, corn, oats, potatoes, rice, beets and wheat; and fruit trees: apple, cherry, peach, plum, walnuts.

91 | Regions considered by zone: North Zone (Atacama, Coquimbo), Central Zone (Maule, Santiago Metropolitan and O'Higgins), and South Zone (Bio Bio, Araucanía, Los Lagos, Los Ríos)

92 | With negative variations ranging from -10.4% (Maule) and -3.5% (Valparaíso). The only region that will have a demand for increased labor is Los Lagos (2.6%).

93 | Another consideration regarding the differentiated impact by zones and regions are indications that the country's agricultural frontier could move south. Similar results regarding the shift of the agricultural zone are reported in (ODEPA, 2017; Ponce et al., 2014).

• Fishing

The cost of inaction for the traditional fishing subsector is presented below. Costs related to the decrease in available hours for fishing, due to changing wave patterns, were calculated based on the impact on 302 coves distributed between the Region of Arica and Parinacota, from Arica (18°S) and the Los Ríos Region, up to Purranque (41°S). The operating threshold of 1.5 m for 2050 represents more than 100 extra hours of inoperability per year between the Arica Region, municipality of Camarones (19°S), and the Maule Region, municipality of Constitución (35°S) as a result of these new conditions.⁹⁴ The greatest increase based on the 2 m threshold, more than 100 hours of inoperability, is between Huasco (28°S) in the Atacama Region and Navidad (34°S) in the O'Higgins Region.

The extent, magnitude and value of the resources affected by shifting wave patterns will be greater around 2050 than at the end of the century. This implies greater urgency for the adoption of targeted measures to support the sector. Estimated losses by mid-century fluctuate between 31,300 and 41,700 tons. However, these losses are found in greater proportion in certain latitudes of the country (central-north zone) and for certain resources (benthic, fish and algae). By 2025, the costs due to restricted operations are estimated at USD 17 million, including lost access to algae, benthic resources and fish associated with downtime estimated by the year 2050, representing a loss of approximately 10% in profits from this subsector. A relevant finding of the evaluation is that traditional fishing sites at latitude 33°S (Valparaíso) will account for 73% of lost resources from fishing at the national level.

These analyses reveal the varying effects of climate change in more than one aspect of the Fisheries and Aquaculture sector, as well as their differentiated impacts. The concentration of impacts in the central zone suggests a priority area on which to focus measures aimed at having a significant effect on the income and lifestyles of traditional fishermen and women dependent on only one type of resource, promoting the necessary re-conversion in terms of infrastructure and technical capacities for the resilient adaptation of fishing activities.

• Ports and Beaches

The evaluation of the costs of inaction for Ports and Beaches considered two effects of climate change: in the case of ports, the reduction in the number of hours of operation due to tidal waves and storms; and, in the case of beaches, the impact of tidal waves on beach erosion.

In the case of ports, a calculation was made of the changes in revenue of eight national ports⁹⁵ due to lost operations from high surf (operational downtime) using

⁹⁴ | In addition, between Tocopilla (22°S) and Taltal (25°S), in the Antofagasta Region, there are more than 200 additional hours of downtime, and up to 300 hours at 25°S.

⁹⁵ | Ports of Arica, Iquique, Antofagasta, Coquimbo, Mejillones, Valparaíso, San Antonio and San Vicente.

each port's rates for the docking of ships and the movement of cargo. In the case of beaches, the costs associated with lower recreational use due to erosion at 45 national beaches were calculated.

The results for 2050 show that operating conditions would worsen at the ports of Arica, Iquique, Antofagasta and San Antonio (north and central zones), with shorter operating times resulting in losses of USD 2 million. Operating conditions would improve at the ports of Coquimbo, Mejillones, Valparaíso and San Vicente (north, center and south zones), with the resulting profits estimated at USD 17 million. With regard to this last result, it could be said that climate change would have a positive impact on the sector's activity. There is no guarantee that port conditions will be able to take advantage of the increase in operating times, but this finding does highlight potential opportunities for managing adaptation in the sector. Similarly, the negative impacts for ports in the north and center of the country point to infrastructure challenges and the need to strengthen local capacities for adaptation to potential impacts on port activity by mid century.

The beach subsector, for its part, will suffer estimated losses of USD 5.6 million due to the effect of erosion⁹⁶ at beaches located between the regions of Tarapacá and Biobío, without any potential benefit in the areas studied. The beaches with the highest estimated losses are in the regions of Coquimbo (municipalities of La Serena and Coquimbo) and Valparaíso (municipalities of Papudo, Puchuncaví, Quintero; and from Casablanca to Santo Domingo). Beaches such as Hornitos (Antofagasta Region), Reñaca, Las Salinas, Los Marineros, Caleta Portales and Las Torpederas (Valparaíso Region) and Bahía de Lebu (Biobío Region) would see their coastlines pushed back by 2050, compared to the current rate of between 2 [m] in Los Marineros and 12 [m] in Hornitos.

The results for beaches are an alert for the design of land use planning, coastline, tourism, infrastructure, cities and biodiversity policies, reflecting the need for a comprehensive and multisectoral vision for adaptation to climate change that involves managing capacities in the transition towards resilient production activities to ensure effective measures in the design of regional implementation instruments.

• Biodiversity

In terms of Biodiversity, costs are quantified by calculating the loss of provision of ecosystem services per unit area for different ecosystems⁹⁷. To identify the impacts of climate change on biodiversity, an analysis of the change in the geographical distribution of representative flora and fauna species was made, based on their current distribution and under future climate scenarios.⁹⁸

The results for the distribution of flora and fauna species show a reduction in the surface area of these ecosystems at the national level⁹⁹. The most affected ecosystems will be the Evergreen Forest (Bosque Siempreverde), with a loss of 18% of the current national area, followed

⁹⁶ | Calculated using benefit transfer methodology on willingness to pay for the change in beach width per trip for each household, taken from the study by Parsons, et al., (2013).

⁹⁷ | The ecosystems considered are: Forests: Laurel, Deciduous, Evergreen, Sclerophyll, Cactus, Desert, Andean Scrub, Steppes Wetlands: Salt Flats and Peat Bogs.

⁹⁸ | Study: Assessment of the Costs of Inaction Against Climate Change in Chile - MMA-CEPAL (2021).

⁹⁹ | Except for Cactus cover, which does not change.

by the wetlands (peat bogs), with a loss of close to 12% of its current national area.

This highlights the relevance of promoting instruments such as the National Plan for the Protection of Wetlands and the NDC goals of Contribution to Integration - LULUCF - Forests No. 5 (15) and contribution to Integration - LULUCF - Peatlands No. 8 (18), which aim to develop metrics to assess the adaptation or mitigation capacity of wetlands (peat bogs) to climate change, with implementation results at five pilot sites in public or private protected areas in the country.

Salt flat-type wetlands are the most affected ecosystems within the SNASPE territory, with a projected 33% reduction of their current area. In second place are Sclerophyll Forests, followed by Steppes, with approximate losses of 21% and 12% of their current area, respectively. Consequently, tourist activities in these ecosystems will be the most affected by 2050.

• Health

The effect of temperature and heat waves on health was analyzed, considering 73% of the national population¹⁰⁰ and using dose-response curves to characterize changes in relative risk due to changes in temperature under the RCP 8.5 scenario through the year 2100. The results indicate that the health effects of modified temperature patterns as a result of climate change will increase over time if current conditions of vulnerability and adaptation are maintained.

By 2050, 2,707 hospitalizations due to respiratory causes are expected, as well as 677 hospitalizations due to cardiovascular causes. The analysis shows that the effects will vary across the national territory, with different territorial and seasonal trends.

The effects are mainly observable in mortality rates, including hospitalizations for respiratory and cardiovascular illnesses in the population over 65¹⁰¹. A greater percentage increase in mortality and morbidity will be observed in the northern part of the country year-round, as well as in the central zone as a consequence of its share of the national population. The mountainous north and south of the country would see a smaller seasonal effect during the warm and intermediate seasons, while death and hospitalizations would fall in the colder months as temperature rise. These heterogenous results highlight the importance of analysis at the regional level, to focus adaptation efforts on the areas that will be most affected by climate change.

The results obtained constitute the first national analysis of the effects of heat on health, providing a quantification of the estimated cases. As a future challenge, other effects must be quantified, including the impact of fires on respiratory health, food- and water-borne diseases, and injuries and deaths due to extreme weather events, among others. Therefore, it is important that the implementation

¹⁰⁰ | The analysis was carried out in single municipalities with a population greater than 100,000 inhabitants or groups of municipalities that together exceed 100,000 inhabitants.

¹⁰¹ | The selection of causes allows considering the potential effect derived from an increase in the concentration of ozone and allergens (both due to the effect of temperature) as part of the projected results.

measures considered in the ECLP with a focus on science and financing strengthen efforts to better characterize the geographic distribution of climate threats and the incidence of associated health effects. This is essential for strengthening decision-making with a local approach, and complementing national risk and vulnerability information in the design of Regional and Local Plans for climate action.

In short, the information provided in these analyses makes it possible to show an approximation of the cost of inaction in the face of climate change, for each sector and dimension analyzed.

The foregoing reveals important information for the design of Sectoral Adaptation Plans, as well as Regional and Local Action Plans on Climate Change that integrate impacts consistent and aligned with local and national context and priorities in their evaluation criteria. This design must consider and coordinate with the proposed means of implementation and existing territorial strategic development instruments, allowing for the integration of climate change management in national and regional public policies by 2050.

7.2 Cost Effectiveness of Carbon Neutrality

On the one hand, the implementation of mitigation measures defined with the objective of achieving carbon neutrality by 2050 implies a significant investment (CAPEX) on the order of USD 50 billion. On the other hand, less energy consumption in a carbon neutrality scenario will lower operational and maintenance (OPEX) costs by around USD 80 billion, resulting in a net benefit of approximately USD 30 billion by 2050. Therefore, from the point of view of cost-effectiveness, the measures are profitable. The cost calculations were made by the Ministry of Energy, the Ministry of Finance and the Ministry of the Environment in the context of defining the carbon neutrality target for 2050 and updating the NDC, with a discount rate of 6%.

In addition, a collaborative macroeconomic evaluation of carbon neutrality by the World Bank and Ministry of Finance¹⁰² showed that Chile's GDP by 2050 could increase by 4.4% compared to the base scenario, confirming the great opportunity that transforming ourselves into a CO₂-neutral economy means for Chile.

¹⁰² | <https://chile.un.org/sites/default/files/2020-11/Oportunidades-de-Crecimiento-Verde-para-la-Meta-de-Des-carbonizaci%C3%B3n-en-Chile-Informe-Sobre-los-Efectos-Macroecon%C3%B3micos-de-Implementar-Pol%C3%ADticas-de-Mitigaci%C3%B3n-de-Cambio-Clim%C3%A1tico-en-Chile%281%29.pdf#:~:text=Chile%20se%20ha%20comprometido%20recientemente,e n%20la%20recientemente%20renovada%20NDC.>

Co-benefits of achieving carbon neutrality by 2050

103 | The marginal abatement cost analysis for Chile is derived from the best information available to date, the results of the Chile MAPS project.

104 | For more methodological detail, see: Evaluation of environmental co-benefits for the reduction of local pollutants associated with the Long-Term Climate Strategy to achieve carbon neutrality by 2050 in Chile. MMA, 2021.

Implementing Chile's mitigation commitments to achieve carbon neutrality by 2050 is not only profitable and cost effective from the point of view of the mentioned direct net benefits; it would also have the benefits of (i) reducing damage and social costs due to the effects of climate change, and (ii) reducing local pollutants associated with reducing greenhouse gas emissions, with consequent health benefits.

This last element is especially relevant as it demonstrates the complementarity of climate policy with other national regulatory management instruments to control atmospheric pollution. Consistency in the management of pollutants benefits the health of people and ecosystems, promotes innovation and investment in clean technologies, and strengthens the transition to compliance with national regulations with better environmental standards.

The benefits estimated by the GHG reduction use as a reference the "social price of carbon", which is established as the shadow price determined by the function of marginal costs of CO₂,¹⁰³ that would allow the fulfillment of the mitigation goals of Chile, based on its Determined National Contribution in force at the date of its publication (MIDESO, 2017). National results set a price carbon of 0.823 UF/ton CO₂ (MIDESO, 2017, p. 5).

The health benefits of the reduction of local pollutants respond to the quantification and assessment of changes in indicators such as mortality, hospitalizations and visits to the emergency room as a result of respiratory and cardiovascular diseases linked to ambient concentrations of PM_{2.5}. The results show the number of cases avoided, according to type of event, by economic sector in the period from 2020-2050. Finally, the benefit is valued by multiplying the number of cases avoided by the unit value of the quantified effects.¹⁰⁴ The results obtained from the analysis of carbon neutrality sectoral measures included in the estimate of reduction of black carbon emissions and local pollutants are presented below:

Table 9: Carbon neutrality sectoral measures included in the estimate of black carbon and local pollutants

Measure	Policies prior to the definition of carbon neutrality	Carbon Neutrality (Projected route in 2019)
Electromobility strategy	40% of the private vehicle fleet electric by 2050.	60% of the private vehicle fleet electric by 2050.
	100% electric public transport by 2050.	100% electric public transport by 2040.
New housing standards	General Urban Planning and Construction Ordinance (OGUC).	New construction regulations.
		New homes are expected to consume 35% less energy by 2040 than current homes.
Electric heating for residential use	New measures are not considered.	By 2050, 39% of heating will be supplied by electricity.
Solar thermal systems in industry and mining	New measures are not considered.	Solar energy is included as energy.
Electric vehicle use in industry and mining	New measures are not considered.	Inclusion of hydrogen-powered vehicles for industrial and mining uses.

The territorial impact of the reduction of PM emissions associated with the implementation of the mitigation measures contemplated in Chile's NDC can be seen in the following figure.¹⁰⁵ The distribution of cumulative emission reductions by pollutant for the 2020-2050 period shows that the greatest reductions in PM 2.5 will be in the center-south zone. The areas in blue represent greater emission reductions while the gray areas indicate smaller reductions.¹⁰⁵

105 | Defining the regional distribution of emissions from the national to the provincial level required establishing criteria for each sector depending on the information available. See: Evaluation of environmental co-benefits for the reduction of local pollutants associated with the Long-Term Climate Strategy to achieve carbon neutrality by 2050 in Chile. MMA, 2021.

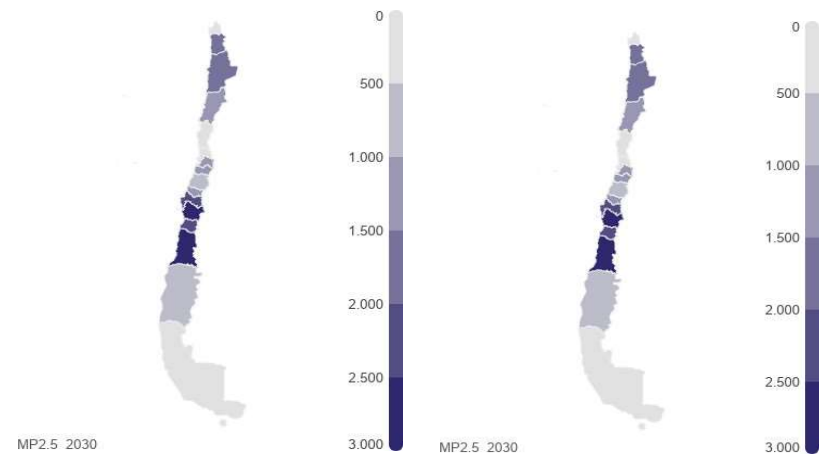
106 | The figures are not comparable with regard to tons emitted since the scale varies according to the order of magnitude of emissions for each pollutant and period.

Figure 20: Regional distribution of the reduction in PM 2.5 emissions in accumulated tons in 2020-2030 (left) and 2020-2050 (right).

107 | This includes solar energy, electromobility and green hydrogen for vehicle uses.

108 | Includes measures such as new construction regulations, electromobility and new energy sources.

109 | Evaluation of environmental co-benefits from the reduction of local pollutants associated with the Long-Term Climate Strategy to achieve carbon neutrality by the year 2050 in Chile.



Source: Authors' research.

The maps show that the largest reductions in PM_{2.5} emissions are distributed for the period 2020-2050 in the northern area in the regions of Tarapacá and Antofagasta, mainly due to the mining, transport and off-road machinery sectors¹⁰⁷ and in the center-south zone in the Santiago Metropolitan, Biobío, Araucanía and Los Lagos regions, in the residential, off-road transport, industry and machinery sectors¹⁰⁸.

The province of Santiago shows a greater impact in terms of emissions reductions, accounting for more than 25% of total accumulated PM 2.5 reductions. In addition, there is evidence of an important variation in the northern zone in the province of Copiapó, and in the southern zone in the provinces of Osorno and Coyhaique.

The estimated reductions in PM 2.5 concentrations would prevent, approximately, a cumulative total of close to 100,300 cases of premature deaths in people over 30 years of age during the evaluation period. The greatest impact would be in reducing lost labor productivity, with an accumulated reduction of around 60,000 cases for people between 18 and 64 years of age. The following table shows total cases prevented by cause and their confidence interval.¹⁰⁹

Table 10 NUMBER of cases at the national level, percentile 50, period 2020-2050 [Thousands of Cases].

Effect	Cause	No. of cases 50th percentile [Thousands of Cases]	Confidence bond [95%-5%]
Mortality	Long Term Cardiopulmonary	100	[155 - 46]
	Asthma (chronic)	4,2	[6.7 - 1.8]
Hospital Admissions	Chronic obstructive pulmonary disease	5.9	[8.2 - 3.6]
	Cardiovascular Disease	107	[238 - (-23)]
	Pneumonia	51	[88 - 13]
	Bronchitis	1000	[1,875 - 126]
ER Visits	Bronchitis	1000	[1,875 - 126]
	Restricted Activity Days	14,888	[16,964 - 12,812]
Lost Productivity	Restricted Activity Days	14,888	[16,964 - 12,812]
	Lost Work Days	46,622	[51,641 - 41,603]

Source: Authors' research.

In terms of reduced emissions, with the implementation of measures such as electric heating, distributed generation and electric vehicles for the commercial sector; green hydrogen for the off-road machinery sector; electromobility in public and private light transport, and green hydrogen in cargo transport for the transportation sector, nearly 87,000 cases of premature death would be avoided for the 2020-2050 period.

Across the national territory, the provinces of Santiago (more than 60,000 cases), Concepción (4,000 cases) and Osorno (2,000 cases) would have the greatest reductions in premature deaths. Santiago leads the group and represents 60% of total cases. It is important to mention that the magnitude of the impact per ug/m³ of reduced concentration varies

significantly depending on the province where it occurs, due primarily to the number of people exposed.

The social benefits from the reduction of emissions of local pollutants at the national level would be as much as USD 29.482 billion. Premature deaths avoided are equivalent to USD 28.078 billion and represent 95% of total benefits. Hospital admissions as a whole represent 1%, and lost productivity 3.5% of total benefits. The following table shows the benefits according to cause and effect at the national level.

Table 11: Benefits of reducing local pollutants at the national level, 2020-2050 [MMUSD].

Effect	Cause	PV Benefit	Confidence Interval	Percentage
		[USD millions]	[95%-5%]	
Mortality	Long Term Cardiopulmonary	\$28,078	[\$52,172 - \$15,601]	95.09%
	Asthma (chronic)	\$1.3	[\$1.8 - \$1.0]	0.005%
Hospital Admissions	Chronic obstructive pulmonary disease	\$1.8	[\$1.9 - \$2.4]	0.006%
	Cardiovascular Disease	\$278	[\$515 - \$66]	0.98%
	Pneumonia	\$11	[\$20 - 4]	0.04%
ER Visits	Bronchitis	\$73	[\$119 - 35]	0.26%
Lost Productivity	Restricted Activity Days	\$262	[\$304 - \$255]	0.91%
	Lost Work Days	\$777	[\$897 - \$781]	2.71%
Total Nationwide		\$30,844		100%

Source: Authors' research.

The provincial analysis of benefits per capita shows that the provinces of Santiago, Osorno, Coyhaique and Copiapó are the ones that experience the highest benefits per capita for the 2020-2050 period, exceeding USD 3,000 per inhabitant.

The direct value of GHG reductions according to the social price of carbon (MIDESO, 2017) is as much as USD 9.048 billion and is equivalent to 23.5% of the benefits associated with the reduction of local pollutants.

Therefore, the direct net benefits associated with carbon neutrality by 2050 are more than doubled when considering the socio-environmental benefits of preventing health problems in the population due to poor air quality.

The results obtained confirm the potential for collaboration in achieving global and local pollutant reduction targets. The measures to be implemented in the Commercial, Off-Road Machinery and Transport sectors are those that generate the greatest co-benefit, and therefore should be prioritized in the regional and local design and implementation of future sectoral mitigation plans to ensure a greater social benefit. The measures evaluated include electric heating, distributed generation and electric vehicles, green hydrogen, and electromobility in public and private light transport. Sectors such as Mining, Industry, Generation and Residential account for 18% of total co-benefits, so it is important to include them in sectoral mitigation plans.

These results contribute to the analysis of the distribution of emissions from the national level to the provincial level, taking into account local realities and strengthening decision making in regional strategic planning processes. This is important to promoting self-management to ensure equity and justice in the climate transition and subnational empowerment (regions and municipalities of Chile). The National Prospective System is expected to pursue this type of development, strengthening and standardizing methodologies for estimating national and regional projections.



Photo by Bryan Contreras

08 MEANS FOR IMPLEMENTING AND MONITORING THE ECLP

09 ANNEXES

Means for implementing and monitoring the ECLP

8.1 Means of Implementation

110 | The Draft Framework Law on Climate Change defines as means of implementation: institutional or normative actions, measures or processes for the development and transfer of technology, creation and strengthening of capacities and financing, and other factors required for the mitigation of and adaptation to climate change.

The design and implementation of measures to deal with climate change requires a solid knowledge base, new technologies, financing, and trained and organized governments at different levels, as well as social actors and a well-prepared community. This series of requirements is referred to internationally and nationally as "Means of Implementation"¹¹⁰ and its relevance has been made clear through efforts to promote the development of these enabling conditions for climate action within the framework of the Paris Agreement

In line with this and Chile's NDC, the Draft Framework Law on Climate Change proposes that the ECLP should address the development of three means of implementation: technology development and transfer; capacity building and climate empowerment; and financing. These means of implementation, which are described below, are at the service of mitigation and adaptation, directing efforts across the different sectors of the country and at different administrative levels.

The Sector Authorities must define and implement concrete actions related to the means of implementation presented in the ECLP, through their Sector Mitigation and Adaptation Plans. Likewise, the CORECCs must identify synergies with national, sectoral and communal policies, and encourage the search for regional resources for the development of measures and actions for mitigation and adaptation to climate change, and the means of implementation defined in the ECLP.

8.1.1 Technology Development and Transfer

Implementing actions to meet both sectoral and national targets will require the development, promotion and attraction of new and better technology with a holistic and comprehensive view of climate problems. That is why Chile's updated NDC includes the commitment to «promote and strengthen the development and transfer of

technology¹¹¹ to support and promote the cultural, social, environmental and economic transformations necessary to achieve sustainable, resilient and carbon-neutral development by 2050 at the latest.».

Technology Development and Transfer for Climate Change in Chile, as a means of implementing the Long-Term Climate Strategy, is organized through the EDTTCC, which is coordinated within the framework of the National Policy on Science, Technology, Knowledge and Innovation. The EDTTCC considers the following as central axes:

- An analysis of technological development and transfer for climate change in Chile that reveals the limitations of the national Science, Technology and Innovation (CTI) ecosystem for the transfer of climate technologies. An analysis of the main barriers (i.e., financing, capacities, information, infrastructure and institutions) that hinder this process in the country.
- An identification and prioritization of areas and sectors for the development and transfer of technology for climate change in Chile. This process is dynamic, with the understanding that as Technological Action Plans are drawn up in each of the sectors, new sectors will be identified and prioritized in response to the country's sustainable development needs.
- The implementation of an enabling framework for the preparation of Technology Action Plans in each of the prioritized sectors. These Plans are prepared considering the inputs provided by the Technological Needs Assessment, the identification and prioritization of technologies, and the removal of barriers to technology development and transfer in prioritized sectors. The Technology Action Plans are the instruments that identify the technologies available to be transferred, their suppliers and recipients, as well as the incorporation of innovative solutions and new technologies for the adaptation and mitigation of climate change in Chile.
- The strengthening of enabling conditions for the deployment of the Technological Development and Transfer Strategy for Climate Change (EDTTCC) and the Technology Action Plans (TAPs) drawn up within this framework. Even though the National Policy on Science, Technology, Knowledge and Innovation (STKI) provides a framework for the development and transfer of technologies, it is imperative that recommendations be made based on the Technology Action Plans, so that climate change is considered in future updates of the STKI National Policy.

This point is essential, since at least five central barriers inhibit the development and transfer of technologies for addressing climate change in Chile: financing, capacities, information, infrastructure and institutions.

In response, the EDTTCC calls for strengthening the institutional framework, public-private networks for the creation of synergies, and strengthening and linkages with R&D&i Centers working on the technology transfer process,

111 | The Technology Development and Transfer Strategy for Climate Change (EDTTCC), as a first exercise developed by the Ministry of Science, Technology, Knowledge and Innovation, is a methodological commitment to identify and prioritize the technological design and implementation of Technology Action Plans in the prioritized sectors. In this context, the EDTTCC defines as (1) Technological Development: The application of knowledge for the creation of technologies from the prototyping stages of an application to its demonstration in a real environment. This complements the Frascati Manual (OECD, 2015), which defines experimental development as systematic work that takes advantage of existing knowledge obtained from research and/or practical experience, producing additional knowledge, and is aimed at the production of new products or processes, or the improvement of existing products and processes. (2) Technological Transfer: Process in which value is assigned to research capabilities by incorporating their results into the country's objectives, facilitating the adoption of technology for the development and well-being of society. This includes promoting the incorporation of state-of-the-art technology, developed locally or abroad, opening up new possibilities for companies, public institutions and society in general. In conceptual terms, it is understood as the formal and informal flow of know-how, capabilities, technical knowledge, procedures, methods, expertise or technology from one organizational environment to another. The term encompasses both the diffusion of technologies and technological cooperation within countries (IPCC, 2018b).

the design of observatories and/or information platforms that integrate and allow data to be displayed quickly, reliably and openly in the prioritized sectors. This way, national, regional and local authorities have more precise information and inputs for the identification of guidelines for research and systematic observation related to climate, as well as the proposal of mechanisms and policy instruments for the adoption of existing technologies worldwide, with reference to the application of Technology Action Plans.

The installation and formalization of a governance mechanism that ensures the deployment of institutional coordination mechanisms associated with the different areas of implementation of the EDTTCC, especially in the prioritization of areas and sectors, the identification and prioritization of technological options, their barriers, development and transfer mechanisms, the design and implementation of Technology Action Plans, and the design and implementation of processes for continuous improvement and updating of the EDTTCC to respond to challenges on the country's path to sustainable development.

This initiative is under the general framework of the National Science, Technology, Knowledge and Innovation Policy,¹¹² | which seeks to strategically guide the country's efforts by promoting, understanding and using research in all disciplines, technologies and innovation to contribute to the comprehensive and sustainable development of Chile. To this end, its focus is on strengthening and promoting the institutional framework, deepening and linking Science, Technology, Knowledge and Innovation with the citizenry, as well as the capacity to anticipate and respond to economic, social and environmental challenges. With this purpose and guidelines, the National Policy defines four lines of action, whose objectives are:

112 | National Policy on Science, Technology, Knowledge and Innovation (minciencia.gob.cl)

- 1) Links with Society, through strengthening the social appropriation of science, technology, knowledge and innovation in the country, promoting its understanding, appreciation and dissemination;
- 2) Future, which seeks to promote and strengthen the contribution of science, technology, knowledge and innovation (STKI) in the identification and construction of future possibilities for the country based on sustainable development and the need to address the environmental and climate crisis.
- 3) Strengthening the STKI Ecosystem through policies, plans and programs that allow a substantial advance in research, technology development and innovation, with permanent coordination between local and international actors.
- 4) Institutional capabilities, with the goal of strengthening the capacities of the STKI public ecosystem and generating the conditions to contribute to sustainable and comprehensive development at the national level.

Linking National STKI Policy with the development and transfer of technology for climate change, based on the understanding that both are key and transformative elements of achieving carbon neutrality and resilience. Thus, the long-term vision for the country in terms of technology transfer for climate change is as follows:

Vision: The country will have tools and an institutional framework that will allow it to identify the sectors that require technological development in climate change and the development of technology action plans appropriate to these needs, as well as knowledge bases and capacities for necessary research and innovation, as well as public-private collaboration at different levels.

• Technology Development and Transfer Strategy

The Technology Development and Transfer Strategy for Climate Change (EDTTCC)¹¹³ | was prepared by the Ministry of Science, Technology, Knowledge and Innovation (MinCiencia) based on a proposal submitted by a commission that included representatives from academia, the public sector, business and civil society in matters of technology development, transfer and climate change. The commission coordinated by the Executive Secretariat of the National Council of Innovation for Development (CNID) under the mandate of the Ministry of Science, Technology, Knowledge and Innovation, with the support of the Ministries of Economy, Development and Tourism, and Environment, in addition to CORFO and the Agency for Sustainability and Climate Change (ASCC).

The EDTTCC is a first step to advance in the identification and prioritization of technologies to face climate change that must be developed and transferred in Chile. Over a five-year horizon, it establishes a methodological commitment to organize the identification and prioritization of the necessary actions for developing technology action plans. In a first instance, the EDTTCC performs a diagnosis of the technology development and transfer for climate change in Chile, identifying the existence of a STKI ecosystem as an institutional framework that has representatives from the Ministries of Science, Technology, Knowledge and Innovation; Economy, Development and Tourism; The National Agency for Innovation and Development (ANID); and the Production Development Corporation (CORFO), with its Sustainability and Climate Change Agency (ASCC). This agency fulfills the role of Designated National Entity of the technological arm of the United Nations Framework Convention on Climate Change (END), a key position in obtaining financing and guidance from international organizations for the implementation of technology strategies. The EDTTCC also identifies relevant actors among public technology organizations, Universities, Research and Development Centers, Technology Hubs, Transfer and Licensing Offices (OTLs), entrepreneurs and investors, the private sector and civil society in general.

113 | <https://www.minciencia.gob.cl/areas-de-trabajo/ciencia-y-gobierno/estrategia-de-desarrollo-y-transferencia-tecnologica-para-el-cam/>

In addition, it acknowledges that the implementation of technologies related to climate change is limited and carried out by limited sectors, with asymmetries in the level of progress in implementing technologies and transfer of skills, mainly due to lack of information, infrastructure and coordination between academia and industry. Specifically, at the public level, there is a lack of coordinating bodies and clear leadership. Additional barriers to technological implementation include financing (limited access to resources); talent development in relevant disciplines (operation and maintenance of technologies); information (there is no mapping of local initiatives, and weak open access information systems), and others.

The general objective of the EDTTCC is to promote and strengthen the development and transfer of technology through the identification of sectors and areas fundamental to promoting institutional, social, economic and environmental change, allowing progress towards a path of sustainable development, resilience and carbon neutrality by 2050. This Strategy provides a five-year methodological framework for organizing the contribution in terms of development and transfer of technologies under Chile's 2020 NDC commitment.

The specific objectives of the EDTCC, which are integrated into this ECLP, are presented below:

- a)** Design and agree on a methodology to identify and prioritize areas and sectors that emit or capture GHG or that are impacted by the effects of climate change. The prioritization criteria will be consistent with the principles of cost-effectiveness, equity, climate justice and regional variations, taking an ecosystem approach and using existing tools, such as ARCLim.
- b)** Prepare and establish an enabling framework that allows the development of Technological Action Plans (TAPs) in prioritized areas and sectors. The starting point for the establishment of this framework is the elaboration of a «Technology Needs Assessment» (TNA) in each of the prioritized sectors. The TAPs are based on the TNAs in line with the development of sector adaptation and mitigation plans, becoming part of these once they are published or updated.
- c)** Strengthen the generation of enabling conditions for technology development and transfer in order to generate more and better knowledge through R&D, strengthen technology and innovation capabilities, develop talents, acquire adequate infrastructure and equipment, and be able to promote R&D&i at the regional level.
- d)** Facilitate public-private cooperation and coordination at the national and international levels through robust governance and institutional coordination.

The EDTTCC identifies on which sectors to focus the initial efforts and resources in terms of technology transfer, according to Chile's medium- and long-term objectives regarding climate change, prioritizing: Adaptation of Water Resources (urban and rural drinking water), Forestry and Agricultural Adaptation, and Energy Mitigation and Adaptation (electricity generation and transportation).

These objectives are implemented through the development of a Technological Needs Assessment (TNA) process for the selected areas and sectors that allows identifying and prioritizing technological options and existing barriers to implementation, so that they can be executed through a Technology Action Plan (TAP), an instrument that details, among other things, the scale at which the measures are intended to be implemented, the type of actions and activities, and estimated resources and costs.

An initiative is currently underway to develop a TNA for the aforementioned sectors, which considers various subsectors and main "challenges". (For example, a challenge for the Forestry subsector is "Management of forestry and agricultural climate information at the national level"; Energy has a subsector of Electricity Generation Networks, whose challenge is the "Climate Resilience of the electrical network"; and the Transportation subsector is challenged to use "Green hydrogen for public and freight transport.")

This TNA includes, among its lines of work, an analysis of existing technologies and technology gaps for the identified sectors; mapping of stakeholders by industry; a market evaluation that considers an analysis of financial schemes, value chains, risks and general barriers to implementation; and a financing plan with timelines, benchmarks and relevant indicators.

In this framework, the EDTTCC highlights the importance of ensuring that the methodology for TNA processes considers the development of indicators to meet goals associated with the fulfillment of NDC commitments. The TNA process has, among its products, the development of specific indicators for each technology group surveyed.

Sectoral adaptation and mitigation plans are also encouraged to develop TNAs to address sectoral challenges with the support of the Ministry of Science using the EDTTCC criteria. Within this same framework, the Energy mitigation plan and the adaptation plans for Water Resources, Forestry, Agriculture, Energy and Biodiversity must include a TAP.

Likewise, Sectoral Plans for Mitigation and Adaptation to Climate Change and Regional Action Plans for Climate Change are expected to consider concrete actions and measures that contribute to the fulfillment of the objectives outlined in the EDTTCC.

• Digital transformation

The digitalization of processes, the adoption of technology and associated innovations can, on the one hand, create enabling conditions for climate action, and on the other, support and promote mitigation and adaptation to climate change by, for example, closing gaps in gender equity and inclusion, promoting innovation, research and entrepreneurship, and accelerating necessary cultural changes.

In terms of policies that advance digitalization, the joint work of the General Secretariat of the Presidency and the Ministries of the Economy, Development and Tourism, Transport and Telecommunications and Finance has produced the Digital Agenda 2020¹¹⁴ |, a roadmap for digital development done in an inclusive and sustainable manner, through Information and Communication Technologies. This Agenda is based on five axes: 1) Adaptation of the regulatory framework for digital development rights, 2) Digital connectivity, 3) Digital government services for citizen processes, 4) Promotion of the digital economy, and 5) Promoting digital skills among the population. The Digital Agenda affects sustainability by reducing the use of physical materials such as paper, cutting down on the number of trips required to carry out procedures, and achieving more efficient use of energy and state infrastructure, among other benefits.

Other initiatives that do not focus directly on climate or sustainable action but have indirect impacts in this regard include:

- Digital Infrastructure, NIC Chile: A project whose main objective is to extend connectivity to remote areas of the country, but which also enables the monitoring of climate conditions¹¹⁵ |. NIC Chile has also carried out studies on the resilience of national communications networks in the face of socio-natural disasters, which may consider the effects of climate change.¹¹⁶ |
- Parametric Insurance, CORFO, agroinsurance commission: Insurance for governments that covers certain risks. In agriculture, for example, it covers areas affected by drought or excessive rainfall. Payment of these insurances relies on photographic monitoring (satellite images) of the subject areas.
- Climate Change Observatory, Ministry of Sciences: Digitization of climate information, modeling and monitoring of oceans and the cryosphere. The Ministry of Science is also looking for ways to apply its Artificial Intelligence (AI) policy to climate change.
- ARClim, Ministry of the Environment: Integrated and dynamic web platform covering the entire national territory that exposes the relative risk posed by climate change. (More information in Chapter 4.3 of this strategy document.)

114 |

<http://www.agendadigital.gob.cl/#/agenda/que#top-page>

115 |

<https://www.nic.cl/anuncios/20210913-red-experimental.html>

116 | <https://niclabs.cl/yafun/>

8.1.2 Capacity Building and Climate Empowerment

The creation and strengthening of capacities allows building the bases for the identification, planning, decision-making and implementation of mitigation and adaptation actions. This must be based on a multi-stakeholder and multi-level approach that includes the empowerment of citizens at all levels, in order to achieve the necessary awareness and involvement for all people and sectors to consider climate change a national and personal priority.

The process of capacity building and climate empowerment will be carried out through a national strategy in line with international recommendations and those of the national scientific community. Chile has committed to the preparation and implementation of a Capacity Development and Climate Empowerment Strategy, hereinafter ACE Strategy or Capacity Strategy, in its NDC (2020). This is considered a means of implementing the ECLP, whose design process began in 2020 and will be completed in 2022.

The vision for the development of citizen capacities and climate empowerment is as follows:

Vision: Chile will have climate governance trained to respond to the challenges of climate change, and informed, aware and proactive citizens who will contribute to the development of public policies, contributing from their personal and organizational spheres to the changes necessary to achieve the country's carbon neutrality and resilience by 2050.

• Capacity Development and Climate Empowerment Strategy

The Capacity Development and Climate Empowerment Strategy takes as its basis the six elements of the Action for Climate Empowerment, proposing to address them through five components:

- a) Information and participation to strengthen climate action with a gender approach
- b) Promotion of capacity building
- c) Research and Science for Climate Action
- d) Raising Awareness and Education for Climate Action
- e) Cooperation and Sharing of Experiences

The objectives for each component of the ACE Strategy are presented below. They are the result of a broad participatory process, and all sectors and parties involved in climate action at the national level should consider them in the design and implementation of climate change management instruments, and other related tools, to advance in the effective implementation of long-term climate goals:

1. Promote and encourage access to information and citizen participation in the country's climate institutions and governance to ensure the effectiveness, quality and legitimacy of decisions and actions to address climate change at all levels of the state and public policy sectors, incorporating a gender approach.

1.1 Make publicly available relevant and truthful information on climate change generated by the public and private sectors and/or civil society organizations, promoting the publication of data of interest for climate action to make it accessible, understandable and reusable, to help guide significant decisions and actions in public services at all levels and empower citizens to implement local climate actions.

1.2 Promote citizen participation in the development, updating and implementation of climate change policies, programs, plans and actions, as well as in public instances of intersectoral coordination around the issue at the national and regional levels, with special emphasis on the participation of the communities most vulnerable to its effects and underrepresented groups of people, applying an intergenerational approach.

1.3 Integrate a gender approach into all climate change policies, programs, plans and actions, so that they take into account the differentiated impacts of climate change, thereby helping close gender gaps and highlighting the participation of women as a climate solution.

2. Generate job skills and competencies among people and organizations to empower them to contribute to carbon neutrality and resilience to climate change.

2.1 Develop skills and competencies among workers at state and municipal agencies.

2.2 Develop skills and competencies among workers in the private sector and micro-enterprises, as well as the self-employed.

2.3 Develop capacities and skills among non-profit foundations, organizations and their collaborators.

2.4 Promote the exchange of skills and labor competencies related to Climate Change between the public and private sectors and non-profit organizations.

3. Promote research and science on climate change and its social effects to produce knowledge and critical information that allows citizens, the production sector and the public sector to make decisions and develop actions to address climate challenges.

3.1 Promote research into climate and socio-environmental change to provide society with knowledge and technologies that allow it to face the challenges of climate change.

3.2 Promote the linking of science with decision-making and the development of public policies, to increase social capacities and climate empowerment.

3.3 Bring information about science and technology to the public, to raise awareness and foster action on climate change.

4. Promote awareness and formal environmental education for girls, boys, young people and adults at all levels (preschool, elementary, secondary and higher), and non-formal and informal education for gender-sensitive climate empowerment to stimulate public participation in the search and implementation of transformative solutions to face pressing climate issues.

4.1 Promote and strengthen student knowledge, skills, values, attitudes and educational paths regarding global and local understanding, as well as active commitment to critical climate and environmental challenges, incorporating a regional and gender approach, at all levels of formal education (preschool, elementary and secondary) through the various instruments of the education system, mainstreaming environmental education for the adaptation and mitigation of climate change.

4.2 Promote and advance knowledge, understanding and environmental ethics among university students, as well as technical-professional training to ensure the development of critical thinking, the search for innovative solutions, and gender-sensitive youth leadership in matters of climate change.

4.3 Promote and generate public knowledge, values, attitudes and skills to mobilize and involve communities,

local authorities and actors in climate management, encompassing all age groups, with a special focus on the inclusion of indigenous peoples and the most vulnerable groups in society, and taking into account gender variables.

5. Promote collaboration, cooperation and exchange between actors with common interests for the development and implementation of climate change mitigation and adaptation actions, and specifically, their means of implementation: capacities, technology transfer and financing.

5.1 Generate cooperation and collaboration between groups of actors with common interests for the implementation of climate action.

5.2 Promote the exchange of knowledge and experiences between peers within regions, to highlight local initiatives for addressing climate change.

5.3 Promote the participation and development of exchange networks among interested parties at the national and international level.

5.4 Make visible national and local initiatives related to climate action.

The Capacity Development and Climate Empowerment Strategy will define the monitoring and evaluation system for the creation and strengthening of capacities and empowerment related to climate change among citizens, organizations and institutions, observing the guidelines established in the ECLP for Monitoring, Reporting and Verification.

8.1.3 Financial guidelines for the Long-Term Climate Strategy

The Climate Change Financial Strategy must be prepared by the Ministry of Finance to contribute to the target of carbon neutrality and resilience by 2050, through the strategic use of public and private financial resources. The strategy should promote a long-term integrated model of value creation that incorporates social, environmental and economic dimensions in a balanced manner.

In 2019, Chile published its first Financial Strategy against Climate Change¹¹⁷, fulfilling one of the country's commitments on climate change following the Paris Agreement. This strategy defines the objectives, pillars and measures that will guide climate finance efforts to promote the transition to a low-carbon economy

117 | Estrategia-financiera.pdf (mma.gob.cl)

that is resilient to the effects of climate change, in line with the Sustainable Development Goals.

- In accordance with Chile's Financial Strategy and commitments to address climate change, the Chilean Ministry of Finance, with the technical support of the Ministry of the Environment and other competent organizations, has promoted specific definitions and actions aimed at accelerating the flow of resources to sectors aligned with the country's NDC, highlighting the following: Public-Private Green Finance Roundtable, formed in 2019, made up of financial regulators, the government and financial sector, which serves as a coordination body aimed at promoting the development of a local green financial market and greater climate risk management.

The members of this Roundtable signed a Voluntary Green Agreement and Joint Declaration on Climate Change and the Financial System by the Chilean Financial Authorities, namely, the Ministry of Finance, the Central Bank of Chile, the Financial Markets Commission and the Superintendency of Pensions. To date, the group is working to implement the commitments contained in the Agreement.

- A total of USD 7.727 billion in Sovereign Green Bonds were issued between 2019 and the beginning of 2021. These obtained the lowest interest rates for this type of sovereign bonds in the history of our country, demonstrating that investing in green projects benefits the environment, society and the economy, including the financial system. The framework for project definition has the CBI (Climate Bond Initiative) certificate and includes projects such as: Renewable Energy, Clean Transportation and Sustainable Construction.

- The Financial Market Commission's strategy for facing climate change was published in 2020 and aims to promote the disclosure of information associated with climate change, facilitate the development of a green financial market and integrate climate risks into prudential supervision.

- The publication of General Rule 276 in 2020 by the Superintendency of Pensions calls on Pension Fund Administrators to incorporate climate risks and Environmental, Social and Corporate Governance (ESG) considerations into its investment and risk management policies.

- The modification of Law 21.210 in 2020 was aimed at increasing the green tax base in Chile. Chile is also studying the possibility of implementing the first national offset-based compensation system to mobilize climate action at the national level.

- In 2020, the Ministry of Economy also implemented green credits to promote renewable energy projects and a circular economy among small- and medium-sized companies.

In addition to the above, it is worth mentioning the role of the Public Investment Plan included in the plan *Paso a Paso, Chile se Recupera (2020)*, which seeks to contribute to the economic reactivation of the country with sustainability criteria. This commitment establishes that at least 30% of public investment projects included in the temporary COVID-19 emergency fund must contribute to accelerating the country's transition towards a climate-resilient economy and low-carbon emissions, within the framework of the Paris Agreement and in line with the current NDC. In August 2021, Chile published its first "Sustainability Report, Progress in Project Allocation for the Sustainable Project and Investment Plan." It identifies more than USD 2.6 billion in projects that contribute to accelerating our transition to sustainable development, including clean transportation, climate-resilient infrastructure, sustainable management of water resources, conservation of biodiversity, sustainable construction and energy efficiency, among other areas.

Along with these important advances, it is necessary to identify the challenges to further developing green finance in our country, in accordance with the objectives outlined in this strategy. The diagnosis made by the *Center for Clean Air Policy (CCAP)* and the Technical Secretariat of the Green Climate Fund in Chile, made up of the Ministry of Finance, the Ministry of the Environment and the Ministry of Foreign Affairs, identified systemic and institutional gaps in capacity and access to financing. These gaps are summarized by level below:

- At a systemic level, it is important to address private sector limitations in identifying and managing risks and opportunities associated with climate change.
- At the institutional level, it is worth highlighting the need to coordinate the measures established in sectoral mitigation and adaptation plans, with public, hybrid/combined and/or private financing according to the benefits and disadvantages of each, based on the sectoral goals defined in this strategy.
- At the financial sector level, there is limited capacity to evaluate low-emission and climate-resilient business models and projects, often resulting in prohibitive terms and conditions for the financial instruments offered.
- Financial ecosystems for developing bankable project portfolios are still in their early stages, with limitations on access to affordable financing by micro, small and medium enterprises (MSMEs) preventing the generation of a significant *deal flow*.

The content and guidelines of the financial strategy, therefore, must take into account the gaps described when addressing the commitments in the NDC. It is worth mentioning that the Draft Framework Law on Climate Change, currently undergoing a second constitutional review in the National Congress, could establish more details in this regard, which will be included once the law is enacted.

Therefore, the update and/or drafting of the Ministry of Finance's Financial Strategy for Climate Change will take into account at least the following elements:

- a) Generate information, data and analysis to mobilize capital flows under an institutional framework of policies and measures consistent with the country's climate objectives, economic growth priorities, fiscal responsibility and sustainable development, with a long-term vision.
- b) Promote the design and implementation of green financial instruments and the promotion of markets to contribute to the development of economic sectors that are resilient to climate and low in carbon emissions.
- c) Promote long-term public-private cooperation in terms of understanding and managing the risks and opportunities associated with climate change, for decision-making by actors in the local financial sector.
- d) Establish a 2020 work plan for creating a fiscal framework for determining climate spending, both direct and indirect, in line with efforts to improve the efficiency and quality of public spending. The implementation of this work plan will be subject to the availability of resources approved by the respective Budget Law.
- e) Improve Chile's institutional ability to comply with the Green Climate Fund (GCF), including:
 - Improve the evaluation methodology and prioritization of projects to be presented to the GCF, in light of the country's current and future priorities. Efforts will be made to ensure that the prioritized projects are aligned with the Long-Term Climate Strategy and NDC objectives and commitments.
 - Standardize calls for public and private projects. This will help identify a portfolio of projects that are compatible with the goal of neutral GHG emissions by 2050.

It is worth mentioning that the Strategy will consider the Helsinki Principles, which are recognized by the Committee of Ministers on Climate Finance chaired by the Ministries of Finance of Chile and Finland.

8.1.4 Guidelines and complementary instruments to promote climate change management

Climate financing and productive development

In Chile, the Ministry of Economy has institutional responsibility for the Corporation for the Promotion of Production, CORFO, which is the executing agency for government policies that aim to enhance the country's competitiveness and economic diversification by promoting investment, innovation and entrepreneurship, while strengthening human capital and technological capabilities to achieve sustainable and territorially balanced development.

The Ministry of Economy, through CORFO, constantly contributes to national economic growth across the country, making it a key actor in Chile's productive development. The Ministry works in coordination and collaboration with other agencies to promote development and support high-potential sectors, moving Chile towards a sustainable economy that takes a socially responsible approach to natural resources and is committed to people's quality of life.

Within the framework of this strategy, there is great opportunity to transform the national economy by promoting actions to reduce emissions, combat climate change, optimize resources, and at the same time, generate new skills and jobs with sustainable growth as one of CORFO's four strategic pillars. For this reason, CORFO has supported a series of initiatives involving the circular economy, renewable energy, and the management of water resources, among other issues, through various promotional lines and instruments. The main programs in this area are explained below:

- **Financing instruments:** Most noteworthy are those for projects focused on sustainable economic reactivation and the generation of new circular business models that promote the development and use of clean technologies, such as technology centers aimed at dealing with climate change (circular economy, electromobility, clean technologies and water management). CORFO has also financed the adaptation of public assets to climate change (2019) and regularly subsidizes SMEs and companies that focus specifically on sustainability issues.

Regarding access to financing, the Green Credit program (2020) funds investments aimed at combating climate change,

including self-sufficiency projects focusing on renewable energy, energy efficiency and environmental improvement measures in the production process.

- **Financial leverage instruments:** An important challenge today is mobilizing additional financial resources from public and private sources at the national and international levels. Concrete examples of coordination among private sector actors include the work carried out by the Agency for Sustainability and Climate Change (ASCC), a CORFO committee that mobilizes climate action in the private sector with financing from that sector to fulfill targets and actions within the framework of the Clean Production Agreements, a policy that has a mitigation MRV and sustainability benefits as a National Appropriate Mitigation Action (NAMA) recognized by the Convention.

In addition, its AGROSEGUROS Committee develops risk transfer tools for facing adverse climatic events in the forestry and agricultural sectors, with state subsidies to encourage their adoption.

Finally, regarding the guidelines for projected lines of work in the future, projects that contribute to the transformation of the power grid will continue to be promoted, such as the Cerro Dominador project, for which CORFO provided a loan that made possible the development of Chile's first thermosolar plant. In the same vein, CORFO will support initiatives of strategic importance for the country, such as, for example, green hydrogen projects, for which a USD \$50 million fund is being tendered. CORFO will contribute to the creation and strengthening of capacities and advanced human capital, supporting the training and/or retraining of workers to incorporate them into new sustainable industries, with an eye toward inclusion and gender equality.

Subnational Climate Action and Finance

An important advance in terms of public sector coordination to support and strengthen the development and implementation of the financial strategy has been the effort to enable conditions for climate action at the subnational level, including financing and complementary capacities. In 2021, the Ministry of the Environment and the Undersecretariat for Regional and Administrative Development (Subdere) led a dialogue between national institutions with key roles in climate action, which culminated in the proposal to form the "Local and Regional (Subnational) Climate Financing and Action Group" (GAFiCoR). The group was created with the purpose of promoting the coordination, planning and orientation of climate financing from national and international sources, between and within sectors, in collaboration

with the private sector, academia and civil society, with a focus on subnational financing mechanisms and schemes. Given the purpose of this group, some degree of participation by the Ministry of Finance and/or Directorate of Budgets (Dipres) is important.

As a result of GAFiCoR's work within the framework of this strategy, the following objectives are proposed:

- Strengthening subnational, regional and local capacities to address climate change, with a focus on climate action and project development.
- Preparing a roadmap that allows the incorporation of climate change criteria in regional public promotion and investment instruments, in line with capacity building.
- Identifying, articulating, orienting and coordinating key actors to promote climate action from an approach that complements climate financing and capacity building at the national and subnational levels.
- Identifying and giving visibility to funding available for climate action. For these purposes, a registry of financing sources for climate action will be compiled at the national and international levels, which will allow projects to be proposed and classified according to scope of financing (mitigation, adaptation or mixed), type of institution, and financing instrument, both public and private. This will provide information for applicants and facilitate knowledge about these types of financing sources.
- Promoting the coordination of strategic sources of financing in key areas that cover priority climate needs, and mobilize private financing that reaches the subnational level effectively, using an approach that promotes innovative financing types and tools, as well as the strengthening of complementary capacities.
- Encouraging private sector involvement in climate action through climate financing and the strengthening of complementary subnational capacities, with the support and participation of civil society and academia, promoting transparency in this matter.

First National Carbon Market, a green tax compensation system for strengthening the development of PUBLIC-private projects at the regional level

Article 8 of Law 20,780, enacted in September 2014, established an annual tax, called the green tax, which is levied on air emissions of particulate matter (PM), nitrogen oxide (NOx), sulfur dioxide (SO₂) and carbon dioxide (CO₂), produced by establishments whose fixed sources (boilers or turbines), individually or as a whole, add up to a power greater than or equal to 50 [MWt]. This law began to be enforced in 2017, allowing the development of monitoring, reporting and verification systems and fiscal controls associated with the payment of the green tax.

Subsequently, through the modernization of the tax legislation introduced through Law 21,210 in February 2020, the tax was modified to reflect an annual emissions threshold instead of installed capacity. Thus, the current tax covers all emissions of particulate matter, nitrogen oxides, sulfur dioxide and carbon dioxide that are emitted into the air by establishments whose emissions sources, individually or as a whole, emit over (a) 100 or more tons of particulate matter per year or (b) 25,000 or more tons of CO₂ per year.

The modified law also allows emissions to be offset, completely or in part, through the implementation of projects to reduce emissions of the pollutant (or projects with equivalent effects) within the national territory, as long as said reductions are additional, measurable, verifiable and permanent. Taxpayers must therefore choose between paying the taxes or offsetting their emissions, offering a relevant opportunity to finance emission reduction projects at a subnational scale and promote the use of private resources in mitigation projects. These represent diverse alternatives that result in cost-efficient synergies, as well as social and environmental benefits deriving from reduced emissions. This modification will take effect in 2023 and is key to improving and complementing the MRV system for reducing emissions at the national level, promoting climate action with environmental integrity and avoiding double bookkeeping.

The compensation system will allow financing for a diversity of projects; for example, reforestation, clean public transport, replacement of heaters, among others, that would not be possible without this mechanism. The system will facilitate the country's transformation towards sustainable and inclusive development that is resilient to climate change, considering the criteria, guidelines and directives established in overarching climate change management instruments, especially those contemplated in Chile's NDC and ECLP. In addition, it will further projects that rely on nature-based solutions to combat climate change, benefiting Chile's native biodiversity. Likewise, it will be consolidated as an economic-

environmental instrument that contributes to improving the quality of life of people who live in areas with environmental problems or concentrated industrial activity.

Emissions offsets are aligned with the long-term climate objectives of our country, generating a mechanism that will directly benefit areas affected by pollutants as well as global emissions (CO₂) projects on a national scale.

The emissions offset system will give rise to Chile's first carbon market, promoting climate action to support the fulfillment of our GHG emission reduction goals. The guidelines that must be observed in the compensation system and development of emission reduction projects are as follows:

- Projects must be Additional, Measurable and Verifiable.
- The reductions must be permanent.
- Projects must have a realistic and credible baseline.
- Projects must safeguard environmental integrity and anticipate, mitigate and reduce unintended impacts.
- Reductions must be traceable through a clear and transparent chain of custody.
- Projects must describe how they relate or contribute to the NDC and ECLP.

As for the future national carbon market at the national level, the Draft Framework Law on Climate Change points to the power of the Ministry of the Environment to develop greenhouse gas (GHG) emission standards, establishing the maximum amount of a GHG and/or a short-lived pollutant that may be emitted by an establishment, emission source or group of these, based on a baseline emission standard by technology, sector and/or activity, in order to meet the objectives of this strategy and the NDC. In addition, the bill proposes a certification system for reduction or absorption of GHG emissions. It establishes that, to comply with emission standards, certifications can be used for the reduction or absorption

of excess GHG emissions, obtained through the implementation of projects for that purpose, requiring that the reductions or absorptions be additional, measurable, verifiable, permanent and in compliance with principles of sustainable development.

The foregoing presents us with an important challenge regarding the formation of a GHG emission reduction market in Chile that contributes to promoting climate action in accordance with the strategic definitions and rules agreed upon under article 6 of the Paris Agreement, thus inserting our country into the global market for emission reductions.

• Natural Capital Committee

Achieving the climate objectives identified in this strategy implies a respect for biodiversity and the contributions it makes to society in a comprehensive manner, including economic analyses to ensure that development can integrate the task of care and restoration of nature, which is essential for the current and future well-being of our society. This has been explicitly demonstrated by science (Ipbes 2019), and was specifically recommended by Professor Partha Dasgupta in research¹¹⁸ | commissioned by Britain's Treasury Department: "Our economies, livelihoods, and well-being all depend on our most precious asset: Nature."¹¹⁹ |

For this reason, the Ministry of the Environment and the Central Bank, following the guidelines of the "Basis for the National Strategy for Science, Technology, Knowledge and Innovation (STKI)" of the National STKI Council, will create a Natural Capital Committee. This Committee will follow the model of the British Natural Capital Committee (2012-2020) in defining its functions and members, but adjusting it to national realities.

The initial objective of the Committee will be to contextualize the process of appraising natural capital, and defining relevant actors and critical interventions for effectively incorporating this element into our country's development. This will include designing the future implementation of a system of national environmental accounts based on ecosystem assets. The process will involve identifying and estimating the extent and condition of all natural capital assets in the country, with a view to incorporating them into the national accounts; identifying and activating channels for generating information pertinent to this process; developing institutional capacities to allow their incorporation into decision-making on investments and public spending; and identifying and designing comprehensive public policies that facilitate and promote the incorporation of natural capital into Chile's future decision-making and sustainability. One of the initial objectives of the Committee will be to define a roadmap for the process and defining critical steps in the short, medium and long term, to inform the guidelines of this strategy.

¹¹⁸ | February, 2021. The Economics of Biodiversity : The Dasgupta Review. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/962785/The_Economics_of_Biodiversity_The_Dasgupta_Review_Full_Report.pdf

¹¹⁹ | https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957629/Dasgupta_Review_-_Headline_Messages.pdf

8.2 Monitoring, Reporting and Verification of the ECLP

The Draft Framework Law on Climate Change proposes the specific contents of Chile's Long-Term Climate Strategy, including **criteria for monitoring, reporting and verifying compliance with the goals and measures of climate change management tools, sector mitigation and adaptation plans, defined according to the requirements of Chile's international commitments, and ensuring transparency in monitoring, quality and consistency of reported data.**

Likewise, the bill proposes that **monitoring, reporting and verification indicators be included in sectoral plans for mitigation and adaptation, in accordance with the provisions of the Long-Term Climate Strategy.**

Consequently, the ministries in charge of preparing Sectoral Mitigation and Adaptation Plans will lead, from their sectors, the monitoring of climate change management measures, with guidelines provided by the Ministry of the Environment (MMA)¹²⁰ | along with support, permanent guidance, measures to facilitate intersectoral coordination and proper monitoring of the objectives and targets. Additionally, the Ministry of the Environment will report every two years on the progress of the country in climate matters, both nationally and internationally, in the National Action Report on Climate Change (RANCC) and the Biennial Transparency Report (BTR), respectively.

8.2.1 Context and Needs

Article 13 of the Paris Agreement¹²¹ | creates the Enhanced Transparency Framework (ETF), which aims to improve the current MRV system of the United Nations Framework Convention on Climate Change (UNFCCC). The ETF defines the requirements that countries must meet, so that through mutual trust and effective application, they can comply with the objectives of the Agreement and the commitments determined at the national level. The specifications on how to implement the Enhanced Transparency Framework are found in the Modalities, Procedures and Guidelines (MPG)¹²² |, agreed upon in the Paris Agreement Rule Book during COP24. The MPG define the requirements for periodically providing information about National Inventories of Greenhouse Gases (INGEI), monitoring progress in the implementation of Nationally Determined Contributions (NDCs), related information climate change and adaptation concerning Article 7 of the Paris Agreement, and information on support in the form of financing, technology development and transfer, and capacity building, delivered/required and mobilized/received (Articles 9, 10 and 11 of the Paris Agreement).

¹²⁰ | Law 19,300, on General Environment Baselines, article 70, letter h).

¹²¹ | https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_spanish_.pdf

¹²² | https://unfccc.int/sites/default/files/resource/CMA2018_3a02S.pdf

Correct implementation of the ETF at the national level will allow monitoring of the different climate policies and instruments that are associated with the fulfillment of the commitments that Chile has taken before the UNFCCC, such as the NDC and the ECLP, which in turn will allow control and monitoring of national policies and actions in the context of climate action.

At the national level, Chile, through the Draft Framework Law on Climate Change¹²³ | proposes different actions and criteria necessary to carry out the MRV of compliance with the goals, plans and measures of the climate change management tools, ensuring transparency in the monitoring, quality and consistency of the reported data.

The implementation of an MRV system that allows monitoring compliance with the ECLP poses an important challenge in terms of capacity building and information gathering, which is why there must be monitoring indicators, reporting requirements, verification, and most critically, clear definition of roles and responsibilities at each stage of the process, with specific attributions of the institutions involved. In this way, the MRV system for the ECLP must:

- Monitor national plans and policies associated with climate change, both in terms of their effectiveness and progress toward their implementation.
- Prepare information to be submitted to the UNFCCC and at a national level.
- Transparently manage information regarding financial support received and needed nationally and internationally for subsequent reporting.
- Others: Avoid double counting of reductions, prioritize sectoral efforts, identify and remedy methodological shortcomings, identify the need for both technical and financial support, and highlight the importance of and need for information and the necessary resources to monitor climate actions.

For all monitoring, reporting and verification systems, and the associated indicators applicable to the climate change management tools, the criteria and guidelines established in this chapter will be observed.

8.2.2 Definitions

Ensuring compliance with the objectives and goals of this Strategy requires clear monitoring of the implementation and effectiveness of plans, policies or actions for mitigation and adaptation to

¹²³ | https://www.senado.cl/appsenado/templates/tramitacion/index.php?bulletin_ini=13191-12

climate change, recognizing their progress, needs and possible problems to provide timely solutions, amend actions and efficiently manage resources.

Ensuring compliance with the objectives and goals of this Strategy requires clear monitoring of the implementation and effectiveness of plans, policies or actions for mitigation and adaptation to climate change, recognizing their progress, needs and possible problems to provide timely solutions, amend actions and manage resources efficiently.

In order to have a common understanding of these processes and what each stage of monitoring, reporting and verification (MRV) means, the definitions described in the following table will be used as a general conceptual framework.

Table 12: Definitions for MRV processes

Monitoring (M)

This refers to the monitoring or measurement of data and information on emissions/absorptions, risk/exposure/sensitivity/threat, mitigation and adaptation actions, support and means of implementation, or other climate action. In the particular case of mitigation actions, this may imply the direct physical measurement of GHG emissions, estimates of emissions or emission reductions using activity data and emission factors, as well as the monitoring of relevant changes for sustainable development (co-benefits) and the implementation progress. In general terms, monitoring can imply the calculation, estimate or collection of information on changes that favor sustainable development and climate action objectives.

Reporting (R):

Consists of the compilation of information in standardized formats, such as inventories or periodic reports so that it is accessible to a variety of users, facilitating the public disclosure of information.

Verification (V):

It will be based on the periodic review, analysis or evaluation of independently reported information that allows establishing a degree of integrity and reliability. Verification helps ensure accuracy and compliance with established procedures and can provide meaningful feedback for future improvements. It can be done through means of verification that make it possible to certify compliance with commitments and/or indicators.

Source: Authors' research based on WRI (https://files.wri.org/d8/s3fs-public/MRV_101_0.pdf) and UNDP (<https://www.adaptation-undp.org/resources/manual/monitoring-and-evaluation-manual-community-climate-change-adaptation-fund>)

8.2.3 Criteria and Principles

Although the MRV for monitoring compliance with the ECLP must be defined through regulations, guidelines and reports once the Draft Framework Law on Climate Change is approved and the ETF is implemented, this strategy will propose the criteria and guiding principles that must be considered in the implementation of each of the associated instruments.

Table 13: ECLP MRV criteria and principles

Draft Framework Law on Climate Change

The policies, plans, programs, regulations, actions and other instruments that are enacted or executed within the framework of the Draft Framework Law on Climate Change will be inspired by the following principles:¹²⁴

- Scientific: The instruments and mitigation or adaptation measures for facing the adverse effects of climate change will be adopted and implemented based on the best available scientific information.
- Transparency: It is the duty of the state to facilitate timely and adequate access to information on climate change, promoting dissemination and awareness of the issue and reducing information asymmetry.
- Participation: It is the duty of the state to have mechanisms that ensure the right of participation of every person or group of people in the management of climate change at the national, regional and local levels.
- Non-Regression: The measures aimed at dealing with the adverse effects of climate change may be modified when technological, environmental, economic or social conditions require it, provided that the established mitigation and/or adaptation objectives are not compromised.
- Progressiveness: The measures aimed at combating climate change must advance gradually in order to comply with the purpose of this law.
- Transversality: State action for the management of climate change must promote the coordinated participation of the government at the central, regional and local levels, as well as the participation of the private sector, academia and civil society.

123 | <https://www.senado.cl/appse-nado/templates/tramitacion/index.php?#>

Enhanced Transparency Framework of the Paris Agreement

In terms of the MRV of policies, actions and mitigation measures, the following principles should be considered:

- Continuous improvement of reporting and transparency over time.
- Promoting transparency, accuracy, consistency, comparability and completeness (TACCC Principles).
- Ensuring the maintenance of the frequency and quality of the reports in accordance with their respective obligations under the Convention.
- Ensuring that double counting is avoided.
- Ensuring environmental integrity.

Defining each of the TACC principles is particularly important:

- **Transparency:** Assumptions and methodologies should be clearly explained and documented to facilitate replication and evaluation. If documentation is not provided, there is no way to demonstrate that the other principles have been met.
- **Accuracy:** This is a relative measure of the accuracy of the emission/absorption estimates with regard to mitigation actions. Estimates should not be systematically over or under actual emissions/absorptions, as far as can be judged from available data and information. Uncertainties should be reduced as much as possible. Appropriate methodologies must be used, in accordance with the IPCC guidelines.
- **Consistency:** The information must be consistent with information reported in previous years; in other words, the same methodologies should be followed for the base year and all subsequent years. To keep track of mitigation, it is also necessary to use consistent data sets to estimate emissions and absorption by sources/sinks.
- **Comparability:** Estimates and definitions must be comparable between Parties. Methodologies and formats agreed to by the COPs. Assignment of source/sink categories, according to the IPCC Guidelines.
- **Completeness:** In terms of mitigation, all sources/sinks and gases included in the IPCC Guidelines. Other specific source/sink categories. Full geographic coverage of a Party's sources/sinks.

For monitoring adaptation measures and processes, see Table 4.F of the Technical Manual for Developing Countries, which establishes that, for the "monitoring and evaluation of adaptation measures", the following specific information should be reported:

- Creation or use of national monitoring and evaluation systems for implementing adaptive measures.
- Monitoring and evaluation approaches and systems, whether existing or under development.
- The following information with regard to monitoring and evaluation: (a) Achievements, impact, resilience, review, effectiveness and results; (b) Approaches and systems used, and their products; (c) Assessment of and indicators for the following aspects: (i) how adaptation has increased resilience and reduced impacts; (ii) the cases in which adaptation is insufficient to avoid impacts; (iii) the effectiveness of the adaptation measures adopted; (d) Enforcement, particularly with regard to: (i) transparency of planning and enforcement; (ii) how support programs respond to specific vulnerabilities and adaptation needs; (iii) the influence of adaptive measures on other development goals; (iv) best practices, experiences and lessons learned from regulatory and policy changes, measures and coordination mechanisms.
- Information on the effectiveness and sustainability of adaptive measures, as appropriate, in particular with regard to: (a) Ownership, stakeholder involvement, alignment of adaptation measures with national and subnational policies, and replicability; (b) The results of adaptive measures and the sustainability of those results.

Source: Authors' research.

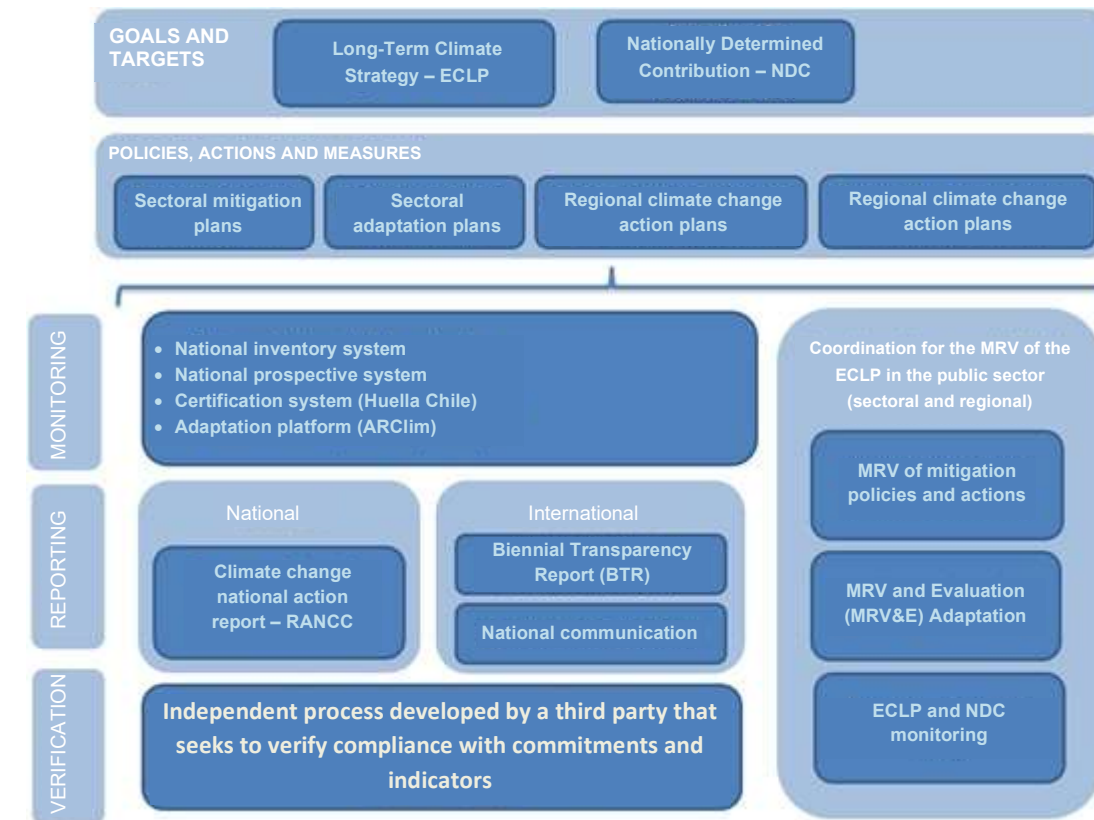
8.2.4 ECLP MRV Process

First of all, it should be clear that the ECLP will not have an independent MRV system; rather, it will be carried out through a coordination process that involves different systems and platforms that already exist or are under development.

The Draft Framework Law on Climate Change calls for the MRV process associated with the ECLP, which will be implemented through different systems to reinforce a common framework that allows compliance with the criteria defined, and thus, making the best use of the resources in different sectors for the collection, compilation and review of information. In this, the Ministry of the Environment (MMA) has a key role in coordinating all MRV systems to ensure that they meet the criteria, timing and efficiency for the use of resources to properly monitor the different targets.

As can be seen in the following figure, to ensure compliance with the ECLP targets, each of the defined budgets and sectoral commitments must be monitored. This, in turn, will allow greater organization and coordination between the sectors, which will be particularly useful for commitments that have more than one associated sector. Figure 20 shows examples of existing and/or planned MRV processes led by the Climate Change Office of the MMA and that are linked to the Draft Framework Law on Climate Change, the NDC and the ECLP. It should be noted that other ministries are also making specific efforts to advance towards the MRV of their climate change management instruments, for which they work in close coordination between the ministries that lead these initiatives and the MMA. Some of these initiatives for monitoring and follow-up of sectoral actions are presented in the section on sectoral contributions and integration components in this document.

Figure 21: ECLP MRV Process



Authors' research.

Monitoring

To monitor compliance with the long-term mitigation objective, progress toward both the neutrality goal and the budget defined in the NDC, and the sectoral budgets defined in the ECLP must be analyzed. In this regard, Chile's existing **National Inventory System (SNI)**, which is in the process of constant review and improvement based on the IPCC guidelines, is key.

125 | As part of the Paris Agreement, the Parties to the UNFCCC agreed to create a Capacity Building Initiative for Transparency (CBIT) to strengthen the country's institutional and technical capacities for complying with the transparency requirements of the Paris Agreement. CBIT Chile is financed by the Global Environment Facility (GEF), executed by UNEP and implemented by the Ministry of the Environment.

To complement this system, through the Capacity Building Initiative for Transparency Project (CBIT)¹²⁵, a **National Prospective System (SNP)** is being designed and implemented to serve as an analysis system that consists of an ex ante approach that will lay the foundations for the permanent analysis of past and projected emissions for purposes of monitoring, planning and updating national and international commitments on climate matters. The main objective of the SNP is to develop a dynamic for the coordination and standardization of updating the national projections of long- and short-lived greenhouse gas (GHG) emissions, also considering their socioeconomic impacts. The SNP will make it possible to facilitate and streamline the evaluation of prospective scenarios and GHG mitigation measures, installing the necessary capacities in the Ministry of the Environment, and establishing a system for coordination and transfer of information between the pertinent agencies. The system will complement the specific analyses and surveys of each of the pertinent institutions (i.e., Ministry of Energy, Ministry of Agriculture, etc.), serving as an additional tool for these institutions for their own analyses and calibrations. To give the SNP technical robustness, the information, models and data that it uses and generates must follow the principles of transparency, completeness, coherence, comparability and accuracy, the same quality pillars used by Chile's National Greenhouse Gas Inventory System.

126 | Huella Chile – Huella Chile (mma.gob.cl)

Another system in operation and hosted by the MMA is the **Huella Chile**,¹²⁶ a voluntary initiative created in 2013 that recognizes the progress and gradual implementation of GHG emissions management in public and private organizations in Chile. An MRV system for GHG emissions is embedded and operational on the MMA servers, and integrated into the Single Window web platform for the Emissions and Transfer of Pollutants Registry (VU RETC). The MRV HuellaChile Web Platform is free to access, and designed to facilitate its use and navigation by different user profiles. It has online calculation modules that incorporate official emission factors and global warming potentials, facilitating the quantification of organizational carbon footprint and events, following the guidelines of the NCh-ISO 14064/1:2019 and the NCh-ISO 14067:2019, respectively. In addition, the MRV HuellaChile web platform allows standardized reporting and monitoring of mitigation actions implemented internally by organizations, which individually or as a whole allow for managing and reducing the annual GHG emissions of an organization following the guidelines of the NCh-ISO 14064/2:2019. The information verification process is voluntary and recommended; however, it is a minimum requirement for all organizations seeking to obtain a seal of approval from the HuellaChile Program. With the support of the initiative for the Transparency of Climate Action (ICAT), the HuellaChile Program is developing a complementary MRV tool for its web platform, which will facilitate the quantification and reportability of carbon footprints at the local government level following the guidelines of the Global Protocol for GHG Emission Inventories at the Local Scale.¹²⁷ It is expected to be operational in early 2022.

127 | https://ghgprotocol.org/sites/default/files/standards_supporting/GHGP_GPC%20%28Spanish%29.pdf

On the other hand, and more closely associated with the monitoring of adaptation measures, there is the **Climate Risk Atlas (ARClim)**, called the "Adaptation Platform" in the Draft Framework Law on Climate Change, which is a collection of public access maps showing the current and future risk level for a set of systems under climate threats organized in 12 sectors (native forests, forest plantations, mining, agriculture, coastal infrastructure, water resources, tourism, traditional fishing, aquaculture, biodiversity, electrical energy, and human health and well-being). For each system, maps of climate threat (A), exposure (E) and sensitivity (S) of the affected system are displayed (example of application: such as corn production). The maps have national coverage and community resolution; in some cases, specific geo-point resolution is available for certain strings (or punctual in certain strings). The three variables (A, E, S) are combined to determine climate change risk in the system in question. (More details of ARClim are presented in Chapter 4.4, Indicators for Monitoring, Reporting, Verification and Evaluating Adaptation in the long term).

It should be noted that when we refer to the monitoring of adaptation actions, the concept of **Monitoring, Reporting, Verification and Evaluation** is used. This is a process for identifying adaptation needs, measuring progress in the implementation of measures and their effectiveness, as well as incorporating learning in a continuous improvement process that seeks to increase the country's resilience (See Chapter 4.4, Indicators for Monitoring, Reporting, Verification and Evaluating Adaptation in the long term). Evaluation is a constant assessment of the usefulness of an intervention at a specific point in time; for example, if a policy has been effective in achieving the established objectives¹²⁸. In particular, Assessment of Adaptation Progress is discussed in terms of monitoring (what is being done?) and actual results (what are the consequences of our actions?). This evaluation is done prior to a new cycle or update of a plan or intervention¹²⁹.

Reporting

In accordance with the foregoing, and considering the reports that must be delivered to the UNFCCC and the ETF, MMA has the role of coordinator in terms of monitoring progress in different sectors, which is key to guaranteeing the coordination and strengthening of synergies between international reports, and follow up at the national level to avoid unnecessary overloads in the different sectoral teams.

To this end, each of the institutions involved must conduct a periodic survey of information on their sectoral progress. This will be achieved through MMA guidelines so that there is coherence with the defined criteria and between the different systems and instruments, both in actions that account for mitigation and those that contribute to adaptation.

At the national level, reporting will be made through the **National Climate Change Action Report – RANCC**, considered by the Draft Framework Law on Climate Change to be the instrument that contains policies,

128 | GIZ 2014 "Development of National Adaptation Monitoring and Assessment Systems: A Guide"

129 | Christiansen, L., Martinez, G. and Naswa, P. (eds.) Adaptation Measurement Systems: Perspectives on How to Measure, Aggregate, and Compare Adaptation Outcomes. UNEP-DTU Partnership, Copenhagen. / Harley, M., Horrocks, L., Hodgson, N. & Van Minnen, J. (2008). Climate change vulnerability and adaptation indicators. Technical Paper 2008/9 of the European Topic Center on Air and Climate Change, European Environment Agency.

plans, programs, regulations, actions and measures, whether they are contemplated in climate change management instruments or have been proposed by other public bodies, with the aim of monitoring and reporting their progress in the short term. The RANCC will group information on the following matters: (a) Adaptation: constituted by the measures contained in the Sectoral Adaptation Plans and the plans, programs, projects and other initiatives that are developed in the country; (b) Mitigation: constituted

by the measures contained in the Sectoral Mitigation Plans and other plans, programs, projects and initiatives developed in the country; (c) Means of Implementation: made up of actions aimed at implementing the development and transfer of technology, the creation and strengthening of capacities and financing, and (d) Climate change management at the regional and local levels: general description of measures and actions at the territorial level.

At the international level, Chile reports to the UNFCCC through:

- **Biennial Update Reports:** In December 2010, within the framework of the 16th Conference of the Parties, Chile joined the Cancun Agreements, which state that developing countries must submit to the Convention biennial update reports (BUR) containing up-to-date information on national greenhouse gas inventories and mitigation actions, mitigation needs and support received. In addition, in December 2011, within the framework of the 17th Conference of the Parties, Chile associated itself with the Durban Results, which called for the first Biennial Update Report to be presented to the Convention no later than December 2014. The main objective of the Biennial Update Reports is to encourage countries to present information in a coherent, transparent, complete, accurate and timely manner, considering specific national circumstances. Chile has presented four Biennial Update Reports, in 2014, 2016, 2018 and 2020. As of 2024, it will start presenting a **Biennial Transparency Report (BTR)**, which will add elements to the Biennial Update Reports, such as: Report on the national inventory of anthropogenic emissions by source and absorption by greenhouse gas sinks, under IPCC 2006 guidelines, with a time series since 1990 (or from the base year of the NDC and every year from 2020 onwards), and a report on the seven main gases (CO₂, N₂O, CH₄, HFCs, PFCs, SF₆ and NF₃); Information necessary to monitor progress made in implementation and compliance with Nationally Determined Contributions under Article 4 of the Paris Agreement; Information regarding the impacts of climate change and adaptation efforts under Article 7 of the Paris Agreement; Information on support in the form of financing, technology development and transfer, and capacity-building required and received under Articles 9-11 of the Paris Agreement; among other requirements.

- **National Communications:** National Communications are submitted every four years to the UNFCCC and contain information on national circumstances, greenhouse gas emissions,

the vulnerability of the country to climate change, mitigation actions, other relevant information, and the gaps, needs and support received and delivered in terms of climate change. Chile has presented four National Communications, in 2002, 2011, 2016 and 2021.

Verification:

As mentioned above, verification corresponds to a process of review, analysis or periodic evaluation of reported information by an independent entity to guarantee accuracy and compliance with established procedures, and to provide meaningful feedback for future improvements.

This process can be carried out by different independent entities to verify compliance with commitments and/or indicators.

Today, they may act as independent entities that use controls and concrete evidence to verify compliance with climate goals, the United Nations Framework Convention on Climate Change (UNFCCC), the Comptroller General of the Republic, the National Congress, and the citizenry through the climate change information platform established in the Draft Framework Law on Climate Change.

Coordination for the ECLP MRV in the public sector

At the time this Strategy was published, other instruments and systems were being developed by the different Ministries associated with it, in direct coordination with the MMA. In particular, the Climate Change Office of the MMA, in its coordinating role, was developing the following studies and instruments:

Monitoring, Reporting and Verification (MRV) of mitigation policies and actions promoted by the Chilean PUBLIC sector¹³⁰. This work will make it possible to define the guidelines for the ex post MRV of mitigation policies and actions, which will be presented by the sectoral authorities in their Sectoral Mitigation Plans based on the criteria defined in this chapter. This system will be designed in accordance with the provisions of the current international requirements of the UNFCCC and the national requirements indicated in the Draft Framework Law on Climate Change, specifically in terms of compliance with sectoral mitigation efforts. Its guidelines will be designed in coordination with the SNP and the Chilean National Inventory System, among other relevant MRV mitigation systems.

130 | This development will be framed in the Capacity Building Initiative for Transparency (CBIT), a project financed by the GEF, executed by UNEP and implemented by the Ministry of the Environment.

Monitoring, reporting, verification and assessment of vulnerability and adaptation to climate change, which has already made significant progress in recent years with respect to the development of policies and instruments, its institutional framework and international commitments, as detailed in Chapter 4.4, Indicators for Monitoring, Reporting, Verification and Evaluation of Adaptation in the long term. This recent development implies important technical challenges in the metrics and indicators for monitoring, reporting and evaluating the effectiveness of adaptive measures. Thanks to these advances, in 2021 the MMA, with the support of the Capacity Building Initiative for Transparency (CBIT) project, is in the process of developing and operationalizing a roadmap to consolidate a system for monitoring and evaluating adaptation to climate change in Chile. This will facilitate the collection of relevant and pertinent indicators to quantify the progress of adaptation in Chile in the sectors most vulnerable to climate change, and improve understanding of the adaptation process at the national and subnational levels, in line with the NDC and ECLP. In a complementary manner, work will be done to deepen information related to gender and climate change indicators, within the framework of climate change vulnerability analyses at the sectoral level and on a regional and local scale.

ECLP and NDC monitoring platform, which seeks to implement and operate an NDC 2020 monitoring database based on the conceptual modeling developed by the Office on Climate Change, with the necessary indicators for monitoring and training potential users of the system. In parallel, and also within the framework of the NDC, a **Monitoring, Reporting and Verification (MRV) mechanism is being designed for the country's needs and the support it has received and delivered within the framework of the UNFCCC**, with special emphasis on future Biennial Transparency Reports (BTR), applying guidelines for compliance with the Reinforced Transparency Framework of the Paris Agreement. As already mentioned, one of the key components of the 2020 NDC is its Social Pillar. MMA is preparing a **proposal to monitor commitments** in this area through indicators and means of verification for monitoring the social component. In terms of equity and gender equality, MMA, together with the Gender and Climate Change Roundtable, has developed relevant criteria for monitoring progress in meeting the gender goals of the social pillar of the ECLP and the NDC: (1) Selection and systematization of experiences in sectors where actions with a gender approach have been implemented. The systematization of experiences will be carried out by 2030, 2040 and 2050. (2) Processes for updating targets and indicators will include an updated analysis of the potential for gender mainstreaming.

(2) The progress of all those goals that have gender indicators will be evaluated and reported, for specific sectors as well as for actions transversal to the sectors of the ECLP.



Photo by Daniel Pineda

09 ANNEXES

Annex 1: Delving into the participatory drafting of the ECLP

One of the fundamentals of the design and development of Chile's climate policy is citizen participation, which is why the country's Long-Term Climate Strategy (ECLP), led by the Ministry of the Environment, was developed in a participatory manner, maintaining a multi-stakeholder, multilevel and transversal focus that is reflected throughout the document. The participatory process for drafting this instrument included different instances of coordination, analysis, discussion and involvement for formulating proposals from the public sector, local authorities, civil society, social organizations, youth, indigenous peoples, unions, the private sector and academia.

The participatory process began in May 2020 and was based on the following principles of citizen participation for climate change management:

- Encourage the participation of all individuals and groups of people in the preparation, review and updating of climate change management tools.
- Facilitate instances of citizen participation, in a transparent and inclusive manner, taking special consideration of vulnerable sectors and communities, and applying a multicultural and gender approach.
- Facilitate timely and adequate access to information on climate change, promoting dissemination and awareness on the matter and reducing information asymmetries.
- Facilitate adequate coordination between the different institutions and representative actors linked to climate change management tools.

The participatory process was conducted in three stages, defined to facilitate and promote the participation of all individuals and groups of people in climate change management at the national, regional and local levels:

- 1) Early involvement, to develop the ECLP proposal.
- 2) Formal citizen participation through public consultation of the ECLP, to improve and complement the proposal.

- 3) Strengthening the proposal through participatory instances designed to deepen specific technical aspects of the instrument and training for capacity building.

In a complementary and transversal manner to the entire process, the Advisory Committee for Climate Action, the Scientific Advisory Committee for Climate Change, the MMA Advisory Council, the Interministerial Technical Team on Climate Change and the Gender and Climate Change Roundtable followed each stage of the participatory drafting of the ECLP.

The steps and instances mentioned above are described in detail below. It should be noted that the entire process of participatory drafting is registered and reported in the electronic version of the ECLP and on the MMA's Citizen Consultation web page,¹³¹ which can be searched for through the ECLP.

¹³¹ | <https://consultasciudadanas.mma.gob.cl/portal/consulta/107>

1. Early Involvement

Early involvement in the participatory preparation of the ECLP proposal was carried out between May 2020 and April 2021 via a total of 71 workshops held virtually due to COVID-19 restrictions. The workshop agenda included sessions with initial presentations and then group work. A total of 2,176 people participated, 52% of them women and 48% men. The virtual format made it possible to encourage multi-stakeholder participation from all over the national territory, promoting dialogue and facilitating the incorporation of wide-ranging views through the analysis of social, environmental, scientific and cultural issues required to draft an instrument as broad in scope as the ECLP. The workshops and working sessions held during the early involvement process had three specific goals:

i) Identify visions, objectives and instruments for long-term climate change management at the sectoral and intersectoral levels

The purpose of this process was to analyze and elaborate, in a participatory manner, sectoral and cross-sectoral long-term challenges, identifying sectoral objectives and instruments to allow progress towards the target of being a carbon-neutral and resilient country by 2050. For the above, three types of workshops were implemented:

- Cross-disciplinary workshops with the Interministerial Technical Team on Climate Change (ETICC), with a focus on state actors.

- Multi-stakeholder and multi-level workshops on transversal, intersectoral and functional visions for state and non-state representatives.
- Multi-stakeholder and multi-level mitigation and adaptation sectoral workshops for state and non-state representatives.

The participatory process was carried out between May and October 2020. It included a total of 39 activities, of which three were ETICC workshops, three were cross-disciplinary technical workshops, and 33 were technical workshops for sectoral mitigation and adaptation. The call for participants considered a wide variety of representatives from the public and private sectors, academia, NGOs/civil society and international organizations. An effort was made to have an equitable distribution between the different categories. In addition, special emphasis was placed on achieving balanced participation of women and men, representatives from different regions of the country, and representatives of youth organizations and indigenous communities.

A total of 1,230 people participated, 53% of them women and 47% men. The virtual format of the sessions allowed the incorporation of regional participants, who accounted for 30% of the total, including the participation of youth organizations and indigenous communities.

The working sessions with the ETICC aimed to collect the views of a diversity of public sector representatives and their contributions in terms of content and identification of relevant technical inputs, complementing and validating the information presented in the workshops for the identification of specific targets and objectives in the ECLP proposal. The main results of the work carried out with the ETICC made it possible to recommend the importance of i) Surveying national, regional and sectoral integration and shedding light on how to align the ECLP with existing and future instruments (for example, regional planning instruments); ii) Incorporating the concerns of indigenous peoples and gender in the strategy, both in its development and in the products that are generated; iii) Incorporating the concepts of fair transition, human rights and sustainable development as general aspects to be addressed in the ECLP; iv) Incorporating the ECLP governance, including inter-institutional coordination and links with citizens; v) Making explicit the links with the private sector and academia in the contents of the ECLP; vi) Incorporating flexibility to consider new issues, for example, international definitions around Article 6 of the Paris Agreement and green recovery and, vi) Including synergies between mitigation and adaptation.

The sectoral workshop sessions, for their part, covered the 14 sectors mentioned in the ECLP: water resources, transportation, biodiversity, mining, energy, tourism, agriculture, coastal areas, health, waste, infrastructure, buildings and cities, forestry, and fisheries and aquaculture, which were defined by the competent bodies in the management of climate change identified in the Draft Framework Law on Climate Change. Sectoral authorities were involved early in the preparation of the process, in particular, to complement and validate the mapping

of interested parties, identify relevant technical inputs, and complement and validate the information to be presented in the working sessions. These organisms will be in charge of drafting sectoral mitigation and adaptation plans.

The work with each sector included three sessions. The first two analyzed main guidelines, objectives and long-term challenges associated with climate change in each sector, dividing them into mitigation issues (for 8 sectors) and adaptation issues (11 sectors). In the third session, main challenges and best practices in terms of sectoral and regional instruments were addressed and analyzed jointly for mitigation and adaptation (for the 14 sectors), to achieve the long-term objectives worked on in the first two sessions.

The main goal of the Sectoral Technical Workshops was to work on a long-term cross-cutting vision for mitigation and adaptation, with three cross-disciplinary workshops on the following topics: i) Human settlements and community life, ii) Ecosystem functions and nature-based solutions, and iii) Transitioning production sectors.

The 39 workshops held at this stage of the preparation process made it possible to identify sectoral objectives for contributing to carbon neutrality and resilience, along with general objectives that go beyond the particularities of each sector, such as the circular economy, education and awareness, efficient use of resources, energy efficiency and low emission technologies, capacity building, strengthening of institutions and governance, disaster risk management and resilience, R&D&I and water resources. In addition, the following wide-ranging issues were identified as priorities for the ECLP: national, regional and sectoral integration that incorporates the concepts of fair transition and sustainable development, as well as indigenous and gender considerations. The process emphasized the importance of incorporating all interested social parties, both in the design and implementation of climate policies.

These inputs are detailed in the process reports, and were the basis for defining sector objectives and goals, as well as the intersectoral and regional nature of climate change management tools, with the purpose of strengthening them and making them effective for the fulfillment of national, sectoral, regional and local targets.

ii) Analyze the robustness of the ECLP, strengthening the evaluation of carbon neutrality measures and the methodology for defining water security indicators for adaptation to climate change

Parallel to the above, the robustness analysis of carbon neutrality and the adaptation of water resources was carried out in a participatory manner through a Robust Decision-Making (RDM) methodology, which seeks to study the different considerations

for robust decision-making in scenarios of uncertainty and identify appropriate strategies.

The path to carbon neutrality by 2050 contemplates a series of measures and a medium- and long-term cost-effectiveness analysis. As might be expected, these steps involve uncertainties, and consequently, are of great importance and interest for decision-making on climate policy, and involve studying elements for strengthening the analysis of potential design adjustments. In this context, the Pontificia Universidad Católica de Chile, the Universidad de Chile and the RAND Corporation contributed to a study, financed by the Inter-American Development Bank, that modeled different scenarios to evaluate the robustness of the carbon neutrality scenario and the different uncertainties that it could face, basing its analysis on science and a participatory process with state and non-state experts.

The central objective of this analysis and its participatory process address worst-case scenarios along the road to carbon neutrality to strengthen and enrich the Long-Term Climate Strategy and its corresponding commitments.

The participatory process sought to collect the necessary inputs for the RDM methodology through eight workshops with a total of 260 participants. These were held in two phases: The first consisted of six sectoral workshops held during June 2020, each of which studied and convened the six sectors present in the GHG Inventory: 1. Energy, 2. Transport and urban development, 3. Industry, Mining and Infrastructure, 4. Forestry and Biodiversity, 5. Agriculture/Livestock and 6. Waste. The main objective of the first round of workshops was to allow experts and other stakeholders to express their views about their priorities and success metrics, policy goals in each sector that can contribute to decarbonization, existing data and models, and uncertainties that should be considered. Using the RDM methodology, information was obtained on results metrics, policy options, data and models, and uncertainties, relying on matrices for Performance, Action, Model and Uncertainty metrics.

The second round of participatory workshops covered the same sectors. Project progress was presented in two workshops to obtain feedback from local experts on their impressions of the methodological approach and the analysis of the first round of workshops, as well as considerations of the designated discussion groups regarding respective modeling of the sectors included in the first round.

The participatory process made it possible to collect valuable inputs for the robustness analysis of carbon neutrality by 2050, based on RDM methodology. Specifically, four main aspects were considered: performance (metrics that reflect policy objectives), actions (public policies, measures or steps considered to achieve goals), models (modeling, data and relationships that facilitate analysis), and uncertainty (factors that may affect the ability to achieve goals), as well as elements of analysis for the ECLP and its considerations in terms of sectoral targets, carbon budgets, among others.

The main findings concerned mitigation scenarios for reducing the vulnerability of the carbon neutrality process and the economic benefit that adopting such a strategy can represent for Chile in the short, medium and long terms. The mitigation chapter of this document goes into greater depth on these issues.

In parallel, information was analyzed and intersectoral consensus sought for the design of the water resources sector of the ECLP, given the wide-ranging nature of water management. Supported by the RDM methodology, guidelines were consolidated for developing a long-term strategy for water management. The interdisciplinary and intersectoral work carried out included multiple experts in water resources, and was divided into two types of workshops.

- **Expert workshops at the national level:** Two expert workshops were held, with a total participation of 68 people, 53% of them women. The first workshop presented international experience in the use of RDM methodology, as well as opportunities and challenges associated with its use for the design of adaptation to climate change in the water resources sector. The purpose of the second workshop was to analyze the results of the first expert workshop, as well as workshops in the country's macro-zones with local actors linked to water management.

- **Macro-zone workshops:** Six working macro-zones were defined for water resources, each covering a minimum of two and a maximum of four administrative regions of the country. A total of 190 people participated, 50% of them women. A workshop was held in each macro-zone with key actors representing public institutions, unions (agricultural, forestry, mining, health and electricity), civil society and academia. Special care was taken that the participants be representative people with knowledge of the particular conditions of each macro-zone in question.

From the dialogues and analyses developed, proposals for macro objectives were obtained that seek to improve and preserve water security with respect to sustaining livelihoods, production activities and ecosystem conservation. Cross-cutting objectives were also recognized to consider the need for quality water sources and proper use of resources. The need to use models or tools to evaluate the effect of uncertainty and the actions considered for achieving the objectives in terms of water resource management was also recognized.

iii) Identify the opportunities and challenges to incorporate and relate the vision, reality and objectives of regional and community climate action to the national ones

Subnational (regions and municipalities), multi-stakeholder and multi-level action is key to achieving carbon neutrality and resilience by 2050. During the early involvement process, virtual workshops were held for the 16 regions of the country, convening members of the Regional Climate Change Committees (CORECC), Regional Governments (GORE), Municipalities, and Regional Environmental Advisory Councils. 428 people participated in these workshops throughout the country, with full gender parity (50% women, 50% men). 45% of the participants were civil servants from regional public services, while 31% were municipal civil servants from 82 municipalities around the country. The remaining participants represented academia (8%) and civil society (10%).

The main result achieved was the identification of the most important regional and municipal public policy instruments for the subnational integration of the ECLP, together with the gaps and obstacles to the integration of long-term objectives at the regional and municipal levels. These contributions made it possible to highlight priority issues for many regions, such as those related to water resources, biodiversity conservation, integrated waste management and circular economy, energy and coastal issues, among others. At the same time, they contributed directly to identifying opportunities for integration of the long-term objectives proposed for Chile at the regional and local level, as the basis for the chapter on Climate Change Management at the subnational (regional and municipal) level.

iv) Climate Workshops

Between September 2020 and January 2021, the Por el Clima project was developed as a program for citizens to meet and become protagonists of the campaign against climate change, acting from a local perspective to have a global impact through learning, participation and collaboration. This program, promoted by the Ministry of the Environment with the support of the European Union and implemented by the Festival Internacional de Innovación Social (fiiS), included a series of digital events, dialogues, training sessions and other activities across the country. The central objective has been to engage citizens with Chile's climate agenda and ambitions.

Among the main results of the project was the development and launch of the digital platform *Reaccionaporelclima*,¹³² which has served as a meeting point for citizens to learn, commit to and get involved with climate action in Chile. 36,226 people throughout the country connected through the platform,

registering their individual commitments on the site, and 8,673 participated in a series of conversations and online surveys. Between December 2020 and January 2021, national and regional meetings held as part of the development of the Action Strategy for Climate Empowerment (ACE) attracted the participation of 1,058 people from all over the country. In addition, environmental education workshops promoted by our base recyclers trained 500 people from all over the country on issues related to inclusive recycling and climate change. National workshops were also held for representatives of academia, civil society, community and municipal organizations from across Chile, training 345 people in the formulation of projects and financing for climate action.

Through the mobilization of citizen participation, awareness and education, the SumaTuAcción platform helped identify 1,540 specific climate action initiatives registered by people from all regions of the country representing diverse sectors, from academia and the scientific community to private companies and entrepreneurs, NGOs and civil society, community organizations, and local governments. Through this platform, the promoters of these projects formed a Climate Action Network, posting their actions on a wall of initiatives. The initiatives relate to the adaptation and mitigation of climate change in a diversity of areas, including affordable and non-polluting energy, protection of the oceans, conservation of biodiversity and ecosystems, sustainable cities and communities, sustainable production and consumption, circular economy, and clean water and water security.

This great effort represents an important milestone, which identifies, recognizes and makes visible citizen actions being implemented throughout the country. International support is key to the maintenance and development of this great digital community, the Climate Action Network, and to its possible expansion to Latin America. Therefore, work will be done to continue and strengthen this community by promoting the link between civil sectors and the ECLP, creating spaces for dialogue, participation and training, so that organizations and people with initiative have the ability to find each other, with the support of institutions and organizations that can help concretize their actions, acknowledging their contributions to the country's medium- and long-term objectives.

2. Formal Citizen Participation

Formal citizen participation was held between May 27 and July 30, 2021 to make the ECLP proposal known to the people across the country, collect their opinions and suggestions, and enable citizen contributions for the drafting of its final version.

The process had the support of the German Government via the German Agency GIZ through multiple sessions, including a dissemination webinar, citizen workshops, workshops focused on ancestral knowledge, and capacity building and development workshops at the regional level. These regional workshops were intended to be a complement to citizen participation and address one of the main issues raised in early participation, the development of skills and knowledge at the regional level. An additional workshop on Carbon Budget methodology was held with the support of UNEP DTU. In total, 44 activities were held during this stage, all of them online, mobilizing 1,570 attendees throughout the country with full gender parity (50% women, 50% men).

i) Regional Citizen Workshops

During the nine weeks of public consultation for the ECLP proposal, citizen workshops were held in all regions of the country, as well as a national workshop to communicate the proposal, educate the public in the use of the Ministry of the Environment's Electronic System for Citizen Participation, identify relevant concepts of the ECLP at the regional level, and open spaces for citizen contributions, suggestions, opinions and proposals. A total of 707 people attended these workshops, 53% of them women and 47% men. Regarding regional representation, the Santiago Metropolitan and Valparaíso regions were the ones with the highest participation, followed by the Coquimbo region, but active participation was received from throughout the country. The sectors with the largest number of workshop attendees were the public sector, accounting for 38%; citizens (individuals), 20%; and civil society organizations, 17%. Members of indigenous groups made up 9% of workshop participants.

ii) Workshops with a focus on Ancestral Knowledge

These workshops were developed with the particular objective of publicizing the commitments associated with Chile's local communities and indigenous peoples that were incorporated into the ECLP proposal, and advancing the bases for the co-construction of a platform to make ancestral practices visible for consideration in programs, plans and policies

related to climate change, identifying other applications relevant to communities.

To deepen the commitment to make visible and disseminate the ancestral knowledge and best practices of local communities and indigenous peoples for protecting biodiversity, mitigation and adaptation to climate change, a cycle of five workshops was held to obtain inputs for the construction of a web platform designed to be an information repository on these issues. The cycle of workshops consisted of three stages: a first informative stage, a second participatory stage, and a third concluding and feedback stage. This process had 103 attendees, of which 62% were women and 38% men. The participants identified with different native peoples, with the Mapuche peoples having the greatest participation, then the Rapa Nui and Huilliche, followed by the Aymara, Diaguita, Atacameño, Alacalufe, Kawésqar, Colla, Pehuenche, Picunche and Selknam. Eighteen indigenous communities or associations participated the entire workshop cycle.

iii) Regional Strengthening Workshops

Between August 9 and 20, 2021, 20 workshops were held with a focus on the Regional Climate Change Committees (CORECC) within the framework of the Institutional Strengthening and Capacity Building Program at the subnational level in the context of preparing the ECLP. Sixteen regional, three macro-zonal and one national session were held to promote dialogue among authorities regarding the role and challenges of regional governments in the development of public policy on climate change by 2050, in coordination with national and local authorities. The specific objectives of this project were to identify: main issues of concern for each region in terms of mitigation and adaptation; regional capacities; and main barriers to completing the tasks established in the Draft Framework Law on Climate Change, especially the preparation of Regional Climate Change Action Plans (PARCC). The workshops contributed to the development of the chapter on Climate Change Management at the regional and community levels. 653 attendees from all regions of the country participated in these workshops, 45% of them women and 55% men.

iv) Workshop for the presentation of sectoral carbon budget allocations

The carbon budget allocation proposal was prepared based on a methodology developed with the support of the consulting firms Ricardo Energy and Environment and Deuman, commissioned by the Chilean Ministry of the Environment and financed by UNEP DTU. The general objective of this workshop, held on June 29, 2021, was to present the procedure for calculating

sectoral budgets, as well as mitigation efforts and their results to inform the participants, and receive feedback on the proposed process, explaining the sequence of analysis and step-by-step work involved. The workshop relied on participatory dynamics, with attendees divided into working groups. The discussions identified the barriers and opportunities associated with each of the mitigation measures in the different sectors and any associated risks. 102 attendees participated in this workshop, with full gender parity (50% men, 50% women).

3. Participation aimed at strengthening the proposal

Once the ECLP proposal was in hand, a series of technical workshops were held with the goal of furthering specific aspects of the instrument. These activities were carried out online between August and September 2021. A total of 926 people participated, 51% of them women and 49% men.

i) Adaptation indicator workshops

On September 3, 2021, 11 sectoral workshops were held to develop indicators for monitoring and evaluating progress toward adaptation to climate change at the national level. This consultancy is part of the Capacity-Building Initiative for Transparency (CBIT) Project, which is financed by GEF, administered by UN Environment, and implemented by Chile's Ministry of the Environment. These workshops sought to strengthen the ECLP's adaptation indicators for the Forestry, Agriculture, Biodiversity, Fisheries and Aquaculture, Health, Infrastructure, Energy, Building and Cities, Tourism, Water Resources, Mining and Coastal sectors. In total they had 82 attendees, of whom 60% were women and 40% men.

ii) Regional and Community Workshops «Advancing to Carbon Neutrality»

These workshops were held in all regions of the country between August 17 and September 10, 2021. They were conceived as a meeting place between the public and private sectors and citizens to learn how to contribute to the goal of carbon neutrality by 2050 from a regional and local perspective, within the framework of the drafting of the ECLP. They were developed with funding from

the European Union (EU), through its EUROCLIMA+ program, and the Initiative for Climate Action Transparency (ICAT), in recognition of Chile's role as President of the 25th Conference of the Parties of the United Nations Framework Convention on Climate Change, to promote climate action both in Chile, as well as in Latin America and the Caribbean. To this end, two types of workshops were held in all regions of the country:

- **"Practical Actions to Neutralize the Carbon Footprint"**: Workshops held with local governments, the private sector and citizens, with a different focus for each group:

- Local governments: Conversation among local government actors to reduce the impacts in their municipalities. Points discussed included the Municipal Environmental Certification System, Initial Municipal Environmental Accreditation System, available financing funds, and climate change adaptation and mitigation measures for municipalities. In some regions, a guest municipality joined the conversation to share actions developed and challenges faced.

- Companies and Citizens: Discussion of actions to reduce the carbon footprint in the day-to-day life of people and companies in the region. Concrete initiatives were presented to reduce the carbon footprint at the individual level, addressing main challenges for implementation. The discussion culminated in a commitment to work towards carbon neutrality.

- **"Territorial Carbon Footprint and its Collaborative Management"**: These workshops, complementary to the previous ones, were carried out by the Ministry of the Environment's Huella Chile program to develop seals of approval for GHG management by local governments. They represent a tool for quantifying local carbon footprints, supported by a capacity development program.

In total, 32 workshops were held with 792 attendees, 52% of them women and 48% men.

iii) «Advancing the National GHG Prospective System for Chile, relevance of quality assurance and control systems» Workshop

Held on September 7, 2021, within the framework of the constant improvement of transparency in Chilean Climate information and the coordination for designing the future National Prospective System (SNP) of

greenhouse gas (GHG) emissions, a key system for monitoring progress and updates of Chile's NDC and ECLP. Organized by the Ministry of the Environment with the collaboration of the UNEP-DTU with the Partnership of Denmark, within the framework of the Capacity-Building Initiative for Transparency (CBIT) Project, its objective was to analyze and discuss the application of various data quality assurance and control (QA/QC) elements to improve both the quality of the information with which GHG emission projections will be prepared, as well as their results. This workshop involved various ministries, members of the Interministerial Climate Change Team (ETICCC), representatives of different regions of the country, academics, private sector actors, and professionals linked to the mitigation of GHG emissions from other countries in the region. It had a total of 52 attendees, with gender parity.

4. Instances of Cross-Disciplinary Participation

i) Advisory Committee for Climate Action

The Advisory Committee for Climate Action is involved in the entire process of participatory drafting of the ECLP. The committee advises the Ministry of the Environment in the process of preparing the ECLP. The committee is made up of 32 members: Carolina Schmidt, Minister of the Environment; Rodrigo Cerda, Minister of Finance; Andrés Couve, Minister of Science, Technology, Knowledge and Innovation; Juan Carlos Jobet, Minister of Energy; Maisa Rojas, president of the Scientific Committee on Climate Change; Gonzalo Muñoz, COP25 Champion; Andrea Rudnick, former Head of the Climate Change Office of the Ministry of the Environment, Executive Director of CR2; Giovanni Calderón, Executive Director of the Sustainability and Climate Change Agency; Carlos Finat, Executive Director of ACERA; Claudio Seebach, Director of SOFOFA, Executive President of Generadoras de Chile; Eduardo Bitrán, President of the Innovation Club, former Minister of Public Works and an academic; Flavia Liberona, Member of the Citizens' Committee on Climate Change, Executive Director of the Terram Foundation; Gonzalo Durán, spokesperson for the Chilean Network of Municipalities on Climate Change, Mayor of the Municipality of Independencia; Isabella Villanueva, President of the Sustainability University Student Congress (CEUS); Joaquín Cortez, President of the Commission for the Financial Market (CMF); Josefa Monge, President of the Sistema B Chile Board of Directors; Juan José Ugarte, President of CORMA; Klaus Schmidt-Hebbel, academic, former OECD Chief Economist, consultant, international adviser; Marcelo Mena, Chile Office of the Global Center on Adaptation, former Minister of the Environment, Director of the UCV Climate Action Center; Margarita Ducci, Executive Director of the Global Compact Network Chile; Marina Hermosilla, Executive Director of Business Leaders for Climate Action (CLG Chile); Maximiliano Bello, expert

in ocean public policy, executive advisor to Mission Blue, Sylvia Earle Alliance; Valentina Durán, member of ComunidadMujer; Rayen Cariman, representative of a Mapuche community in Lof Karumanke and a member of the Chilean Indigenous Caucus on Climate Change; Ricardo Bosshard, Director of WWF Chile; Rodrigo Benítez, former Undersecretary of the Environment and an academic; and Sara Larraín, Director of Sustainable Chile. This committee is designed to reflect a cross-disciplinary, multi-stakeholder and multi-level vision by state authorities, local authorities, academia, the private sector, non-governmental organizations, youth, indigenous people and the high-level champion of COP25. Below are the topics addressed and the dates of the Committee sessions:

Table 14 Advisory Committee Sessions for Climate Action

Subject	Date
Session 1: Participatory drafting process of the ECLP	10/06/2020
Session 2: The Climate Risk Atlas as a tool for Adaptation	11/05/2020
Session 3: Role of the Ocean in long-term climate policy: Ocean Climate Action	12/16/2020
Session 4: Proposals for measures and indicators regarding Nature-based Solutions (NbS) to Climate Change	01/08/2021
Session 5: Proposal for a methodology to determine sectoral Carbon Budgets	01/21/2021
Session 6: Progress in the definition of vulnerability and adaptation indicators at the national level	03/13/2021
Session 7: Options to achieve carbon neutrality by 2050 under conditions of uncertainty	04/27/2021
Session 8: Main contents of the ECLP proposal submitted for Public Consultation	05/20/2021
Session 9: Public investment that contributes to advancing the goals established in the NDC and the road to Carbon Neutrality and Resilience.	07/07/2021
Session 10: Green tax compensation system to mobilize climate action and proposal for methodological adjustment of carbon budget allocations by sector	08/06/2021
Session 11: Negotiation and climate action on the way to Glasgow	09/10/2021

Source: Authors' research.

ii) Ministerial Scientific Advisory Committee on Climate Change

The Ministerial Scientific Advisory Committee on Climate Change (CCACC), as established in the Draft Framework Law on Climate Change, is constituted as an advisory committee of the Ministry of the Environment on the scientific aspects required for the development, design and implementation of climate change management tools.

The CCACC was organized into seven technical work groups, coordinated by Maisa Rojas and led by: Sebastián Vicuña and Paulina Aldunce (Adaptation), Alejandra Stehr (Water), Humberto González (Antarctic Science), Pablo Marquet (Ecosystems and Biodiversity), Laura Farías (Oceans), Juan Carlos Muñoz (Cities), Rodrigo Palma (Mitigation/Energy).

During 2020, the Ministry of the Environment formally asked the CCACC to prepare a document analyzing Nature-Based Solutions and their feasibility in the ECLP. Under the coordination of Dr. Pablo Marquet, the CCACC prepared a document on Nature-based Solutions for inclusion in the ECLP, emphasizing NbS with the greatest mitigation and adaptation potential for the country, and making recommendations in six areas: Forests, Agriculture, Wetlands, Marine Ecosystems, Cities and Andean Cryosphere.

Also in 2021 the CCACC prepared a preliminary report regarding the ECLP proposal submitted for public consultation. The report considered current environmental regulations, the provisions of the Draft Framework Law on Climate Change, and the latest available scientific evidence. It was reviewed by the Ministry of the Environment and other ministries involved in the ECLP to incorporate improvements in the final version of the document. The members of the CCACC took charge of one or more chapters to review and comment on according to their experience and knowledge with the support of invited researchers, among them: Anahí Urquiza (Adaptation to and Management of Climate Change); Sandra Cortes (Health); Álex Godoy (Waste and Circular Economy); Waldo Bustamante (Buildings & Cities and Infrastructure); Cecilia Gutiérrez (Tourism); Eleuterio Yáñez and Doris Soto (Fishing and Aquaculture); Patricio Catalán, Rodrigo Cienfuegos, Cristián Escauriaza, Raúl Flores, Alejandra Gubler, Megan Williams and Patricio Winckler (Coastal Areas); Andrés Pica, Luis Gonzalez, Oscar Melo and Cristian Mardones (Cost Effectiveness Assessment for Carbon Neutrality).

iii) Gender and Climate Change Roundtable

The Gender and Climate Change Roundtable provided technical advice on the incorporation of a gender approach during the formulation process of the ECLP. The technical support it provided resulted in the application of the Gender and Climate Change Checklist, training in how to follow a gender approach for the technical teams in charge of the ECLP, two working sessions to analyze proposed goals and objectives in the 14 sectors, and the development

of a set of considerations to ensure the incorporation of a gender approach during the implementation and monitoring phase of the ECLP.

In a participatory and intersectoral manner, the working sessions addressed the following topics:

- **Session 11 of the Roundtable, held in December 2020:** The objective of the session was to reflect on opportunities for applying a gender approach to the preliminary objectives of the 14 sectors included in the ECLP. At a workshop, members of the roundtable were urged to discuss and propose a list of gender gaps within the 14 sectors of the ECLP, and offer inputs for adding responsive and transformative objectives to the original proposal.

- **Session 17 of the Roundtable, held in July 2021:** The objective of this session was to propose a set of considerations or protocols for mainstreaming a gender approach in fulfilling the goals of the 14 sectors of the ECLP. Attendees were invited to submit their contributions through an online file formatted with information for each type of target identified. The results of the workshop were compiled into a matrix with a set of considerations for including a gender approach in the implementation of the targets and actions of the 14 sectors participating in the ECLP.

In total, the participatory activities involved in preparing the ECLP, not including the multidisciplinary activities carried out throughout the process, mobilized 4,672 people throughout the country, of whom 51% were women and 49% men, through a transparent, multidisciplinary, multi-stakeholder and multi-level process.

Acknowledgements

The ECLP had the valuable support of the following international organizations:

