National Green Growth Strategy

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PRESENTATION

"Environmental protection can not be seen as a dilemma against development, but as one of its elements. When we talk about sustainable development, we are thinking of economic growth with social equity and preservation and protection of natural resources."

Patricio Aylwin Azócar
Law 19.300 Message
Environmental Framework
1994


Promoting the Market for Environmental Goods and Services
Green Growth Indicators
Indicators of Environmental Behavior
Monitoring and Measuring of the Strategy
Green Jobs and Training
Eco-Innovation and Entrepreneurship
SOCIAL
Indicators of Wellbeing
ECONOMIC
SUSTAINABLE DEVELOPMENT
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Introduction

The concept of "green growth" refers to the practice of encouraging economic growth and development while ensuring that ecosystems remain in place and providing the services upon which social welfare depends over time. With this goal in mind, investment and innovation should be encouraged, as they will lay the foundation for sustained growth by generating new economic opportunities (OECD 2011b). This strategy for growth was adopted by the Organization for Economic Cooperation and Development (OECD) in the Declaration on Green Growth, which was issued in June 2009 and signed by ministers from 30 member states and four candidate states, including Chile.

With its official entry into the OECD in May 2010, Chile reiterated its commitment to the Green Growth Strategy. The Ministry of Finance and Ministry of the Environment jointly developed this Green Growth Strategy for Chile in order to promote economic growth while protecting the environment, creating jobs, and encouraging social equity. This strategy proposes that in order to adequately ensure that risks to the population's health are reduced, improve the quality of life and protect the country's environmental heritage, there is a need to strengthen existing environmental management instruments, design new instruments, follow the best regulatory practices at the international level that allow for efficient regulations, and encourage the creation of a national market of environmental goods and services.

It is important to note that, as the OECD has stated, in the context of a transition to a greener economy, the policies and strategies utilized should be designed in accordance with the country's circumstances. In this sense, Chile has initiated a process of moving towards green growth over the past few years, incorporating actions that generate incentives for achieving changes in patterns of consumption and production in the context of sustainable development. In addition, it has promoted efforts in the areas of innovation, technology and environmentally friendly production processes. Following the road that it has begun to take, this strategy involves three strategic axes: the internalization of environmental externalities through the implementation of environmental management instruments, the promotion of the environmental goods and services market and the monitoring and measuring of the strategy. In order to implement these axes, the following lines of action have been proposed: i) implementation of environmental management instruments (command and control instruments, economic and complementary instruments and sectoral sustainability strategies) ii) development of the national market of environmental goods and services (eco innovation and entrepreneurship, green employment and training) and iii) monitoring and measuring the strategy through green growth indicators, environmental behavior indicators and wellbeing indicator. The strategy also involves monitoring and measurement of the strategy through green growth indicators, environmental behavior of the populace, and wellbeing. This will strengthen the active role of the public sector in the areas of sustainability. The State must fulfill its responsibility in implementing necessary measures to protect the environment, in a preventive and corrective way.

The strategy outlines and proposes a set of actions to be implemented over the short-term (2014), medium-term (2018) and long-term (2022). The following pages explain the strategy as follows: after presenting the context and institutional framework, the principles of the strategy are presented in the third chapter. The fourth chapter sets out the vision and objectives of the strategy and chapter five contains a description of the lines of action. It is important to notice that most of the lines of action included in this Strategy held a public participation process and were formalized through administrative acts, if required, while others are still under discussion. Finally, the sixth chapter deals with the monitoring and measurement of the Strategy and the seventh chapter specifies the implementation program.

Context and Institutional Framework

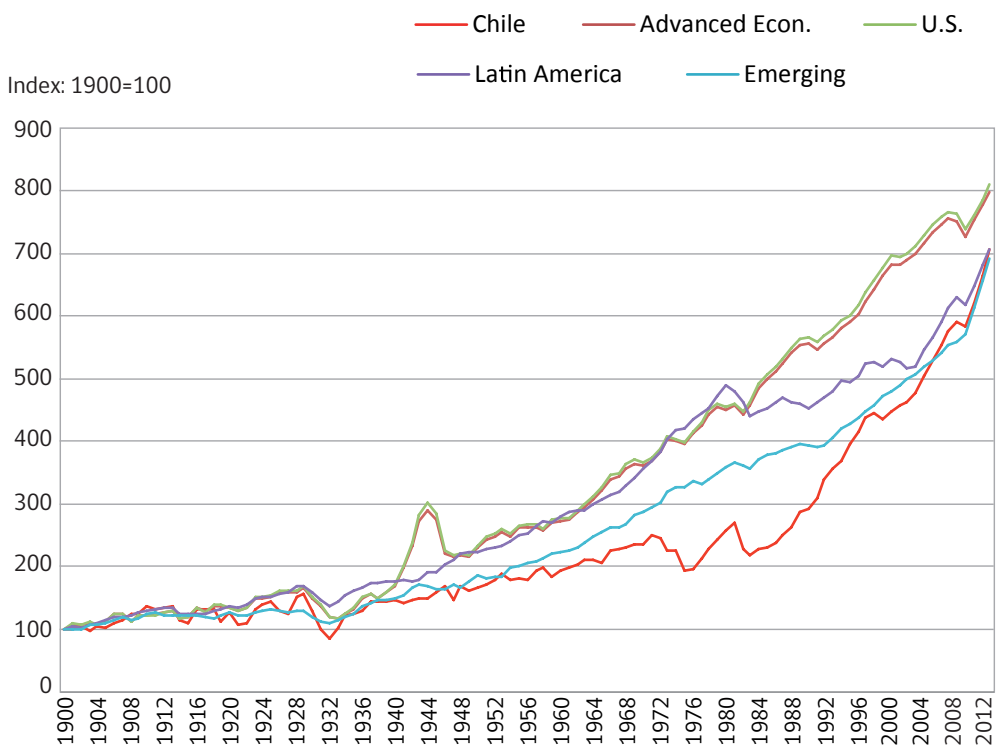
During most of the 20th century, Chile's economic performance was modest, with an economy that presented growth trends that were lower than average for the region. According to Maddison (1995) and Díaz et al. (2007), and considering the evidence analyzed in Lüders (1998), De Gregorio (2005) and Coeymans (1999), the performance of the Chilean economy during this period is explained by its exposure to international fluctuations, such as terms of exchange (i.e. the saltpeter crisis in 1910, high levels of exposure to international conflicts like World War I and World War II, and the Great Depression). To this one must add levels of poverty that exceeded one third of the population, imbalances in the main markets, barriers to international commerce, limited training of human capital, and low levels of innovation, productive efficiency and job creation. However, beginning in the last quarter of the century, these structural problems began to experience significant improvements.

Loayza and Soto (2002) suggest that sustained economic growth over long periods of time allows countries to reduce poverty levels, strengthen democratic systems, improve levels of use of national resources, reduce the effects of negative externalities such as insecurity and thus also improve the quality of the environment. In this sense, following De Gregorio (2005) and Beyer and Vergara (2002), Chile's economic growth over the past 30 years has been significant on average, despite strong contractions like those experienced in 1998, 2001-2002 and 2009 as a result of international crises. Macroeconomic stability has preserved a path of growth towards development, as one can observe in Figure 1. During this period, the nation has managed to strengthen an economy with greater levels of competitiveness and the marked and gradual introduction of incentives for increased productivity in various sectors of the economy (Larraín and Vergara 2000). The pillars of economic stability include the incorporation of an independent monetary authority that ensures compliance with an inflation goal (Mishkin and Schmidt-Hebbel 2007) and a fiscal policy that obeys a publicly known structural balance rule that favors increased savings during phases of economic expansion and softening recessions taking into account permanent long-term income (Corbo et al. 2011).

For its part, macroeconomic stability has been accompanied by reforms in the products and services markets. During the late 1980s and throughout most of the 1990s, private investment allowed for the creation of a trucking route that integrated the country, the improvement and construction of new ports, and the reduction of the infrastructure deficit (Engel et al. 2000). In addition, the introduction of private capital into the main basic services and promotion of competition in the electricity sector made it possible to increase productivity, improving processes and achieving more efficient administration. However, there also is a need for microeconomic reforms that facilitate the introduction of greater competition in order to avoid a decrease in productivity in these sectors (Galetovic et al. 2013).

The full incorporation of the economy into the international context achieved through the reduction of tariff rates, the signing of free trade agreements with important markets (Coeymans and Larraín 1994) and a flexible exchange system accompanied by credible inflation goals and responsible handling of fiscal policy (Edwards 2011) has implied reducing the natural costs of transportation of our air and sea ports, increasing the competitiveness of our exports. It also has allowed costs to be decreased in the acquisition of imported technological and productive capital, which has facilitated improvements in the productivity and efficiency of our economy. However, a strong dependence on copper mining as one of the country's main sources of income persists.

Figure 1: Comparative View of Chile's Per Capita GDP



Source: Developed by the authors based on Clio Lab UC.

The country's economic growth has allowed its inhabitants' quality of life to improve. Per capita income as a measurement of development borders US$20,000 corrected for purchasing power. This is triple what it was three decades ago, when the main economic reforms

began. The percentage of the population with income lower than or equal to US$1.25 per day corrected for purchasing power[1] is lower than 1.5% with a downward trend. The UNDP Human Development Index places Chile first in the region, even if it is adjusted for inequality in income distribution **(Figures 2 and 3)**. According to the UNDP (2012), considerable progress has been made in the improvement of living conditions. Life expectancy is 80 years, the infant mortality rate for children through age 12 is 7.8 per one thousand live births, and the illiteracy rate is under 1.5%. However, the gap between Chile and other OECD nations continues to be wide.

Levels of income inequality in Chile are considerable despite the significant progress made in the areas of economic growth and quality of life. According to the World Bank,[2] even though the gap has tended to narrow over the past few years, Chile places last in this area among OECD member states, with a Gini coefficient of 0.5. As such, more equitable economic growth is an important challenge for the country's future growth.[3]

Figure 2: 2012 Human Development Index

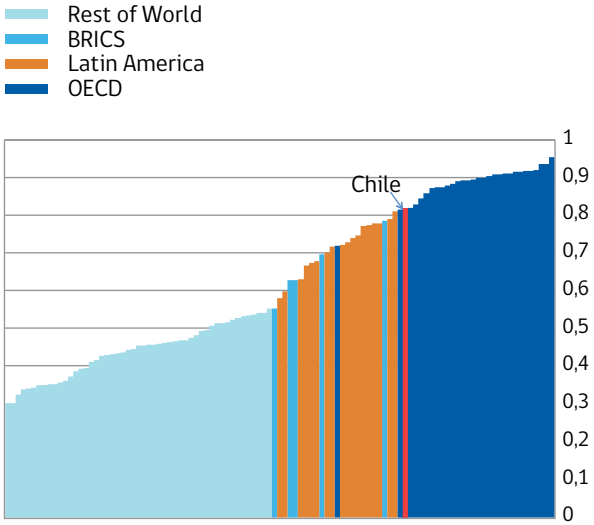
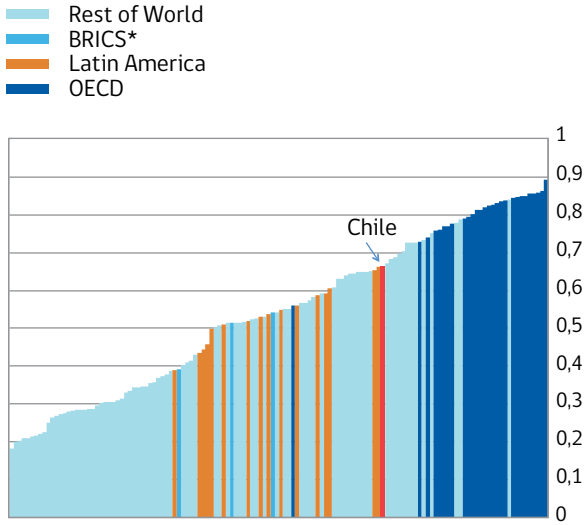


Figure 3: 2012 Human Development Index Corrected for Inequality



Note: Information for some BRICS * countries was not available (Brazil, Russia, India, China and South Africa).
Source: Developed by the authors based on UNDP (2012).

The economic growth achieved over the past 30 years has come with significant environmental costs. According to the First Government Environmental Report (ME 2011)[4], the

1 See http://databank.worldbank.org/data/home.aspx.
2 World Bank (2013). GINI index.
3 President Sebastián Piñera, speech delivered on May 21, 2010.
4 This report presents a detailed analysis of the diverse environmental costs and their distributive effects in accordance with the methodology proposed by the OECD, which is Pressure- State- Response (PRS). The report responds to the requirements of Law 19,300, the Environmental Framework Law, which was modified by Law 20,417, and the recommendations made by the OECD to Chile in 2005, OECD-ECLAC (2005). Evaluaciones del Desempeño Ambiental: Chile).

most serious environmental problems that the country is facing have to do with air pollution, soil pollution, waste management and treatment, threats to biodiversity, water scarcity, and water pollution. Environmental impacts have a disproportionate impact on the most vulnerable sectors of the population, and remedying that is the foundation and ultimate horizon of environmental public policies.

The pressure that has caused the environmental problems observed in the country may have multiple sources, though as was noted in 1992 during the Rio de Janeiro Earth Summit (UN 1992), the main cause of environmental deterioration is unsustainable patterns of consumption and production. In order to achieve sustainable development and provide a greater quality of life for all people, governments must promote changes to these patterns. Measures such as the creation of incentives for the internationalization of environmental externalities and technological change would contribute to this, concomitantly producing positive externalities through innovation and the improvement of productive processes.

As countries develop, they tend to increase their levels of consumption and production and thus their environmental impact. However, this trend does not seem to be linear or direct. As countries achieve greater levels of development, they manage to stabilize and in some cases even decrease those impacts and revert the trend (Beckerman 1992), (Bhagwati 1993), (Panayotou 1993), (Coondoo and Dinda 2002), (Dasgupta et al. 2002) and (Brock and Taylor 2010). Brock and Taylor (2010) suggest that as environmental mitigation technology and the development of new technologies improve at a more accelerated rate than the potential for long-term growth of an economy, we will observe a maximum point of pollution in the transition to the long-term potential and then a gradual decrease in the level of impact. The maximum amount of pollution and speed with which it increases and then decreases depend on the mitigation effort of each country. This matter takes on more importance when one considers countries in different states of development.

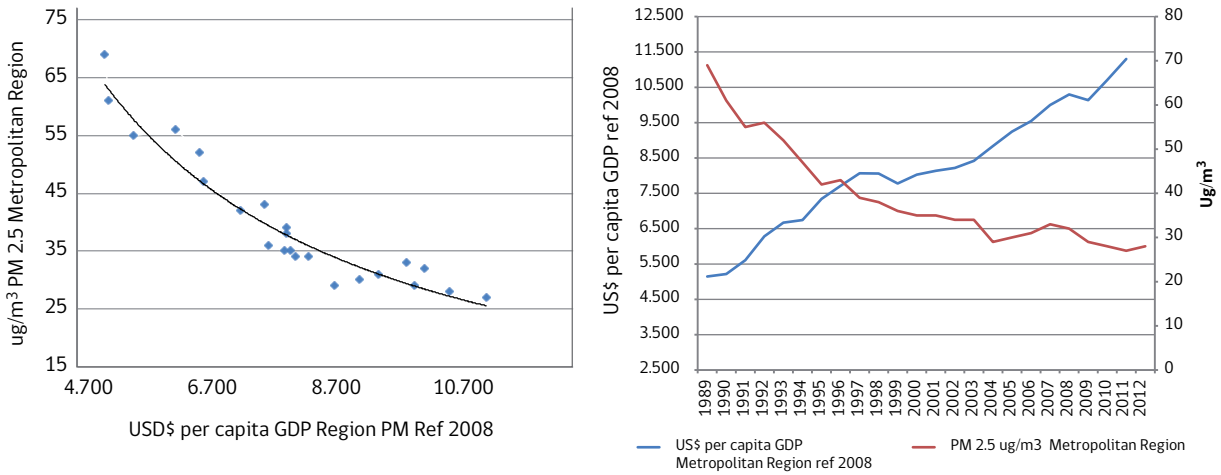
According to Dinda (2004), there have been three phases of development for countries. First, the extraction of natural resources has been made a priority for the achievement of greater added value and thus greater environmental degradation. Next, during stages of industrialization, income increases and the valorization of environmental quality increases as well, leading to greater demand for effective environmental regulations and thus a decrease in pollution. Then, with economic growth, the structure of the economy moves from a capital-intensive system to a structure that is more focused on services and as such one that pollutes less (Grossman and Krueger 1991).

The traditional explanations for this phenomenon are as follows: i) The environmental mitigation effort has to go through periods of maturing that delay the implementation of adequate policies (Brock and Taylor 2010); ii) There may be an income effect that can be interpreted as the environment being a "superior good" that one can worry about more in more developed economies ((Pezzey (1989), Selden and Song (1994), Baldwin (1995) and McConnell (1997)); iii) As an economy develops, a change in the productive structure takes place that leads to the replacement of obsolete technology with less polluting technologies, achieving an improvement in environmental quality (Komen et al. (1997), Acemoglu et al.

(2012) and Vukina et al. (1999)); and iv) There are growing returns to the mitigation effort (Brock and Taylor 2010).

This type of progress can be found in Chile as well. One example is the case of the Metropolitan Region. Due to the considerable effects of exposure to high levels of fine particulate matter on the health of the population ((Sánchez et al. (1998) and (Cifuentes et al. 1999)), greater environmental regulations have been implemented. The reduction in the concentration of particulate matter associated with the air pollution control plan has been accompanied by sustained growth at the level of income (Figure 4).

Figure 4: Per Capita GDP and Concentration of 2.5 Particulate Matter 1989–2012, Metropolitan Region



Source: Developed by the authors based on data from the Chilean Central Bank and www.sinia.cl.

While per capita income has improved economic conditions in Chile, the gap between it and developed economies is significant and the country's tendency towards economic growth must be preserved. The focus should continue to be the generation of investment and innovation, poverty reduction, increased quality of human capital and thus increased productivity of the country's inhabitants, providing equal opportunities for all. The challenge lies in aligning more environmentally friendly development with sustained growth, recognizing that the country is in a privileged economic situation as a result of the implementation of balanced public policies.

Chile, like all economies, faces the challenge of administering limited resources in order to satisfy the many needs of its citizens. Economic growth as a source of opportunities and

better living conditions is subject to care for the environment, establishment of efficient use of natural resources and preservation of their benefits in the medium- and long-terms. This recognizes the fact that the environment and its resources are the basis for the economy, and that this base is subjected to processes of depletion and degradation that must be considered. As such, there is a need to establish solid guidelines in order to ensure sustainable use of these resources and guarantee that future generations will have equal or better access to renewable resources and that the rate of exploitation of non-renewable resources will allow for timely investments to be made in substitutes.

The OECD has invited member states to develop a National Green Growth Strategy in order to achieve economic growth that is environmentally and socially sustainable (OECD 2013c), Hallegatte et al (2011) and World Bank (2012). The OECD (2011) recommends that if we want to be sure that the progress in the area of quality of life reached over the past 50 years continues, we must find new ways of producing and consuming and even redefine what we mean by progress and how we measure it (OECD 2011). In this way, the general goal is to establish incentives and institutions that increase wellbeing by improving management of resources and promoting productivity. Chile's geo-political position, unique geography and condition as an exporter of primary materials must be considered when formulating long-term policies. Chile must be careful about implementing solutions that have been successful in other countries at other times, taking into account the country's social and economic reality and recognizing its natural restrictions.

Chile has faced environmental challenges progressively in accordance with current environmental institutional structure. Following the recommendations of the OECD (OECD-ECLAC 2005), institutional strengthening has been one of the pillars upon which green growth stands for the efficient functioning of the markets. After an arduous Congressional approval process that allowed a political consensus to be reached regarding the inclusion of a Council of Ministers for Sustainability and Environmental Courts in the environmental institutional structure, Law 20,417 was passed on January 26, 2010, modifying Law 19,300, the Environmental Framework Law. According to Article 69 the Ministry of the Environment is a government unit responsible for collaborating with the president on the design and application of environmental policies, plans and programs, and the protection and conservation of biological diversity and renewable and hydric natural resources. Article 70 outlines the jurisdiction of the ministry.

Other key aspects of this legal modification include the differentiation between the functions of regulation and policy design, management and administration of assessment, and environmental monitoring. With this goal in mind, three separate agencies were created: the Ministry of the Environment, the Environmental Assessment Service, and the Office of the Superintendent of the Environment. One of the central axes of this institutional design is the establishment of more efficient and effective monitoring, incorporating greater incentives for complying with the regulations. Note that the environmental institutional structure should be reviewed and strengthened on an ongoing basis.

Relevant Information

Chile, like all economies, faces the challenge of managing scarce resources to meet the multiple needs of its citizens. In this search, economic growth has been a source of opportunities and better living conditions.

Law 20.417, creates the Ministry of Environment as a Secretariat of State in charge of working with the President in the design and implementation of policies, plans and programs on the environment, as well as the protection and conservation of biological diversity and renewable natural resources and water resources. For its part, Article 70 sets out the scope of this Ministry.

NATIONAL GREEN GROWTH STRATEGY

Principles of the Strategy

Sustainable development has at its basis economic growth, continued job creation as a channel for reducing inequality, and economic stability that allows environmental goals to be set that favor medium-and long-term investment. Transparency and responsibility in the establishment of consistent and transcendent "rules of play" along with responsible macroeconomic management create the basis for sustainable development. Simultaneously this process must be implemented through the strengthening of institutions that protect the fundamental right to live in an environment free of pollution, the preservation of nature and the conservation of the nation's environmental heritage.

This Green Growth Strategy is meant to serve as a guide for promoting the country's economic growth and thus continuing down the path towards social development and the eradication of poverty. With this goal in mind, the strategy is based on the following principles:

Prevention

As the principle that inspired environmental law, the principle of prevention points towards avoiding or reducing deterioration or negative environmental effects before they occur. According to the principle of prevention, avoiding environmental damage ex ante through research and appropriate measures is the most effective and most economical way of repairing it.

Holding the Accountable Party Responsible

The principle that "the party that pollutes pays" recognizes that at present, the costs of environmental pollution and damages as well as the impact that they have on the population's health are mainly borne by those affected. As such, it establishes that the party responsible for pollution should assume the costs and provide economic compensation for the impacts.

Efficiency

The principle of efficiency is that the measures taken by authorities to address environmental deterioration must be the most effective at the lowest possible cost, privileging instruments that allow for better resource allocation.

Gradualism

The principle of gradualism recognizes the need to be guided by moderation in the application of environmental instruments without renouncing long-term goals. It recognizes that agents need time to implement measures and that some changes cannot take place immediately without affecting the productive base. In some cases, the government can and should support sectors in order to promote the adjustment of economic goals to match environmental protection objectives.

Realism

The principle of realism establishes that objectives must be reachable given the magnitude of the existing environmental problems, the approach chosen to address them and the resources and means available to do so. It recognizes that environmental problems have been generated over the course of years and that recovery will take time. As such, the application of programs must be planned in the time frames necessary to provide results.

Vision and Objectives of the Strategy

The vision of this strategy is that it is possible to achieve sustainable development in order to improve the quality of life of the Chilean people, both this generation and future ones, through the generation of efficient public policies, promotion of good regulatory practices, and improvement of environmental education.

The objectives of the strategy are presented below:

General Objectives

I. To promote economic growth and the generation of opportunities subject to a commitment to sustainable management of natural resources, the implementation of adequate instruments for the internalization of environmental externalities, and the promotion of the national market of environmental goods and services.

II. To protect the constitutional right to an environment free of pollution, establishing minimum quality and environmental risk standards with clear and verifiable goals and realistic time frames.

III. To continue to develop the government's commitment to international efforts in the area of the environment, considering shared and differentiated responsibilities, maintaining our competitiveness and reaffirming integration into the global market.

IV. To guarantee the constitutional right to access information held by the government and the right to access environmental information set out in Law 19,300.

Specific Objectives

A Implementation of Environmental Management Instruments

i. To fully apply existing legislation, providing the market with legal certainty and encouraging efficient use of natural and energy resources as a path to reducing the environmental impact of our economy.

ii. To promote more efficient environmental management, encouraging the use of economic and other complementary instruments and voluntary agreements or environmental education policies.

iii. To incorporate consideration of the environment into other public policies, promoting the development of sectoral sustainability strategies.

iv. To promote the use of best regulatory practices, evaluating the costs and benefits of available environmental management instruments, guaranteeing active participation of the people, and incorporating criteria of gradualness for small businesses so that they can adapt to new environmental requirements.

B Promotion of the Market of Environmental Goods and Services

i. To generate new opportunities for growth through the promotion of green business development, eco-innovation and technological change in order to improve productive processes.

ii. To promote the generation of green jobs through education and training of the labor force in the skills needed for the environmental goods and services market.

Strategic Axes and Lines of Action

The lines of action of the strategy are organized around three axes: (A) internalization of environmental externalities through the implementation of environmental management instruments; (B) promotion of markets of environmental goods and services and (C) the monitoring and measuring through indicators. This structuring is meant to follow a sequential line, that is, that the implementation of environmental management instruments (A) creates an opportunity for the development of environmental goods and services (B) and that the present Strategy requires an adequate measuring through indicators (C).

In addition, (A) Implementation of Environmental Management Instruments is organized by type of instrument (command and control, economic and complementary) and sectoral sustainability strategies (i.e. tourism, construction). For its part, (B) Promotion of a Market of Environmental Goods and Services addresses the topics of eco-innovation, business development, green jobs and training. Table 1 outlines the contents of this chapter.

Table 1: Axes, Objectives and Lines of Action

General		Objetive	Lines of Action
Axes	GREEN GROWTH	I	Promote a balance between economic growth and environmental protection
	QUALITY AND ENVIRONMENTAL RISK STANDARDS	II	Count with minimum standards of quality and environmental risk
	INTERNATIONAL COMMITMENTS	III	Ensure compliance with international commitments

Implementation of environmental management instruments		Objective	Lines of Action
Axes	COMMAND AND CONTROL	A.i	Enhance the generation and use of emission standards
		A.i	Promote the development of Decontamination and Prevention plans
		A.i	Strengthen the development of management plans
		A.i	Strengthen the design and management of protected areas
		A.i	Enhance the Environmental Impact Assessment System
	ECONOMIC AND COMPLEMENTARY INSTRUMENTS	A.ii	Study the reformulation of a specific fuel tax
		A.ii	Encourage the use of tradable emission permits
		A.ii	Boost Extended Producer Responsibility
		A.ii	Develop and implement Sustainable Public Procurement
		A.ii	Promote eco labeling
		A.ii	Strengthen environmental education
		A.ii	Promote and expand Clean Production Agreements
		A.ii	Promote Corporate Social Responsibility
		A.ii	Promote and expand the use of NAMAs
	SECTORAL SUSTAINABILITY STRATEGIES	A.iii	Promote sustainability strategies in tourism, construction and energy.
	REGULATORY BEST PRACTICES	A.iv	Strengthen regulatory impact assessment
		A.iv	Implement the Strategic Environmental Assessment
		A.iv	Strengthen inter-ministerial coordination
		A.iv	Strengthen citizen participation

Promotion of the market for environmental goods and services		Objective	Lines of Action
Axes	ECO-INNOVATION AND ENTREPRENEURSHIP	B.i	Foster entrepreneurship in environmental matters.
		B.i	Promote national capacity for research and innovation on environment matters.
	GREEN JOBS AND TRAINING	B.ii	Promote the creation of green jobs
		B.ii	Encourage appropriate environmental training

Monitoring and measurement of progress		Objective	Lines of Action
Axes	GREEN GROWTH INDICATORS	IV	Build national and local indicators
	INDICATORS OF ENVIRONMENTAL BEHAVIOR	IV	Develop instruments for measuring environmental performance of citizenship
	INDICATORS OF WELLBEING	IV	Develop environmental accounts
		IV	Promote the use of socioeconomic indicators

Source: Developed by the authors.

Implementation of Environmental Management Instruments

In Chile, the Ministry of the Environment is the agency responsible for collaborating with the President of the Republic on the design and application of policies, plans and programs in the area of the environment. Specifically, it is tasked with the development of environmental regulations through the design and passage of regulations associated with the implementation of the Environmental Institutional Framework and varied environmental management instruments.

Starting with the entry into force of Law 19,300 on March 9, 1994, the legal body that regulates fundamental environmental matters such as biodiversity, pollution, environmental heritage, impact and damage, the government was endowed with environmental management instruments for overseeing and regulating the use of natural resources in general.

Chile has actively participated in the international agenda for sustainable development and has signed most of the multilateral environmental agreements established since 1990. The application of these instruments looks to establish clear objectives and send clear signals to the market that provide the legal certainty required for adequate development of private initiative.

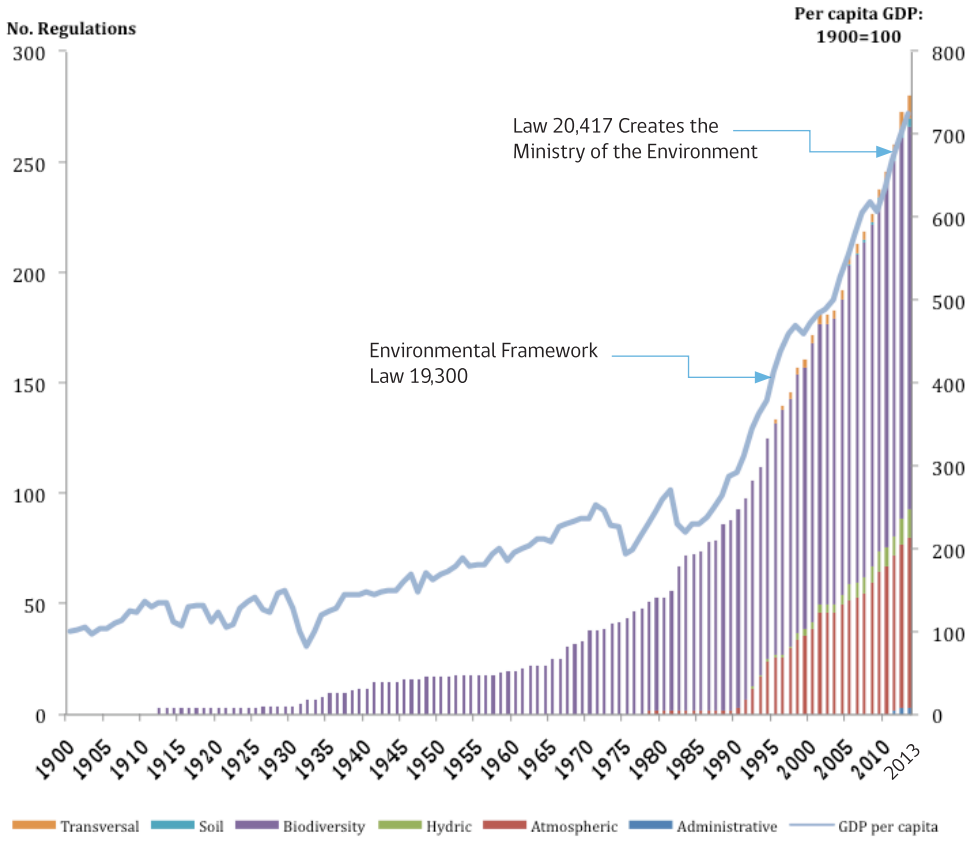
According to Law 19,300, the environmental management instruments that the environmental structure has at its disposal to achieve its goals are: environmental education, the environmental impact assessment system, environmental quality standards, emissions standards, management plans, and prevention or decontamination plans.

There are also other mechanisms that are not set out in the law that allow the government to work towards environmental objectives, such as voluntary actions in the context of corporate social responsibility and nationally appropriate mitigation actions (NAMAS).

In regard to the implementation of this type of instrument, efforts in the country's environmental regulation have been aligned with its economic growth, with the resulting need for greater environmental investment. Figure 5 presents a cumulative analysis of the environmental standards issued in the country since 1900 classified by environmental component. Note the statements regarding protected areas and emissions regulations, and quality standards set in regard to air and water.

It is also important to mention that while there is a positive correlation between the per capita product growth and the passage of environmental standards, their implementation must generate the smallest possible distortions in the market. In this way, the objective of internalizing negative externalities is met without causing significant impacts on economic activity.

Figure 5: **Environmental Standards and Per Capita GDP, 1900–2013**



Source: Developed by the authors.

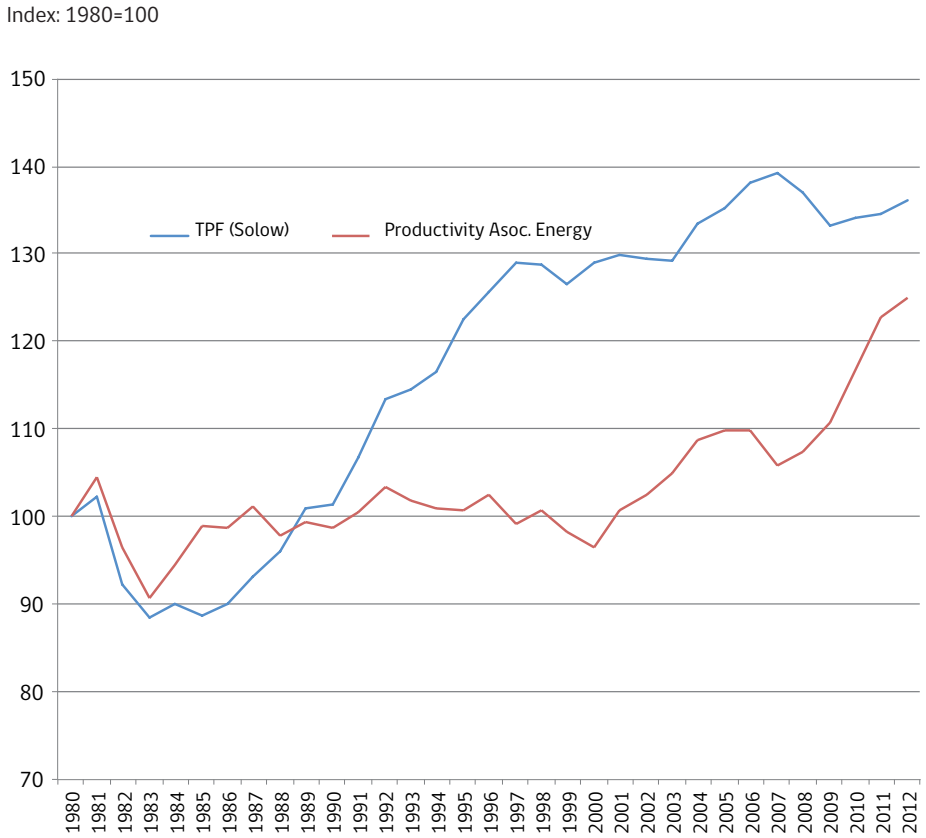
Increased regulations have not only increased the level of capital associated with protection of the environment. Considering that economic growth also depends on the increase in total productivity, the promotion of efficient use of natural resources as a means of reducing the environmental impact of our economy has generated an increase in productivity and, as such, growth[5] (Lehni 1999).

There is no doubt that in sectors like the energy sector, potential gains in efficiency provide environmental benefits as well as a reduced demand for energy for productive sectors, which decreases costs due to use of capital. These are the areas in which measures that promote the efficient use of resources while allowing for reduced environmental impacts must be expanded.

5 The concept of eco-efficiency developed in the early 1990s was supported by the World Business Council for Sustainable Development (WBCSD) in order to prepare for the 1992 Rio conference. Its goal is to produce goods and services that satisfy human needs at competitive prices while progressively reducing environmental impacts and the amount of primary materials used over the product's life cycle.

As Figure 6 shows, the country has substantially increased its productivity, though factors such as energy consumption improve at lower rates due to extreme dependence on international prices, whose fluctuation has increased over the past few years. The challenge that we face in this area is that of maintaining a rate of GDP growth with a decrease in environmental impact rates, working hand in hand with the private sector to move forward with environmental actions that have positive returns.

Figure 6: Total Productivity of Factors (Solow) and Productivity Associated with Energy



Source: Developed by the authors based on Hassler et al. (2012).

Historically, environmental management instruments have been classified into two groups: command and control instruments and economic instruments. However, actions designed to seek change on the basis of greater provision of information to the consumer and/or interested parties have gained ground over the past few years (Kolstad 2011). At the general level, the Strategy conceives of instruments based on the previous classification, but it also recognizes that it is possible to incorporate the environmental dimension into productive sectors

through specific sustainability strategies. For the purposes of this strategy, environmental management instruments are grouped broadly as: Command and Control Instruments, Economic Instruments and Sectoral Sustainability Strategies.

Command and Control Instruments

Like other Latin American nations, Chile has mainly based its environmental policy on command and control instruments. The basic concept is that the regulator specifies the steps that those subject to the regulations must follow in order to solve the environmental problem (Kolstad 2011). The two main forms of command and control regulation are technological standards and performance standards. The former establish the use of specific abatement technology (e.g. gas scrubber vs bag filter) while the latter establish maximum concentrations or volumetric flows in the discharge effluent for certain pollutants. Despite its simple implementation and assurance that the environmental goal will be met, this type of instrument leaves limited room for flexibility in the regulated sector, which results in higher implementation costs.

Environmental regulation has mainly involved the establishment of performance standards through emissions standards such as the emissions standard for regulation of pollutants associated with the discharge of liquid waste into ocean and surface water (S.D. No. 90 of 2000, Office of the Secretary-General of the Presidency), the emissions standard for waste incineration and co-incineration (S.D. No. 45 of 2007, Office of the Secretary-General of the Presidency), the emissions standard for noxious odors associated with the manufacture of sulfate pulp (S.D. No. 37 of 2012, Ministry of the Environment), emissions standards for light, medium and heavy motorized vehicles at the national level (S.D. No. 29, S.D. No. 28, S.D. No. 4 of 2012, Ministry of Transportation and Telecommunications), the liquid waste emissions standard for underground water (S.D. No. 46 of 2002, Office of the Secretary-General of the Presidency), the emissions standard for thermo-electric plants (S.D. No. 13 of 2011, Ministry of the Environment), the emissions standard for heaters (S.D. No. 39 of 2012, Ministry of the Environment), and the emissions standard for lighting regulation (S.D. No. 43 of 2012, Ministry of the Environment). The use of emissions standards must be extended to the national level in order to reach the control of polluting emissions in the main sources identified as responsible, according to the environmental regulation program in accordance with the requirements of the DS 38/2013 of the Ministry of Environment.

In order to define protection objectives, Chile has opted to establish environmental quality standards, which can be classified as follows: a) primary environmental quality standards, which are applied nationally and define the levels of certain elements, compounds, substances or derivatives that can represent a risk to the live or health of the population, setting levels that originate emergency situations; and b) secondary environmental quality standards, which establish the values of concentrations and allowable periods of substances, elements, energy and combinations of them whose presence or absence in the environment may constitute a risk to the protection or conservation of the environment or the preservation of nature (as per the Regulation for the issuing of environmental quality and emissions standards, S.D. No. 38 of 2013).

A noteworthy example of the former is the Primary Environmental Quality Standard for breathable fine particulate matter PM 2.5 (S.D. No. 12 of 2011, Ministry of the Environment). In regard to secondary environmental quality standards, the Secondary Environmental Quality Standards for the protection of surface waters of the Serrano River Basin (S.D. No. 75 of 2010, Office of the Secretary-General of the Presidency), for protection of water in Lake Llanquihue (S.D. No. 122 of 2010, Office of the Secretary-General of the Presidency) and for the protection of the Lake Villarrica Basin (S.D. No. 19 of 2013, Ministry of the Environment) are of note. This Green Growth Strategy considers the establishment of environmental quality standards in Chile, be they primary or secondary, designed to reach the level of coverage maintained in OECD countries.

In order to ensure that primary or secondary environmental quality standards are not exceeded in a latent area or to recover the levels listed in those standards in areas classified as saturated, Law 19,300 provides environmental management instruments known as prevention and decontamination plans. These plans set out specific binding actions designed to meet their objectives.

Table 2 outlines the plans implemented in Chile. Compliance with current quality standards requires the issuing of plans in all areas in which the established limits are exceeded.

Table 2: Environmental Decontamination and Prevention Plans Implemented in Chile

Name	Standard
Area surrounding the Caletones foundry at the El Teniente division of Codelco, Chile	S.D. No. 81 of 1997, Ministry Secretary-General of the Presidency
Locality of María Elena and Pedro de Valdivia	S.D. No. 164 of 1997, Ministry Secretary-General of the Presidency
Area surrounding the Potrerillos foundry at the Salvador division of Codelco	S.D. No. 179 of 1998, Ministry Secretary-General of the Presidency
Area surrounding the Chuquicamata foundry of the Chuquicamata division of Codelco Chile	S.D. No. 206 of 2000, Ministry Secretary-General of the Presidency
Temuco and Padre Las Casas (PM 10)	S.D. No. 78 of 2009, Ministry Secretary-General of the Presidency
Area surrounding the city of Tocopilla	S.D. No. 70 of 2009, Ministry Secretary-General of the Presidency
Air pollution prevention and mitigation plan for the Metropolitan Region	S.D. No. 16 of 1997, S.D. No. 58 of 2002, S.D. No. 46 of 2007 and S.D. No. 66 of 2009, Ministry Secretary-General of the Presidency

Source: Developed by the authors.

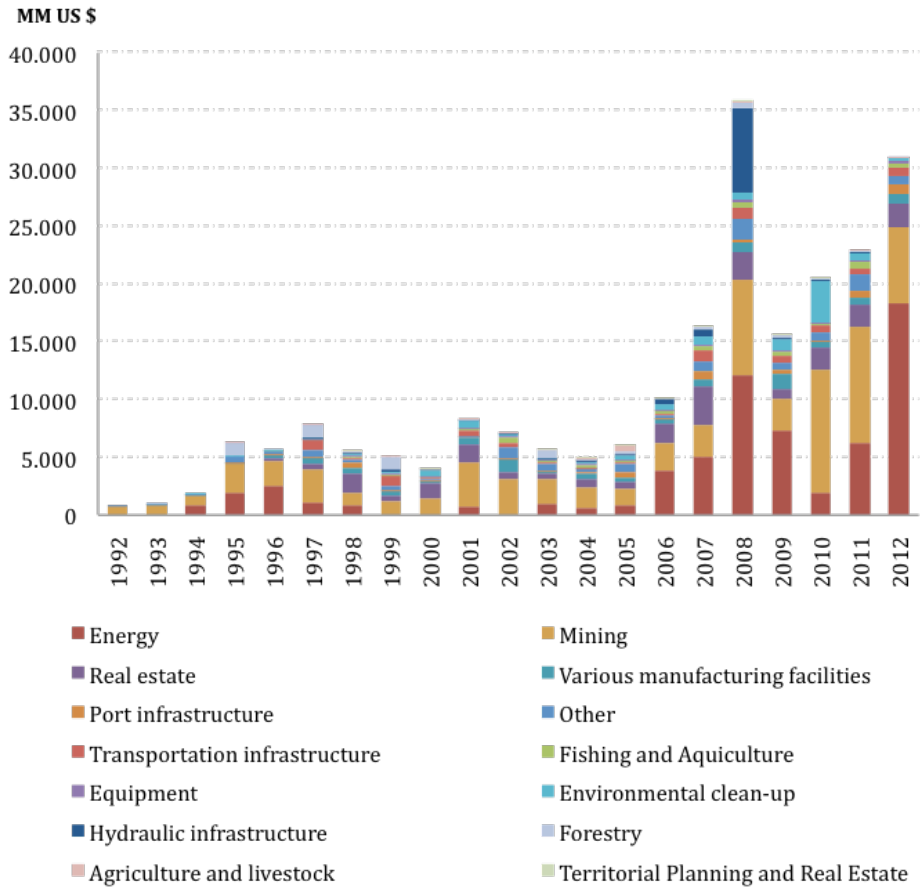
Another key environmental management instrument for the country's development is the Environmental Impact Assessment System (EIAS), a preventive tool set out in Law 19,300 that was reinforced through S.D. No. 40 of 2013 of the Ministry of the Environment. The purpose of the system is to improve the quality of projects or activities through the formulation of observations by public services with environmental jurisdiction. The procedure, which is overseen by the Environmental Assessment Service, determines whether the environmental impact of a project or activity is keeping with current standards. In the case of the studies, investors are made responsible for environmental impacts through mitigation measures, compensation and adequate reparations. Article 10 of Law 19,300 sets out the projects that should enter the assessment system, the ones that may not be conducted and those that must be modified. A project may be submitted for EIAS through an Environmental Impact Declaration (EID) or Environmental Impact Study (EIS).

In accordance with Article 11 of the law, projects that must submit an EIS are those that may generate an impact on the health of individuals or the environment, the number or quality of renewable natural resources, or significant changes to the landscape, the life systems of human communities, monuments or sites that form part of the country's natural heritage, or protected areas set aside for conservation. Submitting a project or activity to the EIAS allows compliance with the law to be accredited and for the respective environmental authorizations to be granted. The law states that the projects or activities outlined in it may only be executed or modified following an assessment of their environmental impact. All permits or declarations that are environmental in nature that current legislation establishes as coming under the purview of government agencies will be granted through the EIAS. This assessment and its approval include the conditions under which specific permits will be granted during the implementation of the project as well as possible mitigation, reparation, and compensation activities.

According to the law, if the assessment is favorable, no government agency can deny the environmental authorizations. On the contrary, if the decision is negative, all agencies must deny them. Note that the respective environmental assessment decision of the Assessment Commission or Executive Director of the Environmental Assessment Service is based on the opinion held by the respective government agencies following their review of the respective documents, Environmental Impact Studies or Environmental Impact Declarations.

It is worth noting that over the past few years there has been a significant social movement against the development of projects that are perceived as threats to local populations' quality of life or other environmental components. In many cases, this has led to court cases, limiting the legal certainty of this type of authorization. In order to minimize these processes, it is essential to increase the people's confidence in the technical work of the environmental assessment service by endowing it with adequate human and financial resources. There is also a need to expand the spaces for formal citizen participation as set out in S.D. No. 40 of 2013, Ministry of the Environment. Despite the improvements made over the past few years and given its importance as a requirement for decisions regarding investment **(Figure 7)**, the system's administration must be improved, along with its coordination with other services.

Figure 7: **Amount of Investment Expected in Projects Submitted to the EIAS**



Source: Developed by the authors based on data from www.e-seia.cl.

In regard to protecting biodiversity, the Ministry of the Environment has been tasked with proposing policies, plans, programs and standards and with overseeing the National Protected Areas System, which includes parks and marine reserves as well as nature sanctuaries. The entity also oversees the handling of private protected areas using the respective management plans. The National Biodiversity Strategy sets out the need to ensure that at least 10% of the surface of key ecosystems are protected, which is one of its most significant goals. However, it has been difficult to arrive at a consensus regarding the concept of 'key ecosystem' (ME 2011). The Ministry is also responsible for other public services, mainly through command and control-type actions. Table 3 presents the main legal bodies regarding biodiversity.

Table 3: Legislation on Biodiversity

Legislation	Description
Law No. 19,300/1994	General Environmental Framework Law, modified by Law No. 20,417
Law No. 20,283/2008	Law on the Recovery of Native Forest and Forest Development
Law No. 20,256/2008	Law on Recreational Fishing
Law No. 18,892/1989	General Law on Fishing and Agriculture
Law No. 4,601/1929	Hunting Law
S.D. NO. 4,363/1931	Forest Law
S.D. NO. 40/2012	Environmental Impact Assessment System Regulation
S.D. NO. 29/2011	Species Classification Regulation
S.D. NO. 5/1998	Hunting Law Regulation

Source: ME (2011).

Note that temporary Article 8 of Law 20,417 establishes that there is a need to create a Protected Wild Area and Biodiversity Service through another specific law. In order for this to go forward, a bill was submitted to Congress in January 2011.[6] The future agency will have jurisdiction over the design of policy and regulations for conserving biodiversity, which are currently held by the Ministry of the Environment. The strengthening of environmental institutional structure is thus pending in this area (ME 2011).

Finally, the Office of the Superintendent of the Environment is responsible for executing, organizing and coordinating the monitoring and oversight of the Environmental Classification Resolutions, Prevention and/or Environmental Decontamination Plans, the content of Environmental Quality and Emissions Standards and Management Plans, where applicable, and all other environmental instruments established by law. The sectoral agencies that carry out environmental oversight duties must adopt and respect all of the criteria set out by the Office of the Superintendent regarding the way in which oversight actions are to be executed and may ask that office to issue a ruling in that regard.

The command and control or direct regulation mechanisms can be an adequate option for reaching Chile's environmental goals and generating opportunities to encourage greener growth. Decisions regarding their use must be decided on a case by case basis, considering alternative policies and their viability. However, there is a consensus regarding the need to incorporate more efficient instruments (in terms of economics) in order to reduce the load of the costs on the economy, promoting incentives for regulatory agents so that they decrease emissions, generating flexibility in the achievement of environmental goals.

6 Mailshot 7487-12.

Economic and Complementary Instruments

Economic instruments can be understood as economic or fiscal measures for encouraging behavior related to the environment (Gilpin 1996) that give economic agents the freedom to respond to incentives in a way that incorporates these factors into their decisions (OECD 1994). The main advantage of economic instruments compared to command and control measures is their efficiency in the control of pollution. This makes economic tools an instrument that contributes to reducing degradation while minimizing the costs of environmental protection (Borregaard 1997).

The OECD therefore proposes using economic instruments that act through market forces as entities that promote compliance with environmental goals (OECD-ECLAC 2005), as this type of mechanism can internalize the externality associated with the product demanded in the very act of consumption. The OECD highlighted this idea in 2011 in its midterm evaluation of Chile. Its third recommendation refers to evaluating opportunities for introducing new economic instruments, such as charges for waste, air emissions, and water in order to improve market creation mechanisms (OECD 2011).

The most frequently utilized economic instruments for the control of externalities include charges or taxes based on pollution, tradable permits, deposit and reimbursement systems, failure to comply rates, performance-based bonuses, subsidies and payment for liabilities (OECD 1999). Their goal is to provide incentives to regulated economic sectors so that they decrease emissions, leaving room for flexibility in the achievement of environmental goals. These tools may be complemented with mechanisms for overcoming lacks of information, voluntary actions, educational policies and other vehicles.

Chile has economic tools in place that can be used to address environmental problems at different stages of the design and implementation phases. One of the first experiences was its use of sustainable management of natural resources like the Water Code (DFL 1.122/1981), which was modified in 2005 and determines the establishment of water usage rights and transactions involving them. In July 2013, the Minimum Ecological Flow Regulation was passed, which sets the minimum amount of water that a surface source should have in order to maintain good conditions of biological diversity of the flow without affecting the country's development or environmental heritage. Despite the updating conducted in 2005 and publication of the regulation in 2013, in a recent study the World Bank suggests that there is still a need to improve the system that allows for sustainable use of these resources (World Bank 2011). Furthermore, while the 2005 reform states that one must retain sufficient water resources to preserve the ecosystems when new water rights are assigned, there is no effective mechanisms for guaranteeing the protection in areas in which the rights were over assigned in the past (OECD 2013). This strategy considers studying existing mechanisms to revert this condition.

In the area of soil protection, Chile has incentives programs for recovery, including the Incentives System for Agro-environmental Sustainability of Agricultural Land (SIRSD) and the Forest Plantation Program (LD No. 701 of 1974, which describes the legal system for forest

lands or those that are apt for forestation and sets out development standards in this area for the Ministry of Agriculture). Both are geared towards avoiding deterioration of degraded soils due to poor use, mainly in Central Chile and the coastal mountains (ME 2011).

On the other hand, the General Law on Fishing and Aquaculture (Law 18,892 of 1989) sets out fishing quotas that can be traded and include sustainability criteria for fisheries.

In the case of air pollution, the emission compensation system in the Metropolitan Region (S.D. No. 4 of 1992, Ministry of Health) has been a groundbreaking experience for developing nations, incorporating market elements and providing companies with flexibility concerning saving on compliance costs in emission goals. In regard to ozone management, maximum import volumes have been established (Law No. 20,096 of 2006). Two development laws for Non-Conventional Renewable Energies (NCRE) have been set out as well for the case of electricity generation, in Law 20,257 of 2008 and Law 20,698 of 2013.

Efforts to reduce pollution have become increasingly costly due to the fact that many more economic options have already been implemented. This generates a need to provide efficient environmental instruments that have not yet been included in Chilean legislation. The economic and complementary instruments set out in this strategy include tradable emissions permits, extended producer responsibility, sustainable public purchasing, environmental labeling, environmental education, voluntary actions and national mitigation actions.

Specific Fuel Tax

According to the ME (2011), mobile sources are one of the main sources of air pollution in urban centers. While current emissions standards have allowed unitary emissions from the automobile park to be reduced over time, the sustained increase in the park has increased aggregate transportation sector emissions. This has generated a need to provide for environmental management instruments that are complementary to emissions standards that allow increased emissions to be separated from the sector of their growth, particularly considering the fact that the vehicle park could increase exponentially as income levels increase (Dargay and Gately 1997).

The OECD (2013) has stated that the government should use taxation to efficiently reduce environmental costs, including air pollution and CO2 emissions. One of the most frequently utilized price instruments for taxing transportation externalities is the specific fuel tax (OECD 2013). While this tax is justified as a means to control externalities, it often does not have a design that represents the marginal damage of consumption of this product. This design problem distorts relative prices among fuels, encouraging greater consumption of a specific type of fuel rather than the one that is socially optimal.

Authors such as Parry and Strand (2011) have estimated that the externalities generated by diesel consumption are at least equivalent to that of gasoline, which is currently subject to a tax that is four times lower. However, those authors use some suppositions that limit their analysis. In order to more precisely estimate statistics at the national level, this strategy considers conducting additional studies that allow one to more precisely establish the social cost

of externalities such as air pollution, noise, traffic, accidents, and others. The progress reports for the research underway such as FONDECYT project "Road transport and second-best policies: the interplay between road charges, gasoline taxes and public transport subsidies" (Rizzi, Fernández et al. 2010 - 2012) will provide insight in this area.

Also, based on the conclusions reached by Sterner (2002), more efficient regulatory actions for controlling transportation externalities will be studied, including roadway tariff systems. Furthermore, the costs and benefits of a specific tax on other sectors such as aviation, maritime transport or industry, and whether or not it would be good to maintain current exemptions in the transportation of merchandise also merit consideration, as Arellano and Corbo (2013) have observed.

Tradable Emissions Permits for Local Pollutants

While tradable emissions permits are considered environmental management instruments at the international level, they are not regulated as such under Title II of Law No. 19,300 Environmental Framework Law. The treatment of tradable emissions permits in this legal body is limited to the recognition of them as one of the regulation or economic instruments that can be used in prevention or decontamination plans.[7] The regulation of these instruments, their nature and the ways that they can be allocated, divided or traded, their duration and other characteristics are supposed to be set out in a special law, as per Article 48 of Law No. 19,300. That special law has yet to be passed, even though it has been nearly 20 years since the environmental framework legislation was enacted.

However, even before Law No. 19,300, the country had experience with the application of economic instruments for managing air quality in the Metropolitan Region. Supreme Decree No. 4 of the Ministry of Health,[8] which was passed in 1992, allows for control of emissions from stationary sources. This system has historically presented limitations that do not allow all of the advantages of this type of mechanism to be utilized, particularly in regard to the high transaction costs identified by Montero et al. (2002). As such, in July 2003, the Congressional Commission of Natural Resources, National Assets and the Environment received the Decontamination Bonds Law, which set out general rules for a system of tradable permits,[9] thus completing only the first constitutional process and rejecting the idea of legislating.

Meanwhile, in 2010, the president stated that there was a need to create instruments for encouraging the adoption of clean technologies, such as tradable permits and emissions taxes as per the proposals set out in the OECD Environmental Performance Evaluation for

7 Article 47 of Law 19,300, the Environmental Framework Law, states that plans to prevent or decontaminate may use, as appropriate, the following regulatory or economic instruments:
a) Emissions standards;
b) Tradable emissions permits;
c) Taxes on emissions or user tariffs that will consider the implicit environmental cost in the production or use of certain goods or services; and
d) Other instruments designed to encourage environmental improvement and repair actions.

8 Sets out the Particulate Mater Emissions Standard for Single and Group Stationary Sources.

9 Mailshot 3290-12.

Chile. The Organization recommends introducing new economic instruments such as emissions charges and improved mechanisms for market creation.[10] As part of the National Green Growth Strategy and in order to facilitate compliance with environmental quality standards and reduce associated costs, the use of emissions compensation systems in prevention and decontamination plans will be promoted and the need to process a special law will be discussed to allow for the use of tradable emissions permits in the context of decontamination plans and elsewhere. Furthermore, a study will be conducted on whether or not it would be wise to extend this mechanism to cover substances such as greenhouse gases.

Extended Producer Responsibility for Waste Valorization

Chile has made important progress in the management of household waste.[11] In just ten years, over 60% of the waste is placed in landfills,[12] in compliance with a series of sanitary and environmental technical requirements (CONAMA 2005). In the Environmental Performance Evaluation, a set of recommendations were established in order to encourage waste assessment in Chile, including evaluating the possibility of introducing new economic instruments such as charges for hazardous waste (OECD-ECLAC 2005).

This year, the Ministry of the Environment submitted a bill for promoting recycling to Congress (Framework for Waste and EPR),[13] which incorporates Extended Producer Responsibility (EPR), a system in which producers are responsible for organizing disposition and financing management of waste from products that are sold in the country and are required to meet collection and assessment goals. Over 45 countries use this quantitative instrument for promoting waste valorization. As part of the National Green Growth Strategy, this law will be passed in order to activate the use of this instrument. As part of the National Green Growth Strategy, this law will be processed to enable the use of this instrument in accordance with the update and incorporation of costs and impacts on various industries.

Sustainable Public Procurement

Sustainable public purchasing is another example of an economic instrument that the national public sector has promoted, intrinsically decreasing environmental impacts. The Chilean government is one of the largest buyers in the national market. Its purchasing power totals US$8 billion annually, which is equivalent to 3.5% of the GDP. As such, its impact on the national economy and reduction of environmental impact can be significant.[14]

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10 Statement made by President Sebastián Piñera Echeñique in his address on May 21, 2010.

11 All of the operational actions to which a waste is subjected including collection, storage, transportation, pre-treatment and treatment.

12 Solid waste disposal facility for household and absorbable solid waste. Such facilities are designed, built and operated in order to minimize problems and risks to the health and safety of the population and damage to the environment, in which trash is compacted into layers at the minimum practical volume and covered daily as per the current regulations.

13 Mailshot9094-12.

14 This does not include investments in public works.

Chile's public purchasing system operates under the single and direct administration of ChileCompra, an agency that forms part of the Ministry of the Treasury. ChileCompra is designed to provide greater transparency, accessibility and value to the public market. Its mission is to coordinate public demand and supply of products and services, acting as a mediator and advising the parties involved in the process.

The entity recently published a sustainable purchasing policy (ChileCompra 2012), in which the conceptual structure and framework of action is set out. The strategy for implementing the policy covers the various entities and platforms that form part of the purchasing process. As required under that policy, changes were made to the Purchasing Law Regulations (S.D. No. 250 of 2004, Ministry of the Treasury), allowing public agencies to assign additional points in bidding processes in accordance with environmental and social criteria.

ChileCompra has an electronic platform where acquisition processes are conducted using a virtual catalogue in which all agencies that do not hold bidding processes, as per Law No. 19.886 through the Bidding Framework Agreements, can make purchases. The agency has stated that the Framework Agreements operate using the ChileCompra Express virtual store, which contains over 170,000 products or services in nearly 50 current agreements with the participation of over 2,000 providers.[15]

In order to support the implementation of the sustainable public purchasing policy, changes were made to a series of framework agreements (such as those regarding vehicles) with the support of the Ministry of the Environment. This allowed the electronic platform for public purchases to include criteria related to environmental and social assessments. Also, environmentally and socially responsible products and providers are highlighted with distinctive seals. To date, the ChileCompra Express virtual catalogue, which covers 25% of the system's purchase orders, has 432 providers who obtained the highest possible score in environmental and/or social criteria (ChileCompra 2012). Training activities have been held for over 10,000 public officials to teach them about the basic concepts behind the policy. Finally, the site www.comprassustentables.cl was created to provide information about the topic and facilitate its dissemination and discussion.

ChileCompra has published directives on energy efficiency in order to guide the sustainable public purchasing process. In 2008, it published the Energy Efficient Purchases Manual along with the program País Eficiencia Energética (Energy Efficiency Country). The Sustainable Purchasing Manual that was developed by ChileCompra and the Ministry of the Environment was scheduled to come out in January 2014.

Recent data also show that progress has been made in this area. According to ChileCompra, 36% of purchase orders in the main areas of the system included some kind of sustainability criteria, compared to the rate of 2.7% reported in late 2009.[16] As part of the Green Growth Strategy, the use of this instrument will be promoted and its application will be extended to

15 See http://www.chilecompra.cl/index.php?option=com_content&view=article&id=944&Itemid=684.

16 See http://www.comprassustentables.cl/index.php?option=com_content&view=article&id=118:36-de-las-licitaciones-cuentan-con-un-criterio-sustentable&catid=6:noticias&Itemid=8.

other products. In addition, the requirements established according to the principle of gradual introduction will be increased.

Eco labeling

In order to maintain competitiveness in international markets and promote trade, Chile has signed Free Trade Agreements (FTAs) with 60 countries. In the very near future, our country's products will reach markets with over 3 billion potential consumers. Many of these consumers, particularly in Europe and North America, are increasingly concerned about their health and the environment and thus prefer environmentally sustainable products. The health officials of importing nations are also increasing environmental requirements, which represent potential barriers to entry for our exports (OECD LEED, Martínez et al. 2013). [17]

One effective tool for facing these challenges is environmental labeling. This economic instrument allows reliable information to be provided to a growing number of consumers who are demanding more sustainable products. It also gives providers an interesting incentive to develop products that have a smaller impact on the environment and thus to differentiate themselves from competitors in the national and international markets.

Chile currently has several independent Eco labels, but these lack the recognition of a single agency and tend to confuse consumers. As such, there is a need to have a Public Eco Labeling System with pre-defined and public criteria and categories. A national Eco label supported by government officials, backed by scientific studies and recognized by the private sector and the general population would give the consumer the necessary confidence in such a practice. The national Eco Label System should be flexible, reliable and consider the opinion of all key stakeholders. The approval of the Framework Law for Waste Management and EPR would give the Ministry of the Environment the authority to certify and label products.[18] The experiences of countries like China, Thailand, Canada, Germany, the Nordic countries, Brazil, India, Kenya, Ethiopia, Mexico and South Africa, among others, which have an Eco Labeling System and have shown satisfactory results, could be applied to the local context.

Environmental Education

Since the passage of Environmental Framework Law 19,300 in 1994 and its modification in 2010, education has been identified as an environmental management tool. Article 2-h defines it as "an ongoing interdisciplinary effort to teach people to recognize values, clarify concepts and develop the skills and attitudes necessary for harmonious coexistence between human beings, their culture and their biophysical surroundings."

In this context, on April 9, 2009, the National Policy on Education for Sustainable Development was approved. This policy created an inter-ministerial team composed of 11 ministries

17 http://www.oecd.org/cfe/leed/Green_growth_Chile_Final.pdf
18 Mailshot 9094-12.

in charge of developing the policy's Plan of Action, thus providing greater coherence for the work of the public sector in this area. The Plan of Action for Environmental Education is the materialization of the goals of the National Policy on Education. The plan is oriented towards involving social actors in the environmental development of Chile through the creation of public and private networks and alliances that allow territorial coverage to be broadened and generate contents and tools that strengthen the priorities and environmental lines of action of the government program, in order to improve environmental education and management and citizen participation in Chile.

This plan includes objectives and actions for each learning sector: formal education (developed in the pre-school, elementary and secondary school and higher education areas), non-formal education (training through other institutions or stakeholders) and informal education (the media). The initiatives include the National School Certification System (SNCAE)[19] for formal education and in the area of non-formal education the Environmental Explorers Club,[20] Environmental Protection Fund21 and the Municipal Environmental Certification System.[22]

Voluntary Actions

Over the past few years, Chile has seen a significant increase in voluntary actions in the area of the environment undertaken by companies. The largest are the Clean Production Agreements (CPA) and Corporate Social Responsibility (CSR).

CPA are agreements reached between a business sector, companies and public agencies with jurisdiction in that area in order to apply clean production through specific goals and actions (Clean Production Council, 2013) that go beyond the minimum legal requirements. The general goal of these agreements is to improve the productive, environmental, workplace hygiene and safety, energy efficiency, water use efficiency and other areas addressed by the agreement for companies in a specific productive center. The goal is to generate synergy and economies of scale in the achievement of the goals that have been set. These agreements also seek to improve productive efficiency and competitiveness.

Signing a CPA encourages companies to go beyond compliance with environmental standards and to make improvements that go beyond mandatory minimums. The respective sector develops public-private alliances in an effort to seek more efficient solutions that generate savings compared to individual actions (Clean Production Council 2013).

This process is led by the Clean Production Council, which was created through Agreement No. 2091/2000 of the Chilean Economic Development Agency (CORFO), the body tasked with

19 As of January 2013, 876 schools had been certified in Chile.
20 Chile has 2,200 active Environmental Explorers.
21 The Environmental Protection Fund promotes new and better relationships with the environment, supporting the people more actively through its involvement in initiatives designed to protect or repair the environment, preserve nature or conserve environmental heritage. The entity offers real channels and spaces through which the people may express their interests, concerns and capacity for action.
22 A total of 92 municipalities from every region of the country participate in one of the stages of the certification process.

encouraging clean production in order to achieve greater sustainability, productive modernization and competitiveness for companies, with a focus on small businesses, through public-private cooperation and the coordination of the policies and decisions of the various stakeholders.

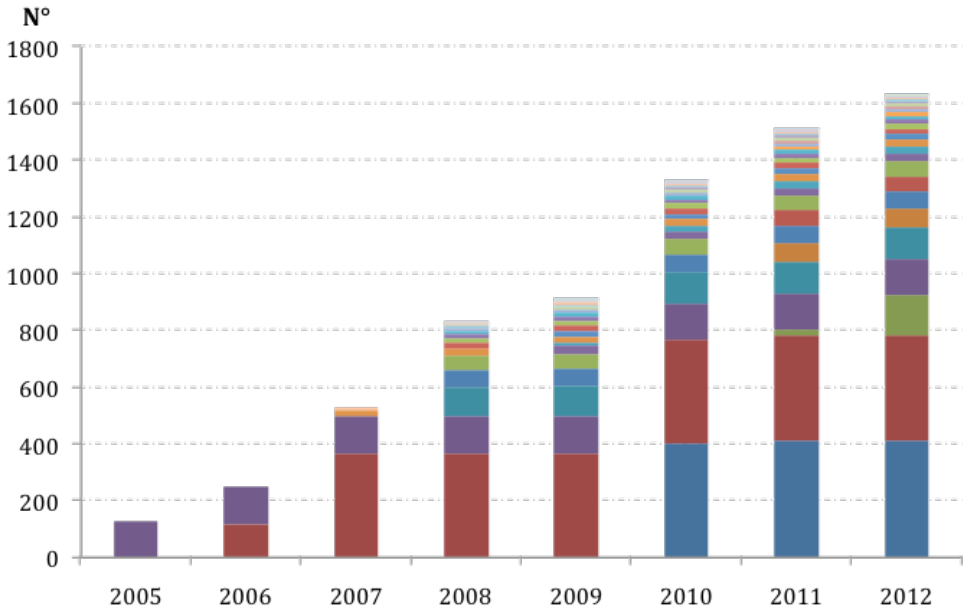
Its Board of Directors, which is led by the Ministry of the Economy, is composed of 12 representatives. Six are from public agencies (two CORFO representatives and individuals from four public agencies with environmental jurisdiction) and six are from the private sector (the Confederation of Production and Trade, the Manufacturers' Association, the United Union Workers Trade Federation, the National Exporters Corporation, the National Agricultural Society and a representative of small businesses). One factor that allows this tool to be promoted is the development of four Chilean standards that set out guidelines for the development, implementation and certification of compliance with Clean Production Agreements (Clean Production Council 2013; El Pulso 2013).

Seven sectors have accepted the clean production agreements, namely agriculture and livestock, construction, hospitality, manufacturing, mining, fishing and trade and service. The National Green Growth Strategy considers incorporating new sectors and companies into the agreements that are currently in place.

Agreements will soon be signed with the electroplating and fruit and vegetable production sectors.[23]

23 Source and official data provided by the Clean Production Council.

Figure 8: **Entities with Clean Production Agreements by Year**



Source: Developed by the authors based on data provided by the Clean Production Council, October 2013.

- Poultry Producers
- Wine
- Agricultural Pesticide Manufacturers, Importers and Distributors
- Salmones
- Pork Producers
- Egg Producers Sector
- Fast Food Industry
- Valparaíso Culinary Sector
- Sawmills and Wood Remanufacturing
- Artisanal Brick-makers
- Small-scale Mining
- Food Service
- Fruit and Vegetable Producers
- San Bernardo
- Pisco Grape Producers in Regions III and IV
- Foundries
- Network Workshop
- Easter Island Public Services
- Concón Culinary Sector
- Boards and Covering Industry
- Pork Product Producers
- Bío Bío Construction
- Frozen Product Manufacturing Plants
- Chemicals
- Codelco
- Easter Island Tourism
- Paper
- Cheese
- Cement Producers

Meanwhile, Corporate Social Responsibility (CSR) has become a new business vision and a strategic element for corporations, increasingly important in the context of competing in international and national markets. The number of companies (and particularly exporters) in Chile who apply CSR principles and objectives is growing, as they allow them to improve their image and increase their ability to compete in different markets. CSR best practices are clearly a new trend at the sectorial level, as can be observed in the mining, agriculture and livestock, wine and tourism sectors.

Progress in the area of CSR is frequently reflected in Sustainability Reports, most of which are generated using the methodology established by GRI, an independent institution that operates with the support of the UNEP. Based on the study "Corresponsables 2012" (conducted at the request of the UN's Global Compact Network Chile, which is linked to Universidad Andrés Bello, Corresponsables 2012), between 2006 and 2011, the number of Sustainability Reports increased 117% (reaching a total of 39) in 2011 (El Pulso 2013). In this context, it is worth noting that the Ministry of the Economy, Development and Tourism created the Social Responsibility for Sustainable Development Council in 2013. Its members belong to the public, private and academic sectors (S.D. No. 60 of 2013, Ministry of the Economy, Development and Tourism).

Nationally Appropriate Mitigation Actions

According to paragraph 1(b) (i) of the Bali Plan of Action of 2007, Nationally Appropriate Mitigation Actions (NAMAs) are measurable, reportable and verifiable actions taken to mitigate greenhouse gases by developing countries in the context of the Climate Change Convention.

In 2010, Chile voluntarily agreed to implement NAMAs that would allow it to decrease its emissions by 20% by 2020 as compared to projected emissions based on 2007. According to Decision 2/CP.17, NAMAs must be registered to request international support for their implementation or simply for their recognition. As **Table 4** shows, Chile has registered NAMAs that would allow it to reduce annual emissions by 10.8 MtCO2e.

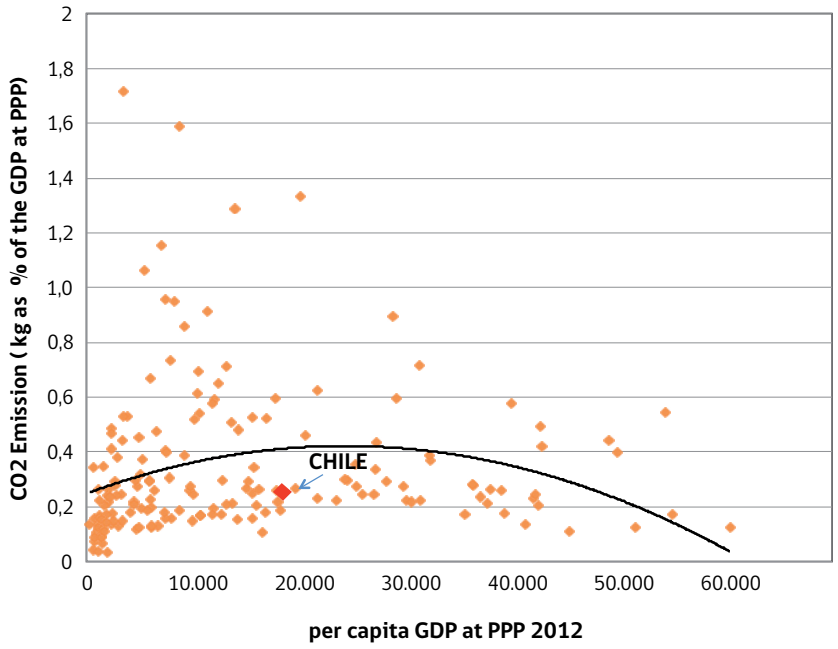
Table 4: **NAMAs Registered by Chile**

Sector	NAMA	Type	Expected Cumulative Reductions
Industry/Energy	Clean Production Agreements in Chile 2012-2020	Recognition	18.4 MtCO2e
Forestry	National Forestry and Climate Change Strategy, including the development and implementation of a platform for the development and sale of carbon bonds	Support for implementation	42 MtCO2e
Energy	Expansion of self-supply systems with non-conventional renewable energy	Support for implementation	1.7 MtC02e/yr
Waste	Program to promote management/ assessment projects for organic waste in Chile	Support for implementation	12 Mt CO2e

Source: Developed by the authors.

In the coming years, efforts must be made to perfect this type of action. At the Conference of Parties of 2012 in Durban, a commitment was made to sign a legally binding agreement for all parties, including Chile, by 2015. The country must define the format and magnitude of the new commitment that will go into effect after 2020, as well as the mitigation actions required in order to comply with the goal set. This process will necessarily involve expanding the use of NAMAs in order to meet our objectives in the area of greenhouse gas mitigation. Note that, as stated in Figure 9, the increase in greenhouse gas emissions is not lineally correlated to higher income levels.

Figure 9: **Per Capita GDP Corrected for PPP and C02 Emissions**



Source: Generated by the authors using World Bank and IMF data.

The country began to address the challenge of facing climate change several years ago, given its vulnerability to this phenomenon. In the Second National Report on Climate Change, which Chile developed following the requirements established as part of the UN Framework Agreement on Climate Change, information is provided on the progress made in the implementation of the Convention for 2000-2010, considering that the country presented its first report in 2000. The results of the national emissions and greenhouse gas absorption inventory are presented, along with the main advances in the areas of vulnerability and adaptation to climate change and aspects of greenhouse gas mitigation efforts (ME 2013).

For its part, the National Plan of Action on Climate Change 2008-2012 serves as the frame of reference for activities focused on evaluation of impact, vulnerability and adaptation to climate change, as well as greenhouse gas emissions mitigation. Its purpose is to respond to an unquestionable need based on the latest scientific evidence regarding climate change for the 21st century and to comply with the commitments made through the ratification of the UN Framework Agreement on Climate Change (CONAMA 2008).

This plan is conceived of as an instrument that coordinates a set of policy lines that will be carried out by the appropriate public agencies in the area of climate change and its adverse effects. The plan of action is organized around a tool that is meant to guide the private and active sector and non-governmental organizations in that it outlines key areas that must be addressed by society as a whole, in order to address the impacts deriving from climate change (CONAMA 2008).

The plan also has been designed to respond to the main axes and objectives of the National Climate Change Strategy that was approved in January 2006 by the Board of Directors of the National Environmental Commission (CONAMA). It is organized around three main areas: adapting to the impacts of climate change, mitigating greenhouse gas emissions, and creating and promoting capacities for addressing the problem in Chile (CONAMA 2008).

Another necessary step that is framed in the development of initiatives and policies regarding climate change, the conservation of ecosystems, protection of biodiversity and natural resources, is the recently published proposal for a Plan of Adaptation to Climate Change for Biodiversity, which is coordinated by the technical team of the Climate Change Office and the Division of Natural Resources, Waste and Risk Assessment of the Ministry of the Environment (ME 2013a).

Other key projects that form part of the efforts to address climate change include the Mitigation Action Plans and Scenarios (MAPS) and the National Carbon Management Program for 2013-2014.

The MAPS project generates, analyzes and validates information, modeling and research on the trajectories of greenhouse gas emissions in Chile. It also identifies a variety of actions that can be taken to mitigate emissions in the country that are compatible with national development strategies. The project proposes possible public and private policy measures that allow for progress to be made in the area of mitigation and with the international commitment to reduce emissions in the nation (MAPS 2013). This project is mainly distinguished by the achievement of an inter-institutional effort that strengthens institutions and the coordination between parts of government.

The National Carbon Management Program 2013-2014 (ME 2013b) is designed to support and promote the management and voluntary quantification of greenhouse gas emissions at the corporate level in the public and private spheres, providing instruments that can be used to calculate corporate carbon footprints, standardized reporting formats, help in the design of mitigation plans, and ongoing monitoring.

Sectoral Sustainability Strategies

The tourism, construction and energy sectors have developed proposals for following a more sustainable path, providing guidelines and actions that identify clear goals and objectives that consider the variable of the environment. Sectors such as mining and transportation present significant actions along these lines but still have work to do in regard to formulating sustainability strategies.

Specifically, in response to potential environmental disputes with communities, some mining sector companies have been proactive, establishing increasingly rigorous environmental and community standards. The state-run mining firm CODELCO has identified 11 standards, eight of which are environmental and three of which are related to communities. The main goal of the development and application of these standards is to increase levels of performance in environmental and community management, in response to the main impacts of the company's operations and projects (CODELCO 2012).

It is also important to mention the publication of the Site and Mining Facilities Closure Regulations published in September 2012, which is meant to set out standards for the prevention and control of risks to the lives, health and safety of individuals and the environment that may be posed by the closure of these facilities (Law 20,551/2011).

Note also that Exempt Resolution No. 1690, which ratifies the Methodology for the Preliminary Identification and Evaluation of Abandoned Soils with Contaminants, was passed in 2011. The document establishes guidelines for conducting each phase of investigating a contaminated piece of land. They are to be applied by the Ministry of the Environment throughout Chile.

In regard to transportation, the vehicle park has grown exponentially over the past few years, which will have increasingly significant environmental and social impacts. In its 2013 organizational structure, the Ministry of Transportation and Telecommunications introduced a Smart Cities Unit as part of the Planning and Development Directorate, which also oversees entities such as the Transportation Planning Office (SECTRA), the Operations Unit for Transit Control (UOCT), the Urban Transportation Unit and a new Short-Term Management or Traffic Unit.

The road towards green growth must include the active participation of the business sector. The public sector will have a key role in the design and implementation of sectoral sustainability strategies and encouraging harmonic territorial planning.

Tourism

Since 2010, the National Tourism Service (SERNATUR) has developed three strategic lines of action in order to contribute to the growth of tourism in the country in a sustainable framework: 1) raising awareness about and disseminating best practices; 2) developing a system for identifying sustainable products; and 3) developing a system for identifying sustainable tourist destinations.

In the context of raising awareness about and disseminating best practices, SERNATUR created the "Chile for Sustainable Tourism Best Practices Manuals" (SERNATUR 2012b). They provide specific advice and examples for key stakeholders in the tourism sector in Chile, including companies that provide tourism and housing services, tour operators, municipalities, food service providers, event organizers and transportation providers. The material offers excellent information for raising awareness among the various participants in the tourism industry, familiarizing them with the criteria for sustainable tourism.

Concerning the development of a system for identifying sustainable lodging, SERNATUR

launched the Seal of Distinction system.[24] The program is designed to recognize efforts in any area of sustainability and set those that have engaged in them, apart from their competitors, allowing visitors to identify companies that have made an effort in the area of sustainability.

In 2012, SERNATUR also launched the 2012–2020 National Tourism Strategy (SERNATUR 2012a). Its purpose is to promote changes in order to increase the competitiveness of the tourism sector. The actions to be taken are interdependent and come together in order to reach the objective of meeting tourists' needs while adding value to the services offered, in order to increase the number of visitors to the country along with their average daily spending and the time they stay in each destination.

This strategy incorporates a long-term vision and serves as a road map for all public and private stakeholders for facing the significant challenges that the country intends to meet by 2020. The National Tourism Strategy is based on five pillars: promotion, sustainability, investment and competition, quality and human capital, and market intelligence.

The sustainability pillar incorporates tools that allow tourism stakeholders to learn about sustainable practices and how to implement them, encourages corporate responsibility, promotes development in public and private protected areas and the development of cultural and rural tourism, formalizes the process by which areas of touristic interest are identified, provides mechanisms for evaluating impacts of tourism on the landscape in the environmental assessment system, and integrates entrepreneurs who belong to indigenous communities and improves their competitiveness.

Construction

On August 1, 2012, the Ministry of Public Works (MOP), Ministry of Housing and Urban Development (MINVU), the Ministry of Energy (MINENERGIA) and the Ministry of the Environment (ME) signed a framework cooperation agreement in order to coordinate, promote, disseminate and encourage the use of sustainable construction in Chile. To this end, MINVU created the Executive Secretariat of Sustainable Construction and tasked it with ensuring that actions and goals were met.

In this context, and through coordinated work with various government administration agencies, the National Sustainable Construction Strategy (MINVU 2013) was generated. This tool sets out the strategies for integrating the concept of sustainable development into the construction field. It is meant to help position the country in this area at the regional level by 2020.

The National Sustainable Construction Strategy seeks to coordinate and link energy and environmental plans that have been developed in parallel by various governmental agencies. The goal is to serve as an instrument for coordinating the various short-, medium- and long-term actions and objectives in this area.

24 See http://www.chilesustentabilidadturistica.cl/.

Those objectives will be monitored using indicators in order to reach the goals within the proposed timeframes. The main areas identified include incorporating sustainability in building and the environment, as well as encouraging innovation, entrepreneurship, education and dissemination of best practices in the industry and within the general population.

The main focus areas of the strategy are habitat and wellbeing, education, dissemination and knowledge, innovation, entrepreneurship and competitiveness, local governance and global responsibility. The strategy runs through 2020, though some of its areas of action project beyond that year. Some of the contents of the strategy can be updated after that date.[25]

It is also worth noting that in an effort to improve Chileans' quality of life in the area of urban development, commanded by the President of the Republic, an advisory commission was formed at MINVU to develop the National Urban Development Policy. A Supreme Decree of the Ministry of Housing and Urban Development was signed on October 30, 2013 and focuses on generating certainties that favor the coexistence of Chile's citizens, providing an environment that is conducive to the development of society and public and private investment initiatives (Presidential Commission 2013). The Policy intends to improve the quality of life for people, comprehensively addressing issues that govern the conformation of cities in Chile, seeking its development in a socially integrated manner, environmentally balanced way and economically competitive modus.

Energy

Chile has 16,970 MW of installed electrical power, of which 73.6% pertain to the Central Interconnected System (SIC). As per the National Energy Strategy for 2012–2030 (MINENERGIA 2012), this capacity will have to be increased by around 8,000 MW by 2020. Chile's geographic characteristics define the potential that the country has for developing various generation technologies.

The primary energy matrix is dominated by thermoelectric generation and the significant use of wood, as Figure 10 shows. Use of the latter has decreased in part due to constant efforts by the government to rationalize its use, particularly during the winter months. In regard to the utilization of fossil fuels, the high amount of diesel used is noteworthy. This fuel is mainly employed for trucking. The country has a significant potential for renewable energy use in the country, and as a result the adoption of this type of energy should be encouraged.

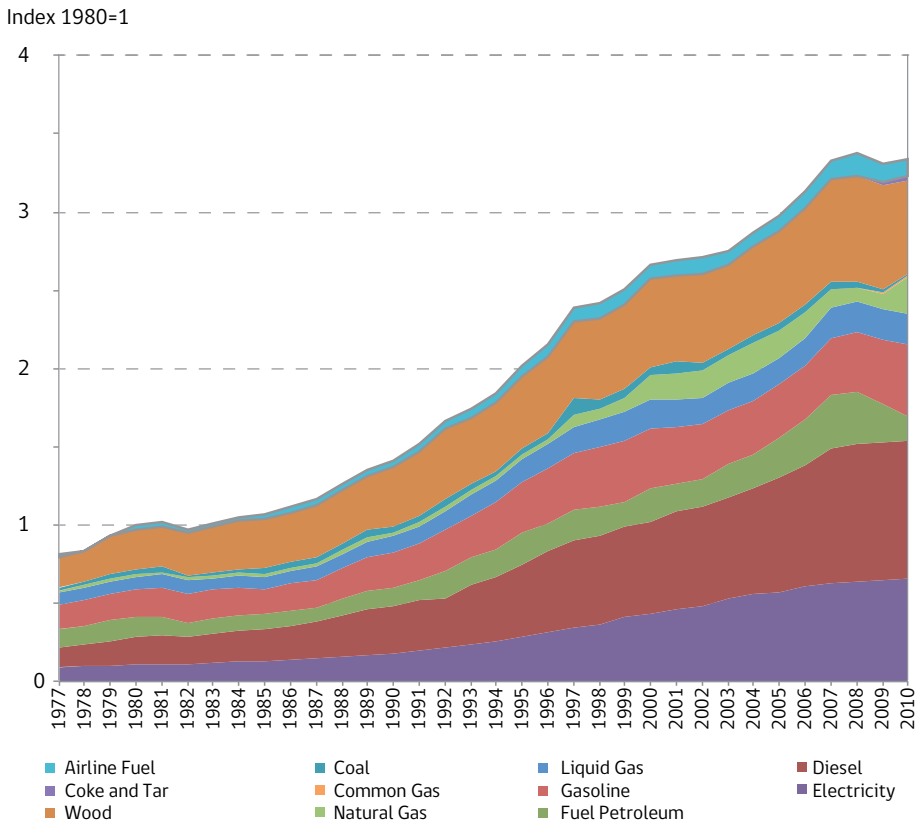
The National Energy Strategy sets out the government's vision of the energy sector for the next few years and presents a summary of the priorities and solutions designed for various problems in the electricity sector. It is a road map for establishing public policy in this area and regulating development plans. The main ideas contained in the strategy include promoting energy efficiency as a priority public policy, providing sufficient and competitive energy resources to sustain the country's development, providing the regulations and infrastructure necessary so that Chile can modernize its electricity market, promoting the development of renewable energies, maintaining high local environmental standards aligned with the needs

25 See http://www.minvu.cl/opensite_20130318120726.aspx.

of the people, participating in international agreements on climate change while focusing on the principle of shared but differentiated responsibilities, reducing external dependence on generation sources, improving our energy security and ensuring that productive sectors are competitive and that individuals' wellbeing is protected.

In order to grow with energy efficiency, the strategy proposes an Energy Efficiency Plan of Action that is meant to serve as a guide for public and private sectors so that they can undertake the actions necessary to capitalize on the significant energy efficiency potential identified for this decade and the next, reaching 12% Energy Efficiency by 2020. This includes the creation of a Committee of Ministries for Energy Efficiency (MINENERGIA 2012). Also, the Chilean Energy Efficiency Agency (AChEE) has funding in order to conduct energy audits, energy efficiency projects and guarantee funds with this purpose.

Figure 10: Energy Matrix Evolution 1977–2010



Source: Developed using the Energy Report (www.cne.cl).

The plan incorporates measures such as energy efficiency seals meant to identify and reward businesses that are leaders in energy efficient development at the national level, which will reduce energy costs, increase companies' competitiveness and reduce their emissions. It also considers establishing Minimum Energy Performance Standards (MEPS), which must be met by products, equipment, materials and other items that use any type of energy resource in order to be sold in Chile. The effort also involves Efficient Residential and Public Lighting Programs, which will be complementary to the setting of MEPS and seek to accelerate the transition to more efficient lighting technologies.

In order to promote the use of Non-Conventional Renewable Energies (NCREs), the strategy includes measures for various types of energy, including solar, wind, bioenergy, biomass, geothermal energy, mini-hydroelectric and ocean-powered energy. It also includes a bidding mechanism for encouraging the development of NCREs, improving current legislation set out through the recently passed NCRE Promotion Law (20/25), which requires that 20% of energy be generated by NCREs by the year 2025. It also incorporates the provision of public georeferenced information for the assessment of the viability of a NCRE project. Furthermore, the Ministry of Energy and CORFO held a bid for the installation of a solar power concentration plant that can store 50 MW of energy for northern Chile. It is currently in the assessment stage. The Agricultural Innovation Fund (FIA) has generated projects based on NCRE that have applications in irrigation technologies.

At the institutional level, the Renewable Energies Center (CER) will be strengthened in order to promote and facilitate conditions for the introduction of NCREs in Chile.

Best Regulatory Practices

The quality of regulations is associated with the implementation of best practices or regulatory procedures. These practices become an important tool for allowing countries to generate more efficient regulations in order to reach public policy objectives, ratifying the legitimacy of processes, promoting transparency and availability of information, generating social benefits and increasing the efficient use of government resources (OECD 2011). These practices must be improved on an ongoing basis, encouraging regulatory efficiency and avoiding unnecessary costs that limit the country's economic growth.

In accordance with the principles promoted by the international entities in which Chile participates, such as the OECD and APEC, regulatory best practices regulations can be summarized in the following components: i) the existence of an internal agency or mechanism that coordinates regulatory work; ii) the assessment of the impact of new regulations and existing ones; and iii) public consultations for processes that involve creating and modifying regulations.

In this regard, the OECD's Council on Regulatory Policy and Governance set out 12 recommendations for regulatory policy for its member states (OECD 2012). Chile accepted the recommendations, which means that it has made a commitment to move towards the standards in the area of regulatory management.

The recommendations recognize the importance of high-level commitments to the development of an explicit and comprehensive government policy on regulatory quality. To that end, regulatory coherence must be promoted through supranational, national and subnational coordination mechanisms, identifying issues with regulations, promoting regulatory coherence and avoiding duplications. Governments must adhere to the principles of open government, including transparency and participation in regulation processes in order to ensure that the regulations serve the public interest and can be informed by legitimate requests from interested parties.

Furthermore, it proposes integrating the Regulatory Impact Analysis (RIA) into the first steps of the process of formulating new regulatory proposals. This is a systemic approach to the critical evaluation of the positive and negative effects of proposed and existing regulations as well as non-regulatory alternatives.[26]

The systematic reviews of compliance and the suitability of current regulatory policy objectives, including considerations of cost and benefits, is another key recommendation for ensuring that the standards in place meet the objectives. These reviews must be included in regular publications on the performance of regulatory policy that include information on the use of management tools such as RIA, public consultation practices and the review of existing standards.

Along these same lines, the changes made in 2010 through Law 20,417 incorporate the Council of Ministers for Sustainability, which is composed of 11 ministers from various areas who must rule on any bill or presidential decree with environmental content. This allows the body to ensure the integrity of the regulations, reducing the possibility of regulatory duplication and facilitating the inter-ministerial coordination process.

In what refers to the exercise of public consultation mechanisms, Chile passed Law 20,285 of 2008 on Access to Public Information, which is known as the Transparency Law, and the Citizen Participation in Public Management Law, Law 20,500 of 2011. The main objective of the latter is to strengthen civil society organizations, promoting a culture of shared responsibility, promoting and guiding citizen contributions towards the improvement of policy efficiency and effectiveness. It also promotes citizen control of actions developed by all public agencies. The law on access to public information states that by virtue of the principle of transparency of the public function, the actions and decisions of government administration agencies, their foundations, the documents used to sustain them or that are essential to them, and the procedures used in their passage are public, except for those identified in the law and provided for in other laws of qualified quorum.

The law states that it is the government's duty to facilitate citizen participation in matters of environmental protection. It sets out minimum mechanisms for citizen participation in three areas: the development of environmental standards, plans and regulations; the environmental impact assessment procedure; and the use of the right to submit complaints regarding potential infractions of environmental law.

26 See http://www.oecd.org/gov/regulatory-policy/ria.htm.

In regard to environmental management instruments, such as environmental quality and emissions standards and prevention and decontamination plans, Law 19,300 allows for a process of citizen consultation with a time frame of 60 business days. Furthermore, a public file for each regulatory project is maintained throughout the process. The Ministry of the Environment has voluntarily submitted for public consultation the proposal for new regulations for the Environmental Impact Assessment System, the Regulations for Emissions Registrations and the Regulations for the Transfer of Pollutants. This has allowed society to be involved in national and regional regulatory management and for the improvement of the regulatory proposals promoted by the ministry as a result of the incorporation of relevant observations received through that channel.

Another type of public consultation is related to ILO Convention 169. In 2009, Chile ratified this convention, which requires that indigenous communities be consulted when legislative or administrative measures that may directly affect them are established. Supreme Decree No. 40 of 2013 by the Ministry of the Environment recognizes this practice in the environmental assessment process for projects.

In regard to RIA, Chile has ex ante assessments as per laws on specific areas, such as technical obstacles to commerce, small businesses, and the environment.[27] Law 19,300 also provides for the development of a General Economic and Social Impact Analysis for all regulatory processes for environmental quality, emissions and prevention and decontamination plan standards. The analysis includes the estimate of costs and benefits (if it is possible to estimate them) for the government, the regulated party and society, and would imply the implementation of the environmental management instrument proposed through S.D. No. 38 and S.D. No. 39, both of the Ministry of the Environment, making it an important decision-making instance.

In addition, Law 20,416 states that ministries or agencies that issue new standards that impact small businesses must report them to the Ministry of the Economy, Development and Tourism, providing a simple estimate of the social and economic impact that the new regulation will have. Specifically, for small businesses, as per Law 20,416, the feasibility of offering compliance deadlines and specific support in order to help the entity adapt to new environmental requirements or exempt it from certain regulations is proposed.

In order to examine which results of the application of the regulation are maintained, ex post assessments must be conducted periodically. These analyses must also contain an assessment of economic, social and environmental impacts. In the area of the environment, Law 19,300 states that all regulations must be reviewed at least every five years in order to improve their implementation and environmental efficiency or analyze and correct possible deviations in the established goals.

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27 Similar spaces for evaluation, such as: i) Law 20,530 states that the Ministry of Social Development must issue a report on new social programs or those that are to undergo significant changes in order to ensure coordination in the design of social policy; and ii) The financial and public spending assessments developed by the Budgeting Office (DIPRES), which fall under the purview of the Ministry of the Treasury, are recognized for bills submitted to Congress related to tax collection and new programs or initiatives that have not previously received resources for their execution, in which clear evidence is requested regarding the existence of a gap or ned in the population and if it is being addressed by another public agency. Entities also are asked to explain damages or negative effects that the presence of the problem causes in the target population, which also can be expressed as opportunities or benefits that the population is not receiving.

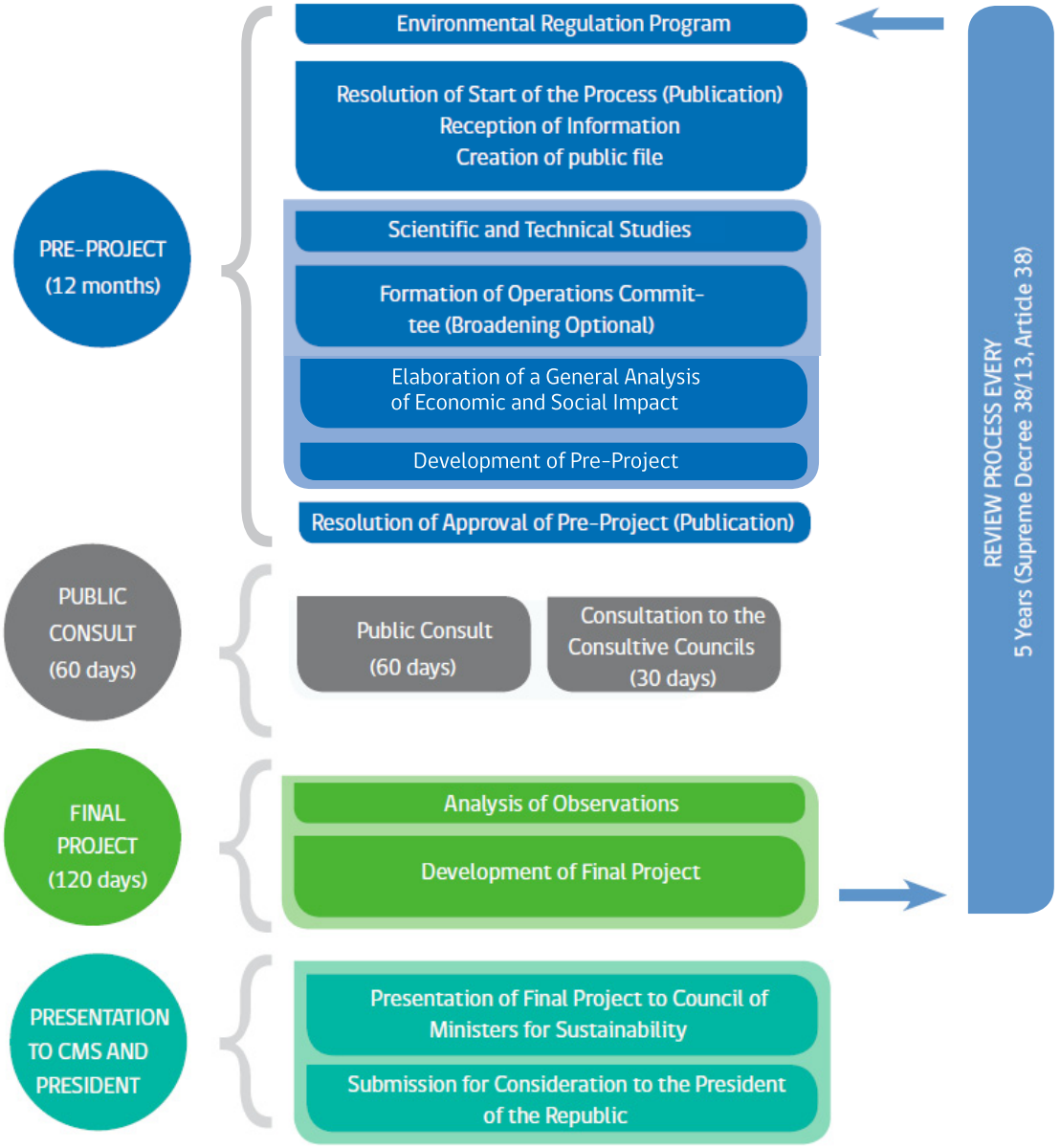
In what refers to international agreements, the Ministry of Foreign Relations established through Law 19,912 and Decree No. 77 of 2004 that, in order to comply with the obligations deriving from the World Commerce Organization (WCO), the new regulations should indicate the purpose of the regulations, the reasons why that approach was used, the alternatives considered and reasons for rejecting them, a description of advantages and disadvantages, the technical viability of the verification of compliance with the measure and the existence of applicable international standards in that area.

Furthermore, Law 19,912 adjusts legislation as per the WCO agreements signed by Chile. All technical regulation projects must be remitted by the entity empowered to issue it by law for the purposes of meeting the notification and reception of observations requirements of other WCO members. The Ministry or agency that may issue regulations in that area shall publish the technical regulation that it wishes to adopt on its Website. The respective official should make available to all interested parties a report that must contain: a succinct explanation of the purpose of the measure that it wishes to implement and its contents; the alternatives considered and reasons they were rejected; a description of the advantages and disadvantages of the technical feasibility of confirming that the measure is met, in order to ensure individuals to formulate written observations for at least 60 days; and the background information that it deems necessary.

Concerning the assessment of regional territorial organization plans, inter-municipal regulatory plans, municipal regulatory plans and sectional plans, urban development regional plans and coastal zoning, maritime territory and the integrated management of basins, Law 19,300 Article 7bis, requires the development of a Strategic Environmental Assessment. This assessment considers the minimum elements recommended as best practices at the international level, namely, inter-ministerial coordination, citizen participation and an environmental report describing the impacts.

As stated in the law, this type of assessment is a procedure conducted by the respective ministry. Environmental considerations for sustainable development are incorporated into the process of formulating the plans that impact the environment or sustainability such that they are included in the issuing of the respective policy and plan and any significant changes. In the case of general policies and plans, the ministry may voluntarily submit to the consideration of the Council of Ministers the issue of whether the President should be asked to submit it to the procedure described. This strategy considers promoting the use of this environmental management instrument in the design of sectoral policies and plans.

Figure 11: **Administrative Procedures for the Approval of Standards and Plans**



Source: Developed by the authors.

Promoting the Market for Environmental Goods and Services

Environmental management instruments and the external market's demand for sustainable products have encouraged the development of a national market of environmental goods and services. A recent study by Environmental Business International Inc. and Nathan Associates Inc. (2011) estimates that the national market for environmental goods and services reached 1.7% of the GDP in 2010. Annual growth of this market is projected to be in the range of 7 to 8% over the next few years, mainly driven by the environmental requirements that have been put in place in the country. In order to develop this market, eco-innovation and development of skills must be encouraged to meet the demand for workers with green skills.

The challenges that Chile has yet to fully address in this area along with the opportunities that it has, will drive significant growth of its environmental goods and services market. Innovation is key for promoting green growth and could be encouraged through a combination of policies in a coherent framework. Technology transfer has an important role to play as long as commercial and financial flows can circulate freely. According to the OECD, technological cooperation can promote green growth. However, in the medium-term, Chile must generate national capacities for developing a market of environmental goods and services (OECD LEED, Martínez et al. 2013)[28].

In conclusion, in order to develop an environmental services and products market, eco-innovation and development of skills must be encouraged in order to meet the demand for workers with green skills. The sections that follow address aspects of this strategy that touch upon eco-innovation, entrepreneurship, green jobs and training.

Eco-Innovation and Entrepreneurship

The European Union panel defines eco-innovation as the creation of innovative articles, processes, systems, services and procedures at competitive prices designed to meet human needs and provide better quality of life for all, with a life cycle that uses the minimum number of natural resources (including energy, materials and surface area) per production units and the minimum release of toxic substances (Bleischwitz 2009).

In response to the various environmental problems that exist, the market has increased its demand for goods and services with smaller environmental impacts in terms of production and consumption. Governments are moving towards legislation that incorporates require-

28 http://www.oecd.org/cfe/leed/Green_growth_Chile_Final.pdf

ments regarding the impact generated by goods and services over the course of their life cycles. Companies have adjusted their business models to reflect this trend, adopting technologies and practices that allow for the generation of products that meet these standards.

This constitutes a fertile ground for innovation and ecological entrepreneurship, which brings an opportunity linked to this new demand as well as a challenge due to the strong competition from developed nations, which are in the lead in this area. As a result, emerging nations must encourage companies and entrepreneurs to invest in eco-innovation in order to lessen the gap with industrialized nations.

In general, the dynamic of environmental innovation is incipient in Chile, particularly given that our country is a net importer of environmental technology. The capacity for innovation depends directly on the business ability to develop knowledge and technological adaptation, the availability of adequate public policies, support from the academic sector, which can respond to the required scientific research, and the development of strategic alliances at the national and international levels (Moguillansky et al. 2006). According to the National Commission of Scientific and Technological Research (CONICYT), the growing openness towards international markets requires Chilean producers to make an effort to broaden their knowledge and increase scientific and technological development, technology transfer and innovation (CONICYT 2007), without which they cannot position themselves in the market.

On the other hand, it is important to note that eco-innovation is closely linked to sustainable production or cleaner production, which emphasizes prevention. This in turn implies a change in production methods and the development of new products that have a smaller impact on the environment.

The first elements for promoting innovative capacity correspond to economic support in the early stages (subsidy and/or financing) for concept and prototype testing, technology transfer, support for internationalizing a company, an environment of financial support (risk funds, financial institutions that encourage entrepreneurship, incubators, etc.) and an institutional environment that limits bureaucracy. In Chile, each of these elements is being encouraged through lines of support from CONICYT and CORFO.[29]

In regard to support during early stages of development, CORFO has had significant media coverage at the international level thanks to its Start-Up Chile initiative. This has become a potent tool for supporting business development and strengthening the innovator/entrepreneur environment, including those corresponding to the market for environmental goods and services. The presence of FTAs in key markets, macroeconomic stability that allows investors to access excellent loan rates and programs like Start-Up Chile will allow Chile to position itself as a pole of innovation in Latin America.

In developed countries, investment in Research and Development represents an average of 25% of the GDP (OECD). By contrast, in Chile, this number reaches only 0.5%, which shows that we still face significant challenges in regard to improving our competitiveness. As a first step towards correcting this, Law 20,241 was drafted in order to improve the competitive

29 CORFO = Economic Development Agency.

capacity of Chilean companies, establishing a tax incentive for investment in R+D that allows entities to reduce through taxes 35% of the resources allocated to this type of activity.

Concerning technology transfer, it is important to establish long-term connections to the academy, research centers and private producers. CORFO has a program for Attracting International Centers of Excellence in R+D through which it has held two international competitions. The goal is to support the creation of such centers in Chile in order to develop R+D activities, technology transfer and marketing in areas on the technological frontier that have a significant national and international impact and strengthen national R+D capabilities.

The majority of these centers have one or more lines of research linked to the sustainability of productive sectors. In 2009, CORFO organized the first call for proposals for Centers of Excellence, approving the installation of the first four such entities (Fraunhofer Chile, Csiro Chile, Inria Chile and Wageningen Chile). A call was issued for institutional and corporate centers during 2013 which will allow for the installation of nine such entities, bringing the total number of International Centers of Excellence contributing to more sustainable development for our country to 13.

In order to encourage innovation in productive sectors that have not fully exploited an opportunity for a market, CORFO has an initiative called Innovation Programs. The first stage involves assessing the level of opportunity and identifying gaps that keep sectors from reaching their full potential. During the second stage, a plan of action is designed to decrease the gaps through coordination and dissemination of a set of initiatives for that purpose. These are implemented with the participation of various interested economic agents. The Innovation Programs are an excellent tool for supporting sustainable sectorial development. Seven Innovation Programs were developed through 2013, each of which presents a different level of progress. They are: Mining Providers, Healthier Foods, Sustainable Tourism, Sustainable Construction, Sustainable Fishing, World Class Technology Companies and Defense Industry.

In addition, the country has developed initiatives focused on NCREs. In 2008, a competition was held to finance two technological consortia with a focus on R+D based on lignocellulose. They were won by Biocomsa and BioEnercel. These projects are currently in the final stages of CORFO funding. In 2009, a similar call was issued for the development of micro and macro algae. The winning projects were submitted by BAL Biofuels, Algae Fuels and Desert Bioenergy. There is also a technological consortium called C4E that seeks applications in the use of copper in energy technologies.

In 2012, the Renewable Energies Innovation competition was held, and ten self-supply projects were awarded using the ESCO model. Finally, in September 2013, a Corporate International Center of Excellence was adjudicated to Laborelec GFD Suez, which has research lines on issues of NCRE and energy efficiency. Also, using Ministry of Energy funds, a call for proposals for a not-for-profit International Center of Excellence with a focus on the solar industry was issued. The German center Fraunhofer ISE was recently awarded that project.

CORFO is currently working on the launch of a new call to attract an International Center of Excellence in the development of marine energy generation technologies involving wave and tidal power, marine currents and saline and/or temperature gradients. It will be awarded

in 2014. There are several projects in the context of the CORFO competition "Public Goods for Competitiveness" and technology dissemination programs in the area that are being developed. CONICYT recently awarded a FONDAP center related to solar power, led by Universidad de Chile and composed of six national universities and Fundación Chile.

The environment for business development in Chile has improved substantially. Law 20,494 reduced the procedures involved with creating a new business to one day with zero cost. In regard to resolving insolvency issues for businesses, Congress approved the bill for the Reorganization and Liquidation of Companies in October 2013, which modifies the bankruptcy law. One of the goals of this bill is to facilitate the transfer of assets from failed companies to new businesses and to keep the failure of a business from limiting the entrepreneurial spirit. The new law sets out reorganization processes that allow for viable conditions and agreements to be established in under 116 business days (less than four months) while the liquidation processes are shortened and may not exceed 327 business days (less than 4.5 years). Efforts to simplify administrative work and reduce the costs involved with developing new businesses must be redoubled (World Bank 2013a).

In order to promote business development, the Chilean government declared 2013 "The Year of Innovation." This initiative has a budget of US$1 billion and involves coordinated efforts by over 20 ministries and public services. In the context of this initiative, the Ministry of the Environment launched an Environmental Innovation and Business Development Competition that forms part of the XVII Environmental Protection Fund. The competition has three major areas: water efficiency, waste management and efficient use of wood.

As part of its attempts to coordinate innovation efforts in the country and project its long-term development, Chile has created the National Innovation Council for Competitiveness, which advises the President on an ongoing basis. Its main goals are to achieve broad and ongoing dialogue with stakeholders in the innovation system and to develop the Innovation and Competitiveness Agenda for 2010-2020.

In general, there is a series of programs and initiatives in place to promote innovation. The focus is on strengthening innovation and business development in order to increase competitiveness. These lines of work also apply to eco-innovation. This Green Growth Strategy involves expanding the development of innovation programs in the area of sustainability, in order to encourage innovation in areas related to sustainability and coordinate the various stakeholders to provide adequate economic support, technology transfer and links to other markets for these new businesses.

Finally, it is important to note that research and innovation require the appropriate training of human capital. According to the Ministry of the Economy data, in 2010, some 17,910 individuals worked on research and development. Of these, 52.8% are researchers and 31.8% are support technicians (MINECON 2012). CONICYT offers national and international scholarships designed to allow individuals who are interested in environmental topics to access funding.

Green Jobs and Training

As the OECD has stated, many empirical studies have shown the connections between business initiative, small business activity, economic growth and job creation. These effects of growth and job creation can occur through innovation given the creation of new companies and increase in small business productivity, providing new uses for or reuse of certain resources (OECD 2010). Public and private investment in R + D + TI (Research + Development + Technological Innovation) plays a key role for the adaptation of existing businesses to environmental requirements and the creation of new businesses (eco-business) and, as a result, the generation of jobs.

At the global level, the implementation of environmental management instruments and greater demand for environmentally friendly products has boosted job creation. Clean production requirements will increase significantly in the coming years, and we expect to see a strong demand for highly qualified human capital in the areas of development and application. Integrated water cycle management (reuse of water, desalination, and efficient risk), integrated ecosystem management, ecological transport systems, solid waste management, ecological agriculture, environmental consulting services, renewable energy development and energy efficiency could be important sources of green jobs in the future. (Note that the OECD states that there is as yet no common definition of "green jobs" at the international level. (OECD 2011a).

Green jobs cannot be understood without the existence of a market for environmental goods and services. In the case of Chile, such a market has begun to grow slowly since 1994 with the passage of the Environmental Framework Law, which marked the beginning of national environmental policy. In general, Chile lacks research on the volume of the market for environmental goods and services and job creation in relation to the protection of the environment. The country must take on the difficult challenge of developing detailed studies that discuss the jobs created and future potential for employment in the environmental sector. Recent research suggests that the environmental goods and services market employed approximately 28,700 workers in nearly 2,010 private companies in 2010 in Chile (Environmental Business International Inc. and Nathan Associates Inc. 2011).

Green jobs represent a significant challenge for countries to adapt their educational and training systems to the new needs in this area. Today, many professions require skills and knowledge related to the environment. Furthermore, new professional profiles have emerged in response to the demands of the environmental market. However, it is not always necessary to train experts with a high academic level. Many small businesses require environmental technicians and have made it clear that there is a lack of training in this area.

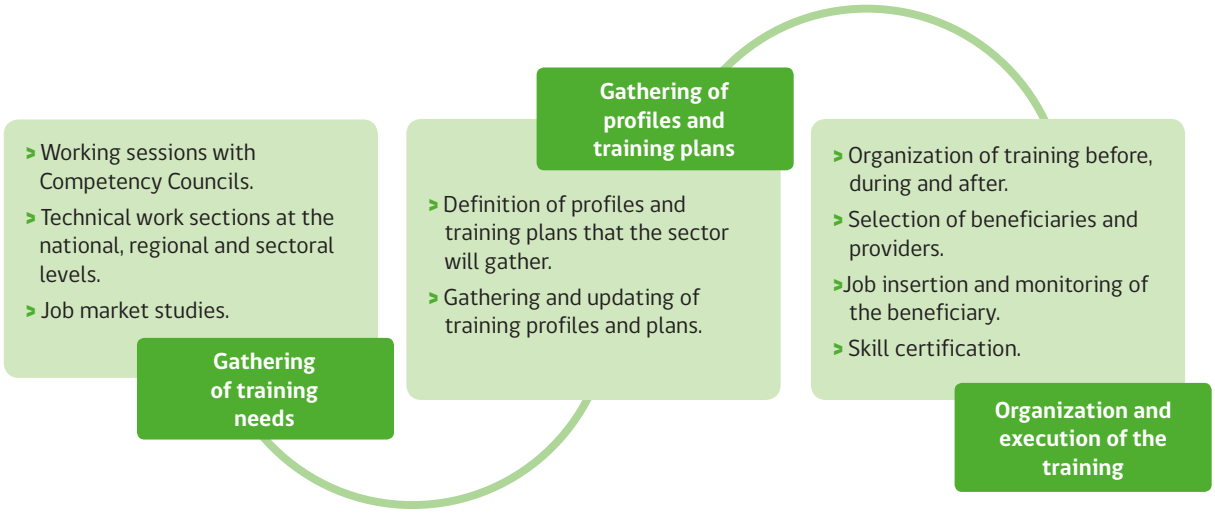
In that context, the National Training and Employment Service (SENCE) faces a series of new challenges. Available tools such as tax franchise management, which allows companies to recover investments in training for their workers, and the administration of the National Training Fund (FONCAP), which provides for the financing of free training in the context of social programs, will allow for the development of skills related to the environment through

their focusing efforts. The National Labor Skills Certification Commission (ChileValora) will certify those skills.

The purpose of SENCE is to promote the development of labor skills. ChileValora is meant to certify those skills in alignment with the demands of the market. Both look to contribute to the existence of a continuous training system in Chile that allows individuals to develop training routes and incorporate new skills over the courses of their lifetime regardless of where they have acquired them.

As such, SENCE and ChileValora work together to achieve a quality training process. This process begins by aligning the offer with productive sectors' training needs through the development of profiles and translation of the same into training plans. The process ends with the execution of the training activity and monitoring of the beneficiaries. The figure below presents the entire process and shows how it should be adjusted in order to allow workers to acquire the skills that they will need for new green jobs.

Figure 12: General Map of the Training Process



The first stage involves gathering key information in each region of the country regarding progress made on green jobs and structuring training programs around green skills and contents throughout the country. Using interviews with companies and organizations in each region, SENCE identifies needs in specific areas, which is a solid approach to learning about the needs that exist for green skills.

During the second stage of the training process, public/private actions must be identified in relation to green training initiatives, and they must be coordinated with ChileValora and SENCE. Two key projects related to the environment that have been promoted by ChileValora merit mention here.

The first is part of the Montreal Protocol on Substances that Deplete the Ozone Layer, which establishes a legally binding multilateral environmental agreement designed to protect the ozone layer through control of production and consumption of the substances that deplete it. The Ministry of the Environment and the Chilean Chamber of Refrigeration and Climate Control (currently accredited as an Assessment and Certification Center) signed a cooperation agreement to gather four occupational profiles in order to develop worker assessment and certification processes.

The process of identifying those profiles was conducted by the Sectorial Labor Skills Agency (OSCL) and the profiles that were accredited were included in the ChileValora catalog. They are: industrial refrigeration systems technician, commercial refrigeration systems technician, climate control systems technician, and commercial climate control systems technician.

The project indirectly or directly benefits at least six thousand workers in the field who install and provide corrective and preventive maintenance of refrigeration and climate control systems, which range from self-contained equipment like domestic refrigerators, freezers, refrigerated cases, and window and split air conditioners to refrigeration chambers and chillers. However, it is not possible to determine the precise number of workers who will benefit from the project because many of them are informal workers and come from other technical specialty areas, such as mechanics and electricity.

The second project is developed in the context of the public policy on promoting NCREs on different scales and the new technology needs for self-generation of energy at the residential and commercial levels, specifically photovoltaic and thermal solar technology. There is thus a need to provide industry with qualified labor that can implement this sort of project and has the technical, security and environmental knowledge to ensure correct installation and implementation. As such, it is possible to satisfy the demand of a growing market with appropriate quality standards. Given this, the Renewable Energies Center recently submitted a project proposal to ChileValora in order to develop profiles for thermal solar and photovoltaic systems installers.

While SENCE and ChileValora have made progress in the area of training, Chile faces various challenges related to training in general. The absence of a national and sectorial program related to green jobs makes it difficult to develop the offer of training in this area. In 2013, 119 courses related to green skills[30] were offered by SENCE. However, the majority of them are not connected to job profiles or specific training plans. SENCE does not have a specific area for courses related to green skills, nor does it have an agreement or funding policy, as companies that train in this area come from various productive sectors.

SENCE and ChileValora have identified 21 sectors as areas of action in order to organize the system.[31] The construction sector has the largest percentage of green training programs (37%) followed by services (13%) and trade (12%). Note that only 1.6% of the 977,141 indi-

30 For the purposes of an analysis of SENCE training programs, we defined green skills training programs as courses related to the environment, eco-energies, renewable energy, sustainability and green spaces.

31 The organization of the sectors is mainly based on the International Economic Activity Classification (CIIU4.CL). See the classification documentation for more information.

viduals trained in 2013 have taken part in courses related to green skills. Also, while SENCE has four program lines related to labor skills (franchise scholarships, training bonuses, training for work and tax franchise), the last line alone offers 92% of the training programs related to this type of skills.

In order for a green skills training program to be successful, the most adequate institutions must be identified, so that training in green skills meets the demand and the needs of target groups. Training of teachers and management staff will allow these institutions to design and implement training based on an analysis of the demand for qualified personnel in a specific sector like the environmental sector.

There is a need to strengthen the work of Technical Training Agencies (TTAs), focusing on training of human capital and increased productivity, ensuring that the skills are useful for the jobs that are offered. Of the 3,044 existing TTAs, only 3% offer courses that involve green skills.

Though the majority of SENCE training courses are offered through TTAs, companies also need to be positioned as training providers. The SENCE Apprentices Program offers training within companies and could install a green skills generation policy. Both TTAs and companies that procure training must have all of the characteristics that allow for optimal execution of this process, in accordance with a labor skills-focused training approach.

In order to provide training on green skills, the existing curricula, standards and training programs must be reviewed. Companies and TTAs must develop permanent links in order to carry out these changes. It also will be necessary to establish minimum objective criteria for authorizing TTAs to provide these skills. The contents, definition of labor profiles and quality of TTA courses must be set out in collaboration with each productive sector, SENCE and the training institutions.

There is also a need to integrate green skills into existing labor profiles, identify the needs of each sector in regard to those skills and define new labor profiles for the topics that are already seen as important opportunities in the economy.

The Green Growth Strategy proposes the design of a national and sectorial green job plan that will be coordinated through the creation of a committee that organizes the work of SENCE, ChileValora, and the Ministry of the Environment, in alliance with the productive sectors and in line with the implementation of CORFO innovation programs on topics of sustainability. This includes the areas of construction, tourism, renewable energies, fishing and aquaculture, and other fields that will be developed in the future.

Finally, it is necessary to determine the volume of the current supply and long-term demand of qualified personnel in the environmental goods and services market. All of the information that is gathered on this area should be systematized in order to allow for proper monitoring and measurement of the progress made in the area of green employment and training. The studies needed to create the minimum base of information to facilitate the development of the proposed green jobs program will be implemented.

Monitoring and Measuring of the Strategy

In order to improve the design and implementation of public policies, one must have systematized, timely and efficient data as well as a set of indicators that allow for adequate monitoring of this type of policy. This section addresses monitoring and measurement tools that will be used to monitor the progress made with the lines of action of the strategy in terms of execution and results.

According to (ECLAC 2009), indicators provide information on complex and dynamic processes of change in a synthesized manner. With the right indicators, public officials who oversee processes can identify trends and avoid undesirable results. Those who apply policies can measure their effectiveness, calibrate instruments and programs and focus efforts at the right time. Indicators also can provide the means to identify the expected results and establish goals using an objective metric (ECLAC 2009). Chile will continue to monitor its progress, adopting green growth indicators and including metrics to adequately valorize natural resources.

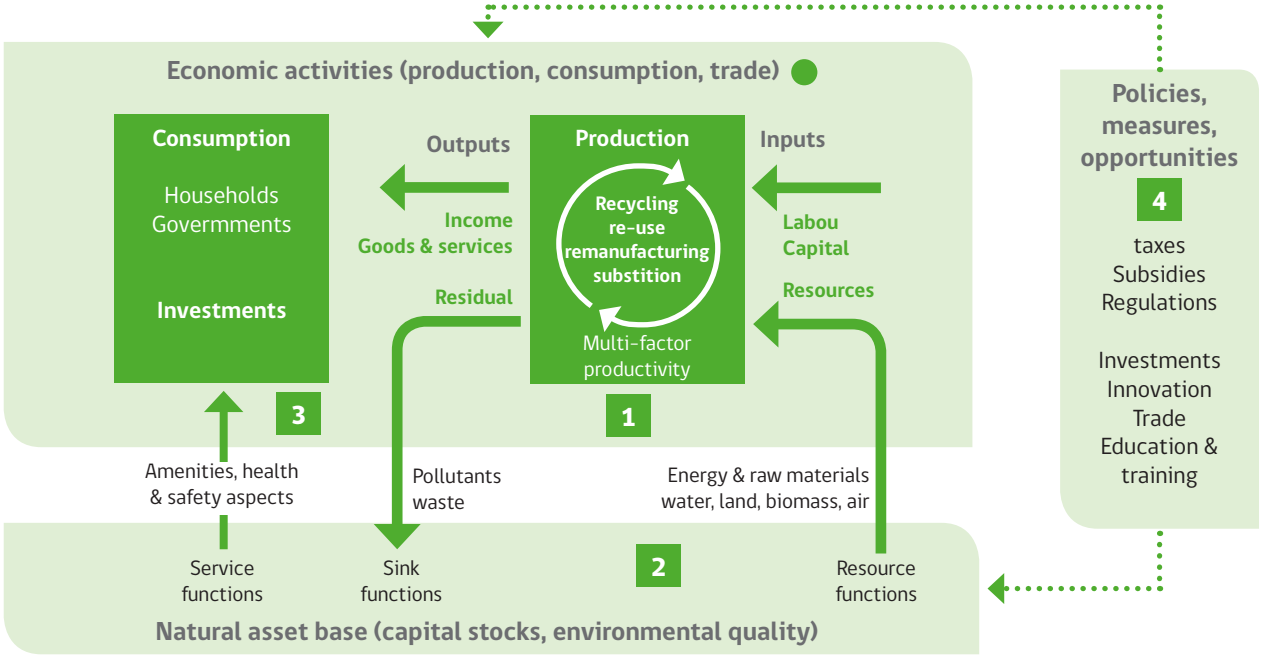
This section on indicators is organized around three topics: green growth, environmental behavior and wellbeing. The first section is based on the indicators proposed by the OECD to monitor green growth. The second describes a responsible environmental behavior index that allows for information about this topic to be explored, understood and broadened. Finally, the third section focuses on indicators that are meant to reflect the wellbeing of the population on an aggregate level.

Green Growth Indicators

An indicator is a variable that shows meanings that are not immediately evident when they are presented in an adequate context and described in function of the value assumed in a territory, sector and other aspects related to context (ECLAC 2009). As a result, in order to adequately monitor the progress of a public policy, an effort must be made to measure progress in the sectorial and territorial context. National, regional and local indicators must be proposed for monitoring the National Green Growth Strategy.

The OECD has identified 30 indicators for monitoring green growth (OECD 2011c) on the basis of the work done by it and other international agencies as well as member states. The framework of green growth indicators, their groupings and the topics addressed are presented in the figure below.

Figure 13: **Framework for the Development of Green Growth Indicators**



1 Indicators monitoring environmental and resource productivity
2 Indicators monitoring the natural assete base
3 Indicators monitoring the environmental quality of life
4 Indicators monitoring economic opportunities and policy responses
● The socio-economic context and characteristics of growth

Source: OECD 2011c.

Some OECD countries do not yet have green growth indicators. Furthermore, the indicators outlined for countries that have this tool often fail to allow for international comparison. The OECD is aware of the problem and has stated that supervising progress towards green growth requires indicators based on comparable data at the international level. However, the agency also has said that what is true for most of the indicators is also true for green growth indicators: they are always limited in some areas, and should be interpreted in the specific context of each country (OECD 2011c). In order to monitor the process towards green growth, the OECD has proposed a series of indicators that are grouped into five areas: environmental productivity and use of resources, base of natural assets, the environmental dimension of quality of life, economic opportunities and response, and characteristics of growth (OECD 2011c).

The first basic step for estimating the proposed indicators is having good quality information. The OECD highlights this idea in its work, and it is thus a priority for our country to have environmental information with international standards. Chile accepted the recommendations of OECD Environmental Information Council recommendations (C (98) 67/Final) on information and environmental indicators (C (90) 165/Final) and the report on the State of the Environment (C (79) 114). In general, these encourage member states to increase the availability of environmental information generated by the public sector regarding environmental indicators and reports on the state of the environment, increase efforts to improve the quality, comparability and importance of data for environmental policies and environmental information systems and related economic variables, and develop and use indicators in order to measure environmental performance.

The Environmental Framework Law provides valuable tools for reaching those goals. Article 70 of Law 19,300 states that the government is required to generate environmental status reports every four years at the national, regional and local levels.[32] The government also must present a consolidated report on the situation of the environment at the national and regional levels (Law 19,300 Article 70 ñ).

Recognition of the right to access to environmental information and the obligation to generate reports on the state of the environment are based on Principle 10 of the 1992 Rio de Janeiro Summit and recommendations formulated in the OECD Environmental Performance Test. As part of the 52 recommendations that it made, the OECD states that the country must consolidate efforts to provide environmental information, reports on the state of the environment and environmental indicators in order to strengthen decision-making and public information, considering international methodologies.

The publication of the Environmental Status Report[33] two years after the creation of the Ministry of the Environment represents an important milestone in the adoption of international standards regarding access to environmental information. This is understood to be separate from access to public information, which is essential to promoting citizen participation, the decrease in asymmetries of information and the strengthening of democracy. As such, this report is a significant step towards facilitating access to environmental information and also contributes to creating a better informed society with more decision-making tools and participation in matters of shared interest.

In addition, the Ministry of the Environment is required to publish an annual report on the state of the environment at the national and regional levels. The first publication was scheduled for 2013. It is to contain a set of environmental indicators[34] including some of those proposed for the 2011 Environmental Status Report, the indicators proposed by the OECD,

32 The Official Environment Status Report 2011 was released in 2012. It was written using the pressure-state-response model proposed by the OECD (http://www.mma.gob.cl/1304/w3-article-52016.html).

33 The information used was obtained from various public and private institutions that have worked with the Ministry of the Environment on the development of environmental indicators and by providing support in the analysis laid out in this document.

34 Core Environmental Indicators, Key Environmental Indicators, Decoupling Environmental Indicators, Green Growth Indicators, etc.

UN Millennium Development Goal indicators, and others. All of the green growth national and local indicators are estimated following adequate procedures and will be included in the reporting instruments used by the Ministry of the Environment.

ECLAC has stated that the development of indicators requires the construction and maintenance of statistics and availability of an integrated system with continuous flows of information, in order to update the process over time. Basic statistics for calculating indicators are built using data based on a predefined set of procedures derived from national norms and international recommendations. The basic statistics series are thus a set of data that have been submitted to a rigorous statistical validation and have been structured in accordance with an adequate classification. A primary component of the statistics is full descriptions and the support of metadata. The Ministry of the Environment is developing an information system that provides a central data warehouse and integrates environmental information in order to develop environmental indicators and work on the promotion of best practices for guaranteeing the quality of information.

Meanwhile, the Ministry of the Environment is working to improve the National Environmental Information Network[35] (SINIA), the main port of entry to public sector environmental information in Chile. It is also looking to publish all public environmental information available in a timely manner. As part of this effort, the Ministry unveiled a metadata catalog that consists of maps, documents, indicators and databases. All of this work contributes to protecting the public's right to access information and citizen participation in decision-making processes.

The National Environmental Information System will act as a platform for integrating environmental information provided by various public institutions and services,[36] facilitating access to it for them, civil society and the general public, thus avoiding the duplication of efforts and contributing to savings of public resources. Furthermore, the processes involved will improve the quality of information, making it official. It also will allow for the generation of new environmental information such as statistics and indicators and the preparation of reports on the state of the environment. It also will permit automatic reports to be generated in order to meet national and international requirements, including OECD requirements. In order for this process to continue these procedures will be regulated to facilitate the operation of SINIA.

In order to allow for inter-ministerial coordination of this process, the Ministry of the Environment created the Inter-Institutional Environmental Information Committee, through Exempt Resolution 0179. Its members are 50-plus public services, and it is designed to meet the obligations and commitments of the Chilean government and Ministry of the Environ-

35 This system works as a database that allows the user to search through various Websites with structured environmental information: http://www.sinia.cl. The Website includes information about the Environmental SIG, which allows for citizen participation in environmental awareness and management: http://ide.mma.gob.cl/.

36 The Ministry of the Environment coordinates information systems related to environmental management in Chile. The information portals on the environment coordinated by the Ministry include: Pollutant Transfers and Emissions (RETC) (http://www.retc.cl), the National Air Quality Monitoring Network (SINCA) (http://sinca.mma.gob.cl), the Environmental Impact Assessment System (SEIA) (http://seia.sea.gob.cl/), and the National Statistics Institute Environmental Information site (http://www.ine.cl/canales/chile_estadistico/estadisticas_medio_ambiente/).

ment regarding the environment as part of their normative framework and as a result of international agreements. The purpose of this committee is to provide and validate the necessary environmental information in order to meet the information needs of the ministry of the Environment as per Law 19,300 and the various international agreements signed by the country or in relation to environmental matters.

Indicators of Environmental Behavior

As we have indicated, one of the greatest causes of environmental deterioration is unsustainable production and consumption patterns. As such, in order to achieve sustainable development and better quality of life for all people, governments must encourage awareness and promote societal involvement in the issue of the environment.

The OECD (2013a) states that one must have a solid understanding of the factors that affect ecological lifestyles in order to develop strategies that promote that behavior. As such, a decision was made to develop an index of responsible environmental behavior[37] that allows members of the public to learn about, understand and expand upon the information available in this area.

In order to build the index, an exhaustive literature review was conducted of the main models that look to characterize and measure environmental behavior. These include cost/benefit analyses such as the Reasoned Action Theory[38] (Hale et al. 2002) and the Planned Behavior Theory[39] (Ajzen 1991); the Norm Activation Model (NAM)[40] (García-Mira and Real-Deus 2001) and the Value-Belief-Norm model[41] ((Stern et al. 1999) and (Stern 2000)), which has been very successfully applied to evaluate the behavior of the suitability of policies. This last model includes comprehensive measurement scales such as the New Ecological Paradigm scale[42] (Dunlap et al. 2002), one of the most frequently used tools for measuring the level of environmental behavior in modern societies.

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37 Responsible environmental behavior is individual or collective human behavior that consciously seeks to protect, preserve and/or minimize negative impact on the natural and built environment (e.g. minimize consumption of resources and energy, use of non-toxic substances, reducing waste production, etc.).

38 The Reasoned Action Theory is meant to explain behavior, assuming that it is under individuals' voluntary control. This approach excludes a large number of behaviors such as those that are spontaneous, impulsive, habitual, the result of desires or simply do not make sense.

39 The Theory of Planned Behavior (TPB) is an extension of TRA that was necessary due to the limitations observed in the original model for evaluating conducts or behaviors over which individuals do not have completely voluntary control, that is, areas in which individuals cannot decide whether or not to engage in the conduct.

40 The Norm Activation Model is composed of four variables that explain behavior: values, personal standard, awareness of consequences and attribution of responsibility.

41 The Value-Belief-Norm Model (VBN) developed by Stern et al. (1999) links the NAM to the New Ecological Paradigm, creating a causal link of five variables that lead to pro-environmental behavior: (i) personal values, (ii) the new ecological paradigm, (iii) awareness of consequences, (iv) attribution of responsibility, and (v) personal standards (see Figure 6) (Stern 2000).

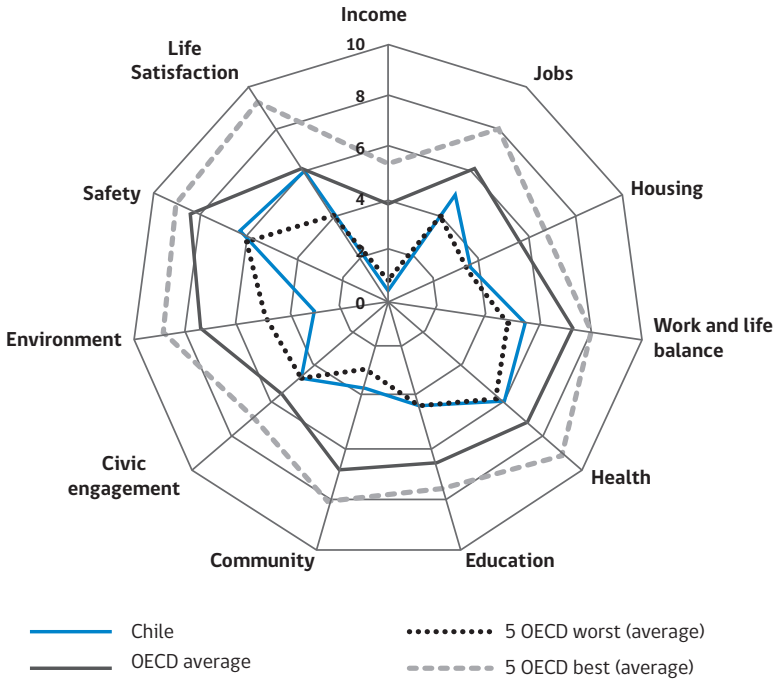
42 The New Ecological Paradigm (NEP) is a scale of 12 items developed to measure the level of responsible environmental awareness. The scale was a milestone in the form of measuring environmental concern in a society that is more aware of environmental deterioration. The authors of the scale, Dunlap and Van Liere, redesigned the original NEP scale in 2002 in an effort to make some improvements.

In the case of Chile, eight areas in which the behavior of households has a significant impact on the country's environment are considered. These are: energy conservation, waste, consumption, biodiversity, water and air conservation, mobility and transportation, noise and participation. The evaluation also includes socio-economic and demographic variables such as: the characteristics of the respondents' housing, gender, age, educational and socio-economic level and environmental attitudes such as participation in an environmental organization, in order to evaluate whether these factors influence environmental behavior. The indicator contemplates measurements through household surveys in the country's main cities, including Iquique, Antofagasta, La Serena-Coquimbo, Valparaíso, Greater Santiago, Rancagua, Greater Concepción, Temuco-Padre Las Casas, Puerto Montt and Valdivia. The challenge of the Ministry of the Environment in this area is estimating the indicator on a trimester basis, which will allow it to identify possible changes of behavior in the populace. This index will be included in reports on the situation of the environment.

Indicators of Wellbeing

Several indicators seek to elucidate the multi-dimensionality of development in a manner similar to the Human Development Index developed by the UNDP. They assess the performance of countries in areas such as health, education, social relations, environmental conditions, sense of security, personal activities, political voice and governance (Stiglitz et al. 2010). One example of this type of indicator is the Better Life Index designed by the OECD (OECD 2013). A recent study of this indicator shows the gap that exists between Chile and other OECD member states in areas of development, such as the environment.

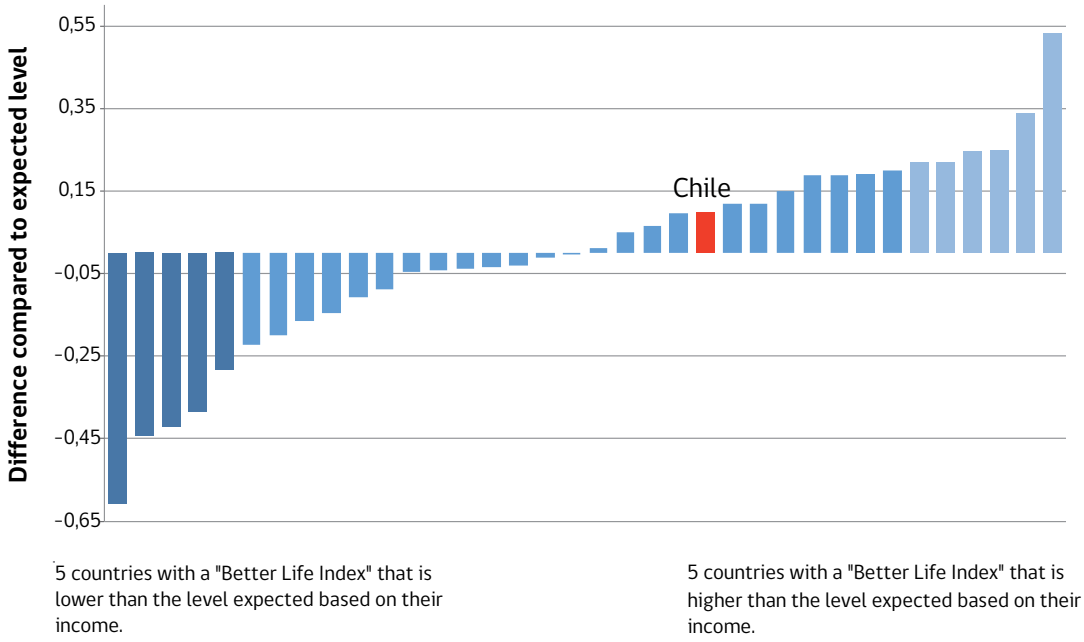
Figure 14: Framework for the Development of Green Growth Indicators



Source: OECD (2013).

Similarly, as shown in Figure 15, Chile is above the expected level of "Better Life Index" compared with countries with similar levels of income. The improvement of some indicators such as the environmental one will cause a continued improvement of living conditions in order to enter the group of the 5 countries with higher than expected level.

Figure 15: Gap of the "Better Life Index" with respect to the expected level according to country income level.



Source: Developed by the authors based on OECD (2013).

There are also indicators that look to complement the GDP through aggregate wellbeing metrics (Arrow et al. 2010). At the global level, there is increasing understanding of the need to include this type of metric in the assessment of development progress as a measurement of sustainability on the path to economic growth ((Costanza et al. 2009), (Stiglitz et al. 2010), (UNU-IHDP and UNEP 2012)). This type of metric includes assessment of goods and services, not traded in the marketplace, that are important for wellbeing such as air or water quality (Costanza et al. 2009) or estimates of spending associated with potential externalities (such as payments for cleaning up toxic waste spills) (Hawken 1997).

According to Costanza et al. (2009), this type of indicator can be broken down into four groups: 1) indexes that can complement the GDP and national economic data; 2) indexes that directly measure wellbeing; 3) compound indexes that combine approaches; and 4) topic-specific indexes.

Some examples of the first group are the Genuine Progress Indicator[43] (Kubiszewski et al. 2013) and Adjusted Net Savings (World Bank 2010). The first is a variant of the Sustainable Economic Wellbeing Index proposed by Daly and Cobb (1989). It uses the same personal consumption data as the GDP and is adjusted through 24 different components such as environmental costs, income distribution, crime, and car accidents. It also aggregates other components that contribute to wellbeing, such as volunteer work and domestic work (Talberth et al. 2006). The only precedent of a national GPI is the work conducted by Castañeda (1999).

The second group includes measurements of subjective wellbeing. The purpose is to measure satisfaction with quality of life or individuals' emotions or outlooks (Diener 2000). The third group is composed of indexes that combine various measurements in a single aggregate index such as those listed, the Human Development Index (UNDP 2013) and the Index for a Better Life.

Finally, the systematic indicators provide data on many indicators separately. Some key examples of these initiatives are the Millennium Development Goals (UN 2013) and the Integrated Economic and Environmental Accounting System ((SEEA 2012); (SEEA 2013)).

Stiglitz et al. (2010) and the EU (2009) recommend complementing the assessment of the development with national studies in social and environmental areas such as distributive effects[44] (ME 2012), environmental sustainability thresholds[45] (Keith et al. 2013), and the impacts of pollution, among others. Based on these recommendations, the Ministry of the Environment will include aggregate indicators of wellbeing and the development of environmental accounts in its reports on the situation of the environment in fulfillment of its commitment to (OECD 2011) and the attributes established in the Environmental Framework Law. To that end, the Ministry is following the guidelines of the (SEEA 2012) and (SEEA 2013), which cover concepts, definitions, classifications, accounting rules and tables agreed upon internationally for the production of comparable statistics at the international level on the environment and its relationship to the economy. The framework of the SCAEI is consistent with the National Accounts System in order to facilitate the integration of environmental and economic statistics. The SEEA also includes physical tables and monetary information.

The SEEA (2012) is divided into three chapters: assets (forests, fishing, water, etc.), flows (air and water pollutants, products, etc.) and environmental spending. Given that the SEEA addre-

43 A revision of the Index of Sustainable Economic Welfare.

44 The environmental impacts are not equally distributed in the population. Effects such as air pollution, final disposal of waste, noxious odors, access to potable water and treatment of waste water, availability of urban green spaces and others, vary depending on income level, age group and other factors (ME, 2012).

45 Ecosystems present points or thresholds of inflection based upon which their capacity to provide goods and services is drastically reduced (TEEB 2010). As such, it is important to monitor indicators that may show how close we are to those thresholds. Examples of these indicators include: the percentage of rivers that do not meet minimum environmental flows as set out in Supreme Decree 14 of 2012 of the Ministry of the Environment, annual fishing quotas as set out in Law 20,657 of the Ministry of the Economy, Development and Tourism, and the number of species classified in various states of conservation as per Supreme Decree 29 of 2011 of the Ministry of the Environment. Finally, the ministry has begun a national initiative to evaluate the state of ecosystems as per the UICN Ecosystem Red List (Keith, Rodríguez et al. 2013), which is designed to determine whether an ecosystem is facing imminent risk of collapse or if it is at risk, in danger or in critical danger.

sses various reports and topics, it recommends starting with accounts that are important for national policies. As such, the Ministry of the Environment has begun to develop reports related to air emissions, forests (existence and flows of biomass and CO2 capture), land use and spending on environmental protection. In regards to air emissions, the work includes the monetization of health impacts perceived by the population due to the problems of air quality in urban areas, using the methodologies described in (MMA 2012), (Zhang, Song et al. 2008) and (World Bank 2013c). Concerning the final point, the Ministry is systematizing the statements on public and private spending as per Supreme Decree No. 1 of 2013 of the Ministry of the Environment and as required by the OECD (OECD 2011).

In order to ensure that these analyses continue to be state-of-the-art, the country recently joined the World Bank's WAVES (2013) initiative, which is designed to promote sustainable development, ensuring that natural resources are included in the planning of development and national economic plans.

Implementation Program

In order to maintain and promote compliance with the principles, objectives and lines of action set out in the strategy, continuous and coordinated work must be carried out under the leadership of the Ministry of Finance and Ministry of the Environment, to promote the inclusion of the environmental component in all areas of sectorial work of public policy.

This requires the development of an operational structure that coordinates and connects the actions to be taken in the area of the environment as per the Green Growth Strategy among the various sectoral ministries. The coordination will be overseen by the Office of the Undersecretary of the Environment through the creation of a Committee on Sustainable Consumption and Production, composed of representatives of participating sectoral ministries from the Council of Ministries on Sustainability. Key stakeholders from civil society and international agencies will be incorporated through consultations.

The work of this committee includes: i) establishing, coordinating and monitoring the procedures required to implement environmental management instruments; ii) developing strategic alliances in order to promote the market for environmental goods and services, establishing programs, mechanisms or plans of action with various specific stakeholders as well as regional government, productive sectors and the people; and iii) managing the necessary public, private and international resources in order to correctly implement the actions and ensure that the strategy objectives can be met in terms of their nature and the timeframes set out in this document.

In order to develop actions that facilitate the transition to green growth, the United Nations Environment Program (UNEP) proposes a ten-year framework program (10YFP) that supports regional and national initiatives. The "Ten-Year Framework of Programs on Sustainable Consumption and Production" is a frame of global action that promotes international cooperation in order to accelerate the transition towards sustainable consumption and production, in both developed and developing nations. The framework supports the creation and strengthening of capacities and facilitates access to technical and financial assistance for developing nations for this transition. The final goal of the transition is to decouple environmental degradation and the use of resources from economic growth, thus contributing to the net increase in economic activities, the eradication of poverty and social development (A/CONF216/5).

The specific actions and goals required in order to reach the goals of this strategy in each environmental area must be defined in detail and in a participatory manner through the design and implementation of a sustainable consumption and production program. A commitment was made in the declaration signed ten years after Johannesburg at Rio+20 (UB 2012). This task will be coordinated through the aforementioned committee.

Both this strategy and the future program on sustainable production and consumption must be reviewed at least every four years, based on a detailed assessment of their results and the degree to which they have achieved their goals using a set of predefined indicators. The monitoring of the progress of the strategy and the sustainable production and consumption program will be conducted based on the national focus point in the area.

The Green Growth Strategy consists of 28 specific actions divided into two main areas: environmental management instruments and promotion of the market for environmental goods and services. The strategy also sets out six monitoring and measurement actions.

The pages that follow present the implementation program generated in order to meet the objectives presented in this document as well as the instruments developed and actions that must be taken in order to do so.

I. General Objectives

Objetive	Instrument	Action	Short-Term (2014)	Medium-Term (2018)	Long-Term (2022)
To promote economic growth and the generation of opportunities subject to a commitment to sustainable management of natural resources, the implementation of adequate instruments for the internalization of environmental externalities, and the promotion of the national market of environmental goods and services.	Environmental management instruments	Sustainable Consumption and Production Program.	✔	✔	
To protect the constitutional right to live in an environment free of pollution, setting minimum standards for quality and environmental risk with clear compliance goals that are verifiable and have realistic time frames.	Minimum standards for environmental quality and risk.	Establish primary and secondary environmental quality standards in order to reach the level of coverage maintained in OECD countries.	✔	✔	
To continue with our commitment to international efforts in the area of the environment, considering shared but differentiated responsibilities, maintaining our competitiveness and reaffirming our integration into the global marketplace.	International commitments	Meet international commitments ratified by the country in environmental issues and participate actively in these matters.	✔	✔	✔

II. Environmental Management Instruments

Command and Control-Type

This type of instrument is related to the goal of fully applying existing legislation, providing legal certainty to the market and promoting efficient use of natural and energy resources as a way of reducing the environmental impact of our economy.

Instrument	Action	Short-term (2014)	Medium-term (2018)	Long-term (2022)
Emissions Standards	Develop emissions standards in order to reach a minimum level of control of polluting emissions.	✔		
Prevention and Decontamination Plans	Develop prevention and decontamination plans in compliance with the limits set in current quality standards.	✔		
Management Plans	Develop management plans for protected wild areas that allow biodiversity to be effectively protected, including protected private property.	✔	✔	
EIAS	Generate and update regulations if needed and technical documents such as assessment guides for sectoral projects that allow compliance with regulations to be accredited and for the respective environmental authorizations to be obtained.	✔	✔	
EIAS	Expand opportunities for formal citizen participation as per S.D. 40/2013 of the Ministry of the Environment.	✔	✔	

Economic and Complementary Instruments

This type of instrument responds to the goal of promoting more efficient environmental management, encouraging the use of economic and complementary tools such as voluntary agreements or environmental education policies.

Instrument	Action	Short-term (2014)	Medium-term (2018)	Long-term (2022)
Specific fuel tax	Conducting local studies that allow us to be able to more precisely identify the social cost of externalities associated with fuel consumption.		✔	
Specific fuel tax	Other more efficient regulatory options for controlling transportation externalities will be considered.		✔	
Tradable emissions permits	Encourage the use of emissions compensation systems in the areas of prevention and decontamination and provide a special law for the use of tradable emissions permits as per Law 19,300.		✔	
Tradable emissions permits	Study the possibility of extending this mechanism to cover substances such as greenhouse gases.		✔	
Extended Producer Responsibility	Process in Congress the Extended Producer Responsibility Law to enable the use of this instrument. according to the update and incorporation of costs and impacts on various industries		✔	
Sustainable Public Purchasing	Encourage the implementation of this practice, incorporating environmental and social criteria for products and services, considering the principle of gradual introduction.	✔	✔	
Environmental Labeling	Allow the Ministry of the Environment to certify, package and label products.		✔	
Environmental Education	Expand the environmental education plan, increasing the coverage of the National Certification of Schools System (SNCAE), the Environmental Explorers Club, the Environmental Protection Fund and the Municipal Environmental Certification System.	✔	✔	
Clean Production Agreements	Incorporate new sectors into Clean Production Agreements and add new businesses to existing agreements.	✔	✔	
Corporate Social Responsibility	Encourage companies from various sectors to follow best practices and publish Sustainability Reports, improving their images and increasing their competitiveness in the markets.		✔	
NAMAs	Expand the use of NAMAs in order to meet our goals in the area of GHG mitigation.	✔	✔	

Sectoral Strategies

This type of instrument responds to the goal of incorporating the environmental area into other public policies, promoting the development of sectoral sustainability strategies.

Instrument	Action	Short-term (2014)	Medium-term (2018)	Long-term (2022)
Sectoral strategies	Formulate sectoral strategies in areas such as Mining and Transportation.		✔	✔
	Promote the introduction of sectoral strategies in areas such as Tourism, Energy and Construction.	✔	✔	

Best Regulatory Practices

This type of instrument responds to two specific objectives: i) assessing the costs and benefits of the available environmental management instruments, incorporating criteria for gradual introduction of small and medium businesses so that they can adapt to new environmental requirements; and ii) guaranteeing active citizen participation.

Instrument	Action	Short-term (2014)	Medium-term (2018)	Long-term (2022)
Interministerial coordination	Strengthen the role of the Ministry of the Environment in the CMS, promoting normative coherence with government coordination mechanisms at the supranational, national and subnational levels.	✔		
Evaluation of regulatory impact	Study the feasibility and efficiency of non-regulatory alternatives as tools for environmental management.		✔	
	Conduct ex ante assessments of the economic and social impact of regulatory and normative proposals and/or environmental programs.	✔		
	Strengthen the analysis of the social impact of regulatory policies, considering aspects of equity and evaluation of vulnerable groups.		✔	
	Expand the regulatory impact assessment to small businesses.	✔		
	Encourage ex post assessments of environmental programs and regulations.		✔	✔
Strategic environmental assessment	Promote SEA in general normative plans of sectoral ministries.		✔	✔
Citizen participation	Establish mechanisms for formal citizen participation.	✔		
	Include citizen participation in the analysis of the socio-economic impact of regulatory policies.		✔	

Development of the Market for Environmental Goods and Services

Eco-innovation and Business Development

This initiative to promote the environmental goods and services market responds to the goal of generating new opportunities for growth through the development of green businesses, eco-innovation and changing technology in order to improve productive processes.

Instrument	Action	Short-term (2014)	Medium-term (2018)	Long-term (2022)
Business Development	To expand the development of innovation programs in areas of sustainability that encourage innovation in areas related to sustainability and to coordinate various stakeholders in order to secure adequate economic support, technology transfer and connections to other markets for these new businesses.	✔	✔	
Eco-innovation	Strengthen research and innovation through adequate training of advanced human capital.		✔	✔

Green Jobs and Training

This initiative for strengthening the market for environmental goods and services is related to the goal of promoting the generation of green jobs through education and training of the labor force with the skills required by the environmental goods and services market.

Instrument	Action	Short-term (2014)	Medium-term (2018)	Long-term (2022)
Training	Develop a national and sectorial l program for green jobs that is coordinated through the creation of a committee that oversees the joint work of SENCE, ChileValora and the Ministry of the Environment, in alliance with productive sectors and in keeping with the implementation of CORFO innovation programs on topics of sustainability including the areas of construction, tourism, renewable energies, fishing and aquiculture and others that are developed in the future.		✔	
Green jobs	Determine the value of the current supply and demand for qualified personnel in the environmental goods and services market in the long-term.		✔	

III. Monitoring and Measurement of Progress

This initiative responds to the overall objective of ensuring the constitutional right of every person to access information held by the state administration and the right of individuals to have access to environmental information established in Law 19.300.

Instrument	Action	Short-term (2014)	Medium-term (2018)	Long-term (2022)
Integration of environmental information	Strengthen the gathering and management of key data for the formulation and reporting of environmental indicators.	✔	✔	
Generation of indicators	Propose local and sectoral indicators for measuring progress in the implementation of the Green Growth Strategy.	✔		
	Generate periodic, local and sectoral indicators that make it possible to measure the policies' progress. Strategies and environmental programs.		✔	
Environmental performance of citizenship	Study citizen environmental behavior through indicators that allow for the evaluation of their environmental performance.		✔	
Environmental accounts	Develop National Environmental Reports, integrating the most important flows of natural capital for the country's development into the concept of sustainability.		✔	✔
Indicators of wellbeing	Including aggregate indicators of wellbeing and developing reports on the situation of the environment.		✔	✔

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